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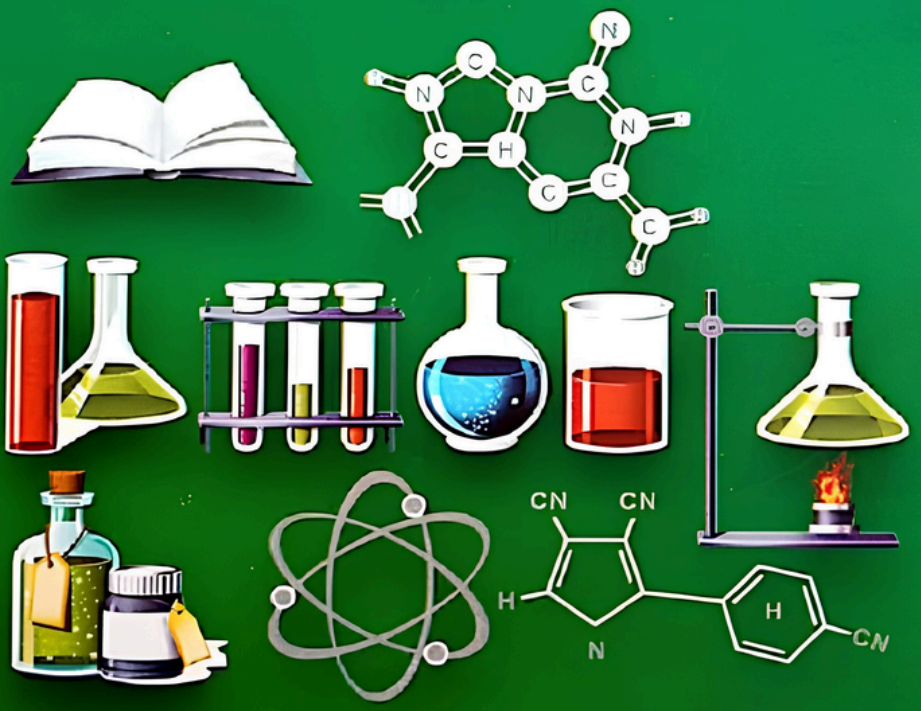
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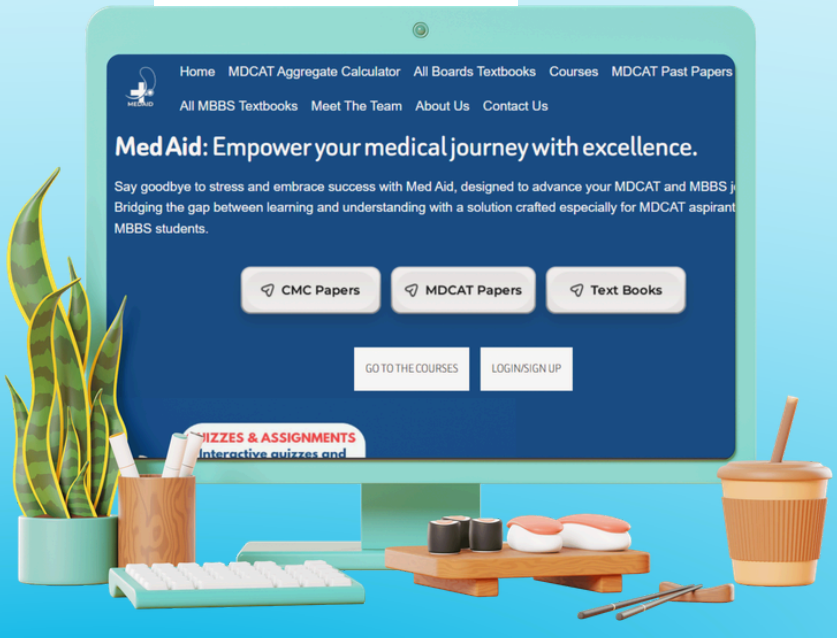
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UNIT 1 PRACTICE EXERCISE

INTRODUCTION TO FUNDAMENTAL CONCEPTS OF CHEMISTRY

1. **Which of the following samples contain the largest number of atoms?**
   A. 1g of Ni (s)
   B. 1g of Ca (s)
   C. 1g of N_2
   D. 1g of B

2. **A metal "M" reacts with "S" to form "MS". If 3.6g of M reacts with 0.09 mole of sulphur. Then what is name of metal "M"**
   A. Cr
   B. Ca
   C. Mg
   D. Mn

3. **The limiting reactant is the reactant which**
   A. is consumed earlier
   B. controls the reaction
   C. gives least moles of product
   D. All of these

4. **Mg metal reacts with HCl to give hydrogen gas. What is minimum weight of HCl required to produced 12g of H_2**
   A. 428g
   B. 448g
   C. 438g
   D. 458g

5. **The number of moles of 0.1kg of calcium**
   A. 0.0025 mole
   B. 0.25mole
   C. 0.025 mole
   D. 2.5 mole

6. **The no. of moles of CO_2 which contain 8.0g of oxygen**
   A. 0.25
   B. 1.0
   C. 0.50
   D. 1.50

7. **The largest number of molecules are present in**
   A. 3.6g H_2O
   B. 2.8g of CO
   C. 4.8g of C_2H_5OH
   D. 5.4g of N_2O_5

8. **The mass of an atom (element) compared with the mass of one atom of C-12 is called:**
   A. One mole
   B. Gram atomic mass
   C. Atomic number
   D. Relative atomic mass

9. **Which of the following is not true for a mole?**
   A. It is a counting unit
   B. It is the gram atomic or gram formula mass of a substance
   C. It contains 6.023×10^{23} particles
   D. It contains different number of particles of different substances

10. **A polymer of empirical formula CH_2 has a molar mass of 28000gmol^{-1}. What is its molecular formula?**
    A. $(CH_2)_{1400}$
    B. $(CH_2)_{2000}$
    C. $(CH_2)_{2800}$
    D. $(CH_2)_{2500}$

11. **The number of moles of NO_2 which contains 16g of oxygen**
    A. 0.25
    B. 1.0
    C. 0.50
    D. 1.50

12. **The mass of H-atom is 1.008 a.m.u. Its mass in kg is**
    A. $1.008 \times 1.661 \times 10^{-23}\,kg$
    B. $1.008 \times 1.661 \times 10^{-27}\,kg$
    C. $\frac{1.008}{1.661 \times 10^{-27}}\,kg$
    D. $1.661 \times 10^{-27}\,kg$

13. Signature of the person with lead pencil increased the weight of the paper by 1.2grams. How many atoms of carbon are present?
A. 6.02×10^{22} C. 3.6×10^{23}
B. 6.0×10^{23} D. 3.6×10^{24}

14. What is the mass (in grams) of 5 moles of water (H_2O)?
A. 90 g C. 18 g
B. 36 g D. 100 g

15. 1g mole of which pair weighs equal?
A. NO_2 and CO_2 C. CH_4 and O_2
B. Na and NH_3 D. N_2 and CO

16. The number of moles of Mg required to produce $11.212dm^3$ of Hydrogen at STP when it reacts with HCl solution, are
$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$
A. 1 mole C. 0.5 moles
B. 2 moles D. 0.25 moles

17. The number of molecules in 22 g of CO_2 is
A. 6.023×10^{23} C. 6.023×10^{21}
B. 3.011×10^{23} D. 6.023×10^{22}

18. 27g of aluminium reacts with how much O_2 to produce aluminium oxide.
A. 3 Mole C. 0.75 Mole
B. 0.27 Mole D. 1.5 mole

19. H_2 burns in chlorine to produce hydrogen chloride. The exact mass of Cl_2 required to convert 4g H_2 into HCl according to following equation is $H_2+Cl_2\rightarrow2HCl$
A. 35.5g C. 142 g
B. 71 g D. 71.5 g

20. Mass of 0.25 moles of SO_2 is
A. 6.4 g C. 46 g
B. 1.6 g D. 16 g

21. Mass of NaOH containing 6.02×10^{23} sodium atoms is
A. 23 g C. 40 g
B. 4.0 g D. 20 g

22. The most doubtful yield is:
A. Expected yield C. Yield from balanced equation
B. Actual yield D. Theoretical yield

23. 10 moles of hydrogen are allowed to react with 6 moles of oxygen. How much water will be obtained from reaction on complete consumption of one gas?
A. 10 moles C. 8 moles
B. 6 moles D. 4 moles

24. The no. of molecules in $5.6\ dm^3$ of oxygen under STP conditions.
A. 1.15×10^{23} C. 3.01×10^{23}
B. 1.34×10^{22} D. 3.01×10^{22}

25. For complete oxidation, 1 mole of an organic compound requires maximum amount of O_2 gas. What could be the formula of the compound?
A. CH_3CHO C. CH_3CH_3
B. CH_3CH_2OH D. CH_3CO_2H

26. What will be the values of temperature and pressure at standard condition (STP),
A. 100°C, 1 atm C. 273 K, 760 mm Hg
B. 298 K, 1 atm D. 0°C, 760 cm Hg

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27. **How many atoms of carbon are present in 18 g of glucose?**
A. 6.02×10^{22} C. 3.6×10^{22}
B. 6.02×10^{23} D. 3.6×10^{23}

28. **What volume of oxygen is required for the complete combustion of a mixture of 5 cm^3 of CH_4 and 5 cm^3 of C_2H_4?**
A. 10 cm^3 C. 20 cm^3
B. 15 cm^3 D. 25 cm^3

29. **Total No. of electrons present in 1.6 g of methane.**
A. 6.02×10^{23} C. 1.6×10^{23}
B. 16×10^{23} D. 6.02×10^{22}

30. **The weight of iron (Fe) which will be converted into Fe_3O_4 by the action of 18 g of steam is;**

$$3Fe + 4H_2O \rightarrow Fe_3O_4 + 4H_2$$

A. 56 g C. 42 g
B. 18 g D. 24 g

31. **How many 'Cl' (chlorine) atoms are in two moles of chlorine?**
A. $2 \times 6.02 \times 10^{-23}$ atoms C. 2×10^{23} atoms
B. $35.5 \times 6.02 \times 10^{23}$ atoms D. $2 \times 2 \times 6.02 \times 10^{23}$ atoms

32. **When 8 grams (4 moles) of H_2 react with 2 moles of O_2, how many moles of water will be formed?**
A. Five C. Six
B. Four D. Three

33. **The molar volume of SO_2 gas at STP is,**
A. 64 dm^3 C. 22.4 dm^3
B. 24 dm^3 D. 2.24 dm^3

34. **Determinate the number of moles of O in 10.6g of Na_2CO_3**
A. 0.4 moles C. 0.2 moles
B. 0.3 moles D. None of these

35. **Calculate the grams of H_2O formed when 8 g of CH_4 burns in excess of oxygen.**
A. 21 grams C. 18 grams
B. 19 grams D. 15 grams

36. **A compound has an empirical formula CH_2Cl, and molecular formula mass as 99gmol^{-1}, identify the compound:**
A. C_2H_4Cl C. $C_2H_4Cl_2$
B. C_4H_8Cl D. $C_2H_3Cl_3$

37. **While finding the relative atomic mass, which of the following standard is used to compare the atomic mass.**
A. Neon-20 C. Nucleon number
B. Carbon-13 D. Carbon -12

38. **Largest number of molecules is present in:**
A. 32.0g O_2 C. 8.00g H_2
B. 44.0g CO_2 D. 56.0g N_2

39. **The percentage of Ca in $CaCO_3$ is,**
A. 12 % C. 48 %
B. 10 % D. 40 %

40. **Given the equation $CO_{2(g)} + C_{(s)} \rightarrow 2\ CO_{(g)}$**
Which of the following equivalences is not correct for the reaction,
A. 1 mol $CO_2 \cong$ 2 mol CO
B. 1 mol C $\cong$ 56 g CO
C. 44 g $CO_2 \cong$ 28 g CO
D. 44 g $CO_2 \cong$ 12 g C

41. **11.207 dm^3 of methane (CH_4) at STP has _____ moles of hydrogen atoms:**
A. 4
B. 8
C. 2
D. 16

42. **The volume occupied by 16g of oxygen at STP is:**
A. 2.24dm^3
B. 22.4dm^3
C. 11.12dm^3
D. 1.24dm^3

43. **Stoichiometric calculations are not possible when:**
A. All the reactants are completely converted into products
B. Reversible reaction occurs
C. In calculations. law of conservation of mass and law of definite proportions are obeyed
D. Side reaction occurs

44. **How many moles of CO_2 are produced from 0.9 moles of O_2 in the reaction $C + O_2 \rightarrow CO_2$:**
A. 0.9 mole
B. 36 moles
C. 1.8 moles
D. 3.6 moles

45. **The number of carbon atoms in 6mg of a graphite piece is:**
A. 3.01×10^{23}
B. 6.02×10^{23}
C. 3.01×10^{20}
D. 6.02×10^{24}

46. **A limiting reactant is one**
A. Which is present in maximum amount
B. Which produces minimum No. of moles of product
C. Which produces maximum No. of moles of product
D. Does not affect the amount of product

47. **24g of each of carbon and oxygen react to form CO_2. The amount of unreacted element left behind is:**
A. 6g
B. 15g
C. 16g
D. 10g

48. **At STP, one mole of any gas may represent:**
A. Molar volume of the gas
B. Molar mass of the gas
C. N_A molecules of the gas
D. All of these

49. **The number of moles of H_2O which contains 16g of oxygen:**
A. 1.0
B. 0.5
C. 0.25
D. 0.1

50. **The mass of 2 moles of electrons is:**
A. 1.008mg
B. 0.55mg
C. 1.10mg
D. 0.275mg

51. **From the complete decomposition of 0.2 moles $CaCO_3$ at S.T.P. the volume of CO_2 obtained is**
A. 2.24 L
B. 4.48 L
C. 44.8 L
D. 48.4 L

52. **If we consider 1/6 in place of $\frac{1}{12}$ mass of carbon atom as the relative atomic mass unit, the mass of one mole of a substance will:**
A. Decrease to half
B. Increase two-fold
C. Remain unchanged
D. Become fractional

53. A collection of $2N_A$ helium atoms weighs.
A. 1 g
B. 2 g
C. 4 g
D. 8 g

54. The no. of protons in 1 mole of H_2:
A. 6.02×10^{23}
B. 1.20×10^{24}
C. 12.04×10^{22}
D. 6.02×10^{24}

55. Efficiency of chemical reaction can be checked by calculating
A. Actual yield
B. Theoretical yield
C. Percentage yield
D. Amount of the reactant unused

56. Actual yield will reach the ideal (theoretical) value if the % yield of the reaction is,
A. 10 %
B. 50 %
C. 90 %
D. 100 %

57. 4 g H_2gas reacts with 8 g O_2 gas to form steam. How many moles of gases are there after the completion of reaction in vessel?
A. 3
B. 3.5
C. 2.0
D. 0.5

58. Which pair shows Empirical formula CH_2O?
A. Methanol; Methanoic acid
B. Glucose, Benzene
C. Methoxy methane, Ethanal
D. Ethanoic acid, methanal

59. What is the mass of same no. of atoms of potassium as are present in 11.5 g of sodium?
A. 23 g
B. 19.5 g
C. 39 g
D. 6.02×10^{23} g

60. The number of molecules of water that one needs to put in a jar to make the total mass equal to 10.8 kg are:
A. 2.4×10^{24}
B. 3.6×10^{26}
C. 1.2×10^{25}
D. 4.8×10^{26}

61. The maximum No. of moles are present in
A. 11.2 dm^3 of H_2 gas at STP
B. 44.8 dm^3 of N_2 gas at STP
C. 67.2 dm^3 of CO_2 gas at STP
D. 22.4 dm^3 of O_2 gas at STP

62. The branch of Chemistry which describes the relationship between the amounts of reactants and products in a balanced chemical equation is called:
A. Physical chemistry
B. Biochemistry
C. Stoichiometry
D. Organic chemistry

63. Calculate number of moles of K_2SO_4 produced when 14g KOH are reacted with excess of H_2SO_4:
A. 0.25
B. 0.125
C. 0.50
D. 1.50

64. How many atoms are there in 0.125 moles of S_8 molecules?
A. 1.6×10^{21}
B. 9.0×10^{22}
C. 3.6×10^{23}
D. 6.0×10^{23}

65. The mass of calcium that release the same no. of valence electrons as 23 g of Na:
A. 40 g
B. 20 g
C. 30 g
D. 50 g

66. What are the number of covalent bonds in 68 g of H_2S gas?
A. 3.01×10^{23}
B. 6.02×10^{23}
C. 2.41×10^{24}
D. 24.1×10^{24}

67. The ratio of volume between 4 g of H_2 and 32g of CH_4 at STP is
A. 1:2 C. 1:1
B. 1:8 D. 2:1

68. The mass of SiC formed when 60g of SiO_2 is reacted with excess of Carbon
A. 68g C. 72g
B. 66g D. 40g

69. The mass of O_2 required to burn 0.1 mole of C_2H_5OH is:
A. 32 g C. 5.6 g
B. 3.2 g D. 9.6 g

70. 4.6g of C_2H_5OH & 3g of C_2H_6 have
A. different no. of molecules C. equal no. of molecules
B. same mass of carbon D. 0.2 moles of oxygen

71. The complete ionization of 36.5 g of HCl produces H^+ ions
A. 6.02×10^{23} C. 6.02×10^{22}
B. 0.6×10^{24} D. 3.01×10^{23}

72. No. of hydrogen atoms in 45g of glucose
A. 6.02×10^{23} C. 1.8×10^{24}
B. 18×10^{24} D. 1.8×10^{22}

73. The volume occupied by one gram of oxygen gas
A. 22.414 dm^3 C. 22414 cm^3
B. 0.70 dm^3 D. 0.22414 m^3

74. The ratio of the volumes between equal masses of O_2, H_2 and CH_4 is
A. 1:1:1 C. 2:16:2
B. 1:16:2 D. 2:16:1

75. Which series of organic compounds shares the same empirical formula
A. Aromatics C. Alkanes
B. Alkynes D. Alkenes

76. Which of the followings does not represent the empirical and molecular formula of the same compound?
A. H_2O C. HCHO
B. NaCl D. CH_4

77. 1 mole of which of these molecules contains highest number of atoms.
A. Water C. Sucrose
B. Benzene D. Glucose

78. The concept of limiting reactant is not applicable while:
A. doing stoichiometric calculations C. calculating theoretical yield
B. the reaction is reversible D. all of these

79. The number of gram molecules of oxygen in 6.02×10^{24} CO molecules is
A. 1 gm molecules C. 2 gm molecules
B. 5 gm molecules D. 8 gm molecules

80. 50 gram of calcium carbonate was completely burnt in air. What is the weight (in grams) of the residue?
A. 28 C. 2.8
B. 46 D. 4.8

81. The volume occupied by 1.4 of N_2 at STP is:
A. 2.24 dm^3 C. 1.12 dm^3
B. 22.4 dm^3 D. 112 dm^3

82. A beaker contains 9 g of water. The number of hydrogen atoms is
A. 6.02×10^{23} C. 6.02×10^{24}
B. 3.01×10^{23} D. 3.01×10^{24}

83. One mole of diamond chain and one mole of gold ring have same number of:
A. Neutrons C. Electrons
B. Protons D. Atoms

84. The largest number of molecules are present in
A. 4.8 g of C_2H_5OH C. 1.8 g of CO
B. 6.6 g of H_2O D. 2.4 g of N_2O_5

85. A compound possesses 8% sulphur by mas. The least molecular mass is
A. 200 C. 400
B. 155 D. 355

86. The weight of one molecule of a compound $C_{60}H_{122}$ is
A. 1.3×10^{-20}g C. 5.01×10^{-21}g
B. 3.72×10^{23}g D. 1.4×10^{-21}g

87. One mole of CH_4 contains
A. 4.0 g atoms of hydrogen C. 3.0 g atom of carbon
B. 1.81×10^{23} molecules of CH_4 D. 6.02×10^{23} atoms of hydrogen

88. The maximum number of molecules in present in
A. 15 dm^3 of H_2 gas at STP C. 1.5 g of H_2 gas
B. 5 dm^3 of N_2 gas at STP D. 5 g of O_2 gas

89. The incorrect statement for 14g of CO is
A. it occupies 2.24 litre at STP C. it corresponds to 0.5 mol f CO
B. it corresponds to same mole of CO and N_2 D. it corresponds to 3.01×10^{23} molecules of CO

90. The amount of product obtained practically is called:
A. Expected yield C. Actual yield
B. Theoretical yield D. Fractional yield

91. Find the number of atoms present in 0.16 g of methane.
A. $0.5N_A$ C. $0.05N_A$
B. N_A D. $1.6N_A$

92. From the complete decomposition of 20g $CaCO_3$ at STP the volume of CO_2 obtained is
A. 2.24dm^3 C. 4.48dm^3
B. 44.8dm^3 D. 48.4dm^3

93. Maximum number of molecules will be in
A. 1 g of H_2 C. 10 g of H_2
B. 22 g of O_2 D. 44 g of CO_2

94. What is the volume (in dm^3) of oxygen at STP required for complete combustion of 32 g of CH_4? (mol. Wt of CH_4=16)
A. 89.6 C. 189.6
B. 98.4 D. 169.5

95. The total number of protons in 10 g of calcium carbonate is ($N_A=6.023\times10^{23}$)
A. 3.01×10^{24} C. 4.06×10^{24}
B. 30.1×10^{24} D. 3.01×10^{23}

96. One mole of CO_2 contains
A. 6.02×10^{23} atoms of C C. 18.1×10^{23} atoms of CO_2
B. 6.02×10^{23} atoms of O D. 3 grams of carbon

97. How many water molecules will be lost on dehydrating 0.684 g of sucrose?
A. 1.3244×10^{22}
B. 6.02×10^{20}
C. 6.622×10^{21}
D. 7.224×10^{21}

98. Choose the wrong statement.
A. 1 mole means 6.023×10^{23} particles
B. Molar mass is mass of 1 molecule
C. Mole is mass of 1 mole of substance
D. Molar mass is molecular mass expressed in grams

99. How many seconds would it take to spend one Avogadro number of rupees at a rate of 6.02×10^{9} rupees per second?
A. 19×10^{9}
B. 19×10^{10}
C. 1×10^{14}
D. 2×10^{11}

100. Which of the following is wrong?
A. One mole of hydrogen weighs less than one mole of glucose
B. Two moles of hydrogen and one mole of helium weigh the same
C. 0.1 mole of oxygen weighs more than one mole of hydrogen
D. One mole of nitrogen and half a mole of oxygen weigh the same

101. How many moles of atoms are present in one mole of CH_3COOH molecule?
A. 2 moles of C atoms, 4 moles of H atoms, 2 moles of O atoms
B. 1 mole of C atoms, 2 moles of H atoms, 1 mole of O atoms
C. 2 moles of C atoms, 3 moles of H atoms, 2 moles of O atoms
D. 2 moles each of C, H and O

102. Caffeine (molecular weight = 194) contains 28.9% nitrogen. The number of nitrogen atoms in caffeine molecule is
A. 2
B. 4
C. 7
D. 8

103. The number of gram atoms of sulphur that represents 0.5 mole of sulphuric acid is
A. 0.2
B. 0.4
C. 0.5
D. 0.9

104. An oxide of metal (M) has 40% by mass of oxygen. Metal M has a relative atomic mass of 24. The empirical formula of oxide is
A. M_2O
B. M_2O_3
C. MO
D. M_3M_4

105. A compound (60 g) on analysis gave C = 24 g, H = 4 g, O = 32 g. Its empirical formula is
A. $C_2H_4O_2$
B. CH_2O_2
C. $C_2H_2O_2$
D. CH_2O

106. The concentration of C = 85.45% and H = 14.55% is not obeyed by the formula
A. CH_2
B. C_2H_4
C. C_2H_6
D. C_4H_8

107. The amount of a given product calculated to be obtained in a chemical reaction that goes to completion is
A. The percent efficiency of the reaction
B. The theoretical yield of the reaction
C. The yield of the reaction
D. The theoretical yield of the reaction

108. 5.6 g of carbon monoxide is heated with excess of O_2 to form carbon dioxide. What is the theoretical yield in grams of carbon dioxide ($2CO + O_2 \rightarrow 2CO_2$)?
A. 44g
B. 88g
C. 4.4g
D. 8.8g

109. Lactose commonly used as a binder in tablets has a molecular weight 342. What weight of CO_2 would be formed when 1/12 mole of this compound is burnt completely?
($C_{12}H_{22}O_{11} + 12O_2 \rightarrow 12CO_2 + 11H_2O$)
A. 12 g
B. 4.4 g
C. 44 g
D. 440 g

110. For the reaction A + 2B → C, 5 moles of A and 8 moles of B will produce
A. 5 moles of C
B. 8 moles of C
C. 4 moles of C
D. 13 moles of C

111. Element A (atomic weight 12.01) and element B (atomic weight 16) combine to form a new substance X. If two moles of B combine with one mole of A, then the weight of one mole of X is
A. 28.01 g
B. 40.02 g
C. 44.01 g
D. 56.02 g

112. 10 g of carbon burns giving 11.2 litres of CO_2 at STP. After combustion, the amount of unburnt carbon is
A. 2.5 g
B. 3 g
C. 4 g
D. 1 g

113. Which among MnO_2, Mn_2O_3, MnO_3 and Mn_2O_7 contains the maximum percentage by weight of combined oxygen?
A. MnO_2
B. MnO_3
C. Mn_2O_3
D. Mn_2O_7

114. A sample of AlF_3 contains 3.0×10^{24} F^- ions. The number of formula units in this sample is
A. 9.0×10^{24}
B. 0.75×10^{24}
C. 3.0×10^{24}
D. 1×10^{24}

115. Percentage of an element in any compound is determined by following formula
A. $\frac{\text{Mass of compound}}{\text{Mass of element}} \times 100$
B. $\frac{\text{Mass of molecule}}{\text{Mass of compound}} \times 100$
C. $\frac{\text{Mass of element}}{\text{Mass of compound}} \times 1000$
D. $\frac{\text{Mass of element}}{\text{Mass of compound}} \times 1000$

116. During combustion, sole products are
A. CO and H_2O
B. CO_2 and H_2O_2
C. CO_2 and H_2O
D. All of them

117. Empirical formula of glucose is
A. CH
B. C_6H_6
C. CHO
D. CH_2O

118. **Atomic mass, molecular mass, formula mass or ionic mass of substance expressed in gram is called**
A. Avogadro's no.
B. Molar mass
C. Molar volume
D. Mole

119. **How many times sodium is heavier than atom of hydrogen?**
A. 21 times
B. 22 times
C. 23 times
D. 24 times

120. **1 mole of sucrose is equal to**
A. 340 gram of sucrose
B. 344 gram of sucrose
C. 342 gram of sucrose
D. 346 gram of sucrose

ANSWER KEY

1	D	16	C	31	D	46	B	61	C	76	B	91	C	106	C
2	B	17	B	32	B	47	B	62	C	77	C	92	C	107	B
3	D	18	D	33	C	48	A	63	B	78	B	93	C	108	D
4	C	19	C	34	B	49	A	64	D	79	B	94	A	109	C
5	D	20	D	35	C	50	C	65	B	80	A	95	A	110	C
6	A	21	C	36	C	51	B	66	C	81	C	96	A	111	B
7	A	22	B	37	D	52	A	67	C	82	A	97	A	112	C
8	D	23	A	38	C	53	D	68	D	83	D	98	B	113	D
9	D	24	A	39	D	54	B	69	D	84	B	99	C	114	D
10	B	25	C	40	C	55	C	70	C	85	C	100	D	115	D
11	C	26	C	41	C	56	D	71	A	86	D	101	A	116	C
12	B	27	D	42	C	57	C	72	C	87	A	102	B	117	D
13	A	28	D	43	D	58	D	73	B	88	C	103	C	118	B
14	A	29	A	44	A	59	B	74	B	89	A	104	C	119	C
15	D	30	C	45	C	60	B	75	D	90	C	105	D	120	C

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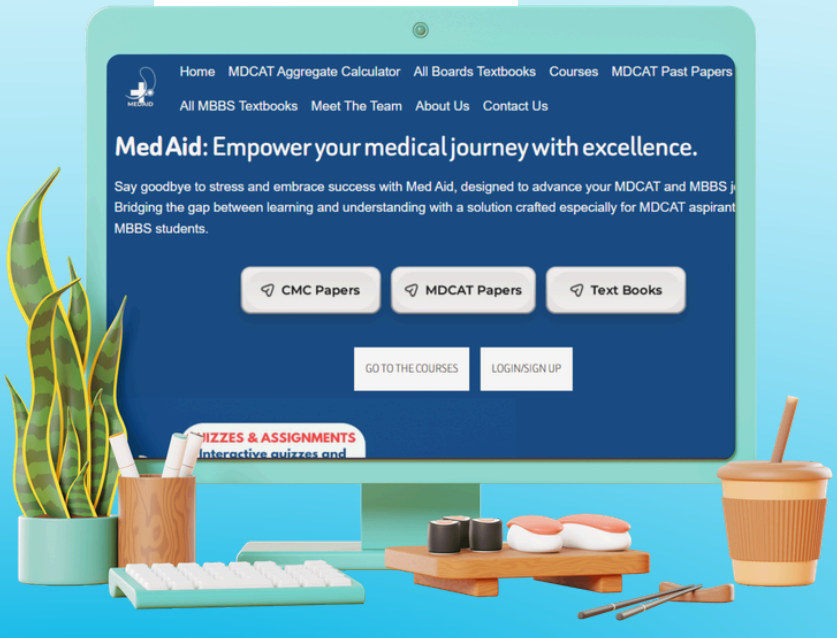
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HINTS

2. $M + S \rightarrow MS$

Stoichiometrically, S:M

1 mole: 1 mole

0.09 mole: 0.09 mole

and 0.09 mole of M = 3.6g

1 mole of $M = \frac{3.6}{0.09} \Rightarrow 40g$ or Ca.

4. $Mg + 2HCl \rightarrow MgCl_2 + H_2$

Stoichiometrically, H_2: HCl

2g: 73g

1g: $\frac{73}{2}$

12g: $\frac{73}{2} \times 12 \Rightarrow 438g$

6. Oxygen: CO_2

32g: 44g

1g: $\frac{44}{32}$

8g: $\frac{44}{32} \times 8 \Rightarrow 11g$ or 0.25 moles.

10. $n = \frac{MFM}{EFM} = \frac{28000}{14} = 2000$

$(CH_2)_{2000}$

13. $\frac{m}{M} \times N_A = \frac{1.2}{12} \times 6.02 \times 10^{23}$ or 6.02×10^{22}

18. $2Al + 3O_2 \rightarrow Al_2O_3$

Al: Oxygen

54g: 96g

1g: $\frac{96}{54}$g

27g: $\frac{96}{54} \times 27 \Rightarrow 48g$ or 1.5 mole.

19. $H_2 + Cl_2 \rightarrow 2HCl$

H_2: Cl_2

2g: 71g

1g: $\frac{71}{2}$

4g: $\frac{71}{2} \times 4 \Rightarrow 142g$.

21. NaOH: Na.

1 mole: 6.02×10^{23} atoms

40g: 6.02×10^{23} atoms

23. $2H_2 + O_2 \rightarrow 2H_2O$

$H_2 : O_2$

$\frac{10}{2} : \frac{6}{1}$

Limiting reactant ← (5) : 6

$H_2 : H_2O$

2 : 2

1 : 1

10 : 10 mole.

27. $\text{Atoms} = \frac{m}{M} \times 60.2 \times 10^{23} \times 6$

$= \frac{\cancel{18}^{1}}{\cancel{180}_{10}} \times 6.02 \times 10^{23} \times 6$

$= 6.02 \times 10^{22} \times 6$

$= 3.6 \times 10^{23}$

30. $H_2O : Fe$

$72g : 56 \times 3 = 168\ g$

$1g : \frac{168}{72}$

$18g : \frac{\cancel{168}^{42}}{\cancel{72}_{1}} \times \cancel{18}^{1} = 42g$

34. $\text{No. of moles of Oxygen} = \frac{10.6}{106} \times N_A \times 3$

$= 0.3\ N_A$ or 0.3 moles

41. $\frac{V}{V_m} \times N_A \times 4 \left(\because 1CH_4 = 4(H)\text{atoms}\right)$

47. $C + O_2 \rightarrow CO_2$

$C : O_2$

$\frac{24}{12} : \frac{24}{32}$

2 : 0.75 → limiting reactant

$O_2 : C$

32 : 12

$1 : \frac{12}{32}$

$24 : \frac{\cancel{12}^{3}}{\cancel{32}_{1}} \times \cancel{24}^{3} = 9g$

Unreacted C = 24 – 9 = 15g

68. $SiO_2 + 3C \rightarrow SiC + 3C$

$SiO_2 : SiC$

60g : 40g

70. $C_2H_5OH = \frac{4.6}{46} = 0.1\,mol\ C_2H_6 = \frac{3}{30} = 0.1\,mol$

Same moles mean same no. of molecules

72. $\frac{45}{180} \times N_A \times 12 \rightarrow 3N_A$

74. $O_2 : H_2 : CH_4$

$\frac{32g}{32} : \frac{32g}{2} : \frac{32g}{16}$

1 : 16 : 2

77. Sucrose contains max (45 atoms / molecule)

85. Let us assume the compound contains one atom of sulphur

S: Compound

8:100

$1 : \frac{100}{8}$

$32 : \frac{100}{8} \times 32 \rightarrow 400$ (One atom of 5 weighs 32)

87. 1 mole of CH_4 = 12g (C) + 4g (H)

91. $\frac{0.16}{16} \times N_A \times 5$

94. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

$CH_4 : O_2$

16g: 44.8 dm^3

32g: 89.6dm^3

97. $\frac{0.684}{342} \times N_A \times 11$

99. 9.02×10^9 Rs = 1 Sec.

$1\ Rs = \frac{1\,sec}{6.02 \times 10^9}$

$6.02 \times 10^{23}\ Rs = \frac{1\,sec}{6.02 \times 10^9} \times 6.02 \times 10^{23}$

$= 1 \times 10^{14}$

102. 28.9% means

100g caffeine contains N = 28.9g

1g caffeine contains $N = \frac{28.9}{100}$

194g caffeine contains $N = \frac{28.9}{100} \times 194$

≈ 56 or 4 nitrogen atoms

104. O = 40% M = 60%

$n_O = \frac{40}{16}$ $n_M = \frac{60}{24}$

$n_O = 2.5$ $n_M = 2.5$

M : O

$\frac{2.5}{2.5}$ $\frac{2.5}{2.5}$

MO = Empirical formula

106. For CH_2, C_2H_4 and C_3H_4 and C_3H_6 C = 85% H = 15%

PAST PAPER 2009 – 2020

Q.1 **If we know the mass of one substance, we can calculate the volume of other substance and vice versa with the help of chemical equation is called**

A. Mass-mass relationship
B. Mass-volume relationship
C. Mass-mole relationship
D. Mole-volume relationship

Q.2 **One mole of any gas at STP occupies a volume of**

A. $22.414 dm^3$
B. $23.414 dm^3$
C. $22.414 cm^3$
D. $20.414 dm^3$

Q.3 **How many chlorine atoms are in 2 moles of Cl**

A. $2 \times 6.022 \times 10^{23}$ atoms
B. $35.5 \times 6.022 \times 10^{23}$ atoms
C. 2×10^{23} atoms
D. $2 \times 6.02 \times 10^{22}$ atoms

Q.4 **An organic compound has empirical formula C_3H_3O if molar mass of the compound is 110.15 molecular formula of this organic compound is (A, of C = 12, H = 1.008 and O = 16)**

A. $C_6H_6O_2$
B. $C_8H_9O_3$
C. C_2H_2O
D. $C_6H_6O_3$

Q.5 **When 8 grams (4 moles) of H_2 react with 2 moles of O_2, how many moles of water will be formed**

A. Five
B. Six
C. Four
D. Three

Q.6 **Hydrogen burns in chlorine to produce hydrogen chloride. The ratio of masses of reactants in chemical reaction $H_2 + Cl_2 \rightarrow 2HCl$ is**

A. 2:35.5
B. 1:35.5
C. 1:71
D. 2:70

Q.7 **A polymer of simplest formula CH_2 has molar mass of 28000 $gmol^{-1}$. Its molecular formula will be**

A. 100 times that of its empirical formula
B. 500 times of its empirical formula
C. 200 times that of its empirical formula
D. 2000 times that of its empirical formula

Q.8 **The number of molecules in 9g of ice (H_2O) is**

A. 6.02×10^{23}
B. 6.02×10^{22}
C. 3.01×10^{22}
D. 3.01×10^{23}

Q.9 **How many moles of sodium are present in 0.1g of sodium?**

A. 4.3×10^{-3}
B. 4.01×10^{-2}
C. 4.03×10^{-1}
D. 4.3×10^{-2}

$M = m/V$

Q.10 **10.0 grams of glucose are dissolved in water to make 100 cm^3 of its solution, its molarity is**

A. 0.55
B. 10
C. 0.1
D. 1

Q.11 **An organic sample consisting of carbon, hydrogen and oxygen was subjected to combustion analysis. 0.5439 g of this compound gave 1.039g carbon dioxide, 0.6369g of water vapors. The empirical formula of this compound is**

A. CH_3O
B. C_2H_6O
C. $C_4H_{12}H_2O$
D. CH_4O

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Q.12 The number of moles of CO_2 which contain 8.00g of oxygen is:

A. 0.75
B. 0.25
C. 1.50
D. 1.00

Q.13 A researcher has prepared a sample of 1-Bromopropane from 10g of 1-propanol. After purification he had made 12g of product. Which of the following is percentage yield? (The test was reconducted).

A. 60%
B. 90%
C. 58%
D. 50%

Q.14 Which one of the followings has same number of molecules as present in 11g of CO_2?

A. 4g of O_2
B. 4g of O
C. 4.5 g of H_2O
D. ¼ moles of NaCl

Q.15 Choose the correct option regarding number of particles associated with one mole of a substance

A. 6.03×10^{23}
B. 6.02×10^{-23}
C. 6.01×10^{-19}
D. 6.02×10^{23}

Q.16 Determinate the number of moles of O in 10.6g of $NaCO_2$

A. 0.4 moles
B. 0.2 moles
C. 0.3 moles
D. None of these

"This is actual question given in UHS so answer is **0.3 moles**. But if $NaCO_2$ is replaced by Na_2CO_3 Its Answer will be **0.2 moles**."

Q.17 Calculate the gram of H_2O formed when 8 g of CH_4 burns in excess of oxygen.

A. 21 grams
B. 18 grams
C. 19 grams
D. 15 grams

Q.18 While finding the relative atomic mass, which of the following standard is used to compare the atomic mass of chlorine (35.5amu)

A. Neon-20
B. Nucleon number
C. Carbon-13
D. Carbon -12

Q.19 The formula which shows the simplest whole number ratio for the atoms of different elements in compound

A. Ionic formula
B. Empirical formula
C. Structural formula
D. Molecular formula

Q.20 3.0 mole of calcium will contain _____ g of calcium

A. 105gm
B. 80gm
C. 100gm
D. 120gm

Q.21 The average atomic mass of Boron is 10.8. It has two isotopes of masses 10 and 11 respectively. What is the percentage of isotope with the average mass of 10?

A. 80%
B. 60%
C. 50%
D. 20%

Q.22 Which two elements are isotopes?

A. $^{12}_{6}X$ and $^{12}_{7}Y$
B. $^{16}_{8}X$ and $^{16}_{8}Y$
C. $^{18}_{9}X$ and $^{20}_{10}Y$
D. $^{14}_{8}X$ and $^{15}_{8}Y$

Q.23 The best standard for the calculation of relative atomic mass
A. H-1.008
B. Carbon -12
C. Carbon-13
D. Oxygen -16

Q.24 A piece of diamond embedded in a gold ring weighs 6.0 gram. How many number of moles of Carbon does it contain?
A. 6.0 mole
B. 0.5 mole
C. 1.0 mole
D.1.5 mole

Q.25 Iron is manufactured industrially in Blast furnace using Hematite, an ore of iron and a reducing agent Carbon monoxide. $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$ Calculate the mass of iron ore used to manufacture 56g of iron with excess carbon monoxide. Assume that the process gives 100% yield.
A. 160g
B.112g
C. 280g
D. 80g

Q.26 How many moles of calcium carbonate are present in 1.75 kg of calcium carbonate? (Ar of Ca = 40, Ar of C = 12, Ar of O=16)
A. 0.0175 mol
B. 1.75 mol
C. 17.5 mol
D. 1750 mol

Q.27 According to law of definite proportion, what is the mass ratio of hydrogen and oxygen in water?
A. Hydrogen is 11.11% and oxygen is 88.89%
B. Hydrogen is 10.11% and oxygen is 89.89%
C. Hydrogen is 20% and oxygen is 80%
D. Hydrogen is 30% and oxygen is 70%

Q.28 $2XeF_6 + SiO_2 \longrightarrow 3XeOF_4 + SiF_4$ Consider the above chemical reaction. If 122.6g of XeF_6 reacts with 60g of SiO_2 to form the products. Select the limiting reagent and amount of SiF_4 formed (XeF_6 245.3 amu, SiO_2 = 60 amu, SiF_4 = 104 amu)
A. XeF_6, 26g
B. SiO_2, 26g
C. XeF_6, 52g
D. SiO_2, 52g

Q.29 How many oxygen atoms are present in 278g of Hydrated Ferrous Sulphate? ($FeSO_4.7H_2O = 278$ amu)
A. 6.023×10^{23}
B. 6.525×10^{24}
C. 2.408×10^{23}
D. 6.023×10^{23}

Q.30 The water formed in the combustion analysis is usually absorbed by
A. $Mg(NO_3)_2$
B. $Mg(ClO_4)_2$
C. $Mg(OH)_2$
D. $Mg(ClO_2)_2$

Q.31 Which contains more atoms?
A. 7gram Mg
B. 8 gram Na
C. 9gram Al
D. All same

Q.32 Which contains highest percentage of nitrogen?
A. NO
B. NO_2
C. N_2O
D. N_2O_5

Q.33 A mixture of 10cm of oxygen and 50cm of hydrogen is spared continuously. What is the maximum theoretical decrease in volume?

A. $10cm^3$ B. $15cm^3$
C. $20cm^3$ D. $30cm^3$

Q.34 The number of moles of water in 1Kg ice are

A. 50 moles B. 1000 moles
C. 55.5 moles D. 100 moles

Q.35 During stoichiometric calculations, which of the following laws must be followed?

A. Law of conservation of mass B. Law of conservation of energy
C. Avogadro's law D. Dalton's law

Q.36 The efficiency of chemical reaction can be expressed as:

A. Theoretical yield B. Actual yield
C. % yield D. Maximum yield

Q.37 In a vessel, 10 g N_2 10g H_2 and 10g O_2 are present. Which one will have least number of atoms?

A. H_2 B. N_2
C. O_2 D. Both A & B

Q.38 The empirical formula of glucose $C_6H_{12}O_6$ is

A. $C_6H_{12}O_6$ B. CHO
C. CH_2O D. CH_2O_2

PAST PAPER QUESTIONS

1	B	6	B	11	B	16	C	21	D	26	C	31	B	36	C
2	A	7	D	12	B	17	B	22	D	27	A	32	C	37	C
3	A	8	D	13	C	18	D	23	C	28	A	33	D	38	C
4	A	9	A	14	C	19	B	24	B	29	B	34	C		
5	C	10	A	15	D	20	D	25	D	30	B	35	A		

HINTS

3. moles × N_A

4. MF = n(EF) and $\frac{MFM}{EFM}$

6. 2: 71

8. $\frac{m}{M} \times N_A$

11. % age of C = $\frac{10.039}{0.5439} \times \frac{12}{44} \times 100 \Rightarrow 52.1$

% age of H = $\frac{0.6369}{0.5439} \times \frac{2}{18} \times 100 \Rightarrow 13.1$

% age of O = 100 – (51.8 + 13.1)

= 34.77

$n_C = \frac{51.8}{12}$ $n_H = \frac{13.1}{1.008}$ $n_O = \frac{34.77}{16}$

$n_C = 4.34$ $n_H = 13.01$ $n_O = 2.17$

C : H : O

$\frac{4.34}{2.17}$: $\frac{13.01}{2.17}$: $\frac{2.17}{2.17}$

2 : 6 : 1

13. $CH_3CH_2CH_2OH \rightarrow CH_3CH_2CH_2Br$

60g : 123g

1g : $\frac{123}{60}$

10g : $\frac{123}{60} \times 10$

: 20.5g

% age yield = $\frac{12}{20.5} \times 100$

= 58%

14. 0.25 moles, NaCl is ionic compound and does not have molecules.

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17. $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

CH_4	:	H_2O
16g	:	36g
1g	:	$\frac{36}{16}$
8g	:	$\frac{36}{16} \times 8$
		18g

21. Percentage of $^{10}B = x$

Percentage of $^{11}B = 100 - x$

$$RAM = \frac{(x \times 10) + ((100 - x) \times 11)}{100}$$

$10.8 \times 100 = 10x + 1100 - 11x$

$1080 = 1100 - x$

$-20 = -x$

$20\% = x$

$$n = \frac{2}{\frac{110}{55}} = 2$$

22. Same atomic no., different atomic mass.

28. XeF_6 : SiO_2

$\frac{122.6}{490.6}$: $\frac{60}{60}$

Limiting reactant ← 0.25 : 1

XeF_6 : SiF_4

490.6 : 104

1 : $\frac{104}{490.6}$

122.6 : $\frac{104}{490.6} \times 122.6$

: 26g

29. $\frac{278}{278} \times 6.02 \times 10^{23} \times 11 \rightarrow$ oxygen atoms is one mole.

31. Lowest molar mass.

33. $2H_2 + O_2 \rightarrow 2H_2O$

$20cm^3 + 10cm^3 \rightarrow$ Liquid water

Unreacted volume = $60cm^3 - 30cm^3 = 30cm^3$

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PAST PAPER 2021

Q. 1 I amu is equal to
A. 0.666×10^{-27}kg
B. 1.661×10^{28}kg
C. 1.661×10^{27}kg
D. 1.661×10^{-27}kg

Q. 2 How much Volume of O_2 is required for formation of SO_3 from 0.222 moles of SO_2
A. 22.4L
B. 11.2L
C. 2.24L
D. 1.12L

Q. 3 Number of single covalent bonds in water molecule are
A. 1
B. 2
C. 3
D. 4

Q. 4 Ascorbic acid has high percentage of
A. Carbon
B. Hydrogen
C. Oxygen
D. All have same

Q. 5 NH_3 can be called
A. Molecule of atoms
B. Molecule of element
C. Molecule of compound
D. Molecule of ion

Q. 6 Diameter of atom is
A. 0.2nm
B. 0.5nm
C. 0.9nm
D. 0.8nm

Q. 7 No side reaction takes place in
A. Spirometry
B. Stoichiometry
C. Tritimetry
D. Spectrometry

Q. 8 NH_4Cl and $Ca(OH)_2$ are react to form Ammonia What is the mass of ammonia is produce when 100 gram of each is give
A. 31.7g
B. 15g
C. 28g
D. 24g

Q. 9 The mass present in $2dm^3$ of O_2 at STP
A. 1.7
B. 2.35
C. 2.8
D. 3.7

Q. 10 Product of combustion of H_2 is
A. CO_2
B. H_2O
C. H_2O_2
D. CO

Q. 11 Mole of N in 2g of N_2
A. 2
B. 1/14
C. 14
D. 28

Q. 12 Chemical equations do not tell about the _____ because of certain limitations.
A. Rate of reaction
B. Conditions
C. Pressure
D. All of these

Q. 13 An ordinary microscope can measure the size of an object up to or above
A. 25nm
B. 45nm
C. 500nm
D. 6nm

Q. 14 18g of water contains _____ atoms of hydrogen
A. 6.022×10^{23}
B. $3\times6.022\times10^{23}$
C. $2\times6.02\times10^{23}$
D. $4\times6.22\times10^{23}$

Q. 15 The relative atomic mass of copper is

A. 63.345amu B. 63.455amu
C. 63.55amu D. 63.456amu

Q. 16 25 cm^3 of the sample of H_2 gas effuses four times as rapidly as 25 cm^3 of an unknown gas what will be the molar mass of unknown gas?

A. 16g mol^{-1} B. 32g mol^{-1}
C. 72g mol^{-1} D. 48g mol^{-1}

Q. 17 The negative ions having group of atoms is/are

A. OH^- B. CO_3^{-2}
C. $Cr_2O_7^{-2}$ D. All of these

Q. 18 The study of composition of pure substance in 17th century clearly shows that few elements are components of many substances

A. Qualitative B. Quantitative
C. Both A and B D. Extensive

Q. 19 The concept of _____ of gases helps to relate solids and liquids in a quantitative manner.

A. Density B. Molar volume
C. Pressure D. Temperature

Q. 20 Empirical formula of ascorbic acid

A. $C_3H_4O_3$ B. $C_3H_2O_4$
C. $C_2H_3O_5$ D. $C_3H_6O_3$

Q. 21 In combustion analysis CO_2 is absorbed by

A. 50%KOH B. $Mg(ClO_4)_2$
C. 100%KOH D. Anhydrous KOH

ANSWER KEY

1	D	11	B	21	A
2	C	12	D		
3	B	13	C		
4	C	14	C		
5	C	15	C		
6	A	16	B		
7	B	17	D		
8	A	18	B		
9	C	19	B		
10	B	20	A		

UNIT 2 PRACTICE EXERCISE

ATOMIC STRUCTURE

1. **The set of orbitals having $n + l = 5$ are:**
   A. 2p, 3d, 3s
   B. 3p, 3d, 5s
   C. 3s, 4p, 4d
   D. 5s, 4p, 3d

2. **The ratio of e/m values of a proton and an α-particle is:**
   A. 2: 1
   B. 1: 2
   C. 1: 1
   D. 1: 4

3. **Two electrons present in same orbital can be distinguished by:**
   A. Principal quantum number
   B. Azimuthal quantum number
   C. Spin quantum number
   D. Magnetic quantum number

4. **An atom has 35 nucleons and has atomic number equal to 17. the number of electrons with $n = 2, l = 0$ in it is:**
   A. 2
   B. $\frac{1}{2}$
   C. 4
   D. $\frac{1}{4}$

5. **The e/m ratio of cathode rays is,**
   A. 1.76×10^{23} C/ kg
   B. 1.76×10^{11} C/kg
   C. 1.76×10^{-31} C/kg
   D. 1.76×10^{7} C/kg

6. **The wave number ($\bar{\upsilon}$) of a radiation with $\lambda = 2 \times 10^{8}$ nm will be,**
   A. 0.5×10^{-8} nm^{-1}
   B. 10 nm^{-1}
   C. 5 nm^{-1}
   D. 100 nm^{-1}

7. **If Aufbau rule is not followed in filling of the sub-shells then the block of which will change in the periodic table?**
   A. K (19)
   B. V (23)
   C. Sc (21)
   D. Ni (28)

8. **Positive rays produce in discharge tube from:**
   A. Electricity
   B. Anode
   C. Gas molecule
   D. Cathode

9. **Which quantum number describes the energy of electron**
   A. s
   B. l
   C. m
   D. n

10. **Maximum number of electrons that can be accommodated in N shell**
    A. 2
    B. 18
    C. 8
    D. 32

11. **Which of the following quantum number has negative quantum number value**
    A. Principal
    B. Azimuthal
    C. Magnetic
    D. Both b & c

12. **e/m ratio of positive rays is _____ than that of cathode rays**
    A. Less
    B. Greater
    C. Equal
    D. Difficult to predict

13. **For an electron in K-shell, the correct four quantum numbers are represented by,**
    A. $n = 1, \ell = 1, m = 0, s = +\frac{1}{2}$
    B. $n = 2, \ell = 0, m = 0, s = +\frac{1}{2}$
    C. $n = 1, \ell = 0, m = 0, s = -\frac{1}{2}$
    D. $n = 2, \ell = 2, m = +2, s = +\frac{1}{2}$

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14. All are electromagnetic in nature except,
A. IR rays
B. X-rays
C. UV-rays
D. Cathode rays

15. Indicate the correct order of sub shell w.r.t penetration power.
A. s>p>d>f
B. f>d>p>s
C. p>s>f>d
D. d>f>s>p

16. An electron moving in orbit having principal quantum number 4 & azimuthal quantum number 2, then the subshell will be
A. 4p
B. 4f
C. 4d
D. 5s

17. Nitrogen has three unpaired electrons in outermost shells according to
A. Aufbau principle
B. Pauli's exclusion principle
C. Hund's rule
D. Le chatilier principal

18. Shape of orbital is determined by _____ quantum number is
A. n
B. ll
C. s
D. ℓ

19. A quantum number which is not obtained by solving Schrodinger wave equation is
A. n
B. m
C. ℓ
D. s

20. At infinite distance from nucleus, potential energy of electron is
A. Positive
B. Zero
C. Negative
D. Infinity

21. The energy associated with quantum of radiation is,
A. hv
B. $\frac{nh}{2\pi}$
C. 2hv
D. $\frac{1}{2}$hv

22. Which of the following has the maximum number of unpaired electrons?
A. Mg^{2+}
B. V^{3+}
C. Ti^{3+}
D. Fe^{2+}

23. Total number of d-electrons in an atom of atomic number 26 is:
A. 4
B. 6
C. 5
D. 7

24. Which one of the following has the same number of electrons as an alpha particle $_2He^{+2}$?
A. H
B. H^+
C. H_2
D. He

25. Which of the following orbital is not possible:
A. 3p
B. 2d
C. 4s
D. 1s

26. The no. of electrons in the M shell of element with atomic number 24 is:
A. 8
B. 13
C. 12
D. 14

27. The maximum number of electrons with n = 3 and l = 2 is:
A. 10
B. 6
C. 8
D. Zero

28. Bohr's theory cannot be applied on,
A. H
B. H^+
C. He^{+1}
D. Li^{+2}

29. **Which of the following sets of quantum numbers are not possible?**
A. $n=3, \ell=2, m=0, s=-\frac{1}{2}$
B. $n=3, \ell=3, m=-3, s=+\frac{1}{2}$
C. $n=4, \ell=3, m=-3, s=+\frac{1}{2}$
D. $n=3, \ell=1, m=0, s=+\frac{1}{2}$

30. **The electronic configurations of four elements are given which of these elements has the highest first Ionization energy?**
A. $1s^2, 2s^2, 2p^3$
B. $1s^2, 2s^2, 2p^6, 3s^1$
C. $1s^2, 2s^2, 2p^4$
D. $1s^2, 2s^2, 2p^6, 3s^2, 3p^3$

31. **The quantum number 'm' of a free gaseous atom is associated with:**
A. The effective volume of the orbital
B. The shape of the orbital
C. The one-dimensional orientation of the orbital
D. The number of electrons in the orbital

32. **The atomic number of an element is 18. The number of electron pairs in its valence shell is:**
A. 3
B. 4
C. 6
D. 8

33. **The correct representation for 'd' orbital is:**
A. $(n-1)d^{1-9}ns^1$
B. $(n-1)d^{1-5}$
C. $(n-1)d^{1-10}ns^{1-2}$
D. $(n-1)d^{1-10}ns^2$

34. **Number of unpaired electrons in Cr are:**
A. 4
B. 5
C. 6
D. 7

35. **The frequency of a green light is 6×10^{14} Hz, its wavelength is,**
A. 5 nm
B. 500 nm
C. 5000 nm
D. 100 nm

36. **Which of the following sub-shell do not exist?**
A. 1p
B. 5d
C. 6f
D. 1s

37. **Which one of the following best explain the valency of a element?**
A. Aufbau principle
B. Hund's rule
C. Pauli's exclusion principle
D. n+l rule

38. **The relative energies of 4s, 4p and 3d orbitals are in the order**
A. $3d < 4p < 4s$
B. $4s < 3d < 4p$
C. $4p < 4s < 3d$
D. $4p < 3d < 4s$

39. **All quantum numbers are obtained from solution of Schrodinger equal except,**
A. Principal quantum number, n
B. Magnetic quantum number, m
C. Spin quantum number, s
D. Azimuthal quantum number, *l*

40. **The maximum number of electrons in 3s orbital,**
A. 1
B. 2
C. 6
D. 10

41. **An electron having highest energy in the set of quantum no. is:**
A. 3, 2, 2, 1/2
B. 4,1,0,1/2
C. 2,2,-1,/2
D. 5,0,0,1/2

42. **Which is correct in case of p-orbitals:**
A. they are spherical
B. they have a strong directional character
C. They are tetra lobed
D. They form ionic bond only

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43. Which one resembles with N after losing an electron

A. O
B. B
C. C
D. Na

44. The splitting of spectral lines in magnetic field is

A. Stark effect
B. Zeeman effect
C. Aufbau principle
D. Pauli exclusion principle

45. Pair having same principle quantum no value for last electron:

A. H & Li
B. Cl & Ar
C. K & Kr
D. Na & Ne

46. With increase in the value of Principal Quantum Number 'n', the shape of the s-orbitals remains the same although their sizes

A. Decrease
B. Increase
C. Remain the same
D. May or my not remain

47. Correct order of energy in the given subshells is:

A. 5s > 3d > 3p > 4s
B. 5s > 3d > 4s > 3p
C. 3p > 3d > 5s > 4s
D. 3p > 3d > 4s > 5s

48. Number of electrons in the outermost shell of chloride ion (Cl^-) is:

A. 17
B. 3
C. 1
D. 8

49. Identify the correct option associated with the shape of p-orbital:

A. 

C. 

B. 

D. 

50. If the mass of electron is reduced to half, the Rydberg's constant

A. Becomes half
B. Becomes double
C. Remains unchanged
D. Becomes one fourth

51. Which element has the electronic configuration of noble-gas notation $5s^2$, $4d^2$

A. Se
B. Sr
C. Zr
D. Mo

52. As we move away from nucleus the distance between the adjacent orbits goes on

A. increasing
B. decreasing
C. remains constant
D. increases for first 3 then decreases

53. Energy difference between the energy levels far away from the nucleus is _____ energy difference between the energy levels near to the nucleus

A. greater than
B. smaller than
C. equal to
D. very close to

54. There are ___ distinct series of H spectrum

A. 1
B. 3
C. 5
D. 7

55. Value of n_1 in Pfund series is

A. 1
B. 2
C. 4
D. 5

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56. Orbital having shape of dumbbell with a dough nut

A. p_x
B. d_z^2
C. s
D. f

57. The mathematical form of Moseley's law is

A. $\sqrt{v} = v(z-a)$
B. $\sqrt{v} = a(z-b)$
C. $\sqrt{v} = \frac{a}{b}\sqrt{z}$
D. $\sqrt{v} = \frac{b}{a}z$

58. If the wavelength of the electromagnetic radiation is increased to thrice the digital value, then what will be the percent change in the value of frequency of the electromagnetic radiation?

A) Increases by 33%
B) Decreases by 66%
C) Increases by 66%
D) Decreases 33%

59. When magnetic field is applied on orbitals of a given sub energy level they become

A. degenerate
B. non degenerate
C. greater in number
D. smaller in size

60. An orbital is also called

A. electronic cloud
B. electron sea
C. sub-shell
D. sub-level

61. Atomic number of Mn is 25 its last electron enters in

A. $4p_x$
B. 3d
C. 4s
D. 5d

62. Which of the following gas has smaller e/m value when it produces positive rays

A. Oxygen
B. Nitrogen
C. Methane
D. Carbon monoxide

63. Number of unpaired d-electrons with Z=25 are

A. 4
B. 5
C. 6
D. 7

64. In Bohr's model, atomic radius of the first orbit is y, the radius of the 3rd orbit, is

A) y/3
B) 3y
C) y
D) 9y

65. If r is the radius of the first orbit, the radius of n^{th} orbit of H-atom is given by

A) rn^2
B) r/n
C) rn
D) r^2n^2

66. The probability of finding the electron is the nucleus is

A. 100% due to forces of attractions
B. Zero for all elements
C. Finite for all elements
D. Zero for some elements and finite for others

67. The correct electronic configuration of Cu^{+2} is

A. $[Ar]3d^9,4s^2$
B. $[Ar]3d^8,4s^2$
C. $[Ar]3d^9,4s^1$
D. $[Ar]3d^9,4s^0$

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68. **The atomic no. of an element is 35. What is the total no. of electrons present in all the 'p' orbitals of the ground state atom of that element?**

A. 17 C. 11
B. 23 D. 6

69. **The correct set of quantum numbers for unpaired electrons in lithium atom is:**

	n	ℓ	m
A.	2	0	0
B.	3	0	0
C.	2	1	1
D.	3	1	0

70. **If electron has spin quantum number of $+\frac{1}{2}$ and magnetic quantum number of +3, it can be present in**

A. s – orbital C. d – orbital
B. p – orbital D. f – orbital

71. **What does negative sign in the electronic energy for hydrogen atom convey:**

A) Energy of electron when $n = \infty$
B) The energy of electron in the atom is lower than the energy of a free electron in motion
C) The energy of electron in the atom is lower than the energy of a free electron of rest
D) The energy of electron decease as it moves away from nucleus

72. **If the principal quantum no. is 3 then the values of azimuthal quantum no. are**

A. 1, 2 C. 1, 2, 3
B. 0, 1, 2 D. – 1, 0, 1

73. **Number of orbitals in M–energy level is:**

A. 2 C. 6
B. 4 D. 9

74. **In ground state, an element has 13 electrons in its M – shell. The element is:**

A. Copper C. nickel
B. iron D. chromium

75. **Which of the following is not possible?**

A. n = 2, l = 1, m = 0 C. n = 2, l = 0, m = –1
B. n = 3, l = 0, m = 0 D. n = 3, l = 1, m = –1

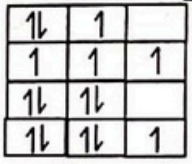
76. **The quantum numbers specify_____ of electron**

A. position C. position and energy
B. energy D. uncertainty

77. **An ion X^{+2} has $2e^-$ in its valence shell, how many electrons were there in its valence shell before ionization**

A. 3 C. 6
B. 4 D. 5

78. **The orbitals of a nitrogen atom may be represented by which of the following arrangement of electrons in the ground state?**

A. 
B. 
C.
D.

79. **After removal of one electron from the outer most shell of each atom, which will have max. no. of unpaired electrons**

A. Na C. O
B. N D. Be

80. The correct electronic configuration of Cu^{+1} is

A. $[Ar]4s'3d^8$
B. $[Ar]4s'3d^9$
C. $[Ar]4s'3d^{10}$
D. $[Ar]3d^9$

81. An improbable electronic configuration is

A. $[Ar]3d^4 4s^2$
B. $[Ar]3d^5 4s^2$
C. $[Ar]3d^6 4s^2$
D. $[Ar]3d^{10} 4s^1$

82. A neutral atom that has only one electron in its 3d subshell has number of electrons in the outermost shell.

A. 9
B. 7
C. 2
D. 5

83. Which of these elements has the valence shell electronic configuration of $3s^2$

A. He
B. Na
C. Mg
D. K

84. The pair of orbitals that share the same value of principal quantum number

A. 2s and $3p_x$
B. $3d_{xy}$ and $3d_{yz}$
C. 1s and 2s
D. 4f and 5p.

85. An alpha particle has charge to mass value

A. greater than electron
B. greater than proton
C. less than nitrogen ion
D. greater than oxygen ion

86. Which of the following specie shows an electronic configuration of $1s^2$?

A. ${}^{3}_{1}H$
B. ${}^{4}_{2}He^{+}$
C. ${}^{1}_{1}H^{+}$
D. ${}^{2}_{1}H^{-}$

87. The total no. of unpaired p – electrons in Br are

A. 1
B. 0
C. 4
D. 9

88. Which of these has max. electrons in its 3d subshell?

A. Sc^{+3}
B. Ti^{+4}
C. Ni^{+2}
D. Fe^{+2}

89. The value of n+l for 4f-subshell is

A. 4+2=6
B. 5+2=7
C. 3+3=6
D. 4+3=7

90. Which of these is true for Na^{+1} and Mg^{+2}

A. Na^{+1} has two shells, Mg^{+2} has 3 shells.
B. Sodium has lost its valence shell while Mg hasn't
C. Both have 10 electrons
D. both have lost similar no. of electrons

91. How many electrons must be added to an atom with valence configuration $3p^6$ so that the next electron goes to upper p-subshell?

A. 10
B. 15
C. 12
D. 18

92. In which of the following shell, the electron will be at maximum distance from the nucleus?

A. 2^{nd}
B. 5^{th}
C. 1^{st}
D. 3^{rd}

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93. Aufbau principle cannot tell us about

A. the no. of electrons in valence shell.
B. relative energies of shells
C. relative energies of subshells
D. distribution of electrons in orbitals

94. $3s^2, 3p^4$ electronic configuration corresponds to

A. S
B. Cl^{+2}
C. Cl^{-2}
D. K^{+1}

95. ${}^{16}_{8}O^{-2}$ has electrons in s-orbitals

A. 8
B. 10
C. 6
D. 4

96. ${}_{6}Y = 2s^1 2P_x^1 2P_y^1 2P_z^1$ this is _____ configuration

A. excited state
B. ground state
C. hybrid state
D. molecular state.

97. Which of the following orbital receives electron the latest?

A. 4s
B. 2s
C. 3d
D. 3p

98. An orbital that has directional character is

A. any s-orbital
B. any s or p-orbital
C. any s or d-orbital
D. any p-orbital

99. All of these have same number of 3p electrons except

A. Si^{+4}
B. S^{-2}
C. Cl^{-1}
D. K^{+1}

100. According to Hund's rule an element with atomic number 15 will have unpaired electrons

A. 8 in d subshell
B. 2 in d subshell
C. 6 in p subshell
D. 3 in p-subshell

101. Sodium and potassium both have same number of electrons in

A. L-shell
B. s-orbitals
C. p-subshells
D. M-shell.

102. How many e^- are present in p-orbitals in Zn-atom?

A. 2
B. 12
C. 6
D. 18

103. Wavelength of spectral line emitted is inversely proportional to

A. energy
B. radius
C. velocity
D. quantum number

104. Number of orbitals in L energy level

A. 1
B. 3
C. 2
D. 4

105. Ratio of radii of second and first Bohr orbits of H atom is

A. 2
B. 3
C. 4
D. 8

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106. In ground state, an element has 10 electrons in its 3d sub-shell. The element is?

A. copper
B. zinc
C. iron
D. chromium

107. An element has 2 electrons in its K shell, 8 electrons in L shell, 14 electrons in M shell and 2 electrons in N shell. The element is

A. Cr
B. V
C. Fe
D. Ti

108. The maximum number of 3d electrons having $s = +\frac{1}{2}$ are

A. 10
B. 14
C. 5
D. 7

109. The fourth electron of Be atom will have which of the following quantum numbers?

A. $1,0,0,\frac{1}{2}$
B. $2,1,0,2+\frac{1}{2}$
C. $2,0,0,-\frac{1}{2}$
D. $1,1,1,+\frac{1}{2}$

110. The electron density between 1s and 2s orbital is

A. high
B. zero
C. low
D. negligible

111. The angular momentum of an e^- can't be

A. $\frac{h}{\pi}$
B. $\frac{2.5h}{\pi}$
C. $\frac{2h}{2\pi}$
D. $\frac{0.5h}{\pi}$

112. The atomic numbers of elements X,Y,Z are 19,21 and 25 respectively. The number of electrons present in the 'M' shells of these elements follow the order

A. X>Y>Z
B. X<Y<Z
C. X<Y>Z
D. X>Y<Z

113. The correct order of number of unpaired electrons in the ion Cu^{2+},Ni^{2+}, Fe^{3+} and Cr^{3+} is

A. $Cu^{2+} > Ni^{2+} > Cr^{3+} > Fe^{3+}$
B. $Fe^{3+} > Cr^{3+} > Cu^{2+} > Ni^{2+}$
C. $Ni^{2+} > Cu^{2+} > Fe^{3+} > Cr^{3+}$
D. $Fe^{3+} > Cr^{3+} > Ni^{2+} > Cu^{2+}$

114. Which of the following statements in relation to the Chlorine atom is correct?

A. 3s and 3p orbitals are of higher energy than 3d orbital
B. 3p orbital is higher in energy than 3d orbital
C. 3s orbital is higher in energy than 3p orbital
D. 3d orbitals are higher in energy than 3s and 3p orbitals

115. Brackett series is found in

A. Ultraviolet region
B. Visible region
C. Infrared region
D. Cosmic region

116. From Lyman to Pfund series, the wave numbers of spectral lines

A. Increase
B. Remain constant
C. Decrease
D. vary inversely to the frequency

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117. The volume of space in which there is _____ chance of finding an electron is called atomic orbital

A. 90%
B. 98%
C. 95%
D. 100%

118. The sets of numerical values which give acceptable solutions for electron of any atom is called

A. Principal quantum no.
B. Magnetic quantum no.
C. Azimuthal quantum no.
D. Quantum no.

119. Quantum number which represents shell or energy level in which electron revolves around nucleus is called

A. Principal quantum no.
B. Magnetic quantum no.
C. Azimuthal quantum no.
D. Quantum no.

120. For p – sub shell

A. $l = 0, m = 0$
B. $l = 2, m = 0, \pm 1, \pm 2$
C. $l = 1, m = 0, \pm 1$
D. $l = 3, m = 0 \pm 1, \pm 2, \pm 3$

ANSWER KEY

1	D	16	C	31	B	46	B	61	B	76	C	91	A	106	B
2	A	17	C	32	B	47	B	62	A	77	B	92	B	107	C
3	C	18	A	33	C	48	D	63	B	78	B	93	D	108	C
4	A	19	D	34	B	49	B	64	D	79	C	94	A	109	C
5	B	20	B	35	B	50	A	65	A	80	C	95	D	110	B
6	A	21	A	36	A	51	C	66	B	81	A	96	A	111	B
7	A	22	D	37	B	52	A	67	D	82	C	97	C	112	B
8	C	23	B	38	B	53	B	68	A	83	C	98	D	113	D
9	D	24	B	39	C	54	C	69	A	84	B	99	A	114	D
10	D	25	B	40	B	55	D	70	D	85	D	100	D	115	C
11	C	26	B	41	D	56	B	71	B	86	D	101	A	116	C
12	A	27	A	42	B	57	B	72	B	87	A	102	C	117	C
13	B	28	B	43	A	58	B	73	D	88	C	103	A	118	D
14	D	29	B	44	B	59	B	74	D	89	D	104	D	119	A
15	A	30	A	45	B	60	A	75	C	90	C	105	C	120	C

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2. $\left(\frac{e}{m}\right)_{p^+} = \frac{1}{1}$ $\left(\frac{e}{m}\right)_{He^{+2}} = \frac{+2}{4} = \frac{1}{2}$

$p^+ : He^{+2}$

$1 : \frac{1}{2}$ or

$2 : 1$

7. It will have last electron in d.

15. Smaller the size of sub-shell, higher will be the penetration power.

18. Orbital properties are described by (n).

19. Information

22. Fe^{+2} has 5 unpaired e^-

24. No electrons in both of them.

26. Element = $1s^2 2s^2 2p^6$ $\underline{3s^2 3p^6}$ $\underline{4s^1 3d^5}$.

30. It is extra stable configuration.

37. Only half-filled orbitals form bonds.

41. D = 5s.

45. Last electron is in 3p.

52. $r_4 - r_3 > r_3 - r_2 > r_2 - r_1$.

59. Magnetic field causes the energy of degenerate orbitals to change.

66. Inside the nucleus electron speed would be greater than speed of light.

72. $n - l = \ell$.

75. If $\ell = 0$ then $m = 0$

79. 3 unpaired e^-

81. An electron must be excited to 3d from 4s sub-shell.

87. $4p_x^2 4p_y^2 4p_z^1 \rightarrow$ only unpaired e^-.

90. $Na^{+} = 11 - 1 = 10$ $Mg^{+2} = 12 - 2 = 10$

93. It deals with shells and sub-shells only.

97. It has highest energy.

99. $Si^{+4} = 1s^2 2s^2 2p^6$ others $1s^2 2s^2 2p^6 3s^2 3p^6$

107. Fe has atomic no. 26

108. Half of d – e^{-} have anticlock wise spin.

111. $\frac{nh}{2\pi} = mvr \quad (n = 1, 2, 3, ...)$

118. Definition

120. $\ell = 0 \quad m = o, \pm\ell$

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Q.1 Which quantum number tells us about orientation of orbitals:

A. Principal quantum number
B. Spin quantum number
C. Azimuthal quantum number
D. Magnetic quantum number

Q.2 The relative energies of 4s, 4p and 3d orbitals are in the order

A. $3d < 4p < 4s$
B. $4p < 4s < 3d$
C. $4s < 3d < 4p$
D. $4p < 3d < 4s$

Q.3 With increase in the value of principal quantum number 'n', the shape of the s-orbitals remain same although their sizes

A. Decrease
B. Remain the same
C. Increase
D. May or may not remain the same

Q.4 Number of electrons in the outermost shell of chloride ion(Cl^-) is:

A. 17
B. 1
C. 7
D. 8

Q.5 Correct order of energy in the given sub-shells is:

A. $5s > 3d > 3p > 4s$
B. $3p > 3d > 5s > 4s$
C. $5s > 3d > 4s > 3p$
D. $3p > 3d > 4s > 5s$

Q.6 According to the number of protons, neutrons and electrons given in the table, which one of the following option is correct?

Species	Proton	Neutron	Electron
As	33	42	30
Ga	31	39	28
Ca	20	20	20

A. As^{+3}, Ga^{+3}, Ca
B. $As^{+3}, Ga^{+3}, Ca^{+2}$
C. As^{+3}, Ga^{+2}, Ca
D. As^{+3}, Ga, Ca^{+2}

Q.7 There are four orbitals s, p, d and f. Which order is correct with respect to the increasing energy of the orbitals

A. $4s < 4p < 4d < 4f$
B. $4s < 4f < 4p < 4d$
C. $4p < 4s < 4f < 4d$
D. $4f < 4s < 4d < 4p$

Q.8 Which one of the following pairs has the same electronic configuration as possessed by neon (Ne-10)

A. Na^+, Cl^-
B. Na^+, Mg^+
C. K^+, Cl^-
D. Na^+, F^-

Q.9 Number of neutrons in $^{66}_{30}Zn$ will be:

A. 30
B. 38
C. 35
D. 36

Q.10 The maximum number of electrons in electronic configuration can be calculated by using formula:

A. $2l+1$
B. $2n^2$
C. $2n^2+2$
D. $2n^2+1$

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Q.11 Number of electrons in $^{71}_{31}Ga^{3+}$ Will be

A. 28 B. 30
C. 29 D. 34

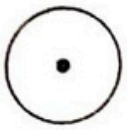
Q.12 Isotopic symbol of ion of Sulphur-33 is $^{33}_{16}S^{-2}$ How many number of protons and neutrons are present if number electrons are 18?

A. P = 18, n = 15 B. P = 16, n = 18
C. P = 16, n = 17 D. P = 17, n = 16

Q.13 Among the following, which contains same no. of electrons & proton but different no. of neutron:

A. Isobars B. Isotones
C. Isotopes D. None of the these

Q.14 Identify the correct option associated with the shape of p-orbital:

A. 

B. 

C. 

D. 

Q.15 Which is the correct electronic configuration of chromium ($_{24}Cr$)?

A. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^4$ B. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1, 3d^5$
C. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^6$ D. $1s^2, 2s^2, 3s^2, 3p^6, 3p^6, 4s^2, 3d^6$

Q.16 Maximum numbers of electron in a sub-shell is given by

A. $2(2l-1)$ B. $2(2l+1)$
C. $2(l+1)$ D. $2l+1$

Q.17 The order of energy level in ^{19}K is?

A. 4s, 4p B. 4s, 3d
C. 3p, 4s D. 3s, 3d

Q.18 Which of the following element in its atomic state has electrons fully occupying first two spherically symmetrical orbitals?

A. Oxygen B. Helium
C. Beryllium D. Carbon

Q.19 What are the values of principal quantum number and azimuthal quantum number for the last electron in Chlorine atom?

A. 1, 6 B. 1, 3
C. 3, 1 D. 6, 1

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Q.20 **Which of the following electronic configuration is / are correct?**

(i) $^{29}Cu\ 1s^2 2s^2 3p^6, 3s^1$ (ii) $^{29}Cu[Ar]4s^1 3d^{10}$

(iii) $^{24}Cr[Ar]4S^1 3d^{10}$ (iv) $^{24}Cr[Ar]4S^2 3d^4$

A. I only B. II only

C. I and II only D. II and III only

Q.21 **Quantum number which describes the orientation of orbitals in three dimensional space is**

A. Spin quantum number B. Azimuthal quantum number

C. Magnetic quantum number D. Principal quantum number

Q.22 **Which of the following is the electronic configuration of Cr?**

A. $[Ar]3d^5 4s^2$ B. $[Ar]3d^4 4s^2$

C. $[Ar]3d^6 4s^0$ D. $[Ar]3d^5 4s^1$

Q.23 **The relationship between quantum number n and ℓ is:**

A. n = I-1 B. ℓ =n-2

C. ℓ = n-1 D. n= ℓ -2

Q.24 **Quantum number values for '2P' orbitals are**

A. n=2 I=1 B. n=1 I=2

C.n=1 I=0 D. n=2 I=0

Q.25 **Which pair has 1 electron in its orbital?**

A. Li& Fe B. Na & Cr

C.K & Mn D. H & He

Q.26 **Which of the following has the lowest e/m ratio?**

A. Li^{2+} B. H^{+1}

C. He^{+} D. Be

PAST PAPER QUESTIONS

1	D	6	A	11	A	16	B	21	C	26	D
2	C	7	A	12	C	17	C	22	D		
3	C	8	D	13	C	18	C	23	C		
4	D	9	D	14	C	19	C	24	A		
5	C	10	B	15	B	20	B	25	B		

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HINTS

4. 2, 8, 8

6. As = 33 – 30 = 03 (As^{+3})

   Ga = 31 – 28 = 03 (Ga^{+3})

   Ca = 20 – 20 = 00 (Ca)

8. All of these have 10 e^-s in their shells.

9. 66 – 30 = No. of neutrons.

11. Atomic no – charge = No. of e^-s.

14. Bilobed

18. $1s^2\ 2s^2$

19. $3p_z^1 = 3, 1$

25. Na = $3s^1$ Cr = $4s^1$

26. Highest mass and small charge

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Q. 1 According to Bohr, the orbits in which electrons revolve around the nucleus are

A. Oval
B. Elliptical
C. Cylindrical
D. Circular

Q. 2 Atomic number of K

A. 19
B. 21
C. 27
D. 11

Q. 3 Number of protons, electrons and neutrons in Pb^{+2}

A. 82, 80, 125
B. 80, 82, 125
C. 125, 82, 80
D. 125, 80, 82

Q. 4 Spin could be

A. +1/2, –1/2
B. 1/2, +1/2
C. ½,0
D. None

Q. 5 Cancer treatment which radiation use

A. Alpha
B. Beta
C. Gamma
D. Cathode rays

Q. 6 M-shell contain

A. s
B. s, p, d
C. s, p, d, f
D. s, p

Q. 7 Who discovered neutron

A. Chadwick
B. Goldstein
C. Palnck
D. Thomson

Q. 8 If electrons are passed in electric and magnetic field then correct equation is

A. Will go straight
B. Will bend towards the positive plate
C. Will bend towards negative plate
D. Will be deflected perpendicular to the axis of magnetic field

Q. 9 Total no. of electrons that can be accommodated in f-subshell

A. 6
B. 14
C. 10
D. 18

Q. 10 n+ *l* value for 5d is

A. 5
B. 6
C. 7
D. 8

Q. 11 Maximum number of electrons in p-subshell are

A. 6
B. 10
C. 12
D. 14

Q. 12 Which one has greater mass?

A. Alpha
B. Beta
C. Gamma
D. Proton

Q. 13 Number of electrons in 3p subshell of Ca?

A. 4
B. 5
C. 6
D. 2

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Q. 14 Number of electrons in chloride ion

A. 8 B. 7
C. 9 D. 18

Q. 15 According to Planck's quantum theory:

A. a body emits energy in quanta
B. a body absorbs energy in quanta
C. emits or absorb radiations discontinuously
D. All of these

Q. 16 Rydberg's constant is related to the atomic no. as:

A. Z^2 B. $1/Z^2$
C. Z^3 D. Z

Q. 17 Magnetic quantum number of s is

A. 0 B. 1
C. 2 D. 3

Q. 18 Planck's constant was named after scientist

A. Heisenberg B. Planck
C. Henry D. Bohr

Q. 19 The probability of finding an electron between s-orbitals is zero. This place is called _____ plane

A. Nodal B. Non nodal
C. Anti-nodal D. Erect

Q. 20 Positive rays are also known as

A. X rays B. Gamma rays
C. Canal rays D. Cathode rays

Q. 21 Each electron in an atom must have its own unique set of quantum number is a statement of _____.

A. Aufbau principle B. Hund's rule
C. Pauli exclusion principle D. None of these

Q. 22 During bond formation, d orbitals splits into _____ of orbitals?

A. 3 sets B. 4 sets
C. 5 sets D. 2 sets

Q. 23 The e/m values of the positive rays depend on _____ enclosed in a discharge tube

A. Nature of gas B. Properties of gas
C. Composition of gas D. All of these

Q. 24 The lobes of d-orbitals lie between the axis

A. First two B. In all axis
C. First three D. None of these

Q. 25 Different kind of atoms of same elements are called isotopes heaving different _____ but same _____ property?

A. Physical, atomic B. Physical, chemical
C. Chemical, Physical D. Chemical, Atomic

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Q. 26 The maximum probability of finding an electron is at distance of

A. 0.53 mm
B. 0.53 nm
C. 0.153nm
D. 1.53mm

Q. 27 Potassium has electronic configuration (2, 8, 8, 1) and become ion by attaining configuration

A. 2, 8, 8, 2
B. 2, 8, 8
C. 2,8,1
D. 2, 8, 8, 8

Q. 28 Which has greater energy according to Auf-bau principle (n + l)

A. 5d
B. 4f
C. 7s
D. 6p

Q. 29 Spectrum is the visual display or _____ of component of while light when it is passed through prism

A. Rarefaction
B. Radiation
C. Collection
D. Dispersion

Q. 30 All the three p-orbitals have same energy in the absence of magnetic field and are called _____ orbital's

A. Generated
B. Delocalized
C. Degenerated
D. Localized

ANSWER KEY

1	D	11	A	21	C
2	A	12	A	22	D
3	A	13	C	23	A
4	A	14	D	24	B
5	C	15	D	25	B
6	B	16	A	26	B
7	A	17	A	27	B
8	B	18	B	28	B
9	B	19	A	29	D
10	C	20	C	30	C

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UNIT 3 PRACTICE EXERCISE

GASES

1. **The pressure of $5dm^3$ gas increases from 250 torr to 500 torr then new volume of gas**
   A. 500 cm^3
   B. 2500 cm^3
   C. 375 cm^3
   D. 200 cm^3

2. **Matter exists in the number of states:**
   A. Two
   B. Three
   C. Four
   D. Five

3. **The SI unit of pressure is:**
   A. Atmosphere
   B. Pascal
   C. Newton
   D. Torr

4. **When graph is plotted between P and 1/V at constant temperature. A straight line is obtained which moves toward _____ when temperature is increased**
   A. Pressure axis
   B. 1/V axis
   C. Volume axis
   D. 1/P axis

5. **If 250 cm^3 of hydrogen gas is cooled from 127°C to -73°C at constant pressure then new volume of gas is _____ dm^3**
   A. 0.25
   B. 0.125
   C. 0.375
   D. 0.0625

6. **If absolute temperature of a gas is doubled and the pressure is reduced to one half, the volume of the gas will:**
   A. Remain unchanged
   B. Reduce to1/4
   C. Increase four times
   D. Be doubled

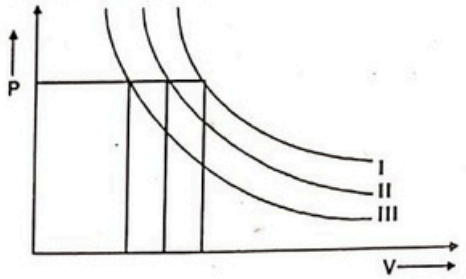
7. **The value of general gas constant, R in SI system is:**
   A. 8.31 Nm K^{-1} mol^{-1}
   B. 8.31 atm dm^3 mol^{-1} K^{-1}
   C. 0.0821 Nm^{-1} mol^{-1}
   D. 0.0821 atm dm^3 mol^{-1} K

8. **At STP volume of one mole of an ideal gas is $22.414dm^3$ but if pressure is measured in Pascal's then comes out to be**
   A. $22.4dm^3$
   B. $0.0224m^3$
   C. $22.4cm^3$
   D. $0.0224dm^3$

9. **The expression for root mean square velocity is**
   A. $C_{rms} = \left(\frac{3RT}{M}\right)^{1/2}$
   B. $C_{rms} = \left(\frac{3P}{d}\right)^{1/2}$
   C. $C_{rms} = \left(\frac{3PV}{M}\right)^{1/2}$
   D. All

10. **The value of R in terms of dm^3 torr $k^{-1}mol^{-1}$**
    A. 62400
    B. 8.313
    C. 62.4
    D. 0.0821

11. **I, II, III are three isotherms as shown in the adjoining figure, respectively at T_1 T_2 and T_3. The temperatures will be in the order**



A. $T_1 = T_2 = T_3$
C. $T_1 < T_2 < T_3$
B. $T_1 > T_2 > T_3$
D. $T_1 > T_2 = T_3$

12. **The pressure of $10dm^3$ gas is increased from 1.5 atm to 3atm, keeping temperature constant, then new volume of gas will be**
A. 5 dm^3
C. 20 dm^3
B. 7.5 dm^3
D. same as before

13. **At STP volume of one mole of an ideal gas is $22.414dm^3$ What will be the volume of gas at 273°C keeping pressure same**
A. $22.4dm^3$
C. $44.818dm^3$
B. $2.24dm^3$
D. $4.4818dm^3$

14. **The instrument that is used to measure the atmosphere pressure is**
A. Thermometer
C. Barometer
B. Manometer
D. Voltmeter

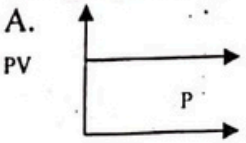
15. **When the Kelvin temperature of _____ doubled, the volume will:**
A. Remain same
C. Reduced to one fourth
B. Be halved
D. Increases 2 times

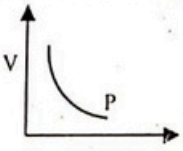
16. **When the kelvin temperature of the gas is doubled and the pressure is reduced to one-half _____ volume of the gas will:**
A. Remain same
C. Reduce to one fourth
B. Be doubled
D. Increase four times

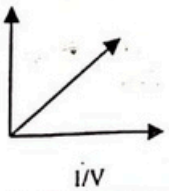
17. **When temperature and pressure are same which of the following property will be same for both H_2 and He, for equal number of moles?**
A. Mass
C. molar mass
B. Average Kinetic energy
D. Mean square velocity

18. **The temperature of 16 dm^3 of methane was increased from 200 K to 400 K. The increase in volume is**
A. 32 dm^3
C. 48 dm^3
B. 16 dm^3
D. 64 dm^3

19. **The graph which is known as isotherm of Boyle's law:**

A.


C.


B.


D. All above

20. Which one has highest C_{rms} at 25°C:
A. H_2
B. N_2
C. CO_2
D. NH_3

21. Which one is correct relation between C_{rms} & T:
A. $C_{rms} \alpha T$
B. $C_{rms} \alpha \left(\frac{1}{T}\right)^{1/2}$
C. $C_{rms} \alpha T^{-2}$
D. $C^{1/2}_{rms} \alpha T$

22. Charles's law is only obeyed at which temperature scale
A. Celsius
B. Fahrenheit
C. Kelvin
D. both A. & B.

23. Which one of the following gases diffuse more rapidly:
A. N_2
B. CH_4
C. O_2
D. CO_2

24. The gases can be liquefied by Lind's method except
A. H_2 and NH_3
B. H_2 and N_2
C. H_2 and He
D. N_2 and O_2

25. The relationship between density and molar mass of a gas is
A. directly proportional
B. straight line
C. inversely proportional
D. stoichiometric

26. At higher temperature isotherm of Boyle's law moves away from both axes, it is due to increase in:
A. pressure
B. Volume
C. no. of moles
D. all of these

27. Under which condition "CO" has the maximum molar volume
A. high 'T' and 'P'
B. high 'T' and low 'P'
C. Low 'T' and High 'P'
D. Low 'T' and low 'P'

28. If volume of an ideal gas at 0C° is 546cm³, what is volume at 100C°
A. 373 cm^3
B. Becomes "0" cm^3
C. 646 cm^3
D. 746 cm^3

29. What assumptions are made in the kinetic theory of gases?
1. There are no forces of attraction b/w molecules.
2. The molecules are in a state of continual, random motion.
3. The size of molecules is negligible.
A. only '1' is correct
B. 2 and 3 are correct
C. 1 and 2 are correct
D. 1,2 and 3 are correct

30. If pressure is expressed in torr and the volume of gas in cm^3, then units of R will be
A. $dm^3 atm\ K^{-1}mol^{-1}$
B. $cm^3 torr\ K^{-1}mol^{-1}$
C. $cal\ K^{-1}mol^{-1}$
D. $J\ K^{-1}mol^{-1}$

31. The root mean square velocity at STP for the gases CO, He, O_2 and Cl_2 are in the order
A. $Cl_2 < He < CO < O_2$
B. $He < O_2 < CO < Cl_2$
C. $CO < Cl_2 < O_2 < He$
D. $Cl_2 < O_2 < CO < He$

32. The kinetic energy ratio of hydrogen gas and helium gas at same temperature is?
A. Same
B. 1
C. 1/5
D. 1.5

33. Which of the following is the correct equation to calculate relative molecular mass of a gas
A. M = mPRT/V
B. M = PV/mRT
C. M = mPR/VT
D. M = mRT/PV

34. **Gas is enclosed in a container of $20cm^3$ with the moving piston. According to kinetic theory of gases, what is the effect on freely moving molecules of the gas if temperature is increased from 20°C to 100°C?**
A. Colliding capability of molecule will become lower
B. Pressure will become one half
C. Temperature has no effect on freely moving molecules
D. Volume will be increased

35. **The pressure of gas at constant temperature in a container of $2dm^3$ is 10 atm what will be its final pressure if it is connected with 10 dm^3 container**
A. 2 atm
B. 1.6 atm
C. 5 atm
D. 1 atm

36. **One dm^3 of H_2 and O_2 has different masses but no. of particles are**
A. same
B. H_2 has greater
C. different
D. O_2 has greater

37. **The molar volume of CO_2 is maximum at:**
A. STP
B. 127°C and 1 atm
C. 0°C and 2 atm
D. 273°C and 2 atm

38. **Highest root mean square velocity at STP is shown by**
A. CO
B. Cl_2
C. O_2
D. He

39. **The no. of molecules in $1dm^3$ dm^3 of gas at STP is**
A. 2.68×10^{22}
B. 3.01×10^{23}
C. 6.02×10^{23}
D. 1.204×10^{24}

40. **The motion imparted to the gas molecules by gravity is**
A. very small
B. negligible
C. very large
D. appreciable

41. **The temperature of a gas is directly proportional to its**
A. average translational kinetic energy
B. enthalpy
C. internal energy
D. hydration energy

42. **The pressure exerted by gas molecules is due to their**
A. collisions
B. masses
C. densities
D. kinetic energy

43. **The volume of gas depends upon the ..... molecules**
A. Size of
B. Molecular weight
C. Space between
D. both a and b

44. **The mono atomic gases are**
A. Halogens
B. 6^{th} group elements
C. Noble gases
D. Nitrogen and oxygen

45. **If the molecular weight of gas is 8.313 g/mole at 27k the root means square velocity of gas is .....**
A. 3 m/sec
B. $\sqrt{27}$ m/sec
C. 9 m/sec
D. $\sqrt{243}$ m/sec

46. **Temperature of gas increase from 300 K to 600 K what will be change in volume if the initial volume is 4 dm^3, using Charles's law**
A. 1 dm^3
B. 2 dm^3
C. 4 dm^3
D. 8dm^3

47. **If the volume of a gas at 101325Nm^{-2} is 10dm^{3}th en the pressure at which its volume will be 20dm^3 will be:**
A. 1 atm C. ½ atm
B. 2 atm D. ¼ atm

48. **Which of the followings represents highest pressure?**
A. 1 torr C. 1 mmHg
B. 1 cm Hg D. 1Nm^{-2}

49. **Which of these ratios gives a constant value?**
A. V/T at constant P C. P/V at constant T
B. n/T at constant V D. V/P at constant T

50. **The volume of a real gas**
A. is constant C. becomes zero at absolute zero
B. increases with T decrease D. never becomes zero

51. **At higher temperature what is true for gases**
A. pressure is decreased. C. number of moles are decreased
B. volume is decreased D. KE is increased

52. **The correct formula to find density of a gas is**
A. d = PRT/V C. d = PR/VT
B. d = PV/mRT D. d = PM/RT

53. **All the molecules of a gas at a particular T**
A. don't have the same speed C. have different root mean square velocity
B. have same speed D. have same momentum

54. **Which of the following statements is correct about the three states of matter: solid, liquid and gas?**
A. Gases and liquids can flow as a common property
B. The molecules in all the three states possess random translational motion
C. Gases are converted into solids without passing through the liquid phase
D. Solids and liquids have vapour pressure as a common property

55. **A closed flask contains water in all its three states: solid, liquid and vapour at 0°C. In this situation the average kinetic energy of the water molecule will be**
A. The greater in the vapour state C. The same in the three states
B. The greatest in the solid-state D. Greater in the liquid than in the vapour state

56. **Which of the following is true about gaseous state?**
A. Thermal energy = Molecular attraction C. Thermal energy >> Molecular attraction
B. Thermal energy << Molecular attraction D. Molecular forces >> those in liquids

57. **Which expression is valid for an ideal gas?**
A. PV = RT/n C. $V_1T_1 = V_2T_2$
B. $P_1T_2d_2 = P_2T_1d_1$ D. $P_1V_1 = V_1P_2$

58. **When gases are heated from 20°C to 40°C at constant pressure, the volume**
A. increased by the same magnitude
B. becomes double
C. increase in the ratio of their molecular masses
D. increases but to a different extent

59. To raise the volume of a gas by four times the following method may be adopted. Which of the method is right?

A. T is doubled and P is also doubled
B. Keeping P constant, T is raised by two times
C. Temperature is kept constant and pressure is halved
D. Keeping temperature constant pressure is reduced to 1/4 of its initial value

60. Which expression holds good for the general gas equation

A. $P_1V_1T_1 = P_2V_2T_2$
B. $P_1V_2T_1 = P_2V_1T_2$
C. $P_1V_1T_2 = P_2V_2T_1$
D. $P_2V_1T_1 = P_1V_2T_2$

61. Gas is enclosed in a container of $20cm^3$ with the moving piston. According to kinetic theory of gases, what is the effect on freely moving molecules of the gas if temperature is increased from 20°C to 100°C?

A. Colliding capability of molecule will become lower
B. Pressure will become one half
C. Temperature has no effect on freely moving molecules
D. Volume will be increased

62. The pressure of gas at constant temperature in a container of $1dm^3$ is 5 atm what will be its final pressure if it is connected with 5 dm^3 container

A. 2 atm
B. 1.6 atm
C. 5 atm
D. 1 atm

63. At constant temperature, in the given mass of an ideal gas

A. The ratio of pressure and volume always remains constant
B. Volume always remains constant
C. Pressure always remains constant
D. The product of pressure and volume always remains constant

64. The four physical quantities that are required to describe a gas completely are

A. the amount, the pressure, the volume and its density.
B. the amount, the pressure, the volume and its temperature
C. the pressure, the volume, the temperature and the molecular weight
D. The pressure, the volume, the temperature and the kinetic energy

65. Isotherm is the graph drawn for

A. P – V
B. V – T
C. PV – T
D. PT – V

66. At constant temperature and pressure, the volume of gas is found to be

A. Increasing with increasing moles
B. Independent of number of moles
C. Decreasing with increasing moles
D. Constant

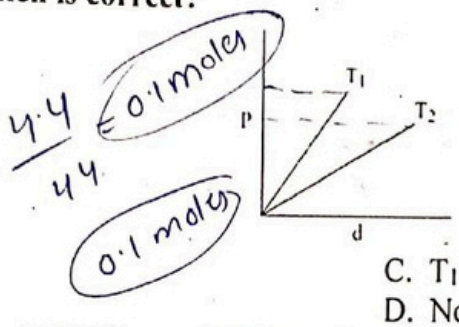
67. According to Avogadro's law, how many moles of oxygen gas are likely to occupy maximum volume at STP:

A. 0.001
B. 0.1
C. 10^{-4}
D. 0.01

68. Pressure remaining constant the volume of a given sample of a gas at 127°C will be doubled at

A. 254°C
B. 400 K
C. 527°C
D. 800°C

69. **Figure shows graphs of pressure versus density for an ideal gas at two temperatures T_1 and T_2. Which is correct?**



A. $T_1 > T_2$
B. $T_1 < T_2$
C. $T_1 = T_2$
D. None of these

70. **4.4 g of CO_2 and 2.24 litres of H_2 at STP are mixed in a container. The total number of molecules present in the container will be**
A. 6.022×10^{23}
B. 2
C. 1.2044×10^{23}
D. 6.0233×10^{24}

71. **The temperature of 20 litres of nitrogen was increased from 100 K to 300 K at constant pressure. Change in volume will be**
A. 80 litres
B. 20 litres
C. 40 litres
D. 60 litres

72. **At constant pressure a certain gas at 0°C was cooled until its volume was reduced to half. The temperature at this stage**
A. −130.5°C
B. −140.0°C
C. −136.5°C
D. −120°C

73. **At absolute zero the kinetic energy of gas molecules would become**
A. negligible
B. close to zero
C. maximum
D. zero

74. **Average kinetic energy of gas molecules is directly related to**
A. Celsius temperature
B. Fahrenheit temperature
C. Absolute temperature
D. Absolute zero

75. **Which is not true in case of an ideal gas?**
A. It cannot be converted into a liquid
B. There is no interaction between the molecules
C. All molecules of the gas move with same speed
D. At a given temperature PV is proportional to the amount of the gas

76. **The molecular speed C_{rms} of gas is**
A. Independent of temperature
B. Proportional to the absolute temperature
C. Proportional to the square root of absolute temperature
D. Proportional to the square of absolute temperature

77. **At constant volume, for a fixed number of moles of a gas the pressure of the gas increases with temperature due to**
A. increase in average molecular speed
B. increase in molecular attraction
C. increase in number of moles
D. decrease in the distance between the molecules

78. **The root mean square velocity of a gas is doubled when the temperature is**
A. reduced to half
B. increased four times
C. reduced to one-fourth
D. increased two times

79. **Which one of the following statements is wrong for gases?**
A. gases do not have a definite shape and volume
B. volume of the gas is equal to volume of container confining the gas
C. confined gas exerts uniform pressure on the walls of its container in which it is enclosed
D. For a particular gas, different molecules have different size

80. An ideal gas, obeying kinetic theory of gases cannot be liquified, because

A. its critical temperature is above 0°C
B. it solidifies before becoming a liquid
C. its molecules are relatively small in size
D. force acting between its molecules are negligible

81. Which of the following expressions correctly represents the relationship between the average molar kinetic energy, K.E. of CO and N_2 molecules at the same temperature?

A. $\bar{K}.E._{CO} < \bar{K}.E._{N_2}$
B. $\bar{K}.E._{CO} = \bar{K}.E._{N_2}$
C. $\bar{K}.E._{CO} > \bar{K}.E._{N_2}$
D. cannot be predicted unless volumes of the gases are given.

82. At what centigrade temperature will the volume of a gas at 0°C double itself, when pressure remains constant?

A. 0°C
B. 273K
C. 273°C
D. 819K

83. What are the conditions under which the relation between volume (V) and number of moles (n) of gas is plotted for Avogadro's law? (P=pressure; T=temperature)

A. constant P and T
B. constant P and V
C. constant T and V
D. constant n and V

84. 'n' moles of an ideal gas at temperature T (in Kelvin) occupy 'V' dm^3 of volume, exerting a pressure of 'P' atmospheres. What is its concentration (in mol dm^{-3})? (R=gas constant)

A. P/RT
B. RT/P
C. PT/R
D. R/PT

85. If a gas expands at constant temperature

1. The pressure decreases
2. The kinetic energy of the molecules remains the same
3. The kinetic energy of the molecules decreases
4. The number of molecules of the gas increase

A. 1,2
B. 1,2,4
C. 1,2,3
D. 2,3

86. At very high-pressure ideal gases would

A. liquefy
B. have very less intermolecular distances
C. solidify
D. develop intermolecular forces

87. An ideal gas expands according to PV=constant. On expansion, the temperature of gas

A. will rise
B. will drop
C. cannot be determined because the external pressure is not known
D. will remain same

88. If increase in temperature and volume of an ideal gas is two times, then the initial pressure P changes to

A. 4P
B. P
C. 2P
D. 3P

89. Helium atom is two times heavier than a hydrogen molecule. At 298 K, the average kinetic energy of a helium atom is

A. same as that of a hydrogen molecule
B. two times that of a hydrogen molecule
C. half that of a hydrogen molecule
D. four times that of a hydrogen molecule

90. For an ideal gas, number of moles in terms of its pressure P, temperature T and gas constant R is

A. PT/R
B. PV/RT
C. PRT
D. RT/P

91. Which type of motion is exhibited by gases?

A. Vibrational
B. Rotational
C. Transitional
D. All of them

92. A gas having a volume of 10 dm^3 is enclosed in vessel at 0°C and pressure is 2.5 atm. This gas is allowed to expand until new pressure is 2 atm. What will be new volume of this gas, if temperature is maintained at 273 K.

A. $12dm^3$
B. $12cm^3$
C. $12.5\ dm^3$
D. $12.5cm^3$

93. Density of an ideal gas in determined by following formula

A. $\frac{PM}{KT}$
B. $\frac{nRT}{PM}$
C. $\frac{RT}{PM}$
D. $\frac{PM}{RT}$

94. Average translational kinetic energy of gas molecules is equal to

A. $\frac{1}{2}mv^2$
B. $\frac{3}{2}m\bar{c}^2$
C. mc^2
D. $\frac{1}{2}m\bar{c}^2$

95. The volume of given mass of gas is directly proportional to absolute temperature when pressure is kept constant this is called

A. Boyle's law
B. Graham's law
C. Charles's law
D. Dalton's law

96. $25dm^3$ of Hydrogen is cooled from 400K to 100K by maintaining pressure constant. Calculate the new volume of gas at this low temperature

A. $53dm^3$
B. $6.25\ dm^3$
C. $0.53\ dm^3$
D. $0.625\ dm^3$

97. If temperature is 73K and volume is 146 cm^3 then calculate the value of K=V/T

A. 5
B. 3
C. 4
D. 2

ANSWER KEY

1	B	11	B	21	D	31	D	41	A	51	D	61	D	71	C	81	B	91	D
2	C	12	A	22	C	32	B	42	A	52	D	62	D	72	C	82	C	92	D
3	B	13	C	23	B	33	D	43	C	53	A	63	D	73	D	83	A	93	D
4	A	14	C	24	C	34	D	44	C	54	A	64	B	74	C	84	A	94	D
5	B	15	D	25	A	35	C	45	C	55	C	65	A	75	C	85	A	95	C
6	C	16	A	26	B	36	A	46	C	56	C	66	A	76	C	86	D	96	B
7	A	17	B	27	B	37	B	47	C	57	B	67	B	77	D	87	D	97	D
8	B	18	B	28	B	38	D	48	B	58	D	68	C	78	B	88	B		
9	D	19	D	29	D	39	A	49	A	59	D	69	A	79	D	89	A		
10	C	20	A	30	B	40	B	50	D	60	C	70	C	80	D	90	B		

HINTS

4. Because V increases and inverse of V decreases.

6. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

8. Pascal = Nm^{-2}

17. At same temperature different gases have the same average kinetic energy.

18. $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

New volume = $32dm^3$ Increase in volume = $16dm^3$

20. $C_{rms} = \sqrt{\frac{3RT}{M}}$

25. $d = \frac{PM}{RT}$

28. $\frac{V}{T} = \frac{546}{273} = 2cm^3K^{-1}$ and for 100^0C 200 cm^3 increase will be observed

33. $PV = \frac{m}{M}RT$

39. $\frac{6.02\times10^{23}}{22.4} = 2.68\times10^{22}$ molecules

43. Size of molecules does not affect the volume occupied by gas.

45. $C_{rms} = \sqrt{\frac{3\times8.313\times27}{8.313}}$

49. Charles's law

53. Law of distribution of velocities

57. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ and $\frac{m}{V}$ =density

58. 20°C to 40°C is not exactly the doubling of temperature.

63. Boyle's law

68. $127^oC = 400K$ and $527^0C = 800K$

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69. $\frac{1}{V}\alpha d$

72. $^{o}C = K + 273$

75. Law of distribution of velocities

79. All particles of a gas are alike.

84. $PV=nRT \rightarrow P=\frac{n}{v}RT$ or $P = CRT$ and $C=\frac{P}{RT}$

87. Boyle's law.

$\frac{x}{4} = x\left(1+\frac{t}{273}\right)$

$\frac{1}{4} = \frac{273+t}{273}$

① 127 − 273 = 400

273 − 73 = 200

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

68 + 136 − 273 = t

4

21

$\frac{PV}{T} = R$

$V = \frac{RT2}{P1/2}$

$\frac{250}{400} = \frac{V_2}{200}$

$1dm^3 = 100cm^3$

$V_2 = \frac{250 \times 21}{400} = 21$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$V_1 = 10\ dm^3$ $V_2 = 12cm^3$

$\left(\frac{25}{10}\right)(10) = (2)\left(\frac{V_2}{2}\right)$ $P_2 = 2atm$ $P_1 = 2.5\ atm$

$\frac{25}{10} \times \frac{10}{2} = V_2$

$T_1 = 273$

$T_2 = 273$

6. $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{25}{400} = \frac{V_2}{100}$

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PAST PAPER 2009-2020

Q.1 All the collisions between the particles of gases are elastic in nature. What is meant by "Elastic Collisions"?

A. The velocity of the molecules changes
B. No change in mass during the collisions
C. No change in the kinetic energy
D. No change in potential energy during the Collisions

Q.2 Which one of the following expression represent the Avogadro law?

A. V= RnT/P (When T and n are constant)
B. V= RnT/P (When T and P are constant)
C. V= RnT/P (When P and n are constant)
D. V= RP/nT (When T, P and n are constant)

Q.3 The root mean square velocity of gases is inversely proportional to square root of their:

A. Temperature
B. Pressure
C. Molar mass
D. Volume

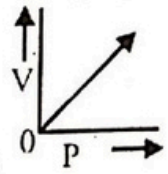
Q.4 The number of molecules in 22.4 dm^3 of H_2 gas at 0°C and 1 atm are

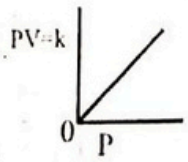
A. 60.2×10^{23}
B. 6.02×10^{25}
C. 6.02×10^{23}
D. 60.2×10^{22}

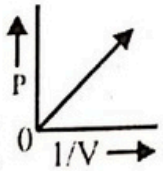
Q.5 There are four gases H_2, He, N_2 and CO_2 at 0°C. Which gas shown greater non-ideal behavior?

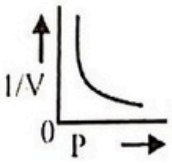
A. He
B. H_2
C. CO_2
D. N_2

Q.6 Which graph represents Boyle's law

A. 

B. 

C. 

D. 

Q.7 Identify the value of R at STP

A. 8.314 atm dm^{-3} mol^{-1}
B. 0.0821 atm dm^3 K^{-1} mol^{-1}
C. 0.0821 cal K^{-1} mol^{-1}
D. 8.314 cal K^{-1} mol^{-1}

Q.8 In the equation $\left(P + \frac{n^2 a}{V^2}\right)(V - nb) = RT$, 'b' represents the

A. Excluded volume
B. Actual volume
C. Excluded pressure
D. Excluded volume per mole

Q.9 Gas is enclosed in a container of $20cm^3$ with the moving piston. According to kinetic theory of gases, what is the effect on freely moving molecules of the gas if temperature is increased from 20°C to 100°C?

A. Colliding capability of molecule will become lower
B. Pressure will become one half
C. Temperature has no effect on freely moving molecules
D. Volume will be increased

Q.10 Which of the following is the correct equation to calculate relative molecular mass of a gas

A. M = mPRT/V
B. M = mPR/VT
C. M = PV/mRT
D. M = mRT/PV

Q.11 Which of the statement is applicable for both ideal and real gases molecules?

A. Have no forces of attraction
B. Collisions between the molecules is elastic
C. Molecules are in random movement
D. The actual volume of gas is negligible as compared to the volume of gas

Q.12 At absolute zero the molecules of hydrogen gas will have

A. Only translational motion
B. Only vibrational motion
C. Only rotational motion
D. All the motion are cased

Q.13 According to the general gas equation, density of an ideal gas depends upon:

A. Pressure
B. Temperature
C. Molar mass of the gas
D. All of the above

Q.14 The actual volume of gas molecules is considered negligible at following pressures.

A. 2 atm
B. 4 atm
C. 6 atm
D. 8 atm

PAST PAPER QUESTIONS

1	C	6	C	11	C
2	B	7	B	12	D
3	C	8	D	13	D
4	C	9	D	14	A
5	C	10	D		

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HINTS

1. During elastic collision momentum and kinetic energy is conserved.

3. $C_{rms} = \sqrt{\frac{3RT}{M}}$

5. Greater forces of attraction.

8. Units of b are $dm^3\ mol^{-1}$ or $m^3\ mol^{-1}$

13. $d = \frac{PM}{RT}$

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PAST PAPER 2021

Q. 1 The unit is _____ commonly used by meteorologist
A. Bar
B. Centibar
C. Millibar
D. Kilobar

Q. 2 Plasma is difficult to maintain at
A. Low temperature
B. Low pressure
C. High temperature
D. High pressure

Q. 3 Effusion is the movement of a gas through extremely small opening of molecular size into region of _____ pressure.
A. High
B. Moderate
C. Low
D. Same

Q. 4 PV/nRT for an ideal gas is called
A. Expansion factor
B. Depression factor
C. Compressibility factor
D. Diffusion factor

Q. 5 The sum of mole fraction of the gases in a mixture of gases is
A. Always greater than 1
B. Always smaller than 1
C. May be equal or less than 1
D. Always 1

Q. 6 According to Avogadro's law, .899 g of 1dm^3 H_2 and 1.4384 g of 1 dm^3 O_2 have number of molecules
A. Same
B. Different
C. H_2 has more
D. O_2 has more

Q. 7 Calculate the mass of 1dm^3 of NH_3 gas at 3°C and 1 mm Hg pressure, considering that NH_3 is ideally behaving
A. 0.99g
B. 0.89g
C. 0.9kg
D. 0.78g

Q. 8 212 degree Fahrenheit is expressed in Kelvin as:
A. 373
B. 273
C. 173
D. 0

Q. 9 For non-ideal gas
A. PV/nRT not equal to 1
B. PV/nRT=1
C. Follow gas Laws
D. Follow general gas equation

Q. 10 R does not depend upon
A. Nature of gas
B. Pressure
C. Temperature
D. None of these

Q. 11 Which law is applicable while respiration
A. Dalton's law
B. Avogadro's law
C. Graham's law
D. Boyle's law

Q. 12 Which has highest rate of diffusion
A. CO_2
B. NH_3
C. HCl
D. SO_2

Q. 13 Effusions is related
A. Inversely to mass
B. Direct to mass
C. Square root of mass
D. Inversely to square root of mass

Q. 14 KMT discovered by
A. Bernoulli
B. Rutherford
C. Bohr
D. Heisenberg

Q. 15 Which of these gasses cannot be Liquify

A. H_2 B. He
C. Both a and b D. CO_2

Q. 16 General gas equation also know as

A. Ideal B. Real
C. A and B both D. None of these

Q. 17 When temperature increases, isotherm moves

A. Away from both axes B. Toward x axis
C. Toward y axis D. Remains at same position

Q. 18 Volume in ideal gas is directly related to

A. n, T B. n, T, P
C. T,P D. K.E, P

Q. 19 According to kinetic molecular theory absolute temperature is directly proportional to _____ of molecules

A. Translational K.E B. Vibrational K.E
C. K.E D. Average translational K.E

Q. 20 General gas equation is also known as

A. Vander walls equation B. Ideal gas equation
C. non ideal gas equation D. Vant-hoff equation

Q. 21 General gas equation is used for:

A. Non real gases B. real gases
C. Ideal gases D. Ideal or non-real

Q. 22 General gas equation

A. PV = MRT B. PV = nRT
C. P = nRt/V D. PM = dMT

ANSWER KEY

1	C	11	A	21	C
2	A	12	B	22	B
3	C	13	D		
4	C	14	A		
5	D	15	C		
6	A	16	A		
7	B	17	A		
8	B	18	A		
9	A	19	D		
10	D	20	B		

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UNIT 4

PRACTICE EXERCISE

LIQUIDS

1. **A compound which can form H—bonding with other compounds, although it does not have atoms like O, N, F is:**
   A. Chloroform
   B. Carbon tetra chloride
   C. Vinyl chloride
   D. Bromoform

2. **Water shows abnormal behaviour when it is cooled from:**
   A. 100°C to 0°C
   B. 4°C to 0°C
   C. 10°C to 0°C
   D. 0°C to 4°C

3. **Which of the following liquids has lowest rate of evaporation at room temperature?**
   A. Diethyl ether
   B. Water
   C. Ethanol
   D. Glycerol

4. **Temperature of the liquid water in a frozen lake is ^{0}C.**
   A. 10
   B. 4
   C. 0
   D. 25

5. **Vapor pressure of which of the following is highest at room temperature**
   A. Liquid ammonia
   B. Acetone
   C. water
   D. HF

6. **Which one has highest boiling point?**
   A. NH_3
   B. PH_3
   C. AsH_3
   D. SbH_3

7. **Which factor is the important in controlling the vapor pressure of a given liquid**
   A. external pressure
   B. Temperature
   C. Surface area
   D. amount of liquid

8. **The oxygen is soluble in water. The forces responsible are:**
   A. Dipole-dipole interaction
   B. Debye forces
   C. London forces
   D. H-bond formation

9. **When the rate of evaporation and rate of condensation of a liquid become equal to each other in a closed container, which statement holds true:**
   A. liquid vaporizes completely
   B. dynamic equilibrium is achieved
   C. liquid starts boiling
   D. no vapors are formed

10. **Correct order of boiling points of the given liquids is**
    A. HF < HCl
    B. HF > H_2O
    C. H_2O > HF
    D. HF < NH_3

11. **When a large amount of heat is provided to a liquid its boiling point:**
    A. Increases
    B. Remains same
    C. Decreases
    D. first increases then decreases

12. **Hydrogen bonding is not responsible for the properties of**
    A. Ice
    B. HF
    C. CsF
    D. Glucose

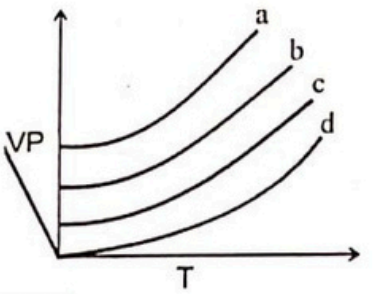
13. **In which of the following hydrogen bonding is absent:**
    A. Steam
    B. ice
    C. H_2SO_4
    D. HF

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14. Liquid state of matter is

A. least common of all forms
B. most dense of all forms
C. more common than gases
D. most common of all forms

15. Given graph contains four curves representing the vapour pressure of liquids (ethanol, water, glycol, glycerol):



Which curve represents glycerol.

A. a
B. b
C. c
D. d

16. Which pair has debye forces:

A. Ar & Ar
B. Ar & H_2O
C. Na^+ & water
D. C_2H_5OH & H_2O

17. Correct order of boiling points of the given liquid is

A. $H_2O > HF > HCl > NH_3$
B. $HF > H_2O > HCl > NH_3$
C. $H_2O > HF > NH_3 > HCl$
D. $HF > H_2O > NH_3 > HCl$

18. What is the reason that ice at 0^0C occupies more volume then water:

A. Empty spaces
B. Ionic bond
C. weaker intermolecular forces in ice
D. Debye forces

19. Possible angle b/w two hydrogen atoms in hydrogen bonded framework of HF is

A. 109.5°
B. 120°
C. 145°
D. 180°

20. In vacuum distillation, the distillation of a compound is carried out by

A. Increasing pressure
B. Decreasing pressure
C. Slow heating of liquid
D. Fast heating of liquid

21. Ice has

A. trigonal structure
B. hexagonal structure
C. pentagonal structure
D. rhombic structure

22. Ice is less dense than water at:

A. 0 °C
B. 4 °C
C. -4 °C
D. 2 °C

23. Melting point of water is higher than petrol, because intermolecular forces in water are:

A. Weaker than petrol
B. Stronger than petrol
C. Same as in petrol
D. Negligible

24. Which one is not related with evaporation?

A. Continuous
B. Exothermic
C. Cooling
D. Spontaneous

25. Which of the following molecules should be more volatile?

A. HF
B. HBr
C. HCl
D. HI

26. **Effect of hydrogen bonding seems to be more prominent in water as compared to HF even 'F' is most electronegative because**
A. F has less tendency to form bond
C. F has small size
B. H_2O has oxygen as central atom
D. H_2O has double chance of hydrogen boding than HF

27. **Which of the following forces is strongest?**
A. Hydrogen-bonding
B. dipole-induced dipole forces
C. Dipole-dipole forces
D. Debye forces

28. **All types of intermolecular forces are collectively called**
A. van der Waal's forces
B. cohesive forces
C. London forces
D. adhesive forces

29. **Ice is less dense than water at:**
A. 0 °C
B. 4 °C
C. -4 °C
D. 2 °C

30. **Liquid A has higher boiling point than liquid B and C. How are the intermolecular forces of these molecules related to each other:**
A. B has the highest intermolecular forces
B. A has the strongest forces
C. C has the highest intermolecular forces
D. A has lower intermolecular forces than B

31. **What type of process is evaporation?**
A. Exothermic
B. Endothermic
C. reversible
D. non-spontaneous

32. **Hydrogen bonding decreases the vapor pressure of which of these molecules in comparison to the rest of them?**
A. HCl
B. HBr
C. HF
D. HI

33. **The structure of water molecule in ice is**
A. tetrahedral
B. hexagonal
C. trigonal
D. pyramidal

34. **The molecules of hydrofluoric acid join with each other in a zigzag manner due to**
A. hydrogen bonding
B. smaller size of fluorine
C. three lone pairs of fluorine
D. polarity of hydrofluoric acid

35. **The liquid water exists in equilibrium with its solid water at temperature**
A. 100 °C
B. 4 °C
C. 0 °C
D. 273 °C

36. **The temperature of water under the layer of ice is**
A. 0 °C
B. – 4 °C
C. 4 °C
D. 100 °C

37. **Increase in the boiling point from ammonia to water is related to?**
A. increase in bond energy
B. increase in ionic radius
C. increase in bond length
D. increase in extent of hydrogen bonding

38. **Which factor brings about increase in the boiling point of a liquid**
A. external pressure
B. temperature
C. surface area
D. amount of liquid

39. No. of H – bonds in 3moles of water will be

A. 3 moles
B. 4 moles
C. 6 moles
D. 9 moles

40. An example of a substance which is liquid at room temperature

A. Water
B. HF
C. HCl
D. all

41. Number of hydrogen bonds formed by ammonia per molecule are

A. 2
B. 3
C. 1
D. 4

42. Water freezes

A. below 0^0C
B. from top to bottom
C. from bottom to top
D. at 4^0C

43. Water below the ice blanket in a cold lake is at temperature

A. 0^0C
B. 4^0C
C. -2^0C
D. 2^0C

44. The energy of molecules in a liquid is

A. not equally distributed
B. minimum at the bottom
C. maximum in the middle
D. negligible at the top

45. Rate of evaporation varies inversely with the

A. strength of IMF's
B. P
C. surface area
D. T

46. Increase in which of these increases vapor pressure of liquid.

A. T
B. polarity nature of liquid
C. size of molecules
D. intermolecular forces

47. Condensation leads to

A. generation of new forces
B. greater vapor pressure
C. greater evaporation
D. decrease in the energy of liquid

48. Most favorable conditions to keep a substance in liquid state are?

A. High T
B. Low P
C. Low T,P
D. Low T, high P

49. Strength of hydrogen bonding is minimum in

A. Liquid ammonia
B. Ethanol
C. water
D. HF

50. Acetone, in principle, can form hydrogen bonding with

A. Chloroform
B. Ammonia
C. Hydrogen fluoride
D. all

51. Nitrogen can form hydrogen bond because

A. it has high ionization energy
B. it has low electron affinity
C. it has two lone pairs
D. it has high electronegativity

52. The kinetic energy of water molecules in the liquid state is maximum at ____^{0}C:

A. 100
B. 110
C. 0
D. 90

53. Which of the following statements is correct if the intermolecular forces in liquids A, B and C are in the order A < B < C?

A. B evaporates more readily than A
B. A and B evaporates at the same rate
C. A evaporates less readily than B
D. A evaporates readily than C

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54. **Kinetic energy of molecule is highest in**
A. Gases
B. Solids
C. Liquids
D. Solutions

55. **The boiling points of methanol, water and dimethyl ether are respectively 65°C, 100°C and 34.5°C. Which of the following best explains these wide variations in b.pt?**
A. The molecular mass increase from water (18) to methanol (32) to diethyl ether (74)
B. The extent of H-bonding decreases from water to methanol while it is absent in ether
C. The density of water, methanol and that of diethyl ether is different
D. The number of H atoms per molecule increases from water to methanol to ether

56. **Which of the following statements is wrong?**
A. Evaporation is a spontaneous process
B. Evaporation is a surface phenomenon
C. Vapour pressure decreases with increases of temperature
D. Vapour pressure of a solution is less than the vapour pressure of a pure liquid

57. **The liquid is in equilibrium with its vapours at its boiling point. On the average the molecules in the two phases have equal**
A. Potential energy
B. Kinetic energy
C. Total energy
D. Intermolecular forces

58. **The boiling point of water in a pressure cooker is**
A. below 100°C
B. 100°C
C. above 100°C
D. dependent upon the size of pressure cooker

59. **Evaporation is accompanied by**
A. absorption of heat
B. neither absorption nor evolution of heat
C. evolution of heat
D. either absorption or evolution of heat

60. **At higher altitudes the boiling point of water lowers because**
A. atmospheric pressure is low
B. atmospheric pressure is high
C. temperature is low
D. none of these

61. **Liquid gets the shape of the container when it is poured into it. Which one of the following reason justifies it**
A. Liquid do not have definite shape
B. Liquid is highly compressible
C. Liquid do not have definite volume
D. Liquid molecules can slide over each other

62. **Which of the following has highest vapour pressure?**
A. Water
B. Glycerol
C. Mercury
D. Pentane

63. **The boiling point of water would be highest at**
A. Skardu
B. K2
C. Karachi
D. Lahore

64. **Which one is false for evaporation**
A. Surface phenomenon
B. Exothermic
C. Continuous
D. Causes cooling

65. **Vapour pressure of water at 100°C is**
A. 55 mm Hg
B. 355 mm Hg
C. 760 mm Hg
D. 1489 mm Hg

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66. The conversion of vapours back into their liquid state is called
A. Crystallization
B. Vapourization
C. Evaporation
D. Condensation

67. Which one of the following would cause severe burning?
A. Boiling water at 90°C
B. Boiling water at 80°C
C. Steam at 100°C
D. Water at 20°C

68. The boiling point of a liquid is that temperature at which
A. The vapour pressure of the liquid is equal to the atmospheric pressure
B. The vapour pressure of the liquid is less than the atmospheric pressure
C. The vapour pressure of the liquid is greater than the atmospheric pressure
D. The vapour pressure of the liquid is equal to intermolecular forces of liquid molecule

69. Greater the strength of intermolecular forces, greater will be
A. Heat of fusion
B. Boiling point
C. Viscosity
D. All of these

70. Which hydride of group VIIA has highest boiling point:
A. HF
B. HCl
C. HBr
D. HI

71. Which liquid has weak intermolecular forces:
A. Gas oil
B. Water
C. Ethyl alcohol
D. Gasoline

72. The vapour pressure of water at 100°C is
A. 260 mmHg
B. 760 mmHg
C. 1074 mmHg
D. 1489 mmHg

73. The boiling point of glycerin at 50 mmHg is:
A. 100°C
B. 120°C
C. 210°C
D. 360°C

74. Which of the following can form hydrogen bonding among its molecules more prominently?
A. CH_3OH
B. $CHCl_3$
C. $CH_3 - \overset{\overset{O}{\|}}{C} - CH_3$
D. CCl_4

75. What type of force is present among water molecules?
A. Hydrogen bonding
B. London forces
C. Dipole-dipole forces
D. Ionic bonds

76. Food cooks more rapidly at
A. Karachi
B. Quetta
C. Murree
D. Mount Everest

77. Surface tension is measured by
A. Stalagmometer
B. Thermometer
C. Viscometer
D. Manometer

78. Which of the following statements is correct?
A. H-bond in HF is stronger than in H_2O
B. Both A and B
C. Extent of H-bonding in HF is lesser than in H_2O
D. Boiling point of HF is greater than that of water

79. At 4°C, the water has _____ density.
A. Maximum
B. Zero
C. Minimum
D. None of them

80. The factors affecting rate of evaporation are

A. Surface area only
B. Size of container and rate of condensation
C. Surface area, temperature, intermolecular forces
D. Acidity and extent of ionization

81. Conversion of liquid into vapors at B.P vapours into liquid state is called

A. Evaporation
B. Condensation
C. Vaporization
D. Sublimation

82. Vapour pressure is not affected by:

A. Surface area
B. Temperature
C. Intermolecular forces
D. Nature of liquid

83. When two ice cubes are pressed over each other they unite to form a single cube. It is due to

A. Dipole- dipole interaction
B. Van der Waal's forces
C. Covalent bond
D. H-bond formation

84. Separation of a mixture of components by boiling and subsequent condensation

A. Fractional distillation
B. Distillation
C. Destructive distillation
D. Vacuum distillation

85. HF is the weakest acid among the Halogen acid due to

A. E.N of the Fluorine
B. Hydrogen bonding
C. Strong polar bond in H & F
D. All of these

86. A pressure cooker reduces the cooking time due to

A. B.P increase of H_2O
B. Vapour pressure decrease of liquid
C. Uniform distribution of heat
D. increase in extent of H-bonding in water

87. Water at 100 °C has

A. Greater energy than steam
B. Less energy than steam
C. Same energy as steam
D. Zero energy

ANSWER KEY

1	A	11	B	21	B	31	B	41	C	51	D	61	A	71	D	81	C
2	B	12	C	22	A	32	C	42	B	52	A	62	D	72	B	82	A
3	D	13	A	23	B	33	A	43	B	53	D	63	C	73	C	83	D
4	B	14	A	24	B	34	C	44	A	54	A	64	B	74	A	84	B
5	A	15	D	25	C	35	C	45	A	55	B	65	C	75	A	85	D
6	D	16	B	26	D	36	C	46	A	56	C	66	D	76	D	86	A
7	B	17	C	27	A	37	D	47	A	57	B	67	C	77	A	87	B
8	B	18	A	28	A	38	A	48	D	58	C	68	A	78	A		
9	B	19	B	29	A	39	C	49	A	59	A	69	D	79	A		
10	C	20	B	30	B	40	A	50	D	60	A	70	A	80	C		

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2. Its volume increases
5. Its boiling point is lowest
7. Others do not affect vapor pressure
11. Boiling point is independent of rate of heating
15. It has highest forces of attraction
22. At 0°C both ice and water are present
25. Weakest intermolecular forces
33. Water molecule has tetrahedral structure while ice has hexagonal crystal structure
39. On average one water molecule forms two hydrogen bonds
40. Boiling point of HF and HCl is below room temperature
44. KMT
47. Conversion of vapors to liquid is called condensation
50. All these have partial positive hydrogen
53. Evaporation $\alpha \frac{1}{\text{IMF's}}$
74. It follows both conditions of H-Bond formation
78. H-Bond is stronger in HF while H-Bonding extent is greater in H_2O
85. All these factors contribute to the overall effect
87. The relation b/w KE of different phases at the same temperature is

$KE_{Gas} > KE_{Liquid} > KE_{Solid}$

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Q.1 **Correct order of boiling points of the given liquids is**

A. $H_2O > HF > HCl > NH_3$
B. $H_2O > HF > NH_3 > HCl$
C. $HF > H_2O > HCl > NH_3$
D. $HF > H_2O > NH_3 > HCl$

Q.2 **At 1489 mmHg, water will boil at**

A. 120C°
B. 110C°
C. 100C°
D. 90C°

Q.3 **Ice is less dense than water at**

A. 0°C
B. 4°C
C. -4°C
D. 2°C

Q.4 **In crystal lattice of ice, each O-atom of water molecule is attached to**

A. Four H-atoms
B. Two H-atoms
C. One H-atom
D. Three H-atoms

Q.5 **What is reason that the ice at 0^0C occupies more volume then water:**

A. Empty spaces
B. Intermolecular forces
C. Ionic bond
D. Debye forces

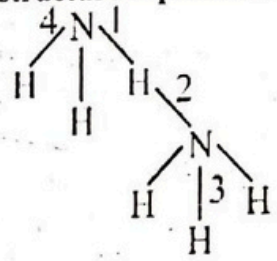
Q.6 **Water has maximum density at**

A. –4°C
B. 1°C
C. 0°C
D. 4°C

Q.7 **DNA molecule is double stranded, in which two chains of DNA are twisted around each other by:**

A. Hydrogen bonds
B. Van der Waal's forces
C. Covalent bonds
D. Dative bonds

Q.8 **Which bond in the following structure represents hydrogen bonding?**



A. 1
B. 2
C. 3
D. 4

Q.9 **Which of the following substances exhibits hydrogen bonding?**

A. H_2S
B. HI
C. NH_3
D. SiH_4

Q.10 **In 'H-F' bond Electronegativity difference is 2.0. What is the type of this bond?**

A. Polar covalent bond
B. pi (π) bond
C. Non-polar covalent bond
D. Co-ordinate covalent bond

Q.11 **Boiling point of water is higher than petrol , because intermolecular forces in water are:**

A. Weaker than petrol
B. Stronger than petrol
C. Same as in petrol
D. Negligible

Q.12 **Metallic conduction involves the relatively free movement of their---------- throughout the metallic lattice:**

A. Atoms
B. Electrons
C. Ions
D. Molecules

Q.13 Which type of force is present in gasoline?

A. Dipole-dipole forces
B. Hydrogen bonding
C. Dipole-induced dipole forces
D. London dispersion forces

Q.14 Which one of the following hydrogen bond is stronger than others?

A. $N^{\delta-} - H^{\delta+} \cdots\cdots N^{\delta-} - H^{\delta+}$
B. $O^{\delta-} - H^{\delta+} \cdots\cdots O^{\delta-} - H^{\delta+}$
C. $F^{\delta-} - H^{\delta+} \cdots\cdots F^{\delta-} - H^{\delta+}$
D. $N^{\delta-} - H^{\delta+} \cdots\cdots O^{\delta-} - H^{\delta+}$

Q.15 An-inter molecular force of attraction X is relatively stronger than the other inter molecular forces, it stabilizes ∝helix and β-pleated sheets of proteins. The double helical structure of DNA is also stabilized by this force of attraction. Identify X.

A. Dipole dipole attraction
B. Hydrogen bonding
C. Ionic interactions
D. van der Waal's Forces

Q.16 At higher altitude, the boiling point water is less than 100°C, this is because of

A. Higher atmospheric pressure
B. Weak hydrogen bonding
C. No change in atmospheric pressure
D. Lower atmospheric pressure

Q.17 Steam causes severe burns than boiling water. It is due to

A. Absence of hydrogen bonding
B. Freely moving molecules
C. High latent heat of vaporization
D. Statement is incorrect

Q.18 According to Watson and Crick's model of DNA, the DNA molecule consists of a double helix. What type of forces are responsible to keep two strands of DNA together?

A. Hydrogen bonding
B. van der Waal's forces
C. Ionic bonding
D. Dipole-induces dipole forces

Q.19 Which of the following substances exhibits hydrogen bonding?

A. H_2S
B. HI
C. NH_3
D. SiH_4

Q.20 CO_2 and SO_2 both are tri-atomic molecules but heat of vaporization of SO_2 is greater than that of CO_2 due to

A. High electronegativity of S
B. Greater size of SO_2
C. SO_2 is polar and CO_2 is non polar
D. SO_2 is more acidic than CO_2

Q.21 Which of the following has the lowest vapor pressure at 20°C?

A. Diethyl ether
B. Chloroform
C. Carbon tetrachloride
D. Water

Q.22 Which of the following is not a molecular solid?

A. Bromine
B. Sulphur
C. Phosphorus
D. Carbon dioxide

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1	B	6	D	11	B	16	D	21	D
2	A	7	A	12	B	17	C	22	A
3	A	8	B	13	D	18	A		
4	A	9	C	14	C	19	C		
5	A	10	A	15	B	20	C		

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HINTS

3. At 0°C both water and ice are present, above 0°C only water is present while below 0°C only ice is present.

4. O-atom is attached to a total of four H-atoms. Two H-atoms are covalently bonded to O-atom while the other two H-atoms are hydrogen bonded to O-atom.

8. Hydrogen bonding is the inter molecular force between two ammonia molecules.

10. Tow non-metals form covalent bonds with each other even when they have greater than 1.7 electronegativity difference.

14. Strength of H-bond is greater in HF while extent of hydrogen bonding is greater in H_2O.

17. Water absorbs latent heat vaporization to form steam. This extra energy is responsible for more severe burns caused by steam.

22. It is a liquid at room temperature

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Q. 1 The distillation which is carried out under reduced pressure is called as
A. Pressure distillation
B. Reduced distillation
C. Vacuum distillation
D. Low boiling distillation

Q. 2 In which of the following water evaporate earlier
A. Cup
B. Saucepan
C. Glass
D. Small bowl

Q. 3 Conversion of water into steam is a
A. Spontaneous reaction
B. Reversible reaction
C. Exothermic reaction
D. Combustion reaction

Q. 4 On which factors the vapor pressure of a substance does not depend?
A. Physical state of matter
B. Surface area
C. Intermolecular forces
D. Temperature

Q. 5 How many times a covalent bond is stronger than H-bond?
A. 10
B. 20
C. 12
D. 2

Q. 6 The separation of components of liquid on the basis of their boiling points is called as?
A. Destructive distillation
B. Vacuum distillation
C. Fractional distillation
D. Partial distillation

Q. 7 Which instrument is used to measure the vapor pressure of a liquid?
A. Barometer
B. Manometer
C. Thermometer
D. Sphygmometer

Q. 8 Which of the following has highest vapour pressure?
A. Diethyl ether
B. Ethanol
C. Water
D. Ethylene glycol

Q. 9 When heat is provided to a liquid it causes it to _____?
A. Contract
B. Decompose
C. Expand
D. Become non volatile

Q. 10 Which of the following intermolecular forces are present between octane molecules?
A. London dispersion forces
B. Dipole dipole forces
C. Debye forces
D. H-bonding

Q. 11 Which of the following forces has ability to form clusters and large molecules?
A. Ionic bond
B. Induced dipole forces
C. H-bond
D. All of these

Q. 12 At 0°C, what is the physical state of water?
A. ice
B. Liquid
C. Vapour
D. Both ice and liquid

Q. 13 Steam causes more server burns than boiling water because it has
A. Latent heat of fusion
B. Latent heat of vaporization
C. Latent heat of sublimation
D. All of above

Q. 14 Hydrogen bonding is involved in
A. Cleansing action of soap
B. Biological molecule
C. Solubility
D. All of those

Q. 15 In vacuum distillation the boiling point of glycerin is reduced to _____?
A. 290°C
B. 110°C
C. 156°C
D. 210°C

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Q. 16 H-bonding is stronger than _____?

A. Dipole dipole forces
B. Debye forces
C. London forces
D. All of these

Q. 17 While calculating vapor pressure of a liquids in manometer, the column of mercury facing the vapors of a liquids is _____ due to pressure on surface of liquids in flask

A. Compressed
B. Depressed
C. Rises
D. Lowers

Q. 18 The measurement of the extent to which electron cloud is distorted is termed as

A. Polarizability
B. Molecularity
C. Induction
D. Dispersion

Q. 19 Molecules of liquids are in constant state of motion, it causes

A. Diffusion
B. Evaporation
C. Melting
D. Both A and B

Q. 20 In the formation of HF, _____ donates the major of its electron among hydrogen atom or fluorine atom

A. H-atom
B. F-atom
C. Both A and B
D. None of these

Q. 21 The temperature at which vapor pressure of a liquid becomes equal to external pressure or atmospheric pressure is called as?

A. Melting point
B. Freezing point
C. Boiling point
D. Sublimation point

Q. 22 HF has high boiling point than HCl is

A. Dipole dipole forces
B. LDF
C. Hydrogen bonding
D. Debye forces

Q. 23 The molecules of _____ have dipole-dipole interaction

A. Methane
B. Neon
C. Ammonia
D. Ethane –ethyl alcohol

ANSWER KEY

1	C	11	C	21	C
2	B	12	D	22	C
3	A	13	B	23	C
4	B	14	D		
5	B	15	D		
6	C	16	D		
7	B	17	B		
8	A	18	A		
9	C	19	D		
10	A	20	A		

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UNIT 5 PRACTICE EXERCISE

SOLIDS

1. **Dry ice (solid CO_2) belongs to which class of solids**
   A. Covalent
   B. Molecular
   C. Ionic
   D. H- bonded

2. **All are ionic solid except one:**
   A. NaCl
   B. CdI_2
   C. AlF_3
   D. MgO

3. **Which of the following statement is not a property of crystalline solids?**
   A. Anisotropy
   B. Specific fracture plane
   C. Definite geometry
   D. Wide range of melting point

4. **Electrical conductivity of graphite is:**
   A. Isotropic
   B. Anisotropic
   C. Polymorphic
   D. Isomorphic

5. **10% urea in NaCl changes the shape of crystal because**
   A. It reacts chemically with
   B. It disturbs packing of ions in a crystal
   C. Urea itself is not crystalline
   D. Urea do not interact with *NaCl*

6. **Crystalline solids are also called**
   A. True solids
   B. Pseudo solids
   C. Glasses
   D. Amorphous solids

7. **Which of the following is amorphous solid?**
   A. Sucrose
   B. NaCl
   C. Rubber
   D. SiC

8. **Halide having highest Lattice energy**
   A. NaF
   B. NaBr
   C. NaCl
   D. NaI

9. **Which of the following is a non-crystalline solids pair**
   A. diamond, wood
   B. wood, glass
   C. glass, table, salt
   D. sucrose, glass

10. **Which property is always isotropic**
    A. refractive index
    B. thermal conductivity
    C. coefficient of thermal expansion
    D. boiling point

11. **The isomorphism depends upon**
    A. ratio between the atoms
    B. types of atoms
    C. way of combination of atoms
    D. both a & b

12. **The transition temperature of sulphur is**
    A. 100 °C
    B. 13 °C
    C. 95.5 °C
    D. 13.2 °C

13. **The repetition of faces, angles or edges on rotation of crystal at 360 ° is called**
    A. habit of crystal
    B. isomorphism
    C. symmetry
    D. polymorphism

14. **Solid is made up of**
    A. Atoms
    B. Ions
    C. Molecules
    D. All of them

15. **The process in which same compound is present in more than one crystalline forms is called:**
A. Allotropy C. Isomorphism
B. Anisotropy D. Polymorphism

16. **The smallest part of crystal that shows its properties is called**
A. crystal lattice C. crystal unit
B. unit cell D. cell dimensions

17. **Which of the followings does not exist as molecular crystals in the solid state?**
A. Sulphur C. Phosphorus
B. Iodine D. Silicon

18. **Among solids the highest melting point is of**
A. amorphous solids C. Ionic solids
B. Pseudo solids D. Molecular solids

19. **Which of the following ion contributes the least towards lattice energy of compound**
A. Al^{+3} C. Mg^{+2}
B. Ba^{+2} D. Na^{+}

20. **Amorphous solids are**
A. Supercooled liquids C. Solid substances in real sense
B. Liquids in real sense D. Substances with definite melting point

21. **In phosphorous crystal, phosphorous atoms are joined together due to**
A. Covalent bonding C. Van der Waal's forces
B. Metallic bonding D. Ionic bonding

22. **Which of the following is molecular crystal?**
A. NaCl C. KBr
B. Ice D. Diamond

23. **Which solid will have the weakest intermolecular forces**
A. Dry ice C. Ice
B. NaCl D. Glucose

24. **The solid NaCl is a bad conductor of electricity since**
A. In solid NaCl there are no ions C. In solid NaCl there are no electrons
B. Solid NaCl is covalent D. In solid NaCl there is no velocity of ions

25. **All of the followings are examples of molecular solids containing non-polar molecules except**
A. Dry ice C. Ice
B. iodine D. sulphur

26. **Which of the following molecular solids consists of atoms only:**
A. sulphur C. Sugar
B. phosphorous D. solidified noble gas

27. **Which of these does not show allotropy**
A. sulphur C. tin
B. C D. frdddluorine

28. **Isomorphs have**
A. Same physical properties C. Same chemical properties
B. Different physical properties D. Different ratio of atoms

29. **Points in a crystal lattice cannot represent**
A. atoms C. protons
B. ions D. molecules

30. Difference in the physical properties of polymorphs is due to
A. same structure
B. same electronic configuration
C. different structural arrangement
D. different chemical properties

31. Ionic reactions are
A. always exothermic
B. always spontaneous
C. fast
D. slow

32. NaCl and CsF have same structure because they have same
A. atomic mass
B. formula mass
C. radius ratio
D. atomic ratio

33. Polymorphism is the property of
A. atoms
B. elements
C. isotopes
D. compounds

34. Habit of a crystal is changed by
A. cooling
B. melting
C. adding impurity
D. crystallization

35. Isomorphs differ with respect to
A. atomic ratio
B. physical properties
C. chemical properties
D. B, C

36. If the combining atoms show similarity in radius ratio, the substance will show
A. Allotropy
B. Isomorphism
C. Polymorphism
D. Habit of Crystal

37. The building blocks of NaCl cubic crystal lattice are
A. Positive ions and valence electrons
B. Lattice points of Na^+ and Cl^-
B. Negative ions and valence electrons
D. Unit cells of NaCl

38. The lattice sites in NaCl are occupied by
A. positive ions
B. negative ions
C. formula units
D. positive or negative ions

36. A crystal lattice is a structure formed by 3-dimensional repetitive growth of
A. lattice points
B. Crystallographic elements
C. lattice sites
D. unit cells

37. At the transition temperature of sulphur, there exists
A. only one allotropic form
B. dynamic equilibrium between two allotropic forms
C. a static equilibrium
D. a new 3rd allotropic form

38. Melting and fast cooling of a crystalline solid may convert it to
A. allotrope
B. polymorph
C. polymer
D. amorphous solid

39. Cleavage planes of a crystal are
A. at right angles
B. at 45^0 angles
C. parallel to each other
D. inclined at a particular angle

40. Which of the following is not a feature of solids?
A. definite mass and volume
B. rigidity
C. frequent fluidity
D. definite shape

41. Which of the following is not a characteristic of amorphous solids?
A. have sharp melting point
B. have non-orderly or very short-range orderly arrangement
C. show isotropy
D. have tendency to undergo irregular cleavage

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42. **In simple cubic crystal the radius ratio should be**
A. >0.732
B. 0.424-1.02
C. 0.424-0.732
D. 0.225-0424

43. **Which substance will conduct electric current in the solid state?**
A. diamond
B. sodium chloride
C. Graphite
D. iodine

44. **Solids that can be drawn into thin wires are called**
A. Ductile
B. Malleable
C. Brittle
D. Flexible

45. **Which one of the following has the highest value of lattice energy**
A. NaI
B. NaBr
C. NaCl
D. NaF

46. **Match list I with list II and select the correct answer:**

List I (Shape)	**List II (Radius ratio)**
1) Planar triangle	**(i) 0.732**
2) Cubic	**(ii) 0.654**
3) Body-centred cubic	**(iii) 0.155**
4) Tetrahedral	**(iv) 0.414**

	1	2	3	4
A.	(iii)	(ii)	(i)	(iv)
B.	(iii)	(iv)	(i)	(ii)
C.	(ii)	(i)	(iv)	(iii)
D.	(ii)	(iv)	(iii)	(i)

50. **Which one of the following statements is not correct about the three states of matter, i.e., solid, liquid and gaseous?**
A. Molecules of a solid possess least energy, where as those of a gas possess high energy
B. The density of solid is highest, whereas that of gases is lowest
C. Gases like liquids possess definite volume
D. Molecules of a solid possess vibratory motion

51. **Transition temperature is shown by which of the following pairs**
A. Isomorph and polymorph
B. Isomorph and allotrope
C. Allotrope and polymorph
D. All of these

52. **Which solids are called true solids**
A. Metallic
B. Crystalline
C. Amorphous
D. Vitreous

53. **Which ionic solid has highest lattice energy**
A. RbCl
B. KCl
C. NaCl
D. CsCl

54. **Which of the following intermolecular forces are present in solid iodine**
A. Dipole – dipole forces
B. Hydrogen bonding
C. London dispersion forces
D. Debye forces

55. **Which one of the following is a polar molecular solid:**
A. Dry ice
B. Ice
C. Phosphorus
D. Sulphur

56. **In cubic system, the angles**
A. $\alpha \neq \beta \neq \gamma \neq 90°$
B. $\alpha = \beta = \gamma \neq 90°$
C. $\alpha = \beta = \gamma = 90°$
D. $\alpha = \beta = 90°, \gamma \neq 90°$

57. **Which of the following is not amorphous solid**
A. Glass
B. Glue
C. Table salt
D. Rubber

58. **Which of the following is isotropic property**
A. Refractive index
B. Cleavage
C. Coefficient of thermal expansion
D. Metallic conduction

59. **When an element exists in more than one crystalline forms, it is known as**
A. Anisotropy
B. Allotropy
C. Isomorphism
D. Polymorphism

60. **Crystalline part of otherwise amorphous solids are known as**
A. Allotrope
B. Isomorph
C. Crystallites
D. Polymorph

61. **In crystal structure of NaCl, the arrangement of Cl^- ions is**
A. Face centered cubic
B. Simple Cubic
C. Body centered cubic
D. Hexagonal

62. **Which of the following is NOT the property of solid?**
A. The definite melting point
B. The high density
C. The extremely low rate of diffusion
D. The high expansion on heating

63. **Points in a crystal lattice can represent**
A. neutrons
B. electrons
C. ions
D. protons

64. **Total unit cell dimensions are**
A. Seven
C. Six
C. Fourteen
D. Thirty-two

65. **Molecular crystals are**
A. Hard
B. Soft
C. Very hard
D. Always polar

66. **Each point in the crystal lattice of solid oxygen represents**
A. an oxygen atom
B. an oxygen molecule
C. an Oxygen ion
D. a double bond

67. **The phenomenon of polymorphism arises due to the fact that atoms or ions of a compound can have**
A. same structure
B. same electronic configuration
C. different structural arrangement
D. different chemical properties

68. **Which is incorrect about structure of iodine**
A. Face-centered cubic
B. $I - I_{(g)} > I - I_{(s)}$
C. Molecular solid
D. $I - I_{(g)} < I - I_{(s)}$ Bond length

69. **The coordination number of each ion in NaCl is**
A. 4
B. 6
C. 8
D. 10

70. **Independent molecule of NaCl may exist in**
A. Solid phase
B. Liquid phase
C. Molten phase
D. Vapour phase

71. **Solids in which atoms, ions or molecules are arranged in definite three dimensional pattern are called**
A. Crystalline solids
B. Crystal lattice
C. Amorphous solids
D. Unit cells

72. **The crystallites are**
A. Crystalline part of amorphous solid
B. Crystalline part of liquid crystal
C. Crystalline part of crystalline solid
D. Amorphous parts of crystalline solids

73. **The phenomenon in which crystals show variation in physical properties depending upon the direction is called**
A. Isotropy
B. Isomorphism
C. Anisotropy
D. Polymorphism

74. **Electrons in graphite are mobile for electrical conduction _____ to the layers only.**
A. Horizontal
B. Parallel
C. Vertical
D. Non-parallel

ANSWER KEY

1	B	11	D	21	A	31	C	41	D	51	C	61	A	71	A
2	B	12	C	22	B	32	C	42	D	52	B	62	D	72	A
3	D	13	C	23	A	33	D	43	C	53	C	63	C	73	C
4	B	14	D	24	A	34	C	44	A	54	C	64	C	74	B
5	B	15	D	25	C	35	D	45	C	55	B	65	B		
6	A	16	B	26	D	36	B	46	C	56	C	66	B		
7	C	17	D	27	D	37	D	47	A	57	C	67	C		
8	A	18	C	28	B	38	D	48	D	58	D	68	B		
9	B	19	B	29	C	39	D	49	A	59	B	69	B		
10	D	20	A	30	C	40	B	50	C	60	C	70	D		

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HINTS

2. It is a covalent solid

4. It depends upon direction

8. LE $\alpha \frac{q_1 q_2}{2r}$

16. This is the definition of unit cell

18. Generally they have the strongest forces

19. Small e/m value

21. In P_4 molecule there is covalent bond while between P_4 molecules are London forces.

23. van Der Waal's forces

25. Ice has polar molecules

29. Protons do not combine to form a crystal lattice

38. Either Na^+ or Cl^- is present at the lattice site

41. Particles don't get enough time to arrange themselves

49. See prep book

57. NaCl

58. Independent of direction

64. Three axes and three angles

68. Due to the attraction posed by neighbouring molecule, bond length in solid form is greater than that in gaseous form.

74. Perpendicular to the layers, electrons fail to flow

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PAST PAPER 2009-2020

Q.1 The coordination number of Na+ in NaCl crystal is
A. 8 B. 4
C. 2 D. 6

Q.2 In the structure of NaCl, each sodium ion is surrounded by chloride ions
A. 4 B. 6
C. 5 D. 8

Q.3 Which one the following have highest lattice energy?
A. NaCl B. KCl
C. KBr D. LiCl

Q.4 Electrical conductivity of graphite is greater in one direction than in other due to
A. Isomorphism B. Anisotropy
C. Cleavage plane D. Symmetry

Q.5 In diamond each of the four outer electrons on every carbon atom is involved in covalent bonding. This means that there are no free electrons available. Which of the following property is explained by this statement
A. Diamond does not conduct heat and electricity
B. Diamond is very hard
C. Diamond has high refractive index
D. Diamond cuts diamond

Q.6 Graphite is one of the allotropic form of Carbon it is
A. Isotropic B. Anisotropic
C. Good conductor of electricity D. Both B & C

Q.7 Substance that has sharp melting point in the following is
A. Gemstone C. Coal tar
B. Glass D. Diamond

Q.8 The lattice energy is also called as
A. Energy of affinity B. Bond energy
C. Crystal energy D. Potential energy

PAST PAPER QUESTIONS

1	D	2	B	3	D	4	B	5	A	6	D	7	D	8	C

HINTS

3. Lattice energy α $\frac{q^2}{2r}$

5. Only non-conduction of electricity is explained by this statement but
A is the most suitable answer here.

6. It has relatively free electrons and is conductor only parallel to the players.

7. Crystalline substance.

8. Definition.

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Q. 1 Highest vapor pressure

A. Molecular solids
B. Ionic solids
C. Covalent solids
D. Metallic solid

Q. 2 The molecular theory for metallic Solids is

A. Electron gas theory
B. VSEPR theory
C. Crystal field theory
D. VB theory

Q. 3 Position of particles in crystalline solids represented by

A. Crystal lattice
B. Unit cell
C. Lattice point
D. Bravais lattice

Q. 4 Shape of iodine unit cells.

A. Orthorhombic
B. Hexagonal
C. Tetragonal
D. Cubic

Q. 5 Radius ratio has units

A. Joule
B. Nano meter
C. Unitless
D. Angstrom

Q. 6 Which of the following solids is isotropic?

A. Ionic solids
B. Molecular solids
C. Amorphous solids
D. Metallic solids

Q. 7 Properties due to change of direction are called__

A. Isotropic properties
B. Anisotropy
C. Symmetry
D. Cleavage plane

Q. 8 Which of the following has transition temperature equal to 128 degree celsius?

A. KNO_3
B. Sulphur
C. Tin
D. Na_2CO_3

Q. 9 Polymorphs have different:

A. chemical properties
B. Bonding of anion
C. Structure of anion
D. Physical properties

Q. 10 Allotropy is for

A. Elements
B. Compound
C. Molecules
D. Formula units

Q. 11 Isomorphism is shown by

A. Ionic solid
B. Metallic solid
C. Coinage metal
D. All of there

Q. 12 Current in electrolysis is carried through

A. Free electrons
B. Positive ions
C. Negative ions
D. Both B and C

Q. 13 The most symmetrical crystal system

A. Triclinic
B. Tetragonal
C. Cubic
D. Rhombohedral

Q. 14 Which one the characteristic of ionic solids?

A. High vapor pressure
B. Good conductivity
C. Low melting point
D. Solubility in polar solvents

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Q. 15 The size and shape of crystal depends upon some crystallographic elements which are

A. 3 B. 4
C. 6 D. 8

Q. 16 The deliquescence is a property in which a solid

A. Absorbs moisture and remains solid
B. Absorbs moisture and turns to liquid form
C. Loses water of crystallization
D. Increases the number of water of crystallization

Q. 17 Which one of them is known as super cooled liquids?

A. Glass B. Silica
C. Diamond D. Carbon

Q. 18 To conduct electricity through ionic solid, ions should be

A. Excited B. Energized
C. Free D. In random motion

Q. 19 The smallest part of the crystal lattice has all the properties of the entire crystals this is called

A. Unit B. Unit cell
C. Unit crystal D. All of these

Q. 20 Lattice points are also called

A. Space lattice B. Crystal lattice
C. Lattice sites D. Lattice location

Q. 21 Definite shape of NaCl crystal is its

A. Characteristics B. Habit
C. Symmetry D. All of these

Q. 22 Which of the following are isomorphs

A. $NaNO_3$, KNO_3 B. NaCl, KNO_3
C. NaCl, Mg D. KCl, $NaNO_3$

Q. 23 Symmetry is repetition of _____ when a crystal rotates at 360° along its axis

A. Faces B. Angles
C. Edge D. All of these

Q. 24 Which of the following is directional bond?

A. Ionic bond B. H-bond
C. Metallic bond D. None of these

Q. 25 Thermal conductivity of graphite is greater when mobile electron is moving to its layers

A. Perpendicular B. Right angle
C. Parallel D. All of these

Q. 26 Which of the following is true regarding polymorphism

A. Same chemical properties B. Different chemical properties
C. Same physical properties D. All of above

Q. 27 Types of solids on basis of bonds present in them

A. 2 B. 3
C. 4 D. 5

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Q. 28 Ionic solids are

A. Soft
B. soluble in benzene
C. Good conduct or of electricity
D. Brittle

Q. 29 Coordination number of Na in NaCl

A. 4
B. 5
C. 6
D. 8

Q. 30 Molecular solids are

A. Bad conductors of electricity
B. Have high melting and boiling point
C. Non-volatile
D. Non-compressible

ANSWER KEY

1	A	11	D	21	B
2	D	12	D	22	A
3	C	13	C	23	D
4	D	14	D	24	B
5	C	15	C	25	C
6	C	16	B	26	A
7	B	17	A	27	B
8	A	18	C	28	D
9	D	19	B	29	C
10	A	20	C	30	A

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UNIT 6

PRACTICE EXERCISE

CHEMICAL EQUILIBRIUM

1. **Which expression represents the solubility product of lead (II) chloride?**

A. $[Pb^{2+}]^2 [Cl^-]$

B. $[Pb^{2+}] [Cl^-]^2$

C. $[Pb^{2+}] [2Cl^-]$

D. $\frac{[Pb^{2+}][Cl^-]^2}{[PbCl_2]}$

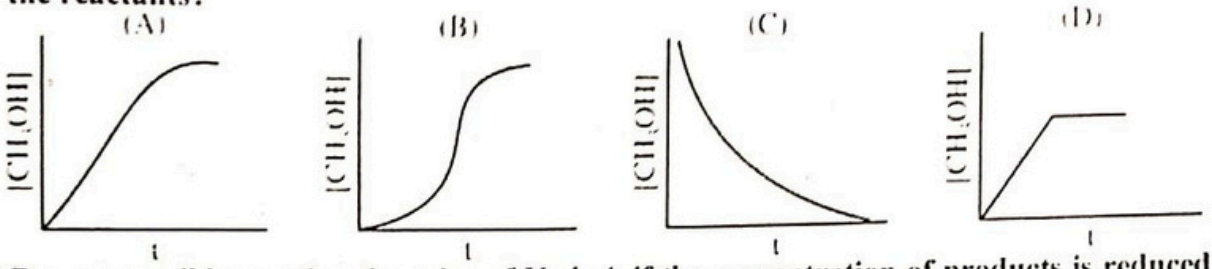
$PbCl_2 \rightarrow [Pb^{+2}]^1 [Cl_2^{-1}]^2$

2. **The reaction represented by following equation was carried out.**

$HCOOCH_3 + NaOH \rightarrow HCOONa + CH_3OH$

Which graph best shows the relationship between $[CH_3OH]$ and time from mixing of the reactants?

(A) (B) (C) (D)



3. **For a reversible reaction the value of Kc is 4, if the concentration of products is reduced to half, then the value of Kc for that reaction at constant temperature will be:**

A. 2

B. 1.5

C. 3

D. 4

4. **The value of Kc is changed by change in temperature because:**

A. Reactants become more reactive than products

B. The rate of reaction is increased

C. The activation energy of reaction is decreased

D. Equilibrium position shift without any substance being added or removed

Rate of Reaction ∝ T

+ve ↓ K_c ⇒ $\overline{\uparrow}$ ↓

5. **The reactions that occur only in one direction are known as:**

A. Reversible reaction

B. Irreversible reaction

C. Spontaneous reaction

D. Non-spontaneous reaction

−ve

6. **The reaction which is favored at low pressure:**

A. $N_2 + 3H_2 \rightleftharpoons 2NH_3$

B. $PCl_5 \rightleftharpoons PCl_3 + Cl_2$

C. $N_2 + O_2 \rightleftharpoons 2NO$

D. $H_2 + F_2 \rightleftharpoons 2HF$

↑ K_c ⇒ ↑V ↓

7. **The rate constant for forward and backward reactions of hydrolysis of ester are 1×10^{-2} and 2×10^{-3} respectively. The equilibrium constant of the reaction is:**

A. 3

B. 4

C. 5

D. 6

$K_c = \frac{k_f}{k_r} = \frac{1 \times 10^{-2}}{2 \times 10^{-3}} = 0.5 \times 10^1 = 5$

8. **The reaction will proceed in the reverse direction when**

A. $Q_c < K_c$

B. $Q_c > K_c$

C. $Q_c = K_c$

D. $Q_c = (K_c)^3$

$[A^{+3}]^2 [X^{-2}]^3 = 45^2 \; 27s^3$

9. **The solubility of A_2X_3 is X mol.dm^{-3}, its solubility product is:**

A. $4X^3$

B. $64X^4$

C. $36X^5$

D. $108X^5$

$\Rightarrow (2s)^2 (3s)^2$

10. **The pH of acidic buffer increases by adding more salt in it because:**

A. Dissociation of acid is increased

B. Dissociation of acid is decreased

C. Added salt produces more OH^- ions

D. Added salt increases pKa of acid

11. **An acidic buffer solution can be prepared by mixing:**
A. NaF + NaOH
B. HCl + NaCl
C. $NH_4F + NH_4OH$
D. NaF + HF

12. **A certain buffer solution contains equal concentration of salt and acid. The K_a for salt is 10^{-10}. The pH of the buffer is:**
A. 6
B. 10
C. 4
D. 14

13. **Which of the following value of K_c indicates maximum yield of products?**
A. $K_c=10^2$
B. $K_c=1$
C. $K_c=10^{-2}$
D. $K_c=10^{-3}$

14. **If $[CH_3COOH]$ = 0.1 mole dm^{-3} and that of $[CH_3COONa]$ = 1.0 mol.dm^{-3} the pH of buffer is:**
A. 5.74
B. 3.74
C. 4.74
D. Zero

15. **A basic buffer solution can be prepared by mixing:**
A. Weak acid and its salt with strong base
B. Weak base and its salt with strong acid
C. Strong acid and its salt with weak base
D. Strong base and its salt with strong acid.

16. **Which of the following change will favour the formation of adequate amount of ammonia at equilibrium in the reaction given below:**

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$$

A. By decreasing pressure
B. By increasing pressure
C. By adding ammonia
D. By removing nitrogen

17. **A dynamic equilibrium is disturbed by**
A. Concentration change
B. Pressure change
C. Temperature change
D. All of these

18. **The equilibrium expression for a reaction is $Kc = x^2/V(a - x)$, what is true for this reaction.**
A. Increase of pressure favors forward reaction
B. Decrease of pressure favors backward reaction
C. Decrease of pressure favors forward reaction
D. Increase of volume favors backward reaction

19. **What is the unit of Kc for the reaction:**

$$2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$$

A. mol dm^{-3}
B. mol^{-1} dm^{-3}
C. mol^{-1} dm^3
D. mol^2 dm^{-6}

20. **The solubility product constant of MY_2 is 32 x 10^{-9} mol^3 dm^{-9}. What is the concentration of M ions in the solution?**
A. 1.6×10^{-6}
B. 2×10^{-3}
C. 4×10^{-6}
D. 1.6×10^{-6}

21. **A chemical reaction in which product formed are stable at the temperature at which reaction is taking place is called**
A. forward reaction
B. irreversible reaction
C. backward reaction
D. reversible reaction

22. **When no. of moles of reactants and products are equal, then K_c has units**
A. moles/dm^3 C. moles^2/dm^{-6}
B. moles^{-2}/dm^{+6} D. no units

23. **When the equilibrium constant is small, it indicates**
A. reaction is at the start C. reaction is at the end
B. reaction is at equilibrium D. very little forward reaction

24. **The addition of any of the reactants or removal of any of the products favors**
A. forward reaction C. backward reaction
B. equilibrium position D. equilibrium constant

25. **In Haber's process, the equilibrium mixture has which of following percentage of Ammonia**
A. 13% C. 35%
B. 80% D. 20%

26. **[CH$_3$COOH]=0.1 mol dm^{-3} and that for [CH$_3$COONa]=0.1 mol.dm^{-3} the pH of buffer is [pKa=4.74]:**
A. 5.74 C. 3.74
B. 4.74 D. 0

27. **When the total number of moles of reactants and products are equal then the equilibrium state is NOT disturbed by:**
A. Concentration change C. Temperature change
B. Pressure change D. Catalyst

28. **Exothermic reactions are favoured in the forward direction by**
A. Decrease in temperature C. Adding a catalyst
B. Increase in temperature D. Removal of reactant

29. **Which of the following is not the characteristic feature of dynamic equilibrium?**
A. It is characterized by constant macroscopic property
B. It is only achieved in an open system
C. It can be obtained in either direction
D. It can be achieved in closed system

30. **In a given system water and ice are in equilibrium if pressure is applied to the above system then:**
A. More ice is formed C. Amount of ice and water remains constant
B. More ice is melted D. None of these

31. **Chemical equilibrium is established in:**
A. Reversible reaction C. Both A and B
B. Irreversible reaction D. forward reaction

32. **Which of the following is correct statement about "K_c":**
A. May or may not have a unit C. Thermodynamic property
B. Depend upon equilibrium concentrations D. All of these

33. **In which of the following reaction K_c has moles^{-2} dm^{+6} unit?**
A. $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$
B. $PCl_5 \rightleftharpoons PCl_3 + Cl_2$
C. $CH_3COOH + C_2H_5OH \rightleftharpoons CH_3COOC_2H_5 + H_2O$
D. $SO_{2(g)} + O_2 \rightleftharpoons 2SO_{3(g)}$

34. **Oxidation of SO_2 by O_2 is exothermic reaction the yield of SO_3 will be maximum if:**
A. Temperature is increased and pressure is kept constant
B. Temperature is reduced and pressure is increased
C. Both temperature and pressure are increased
D. Both temperature and pressure are decreased

35. **Formation of NH_3 is a reversible and exothermic process. What will happen on cooling?**
A. More reactant will be formed
B. More N_2 will be formed
C. More H_2 will be formed
D. More product (NH_3) will be formed

36. **Equation used to calculate pH of acidic buffer solution is:**

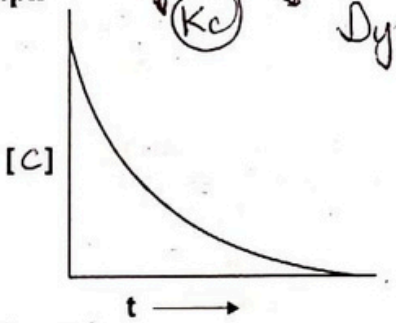
$$pH = pK_a + \log \frac{[Salt]}{Acid}$$

Which of the following is correct about this equation:
A. $pH = pK_a when [acid] = [salt]$
B. $pH > pK_a when [acid] > [salt]$
C. $pH < pK_a when [acid] > [salt]$
D. All of these

37. **The product of the concentrations of each ion in saturated solution of a sparingly soluble salt at the power their relative concentrations is**
A. K_{sp}
B. K_a
C. K_b
D. K_w

38. **For a reversible reaction at equilibrium**
A) Reactants form products
B) The macroscopic properties remain same
C) Products form reactants
D) All

39. **What is true about this graph**



A) It shows concentration of products
B) It shows [R] in reversible reaction
C) It shows concentration of products in an irreversible reaction
D) It shows [R] in an irreversible reaction

40. **According to law of mass action, the rate at which a reaction proceeds is proportional to the ____ of reactants**
A) Mass
B) Active mass
C) Molar mass
D) Molality

41. **Which of the following is true for a reversible reaction at equilibrium:**
A. $k_f = k_r$
B. $[P] = [R]$
C. $R_f = R_r$
D. $[P] < [R]$

42. **For a reversible rex. $K_c = \frac{x^2}{(a-x)(b-x)}$, The true statement is**
A. It is a gas phase reaction.
B. It is a liquid phase reaction.
C. There is no change in no. of moles during the course of reaction.
D. Value of K_c is 4

43. **For which reaction, the volume is an irrelevant factor in determining K_c**
A. Formation of ester
B. Dissociation of PCl_5
C. Decomposition of N_2O_4
D. Synthesis of NH_3

44. **Which is not linked to equilibrium process.**
A. V.P of a liquid.
B. Solubility of a solute
C. Distribution of solute b/w two immiscible solvents
D. Formation of alloys.

45. **For the rex. $SCN^- + Fe^{+3} \rightleftharpoons [Fe(SCN)]^{2+}$ the addition of SCN^- will result in**

Yellow	Red
A. intensification of red color.	C. yellowing of solution
B. decolorization	D. Decrease in $[Fe(SCN)]^{2+}$ concentration

46. **When HCl is added to the aqueous solution of NaCl, the ionization of NaCl:**
A. Increases
B. Decreases
C. Remains same
D. First decreases and then increases

47. **Precipitation occurs when**
A. K_{sp} < ionic product
B. K_{sp} > ionic product
C. K_{sp} = ionic product → Saturated
D. $\sqrt{K_{sp}}$ < ionic product

48. **For the reaction $3X_{(g)} + Y_{(g)} \rightleftharpoons X_3Y_{(g)}$ $\Delta H = +ve$ the amount of product obtained depends upon**
A. T
B. P
C. T,P
D. T,P and Catalyst

49. **For $X + Y \rightleftharpoons Z$ $K_c = 6 \times 10^{-7}$ it means that at equilibrium**
A. Z would be favored
B. X would be favored
C. X and Y would be favored
D. X,Y,Z would be favored.

50. **$2O_3 \rightleftharpoons 3O_2$ $K_c = 10^{55}$ at 25°C, it explains**
A. the reducing power of ozone
B. The extraordinary instability of ozone
C. The UV absorption capacity of ozone
D. Pollutant property of ozone

51. **When a small amount of acid is added to a buffer its pH**
A. is doubled
B. changes only slightly
C. remains the same
D. shifts to 9

52. **$A + B \rightleftharpoons C + D$ $K_c = 10$ at 25°C**
If a container contains 1,2,3,4 moles /L of A, B, C, D respectively, the reaction shall
A. Proceed to right
B. Proceed to left
C. Be in dynamic equilibrium
D. Be in static equilibrium

53. **The forward reaction is almost near completion if the value of K_c is:**
A. Very small
B. Very large
C. Unity
D. Zero

54. **Buffer solutions are mostly prepared by mixing:**
A. Three substances
B. four substances
C. two substances
D. five substances

55. **For $A + B \rightleftharpoons C + D$ $K_c = 10, if k_f = 203$ the value of k_r will be**
A. 20.3
B. 10.3
C. 2.03
D. 203

56. **Which of the following can be regarded as a favorable condition for ammonia synthesis?**
A. High T
B. Low P
C. Low T,P
D. Low T, high P

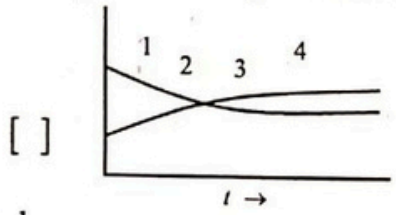
57. **Haber's process operates at 450°C, if it is carried out at 250°C**
A. No ammonia will form.
B. %age of NH_3 will be low
C. Catalyst would be of no use.
D. Rate of formation will be very slow.

58. **Which oxide of nitrogen is most stable if K_c values for their decomposition are as follows:**
A. NO_2 $K_c = 10^{6}$
B. NO $K_c = 10^{30}$
C. N_2O_5 $K_c = 10^{34}$
D. N_2O $K_c = 10^{23}$

59. **A small value of K_c suggests that position of equilibrium**
A. is constantly changing
B. remains same after adding reactant
C. lies towards left
D. is independent of T

60. **The pH of a buffer containing equal concentrations of weak acid and its salt is**
A. always same for different buffer solutions
B. 4.74
C. equal to the pK_a of weak acid used in buffer
D. 3.74

61. **Which point corresponds to the state of equilibrium**



A. 1
B. 2
C. 3
D. 4

62. $A + B \rightleftharpoons$ $K_c = 4.0$, **if** $Q_c = 2$ **than**
A. More products should react
B. More reactants should form
C. More reactant should react.
D. The rex, is at equilibrium.

63. **Mixture of NH_4OH and NH_4Cl is one of the best examples of:**
A. Acidic buffer
B. Basic buffer
C. Natural buffer
D. Acid base buffer

64. **Buffer action can be explained by:**
A. Le-Chatelier's principle
B. Common ion effect
C. Solubility Product
D. A, B

65. **When pressure is applied to the equilibrium system Ice $\rightleftharpoons$ water. Which of the following phenomenon will happen?**
A. More ice will be formed
B. More water will be formed
C. Water will evaporate
D. Equilibrium will not be formed

66. $2HF \rightleftharpoons H_2 + F_2 \rightleftharpoons PCl_5 \rightleftharpoons PCl_3 + Cl_2$
The statement that is false about the K_c of both the reactions
A. Unaffected by ΔV
B. Unaffected by ΔP
C. A, B
D. Unaffected by ΔT

67. **Dissolution of which of these increases with temperature**
A. Li_2CO_3
B. $LiCl$
C. $NaCl$
D. KI

68. **For a reaction proceeding with increase in no. of moles, which of these can affect in more than one ways.**
A. Increase in V
B. Increase in P
C. Change in T
D. catalyst

69. **The K_{sp} of a AB type salt is 16×10^{-3}, the solubility will be**
A. 4×10^{-8} C. 0.4×10^{-2}
B. 4×10^{-4} D. 4×10^{-2}

70. **Rate at which a reaction proceeds is directly related to the**
A. concentration of product C. volume of reactant
B. concentration of reactant D. volume of product

71. **Which statement is false in case of equilibrium state?**
A. There is no apparent change in the properties with time.
B. It is dynamic in nature since both forward and backward reactions occur at all times with same speed.
C. It can be attained from either side of the reaction.
D. It does not change with temperature.

72. **Just before a reversible reaction attains equilibrium it is found that**
A. The velocity of the forward reaction is increasing and that of a backward reaction is decreasing.
B. The velocity of the forward reaction is decreasing and that of a backward reaction is increasing.
C. The velocity of both forward and backward reactions is decreasing.
D. The velocities of both forward and backward reactions are decreasing.

73. **For the reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$ in a vessel, after the addition of equal number of moles of N_2 and H_2, equilibrium state is formed. Which of the following is correct?**
A. $[H_2] = [N_2]$ C. $[H_2] < [N_2]$
B. $[H_2] > [N_2]$ D. $[H_2] < [NH_3]$

74. **Considering the influence of a catalyst on a chemical equilibrium, which one of the following is wrong? The catalyst**
A. increases the speed of both forward and reverse reactions to the same extent
B. does not change the relative amount of substances present at equilibrium
C. changes the time required for reacting the equilibrium
D. changes the equilibrium constant

75. **For $N_2 + 3H_2 \rightleftharpoons 2NH_3$; ΔH = Negative, then**
A. $K_P = K_C$ C. $K_P = K_C\,RT$
B. $K_P = K_C\,(RT)^{-2}$ D. $K_P = K_C\,(RT)^{-1}$

76. **The equilibrium constant of a reversible chemical reaction at a given temperature**
A. depends on the initial concentration of the reactants
B. depends on the concentration of one of the products at equilibrium
C. does not depend on the initial concentration of reactants
D. is not characteristic of the reaction

77. **At a constant temperature the concentration of a reactant is increased at equilibrium, the equilibrium constant**
A. increases C. decreases
B. remains unaffected D. first increases and then decreases

78. **A certain buffer solution contains equal concentration of salt and acid. The K_a for salt is 10^{-10}. The pH of the buffer is:**
A. 6 C. 4
B. 10 D. 14

79. **A higher value of equilibrium constant K shows that**
A. The reaction has gone to near completion towards right.
B. The reaction has not yet started.
C. The reaction has gone to near completion towards left.
D. Whenever equilibrium will be achieved, the [product] will be very high

80. **The equilibrium $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ shifts forward if**
A. a catalyst is used
B. an adsorbent is used to remove SO_3 as soon as it is formed
C. small amounts of reactants are used
D. pressure is decreased

81. **In $K_P = K_C (RT)^{\Delta n}$, Δn may have**
A. Positive values
B. integer or fractional values
C. Negative values
D. either of these

82. **In which of the following cases, does the reaction goes farthest to completion**
A. $K = 10^3$
B. $K = 10$
C. $K = 10^{-2}$
D. $K = 1$

83. **For which system at equilibrium, at constant temperature will the doubling of the volume cause a shift to the right?**
A. $H_2(g) + Cl_2(g) \rightleftharpoons 2HCl(g)$
B. $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
C. $2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g)$
D. $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

84. **Ionization of $KClO_3$ is suppressed by:**
A. changing temperature
B. Adding KCl
C. Adding $NaNO_3$
D. Decreasing pressure

85. **At 1000°C, the equilibrium constant for the reaction of the system $2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)$ is very large. This implies that**
A. $H_2O(g)$ is unstable at 1000°C
B. $H_2(g)$ is unstable at 1000°C
C. H_2 and O_2 have very little tendency to combine at 1000°C
D. $H_2O(g)$ has very little tendency to decompose into $H_2(g)$ and $O_2(g)$ at 1000°C

86. **The chemical equation for the equilibrium denoted by the following equilibrium constant expression**

$$K_c = \frac{[H_2O][NH_3]^2}{[N_2O][H_2]^4}$$ **is**

A. $H_2O + NH_3 \rightleftharpoons N_2O + H_2$
B. $N_2O + 4H_2 \rightleftharpoons H_2O + 2NH_3$
C. $H_2O + 2NH_3 \rightleftharpoons N_2O + 2H_2$
D. $N_2O + H_2 \rightleftharpoons H_2O + NH_3$

87. **For the reaction $X + Y \rightleftharpoons Z$**
$K_C = 6 \times 10^{-7}$; then at equilibrium
A. Z would be favoured
B. Both X and Y would be favoured
C. X would be favoured
D. X, Y and Z would be favoured

88. **For which reaction high pressure and high temperature is helpful in obtaining a high equilibrium yield?**
A. $2NF_3(g) \rightleftharpoons N_2(g) + 3F_2(g)$ $\Delta H = -54.40$ kJ
B. $2NH_3 \rightleftharpoons N_2 + 3H_2$ $\Delta H = +92.08$ kJ
C. $Cl_2(g) + 2O_2(g) \rightleftharpoons 2ClO_3(g)$ $\Delta H = -49.4$ kJ
D. $2Cl_2O_7(g) \rightleftharpoons 2Cl_2(g) + 7O_2(g)$ $\Delta H = +126.8$ kJ

89. **The following equilibrium exists in aqueous solution $CH_3COOH \rightleftharpoons CH_3COO^- + H^+$. If dilute HCl is added without a change in temperature then**
A. concentration of CH_3COO^- will decrease
B. the equilibrium constant will increase
C. concentration of CH_3COO^- will increase
D. the equilibrium constant will decrease

90. Le-Chatelier's principle suggests

A. If a system in equilibrium is subjected to equilibrium system tries to minimize stress a change of concentration, pressure or temperature the equilibrium shifts in the direction that tends to minimize the effect of change.
B. It is applicable to all types of dynamic equilibria.
C. A catalyst keeps both equilibrium position and equilibrium constant unchanged.
D. All of these

91. Which of the following value of K_c indicates maximum yield of products?

A. $K_c=10^2$
B. $K_c=1$
C. $K_c=10^{-2}$
D. $K_c=10^{-3}$

92. A chemist who is concerned with large-scale manufacture of useful compounds is primarily interested in

A. minimizing the energy consumption
B. minimizing the reverse reaction
C. maximizing the backward reaction
D. decreasing the acidity of the product

93. A chemical reaction reactants $\rightleftharpoons$ products is shifted towards the products both by increase of pressure and rise in temperature then the forward reaction is

A. endothermic with Δ n positive
B. exothermic with Δ n negative
C. exothermic with Δ n positive
D. endothermic with Δ n negative

94. If a reversible reaction attains equilibrium quickly, it predicts that

A. $K_C > 1$
B. $K_C = 1$
C. $K_C < 1$
D. $K_C >> 1$

95. Which of the following is correct?

A. K_P will always have some unit.
B. K_P and K_C will never have units.
C. K_C will always have some unit.
D. K_P and K_C will have some unit if $\Delta n \neq 0$.

96. For an equilibrium, which of the following statements is false?

A. If the reaction quotient of the reaction is greater than K_{eq} the reaction moves in the backward direction.
B. If the reaction quotient of the reaction is lesser than K_{eq} the reaction moves in the forward direction.
C. If the reaction quotient of the reaction is equal to K_{eq} the reaction is at equilibrium.
D. There is no correlation between the reaction quotient and K_{eq} in predicting the direction in which the reaction proceeds.

97. Which of the following statement is false?

A. If 1 M CH_3COONa is added to 1M CH_3COOH, pH of the solution decreases
B. If water is added to a mixture of CH_3COOH + CH_3COONa its pH remains constant
C. If HCl is added to acetic acid its ionization will be suppressed
D. If a crystal of NH_4Cl is added to NH_4OH solution its pH decreases

98. The wrong statement among the following is

A. Buffer solutions have reserve pH
B. An acidic buffer mixture can be prepared by mixing a solution of formic acid and sodium formate
C. Buffer solution resist the change in pH by the addition of an acid or base
D. Addition of sodium acetate to a buffer solution of sodium acetate and acetic acid does not affect its pH

99. The relation for calculating pH of a solution containing weak acid and its salt is

A. $pH = pKa + \log \frac{[Salt]}{[Acid]}$

B. $pH = pKa + \log \frac{[Acid]}{[Salt]}$

C. $pH = pKa - \log \frac{[Salt]}{[Acid]}$

D. $pK_a = pH + \log \frac{[Salt]}{[Acid]}$

100. Henderson's equation used to calculate the pOH of a basic buffer is

A. $pOH = pKb + \log \frac{[Salt]}{[Base]}$

B. $pOH = pKb + \log \frac{[Base]}{[Salt]}$

C. $pOH = pKb - \log \frac{[Salt]}{[Base]}$

D. $pOH = pH - \log \frac{[Base]}{[Salt]}$

101. The most important buffer in blood consists of

A. HCl and Cl^-

B. H_2CO_3 and Cl^-

C. H_2CO_3 and HCO_3^-

D. HCl and HCO_3^-

102. In a buffer solution consisting of a weak acid and its salt, the ratio of concentration of salt to acid is increased 10-fold, then the pH of the solution

A. increases by one

B. decreases by one

C. increases by 10-fold

D. decreases by 10-fold

103. Which of the following statements is wrong?

A. for an acid buffer solution the pH can be increased by increasing the concentration of salt

B. for a basic buffer solution the pH can be increased by decreasing the concentration of base

C. buffer capacity of a buffer solution is maximum when the ratio of salt/acid or base is 1

D. the number of moles of acid or base required by one litre of buffer solution to alter its pH by one unit is called buffer efficiency

104. When acid is added to a buffer solution composed of a weak base (B. and its salt with strong acid, then the reaction which occurs to maintain the pH is

A. $B + H_3O^+ \rightarrow BH^+ + H_2O$

B. $B + H_2O \rightarrow BH^+ + OH^-$

C. $OH^- + BH^+ \rightarrow B + H_2O$

D. $BH^+ + H_2O \rightarrow B + H_3O^+$

105. The pKa of certain weak acid is 4.0. What should be the salt to acid ratio if we have to prepare a buffer with pH = 3 using the acid and of its salts?

A. 4:5

B. 10:1

C. 5:4

D. 1:10

106. The solubility product of a sparingly soluble salt AB at room temperature is 1.21×10^{-6}. Its molar solubility is

A. 1.21×10^{-6}

B. 1.1×10^{-4}

C. 1.21×10^{-3}

D. 1.1×10^{-3}

107. $K_{sp} = [A]^3 [B]^2$ for the salt where A and B are the cation and anion as the case may be stands true for

A. $Ca_3(PO_4)_2$

B. Bi_2S_3

C. As_2S_3

D. $CaCl_2$

108. If the solubility product of $AgBrO_3$ and Ag_2SO_4 are 5.5×10^{-5} and 2×10^{-5}, respectively the relationship between the solubilities of these can be correctly represented as

A. $sAgBrO_3 > sAg_2SO_4$

B. $sAgBrO_3 < sAg_2SO_4$

C. $sAgBrO_3 = sAg_2SO_4$

D. $sAgBrO_3 << sAg_2SO_4$

109. **The solubility products of MA, MB, MC and MD are 1.8×10^{-10}, 4×10^{-3}, 4×10^{-5} and 6×10^{-5}, respectively. If a 0.01 M solution of MX is added dropwise to a mixture containing A, B, C and D ions then the one to be precipitated first will be**

A. MA
B. MC
C. MB
D. MD

110. **The addition of NaCl to AgCl decreases the solubility of AgCl**

A. as solubility product decreases
B. as solubility becomes unsaturated
C. due to the common ion effect of Cl^-
D. as solution becomes supersaturated

111. **The solubility of AgI in NaI solution is less than that in pure water because**

A. AgI forms a complex with NaI
B. of common ion effect
C. solubility product of AgI is less than that of NaI
D. the temperature of the solution decreases

112. **A precipitate is formed when**

A. the solution becomes saturated
B. the ionic product is nearly equal to the solubility product
C. the ionic product is less than the solubility product
D. the ionic product exceeds the solubility product

113. **pH of a mixture which is 0.1 M CH_3COOH and 0.05 M $(CH_3COO)_2Ba$ is [pKa of CH_3COOH = 4.74]**

A. 4.74
B. 4.44
C. 5.04
D. 7.00

114. **The reaction $PCl_5(g) \rightleftharpoons PCl_3(s) + Cl_2(g)$ is an example of**

A. backward reaction
B. irreversible reaction
C. forward reaction
D. reversible reaction

115. **For a reversible reaction, if the concentrations of the reactants are doubled, at constant temperature the reaction will**

A. stand still
B. slow down
C. speed up in reverse direction
D. move towards right

116. **$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$, in the above reaction K_p and K_c are related as**

A. $K_p = K_c \times (RT)$
B. $K_p = K_c \times (RT)^2$
C. $K_p = K_c \times (RT)^{-1}$
D. $K_p = K_c \times (RT)^{-2}$

117. **Which of the following change will shift the reaction in forward direction?**

$I_2(g) \rightleftharpoons 2I(g)$ $\Delta H° = +150kJ$

A. increase in concentration of I
B. increase in total pressure
C. decrease in concentration of I_2
D. increase in temperature

118. **A reversible reaction is said to have attained equilibrium, when**

A. backward reaction stops
B. both backward and forward reactions take place at equal speed
C. both backward and forward reactions stop
D. concentration of each of the reactions and products becomes equal

119. **The equilibrium between water and its vapour, in an open vessel**

A. can be achieved
B. cannot be achieved
C. depends upon pressure
D. depends upon temperature

120. **Amongst the following hydroxides, the one which has the lowest value of K_{sp} at ordinary temperature (about 25°C) is**

A. $Mg(OH)_2$ C. $Ca(OH)_2$

B. $Ba(OH)_2$ D. $Be(OH)_2$

121. **When a catalyst is added to a reversible reaction in equilibrium state, the value of equilibrium constant**

A. increases C. decreases

B. does not change D. becomes zero

122. **A chemical reaction is catalysed by a catalyst X. Hence, X**

A. increases activation energy of the reaction

B. does not affect equilibrium position of the reaction

C. increases rate constant of the reaction

D. reduces enthalpy of the reaction

123. $N_2(g) + 3H_2(g) \rightleftharpoons \underset{200\,atm}{\overset{Fe/Mo,\,500°C}{\rightleftharpoons}} 2NH_3 + 92.46kcal$ **formation of NH_3 by above reaction shows**

A. cyanamide process C. Serpeck's process

B. Haber process D. Contact process

124. **In which of the following cases the reaction is farthest from completion?**

A. K=1 C. K=10

C. $K=10^{-2}$ D. $K=10^2$

125. **1 mole of CH_3COOH and 1 mole of C_2H_5OH react to produce $\frac{2}{3}$ mole of $CH_3COOC_2H_5$. The equilibrium constant is**

A. 2 C. +2

B. –4 D. +4

126. **The equilibrium constant of a reaction is 300. If the volume of reaction flask is tripled, the equilibrium constant is**

A. 300 C. 600

B. 900 D. 100

127. **The rate constants for the forward and backward reactions of hydrolysis of ester are 5.5×10^{-3} mol dm^{-3} s^{-1} and 1.1×10^{-3} mol dm^{-3} s^{-1} respectively. The equilibrium constant of the reaction, $CH_3COOC_2H_5 + H^+ \rightleftharpoons CH_3COOH + C_2H_5OH$ is**

A. 6 C. 5

B. 7 D. 8

128. **One of the following equilibria is not affected by change in volume of the flask:**

A. $PCl_5(g) \rightleftharpoons PCl_3(g)Cl_2(g)$ C. $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

B. $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ D. $SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$

ANSWER KEY

1	B	21	B	41	C	61	D	81	D	101	C	121	B
2	A	22	D	42	C	62	C	82	A	102	A	122	C
3	D	23	D	43	A	63	B	83	D	103	D	123	B
4	D	24	A	44	D	64	D	84	B	104	A	124	C
5	B	25	C	45	A	65	B	85	D	105	D	125	D
6	B	26	B	46	B	66	D	86	B	106	D	126	A
7	C	27	B	47	A	67	D	87	B	107	A	127	C
8	B	28	A	48	C	68	C	88	B	108	A	128	B
9	D	29	B	49	C	69	B	89	A	109	A		
10	B	30	B	50	B	70	B	90	D	110	C		
11	D	31	A	51	B	71	D	91	A	111	B		
12	B	32	A	52	A	72	B	92	B	112	D		
13	A	33	A	53	B	73	C	93	D	113	A		
14	A	34	B	54	C	74	D	94	B	114	D		
15	B	35	D	55	A	75	B	95	D	115	D		
16	B	36	A,C	56	D	76	C	96	D	116	C		
17	D	37	A	57	D	77	B	97	A	117	D		
18	C	38	D	58	C	78	B	98	D	118	B		
19	C	39	D	59	C	79	D	99	A	119	B		
20	B	40	B	60	C	80	B	100	A	120	D		

$(10^{-3})^{\frac{1}{3}}$

P↑, V↓

Ice ⇌ Water

$\Rightarrow \frac{2}{3} \times \frac{2}{3}$

$\frac{1}{3} \times \frac{1}{3}$

$\Rightarrow \frac{4}{9} \times \frac{9}{1}$

$\frac{2}{3} + \frac{4}{3}$

$= \frac{2+4}{3} = \frac{6}{3} = 2$

$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5 + H_2O$

1 1 0 0

$\frac{2}{7}$

$\frac{2-\frac{2}{3}}{1}$

$= \frac{6-2}{3} = \frac{4}{3}$

$\Rightarrow 4.74 + \frac{1 \times 10}{1}$

$\Rightarrow$

$\Rightarrow \frac{\left(\frac{2}{3}\right)\left(\frac{4}{3}\right)}{1} = \frac{8}{9}$

HINTS

2. Concentration of product increases and becomes constant after a certain time.
3. K_C is independent of temperature.
6. Increase in volume
9. $K_{sp} = (2X)^2 (3X)^3$
   $= 108\ X^5$
11. Weak acid and salt with strong base.
18. Volume in denominator means no. of moles of product are greater than those of reactants.
20. $\left(\frac{K_{sp}}{4}\right)^{1/5} = S$
29. Dynamic equilibrium is achieved in closed container.
41. For a reversible reaction at equilibrium, the rates of forward and reverse reaction are always equal.
48. Catalyst does not affect position of equilibrium
55. $K_c = \frac{k_f}{k_r}$
66. Most of the reactions involve heat changes so they are affected by ΔT.
67. Endothermic heat of solution.
68. The effect will be different for endothermic and endothermic reactions.
72. Law of mass action.
73. N_2 and H_2 react in 1:3 mole ratio.
79. K_C value shows how the reaction will proceed if the reaction is carried out.
85. High K_C values show product stability.
92. Lower the reverse reaction, higher the yield of product.
97. $[H^+]$ will decrease and pH will increase.
102. Henderson's equation.
104. Base reacts with added acid to minimize the stress of adding acid.
108. Greater the solubility product higher will be the solubility.
113. $Ba(CH_3COO)_2 \rightleftharpoons Ba^{+2} + 2\ CH_3COO^-$

$0.05 \qquad 2 \times 0.05 \rightarrow 0.1$

120. Similar ions produce compounds that have high lattice energy.
124. Lower K_C means less favored product.
125. $[CH_3COOH] = [C_2H_5OH] = \frac{1}{3}$

CamScanner

PAST PAPERS 2009-2020

Q.1 Units of Kc for the following reaction is: $H2 + I2 \rightarrow 2HI$

A. mol^2dm^{-6} B. no unit

C. $moldm^{-3}$ D. $mol^{-2}dm^6$

Q.2 If in AgCl solution, some salt of NaCl is added, AgCl will be precipitated due to:

A. Solubility B. Electrolyte

C. Un saturation effect D. Common ion effect

Q.3 Formation of NH_3 is reversible and exothermic process, what will happen on cooling?

A. More reactant will form B. More H_2 will be formed

C. More N_2 will be formed D. More product (NH_3) will be formed

Q.4 A buffer solution is that which resists/minimizes the change in

A. pOH B. pK_a

C. pH D. pK_b

Q.5 The chemical substance, when dissolved in water, gives "H^+" is called:

A. Neutral B. Base

C. Acid D. Amphoteric

Q.6 The 'pH' of our blood is:

A. 6.7 - 8 B. 7.5

C. 7.9 D. 7.35 – 7.42

Q.7 The value of equilibrium constant (K_B for the reaction $2HF_{(g)} \rightleftharpoons H_{2(g)} + F_{2(g)}$ is 10^{-13} at 2000°C calculate the value of K_p for this reaction

A. 2×10^{-13} B. 186×10^{-13}

C. 10^{-13} D. 3.48×10^{-9}

Q.8 What will be the pH of a solution of NaOH with a concentration of 10^{-3} M?

A. 3 B. 11

C. 14 D. 7

Q.9 During the manufacture of nitric acid, nitric oxide is oxidized to nitrogen dioxide. This reaction is given as

$$2NO_{(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)} \quad \Delta H = -114kJ/mol$$

According to Le Chatelier's Principle

A. Reaction must not be temperature dependent

B. Reaction must be carried out at room temperature

C. Reaction must be carried out at low temperature

D. Reaction must be carried out at high temperature

Q.10 What is the correct relation between pH and pKa?

A. $pH = pKa + \log\left[\frac{Acid}{Base}\right]$ B. $pH = pKa - \log\left[\frac{Base}{Acid}\right]$

C. $pH = pKa - \log\left[\frac{Acid}{Base}\right]$ D. $pKa = pH + \log\left[\frac{Base}{Acid}\right]$

Q.11 Which one of the following is the correct representation for k_{sp}?

$$AgCl \rightleftharpoons Ag^+ + Cl^-$$

A. $K_{sp} = \frac{[AgCl]}{[Ag^+][Cl^-]}$ B. $K_{sp} = \frac{[Ag^+][Cl^-]}{[AgCl]}$

C. $K_{sp} = [Ag^+][Cl^-]$ D. $K_{sp} = [AgCl]$

Q.12 Human blood maintains its pH between:

A. 6.50 – 7.00 B. 7.50 – 7.55

C. 7.20 – 7.25 D. 7.35 – 7.40

Q.13 **Value of K_{sp} for $PbSO_4$ system at 25°C is equal to:**

A. $1.6\times10^{-5}\ mol^2dm^{-6}$ B. $1.6\times10^{-8}\ mol^2dm^{-6}$

C. $1.6\times10^{-6}\ mol^2\ dm^{-6}$ D. $1.6\times10^{-7}\ mol^2dm^{-6}$

Q.14 **For which of the following equilibrium reaction, K_c has no units?**

A. $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ B. $CO_{(g)} + H_2O_{(g)} \rightleftharpoons CO_{2(g)} + H_{2(g)}$

C. $SO_{2(g)} + 2O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ D. $2NO_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$

Q.15 **Consider the following reversible reaction**

$$CH_3-CH_2-OH_{(\ell)} + CH_3-\overset{\overset{O}{\|}}{C}-O-H \rightleftharpoons CH_3-CH_2-O-\overset{\overset{O}{\|}}{C}-CH_{3(\ell)} + H_2O_{(\ell)}$$

Initial concentration

$(CH_3CH_2OH) = 1mol$ $\left(CH_3-CH_2-O-\overset{\overset{O}{\|}}{C}-CH_3\right) = 0\,mol$

$(CH_3COOH) = 1\,mol$ $(H_2O) = 0mol$

Equilibrium concentration

$(CH_3CH_2OH) = 0.333mol$ $\left(CH_3-CH_2-O-\overset{\overset{O}{\|}}{C}-CH_3\right) = 0.666mol$

$(CH_3COOH) = 0.333mol$ $(H_2O) = 0.666mol$

$K_c = 4$ at 100°C

What are new equilibrium concentrations of all species if 1 mole of each of CH_3CH_2OH and CH_3COOH are added to this equilibrium mixture? (Apply Le-Chateller's Principle) (Temperature remained same)

A. $(CH_3COOH) = 0.333mol$ $(CH_3COOC_2H_5) = 1.666mol$
$(C_2H_5OH) = 1.333mol$ $(H_2O) = 0.666mol$

B. $(CH_3COOH) = 1.333mol$ $(CH_3COOC_2H_5) = 0.666mol$
$(C_2H_5OH) = 0.333mol$ $(H_2O) = 1.666mol$

C. $(CH_3COOH) = 0.666mol$ $(CH_3COOC_2H_5) = 1.333mol$
$(C_2H_5OH) = 0.666mol$ $(H_2O) = 1.333mol$

D. $(CH_3COOH) = 0.333mol$ $(CH_3COOC_2H_5) = 1.333mol$
$(C_2H_5OH) = 0.333mol$ $(H_2O) = 1.333mol$

Q.16 **$Ca(OH)_2$ is sparingly soluble having solubility product value 6.5×10^{-6}. What will be its solubility**

A. 2.75×10^{-2} B. 1.17×10^{-2}

C. 2.75×10^{2} D. 3.63×10^{3}

Q.17 **The product of the concentrations of each ion in saturated solution of a sparingly soluble salt at 298K raised to the power of their relative concentrations is**

A. Ksp B. Kb

C. Ka D. Kw

Q.18 **Which of the following factors effect a reversible chemical reaction in accordance with the Le-Chatelier principle?**

A. Pressure
B. Temperature
C. Concentration
D. Pressure, concentration and temperature

Q.19 **Which one of the following factors does not affect the equilibrium position?**

A. Catalyst
B. Concentration of reactants and product
C. Temperature
D. Pressure

Q.20 **The Kc Unit for the reaction $N_{2(g)}+3H_{2(g)} \rightarrow 2NH_{3(g)}$ are**

A. $mole^{-1}dm^{+6}$
B. $mole^{-2}dm^{+3}$
C. $mole^{-2}dm^{+6}$
D. $mole^{-1}dm^{+3}$

Q.21 **Which one of the following bases has highest Kb value?**

A. NH_4OH
B. NaOH
C. $Ca(OH)_2$
D. CH_3NH_2

Q.22 **What is the pH of 0.1M of HCl?**

A. 1
B. 0.1
C. 0.01
D. −1

Q.23 **The Pka values of CH_3COOH is 4.74, the pH of equimolar solution of acetic acid and sodium acetate is:**

A. 13.0
B. 7.2
C. 4.79
D. 4.74

Q.24 **Precipitation occurs when the product of ionic concentration is?**

A. Greater than Ksp
B. Less than Ksp
C. Equal to Ksp
D. Equal to unity

Q.25 **$K_p = K_c(RT)$ in the equation if $\Delta n < 0$ then:**

A. $K_p = K_c$
B. $K_p < K_c$
C. $K_p > K_c$
D. $K_p < 0$

Q.26 **Pka values of some acids are given below choose the weaker acid?**

A. $HClO_4(-10)$
B. HBr(−9)
C. $H_2SO_4(-3)$
D. HCl(−7)

Q.27 **Consider the reversible reaction.**

$$N_2 + 2NH_3 \rightleftharpoons 2NH_3 + Heat$$

The yield of NH_3 will be maximum at

A. High temperature and low pressure
B. High temperature and high pressure
C. Low temperature and low pressure
D. Low temperature and high pressure

Q.28 **Ice and water is in equilibrium with each other. By increasing the pressure the equilibrium will shift in**

A. Forward
B. Reverse
C. To all system at equilibrium
D. None of the above

Q.29 **For an equilibrium reaction;**

$2SO_{2(g)} + O_{2(g)} <> 2SO_{3(g)}$

the forward reaction is exothermic, increase in temperature shifts the equilibrium position towards left because,

A. The concentrations of SO_3, SO_2 and O_2 increase as the temperature increases
B. The concentrations of SO_2 and O_2 increase and concentration of SO_3 decreases as the temperature increases
C. The concentrations of SO_2 and O_2 decrease and concentration of SO_3 increases as the temperature increases
D. The concentrations of SO_2 and O_2 increase and concentration of SO_3 stays same as the temperature increases

Q.30 **Which of the following reaction has greater K_p than K_c ($K_p > K_B$.?**

A. $2NO + Cl_2 \rightleftharpoons 2NOCl$

B. $2SO_2 + O_2 \rightleftharpoons 2SO_3$

C. $2NOCl \rightleftharpoons 2NO + Cl_2$

D. $N_2 + 3H_2 \rightleftharpoons 2NH_3$

$K_p = K(RT)^{\Delta n}$

Q.31 **The equation $N_{2g} + 3H_{2g} \rightleftharpoons 2NH_{3g}$ represents:**

A. Contact process

B. Haber's process

C. Solvay process

D. Avogadro's law

Q.32 **For a gaseous phase reaction, when number of moles of reactants and products are equal:**

A. The values of K_p and K_c are different

B. The value of K_p is greater that K_c

C. The value of K_c is greater that K_c

D. The value of K_p and K_c are the same

Q.33 **Purification of table salt (NaCl) by passing HCl gas through its saturated aqueous solution is an example of**

A. Law of mass action

B. Hess's law

C. Common ion effect

D. Henry's law

PAST PAPER QUESTIONS

1	B	6	D	11	C	16	B	21	B	26	C	31	B
2	D	7	C	12	D	17	A	22	A	27	D	32	D
3	D	8	B	13	B	18	D	23	D	28	A	33	C
4	C	9		14	B	19	A	24	A	29	B		
5	C	10	C	15	C	20	C	25	B	30	C		

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HINTS

3. Exothermic reactions are favored at low temperature.

4. Although buffers indirectly minimize the change in pOH as well yet pH is the most suitable answer here

7. $\Delta n = 0$

8. $pH = 14 - pOH$

10. $pH = pK_a + \log \frac{[Salt]}{[Acid]}$ or $pH = pKa - \log \frac{[Acid]}{[Salt]}$

Here salt = conjugate base or base.

13. Memory based question

15. According to the given initial and equilibrium concentrations.

	CH_3CH_2OH +	CH_2COOH	$\rightleftharpoons$ $CH_3COOC_2H_5$	+ H_2O
Added conc.	1	1	0	0
Eq. conc. already present	0.33	0.33	0.66	0.66
Total eq. conc.	0.66	0.66	1.33	1.33

16. $S = \left(\frac{K_{sp}}{4}\right)^{1/3}$

$$K_c = \frac{\frac{2}{3} \times \frac{1}{3}}{1 \times 1}$$

21. Strongest base out of these.

22. $pH = -\log [H^+]$

26. Higher pKa means weaker acid.

28. Increase in pressure shifts the physical equilibrium in a direction where volume is lesser.

30. If $\Delta n = +ve$ $K_p > K_c$

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Q. 1 The conversion of nitrogen to ammonia or nitrogenous compounds is called
A. Nitrification
B. Nitrogen Fixation
C. Denitrification
D. Assimilation

Q. 2 Reversible reaction is
A. Spontaneous
B. Non spontaneous
C. Intermediate b/w spontaneous and non-spontaneous
D. Either spontaneous or non-spontaneous

Q. 3 $H_2 + I_2 \rightleftharpoons 2HI$ relation between Kp and Kc for this reaction is
A. $Kp = Kc/RT$
B. $Kp = Kc$
C. $Kc = Kp/RT$
D. $Kp = Kc(RT)^{-1}$

Q. 4 Production of ammonia by Haber process is made economical by using
A. Law of Mass action
B. Catalyst
C. Le Chatelier's principle
D. All of these

Q. 5 With different number of moles of reactants and product the volume of system
A. Remains unchanged
B. Changes
C. Decreases
D. Increases

Q. 6 Kc and Kp have the same value when reactants and products have same number of
A. Atoms
B. Ions
C. Molecules
D. Moles

Q. 7 According to Le Chatelier's principle exothermic reactions are favored by
A. Increase in pressure
B. Increase in volume
C. Decrease in temperature
D. All of these

Q. 8 $Kp = Kc\,(RT)^{\Delta n}$, T stands for
A. Temperature
B. Absolute temperature
C. Critical temperature
D. All of these

Q. 9 Manufacturing of Ammonia by Haber's process is an
A. Endothermic reaction
B. Irreversible
C. Exothermic reaction
D. Slow

Q. 10 Equilibrium constant for ideal gases in terms of partial pressure in denoted by
A. Kc
B. K
C. Kp
D. None of these

Q. 11 A very small value of Kc depicts
A. No reaction
B. Backward reaction
C. Little forward reaction
D. Complete reaction

Q. 12 The equilibrium constant is always written as a ratio of
A. Reactants over products
B. Product over reactants
C. Product times reactants
D. None of these

ANSWER KEY

1	B	2	B	3	B	4	C
5	B	6	D	7	C	8	B
9	C	10	C	11	C	12	B

UNIT 7

PRACTICE EXERCISE

REACTION KINETIC

1. **The rate of reaction is doubled for every 10° C rise in temperature. The increase in reaction rate as a result of temperature rise from 10° to 100° is:**
   A. 112
   B. 400
   C. 512
   D. 614

2. **Rusting of iron is the example of _____ reaction:**
   A. Fast
   B. Slow
   C. Moderate
   D. Depends upon conditions

3. **The reaction kinetics is concerned with the _____:**
   A. Rate of reaction
   B. Direction of reaction
   C. Factor affecting rate of reaction
   D. both a & c

4. **Activated complex is a substance which is**
   A. Stable
   B. Unstable
   C. Can be isolated
   D. Can exist as product

5. **A reaction is first order with respect to A and second order with respect to B, the rate equation is**
   A. rate = $[A]\,[B]^2$
   B. rate = $k\,[A]^2\,[B]$
   C. rate = $k\,[A]\,[B]$
   D. rate = $k\,[A]$

6. **For a reaction A → product, doubling the concentration of A, quadruple the rate. The reaction is;**
   A. first order
   B. second order
   C. zero order
   D. third order

7. **Consider gas is measured in bars then the units of rate of reaction is:**
   A. Mole dm^{-3} sec
   B. Bars sec
   C. Mole dm^{-3} sec^{-1}
   D. Bars sec^{-1}

8. **The concentration of product is increasing from 30 mole/dm^3 to 40mol/dm^3 in 0.5 sec then rate of reaction will be _____ mole dm^{-3} sec^{-1}:**
   A. 10
   B. 20
   C. 15
   D. 25

9. **The number of reacting molecules whose concentration change during reaction is called:**
   A. Rate of reaction
   B. Order of reaction
   C. Activated molecule
   D. half-life

10. **With the increase in temperature the rate of reaction increases due to**
    A. Decrease in collisions
    B. Decrease in activation energy
    C. Increase in kinetic energy of the molecules
    D. More number of molecules attain activation energy

11. **You can speed up a reaction by;**
    A. using less concentrated solution
    B. by lowering the temperature
    C. using more concentrated solution
    D. stopping stirring

12. **When the catalyst and reactants are in different physical phases, we call the catalysis**
    A. Heterogeneous
    B. Homogeneous
    C. Concentrated
    D. Positive catalysis

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13. **The reaction which is zero order:**
A. Decomposition of N_2O_5
B. Formation of FeI_2
C. Formation of Glucose in plant
D. Chlorination of methane in sunlight

14. **The order of reaction of carbon tetra chloride from chloroform is:**
A. 4
B. 1.5
C. 2.5
D. Zero

15. **Let us consider the following reaction $NO_{2(g)} + CO_{(g)} \rightarrow NO_{(g)} + CO_{2(g)}$ the rate equation of reaction is Rate = $K[NO_2]^2$ then the rate determining step is:**
A. $2NO_2 + CO \rightarrow 2NO + CO_2$
B. $NO_2 + NO_2 \rightarrow NO_3 + NO$
C. $NO_2 + NO \rightarrow NO + CO_2$
D. $NO_2 + CO \rightarrow NO + CO_2$

16. **In dilatometric method _____ is directly proportional to extent of reaction:**
A. Change in concentration
B. Chang in volume
C. Change in pressure
D. Change in temperature

17. **Increasing the temperature increases the rate of reaction by**
A. Lowering the activation energy
B. Increasing the activation energy
C. Lowering the frequency of effective collisions between reactive molecules
D. Increasing the frequency of effective collision between reactive molecules

18. **The energy needed to start the reaction is called**
A. Potential energy
B. Activation energy
C. Kinetic energy
D. Ionization energy

19. **As the number of effective collisions between the reacting particles increases, the rate of reaction**
A. Decreases
B. Increases
C. Remains the same
D. Both B and C

20. **The specific rate constant of a first order reaction depends on the:**
A. Concentration of the reactant
B. Time
C. Concentration of the product
D. Temperature

21. **The conversion of molecules of A to B follows a second order kinetics. Doubling the concentration of A will increase the rate of formation of B by a factor of:**
A. 2
B. ½
C. 4
D. ¼

22. **Diazonium salt decomposes as $C_6H_5N_2^+Cl^- \rightarrow C_6H_5Cl + N_2$. At 0°C, the evolution of N_2 becomes two times faster when the initial concentration of the salt is doubled. Therefore, it is:**
A. A first order reaction
B. Independent of the initial concentration of the salt
C. A second order reaction
D. A zero order reaction

23. **Which condition will increase the rate of reaction?**
A. Decrease in temperature and concentration of reactants
B. Decrease in temperature and increase in concentration of reactants
C. Increase in temperature and decrease in concentration of reactants
D. Increase in temperature and increase in concentration of reactants

24. **In the reaction A + B → Products, if B is taken in excess, then it is an example of:**
A. Second order reaction
B. Pseudo first order reaction
C. zero order reaction
D. first order reaction

25. **The number of atoms or molecules whose concentration determines the rate of a chemical reaction is called the:**
A. Molecularity of the reaction
B. Order of the reaction
C. specific activity of the reaction
D. rate constant of the reaction

26. **Consider the following $2N_2O_5 \longrightarrow 2N_2O_4+O_2$ the molecularity and order of reaction for this reaction is**
A. 1, 1
B. 1, 2
C. 2, 0
D. 2, 1

27. **A catalyst**
A. Decrease the activation energy and decrease the rate of reaction
B. Decrease the activation energy and increase the rate of reaction
C. Increase the activation energy and decrease the rate of reaction
D. Increase the activation energy and increase the rate of reaction

28. **Which of the following statements is incorrect?**
A. Specific rate constant changes with temperature
B. Decomposition of nitrogen pentoxide is 1st order reaction
C. Half-life of first order reaction is independent of initial concentration of reactant
D. In zero order reaction the rate is dependent on concentration of reactant

29. **The molecularity of reaction**
$CH_3COOC_2H_5 + H_2O \rightleftharpoons CH_3COOH + C_2H_5OH$ is 2. The order of reaction is
A. 0
B. 1
C. 2
D. 3

30. **A study of chemical kinetics of a reaction between A and B gave the following data**
A + B $\longrightarrow$ Products

[A]	[B]	Rate constant ($dm^3mol^{-1}s^{-1}$)
0.004	0.001	0.2
0.008	0.002	0.8
0.008	0.001	0.4
0.004	0.002	0.4

The overall order of the reaction will be:
A. First order
B. Second order
C. Third order
D. Fractional order

31. **Consider the following reactions:**
(i) $2N_2O_5 \rightleftharpoons 2N_2O_4 + O_2$
(ii) $NO_2 + O_3 \rightleftharpoons NO_2 + O_2$
(iii) $6CO_2+6H_2O \rightleftharpoons C_6H_{12}O_6+6O_2$
(iv) $(CH_3)_3CBr + HOH \rightleftharpoons (CH_3)_3COH + HBr$
Which of the following is zero order reaction
A. I
B. II
C. III
D. II and III

32. **Which aluminum sample would react most rapidly with 1 M $CuSO_4$ solution under the same conditions?**
A. 1 g Al rod
B. 1 g Al pellets
C. 1 g Al ribbon
D. 1 g Al powder

33. **Unit of the rate constant depends upon the:**
A. Molecularity of reaction
B. Concentration terms
C. Order of reaction
D. Number of reactants

34. **$A + 2B \longrightarrow C$ What are the possible units of the rate constants 'k' for the given reaction:**
A. mol dm^{-3} s^{-1} C. s^{-1}
B. mol^{-1} dm^3 s^{-1} D. mol^{-2} dm^6 s^{-1}

35. **The slope of the graph is steepest at the beginning of reaction showing**
A. Rapid decrease in concentration of reactants
B. Rapid increase in the concentration of products
C. Fast rate of reaction
D. All of the above

36. **A reaction A→ B is independent of concentration of reactant A. The order of reaction will be**
A. First order C. Second order
B. Third order D. Zero order

37. **The study of which one of the followings guides to the mechanism of the reaction**
A. Order of reaction C. Half-life period of reaction
B. Rate of reaction D. Rate determining step

38. **The collision which results in chemical reaction**
A. Effective collision C. Ineffective collision
B. Useless collision D. All of the above

39. **One mole of a reactant reacts with a rate of 0.6 mol dm^{-3} s^{-1}. What is the rate constant of this reaction?**
A. 1 s^{-1} C. 0.6 s^{-1}
B. 0.3 s^{-1} D. 0.9 s^{-1}

40. **Chemical kinetics deals with the study of:**
A. Reaction rate C. Factors that affect the reaction rate
B. Reaction mechanism D. All of them

41. **The energy of activated complex is:**
A. Lower than the energy of reactants and higher than the energy of products
B. Lower than the energy of products and higher than the energy of reactants
C. Lower than the energy of both the reactants and products
D. Higher than the energy of both the reactants and products

42. **A substance that alters the rate of chemical reaction without being consumed in the reaction is called:**
A. Catalyst C. Product
B. Reactant D. Activated complex

43. **The slowest step in a step-by-step reaction is called**
A. Rate determining step C. Rate controlling step
B. Rate limiting step D. All of them

44. **The radioactive disintegration of $^{238}_{92}U$ is**
A. First order C. Second order
B. Third order D. Zero order

45. **All the Hydrolytic reactions are**
A. First order C. Second order
B. Third order D. pseudo-first order

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46. **For a hypothetical reaction $x_2 + y_2 \rightarrow 2xy$ the proposed mechanism is**
(i) $x_2 \rightarrow x + x(Fast)$
(ii) $x + y_2 \rightarrow xy + y$ (slow)
(iii) $x + y \rightarrow xy(Fast)$
The order of reaction will be
A. 0
B. 1
C. 1.5
D. 2

47. **A first order reaction has $k = 10^{-2} Sec^{-1}$, the time required to convert 20g of it to 5g will be**
A. 138.6s
B. 238.6s
C. 346.5s
D. 693s

48. **Addition of catalyst during a chemical reaction alters.**
A. H
B. E
C. E_a
D. Collision frequency

49. **Which is the faster reaction**
A. $CH_4 + Cl_2$
B. $CH_3COOH + C_2H_5OH$
C. $AgNO_3 + NaCl$
D. $C + 2H_2$

50. **Some reactions are slower than others because they**
A. Lack light
B. Lack catalyst
C. Have high E_a
D. have low [R]

51. **100g of a substance decays slower than 50g of the same substance, the order of decay follows kinetics**
A. zero order
B. 1st order
C. 2nd order
D. 3rd order

52. **For 2nd order reaction_____ changes with time**
A. order, k
B. k, Rate
C. Rate, $t_{\frac{1}{2}}$
D. $t_{\frac{1}{2}}$

53. **The rate of which reaction increases four times by doubling _____ concentration(s) of reactant(s)**
A. First order
B. Second order
C. Third order
D. Zero order

54. **Decomposition of N_2O_5 is an example of:**
A. First order
B. Second order
C. Third order
D. Zero order

55. **Amount of product formed increases with time, this statement is true for reactions with _____ kinetics**
A. 1st order
B. zero order
C. 3rd order
D. Any order

56. **Unit of rate of reaction for a second order mol^{-1} reaction is**
A. s^{-1}
B. mol $dm^{-3} s^{-1}$
C. mol $dm^{+3} s^{-1}$
D. mol^{-2} dm^{+6} s^{-1}

57. **Doubling the pressure in a liquid phase reaction**
A. Will double the reaction
B. Will increase the reaction
C. Will decrease the reaction
D. Will not alter the concentration of reactant

58. **The collision that results in the formation of product is called:**
A. Fruit full collision
B. Effective collision
C. Both A and B
D. Ineffective collision

59. **Which one of the following does NOT influence rate of reaction?**
A. Concentration
B. Temperature
C. Catalyst
D. Activation energy

60. **Half-lives required to convert 100% reactant to product for a first order reaction are**
A. 10
B. 100
C. 1000
D. Infinity

61. **The reaction takes place among the molecules when they have:**
A. Activation energy
B. Properly oriented
C. Concentrated
D. Activation energy and proper orientation

62. **Given is the mechanism of decomposition of N_2O_5.**

(i) $N_2O_5 \xrightarrow{Slow} NO_2 + NO_3$

(ii) $NO_2 + NO_3 \xrightarrow{Fast} NO + NO_2 + O_2$

(iii) $NO + NO_3 \xrightarrow{Fast} 2NO_2$

The order of reaction is
A. 1
B. 2
C. 3
D. 0

63. **What are the possible units of the rate constant, "k" for the given rate equation of a reaction?**
rate = K [A][B]
A. mol. dm^{-3} . s^{-1}
B. mol^{-1}. dm^3. s^{-1}
C. mol^{-2}. dm^3. s^{-1}
D. mol^{-1}. s^{-1}

64. **If the reaction 'P + Q → R + S' is described as being of zero order with respect to P, it means that**
A. P is catalyst in this reaction
B. P molecules do not possess sufficient energy to react
C. The concentration of P does not change during the reaction
D. The rate of reaction is independent of the concentration of P

65. **The unit of rate constant for third order reaction is**
A. s^{-1}
B. $mol^{-1}dm^3s^{-1}$
C. $mol^{-2}dm^6s^{-1}$
D. mol $dm^{-3}s^{-1}$

66. **Which one of the following reactions is NOT the example of heterogeneous catalysis?**
A. $2SO_2 + O_2 \xrightleftharpoons{Pt} 2SO_3$
B. $CH_2 = CH_2 + H_2 \xrightarrow{Ni} CH_3 - CH_3$
C. $CO + 2H_2 \xrightarrow{Cr_2O_3 + ZnO} CH_3OH$
D. $2SO_2 + O_2 \xrightleftharpoons{NO} 2SO_3$

67. **Rate of formation or disappearance of an optically active substance is monitored by**
A. Dilatometry
B. Refractrometry
C. Spectrometry
D. Optical rotation

68. **For a chemical reaction which can never be a fractional no.**
A. order
B. half – life
C. molecularity
D. rate constant

69. **75% of a first order reaction was completed in 32 min. When was 50% of the reaction completed?**
A. 16 min
B. 8 min
C. 24 min
D. 64-min

70. **A reaction is found to be second order with respect to B, if B is doubled, keeping every other substance constant. The rate of reaction will,**
A. remain unchanged
B. increase four times
C. increase three times
D. double

71. **Some of the methods used for the determination of rate of reaction are called physical methods because**
A) They involve a simple chemical reaction
B) They produce mass change
C. They lower E_a physically
D. They monitor some physical property

72. **If half – life of a substance is 5 yrs, then the total amount of substance left after 15 years, when initial amount is 64 grams is**
A. 16 grams
B. 32 grams
C. 2 grams
D. 8 grams

73. **If the rate of the reaction is equal to the rate constant, the order of the reaction is**
A. 3
B. 1
C. 0
D. 2

74. **The reactions occur due to**
A. Slow moving molecules
B. Polar molecules
C. Collisions b/w molecules
D. High E_a

75. **Rate of which reaction increases with temperature for?**
A. Exothermic and endothermic reactions
B. Endothermic reactions
C. Exothermic reactions
D. None of these

76. **Which of the following reactions are usually slow?**
A. Neutralization of acids and bases
B. Organic substitution reaction
C. Displacement Reactions
D. Free-radical reactions

77. **The increase in reaction rate as a result of increase in temperature from 10K to 90K is**
A. 512
B. 400
C. 256
D. 112

78. **All are examples of fast reactions except**
A. Neutralization
B. Redox
C. Decomposition
D. Ionic

79. **By increasing the concentration of reactants, the rate of reaction_____**
A. Decreases
B. Remains constant
C. Increases
D. Not predicted

80. **Select the correct rate law from given data**

[A] moles dm^{-3}	[B] moles dm^{-3}	Rate of reaction (moles dm^{-3} sec^{-1})
10	10	2×10^{-5}
20	10	4×10^{-5}
10	20	4×10^{-5}
20	20	8×10^{-5}

A. Rate = $k[A][B]$
B. Rate = $k[A]^{\circ}[B]^2$
C. Rate = $k[A]^2[B]$
D. Rate = $k[A][B]^2$

81. The specific rate constant of a chemical reaction is the rate of the reaction when the concentration of the reactant is

A. Less than unity
B. Equal to unity
C. Greater than unity
D. Equal to the concentration of 2nd order reaction

82. The unit of rate constant of second order reaction is

A. mol dm^{-3} sec^{-1}
B. mol^{-2} dm^{6}
C. sec^{-1}
D. $mole^{-1}$ dm^{3} sec^{-1}

83. The 2nd order reaction becomes 1st order when

A. One of the reactants is limiting
B. One of the reactants is in large excess
C. None of the reactants is in large excess
D. Both reactants in large excess

84. All those factors that change the _____ affect rate of reaction

A. Polarity of molecules
B. Velocity const.
C. Rate const.
D. Effective collisions per s

85. Rate of formation of SO_3 in the reaction $2SO_2 + O_2 \rightarrow 2SO_3$ is 2 moles min^{-1}. Hence rate of disappearance of SO_2 will be:

A. 2 moles min^{-1}
B. 4 moles min^{-1}
C. 8 moles min^{-1}
D. 3 moles min^{-1}

86. Reaction kinetics is important to discover the _____ under which reaction will proceed most economically:

A. rate constant
B. volume
C. Conditions
D. equilibrium point

87. The half-life time for a 1st order decomposition of a substance dissolved in CCl_4 is 2.5 hours at 30°C. The amount of substance left after 10 hours if the initial weight of the substance is 160g

A. 5g
B. 15g
C. 10g
D. 20g

88. For a reaction $A + 2B \longrightarrow C$, rate is given by $Rate = k[A][B]$, hence the order of the reaction is

A. 3
B. 1
C. 2
D. 0

89. For a chemical reaction $A \longrightarrow B$, the rate of reaction doubles when the concentration of A is increased four times. The order of reaction for A is

A. Zero
B. Two
C. One
D. Half

90. What will be order of reaction if doubling the concentration of reactant increases the rate by factor 4 and tripling the concentration of reactant by a factor of 9

A. 1
B. 3
C. 2
D. 0

91. For the 1st order decomposition reaction $2N_2O_{5(g)} \rightarrow 2N_2O_{4(g)} + O_{2(g)}$ the half-life is given as

A. 0.693/k
B. log2/k
C. 0.693/2k
D. ln2/k

92. The rate of reaction for a reaction is 30 mol dm^{-3} sec^{-1} if the product of concentration of reactant is unity the specific rate constant is:

A. 2.5
B. 15
C. 30
D. 25

93. **The order of reaction provides valuable information about _____ of reaction:**
A. Condition C. Concentration
B. Mechanism D. Parameters

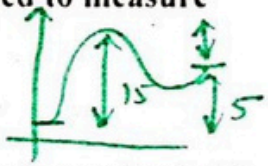
94. **The rate constant of reaction is $3 \times 10^{-3} mol dm^{-3} sec^{-1}$. The order of reaction is**
A. 1 C. 2
B. 3 D. 0

95. **Activation energy of a reaction**
A. excludes the average kinetic energy of the reactants
B. Is in addition to the total K.E. of the reactants
C. Is in addition to the average K.E. of the products
D. Is needed for effective collisions

96. **E_a appears as a potential energy hill between _____ for carrying out the reaction**
A. Reactants C. Products
B. Reactants and the products D. Products and Activated complex

97. **If E_f and E_r are activation energies of forward and reverse reaction. The reaction is known to be exothermic then**
A. $E_f > E_r$ C. $E_f >>> E_r$
B. $E_f < E_r$ D. $E_f = E_r$

98. **If reactants are conductor of electricity, then _____ method is used to measure the change in concentration of reaction:**
A. Optical rotation C. Refractrometric
B. Dilatometric D. Electrical conductivity



99. **For an endothermic reaction A ⟶ B , an activation energy of forward reaction is 15 kcal mol^{-1} and enthalpy change of reaction is 5 kcal mol^{-1}. The activation energy for reverse reaction B ⟶ A is**
A. 10 kcal mol^{-1} C. 20 kcal mol^{-1}
B. 15 kcal mol^{-1} D. Zero

100. **If the energy of the activated complex lies close to energy of reactants, it means that reaction is**
A. Slow C. Exothermic
B. Endothermic D. Exothermic and fast

101. **The activation energy for a simple chemical reaction A ⟶ B is E_a in forward direction. The activation energy for reverse reaction**
A. Can be less than or more than E_a C. Is always double of E_a
B. Is negative of E_a D. Is always less than E_a

102. **The reaction rate in forward direction decreases with the passage of time because**
A. Concentration of reactants decreases C. The order of reaction changes
B. Concentration of product decreases D. Temperature of the system changes

103. **What is the speed of rate determining step?**
A. very fast and increasing C. Moderate and decreasing
B. Slow and decreasing D. continuously increasing

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104. What is the effect of decrease in reactants concentration on products concentration?
A. Decreases products
B. Increases products
C. Affects negligibly
D. Improves reaction efficiency

105. _____ are units of rate of reaction.
A. $moldm^3\ sec^{-1}$
B. $moldm^3\ minute^{-1}$
C. $moldm^{-3}\ sec^{-1}$
D. $moldm^3\ hour^{-1}$

106. _____ units are used in place of molar concentration in gas phase reactions.
A. Volume
B. Pressure
C. Density
D. Temperature

107. The rate at any one instant during the intervals called as
A. Average rate
B. Instantaneous rate
C. Reaction rate
D. Limiting rate

108. At the start of chemical reaction, the instantaneous rate is _____ than average rate.
A. Higher
B. Equal to
C. Lower
D. comparable

109. Law of mass action expresses relationship between
A. Rate of reaction and concentration of reacting substance
B. Rate of reaction and concentration of products
C. Concentration of reactants and concentration of products
D. Concentration of reactants and catalysts

110. Optical rotation method is concerned with _____ of reacting substances.
A. Refractive Index
B. Optical activity
C. Concentration
D. Density

111. Unite of k in first order Reaction is:
A. s^{-1}
B. moles $dm^{-3}\ s^{-1}$
C. moles dm^{-3}
D. $mol^{-1}\ dm^3$

112. For a chemical reaction in which, one of the reactant also acts as solvent, the order will be
A. First order
B. Third order
C. Second order
D. pseudo-first order

113. The slope of concentration time graph gives value of
A. Concentration of reactants
B. Amount of catalyst
C. Concentration of products
D. Rate of reaction

114. The curve of concentration time graph becomes horizontal when the rate of reaction
A. Increases
B. Become constant
C. Decreases
D. becomes zero

115. Which substance controls rate of reaction in method of large excess?
A. Substance in excess
B. Catalyst
C. Substance in small amount
D. Quantity of product

116. Frequency of molecular collisions is affected by _____ of reacting substance.
A. Temperature
B. Polarity
C. Refractive Index
D. Packing

117. The concentration of gas can be increased by increasing _____ of the gas.

A. Temperature
B. Volume
C. Pressure
D. Specific gravity

118. Arrhenius constant depends upon _____ reacting substance.

A. Concentration
B. Pressure
C. Volume
D. Collinson frequency

Rate = k

119. Oxidation reduction reactions are _____ than ionic reactions.

A. Faster
B. Equal in speed
C. Slower
D. comprised of lesser number of steps

ANSWER KEY

1	C	11	C	21	C	31	C	41	D	51	A	61	D	71	D	81	B	91	A	101	A	111	A
2	B	12	A	22	A	32	D	42	B	52	C	62	A	72	D	82	D	92	C	102	A	112	D
3	D	13	C	23	D	33	C	43	D	53	B	63	B	73	C	83	B	93	B	103	B	113	D
4	B	14	B	24	B	34	D	44	A	54	A	64	D	74	C	84	D	94	D	104	B	114	D
5	A	15	B	25	B	35	D	45	D	55	D	65	C	75	A	85	A	95	D	105	C	115	C
6	B	16	B	26	D	36	D	46	C	56	C	66	D	76	B	86	C	96	B	106	B	116	A
7	D	17	D	27	B	37	A	47	D	57	D	67	D	77	A	87	C	97	B	107	B	117	C
8	B	18	B	28	D	38	A	48	C	58	C	68	C	78	C	88	C	98	D	108	A	118	D
9	B	19	B	29	B	39	C	49	C	59	D	69	A	79	C	89	D	99	A	109	A	119	C
10	D	20	D	30	B	40	D	50	D	60	D	70	B	80	A	90	C	100	D	110	B		

$k = \frac{2.5\ ①\ \ 2.5\ ②\ \ 2.5\ ③\ \ 2.5\ ④}{} \Rightarrow \frac{0.693 \times 100}{1}$

$15 = n(5)$

$n = 3$

②

$1-n \quad 160$

$1-2 \quad 80$

40

20

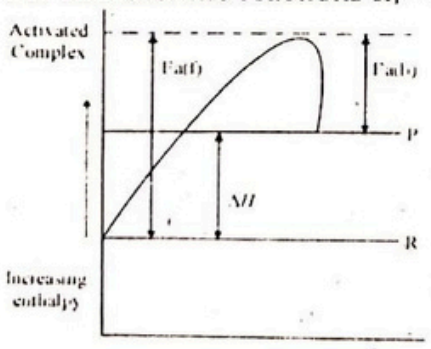
$5\ \ 5\ \ 5$

64
32
16
8

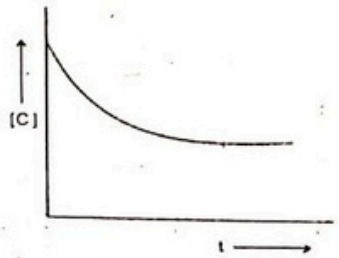
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HINTS

1. $\frac{\Delta T}{10} = n$ and 2^n = Increase in rate
7. Change in pressure / unit time = Rate of reaction
8. $\frac{\Delta C}{\Delta t} = \frac{10 mol dm^{-3}}{0.5 sec} = 20 mol dm^{-3} s^{-1}$
13. Photocatalyzed reaction
20. Rate constant increases with temperature
22. Rate α [salt]
24. If in a second order reaction, one of the reactants is deliberately taken in excess, the reaction overall becomes pseudo first order
28. For zero order reaction, rate is only temperature dependent
29. Hydrolytic reactions have water as a solvent
33. Rate constant has different units for different order reaction
44. Radioactive decay follows first order kinetics
46. Rate = $k[x_2]^{\frac{1}{2}}[y_2]$
47. $t_{\frac{1}{2}} = \frac{0.693}{0.01}$
49. Ionic reaction
55. Concentration of products always increases with time.
60. After half-life, initial concentration become half. The matter never disappears completely.
68. Molecularity is the no. of molecules taking part in a chemical reaction. A molecule either takes part in reaction or it does not.
75. For all types of reactions, the rate of reaction increases with time.
79. Chances of collision between the molecules increase.
87. Four half-lives have passed.
94. Units tell that it is zero order reaction.
98. For endothermic reactions $E_f = E_b + \Delta H$
99.



104. Reactants form products.
113.



$\frac{\Delta C}{\Delta t}$ = Slope = Rate

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Q.1 **In some reactions a product formed acts as a catalyst. This phenomenon is called**
A. Negative catalysis
B. Heterogeneous catalysis
C. Activation of catalyst
D. Autocatalysis

Q.2 **The reaction rate in forward direction decreases with the passage of time because**
A. Concentration of reactants decreases
B. The order of reaction changes
C. Concentration of product decreases
D. Temperature of the system changes

Q.3 **For the reaction $2NO + O_2 \rightleftharpoons 2NO_2$, the rate equation for the forward reaction is**
A. Rate = k $[NO][O_2]$
B. Rate = k $[NO_2]^2$
C. Rate = k $[NO_2]^2[O_2]$
D. Rate = k $[NO_2]$

Q.4 **Choose the type of catalysis in the following reaction**

$$2SO_{2(g)} \xrightleftharpoons{NO_{(g)}} 2SO_{3(g)}$$

A. Homogeneous catalysis
B. Biological catalysis
C. Heterogeneous catalysis
D. Gas catalysis

Q.5 **What is the measure of activation energy in an endothermic reaction?**
A. The energy of activation of backward reaction is less than that of forward reaction.
B. The energy of activation of forward-backward reaction is same.
C. The energy of activation of backward reaction is more than that of forward reaction.
D. The energy of activation of forward reaction is less than that of backward reaction.

Q.6 **If energy of activated complex is close to energy of reactants, it means that the reaction is**
A. Fast
B. Moderate
C. Slow
D. Very slow

Q.7 **According to the collision theory of bimolecular reactions in gas phase, minimum amount of energy required for an effective collision is known as**
A. Heat of reaction
B. Rate of reaction
C. Has no effect on the reaction
D. Energy of activation

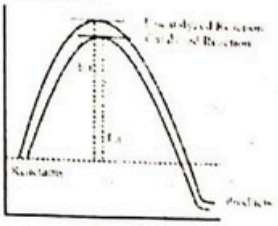
Q.8 **If the energy of activation of a chemical reaction is very low, the rate of that chemical reaction is observed to be very high because?**
A. Concentration of the reactants becomes irrelevant
B. Number of efficient or fruit collisions increase
C. Reaction proceeds without any transition state
D. Molecules of the reactants move slowly

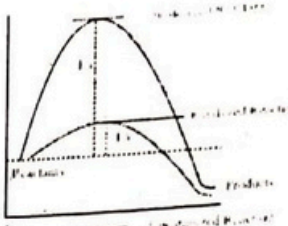
Q.9 **The influence of temperature on reaction rate is predicted by**
A. Free energy charge
B. Wander Waal's equation
C. Arrhenius equation
D. Kinetic equation

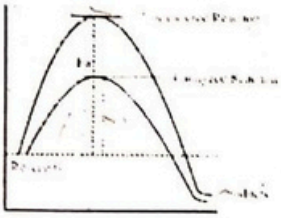
Q.10 **For which change of temperature, the rate of reaction become approximately double**
A. 293K
B. 283K
C. 20°C
D. 10°C

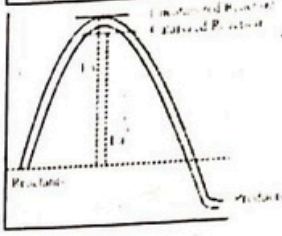
Q.11 **It is experimentally found that catalyst is used to**
A. Lower the activation energy
B. Increase the activation energy
C. Lower the pH
D. Decrease the temperature of other reactants

Q.12 Which one of the following graphs is representation for more rapid catalyzed reaction?

A. 

B. 

C. 

D. 

Q.13 Role of a catalyst in a chemical reaction is to

A. Increase rate of a reaction
B. Decrease rate of a reaction
C. Decrease yield of a reaction
D. Increase yield of product

Q.14 Glucose is converted into ethanol by the enzyme present in the yeast

A. Urease
B. Zymase
C. Invertase
D. Sucrase

Q.15 In zero order reaction, the rate is independent of

A. Concentration of the product
B. Concentration of the reactant
C. Temperature of the reaction
D. Surface area of the product

Q.16 $2A + B \rightarrow$ Product

If the reactant 'B' is in excess, the order of reaction with respect to 'A' in given rate law Rate = $k[A]^2[B]$ is

A. 2nd order reaction
B. Pseudo 1st order reaction
C. 1st order reaction
D. 3rd order reaction

Q.17 The rate constant 'k' is 0.693 min^{-1}. The half-life for the 1st order reaction will be

A. 1 min
B. 0.693 min
C. 2 min
D. 4 min

Q.18 Unit of K in first order Reaction is

A. s^{-1}
B. moles dm^{-3}
C. moles dm^{-3} s^{-1}
D. mol^{-1} dm^3

Q.19 Rate of first order reaction depends on

A. Concentration of one reactant
B. Concentration of two reactants
C. Concentration of three reactants
D. Independence of the initial concentration

Q.20 The unit of rate constant is same as that of rate of reaction in

A. First order reaction
B. Zero order reaction
C. Second order reaction
D. Third order reaction

Q.21 The decomposition of phosphorus pentachloride in the presence of moisture takes place by the following mechanism

$PCl_{5(s)} + H_2O_{(l)} \rightarrow POCl_{3(l)} + 2HCl_{(aq)}$ (Slow Step)

$POCl_{3(l)} + 3H_2O_{(l)} \rightarrow H_3PO_{4(l)} + 3HCl_{(aq)}$ (Fast Step)

$PCl_{5(s)} + 4H_2O_{(l)} \rightarrow H_3PO_{4(l)} + 5HCl_{(aq)}$

The rate equation for this reaction will be:

A. $Rate = k[PCl_5][H_2O]^4$
B. $Rate = [PCl_5][H_2O]$
C. $Rate = k[PCl_5][H_2O]$
D. $Rate = k[POCl_3][H_2O]^3$

Q.22 Rates of photo-chemical reactions do not change with the change in concentration of reactants. What is the order of such reactions?
A. Second order reactions
B. First order reactions
C. Pseudo first order reactions
D. Zero order reactions

Q.23 The half-life of N_2O_5 at 45°C is 24 minutes. How long will it take for sample of N_2O_5 to decay to 25% of its original concentration?
A. 24 minutes
B. 120 minutes
C. 72 minutes
D. 48 minutes

Q.24 When the change in concentration is 6×10^{-4} moldm^{-3} and time for that change is 10 seconds, the rate of reaction will be
A. 6×10^{-3} moldm^{-3} sec^{-1}
B. 6×10^{-2} moldm^{-3}sec^{-1}
C. 6×10^{-4} moldm^{-3} sec^{-1}
D. 6×10^{-5} moldm^{-3}sec^{-1}

Q.25 For the first order reaction, half-life is related to the expression $t_{1/2}=0.693/k$ Half- life is the
A. Time taken for the conc. of the product to the increase to half of its original value.
B. Time taken for the concentration of the reactant, to fall to half of its products value.
C. Time taken for the concentration of the reactant to fall to half of its original value
D. Time taken for the concentration of the reactant to fall to quarter of its original value

Q.26 The rate of reaction involving ions can be studied by method
A. Dilatometric
B. Electrical conductivity
C. Refractrometric
D. Optical rotation

Q.27 If the reactants or product of a chemical reaction can absorb ultraviolet, visible or infra-red radiation then the rate of a chemical reaction can best be measured by which one of the following methods?
A. Chemical method
B. Graphical method
C. Spectrometry
D. Differential method

Q.28 If concentration time graph of a reactant indicates a constant half-life, then the order reaction with respect the reactant is
A. First order
B. Zero order
C. Second order
D. Half order

Q.29 Choose the one which is not the assumption of collision theory of reaction rate:
A. For chemical reaction to occur molecule / particles must colloids
B. For reacting Particles must possess a certain minimum amount of energy, the Ea
C. Every collision is not productive
D. For hydrogen molecule formation from atoms require specific orientation

Q.30 For exothermic reversible reaction activation energy for forward direction depends upon
A. Temperature
B. Nature of product
C. Nature of reactant
D. Both A and B

Q.31 What is the measure of activation energy is an endothermic reaction?
A. The energy of activation of backward reaction is less than that of forward reaction.
B. The energy of activation of forward-backward reaction is same.
C. The energy of activation of backward reaction is more than that of forward reaction.
D. The energy of activation of forward reaction is less than that of backward reaction.

Q.32 The unit of the rate constant is the same as that of the rate of reaction in
A. Zero order reaction
B. First order reaction
C. Second order reaction
D. Third order reaction

Q.33 The study of rates of chemical reactions and the factors that affect the rates of chemical reactions is known as:

A. Thermodynamics
B. Stoichiometry
C. Electrochemistry
D. Chemical kinetics

Q.34 For which reaction $A_{(g)} \rightarrow$ product

When the concentration of $A_{(g)}$ doubles, the rate of reaction increased four folds, which means it is:

A. Negative order of reaction
B. 1^{st} order reaction
C. Zero order of reaction
D. 2^{nd} order reaction

Q.35 For which of the following order of the reaction, rate of reaction is inversely proportional to the concentration reaction?

A. 1^{st} order reaction
B. 2^{nd} order reaction
C. Negative order of reaction
D. Zero order of reaction

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1	D	6	A	11	A	16	A	21	C	26	B	31	A
2	A	7	D	12	B	17	A	22	D	27	C	32	A
3	C	8	B	13	A	18	A	23	D	28	A	33	D
4	A	9	C	14	B	19	A	24	D	29	D	34	D
5	A	10	D	15	B	20	B	25	C	30	D	35	C

HINTS

2. Law of mas action.

4. Both reactants and catalyst are in the same phase.

12. Activation energy shows maximum decrease.

15. Although rate is independent of concentration of product as well but as product does not affect any order reaction so this is considered as an irrelevant option.

17. $t = \frac{0.693}{k}$

23. $100\% \xrightarrow{t} 50\% \xrightarrow{t} 25\%$

24. $\frac{\Delta C}{\Delta t}$ = Rate of reaction

30. The energy of reactant is vital in determination of (E_a)

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Q. 1 Activated complex is formed due to

A. Pressure
B. Temperature
C. Effective collision
D. Ineffective collision

Q. 2 The chemical reactivities of elements depend upon their characteristics electronic _____.

A. Shields
B. Forces
C. Configurations
D. Shells

Q. 3 Activated complex has

A. High potential energy
B. High K.E
C. Low P.E
D. All

Q. 4 Catalyst can

A. Increase rate of reaction
B. Increase conc of reactant
C. Increase conc of product
D. Decrease rate of reaction

Q. 5 Rate of reaction in gases is best describe as

A. $\Delta c/\Delta t$
B. $\Delta p/\Delta t$
C. $\Delta t/\Delta x$
D. All

Q. 6 Energy required to start a reaction is called.....

A. Ionization energy
B. Activation energy
C. Bond energy
D. Lattice energy

Q. 7 The number of reacting molecules which changes their concentration is called

A. Extent of a reaction
B. Order of a reaction
C. Specific rate of a reaction
D. Enthalpy of reaction

Q. 8 Drawing a graph between concentration change with time gives a

A. Straight line
B. Parabola
C. Curve
D. Scattered graph

Q. 9 Rate = $k[NO_2]$, the order of this reaction is

A. Zero
B. Three
C. Two
D. One

Q. 10 With the passage of time rate of reaction always

A. Increases
B. Remains constant
C. Decreases
D. Increases exponentially

Q. 11 Hydrolysis of tertiary butyl bromide is

A. Pseudo 1st order
B. 2nd order
C. Zero order
D. Negative order

Q. 12 If a graph is plotted with concentration data of a reactant in a chemical reaction the curve is

A. Rising
B. Falling
C. U shaped
D. None of these

Q. 13 After one half life, the mass of the substance becomes:

A. Half
B. Double
C. Remain same
D. Increases 4 times

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Q. 14 Activated state is

A. Most stable
B. Least stable
C. Most energetic
D. Both B and C

Q. 15 In spectrometry, spectrometer can analyze

A. Atom
B. Ions
C. Molecules
D. All of these

Q. 16 When rate of reaction is measured by the amount of radiation absorbed, it is called

A. Optical rotation method
B. Electrical conductivity method
C. Refractometry method
D. Spectrometry

Q. 17 If the time interval is very small for determining the rate of a reaction the values of average and instantaneous rate

A. Are both zero
B. Are very close to each other
C. Differ by a large number
D. Are negative

Q. 18 As reaction starts instantaneous rate is

A. Higher than average rate
B. Lower than average rate
C. Equal to average rate
D. None of these

Q. 19 Activated complex in a reaction Has

A. K.E max
B. PE max
C. P.E min
D. a and c

Q. 20 When the colliding Molecules comes Closer to each Other It____ to go to Transition

A. Complex
B. collide fast
C. Slows Down
D. does not depend Upon The energy

Q. 21 Half-life period for a first order reaction is independent of

A. Conditions of temperature
B. Initial concentration of the compound
C. Presence of catalyst
D. All of these

Q. 22 Reaction which are completed in steps must contain

A. Rate determining step
B. Slowest step
C. Fastest step
D. Both A and B

ANSWER KEY

1	C	11	A	21	B
2	C	12	B	22	D
3	C	13	A		
4	A	14	D		
5	B	15	D		
6	B	16	D		
7	B	17	B		
8	C	18	A		
9	D	19	B		
10	C	20	C		

1 mole = 57.1 kJmol⁻¹

$= \frac{57.1}{10} \times \frac{2}{10}$

= 11.48

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UNIT 8 PRACTICE EXERCISE

THERMOCHEMISTRY AND ENERGETIC OF CHEMICAL REACTIONS

1. **If enthalpy change is written in negative sign the reaction will be:**
   A. Exothermic
   B. Spontaneous
   C. Endothermic
   D. Non–Spontaneous

2. **ΔH per mole is expressed in the units of**
   A. k J
   B. °F
   C. °C
   D. K

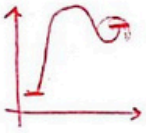
3. **Which one of the following is NOT a state function?**
   A. Enthalpy
   B. Heat
   C. Temperature
   D. Pressure

4. **ΔH_n for the reaction: $NaOH + CH_3COOH \longrightarrow CH_3COONa + H_2O$**
   A. Zero
   B. Less than 57 kJ mol^{-1}
   C. 57kJ mol^{-1}
   D. More than 57 kJ mol^{-1}

5. **A type of enthalpy which is always positive, The enthalpy of:**
   A. Formation
   B. Atomization
   C. Neutralization
   D. Electron affinity



6. **$NH_4Cl_{(s)} + H_2O_{(l)} \longrightarrow NH_4Cl_{(aq)}$, The enthalpy change is known as:**
   A. Enthalpy of atomization
   B. Enthalpy of combustion
   C. Enthalpy of neutralization
   D. Enthalpy of solution



7. **If $H^+ + OH^- \longrightarrow H_2O$ $\Delta H = +13.7$ kcal**
   Heat of neutralization for complete neutralization of one mole of H_2SO_4 by base will be:
   A. 13.7 kcal
   B. 6.85 kcal
   C. 27.4 kcal
   D. 3.425 kcal

8. **Lattice energy of an ionic crystal is the enthalpy of:**
   A. Combustion
   B. Dissociation
   C. Dissolution
   D. Formation

9. **Which of the following values of heat of formation indicates that the product is least stable?**
   A. – 94 kcal
   B. + 21.4 kcal
   C. – 231 kcal
   D. + 64.8 kcal

10. **If $C(s) + O_2(g) \rightarrow CO_2(g)$; $\Delta H = X$, and $CO(g) + 1/2\ O_2(g) \rightarrow CO_2(g)$; $\Delta H = Y$, Then the heat of formation of CO (g) is**
    A. X + Y
    B. Y – X
    C. X – Y
    D. XY

11. **The heat of neutralization of a strong acid and strong alkali is 57.0 kJ mol^{-1}. The heat released when 0.5 mole of HNO_3 solution is mixed with 0.2 mole of KOH is:**
    A. 57.0 kJ
    B. 28.5 kJ
    C. 11.4 kJ
    D. 34.9 kJ

12. **The amount of heat evolved or absorbed at constant volume is equal to change in _____ of system:**
    A. Work done
    B. Internal energy
    C. Enthalpy
    D. State of system

13. **What is not a state function?**
A. Internal energy
B. Volume
C. Work
D. Enthalpy

14. **The sum of all kinds of energy of system is called internal energy. They include**
A. translational energy only
B. All kinds of K.E.
C. Elastic potential energy only
D. All of these

15. **When a pressure of 500 Nm^{-2} is applied the volume changes from 0.05m^3 to 0.03m^3 then work done by the system is:**
A. 10 J
B. -5 J
C. -10 J
D. +5 J

16. **If the amount of heat supplied at constant volume is 40kJ at 45^{0}C temperature then work done on the system is**
A. 40 KJ
B. 10 KJ
C. 20 KJ
D. 0 KJ

17. **If, for a gas, pressure of 2Nm^{-2} produces 3m^3 volume change and enthalpy of system is 9 J/mole the internal energy of system is:**
A. 12 J/mole
B. 3 J/mole
C. 6 J/mole
D. 9 J/mole

18. **The amount of heat supplied at constant pressure is 18 kJ/mol at 45^{0}C, the enthalpy change of system is**
A. 9 kJ/mol
B. 27 kJ/mol
C. 18 kJ/mol
D. 36 kJ/mol

19. **Which of the following is endothermic process?**
A. Condensation of steam
B. Haber's process for the manufacture of NH_3
C. Electrolysis of water
D. Freezing of water

20. **In an exothermic reaction ΔH is assigned:**
A. Unity value
B. Positive value
C. Zero value
D. Negative value

21. **First law of thermodynamics is represented as:**
A. $\Delta E = q + RT$
B. $\Delta E = q + w$
C. $\Delta E = \Delta H$
D. $\Delta E = q + \Delta P$

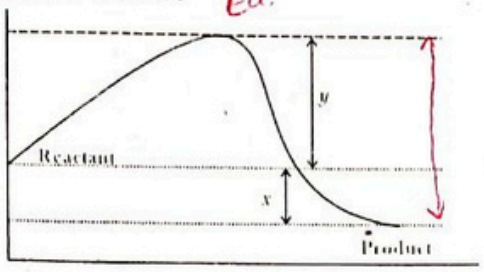
22. **The conditions for standard enthalpy changes is:**
A. 1 atm and 273 K
B. 1 atm and 0 K
C. 1 atm and 298 K
D. 1 atm and -273° C

23. **Which substance has $\Delta E = \Delta H$ and no pressure-volume work:**
A. Liquid only
B. Solid only
C. Gases
D. Liquids and solids

24. **At constant volume, heat of reaction is represented by:**
A. ΔP
B. ΔS
C. ΔE
D. ΔG

25. **First law of thermodynamics is also called:**
A. Hess's law
B. Law of mass action
C. Law of conservation of energy
D. Law of conservation of mass

26. **An energy diagram is shown below:**



What is the activation energy of reverse reaction?
A. x
B. x – y
C. x + y
D. y

27. **For solids and liquids**
A. $\Delta H = \Delta E$
B. $\Delta H > \Delta E$
C. $\Delta H < \Delta E$
D. $\Delta H = 0$

28. **1 k cal is equal to**
A. 41.8×10^3 J
B. 418×10^3 J
C. 4.18×10^3 J
D. 0.418×10^3 J

29. **Standard enthalpy ($\Delta H°$) for 1 mole of a substance, which exists in its natural state, at 1 atm. Pressure is measured at**
A. 0 K
B. 298 K
C. 273 K
D. 0°C

30. **ΔH can be measured indirectly by applying**
A. Avogadro's law
B. Gas laws
C. Hess's law
D. Faraday's law

31. **Identify the state function among the following:**
A. Q
B. Q – W
C. Q / W
D. Q + Q

32. **For an endothermic reaction, where ΔH represents the enthalpy of the reaction in kJ/mol, the minimum value for the energy of activation will be:**
A. Less than ΔH
B. Zero
C. Mole than ΔH
D. Equal to ΔH

33. **Which of the following statement is true?**
A. All spontaneous reactions are exothermic
B. Hess's law cannot be used to find the lattice energy of $CaCl_2$
C. Heat change at constant pressure is equal to change in internal energy
D. Enthalpy change depends upon internal energy change and pressure-volume work

34. **The heat of formation of a compound is equal in magnitude to its:**
A. Heat of reaction
B. Heat of decomposition into its elements
C. Heat of combustion
D. Heat of hydrogenation

35. **The enthalpy change for the process $C_{(s)} \rightarrow C_{(g)}$ corresponds to enthalpy of:**
A. Fusion
B. Vaporization
C. Combustion
D. Sublimation

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36. **The heat liberated in the following reaction $H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$ is:**

A. 57.0 kJ
B. 60 kJ
C. 5.7 kJ
D. unpredictable

37. **Enthalpy means**

A. Disorder
B. Transition state
C. Rate constant
D. Heat content

38. **Which of the following statements is incorrect?**

A. ΔH_n can be determined by glass calorimeter
B. ΔH_c can be determined by bomb calorimeter
C. ΔH_{latt} of NaCl is -787 kJ mol^{-1}
D. $Na_{(s)} \rightarrow Na_{(g)} + e \quad \Delta H_{ion} = 108 kJmol^{-1}$

39. **Which one of the following is not correct statement about ΔH?**

A. ΔH_{fusion} is positive only
B. $\Delta H_{vap.}$ is positive only
C. ΔH_n is negative only
D. $\Delta H_{soln.}$ is negative only

40. **'ΔH' will be given a negative sign in**

A. Exothermic reactions
B. Decomposition reactions
C. Dissociation reaction
D. Endothermic reactions

41. **Heat of formation (ΔH_f°) for CO_2 is:**

A. -394 kJ/mol
B. +394 kJ/mol
C. -294 kJ/mol
D. -390 kJ/mol

42. **Reactants have high energy than products in:**

A. Exothermic reactions
B. Endothermic reactions
C. Photochemical reactions
D. Non-spontaneous reactions

43. **No work is done at constant**

A. Pressure
B. Volume
C. Temperature
D. Mass

44. $2H_2 + O_2 \longrightarrow 2H_2O \quad \Delta H = +285.5 \text{ kJ mol}^{-1}$

What will be the enthalpy change in the above reaction?

A. +285.5 kJ/mol
B. Zero kJ/mol
C. –285.5 kJ/mol
D. 1 kJ/mol

45. **Combustion of graphite to form CO_2 can be done by two ways. Reactions are given as follows:**

$C + O_2 \longrightarrow CO_2 \quad \Delta H = -393.7 \text{ kJ mol}^{-1}$

$C + \frac{1}{2}O_2 \longrightarrow CO \quad \Delta H = ?$

$CO + \frac{1}{2}O_2 \longrightarrow CO \quad \Delta H = -283 \text{ kJ mol}^{-1}$

What will be enthalpy of formation of CO?

A. –676 kJ mol^{-1}
B. –110 kJ mol^{-1}
C. 110 kJ mol^{-1}
D. 676 kJ mol^{-1}

46. **Standard enthalpy of combustion of graphite at 25 °C is -393.51 kJ mol^{-1} and that of diamond is –395.41 kJ mol^{-1}. The enthalpy change for conversion of graphite to diamond is:**

A. – 1.91
B. +2.1
C. –2.1
D. +1.91

47. $\frac{1}{2} H_{2(g)} \rightarrow H_{(g)} \qquad \Delta H = 218 \text{ kj mol}^{-1}$

In this reaction, ΔH will be called:

A. Enthalpy of atomization
B. Enthalpy of decomposition
C. Enthalpy of formation
D. Enthalpy of the dissociation

48. ΔH_f of compound is:
A. Zero in standard state
B. Always negative
C. Always positive
D. sometimes positive and sometimes negative

49. Heat capacity depends on
A. Pressure
B. Volume
C. Composition
D. Mass

50. By definition, the standard heat of formation of $C_2H_{6(g)}$ is the enthalpy change for the reaction:
A. $2C_{(s)} + 6H_{(g)} \longrightarrow C_2H_{6(g)}$
B. $2C_{(g)} + 6H_{(g)} \longrightarrow C_2H_{6(g)}$
C. $2C_{(s)} + 3H_{2(g)} \longrightarrow C_2H_{6(g)}$
D. $2C_2H_{4(s)} + H_{2(g)} \longrightarrow C_2H_{6(g)}$

51. Which of the following may depend on the path of reaction?
A. Energy of activation
B. Enthalpy of reaction
C. Internal energy change
D. Change in temperature

52. Which equation represents Enthalpy of formation of NaCl
A. $Na(s) + Cl_2(g) \longrightarrow NaCl \quad \Delta H = -787kJ/mol$
B. $Na(s) + Cl_2(g) \longrightarrow 2\,NaCl \quad \Delta H = -787kJ/mol$
C. $2Na(s) + Cl_2(g) \longrightarrow NaCl \quad \Delta H = -787kJ/mol$
D. $Na(s) + 1/2Cl_2(g) \longrightarrow NaCl \quad \Delta H = -411kJ/mol$

53. The enthalpy of formation of MgO is _____ kJ/mol
A. – 393.7
B. –692
C. –285.7
D. –474.7

54. The enthalpy of formation of ionic compounds is
A. Always less than lattice energy
B. Same as lattice energy
C. Always greater than lattice energy
D. May or may not be same as lattice energy

55. If an exothermic reaction is allowed to take place very rapidly in the air, the temperature of the surrounding air:
A. Remains constant
B. Increases
C. Decreases
D. Remains unchanged

56. In the reaction
$C(s) + O_2(g) \longrightarrow CO_2(g)$
$\Delta H^\circ = -394KJ$: ΔH° represents
A. Standard heat of formation of CO
B. Standard heat of combustion of CO_2
C. Standard heat of combustion of CO
D. Standard heat of combustion of C

57. Which equation represents the change corresponding to the enthalpy change of atomization of Iodine?
A. $\frac{1}{2} I_{2\,(s)} \rightarrow I_{(g)}$
B. $I_{2\,(s)} \rightarrow 2I_{(g)}$
C. $I_{2\,(l)} \rightarrow 2I_{(g)}$
D. $I_{2\,(g)} \rightarrow 2I_{(g)}$

58. Which one of the following reactions is spontaneous?
A. Endothermic
B. Exothermic
C. Reversible
D. Irreversible

59. The enthalpy change of a reaction does not depend on
A. initial and final enthalpy change of reaction
B. state of reactants and products
C. different intermediate reactions
D. nature of reactant and products

60. The value of enthalpy change for the process represented by the equation; ($Na_{(s)} \rightarrow Na^{+}_{(g)} + e^{-}$) is equal to;

A. $I.E_1$ of sodium
C. ΔH°_{at} of sodium + $I.E_1$ of sodium
B. ΔH_f of sodium
D. $I.E_1$ of sodium + ΔH_{at} of sodium

61. The net heat change in a chemical reaction is same whether it takes place in one step or more than one is known as

A. Ostwald's law
C. Joule's principle
B. Hess's law
D. 1st law of thermodynamics

62. In exothermic reactions, the heat content of the

A. product is more than that of reactants
C. reactants and products remains equal
B. reactant is more than that of products
D. All are correct

63. A reaction gives out heat. This means that

A. Only new bonds are being made
B. bonds being made are stronger than bonds broken
C. Only existing bonds are being broken
D. bonds being made are stronger than bonds made

64. Which of the following reaction is the definition of ΔH°_{f}?

A. $C_{(diamond)} + O_{2(g)} \rightarrow CO_{2(g)}$
C. $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$
B. $H_{2(g)} + F_{2(g)} \rightarrow 2HF_{(g)}$
D. $CO_{(g)} + \frac{1}{2} O_{2(g)} \rightarrow CO_{2(g)}$

65. If a gas absorbs 200kJ energy and consumes 100 kJ to do work. Increase in internal energy is:

A. –200 kJ
C. +100 kJ
B. –100 kJ
D. +300 Kj

66. In glass calorimeter, which is constant

A. Pressure
B. Volume
C. Temperature
D. None

67. Energy changes in a chemical reaction can take place in the form of

A. heat evolution
C. work done
B. heat absorption
D. all of these

68. A gaseous system changes from A to B to C and then back to A. It will be regarded as

A. endothermic
C. Exothermic
B. fast
D. cyclic

69. For a change in state from A to B.

A. q depends only on the initial and final state
B. E depends only on the initial and final state
C. w depends only on initial and final state
D. E depends upon path adopted to state go from A to B.

70. Internal energy does not include

A. vibrational energy
C. translational energy
B. rotational energy
D. energy due to gravitation

71. Correct depiction of enthalpy is:

A. $q = \Delta E + w$
C. $\Delta E = q + w$
B. $\Delta E = q - w$
D. $\Delta H = \Delta E + P\Delta V$

72. **For a reaction $2NH_3 \rightarrow N_2 + 3H_2$ which of the following statements is correct.**
A. $\Delta H = O$
B. $\Delta H = \Delta E$
C. $\Delta H > \Delta E$
D. $\Delta H < \Delta E$

73. **If work done on a system is 650J and heat taken out from the system is 500J, the change in internal energy is,**
A. – 1150
B. + 1150
C. + 150
D. – 150

74. **The energy possessed by water in a dam is**
A. Potential energy
B. Kinetic energy
C. Electric energy
D. Heat energy

75. **When heat is absorbed from the surrounding, the process is**
A. Reversible
B. Mechanical
C. Exothermic
D. Endothermic

76. **The sum of all the energies of all the molecules or atoms of a substance is called its**
A. Specific heat
B. Heat capacity
C. Latent heat
D. Internal energy

77. **$\Delta H_f = -572kJ/mol^{-1}$ for water It means that**
A. It is an endothermic process
B. Formation of water is a spontaneous process
C. It is the heat evolved for complete reaction of 2 moles of oxygen with excess of hydrogen
D. Water is at lower energy than its reactants

78. **$\Delta H = \Delta E$ in all the cases except one**
A. For liquids
B. for solids
C. for $\Delta n = O$ in gas phase rex.
D. For gas phase rex. having greater no. of moles of product.

79. **$CH_3COOH + OH^- \rightarrow CH_3COO^- + H_2O \quad q_1$**
$H^+ + OH^- \rightarrow H_2O \quad q_2$
The ΔH for $CH_3COOH \rightarrow CH_3COO^- + H^+$ is
A. $q_1 + q_2$
B. $q_1 - q_2$
C. $q_2 - q_1$
D. $-q_1 - q_2$

80. **Which one of the following processes has ΔH positive**
A. Ionization energy
B. Electron affinity
C. Combustion
D. Exothermic reaction

81. **For which of the following reactions the change in enthalpies is equal to the change in internal energy?**
A. $H_2 + I_2 \rightarrow 2HI$
B. $2H_2O_2 \rightarrow 2H_2O + O_2$
C. $PCl_5 \rightarrow PCl_3 + Cl_2$
D. $C + O_2 \rightarrow CO_2$

82. **Change in enthalpy is defined as**
A. The change in heat content
B. The total energy change at constant pressure and temperature
C. The heat change at constant volume if $\Delta n = 0$
D. Work done at constant pressure

83. Which of the following statement is false?

A. Thermochemistry is the study of relationship between the heat energy and chemical energy.
B. An exothermic reaction is one which is accompanied by evolution of heat.
C. An endothermic reaction is one in which heat is absorbed.
D. Energy needed to raise the temperature of substance by 1°C is specific heat.

84. The study of heat changes that accompany a chemical reaction is called:

A. Thermochemistry
B. Electrochemistry
C. Nuclear chemistry
D. Chemical kinetics

85. Which is not characteristic of a thermochemical equation?

A. It indicates physical state of reactants and products.
B. It indicates whether the reaction is exothermic or endothermic.
C. It indicates allotrope of the reactants if present.
D. It indicates whether a reaction would occur or not.

86. The false statement among the following is

A. The heat liberated during the neutralization of a strong acid and a strong base in an aqueous solution is constant.
B. The heat of combustion is always an exothermic change.
C. The enthalpies of formation of Carbon dioxide can be conveniently determined from heat of combustion data of Carbon.
D. Heat of formation of a compound is equal in magnitude to heat of combustion.

87. ΔH for the transition of carbon in the diamond form to carbon in the graphite form is –1.9kJ. This suggests that

A. Graphite is chemically different from diamond.
B. Graphite is as stable as diamond.
C. Graphite is more stable than diamond.
D. Diamond is more stable than graphite.

88. The magnitude of heat of solution .... on addition of solvent to solution.

A. decreases
B. remains constant
C. increases
D. increases or decreases

89. Which one of the following is NOT the unit of heat

A. Joule
B. Kelvin
C. Calorie
D. Kilojoule

90. Anything which is under observation or experiment is called:

A. Universe
B. Boundary
C. System
D. Surrounding

91. According to the equation $C_6H_6(l) + \frac{15}{2} O_2(g) \rightarrow 6CO_2(g) + 3H_2O(l)$, $\Delta H = -3264.4$ kJ/mol, the energy evolved when 7.8 g of benzene is burnt in air will be

A. 163.32 kJ/mol
B. 32.64 kJ/mol
C. 326.4 kJ/mol
D. 3.264 kJ/mol

92. The heat change in a reaction does not depend upon the

A. Conditions of P or V under which a reaction is carried out.
B. Initial and final enthalpies of the reactants and products.
C. State of reactants and products.
D. Number of intermediate stages involved.

93. Given that $CH_3CHO + \frac{5}{2} O_2 \rightarrow 2CO_2 + 2H_2O$; $\Delta H = -1168$ kJ/mole; $CH_3COOH + 2O_2 \rightarrow 2CO_2 + 2H_2O$; $\Delta H = -876$ kJ/mole. ΔH for the reaction $CH_3CHO + \frac{1}{2} O_2 \rightarrow CH_3COOH$ is

A. –292 kJ/mole
B. 195 kJ/mole
C. 378 kJ/mole
D. –2044 kJ/mole

94. From the following data, the heat of formation of PCl_5 comes out to be
$2P(s) + 3Cl_2(g) \rightarrow 2PCl_3(g)$; $\Delta H = 151.8$ kJ $PCl_3 + Cl_2(g) \rightarrow PCl_5(g)$; $\Delta H = -32.8$ kJ

A. –217.4 kJ
B. –119 kJ
C. +217.4 kJ
D. +119 kJ

95. Among the following, for which reaction, heat of reaction represents bond energy of HCl?

A. $HCl(g) \rightarrow H(g) + Cl(g)$
B. $HCl(g) \rightarrow \frac{1}{2} H_2(g) + \frac{1}{2} Cl_2(g)$
C. $2HCl(g) \rightarrow H_2(g) + Cl_2(g)$
D. $HCl(g) \rightarrow H^+(g) + Cl^-(g)$

96. $S(s) + \frac{3}{2} O_2(g) \rightarrow SO_3(g) + 2x$ kJ

$SO_2(g) + \frac{1}{2} O_2(g) \rightarrow SO_3(g) + y$ kJ

Find the heat of formation of $SO_2(g)$.

A. $(y - 2x)$
B. $(x + y)$
C. $(2x - y)$
D. $2x/y$

97. The enthalpy change of a reaction does not depend on

A. initial and final enthalpy change of reaction
B. different intermediate reactions
C. state of reactants and products
D. nature of reactants and products

98. Plants and living beings are examples of

A. isolated system
B. open system
C. adiabatic system
D. closed system

99. The work done by a system is 10 Joule, when 40 Joule heat is supplied to it. What is the increase in internal energy of system?

A. 30 J
B. 40 J
C. 50 J
D. 20 J

100. The energy of the system during endothermic reactions is:

A. Increased
B. Decreased
C. Neither increased nor decreased
D. First increased and then decreased

101. The sum of kinetic energy and potential energy of the particles of substance is called:

A. Heat capacity
B. Specific heat
C. Enthalpy of the system
D. Internal energy

102. The kinetic energy of particles is due to

A. Vibrational, translational and rotational movements
B. Uniform and instantaneous movements
C. Uniform and average movements
D. All of them

103. On the basis of the following thermochemical data:

$$H_2O(l) \longrightarrow H^+(aq) + OH^-(aq); \quad \Delta H = 57.32kJ$$

$$H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(l); \quad \Delta H = -286.20kJ$$

The value of enthalpy of formation of H^+ and OH^- ions from Hydrogen and Oxygen at 25°C is:

A. –228.88kJ
B. –343.52kJ
C. +228.88kJ
D. –22.88kJ

104. Solid particles exhibit

A. Vibrational movement
B. Rotational movement
C. Translational movement
D. no potential energy

105. Mathematical expression for change in internal energy when no work done is involved

A. $\Delta E = q + w$
B. $\Delta E = q_v$
C. $\Delta E = q + P\ \Delta V$
D. $\Delta E = q_p$.

ANSWER KEY

1	A	11	C	21	B	31	B	41	A	51	A	61	B	71	D	81	A	91	C	101	D
2	A	12	B	22	C	32	C	42	A	52	D	62	B	72	C	82	A	92	D	102	D
3	B	13	C	23	D	33	C	43	B	53	B	63	B	73	C	83	A	93	A	103	A
4	B	14	D	24	C	34	B	44	A	54	A	64	A	74	A	84	A	94	D	104	A
5	B	15	C	25	C	35	B	45	B	55	C	65	C	75	D	85	D	95	A	105	B
6	D	16	D	26	C	36	A	46	D	56	B	66	A	76	D	86	D	96	C		
7	C	17	B	27	A	37	D	47	A	57	A	67	D	77	D	87	C	97	B		
8	D	18	C	28	C	38	D	48	D	58	D	68	D	78	D	88	A	98	B		
9	D	19	C	29	B	39	D	49	D	59	C	69	B	79	B	89	B	99	A		
10	C	20	D	30	C	40	A	50	C	60	C	70	D	80	A	90	C	100	A		

HINTS

4. For weak acid and strong base titration, the heat of neutralization is lesser than the standard value of -57kJmol^{-1}. This is due to the incomplete ionization of weak acid.

7. 13.7 kcal = 57.4 kJ

9. Endothermic reactions lead to less stable product formation.

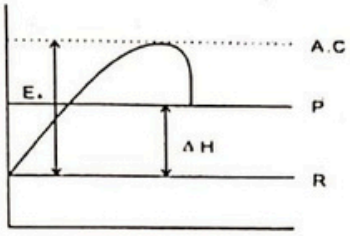
11. KOH is limiting reactant here so 0.2 moles of it react to give 11.4 kJ of energy.

15. $-P \Delta V$

16. At constant volume, work done is zero.

18. $\Delta H = q_p$

31. Internal energy

32. 

38. Atomization is an endothermic process.

44. Heat change during the reaction is actually the enthalpy change.

46. Graphite $\xrightarrow{-393.5}$ CO_2 (+1.91 to Diamond; Diamond to CO_2: -395.4)

50. Standard enthalpy of formation is the heat of formation from elements in standard physical state.

54. Some energy is used to convert elemental species into ions.

59. State function

67. Heat and work are two fundamental ways of energy transfer to and from the system.

77. Exothermic reaction.

79. $CH_3COOH + OH^- \xrightarrow{q_1} CH_3COO^- + H_2O$

$CH_3COOH \xrightarrow{x} H^+ + OH^-$; $H^+ + OH^- \xrightarrow{q_2} H_2O$

$x = q_1 - q_2$

81. $\Delta n = 0$

85. Thermochemical equation cannot predict the feasibility of a reaction.

91. 1 mole or 78g C_6H_6 release = 3264.4kJ

0.1 mole or 7.8g C_6H_6 release = 326.4kJ

93. $-1168 - (-876) = -292$

94. $151.8 + (-32.8) = 119$

98. Both energy and mass are transferrable.

102. $H_2 + \frac{1}{2} O_2 \longrightarrow H_2O$

x : $H^+ + OH^-$: -57.32

$x = -286.2 - (-57.32)$

$= -228.88$ kJ

Antigen (B)

Anti-A , Anti-B

Antigen A → A

B → B

Anti-B , Anti-A

Antigen B

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Q.1 A spontaneous process is

A. Unidirectional and irreversible
B. Unidirectional and real
C. Irreversible and real
D. All of above

Q.2 ΔH will be given a negative sign in

A. Exothermic reactions
B. Dissociation reactions
C. Decomposition reactions
D. Endothermic reactions

Q.3 Reactants have high energy than products in

A. Endothermic reactions
B. Exothermic reactions
C. Photochemical reactions
D. Non-spontaneous reactions

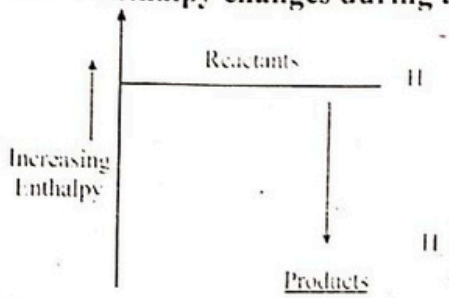
Q.4 Reaction of water with quick lime result in the rise in the temperature of the system. Using the concentration change, indicate the nature of the reaction?

A. Third order reaction
B. Endothermic reaction
C. Non spontaneous reaction
D. Exothermic reaction

Q.5 Which of the following enthalpy change is always exothermic?

A. Enthalpy of solution
B. Enthalpy of formation
C. Enthalpy of combustion
D. Enthalpy of atomization

Q.6 The given diagram shows the enthalpy changes during a chemical reaction.



This diagram represents:

A. An endothermic reaction
B. An exothermic reaction
C. A non-spontaneous process
D. An isothermic process

Q.7 Heat of formation of MgO is given below. $Mg+1/2O_{2(g)} \rightarrow MgO_{(s)}$ $\Delta H = -692 kj\ mol^{-1}$ This equation shows that:

A. The product is very stable
C. The reaction is endothermic
B. The product is highly unstable
D. The reactants are very stable

Q.8 When one mole of gaseous hydrogen ions are dissolved in water to form infinitely dilute solution, amount of heat liberated is

A. -1075kJ/mol
B. -499kJ/mol
C. -1891kJ/mol
D. -1562kJ/mol

Q.9 In standard enthalpy of atomization heat of surrounding

A. Remains same
B. Increases
C. Decreases
D. Increases then decreases

Q.10 Heat of formation (ΔH°_f) for CO_2 is

A. -390 kJ/mole
B. +394 kJ/mole
C. -394 kJ/mole
D. -294 kJ/mole

Q.11 $2H_2 + O_2 \longrightarrow 2H_2O$ $\Delta H = 205.5\ kJ\ mol^{-1}$ what will be the enthalpy change in the above reaction

A. 205.5 kJ mol^{-1}
B. – 205.5 kJ mol^{-1}
C. Zero kJ mol^{-1}
D. 1 kJ mol^{-1}

"Actual value of enthalpy change for given reaction is **-285.8 kJ mol^{-1}**"

Q.12 The equation that represents standard enthalpy of atomization of hydrogen is

A. $\frac{1}{2}H_2O_{(\ell)} \longrightarrow H_{2(g)} + \frac{1}{2}O_{(g)}$ $+218 kJmol^{-1}$

B. $\frac{1}{2}H_2O_{(\ell)} \longrightarrow H_{2(g)} + \frac{1}{2}O_{(g)}$ $-218 kJmol^{-1}$

C. $\frac{1}{2}H_{2(g)} \longrightarrow H_{(g)}$ $+218 kJmol^{-1}$

D. $\frac{1}{2}H_{2(g)} \longrightarrow H_{(g)}$ $-218 kJmol^{-1}$

Q.13 $\frac{1}{2}H_{2(g)} \longrightarrow H_{(g)}$ $\Delta H = 218 KJmol^{-1}$

In this reaction ΔH will be called

A. Enthalpy of atomization
B. Enthalpy of formation
C. Enthalpy of decomposition
D. Enthalpy of the dissociation

Q.14 $Mg + \frac{1}{2}O_2 \longrightarrow MgO_{(s)} + -692 KJmol^{-1}$ **at STP.**

Enthalpy of the above reaction will be called:

A. ΔH°_{at}
B. ΔH°_{sol}
C. ΔH°_{n}
D. ΔH°_{f}

Q.15 Determinate the value of Enthalpy of formation of NH_4Cl:

A. $-788\ kJmol^{-1}$
B. $-692\ kJmol^{-1}$
C. $-314.55\ kJmol^{-1}$
D. None of these

Q.16 Enthalpy is measured at _____

A. 300 K and 2 atm
B. 298 K and 1 atm
C. 300 K and 1 atm
D. 295 K and 1 atm

Q.17 Which enthalpy change is relevant in the following process?

$Na_{(s)} \rightarrow Na_{(g)}$ $\Delta H = +108 kJmol^{-1}$

A. Enthalpy of fusion
B. Enthalpy of vaporization
C. Enthalpy of atomization
D. Enthalpy of formation

Q.18 When two moles of H_2 and one mole of O_2 react to form H_2O 484KJ heat is evolved what is ΔH_f for one mole of H_2O

A. $-484 KJmol^{-1}$
B. $-242 KJmol^{-1}$
C. $-121 KJmol^{-1}$
D. $+242 KJmol^{-1}$

Q.19 For a given reaction $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$ the change in enthalpy under standard conditions is called?

A. Standard enthalpy change of solution
B. Standard enthalpy change of hydration
C. Standard enthalpy of neutralization
D. Standard enthalpy change of formation

Q.20 Which of the equations shows the same "twice" the enthalpy change of neutralization as the following equation

$$HCl + NaOH \rightarrow NaCl + H_2O$$

A. $H_2SO_4 + Mg(OH)_2 \rightarrow MgSO_4 + 2H_2O$
B. $NH_4Cl + NaOH \rightarrow NaCl + H_2O + NH_3$
C. $MgCO_3 + 2HCl \rightarrow MgCl_2 + CO_2 + H_2O$
D. $KOH + HCl \rightarrow KCl + H_2O$

Q.21 Lattice energy of an ionic crystal is the enthalpy of:

A. Combustion
B. Dissociation
C. Dissolution
D. Formation

Q.22 Combustion of graphite to form CO_2, can be done by two ways. Reactions are given as follow

$C + O_2 \longrightarrow CO_2$ $\quad \Delta H = -393.7\ kJmol^{-1}$

$C + \frac{1}{2}O_2 \longrightarrow CO$ $\quad \Delta H_1 = ?$

$CO + \frac{1}{2}O_2 \longrightarrow CO_2$ $\quad \Delta H_2 = -283\ kJmol^{-1}$

A. $-676\ kJ\ mol^{-1}$
B. $+110\ kJ\ mol^{-1}$
C. $-110\ kJ\ mol^{-1}$
D. $676\ kJ\ mol^{-1}$

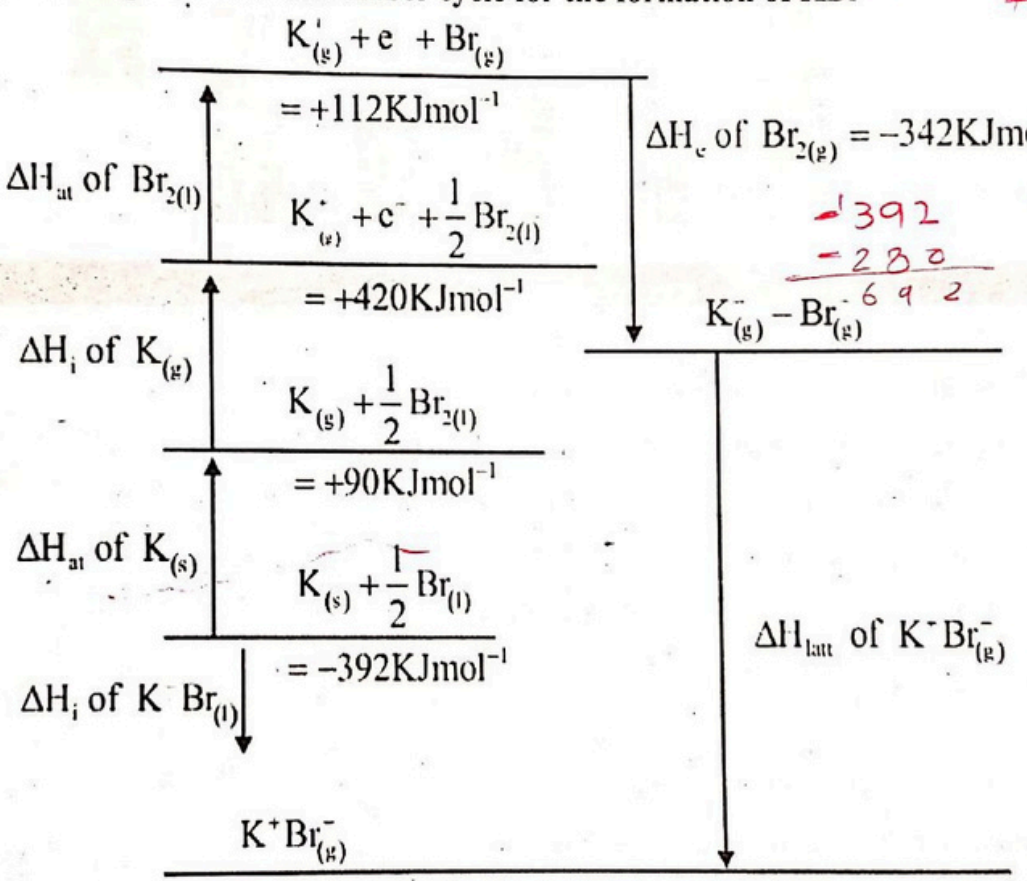
Q.23 Calculate the lattice energy of sodium chloride on the basis of Born-Haber cycle when

$\Delta H_f[NaCl] = -411 KJmol^{-1}$, $\Delta H_{at}[Na] = +107 KJmol^{-1}$, $\Delta H_{at}[Cl] = +122 KJmol^{-1}$,

$\Delta H_{ii}[Na] = +496 KJmol^{-1}$, $\Delta H_{eat}[NaCl] = -349 KJmol^{-1}$

A. 376 kJ/mole
B. -376 kJ/mole
C. +787 kJ/mole
D. -787 kJ/mole

Q.24 The given diagram is a Born-Haber cycle for the formation of KBr



Using the given data, the lattice energy of potassium bromide is calculated to be

A. $-672 kJmol^{-1}$
B. $-672 KCalmol^{-1}$
C. $-787\ kJmol^{-1}$
D. $+672\ Jmol^{-1}$

Q.25 Which one of the following is not a state function?

A. Work
B. Enthalpy
C. Internal energy
D. Pressure

Q.26 The thermal energy at constant pressure is called

A. Enthalpy
B. Internal energy
C. Heat capacity
D. Work done

Q.27 Born-Haber cycle is used to determine the lattice energies of:

A. Molecular solids
B. Metallic solids
C. Ionic solids
D. Covalent solids

Q.28 One calorie is equal to

A. 4.18 KJ
B. 4.18 J
C. 0.418 KJ mol^{-1}
D. 0.418 KJ

PAST PAPER QUESTIONS

1	D	6	B	11	B	16	B	21	D	26	A
2	A	7	A	12	C	17	C	22	C	27	C
3	B	8	A	13	A	18	B	23	D	28	B
4	D	9	C	14	D	19	C	24	A		
5	C	10	C	15	B	20	A	25	A		

HINTS

1. All are properties of spontaneous process.
5. Combustion is always an exothermic process.
7. Exothermic reactions lead to stable product formation.
8. Memory based question.
11. The given alue is actually the enthalpy of reaction.
18. $\frac{484}{2} = 242 kJmol^{-1}$

    For exothermic reaction = $-242 kJmol^{-1}$
21. Formation of lattice from gasesous ions
24. $\Delta H_{lat} = \Delta H_f - (\Delta H_{at(K)}) + \Delta H_{i(K)} + \Delta H_{at(Br)} + \Delta H_{e(Br)}$

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Q. 1 The change in volume depends on:

A. Initial state reaction
B. Final state
C. Initial and final states
D. Path of reaction

Q. 2 Hess's law is known as

A. Law of heat summation
B. Law of constant heat capacity
C. Law of mass action
D. Law of conservation of mass

Q. 3 Relation between q_p and q_v

A. $q_p < q_v$
B. $q_p > q_v$
C. $q_p = q_v$
D. $q_p \leq q_v$

Q. 4 Formation of SO_3 from SO_2 is ____Reaction:

A. Endothermic
B. Exothermic
C. Both
D. None

Q. 5 For strong acid and acid strong base Neutralisation energy

A. Constant
B. Variable
C. Depends on nature of acid
D. None

Q. 6 Unit of energy

A. Joule
B. Kilojoule
C. Calorie
D. All

Q. 7 Unavailability of methods to find out heat of reactions accurately makes thermochemistry

A. Widely applicable in science
B. A limited field of study
C. A useful aspect of industrial research
D. None of these

Q. 8 Which one of the following is not an example of state function?

A. Temperature(T)
B. Enthalpy(E)
C. Volume(V)
D. Heat(q)

Q. 9 Temperature and volume in an experiment are part of

A. Surroundings
B. System
C. State of a system
D. All of these

Q. 10 In endothermic reaction heat is absorbed from

A. System
B. Surrounding
C. Both
D. None of these

Q. 11 ΔH for exothermic reaction is _____?

A. More than 1
B. Positive
C. Negative
D. Neutral

Q. 12 Which of the following condition is constant in bomb calorimeter?

A. Pressure
B. Volume
C. Temperature
D. All of these

Q. 13 Heat exchanged between the system and surrounding at constant volume is shown by the relation

A. $\Delta H = qv + w$
B. $\Delta E=(q)v$
C. $\Delta H = (q)v$
D. $\Delta E =(qv)+PV$

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Q. 14 At constant volume the heat supplied is equal to

A. Work done
B. Internal energy change
C. Enthalpy
D. Entropy

Q. 15 Work done on the system is

A. Negative
B. Depends upon Boundary conditions
C. Positive
D. Zero

Q. 16 Which one is not a state function?

A. Internal energy
B. Enthalpy
C. Work
D. None of these

Q. 17 Heat supplied at constant pressure equals to

A. Activation energy
B. Internal energy change
C. Entropy
D. Enthalpy

Q. 18 Enthalpy is the sum of internal energy and

A. Work done
B. Entropy
C. Potential energy
D. Kinetic energy

Q. 19 Heat of a solution for the substance whose solubility decreases with increase in temperature is

A. Positive
B. Zero
C. High
D. Negative

Q. 20 Enthalpy change of solution of Na_2CO_3 is a _____ reaction?

A. Exothermic reaction
B. Endothermic reaction
C. Spontaneous reaction
D. Nonspontaneous reaction

Q. 21 An enthalpy cycle used to calculate the lattice energy is

A. Hess law
B. Carnot cycle
C. Born Haber cycle
D. Haber's process

Q. 22 Energy for the endothermic reaction is given a _____ value

A. Positive
B. Negative
C. 0
D. Neither positive nor negative

Q. 23 Which is correct for 1st law of thermodynamics?

A. $\Delta E=q+w$
B. $\lambda = h/mv$
C. $E = mc^2$
D. $P_1V_1 = P_2V_2$

Q. 24 Energy of products is greater in

A. Exothermic process
B. Endothermic process
C. Spontaneous process
D. Neutralization

Q. 25 Amount of heat absorbed by 2kg water when temperature changes by 1°C is

A. 4180J
B. 8300J
C. 8000J
D. 8400J

Q. 26 When a bond formed, energy is

A. Absorbed
B. Released
C. Constant
D. None

Q. 27 Which one is state function

A. Work
B. Heat
C. Pressure
D. None

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Q. 28 What is the value of One calorie in joule?

A. 4.98J
B. 8.21J
C. 7.98J
D. 4.18J

Q. 29 Formation of carbon dioxide hinders in calculating the heat of formation of

A. CCl_4
B. O_3
C. CO
D. C

Q. 30 Decomposition of water into hydrogen and oxygen is a

A. Reversible reaction
B. Endothermic reaction
C. Exothermic reaction
D. Oxidation reaction

ANSWER KEY

1	C	11	C	21	C
2	A	12	B	22	A
3	B	13	B	23	A
4	B	14	B	24	B
5	A	15	C	25	D
6	D	16	C	26	B
7	B	17	D	27	C
8	D	18	A	28	D
9	C	19	D	29	C
10	C	20	A	30	B

4200
2
8400

① 4200
8
33600

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UNIT 9 PRACTICE EXERCISE

ELECTROCHEMISTRY

1. $Al^{3+} + 3e^- \longrightarrow Al$ $E^0 = -1.66V$
   $Cu^{2+} + 2e^- \longrightarrow Cu$ $E^0 = +0.34V$
   If we couple these two electrodes the cell voltage will be:
   A. 0.32V
   B. 2.00V
   C. 1.32V
   D. 1.10V

2. **Given $E^0(Fe^{2+}/Fe) = -0.44V$ and $E^0(Fe^{3+}/Fe^{+2}) = 0.77V$" Fe^{2+}, Fe^{3+} and Fe are placed together then:**
   A. Fe^{3+} increases
   B. Fe^{3+} decreases
   C. Fe^{3+}/Fe^{+2} remains unchanged
   D. Fe^{2+} decreases

3. **In the following reaction** $Cr(OH)_3 + OH^- + IO_3^- \longrightarrow CrO_4^{2-} + H_2O + I^-$
   A. IO^{-3} is oxidizing agent
   B. $Cr(OH)_3$ is oxidized
   C. $6e^-$ are being taken per I atom
   D. All are true

4. **When a Zn strip is placed in $CuSO_4$ solution, Cu is precipitated, because standard oxidation potential of Zn is:**
   A. < Cu
   B. > Cu
   C. $< SO^{-2}_4$
   D. $> SO^{-2}_4$

5. **In aqueous solution hydrogen will not reduce:**
   A. Ag^+
   B. Cu^{2+}
   C. Zn^{2+}
   D. Fe^{3+}

6. **A standard hydrogen electrode has zero electrode potential because:**
   A. Hydrogen is easiest to oxidize
   B. Its electrode potential is assumed to be zero
   C. Hydrogen atom has only one electron
   D. Hydrogen is the lightest element

7. **The cell in which electrical energy is converted into chemical energy is:**
   A. Electrolytic cell
   B. Galvanic cell
   C. Ni-Cd cell
   D. Fuel cell

8. **Of the following matters, those that cannot be obtained by the electrolysis of aqueous solution of their salts are:**
   A. Ag and Mg
   B. Ag and Al
   C. Mg and Al
   D. Cu and Cr

9. **In the electrolytic cell, flow of electron is from:**
   A. Cathode to Anode in solution
   B. Cathode to Anode through external supply
   C. Cathode to Anode through internal supply
   D. Anode to Cathode through external supply

10. **Which one of the following reactions is NOT a redox reaction:**
    A. $C + O_2 \rightarrow CO_2$
    B. $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
    C. $ZnSO_4 + Cu \rightarrow CuSO_4 + Zn$
    D. $2Na + Cl_2 \rightarrow 2NaCl$

11. **A dilute aqueous solution of Na_2SO_4 is electrolyzed using platinum electrodes. The product at the anode and cathode are:**
    A. O_2, H_2
    B. $S_2O_8^{2-}$, Na
    C. O_2, Na
    D. $S_2O_8^{2-}$, H_2

12. **Standard electrode potential is usually considered:**
A. SHE
B. Reduction potential
C. Oxidation potential
D. Emf

13. **The element which has greatest value of Reduction potential is used as:**
A. Strongest reducing agent
B. Strongest oxidizing agent
C. Weak oxidizing and strong reducing agent
D. None of these

14. **If Cl_2^0 is passed through hot NaOH, $NaClO_3$ is formed and the oxidation number of Cl changes from:**
A. –1 to 0
B. 0 to –1
C. 0 to +5
D. 0 to +1

15. **The emf produced by galvanic cell is called:**
A. Cell potential
B. Redox potential
C. Oxidation potential
D. Reduction potential

16. **Which of following is oxidation state of oxygen in peroxides?**
A. -2
B. -1
C. -1/2
D. +2

17. **The reduction potentials of non-metals are A = + 0.54V, B = +1.08V, C = +1.36V, D = +2.87V Which non – metal can displace all other from aqueous solution of their salts:**
A. A
B. B
C. C
D. D

18. **The oxide in which oxygen has positive oxidation state is:**
A. OF_2
B. H_2O
C. KO_2
D. Na_2O_2

19. **The oxidation state of manganese is +3 in:**
A. MnO
B. MnO_2
C. Mn_2O_3
D. Mn_2O_7

20. **In the following reaction, the substance that undergoes reduction is:**

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$$

A. H_2O
B. CO_2
C. $C_6H_{12}O_6$
D. O_2

21. **By the electrolysis of $CuCl_{2(aq)}$ using inert electrodes of platinum which species is deposited at cathode:**
A. H_2
B. Cu
C. O_2
D. Cl_2

22. **Which of the following statements is not correct about galvanic cell?**
A. Anode is negatively charged
B. Reduction occurs at anode
C. Cathode is positively charged
D. Reduction occurs at cathode

23. **If a strip of Cu metal is placed in a solution of $FeSO_4$:**
A. Cu will be deposited
B. Fe is precipitated out
C. Cu and Fe both dissolve
D. No reaction take place

24. **Which of the following is an application of electrochemical series:**
A. Prediction of the feasibility of chemical reaction
B. Calculation of the cell voltage
C. prediction of reaction of metal with dilute acid
D. all of the above

25. **Electrolytic products of dilute aqueous solution of sodium sulphate is:**
A. Na, SO_2
B. Na, O_2
C. H_2, SO_2
D. H_2, O_2

26. Which one of the following is the strongest oxidizing agent?
A. Oxygen
B. Chlorine
C. Fluorine
D. Nitrogen

27. Zinc reacts with dilute acids to liberate hydrogen. This is because:
A. Zn^{2+} ion is a powerful oxidising agent than H^+ ion
B. H^+ ion is a powerful oxidising agent than Zn^{2+} ion
C. Zn^{2+} ion is a powerful reducing agent than H^+ ion
D. H^+ ion is a powerful reducing agent than Zn^{2+} ion

28. Molten lead and lead (II) bromide both conduct electricity. Which one of the following statements relating to this is true?
A. Both undergo chemical change when they conduct
B. Both conduct by the movement of charge particles
C. Both will also conduct in the solid state
D. Both contain mobile electrons

29. Which one of the following substances is oxidized in the reaction given below:

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

A. Mg
B. HCl
C. $MgCl_2$
D. H_2

30. Which one of the following processes involves redox reaction:
A. $Ag^+ + 2NH_3 \rightarrow [Ag(NH_3)_2]+$
B. $Ba^{+2} + CrO_4^{-2} \rightarrow BaCrO_4$
C. $2Al + 3Cl_2 \rightarrow 2AlCl_3$
D. $CuCO_3 \rightarrow CuO + CO_2$

31. In galvanic cell, a salt bridge is used in order to:
A. Pass the electric current
B. Prevent the flow of ions
C. Mix solution of two half cells
D. Allow movement of ions b/w two half cells

32. In all oxidation reactions, atoms of an element in a chemical species lose electrons and increase their:
A. Oxidation states
B. Reductions
C. Electrode
D. Negative charges

33. Which one of the following is a redox reaction?
A. $NaCl + AgNO_3 \longrightarrow NaNO_3 + AgCl_2$
B. $2Cl^- \longrightarrow Cl_2 + 2e^-$
C. $2Na + Cl_2 \longrightarrow 2NaCl$
D. $Na^+ + 1e^- \longrightarrow Na$

34. In SO_4^{-2} the oxidation number of Sulphur is
A. –8
B. +8
C. –6
D. +6

35. Study the following redox reaction:

$$10Cl^- + 16H^+ + 2MnO_4^- \longrightarrow 5Cl_2 + 2Mn^{+2} + 8H_2O$$

A. Manganese is oxidized from +7 to +2
B. Chlorine ions are reduced from –1 to zero
C. Chlorine is reduced from zero to –1
D. Manganese is reduced from +7 to +2

36. The products of electrolysis of which of the followings are known
A. Fused electrolyte
C. Solid electrolyte
C. Aqueous solution of electrolyte
D. Solid metal

37. During the electrolysis of Fused NaCl, the products are
A. $Na_{(s)}$ and $H_{2(g)}$
B. $Na_{(s)}$ and $O_{2(g)}$
C. $Na_{(l)}$ and $Cl_{2(g)}$
D. $H_{2(g)}$ and $Cl_{2(g)}$

38. The electrochemical reactions occurring at both the electrodes along with the electrolytic conduction constitute
A. Oxidation
B. Redox reaction
C. reduction
D. Electrolysis

39. Which statement is correct about the Deniel cell (Zn-Cu cell)
A. The Daniel cell is an example of an electrolytic cell
B. The spontaneous cell reaction involves the oxidation of Cu by Zn^{2+}
C. The spontaneous cell reaction involves the reduction of Zn^{2+} to Zn
D. The spontaneous cell reaction involves the reduction of Cu^{2+} to Cu

40. The reaction that occurs at cathode is known as:
A. Redox
B. Oxidation
C. Reduction
D. Decomposition

41. On ascending the electrochemical series strength as reducing agent
A. Increases
B. Remains same
C. Decreases
D. not determinable

42. When a metal rod is dipped in its one molar ionic solution
A. Electricity is produced
B. Redox reaction occurs
C. electricity is consumed
D. Potential difference is set up

43. The standard reduction potential of Zinc is
A. 0.76V
B. –0.34V
C. 0.34V
D. –0.76V

44. Which one of the following metals can replace the Copper from aqueous solution of its salt more easily?
A. Cd
B. Zn
C. Fe
D. Na

45. Only those metals can replace Hydrogen from dilute acids, which have
A. High negative reduction potential
B. Low negative reduction potential
C. High positive reduction potential
D. low positive reduction potential

46. On the basis of electrochemical series, predict which reaction is feasible:
A. $Zn + CuSO_{4(aq)} \longrightarrow ZnSO_4 + Cu$
B. $Cl_2 + 2KF \longrightarrow 2KCl + F_2$
C. $I_2 + KBr \longrightarrow 2KI + Br_2$
D. $2Ag + Cu(NO_3)_{2(aq)} \longrightarrow 2AgNO_{3(aq)} + Cu$

47. $CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$
In this reaction, which element acted as reducing agent
A. Cu
B. Zn
C. S
D. O

48. Which of the following statement is NOT correct for a galvanic cell:
A. Oxidation occurs at anode
B. Reduction occurs at cathode
C. Both A and B
D. Electrons flow from cathode to anode

49. In Which reaction, H_2O_2 acts as reducing agent
A. $2Fe^{+2} + 2H^+ + H_2O_2 \rightarrow 2Fe^{+3} + 2H_2O$
B. $2PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$
C. $2I^- + 2H^+ + H_2O_2 \rightarrow I_2 + H_2O$
D. $Ag_2O + H_2O_2 \rightarrow 2Ag + O_2 + H_2O$

50. Carbon is in its lowest O.S in
A. CO_2
B. CCl_4
C. CF_4
D. CH_4

51. The strongest reducing agent is
A. *Al*
B. *Mg*
C. *K*
D. *Br*

52. When H_2S is passed through SO_2 solution in water, H_2S changes to S, hence SO_2 acts as
A. Catalyst
B. Oxidizing agent
C. reducing agent
D. Acid

53. Which is not a redox reaction.
A. $CaCO_3 \rightarrow CaO + CO_2$
B. $O_2 + 2H_2 \rightarrow 2H_2O$
C. $Na + H_2O \rightarrow NaOH + \frac{1}{2} H_2$
D. $MnCl_3 \rightarrow MnCl_2 + \frac{1}{2} Cl_2$

54. $xCu + yHNO_3 \rightarrow Cu(NO_3)_2 + NO_2 + H_2O$ x and y are
A. 2, 3
B. 1, 4
C. 1, 6
D. 2, 6

55. In which of the following there is the greatest difference in the O.N of the underlined elements.
A. $\underline{NO_2}$ and $\underline{N_2O_4}$
B. $\underline{N_2O}$ and $\underline{NO}$
C. $\underline{P_2O_5}$ and $\underline{P_4O_{10}}$
D. $\underline{SO_2}$ and $\underline{SO_3}$

56. The reduction potentials of Zn, Cu, Fe and Ag are in the order:
A. Ag, Cu, Fe, Zn
B. Cu, Ag, Fe and Ag
C. Zu, Cn, Fe, Ag
D. Fe, Zn, Cn, Ag

57. $3ClO^- \rightarrow ClO_3^- + 2Cl^-$, it is a
A. Oxidation reaction
B. Reduction reaction
C. disproportionation reaction.
D. decomposition reaction.

58. O.N of Fe in Fe_3O_4 is
A. $\frac{5}{4}$
B. $\frac{4}{5}$
C. $\frac{3}{2}$
D. $\frac{8}{3}$

59. $MnO_2 + HCl \rightarrow MnCl_2 + H_2O + Cl_2$ total no. of e^-'s lost by 'Cl' in this reaction are
A. 1
B. 2
C. 3
D. 4

60. $Cu + H_2SO_4 \rightarrow CuSO_4 + SO_2 + H_2O$
What is true about this reaction?
A. Disproportionation reaction
B. redox reaction,
C. not feasible
D. Cu is oxidizing agent

61. Galvanizing is a process in which sheets of metals are coated with thin layer of ____ to prevent corrosion:
A. Tin
B. Zinc
C. Copper
D. Silver

62. Which of these will react most spontaneously with Au to give the reaction, $Au \rightarrow Au^{+3}$
A. F_2
B. Cl_2
C. Br_2
D. I_2

63. Apparent charge on an atom of an element in a molecule or ion is called oxidation number. It may be
A. Positive
B. Negative
C. Zero or fraction
D. All of these

64. The oxidation number of oxygen atom in OF_2 and H_2O_2

A. −2, −1
B. −1, +2
C. +2, −1
D. +2, +1

65. The element on the reactant side which has been reduced is

$$\overset{-1}{HI} + H_2\overset{+6}{S}O_4^{-2} \longrightarrow \overset{0}{I_2} + SO_2 + H_2O$$

A. H
B. S
C. I
D. O

66. In which of the following changes there is a transfer of five electrons

A. $MnO_4^{2-} \rightarrow MnO_2$
B. $MnO_4^{1-} \rightarrow Mn^{+2}$
C. $CrO_4^{2-} \rightarrow Cr^{+3}$
D. $Cr_2O_7^{-2} \rightarrow 2Cr^{+3}$

67. Weak electrolyte in solution is

A. Completely ionized
B. Slightly ionized
C. Never ionized
D. Destroyed

68. Which one of the following is a strong electrolyte in solution?

A. Ammonium hydroxide
B. Carbonic acid
C. Potassium iodide
D. Acetic acid

69. In electrolytic cell the cathode has a charge

A. Positive
B. Negative
C. Neutral
D. Zero

70. The oxidation number of Cl in $HClO_3$ is

A. − 1
B. + 1
C. + 3
D. + 5

71. The oxidation number of magnesium in $MgCO_3$ is

A. + 3
B. + 2
C. + 1
D. − 1

72. In the reaction $H_2S + Cl_2 \rightarrow 2HCl + S$, H_2S acts as

A. Reducing agent
B. Oxidizing agent
C. Nitrating agent
D. Sulphonating agent

73. Which of the following reactions occur at cathode?

A. $Cu^{2+} + 2e^- \rightarrow Cu$
B. $Hg + \frac{1}{2}O_2 \rightarrow HgO$
C. $Cu + 2e^- \rightarrow Cu^{2+}$
D. $Mg + \frac{1}{2}O_2 \rightarrow MgO$

74. In which of the following changes there is a transfer of three electrons

A. $MnO_4^{2-} \longrightarrow MnO_2$
B. $CrO_4^{2-} \longrightarrow Cr^{+3}$
C. $MnO_4^{-} \longrightarrow Mn^{+2}$
D. $Cr_2O_7^{2-} \longrightarrow 2Cr^{+3}$

75. The reaction taking place at anode and cathode are respectively

A. Oxidation and reduction
B. Reduction and oxidation
C. Reduction and hydrolysis
D. Oxidation and hydrolysis

76. The electrolysis product of aqueous NaCl at electrodes

A. Na and Cl_2
B. Na and NaOH
C. H_2 and Cl_2
D. H_2, Cl_2 and NaOH

77. Which one of the following is a reducing reaction

A. $Br_2^0 \rightarrow Br^-$
B. $Fe^{2+} \rightarrow Fe^{3+}$
C. $Zn^0 \rightarrow Zn^{2+}$
D. $Sn^{2+} \rightarrow Sn^{4+}$

78. **The cathodic reaction in the electrolysis of dil. H_2SO_4 with Pt electrodes**
A. Reduction
B. Oxidation
C. Both oxidation and reduction
D. Neither oxidation nor reduction

79. **The product produced at the cathode when aqueous sodium chloride is electrolyzed**
A. H_2
B. O_2
C. Cl_2
D. Na

80. **For the purification of copper, impure copper is made the_____**
A. Cathode
B. Anode
C. Solution
D. Both A & B

81. **Cell potential depends upon**
A. Temperature
B. Nature of electrolyte
C. Concentration of ions
D. All of these

82. **When an element is in contact with aqueous solution of its own ions, then potential is called?**
A. Standard reduction potential
B. electrode potential
C. Standard electrode potential
D. Standard oxidation potential

83. **Which is not true about SHE**
A. Finely divided platinum black is used as electrode
B. Temperature is kept 25°C
C. One molar solution of H_2SO_4 is used as electrolyte
D. Electrode potential of any element can be calculated by comparison method

84. **The oxidation reaction that takes place in the SHE is**
A. $H_{2(gas)} \longrightarrow 2H^+_{(aq)} + 2e^-$
B. $2H^+_{(aq)} + 2e^- \longrightarrow H_{2(gas)}$
C. $2H_2O_{(l)} \longrightarrow 2H_{2(g)} + O_{2(g)}$
D. $2H_2O_{(l)} + 2e^- \longrightarrow OH^-_{(aq)} + H_{2(g)}$

85. **The working condition/s for SHE**
A. 1atm pressure
B. 298K temperature
C. 1M H^+ solution
D. All of these

86. **SHE acts as anode when connected with Cu electrode but act as cathode with Zn electrode, which one is correct**
A. Zn has less reduction potential than hydrogen and Cu
B. Zn has high reduction potential than hydrogen and Cu
C. Zn is below electrochemical series than hydrogen and Cu
D. Zn has least tendency to lose electron

87. **If a salt bridge is removed from two half cells the emf is**
A. Increased
B. Dropped to zero
C. Decreased
D. Electrodes will be reversed

88. **A cell in which a non-spontaneous redox reaction is carried out by passing an electric current in a/ an**
A. Galvanic cell
B. Voltaic cell
C. Daniel cell
D. Electrolytic cell

89. **Zinc rod acts as anode in the Daniell cell but acts as cathode when coupled with aluminum electrode, this is because the standard reduction potential of**
A. Zn > Al
B. Zn < Al
C. Zn = Al
D. Zn = 0

90. **Electrolysis is a process in which the cations and anions liberated from electrolyte are**
A. Hydrated
B. Hydrolyzed
C. Charged
D. Discharged

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91. A cell which produces electric current by a redox reaction is called a/ an
A. Volatic cell
B. Electrolytic cell
C. Half-cell
D. Standard cell

92. The value of oxidation potential would be positive if it is
A. Below SHE
B. For SHE
C. Above SHE
D. Just below SHE

93. In the following cell representation

$$Zn_{(s)}\left|Zn^{2+}_{(aq)}(1M)\right\|Cu^{2+}_{(aq)}(1M)\left|Cu_{(s)}\right.$$

The line || in the representation shows
A. Salt bridge
B. KCl
C. Molar concentration
D. Reduction potential

* All upper metals can replace lower metals

ANSWER KEY

1	B	11	A	21	B	31	D	41	A	51	C	61	B	71	B	81	D	91	A
2	B	12	B	22	B	32	A	42	D	52	B	62	A	72	A	82	B	92	C
3	C	13	B	23	D	33	C	43	D	53	A	63	D	73	A	83	C	93	A
4	B	14	C	24	D	34	D	44	D	54	B	64	C	74	A	84	A		
5	C	15	A	25	D	35	D	45	A	55	D	65	B	75	A	85	D		
6	B	16	B	26	C	36	A	46	A	56	A	66	B	76	C	86	A		
7	A	17	D	27	B	37	C	47	B	57	C	67	B	77	A	87	B		
8	C	18	A	28	B	38	D	48	D	58	D	68	C	78	A	88	D		
9	D	19	C	29	A	39	D	49	D	59	B	69	B	79	A	89	B		
10	B	20	D	30	C	40	C	50	D	60	B	70	D	80	B	90	D		

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HINTS

3. Formation of Fe^{+2} from Fe^{+3} is a spontaneous reaction.

4. $I^{+5} \rightarrow I^{-1}$

8. They have large negative reduction potential.

11. H^+ and OH^- are discharged

21. Cu^{+2} has greater reduction potential than that of H^+.

27. H^+ ions from solution act as oxidizing agent to produce Zn^{+2} ions by the oxidation of Zn.

30. Elements form compound.

41. Tendency to lose e^- is maximum at the top of electrochemical series.

44. It has the highest oxidation potential.

49. $Ag^+ \rightarrow Ag$

54. $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$

55. $S^{+4} \rightarrow S^{+6}$

62. Highest reduction potential.

72. Cl_2 is reduced.

76. NaOH is formed in solution.

78. Reduction always occurs at cathode.

82. No standard conditions are specified.

83. HCl is the electrolyte

92. Reactive metals lie above SHE.

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Q.1 **The reaction which is responsible for the production of electricity in the voltaic cell is**

A. Hydrolysis
B. Oxidation
C. Reduction
D. Redox

Q.2 **In all oxidation reactions, atoms of an element in a chemical species lose electrons and increases their**

A. Oxidation states
B. Reduction states
C. Electrode
D. Negative charges

Q.3 **In $MgCl_2$, the oxidation state of Cl is**

A. Zero
B. -2
C. +2
D. -1

Q.4 **Which one of the following behave as a redox reaction?**

A. $NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl$
B. $2Na + Cl_2 \rightarrow 2NaCl$
C. $2Cl^- \rightarrow Cl_2 + 2e^-$
D. $Na^+ + 1e^- \rightarrow Na$

Q.5 **In SO_4^{-2} the oxidation number of sulphur is**

A. –8
B. –6
C. +8
D. +6

Q.6 **Study the following redox reaction:**

$$10Cl^- + 16H^+ + 2MnO_4^- \longrightarrow 5Cl_2 + 2Mn^{+2} + 8H_2O$$

Which statement is true about this reaction?

A. Manganese is oxidized from +7 to +2.
B. Chlorine is reduced from zero to -1
C. Chloride ions are reduced from -1 to zero
D. Manganese is reduced from +7 to +2

Q.7 **In NO_3^- the oxidation number of N is**

A. +5
B. +3
C. +2
D. –3

Q.8 **The oxidation state of carbon in $C_2O_4^{-2}$ is**

A. +4
B. –4
C. +3
D. +2

Q.9 **The value of oxidation number of chlorine in $HClO_3$ is**

A. +7
B. +5
C. –1
D. +3

Q.10 **In voltaic cell a salt bridge is used in order to**

A. Pass the electric current
B. Prevent the flow of ions
C. Mix solutions of two half cells
D. Allow movement of ions between two cells

Q.11 **The potential difference of an electrochemical cell is measured by**

A. Galvanometer
B. Calorimeter
C. Voltmeter
D. Ammeter

Q.12 **In an electrochemical series, elements are arranged on the basis of:**

A. pH scale
B. pKa scale
C. pOH scale
D. Hydrogen scale

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Q.13 The E° value of standard copper half-cell is +0.34V, measured when it is connected with SHE i.e. Standard hydrogen electrode. In this case the half reaction taking place at SHE is

A. $2H^{+}_{(aq)} + 2e^{-} \longrightarrow H_{2(g)}$
B. $H_{2(g)} \longrightarrow 2H^{+}_{(aq)} + 2e^{-}$
C. $2H^{+}_{(aq)} + 2e^{-} \longrightarrow 2H_{(g)}$
D. $H_{2(g)} \longrightarrow 2H_{(g)} + 2e^{-}$

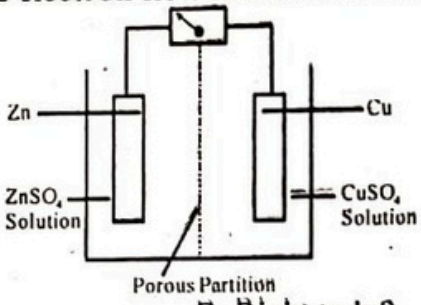
Q.14 The standard electrode potential of hydrogen is arbitrarily taken at 298k is ____

A. 1.00volt
B. 0.10 volt
C. 0.00 volt
D. 10.0 volt

Q.15 Coinage metals Cu, Ag and Au are the least reactive because they have

A. Negative reduction potential
B. Negative oxidation potential
C. Positive reduction potential
D. Positive oxidation potential

Q.16 In the figure given below, the electron flow in external circuit is from



A. Zinc to copper electrode
B. Right to left
C. Copper to zinc electrode
D. porous partition to zinc electrode

Q.17 Study the following facts

$Zn \longrightarrow Zn^{+2} + 2e^{-} \quad E° = +0.76V$

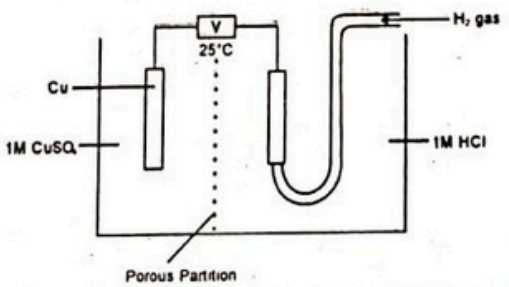
$Cu \longrightarrow Cu^{+2} + 2e^{-} \quad E° = -0.34V$

A. $Cu + Zn^{+2} \longrightarrow Cu^{+2} + Zn$
B. $Cu^{+2} + Zn \longrightarrow Cu + Zn^{+2}$
C. $Cu^{+2} + Zn^{+2} \longrightarrow Cu + Zn$
D. $Cu^{+2} + Zn^{+2} \longrightarrow Cu + Zn^{+2}$

Q.18 Keeping in mind the electrode potential, which one of the following reactions is feasible?

A. $Zn^{+2} + Cu \longrightarrow Cu^{+2} + Zn$
B. $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$
C. $Zn + MgSO_4 \longrightarrow ZnSO_4 + Mg$
D. $Cd + MgSO_4 \longrightarrow CdSO_4 + Mg$

Q.19



The diagram shows a galvanic cell. The current will flow from

A. Hydrogen electrode to copper electrode
B. Copper electrode to hydrogen electrode
C. Hydrogen electrode to HCl solution
D. $CuSO_4$ solution to hydrogen electrode

Q.20 Stronger is the oxidizing agent, stronger is the

A. emf of cell
B. Oxidation potential
C. Reduction potential
D. Redox potential

Q.21 Which of the following metal does not liberate hydrogen on reaction with acid?
A. Mg
B. Pt
C. Zn
D. Ca

Q.22 Which one of the following elements is the strongest reducing agent?
A. Chlorine
B. Sodium
C. Magnesium
D. Aluminum

Q.23 Rusting of iron metal Fe occurs when Fe gets converted into Fe_2O_3. What happen with Fe?
A. Fe is neutralized
B. Fe is sublimed
C. Fe is reduced
D. Fe is oxidized

Q.24 During space flights, astronauts obtained water from
A. Nickel cadmium cells
B. Lead accumulator
C. Fuel Cell
D. Alkaline battery

Q.25 The electrolyte used in fuel cell is
A. KOH
B. NaCl(aq)
C. $NaNO_3$
D. Molten NaCl

Q.26 In which of the following reaction hydrogen acts as oxidizing agent.
A. $H_2 + Cl_2 \longrightarrow 2HCl$
B. $C_2H_4 + H_2 \longrightarrow C_2H_6$
C. $2Na + H_2 \longrightarrow 2NaH$
D. $N_2 + 3H_2 \longrightarrow 2NH_3$

Q.27 Choose the true statement regarding the reaction given below

$$2Na_{(g)} + Cl_{2(g)} \longrightarrow 2NaCl_{(g)}$$

A. Chloride is oxidized and sodium is reduced
B. Chlorine acts as an oxidizing agent and sodium as reducing agent
C. Chloride acts as a reducing agent and
D. None of the above

Q.28 A cell is constructed of the following two half cells. What is E^+ of the cell?

$Ag^+ + e^- \rightleftharpoons Ag + 0.80V$ $\quad$ $Al^{3+} + e^- \rightleftharpoons Al - 1.67V$

A. 2.47V
B. 0.087
C. –0.87 V
D. 5.81 V

Q.29 Which of the following is spontaneous reactions?
A. $Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$
B. $2NaCl_{(g)} \longrightarrow 2Na_{(g)} + Cl_{2(g)}$
C. $Zn^{2+} + Clu \longrightarrow Zn + Cu^{2+}$
D. $2Fe(OH)_3 \longrightarrow 2Fe + 3O_2 + 3H_2$

Q.30 When zinc electrode is coupled with copper electrode in a galvanic cell A. Reduction takes place at zinc electrode
C. Oxidation takes place at copper electrode
B. Reduction takes place at copper electrode
D. Both A and B

Q.31 The oxidation state of nitrogen in NH_4NO_3 are
A. 3 and 5
B. +5 and 3
C. -3 and -3
D. Zero

Q.32 Aqueous solutions of Iodine and Sodium hydroxide were mixed in a round bottom flask at 70°C. Following chemical reaction was carried out.

$3I_2 + 6NaOH \rightarrow NaIO_3 + NaI + H_2O$

This reaction is termed as
A. Free radical reaction
B. Precipitation reaction
C. Substitution reaction
D. Redox reaction

Q.33

$Mg^{2+} + 2e^- \rightarrow Mg$ $E^o = -2.37V$

$Zn^{2+} + 2e^- \rightarrow Zn$ $E^o = -0.76V$

$2H^+ + 2e^- \rightarrow H_2$ $E^o = 0.000V$

$Cu^{2+} + 2e^- \rightarrow Cu$ $E^o = +0.34V$

$Cl_2 + 2e^- \rightarrow 2Cl^-$ $E^o = +1.36V$

$Au^{3+} + 3e^- \rightarrow Au$ $E^o = +1.50V$

Keeping in view the values of standard reduction potential given above, which one of the following would you select as a feasible redox chemical reaction?

A. $2Au + 6H^+ \rightarrow 2Au^{3+} + 3H_2$

B. $2Cl^- + I_2 \rightarrow Cl_2 + 2I^-$

C. $Mg + 2H^+ \rightarrow Mg^{2+} + H_2$

D. $Cu + Zn^{2+} \rightarrow Cu^{2+} + Zn$

Q.34 The oxidation state of "S" in the $(S_2O_3)^{-2}$ is:

A. +4

B. +6

C. -2

D. +2

Q.35 The common oxidation number of halogens is

A. -1

B. +1

C. -2

D. 0

Q.36 During oxidation process, oxidation number of an element

A. Decreases

B. Increases

C. Remains constant

D. Both a and b

PAST PAPER QUESTIONS

1	D	6	D	11	C	16	A	21	B	26	C	31	A	36	B
2	A	7	A	12	D	17	A	22	B	27	B	32	D		
3	D	8	C	13	B	18	B	23	D	28	A	33	C		
4	B	9	B	14	C	19	A	24	C	29	A	34	D		
5	D	10	D	15	C	20	C	25	A	30	C	35	A		

HINTS

1. Both oxidation and reduction take place simultaneously.
4. In a chemical reaction, if an element in free state reacts or is produced then it will be a redox reaction.
10. To move cations from cathodic compartment to anodic compartment.
13. Hydrogen has greater tendency to get oxidized.
15. Negative oxidation potential is also correct but as electrochemical series is generally made on the basis of reduction potential so it is the most suitable answer.
16. Zn acts as anode.
21. Positive reduction potential.
26. $H_2^0 \rightarrow H^{-1}$
31. $NH_4^+ = -3 \qquad NO_3^- = +5$
32. More appropriately disproportion reaction.
33. Maximum value for $E^0_{oxi} + E^\circ_{red}$

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Q. 1 In oxidation number method, the final step to balance equation is
A. Hit and Trial method
B. Inspection method
C. Identifying the reducing participants
D. Identifying the oxidized participants

Q. 2 Pure metal
A. Corrode slowly
B. Corrode rapidly
C. Does not corrode easily
D. None of these

Q. 3 For a galvanic cell consisting of Zn and Fe dipped in their respective solutions
A. Zn act as anode
B. Zn act as cathode
C. Fe act as anode
D. None

Q. 4 The least reactive transition metal
A. Zn
B. Sc
C. Cu
D. Au

Q. 5 Elements like F_2, Cl_2 lie
A. Above jn ECS
B. Below in ECS
C. Mid of ECS
D. None

Q. 6 Strongest reducing agent
A. I^-
B. F^-
C. Cl^-
D. Br^-

Q. 7 F_2, Cl_2, Br_2 present in
A. Above in series
B. Above hydrogen
C. Below in series
D. None

Q. 8 Which of the following is strong reducing agent
A. Li
B. F
C. Na
D. Mg

Q. 9 In galvanic cell in salt bridge
A. Aqueous solution of KCl in a gel
B. Solution of $CaCl_2$ in a gel
C. Solution of $MgCl_2$ in a gel
D. Any of above can be used

Q. 10 Efficiency of fuel cell
A. 70%
B. 75%
C. 68%
D. 20%

Q. 11 Metals are _____?
A. Reducing agents
B. Oxidizing agents
C. Both A and B
D. Dehydrating agents

Q. 12 Electrolysis of a dilute solution of NaCl results at the anode
A. Sodium
B. Chlorine
C. Hydrogen
D. Oxygen

Q. 13 Each half reaction in ion electron method is balanced by adding
A. Electrons on left hand side
B. Electron on right hand side
C. Both left or right hand side
D. None of these

Q. 14 In metal hydrides the oxidation number of hydrogen is
A. I
B. -I
C. 0
D. 2

Q. 15 Formation of $ZnSO_4$ from blue copper sulphate solution is a spontaneous
A. Oxidation reaction
B. Reduction reaction
C. Addition reaction
D. Redox reaction

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Q. 16 Electrolysis is a

A. Spontaneous reaction
B. Reduction reaction
C. Oxidation-reduction reaction
D. Oxidation reaction

Q. 17 In balancing redox equation the first thing is to

A. Balance out all the reactants
B. Write the skeleton equation
C. Calculate the oxidation number
D. Identify the elements

Q. 18 In electrochemical series reduction potential relates to only

A. Real conditions
B. Standard Condition
C. Positive values
D. Negative values

Q. 19 In ion electron method, while balancing oxygen and Hydrogen atoms

A. First balance hydrogen
B. First balance oxygen
C. Balance both at the same time
D. Order doesn't matter

Q. 20 In Al_2S_3, the valency of Al is

A. 2
B. 3
C. -3
D. -2

Q. 21 Which of the following is feasible reaction

A. $Pb + SnO \longrightarrow PbO + Sn$
B. $Pb + Zn \longrightarrow PbO + Zn$
C. $Zn + HCl \longrightarrow ZnCl_2 + H_2$
D. $Ag + 2HCl \longrightarrow AgCl_2 + H_2$

Q. 22 The element present at bottom of electrochemical series act as

A. Anode
B. Cathode
C. Oxidizing agent
D. Both B and C

ANSWER KEY

1	B	11	A	21	C
2	A	12	D	22	D
3	A	13	D		
4	D	14	B		
5	B	15	D		
6	A	16	C		
7	C	17	B		
8	A	18	B		
9	A	19	A		
10	B	20	B		

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UNIT 10 PRACTICE EXERCISE

CHEMICAL BONDING

1. **Which of the following bonds is not present in NH_4Cl**
   A. Ionic bond
   B. Co-ordinate covalent bond
   C. Covalent bond
   D. De-localized covalent bond

2. **The head on overlap of p-orbitals of two atoms give rise to bond called**
   A. Sigma bond
   B. Pi (π) bond
   C. Ionic bond
   D. Metallic bond

3. **Most reactive among the following:**
   A. Li
   B. Ca
   C. Mg
   D. Na

4. **Which molecule is least ionic?**
   A. NaCl
   B. HF
   C. HCl
   D. CsF

5. **Which one of the following molecules has a pyramidal structure?**
   A. CH_4
   B. NH_3
   C. H_2O
   D. C_2H_4

6. **In which molecule, all atoms are coplanar?**
   A. CH_4
   B. NH_3
   C. BF_3
   D. PH_3

7. **Total number of valence electrons in CH_4**
   A. 8
   B. 10
   C. 9
   D. 12

8. **Which covalent bond has highest ionic character?**
   A. HF
   B. HBr
   C. HCl
   D. H_2O

9. **The number of bonds in nitrogen molecule is:**
   A. One σ and π
   B. Three sigma bonds only
   C. One σ and two π
   D. Two σ and one π

10. **The value of ionization energy is maximum for:**
    A. B
    B. N
    C. C
    D. O

11. **The geometry of H_2O is similar to that of:**
    A. $MgCl_2$
    B. $SnCl_2$
    C. $HgCl_2$
    D. NH_2^-

12. **Which one of the following molecules does not follow duplet or octet rule?**
    A. NH_3
    B. HCl
    C. $AlCl_3$
    D. CCl_4

13. **Bond length is minimum in:**
    A. HCl
    B. H_2O
    C. NH_3
    D. HF

14. **Which of the following pair has same shape?**
    A. PH_3, NH_3
    B. BF_3, PCl_3
    C. H_2S, CO_2
    D. SO_2, CO_2

15. **In which of the following molecules would you expect the nitrogen-nitrogen bond to be the shortest?**
A. N_2H_4
B. NH_3
C. N_2
D. N_2O

16. **Which of the following best describes the shape and polarity of the carbon disulphide molecule?**
A. Bent and polar
B. Pyramidal and polar
C. Linear and non-polar
D. Bent and non-polar

17. **Energy of atom in compound is**
A. Higher than individual atom
B. equal to individual atom
C. Lower than individual atom
D. Impossible to predict

18. **Bond will be perfectly covalent when electronegativity difference of bonded atom is:**
A. Equal to 1.7
B. Greater to 1.7
C. between 0.5 to 1.7
D. zero

19. **Mostly ionic compounds are produced between elements of group:**
A. IA and IIA
B. IB and VIIB
C. IA, IIA and VII A
D. IA and IB

20. **Specie in which the central atom uses sp^2 hybrid orbitals in its bonding is**
A. PH_3
B. NH_3
C. CH^+_3
D. SbH_3

21. **On the basis of VSEPR theory, a molecule with three bond pair and no lone pair of electrons will have a structure**
A. Linear
B. Trigonal planar
C. Tetrahedral
D. Trigonal pyramidal

22. **Pi bonds are produced by overlapping of orbital's**
A. some unhybridized orbitals
B. Hybrid and unhybridized orbitals
C. Hybrid orbitals
D. s-orbitals

23. **Which of the followings shows zero dipole moment**
A. CH_4
B. NH_3
C. HF
D. H_2O

24. **Molecule in which overlap is of p and p orbitals only:**
A. H_2
B. F_2
C. HF
D. N_2

25. **Carbon-Carbon double bond length in C_3H_6**
A. 154 pm
B. 120 pm
C. 133 pm
D. 105 pm

26. **Polarity of a molecule is expressed in terms of**
A. Bond strength
B. Bond length
C. Dipole moment
D. Shape

27. **A covalent bond may be**
A. 100% covalent
B. 100% ionic
C. Partially ionic
D. Both a and c

28. **Bonding in MgO is an example of**
A. Ionic bond
B. Polar bond
C. Covalent bond
D. Coordination covalent bond

29. **Covalent bonds are**
A. directional
B. Multidirectional
C. Bidirectional
D. Non directional

30. **The hybridization of atomic orbitals of central atoms in CO_2, BF_3 and NH_4^+ are, respectively**
A. sp, sp^2, sp^3
B. sp^2, sp, sp^3
C. sp, sp^3, sp^2
D. sp^2, sp^3, sp

31. **The shape of NH_2^- is:**
A. Linear
B. Pyramidal
C. Angular
D. Tetrahedral

32. **In H_2O molecule σ bonds are formed by overlapping**
A. sp^2-s
B. sp-s
C. p-p
D. sp^3-s

33. **Ratio of percentage of s and p in sp^2 hybridization**
A. s = 33.3% p = 66.6%
B. s = 30% p = 70%
C. s = 40% p = 60%
D. s = 25% p = 75%

34. **Bond angle of H_2S**
A. 90°
B. 104.5°
C. 92°
D. 105.5°

35. **Indicate the correct order for ionization energy**
A. $M^+ > M^{++} > M^{+++}$
B. $M^{++} > M^{+++} > M^+$
C. $M^{+++} > M^{++} > M^+$
D. $M^{++} > M^+ > M^{+++}$

36. **Which one is not an absolute term for the element?**
A. Ionization energy
B. Electronegativity
C. Electron affinity
D. Atomic size

37. **The charge on a cation M is +2 & on anion A is - 3, the compound formed has formula**
A. M_2A
B. M_3A_2
C. MA_2
D. M_2A_3

38. **Which of the following is not planar?**
A. Benzene
B. Formaldehyde
C. BF_3
D. Propane

39. **Which of the follwing molecule has highest dipole moment**
A. SO_3
B. $SnCl_2$
C. CO_2
D. BF_3

40. **Which compound is more ionic?**
A. HF
B. CsCl
C. NaCl
D. H_2O

41. **An ionic compound A^+B^- is most likely to be formed when;**

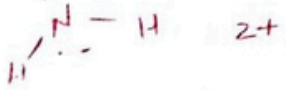
	Ionization Energy of A	Electron Affinity of B
A.	high	low
B.	low	high
C.	high	high
D.	low	low

42. **Which of the following is an example of a ionic solid?**
A. Sugar, $C_{12}H_{22}O_{11(s)}$
B. Graphite, $C_{(s)}$
C. Carbón dioxide, $CO_{2(s)}$
D. Magnesium fluoride, $MgF_{2(s)}$

43. **All are true for π-bond except**
A. π-bond is formed from sp hybrid orbitals
B. π-bond is formed by the parallel overlap of half-filled p-orbitals
C. π-bond is formed when as sigma bond is already present
D. π-bond is weaker than sigma bond

44. **Which one of the following molecules has zero dipole moment**
A. NH_3
B. NF_3
C. BF_3
D. H_2O

45. **The bond angle in H_2O is**
A. 90°
B. 109.5°
C. 180°
D. 104.5°



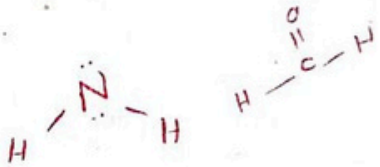
46. **Which of the following has no tendency to form coordinate covalent bond with H^+?**
A. NH_3
B. H_2O
C. BF_3
D. CH_3OH

47. **Which one is non – polar although it contains polar bonds?**
A. HCl
B. H_2O
C. SO_3
D. SO_2

48. **When 's' character of hybridized orbitals decreases the bond angle:**
A. Decreases
B. Increases
C. Becomes zero
D. Does not change

49. **A chemical bond is formed to:**
1. **attain the octet state**
2. **minimize energy**
3. **gain stability**
4. **decrease reactivity**

Which statements ae correct.
A. 1 and 2 only
B. 1, 2, 3 and 4 are all correct.
C. 1, 2 and 3 only
D. 2, 3 and 4 only



50. **Which one of the following molecules is not planar?**
A. Benzene
B. Phosphorus trichloride
C. ethene
D. Boron trifluoride

51. **The ability of an atom in a covalent bond to attract the bonding electrons is called:**
A. Ionization energy
B. Ionic bond energy
C. Electronegativity
D. Electron affinity

52. **The angle between unhybridize p-orbital and three sp^2 hybrid orbitals of each carbon atom in ethene is:**
A. 120°
B. 90°
C. 109.5°
D. 180°

53. **In 'H-F' bond electronegativity difference is '1.9'. What is the type of this bond?**
A. Polar covalent bond
B. Non-polar covalent bond
C. Pi (π) bond
D. Co-ordinate covalent bond

54. **When the two partially filled atomic orbitals overlap in such a way that the probability of finding electron is maximum around the line joining the two nuclei, the result is the formation of**
A. Sigma Bond
B. Pi-Bond
C. Hydrogen Bond
D. Metallic Bond

55. **Electron affinity of the atom is the energy released when**
A. Electron is added to gaseous atom
B. Covalent bond of molecule is broken
C. Electron is removed from gaseous atom
D. Covalent bond is formed between the atoms

56. **Liquid oxygen is** ★ Imp ⇒
A. Diamagnetic
B. Paramagnetic
C. Antimagnetic
D. Ferromagnetic

57. **In carbon dioxide (CO_2) molecule, the number of sigma covalent bond(s) is/ are,**
A. 1
B. 2
C. 3
D. 4

58. **H_2S has a net dipole moment while BeF_2 has zero dipole moment, because**
A. H_2S molecule is linear while BeF_2 is angular
B. H_2S molecule is angular, while BeF_2 molecule is linear
C. Fluorine has more electronegativity than S
D. Be is more electronegativity than S

59. **Octet rule is not allowed in the formation of:**
A. NF_3
B. CCl_4
C. CF_4
D. PCl_5

60. **The ionization energy:**
A. generally increases from left to right in a period
B. increases from top to bottom in a group
C. does not change in a period
D. does not change in a group

61. **In a period the atomic radii:**
A. increase
B. remain same
C. decrease
D. first increase, then decrease

62. **In a group, the atomic radii:**
A. increase
B. don't change
C. decrease
D. show variable trend

63. **Energy required to remove electron from an atom:**
A. Ionization potential
B. Electropositivity
C. Electronegativity
D. Electron affinity

64. **Ionic bond is produced after complete transfer of:**
A. nucleus
B. electrons
C. neutrons
D. protons

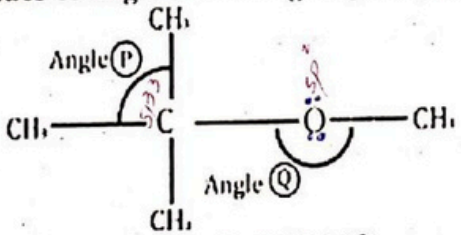
65. **Elements of group IA and IIA are:**
A. electronegative
B. electropositive
C. neutral
D. non-metals

66. **Which one has the least bond angle**
A. NH_3
B. H_2O
C. CH_4
D. BF_3

67. **The bond order in O_2 molecule is**
A. Zero
B. 1
C. 2
D. 3

68. **Total number of valence electrons in phosphonium ion $(PH_4)^+$ is**
A. 8
B. 10
C. 9
D. 12

69. **MTBE is part of petrol:**
What are approximate values of angle P and angle Q in a molecule of MTBE?



A. 90°105°
B. 109°105°
C. 90°180°
D. 109°180°

70. **Which of the following molecule has trigonal planar shape?**
A. NH_3 C. PCl_3
B. BF_3 D. PF_3

71. **The unhybridized "p" orbital in sp^2 hybridization is**
A. Parallel to sp^2 C. Perpendicular to sp^2 orbitals
B. In the same plane D. Out of plane

72. **All are Lewis acids except:**
A. BF_3 C. $AlCl_3$
B. H_2O D. $FeCl_3$

73. **Which of the following compound has sp^3 hybridization:**
A. PCl_5 C. NH_3
B. SF_6 D. HN=NH

74. **The chemical species having smallest bond angle:**
A. NH_3 C. NF_3
B. NCl_3 D. NBr_3

75. **Which of the following has distorted tetrahedral structure?**
A. CCl_4 C. $SiCl_4$
B. ASH_3 D. C_2H_2

76. **CO_2 is iso structural with.**
A. H_2S C. CS_2
B. SO_2 D. $SnCl_2$

77. **Which one of the followings can form strong sigma bond?**
A. $sp^3 - sp^3$ C. $sp^2 - sp^2$
B. $sp - sp$ D. All have same strength

78. **Which one of the followings contains all types of bonds?**
A. NH_4Cl C. HCl
B. $NaCl$ D. $AlCl_3$

79. **The number of unpaired electrons in NH_3:**
A. 0 C. 3
B. 1 D. 4

80. **How many pure covalent bonds are there in NH^+_4 ion:**
A. 0 C. 3
B. 1 D. 4

81. **The number of sigma electrons in ethene are:**
A. 5 C. 4
B. 10 D. 8

82. **Point out the shape and bond angles present in Boron trifluoride:**

	Shape	*Bond angle*
A.	Triangular pyramidal	107°
B.	Tetrahedral	109.5°
C.	Triangular planar	120°
D.	Triangular pyramidal	120°

83. **_____ pair of molecules will have similar shape:**
A. SO_3 and PCl_3 C. CO_2 and SO_2
B. $CdCl_2$ and $SnCl_2$ D. BF_3 and SO_3

84. Which bond is formed first between two atoms?

A. Sigma bond
B. Pi-bond
C. Double bond
D. Triple bond

85. Which of the following has different molecular geometry and electron pair geometry?

A. SO_3
B. $SnCl_2$
C. CO_2
D. BF_3

86. In which of the following compounds, the underlined element does not' have eight electrons in the outer shell

A. $\underline{Li_2}O$
B. $H_2\underline{O_2}$
C. $\underline{P}Cl_3$
D. $P\underline{Cl_5}$

87. In which sequence are the molecules quoted in order of increasing bond angle with in the molecule.

A. H_2O, SF_6, BF_3
B. H_2O, NH_3, CH_4
C. H_2O, CO_2, BF_3
D. CO_2, H_2O, BF_3

88. Molecules having four bond pairs and no lone pair give geometry:

A. Trigonal
B. Tetrahedral
C. Octahedral
D. Triangular

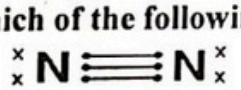
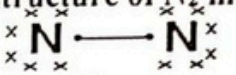
89. The ratio of π and σ bonds in benzene is

A. 1: 2
B. 1: 4
C. 1: 6
D. 3: 6

90. Hybridization of 1 and 2 carbon atom in $^1CH_2 = {}^2C = CH_2$ are

A. sp, sp
B. sp^2, sp^2
C. sp^2, sp
D. sp^3, sp^2

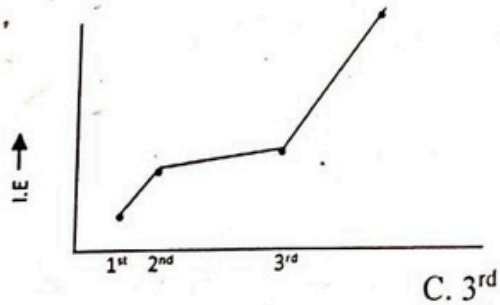
91. Which of the following represents the Lewis structure of N_2 molecule?

A. 
B. 
C. 
D. 

92. The strongest bond is

A. C = C
B. C ≡ C
C. C – C
D. C ≡ O

93. The graph is for I – E of an element of group



A. 1st
B. 2nd
C. 3rd
D. 4th

94. The presence of exactly half-filled valence p – orbital abnormally increases the I.E of

A. Be
B. B
C. N
D. Ne

95. The abnormal electron affinity values are associated with

A. I A
B. II A, V A
C. V A, VII A
D. V A, VIII A

96. **Which two elements have almost same electron affinity values?**
A. F, Cl
B. Cl, Br
C. F, Br
D. Br, I

97. **Which information cannot be deduced from the fact that an element has low I.E?**
A. It is a metal
B. It forms positive ions
C. It may form ionic bond
D. It belongs to p – block

98. **An example of a linear molecule is**
A. C_3H_8
B. C_2H_4
C. C_2H_2
D. SO_2

99. **Which of these will not show AB_4 type geometry?**
A. Group IVA element with 4 single bonds
B. Group V A element with 3 single and one coordinate bond
C. Group VI A element with 2 single and two double bonds
D. Group VI A element with 3 double bonds.

100. **Highest no. of covalent bonds are present in**
A. NH_3
B. NH_4Cl
C. CH_4
D. CO

101. **Which of the following compounds has linear shape?**
A. CO_2
B. CS_2
C. $BeCl_2$
D. All of them

102. **Which of the following molecules show sp hybridization** _____
A. NH_3
B. $AlCl_3$
C. $MgCl_2$
D. BeH_2

103. **The no. of polar covalent bonds in ethanol**
A. 1
B. 2
C. 3
D. 4

104. **Which of these contains only one polar covalent bond?**
A. CH_3F
B. CH_2F_2
C. CHI_3
D. CBr_4

105. **A molecule that has polar bonds but is overall non – polar**
A. IF_7
B. PCl_5
C. CCl_4
D. All

106. **The no. of lp's on oxygen in CO are**
A. 1
B. 2
C. 3
D. 4

107. **Which one is a non-polar compound?**
A. $SnCl_2$
B. PH_3
C. $GeCl_4$
D. H_2O

108. **All of these can act as donor except**
A. Br^-
B. PH_3
C. $GeCl_4$
D. H_2O

109. **What is true for a molecule with standard geometry**
A. It lacks a lp
B. It can't be a donor
C. It can be an acceptor
D. All

110. **All of these have tetrahedral geometry except**
A. HF
B. NH_3
C. H_2O
D. SO_2

111. The shape of $SOCl_2$ molecule is
A. Triangular planar
B. Tetrahedral
C. Linear
D. Distorted tetrahedral.

112. In which of the following the central atom has least no. of lp's.
A. $HClO_3$
B. H_2S
C. H_3O^+
D. $PbCl_4$

113. Identify the one that has different shape than the rest
A. SO_4^{-2}
B. NH_4^+
C. ClO_4^-
D. XeF_4

114. Which pair has the same geometry
A. $BeCl_2$, $SnCl_2$
B. $SnCl_2$, SO_2
C. SO_2, OF_2
D. OF_2, $BeCl_2$

115. Bond angle is minimum in case of
A. NH_3
B. NF_3
C. H_2O
D. CH_4

116. Identify the shortest bond
A. C – C
B. N – N
C. P – P
D. O – O

117. Least bond energy is associated with
A. C – C
B. N – N
C. O – O
D. S – S

118. Which bond deviates maximum from expected bond length
A. C – C
B. Si – H
C. Si – F
D. C – Cl

119. At compromise distance the forces dominating between atoms are
A. repulsive forces
B. Dipole induced dipole forces
C. attractive forces
D. H – bonding

120. Low IE is a symbol of
A. high electronegativity
B. small size
C. High electron affinity
D. metallic character

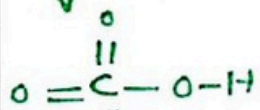
ANSWER KEY

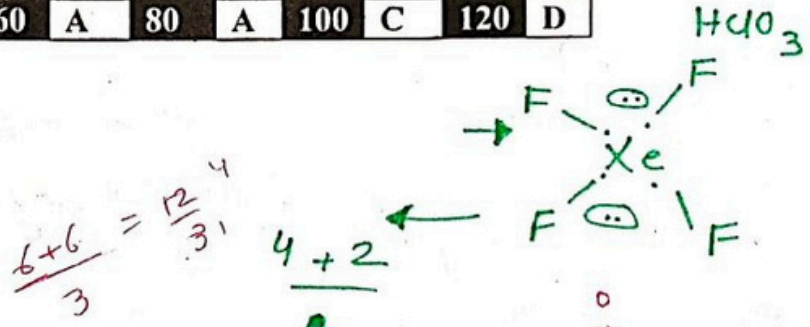
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2	A	22	A	42	D	62	C	82	C	102	D
3	D	23	A	43	A	63	A	83	D	103	B
4	C	24	B	44	C	64	B	84	A	104	A
5	B	25	C	45	D	65	B	85	B	105	D
6	C	26	C	46	C	66	B	86	A	106	A
7	B	27	D	47	C	67	C	87	B	107	C
8	A	28	A	48	A	68	A	88	B	108	C
9	C	29	A	49	B	69	B	89	B	109	D
10	B	30	A	50	B	70	B	90	C	110	D
11	B	31	C	51	C	71	C	91	A	111	D
12	C	32	D	52	B	72	B	92	D	112	D
13	D	33	A	53	A	73	C	93	C	113	D
14	A	34	C	54	A	74	A	94	C	114	B
15	C	35	C	55	A	75	B	95	B	115	B
16	C	36	B	56	B	76	C	96	C	116	D
17	C	37	B	57	B	77	B	97	D	117	C
18	C	38	D	58	B	78	A	98	C	118	C
19	C	39	B	59	D	79	A	99	D	119	C
20	C	40	B	60	A	80	A	100	C	120	D

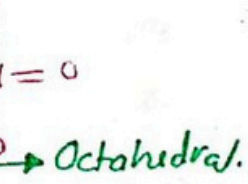
A

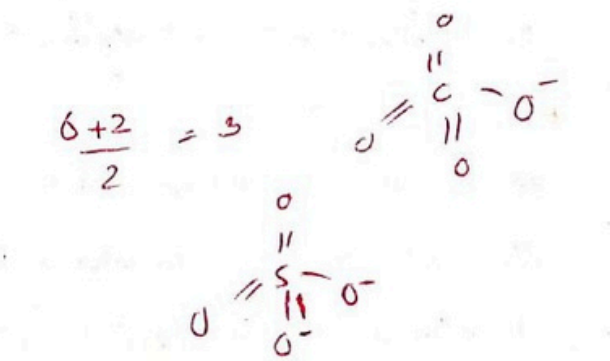
A

86 - D









HINTS

3. Lowest ionization energy

6. sp^2 hybridization leads to planarity

10. Stable electronic configuration

14. Pyramidal shape

15. Triple bond

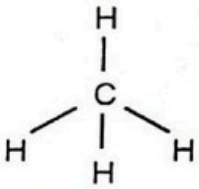
17. Compound formation leads to stability

22. s-orbitals and hybridized orbitals never form pi-bonds.

24. $_9F = 1s^2\ 2s^2\ 2p_x^2\ 2p_y^2\ 2p_z^1$

27. H – H H – F

100% covalent Partially ionic

29. 

Four covalent bonds are directed towards four corners of a regular tetrahedron

34. Sulphur is large sized atom with small electronegativity

36. Electronegativity is calculated using the difference of actual bond energy and calculated bond energy of bonds in a molecule. It value changes from bond to bond.

46. No lone pair

48. sp sp^2 sp^3

180° 120° 109.5°

52. Unhybridized p-orbital lies perpendicular to the sigma sp^2 frame work.

59. Ten valence electrons

68. Three covalent bonds and one coordinate covalent bond.

72. All others are electron deficient compounds with a vacant orbital.

77. Smaller the bond length, higher the bond strength.

80. Once a coordinate covalent bond is formed in a compound, all the covalent bonds start showing coordinate character.

CamScanner

85. For molecules with lone pairs, the molecular geometry and electron pair geometry is different.

89. 3π and 12σ bonds

93. A large increase in ionization energy marks the group no. the element belongs to

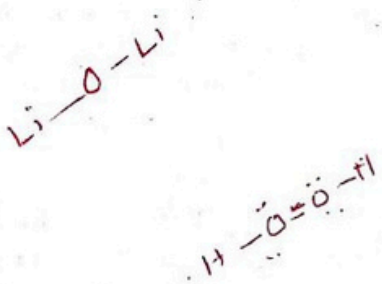
97. In p-block elements, the ionization energy values are usually high

99. Triangular planar

103. C – O – H

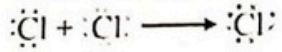
106. :C≡O:

109. Molecules with standard geometry never have a lone pair but can have a vacant orbital e.g. BF_3



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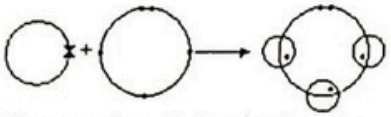
Q.1 Which one of the following is the correct dot and cross diagram of bonding between two chlorine atoms

A. 

B. 

C. 

D. 

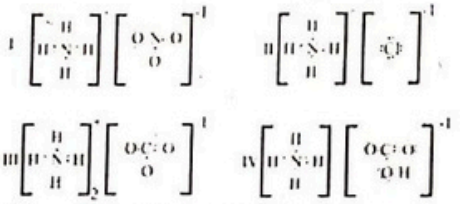
Q.2 

Choose the right molecule

A. CH_3 B. H_2O

C. CO D. NH_3

Q.3 Observe the given dot and cross structures for the following molecules or ionic species.



The co-ordinate covalent bond exists between:

A. N and C atoms in structure III and IV

B. N and one H ion in all four structure

C. N and Cl atoms of structure II

D. N and N atoms of structure I

Q.4 According to Valence shell electron pair repulsion theory, the repulsive forces between the electron pairs of central atom of a molecule are in the order

A. Lone pair bond pair> Lone pair-Lone pair

B. Bond pair> Bond pair> Lone pair-Lone pair> Lone pair-Bond pair

C. Lone pair-Bond pair> Bond pair-Bond pair> Lone pair-Lone pair.

D. Lone pair-Lone pair>Lone pair-Bond pair>Bond pair-Bond pair

Q.5 What is the exact value of angle in BF_3

A. 90° B. 104.5°

C. 119.5° D. 120°

Q.6 Which option show all the molecules with bond angle 109.5°.

A. $SiCl_4$, NH_4^+, CH_4 B. $SiCl_4$, H_2O, $BeCl_2$

C. CH_4, CCl_4, NH_3 D. CH_4, NH_4^+, PH_3

Q.7 The structure of Xenon trioxide is shown below,



With reference to the Valence shell electron pair repulsion theory, (VSEPR), the shape of XeO_3 is:

A. Tetrahedral B. Trigonal pyramidal

C. Bent (or angular) D. Trigonal planar

Q.8 **Which of the following sets constitutes of all the molecules and ions of non-planar geometry?**

A. $SO_2, C_2H_4, BF_3, NO_3^-$
B. $CH_4, NH_4^+, MnO_4^-, NF_3$
C. $CH \equiv CH, H_2O, BeCl_2, H_2S$
D. PH_4^+, NH_3, SO_3, Benzene

Q.9 **The shape of CO_2 molecule is similar to**

A. H_2S
B. SO_2
C. $SnCl_2$
D. BeF_2

Q.10 **What is the shape of ammonia NH_3 molecule?**

A. Pyramidal
B. Linear
C. Tetrahedral
D. Trigonal planar

Q.11 **The number of bonds in nitrogen molecule is**

A. One σ and one π
B. Three σ only
C. One σ and two π
D. Two σ and one π

Q.12 **When the two partially filled atomic orbital overlap in such a way that the probability of finding the electron is maximum around the line joining the two nuclei, the result is the formation of**

A. Sigma bond
B. Hydrogen bond
C. Pi-bond
D. Metallic bond

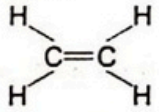
Q.13 **pi- bond is formed by sideways overlap of**

A. s-orbital
B. d-orbital
C. p-orbital
D. None of these

Q.14 **The angle between un-hybridized p-orbital and three sp^2 hy brid orbitals of each carbon atom is**

A. 120°
B. 109.5°
C. 90°
D. 180°

Q.15



Count the number of σ bonds and π bonds in the molecule

A. 1π and 5σ bonds
B. 3π and 3σ bonds
C. 2π and 4σ bonds
D. 6π and 6σ bonds

Q.16 **Which if the following molecule has largest number of shared pair electrons?**

A. NH_3
B. CO_2
C. C_2H_4
D. N_2

Q.17 **Which one of the following molecules has sp^3 hybridization?**

A. CH_4
B. C_2H_2
C. C_2H_4
D. CO_2

Q.18 **According to the Lewis Concept, ammonia is a lone pair donor, therefore easily accepts a proton to form an ammonium ion as given by an equation**

$$NH_{3(g)} + H^+_{(aq)} \longrightarrow NH^+_{4(aq)}$$

A. H–N–H bond angle decrease from 180°-109.5°
B. H–N–H bond angle decrease from 107°-104.5°
C. H–N–H bond angle increase from 107°-109.5°
D. H–N–H bond angle decrease from 109.5°-120°

Q.19 **Which of the following molecule has zero dipole moment?**

A. PCl_3
B. BF_3
C. NH_3
D. H_2O

Q.20 Which one of the following has zero dipole moment:
A. NH_3 B. H_2O
C. $CHCl_3$ D. BF_3

Q.21 Among the following molecules, which one has coordinate covalent (dative) bond?
A. CCl_4 B. CO
C. CO_2 D. CH_4

Q.22 Which of the following molecule has zero dipole moment?
A. PCl_3 B. BF_3
C. NH_3 D. H_2O

Q.23 For formation of ionic bond, electronegatively difference should be
A. Equal to zero B. Equal to 0.5
C. More then 1.7 D. Less than 1.7

Q.24 The ionization energy of hydrogen atom is:
A. Zero B. 131.3kJmole
C.13.13kJ/mole D. 1313kJ/mole

Q.25 The elements for which the value of ionization energy is low can
A. Gain electrons readily B. Gain electrons with difficulty
C. Lose electron less readily D. Lose electron readily

Q.26 Electron affinity of the atom is the energy released when
A. Electron is added to gaseous atom B. Electron is removed from gaseous atom
C. Covalent bond of molecule is broken D. Cov. bond is formed between the atoms

Q.27 The shielding effect of inner electron is responsible for:
A. Decreasing ionization energy
B. Having no effect on ionization energy
C. Increasing ionization energy
D. Increasing electronegativity

Q.28 What will be the shape of a molecule which contains two sigma bond pairs and one lone pair?
A. Linear B. V shape
C. Tetragonal D. Triangular

Q.29 A molecule which contains two lone pairs and two bond pairs of electrons in valence shell of central atom, geometrical shape of molecules will be
A. Tetrahedral B. Trigonal pyramidal
C. Angular D. Linear

Q.30 Fe^{+2} will from the most ionic bond with
A. N^{-3} B. SN^{-3}
C. P^{-3} D. F-1

Q.31 Which of the following elements has lowest first ionization energy?
A. N B. O
C. C D. B

Q.32 Which one of the following elements has the largest second ionization energy?
A. O B. F
C. Na D. N

Q.33 Which equation relates to the fist ionization energy of bromine?

A. $Br_{(g)} \rightarrow Br^{-}_{(g)} + 1e^{-}$ B. $Br_{(g)} \rightarrow Br^{+}_{(g)} + 1e^{-}$

C. $\frac{1}{2}Br_{2(g)} \rightarrow Br^{-}_{(g)} + 1e^{-}$ D. $\frac{1}{2}Br_{2(g)} \rightarrow Br_{g} + 1e^{-}$

Q.34 The bond angle in H_2S is less than H_2O. It is due to

A. Small size of oxygen atom

B. Greater E N of oxygen atom

C. Oxygen contain two lone pairs of electrons

D. All of the above

Q.35 In the second period of elements, although oxygen lies next to nitrogen yet its ionization first energy is lower than that of nitrogen because?

A. In oxygen, there exists repulsion between pair of electrons present in the same orbital of valence shell

B. Oxygen is paramagnetic in character.

C. Nuclear charge of oxygen is greater than nitrogen.

D. Oxygen has higher electron affinity.

Q.36 Nitrogen has the atomic mass of 7. Which of the following electronic configurations is of a Nitrogen atom in ground state?

A. $1s^2, 2s^2, 2px^1, 2py^1, 2pz^1$

B. $1s^2, 2s^2, 2py^2, 2pz^1$

C. $1s^2, 2s^2, 2px^2, 2py^1$

D. $1s^2, 2s^2, 2px^2, 2pz^1$

Q.37 Which of the following has the highest value of electronegativity?

A. I

B. Br

C. Cl

D. F

Q.38 Which of the following hybrid orbital have maximum s-character?

A. sp^3

B. sp^2

C. sp

D. dsp^2

Q.39 The first ionization energy is maximum for

A. Na

B. Mg

C. Al

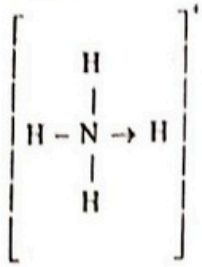
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PAST PAPER QUESTIONS

1	B	6	A	11	C	16	C	21	B	26	A	31	D	36	A
2	D	7	B	12	A	17	A	22	C	27	A	32	C	37	D
3	B	8	B	13	C	18	C	23	B	28	B	33	B	38	C
4	D	9	D	14	C	19	B	24	D	29	C	34	B	39	B
5	D	10	A	15	A	20	D	25	D	30	D	35	A		

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HINTS

3. 

6. All are tetrahedral species.

8. All are AB_4 systems.

14. p – orbital lies perpendicular to the sigma framework of sp^2 hybrid orbitals.

16. 5

21. $C \overset{+}{\equiv} O$

27. Greater repulsion means lower IE.

30. Greatest Δ EN

32. Valence e^- is lost.

34. Bond angle is directly proportional to the EN of the central atom.

35. $_8O = 1s^2 2s^2 2p_x^{\overset{\text{Repulsion}}{2}} 2p_y^1 2p_z^1$

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Q. 1 All elements get their stabilization to attain nearest configuration
A. Alkali metals
B. Noble metals
C. Alkaloids
D. Noble gases

Q. 2 The difference in the E.N values of the bonded atoms between two atoms is an index to _____ of covalent bond
A. Polar nature
B. Non-polar nature
C. Strength
D. Nature

Q. 3 p character in sp
A. 75%
B. 50%
C. 25%
D. 33%

Q. 4 Which bonds are present in molecule of H_2 according to VBT
A. Pi bond
B. Sigma bond
C. Electrovalent bond
D. Double bond

Q. 5 Due to ionic character bond length
A. Decreases
B. Increases
C. Constant
D. None

Q. 6 Which of the following bond has more energy
A. Covalent
B. Polar covalent
C. Non-polar covalent
D. Ionic

Q. 7 Hybridization in ethyne
A. sp-sp
B. sp^2-sp
C. sp^2-sp^2
D. sp^3–sp^3

Q. 8 The geometry of AB_3 type molecule is
A. Trigonal pyramidal
B. Trigonal planar
C. Trigonal bipyramidal
D. Tetragonal

Q. 9 Number of unpaired electrons in Co^{+2}
A. 2
B. 3
C. 4
D. 7

Q. 10 Bond order of O_2^{-2}
A. 0
B. 1
C. 2
D. 3

Q. 11 The cationic radius is always _____ than the atomic radius from which it is derived
A. Higher
B. Larger
C. Moderate
D. Smaller

Q. 12 The valence electron pairs are arranged around the central atom to remain at maximum distance apart to keep repulsion
A. Maximum
B. Moderate
C. Zero
D. Minimum

Q. 13 Geometry of $AlCl_3$
A. AB
B. AB_2
C. AB_3
D. None

Q. 14 Which one is more electronegative
A. F
B. Cs
C. O
D. N

Q. 15 All are AB_2 type except
A. $BeCl_2$ B. $HgCl_2$
C. SO_3 D. $MgCl_2$

Q. 16 Ionization energy is inversely proportional to
A. Nuclear charge B. Shielding effect
C. Atomic size D. Both B and C

Q. 17 Hybridization of carbon in carbonyl group is
A. sp B. sp^2
C. sp^3 D. dsp^3

Q. 18 Ionization energy depends on which of the following factors?
A. Size of atoms B. Nuclear charge
C. Number of shells D. All of these

Q. 19 Angle in ammonia
A. 92 B. 109.5°
C. 180° D. 107.5°

Q. 20 Bond length in alkyne
A. 1.39A° B. 1.54A°
C. 1.20A° D. 1.34°

Q. 21 Shape of H_2S
A. Angular B. Tetrahedral
C. Octahedral D. Trigonal plannar

Q. 22 He follows
A. Duplet rule B. Octet rule
C. Both D. None of these

Q. 23 Extended octet rule
A. Oxonium ion B. H_3O^+
C. PCl_5 D. NH^+_4

Q. 24 The second Ionization Energy is maximum for:
A. Li B. Be
C. B D. C

Q. 25 Valence shell electron pair repulsion theory is given as
A. VESPER B. VSEPR
C. VSER D. All

Q. 26 $SnCl_2$ is an example of
A. AB B. AB_2
C. AB_3 D. AB_4

Q. 27 Which of the following has least bond energy
A. F_2 B. Cl_2
C. Br_2 D. I_2

Q. 28 VSEPR explains the
A. Shapes of molecules B. Bond energy
C. Nature of bond D. Paramagnetic nature of molecule

Q. 29 Bond angle in water
A. 109.5 degree B. 120 degree
C. 107.5 degree D. 104.5 degree

Q. 30 The ionization energy increases from left to right in a period due to increase in
A. Nuclear charge B. Number of electrons
C. Atomic number D. All of these

ANSWER KEY

1	D	11	D	21	A
2	D	12	D	22	D
3	B	13	C	23	C
4	B	14	A	24	A
5	A	15	C	25	B
6	D	16	D	26	C
7	A	17	B	27	D
8	B	18	D	28	A
9	B	19	D	29	D
10	B	20	C	30	D

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UNIT 11 PRACTICE EXERCISE

s and p BLOCK ELEMENTS

1. Highest ionization potential in a period is shown by:
A. Alkali metals
B. Halogen
C. Transition elements
D. Alkaline earth metals

2. Electronegativity of Be is approximately equal to that of
A. Al
B. B
C. Mg
D. Na

3. The following pair represents elements of the same group:
A. A = 17 and A = 38
B. A = 17 and A = 53
C. A = 20 and A = 40
D. A = 11 and A = 33

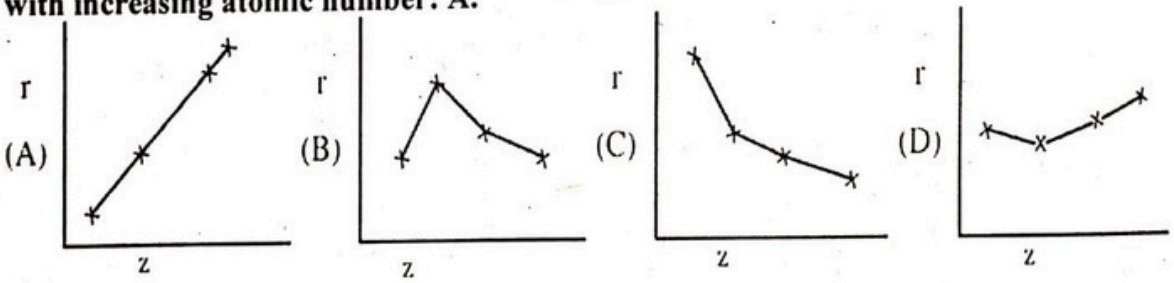
4. Each period in the periodic table starts with a sub shell of a new shell and ends with:
A. Small sub shell
B. The next higher shell
C. Different sub shell of the same shell
D. d-sub shell of the same shell

5. The most nonmetallic out of the following is:
A. Be
B. Mg
C. B
D. Al

6. The first ionization energy is the smallest for the atom of configuration:
A. ns^2np^3
B. ns^2np^5
C. ns^2np^4
D. ns^2np^6

7. An atom with high electro negativity generally has:
A. Tendency to form positive ions
B. Large atomic size
C. High ionization potential
D. Low electron affinity

8. Which diagram shows the variation of atomic radius of group II elements, Mg, Ca, Ba with increasing atomic number: A.



9. The property which shows decreasing trend across the periods (left to right):
A. Ionization energy
B. Electronegativity
C. Melting point
D. Atomic radius

10. The element which shows maximum electrical conductivity among the following is:
A. Na
B. Al
C. Fe
D. Si

11. The element with atomic number 13 belongs to _____ group and _____ period:
A. IA, third
B. IIIA, third
C. IIIA, second
D. IVA, second

12. Most of the known elements are:
A. Metals
B. Metalloids
C. Non metals
D. Transition metals

13. Which of the following has maximum first ionization potential
A. Al
C. Si

B. P D. Mg

14. **The correct order of radii is:**
A. Na < Li < K < Cs C. Li < K < Na < Cs
B. N < Be < B < Li D. S < P < Si < Al

15. **Potassium forms K^{1+} ion and not K^{2+} easily because:**
A. $I.E_1 > I.E_2$ C. $I.E_1 <<< I.E_2$
B. $I.E_1 = I.E_2$ D. $I.E_1 \leq I.E_2$

16. **The word Alkali means**
A. Base C. Basic salt
B. Ashes D. Spirit

17. **The elements which are most abundant in earth crust.**
A. Si & Al C. Ca & Mg
B. B & Ar D. All

18. **A sudden large difference between the values of second and third ionization energies of elements would be associated with which of the following electronic configuration:**
A. $1s^2, 2s^2, 2p^6$ C. $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$
B. $1s^2, 2s^2, 2p^6, 3s^2$ D. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^4$

19. **Many properties of an element and its compound can be predicted from the position of the element in the periodic Table. What property could not be predicted in this way?**
A. The acidic or basic nature of its oxides C. The formula of its oxide
B. The charge on its ions D. The number of isotopes it has

20. **The table shows the electronic structures of five elements**

Element	electron structure
P	2, 4
Q	2, 8, 2
R	2, 8, 5
S	2, 8, 6
T	2, 8, 8, 1

Which two elements form ionic chlorides?
A. P and S C. R and S
B. Q and T D. R and T

21. **Keeping in view the size of atoms, which order is the correct one:**
A. Mg > Sr C. Ba > Mg
B. Lu > Ce D. Cl > I

22. **Carbonates of Li are not stable like that of sodium due to**
A. Low electronegativity C. Low electropositivity
B. High charge density of Li^+ D. All of the above

23. **Which one of the following is not an alkali metal?**
A. Fr C. Cs
B. Rb D. Ra

24. **Melting Point is highest for the elements of group:**
A. IA C. IIA
B. IIIA D. IV A

25. **An element having high, I.E & E.A is likely to belong to:**
A. Group IA C. Group IB
B. Group VIIA D. Group VIIIA

26. An element has electronic configuration $1s^2$, $2s^2$, $2p^2$. with which group does this element belong:
A. Group II
B. Group VII
C. Group IV
D. Group zero

27. The property, which increases up to the middle of the period & then decreases is:
A. Ionization energy
B. Melting & boiling points
C. Atomic energy
D. Atomic volume

28. Ionization energy depends upon:
A. Nuclear charge
B. Shielding effect
C. Atomic size
D. All of the these and nature of orbital

29. Iodine is solid due to:
A. Strong covalent character
B. High polarizability
C. Strong dipole moment
D. Strong Debye forces

30. Which of the following species require least amount of energy to remove one electron:
A. Ne
B. Mg
C. Na
D. Al

31. Which one of the following metal sulphates is not soluble in water?
A. Na_2SO_4
B. $BaSO_4$
C. K_2SO_4
D. $ZnSO_4$

32. Which of the following is isoelectronic with carbon atom?
A. Na^+
B. O^{2-}
C. Al^{+3}
D. N^+

33. Second ionization potential of alkali metals are very high as:
A. These are s-block elements
B. they have ns^2 electronic configuration
C. they obtain inert gas configurations
D. They are metals

34. Carbon exists as allotropes, which are different crystalline or molecular forms of the same substance. Graphite and diamond are allotropes of carbon. Diamond is a non-conductor whereas graphite is a good conductor because:
A. Graphite has a layered structure
B. In graphite, all valence electrons are tetrahedrally bound
C. In graphite one of valence electron is free to move
D. Graphite is soft and greasy bound

35. More the ionization energy of an element:
A. More the electropositivity
B. More the reducing power
C. Less the metallic character
D. Bigger the atomic radius

36. What is the trend of melting and boiling point of the elements of short periods as we move from left to right in a periodic table?
A. Melting and boiling points first decrease then increase
B. Melting and boiling points increase gradually
C. Melting and boiling points first increase then decrease
D. Melting and boiling points decrease gradually

37. Along a period, atomic radius decreases. This gradual decrease in radius is due to:
A. Increase in number of electrons in valence shells
B. Increase in number of protons in the nucleus
C. Decrease in number of shells
D. Increase in number of shells

38. **Arrange the following elements according to the trend of ionization energies.**
A. Ne < N < C < B
B. B < N < C < Na
C. B < C < N < Ne
D. Ne < B < C < N

39. **Which one of the following will have the smallest radius?**
A. Al^{+3}
B. Si^{+4}
C. Mg^{+2}
D. Na^{+1}

40. **Keeping in view the size of atoms, which order is correct?**
A. N > C
B. P > Si
C. F > Cl
D. Li > Be

41. **Melting points of group II-A elements are higher than those of group I-A because:**
A. Atoms of II-A elements have smaller size
B. II-A elements are more reactive
C. Atoms of II-A elements provide two binding electrons
D. I-A elements have smaller atomic radius

C N
Si P

42. **The ionic radius of fluoride ion is:**
A. 72 pm
B. 95 pm
C. 136 pm
D. 157 pm

43. **Melting point of IA & IIA group decrease down the group due to _____:**
A. Strong electronegativity
B. Strong attractive forces
C. Increment in size
D. High Ionization energy

44. **The following sketch shows the variation in a physical property of third period elements against their number:**



What physical property is plotted in this sketch?
A. Ionic radius
B. Ionization energy
C. Melting point
D. Atomic radius

45. **Halogen having greatest electron affinity is:**
A. I
B. F
C. Cl
D. Br

46. **Which one of the following alkali metal forms only normal oxide with O_2?**
A. Li
B. Na
C. K
D. Rb

47. **Strongest reducing agent among the halogens is:**
A. Cl_2
B. Br_2
C. F_2
D. I_2

48. **Melting points of halogens.**
A. Decrease down the group
B. Remain the same throughout the group
C. Increase down the group
D. First increase and then decrease down the group

49. **In which of the following atomic radii of elements decreases by increasing atomic number:**
A. Alkali metal
B. Alkaline earth metal
C. Elements from Li to Ne
D. Halogens

50. **Which of the following iso-electronic species has largest size:**
A. N^{3-}
B. O^{2-}
C. F^-
D. Na^+

51. **Which element has highest ionization energy:**
A. Na
B. P
C. Al
D. Ar

52. **Which metal of II A does not react with H_2O?**
A. Be
B. Ca
C. Mg
D. Sr

53. **Ionization energy of Calcium is.**
A. Lower than that of Barium
B. Lower than that of Magnesium
C. Higher than that of Beryllium
D. Lower than that of Strontium

54. **In which group of periodic table is the element which has atomic number 14.**
A. I
B. IV
C. V
D. VI

55. **Consider the ion pairs listed below, indicate for which pair does the second ion has a larger ionic radius than the first one.**
A. Na^+, Mg^{+2}
B. Cs^+, K^+
C. Br^-, Cl^-
D. Cl^-, S^{-2}

56. **Among the following, which one is least reactive metal:**
A. Mg
B. Ca
K L M N
C. Na
D. Be

57. **Alkali means**
A. Base
B. Both
C. Salt
D. Ash

58. **The shielding effect is also called**
A. Zee effect
B. Screening effect
C. Negative effect
D. Reducing effect

59. **Due to the formation of protective layer of oxides at aluminum oxide surface, it is hard to burn it**
A. Completely in air
B. Completely in oxygen
C. With carbon
D. With nitrogen

60. **In M shell, which subshells are present**
A. s
B. s, p
C. s, p, d
D. s, p, d, f

61. **Greater no. of protons in the nucleus pull the valence electrons more towards the nucleus as a general rule. In a group, moving down, the no. of protons increase significantly so the size**
A. will decrease
B. Will decrease significantly
C. will increase
D. will decrease slightly

62. **The abnormal I.E values are related to groups**
A. *IIA , VA*
B. VA, VIIA
C. *IIIA , VIA*
D. *IA , VIIA*

63. **M.P of *IA* elements**
A. decrease down the group due to decrease in *I.E*
B. decrease down the group due to weaker binding forces
C. increase down the group due to stronger metallic bonding
D. increase down the group due to decrease in *I.E*

64. **Increase in atomic size _____ the M.P of a group of metals and _____ the M.P of a group of non – metals**
A. increases, increases
B. decreases, decreases
C. increases, decreases
D. decreases, increases

65. **Which of the following has the highest *I.M.F's***
A. P_4
B. S_8
C. Cl_2
D. Ar

(Intermolecular forces of attractions).

66. **Exceptionally high electrical conductivity has been reported for elements of**
A. *IA*
B. *IIA*
C. *IB*
D. *IIB*

$1s^2, 2s^2, 2p^6, 3s^2, 3p^6$ = 18.

67. ***M.P* of *P* is less than Si due to**
A. H. bonding in P_4
B. London forces between P_4
C. Covalent bonding within P_4
D. Polymeric covalent 3D structure of P_4

68. **A specie has electronic configuration of $3s^2, 3p^6$ what is incorrect about the specie**
A. Its size can be higher than size of Ar
B. Its E.A can be higher than E.A of Ar.
C. Its I.E can be lower than I.E of Ar.
D. Its electron count can be lower than that of Ar $\bar{e}$ count

69. **In isoelectronic anions, least size is linked to ion with**
A. Most electrons
B. Most negative charge
C. Least negative charge
D. Most neutrons

70. **The metal that forms oxide on reaction with boiling water**
A. Be
B. Mg
C. Ca
D. Sr

71. **All of these form acidic oxides except**
A. B
B. C
C. Si
D. Be

72. **Ionic radius along the period decreases due to:**
A. Addition of a new shell
B. High Ionization energy
C. Increase in nuclear charge
D. Decrease in nuclear charge

73. **Among the following, which one is least reactive metal:**
A. Mg
B. Ca
C. K
D. Cs

74. **Second ionization potential of alkali metals are very high as:**
A. These are s-block elements
B. they have ns^2 electronic configuration
C. they obtain inert gas configurations
D. They are metals

75. **Most of the known elements are metals of _____ of periodic table.**
A. d – block
B. p – block
C. III – group
D. Zero group

76. **The lowest ionization energies are found in the _____**
A. Inert gases
B. Alkali metals
C. Transition elements
D. Halogens

77. **Which is the highest melting halide?**
A. NaCl
B. NaF
C. NaBr
D. NaI

78. **The highest boiling point of HF amongst the hydrogen halides is due to**
A. Lowest electronegativity of F
B. Lowest atomic weight of F
C. Highest electronegativity of F
D. Lowest atomic radius of F

79. **The dry ice is**
A. Solid ice without water
B. Solid SO_2
C. Solid CO_2
D. Solid C_6H_6

80. **_____ ion has the largest radius.**
A. Al^{+3}
B. Cl^{-1}
C. F^{-1}
D. O^{-2}

81. **One of the following species is not iso-electronic with Al^{3+}. Which is that**
A. Sr^{2+}
B. F^-
C. Na
D. Mg^{2+}

82. **The radii of H, H^+ and H^- are in the order of**
A. $H^+ > H > H^-$
B. $H^- > H > H^+$
C. $H > H^- > H^+$
D. $H > H^+ > H$

83. **The ionization energy of an element is**
A. The energy released when an electron is added to an atom of the element
B. The same as the electron affinity of element
C. Equal in magnitude but of opposite sign to the electron affinity of the element
D. The energy required to remove the outermost electron of an atom of the element

84. **The power of an atom to attract shared pair of electrons towards itself in a molecule is called**
A. Electron Affinity
B. Ionization Potential
C. Electronegativity
D. Hydration Energy

85. **Which one of the following elements has greater electronegativity value?**
A. N
B. O
C. Br
D. C

86. **Which statement is correct?**
A. Loss of valence electron may lead to loss of valence shell
B. Radius of isoelectronic ions decreases left to right in 3rd period
C. Anionic radius increases with magnitude of negative charge
D. All of these

87. **Which of the following group of elements has highest 1st electron affinity?**
A. IA
B. IIA
C. VIA
D. VIIA

88. **Which one of the following is acidic in nature?**
A. Al_2O_3
B. CO
C. CO_2
D. CaO

89. **Third period element that initially reacts rapidly with oxygen to form a protective oxide coating that prevents father reaction is:**
A. Na
B. Si
C. Al
D. Mg

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90. The yellow flame shown by sodium in Bunsen flame is due to excitation of electron.
A. 2p to 3s
B. 4p to 4s
C. 3p to 1s
D. 5p to 4s

91. Which of the following halogens has abnormally small electron affinity?
A. F
B. Br
C. I
D. Cl

92. Melting points of group IIIA elements are considerably higher than those of group IA elements because
A. Size of IIIA is greater than IA
B. I.E of IIIA is less than IA
C. I.E of IIIA is higher than IA
D. IIIA provide more binding electron

93. When sodium is heated with excess of O_2, which of the following is formed?
A. NaO
B. Na_2O
C. NaO_2
D. None of these

94. Which of the following has a greater affinity for oxygen?
A. B
B. K
C. Na
D. Mg

95. Correct order of melting point of group II A elements
A. Be > Mg > Ca
B. Mg > Be > Ca
C. Ca > Be > Mg
D. Be > Ca > Mg

96. In which group melting and boiling point decreases down the group
A. IA
B. VIIIA
C. VIIA
D. VA

97. The element which has boiling point less than 0°C is
A. Beryllium
B. Boron
C. Carbon
D. Nitrogen

98. Which of the following is the strongest base?
A. $Si(OH)_4$
B. $Mg(OH)_2$
C. $Be(OH)_2$
D. $Al(OH)_3$

99. Which of the following give strong alkaline solution in water?
A. Sodium
B. Potassium
C. Beryllium
D. Magnesium

100. The elements of group I-A react violently with water and make the solution
A. Neutral
B. Acidic
C. Amphoteric
D. Alkaline

101. What is the nature of reaction $Li_2O + H_2O \longrightarrow 2LiOH_{(aq)}$
A. Decomposition
B. Redox
C. Acid-base
D. Organic synthesis

102. Which one of the following doesn't react with water even at red hot temperature
A. Be
B. Ca
C. Mg
D. Ba

ANSWER KEY

1	B	11	B	21	C	31	B	41	C	51	D	61	C	71	D	81	A	91	A	101	C
2	A	12	A	22	C	32	D	42	C	52	A	62	A	72	C	82	B	92	D	102	A
3	B	13	B	23	D	33	C	43	C	53	B	63	B	73	A	83	D	93	D		
4	C	14	D	24	D	34	C	44	C	54	B	64	D	74	C	84	C	94	B		
5	C	15	C	25	B	35	C	45	C	55	D	65	B	75	A	85	B	95	C		
6	C	16	B	26	C	36	C	46	A	56	D	66	C	76	B	86	D	96	A		
7	C	17	A	27	B	37	B	47	C	57	D	67	B	77	B	87	D	97	D		
8	A	18	B	28	D	38	C	48	C	58	B	68	D	78	C	88	C	98	B		
9	D	19	D	29	B	39	B	49	C	59	B	69	C	79	C	89	C	99	B		
10	B	20	D	30	C	40	D	50	A	60	C	70	B	80	B	90	A	100	D		

HINTS

3. A = Cl B = I

5. Left to right non-metallic character increases.

10. Three electrons per at for conduction.

18. IIA elements show very high 3rd ionization energy.

24. Max. Number of binding electrons.

32. C and N^+ have electronic configuration of $1s^2\ 2s^2\ 2p^2$

38. In a period ionization energy increases.

43. Larger sized atoms have less close packing / loose packing.

48. Due to increase in polarizability.

61. Shielding effect and greater no. of shells are the dominant factors here.

65. Highest atomicity

68. $3s^2\ 3p^6$ means at least $18e^-$

80. It has 3-shells.

91. Due to high charge density.

95. Mg shows abnormally low MP due to loose metallic packing.

100. Alkali metal oxides are basic in nature.

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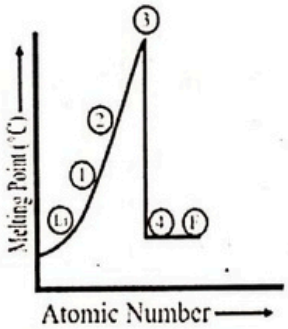
Q.1 Energy required to remove an electron from gaseous neutral atom is:

A. Electron affinity
B. Lattice energy
C. Ionization energy
D. Crystal energy

Q.2 The elements for which the value of ionization energy is low can

A. Gain electrons readily
B. Lose electron less readily
C. Gain electrons with difficulty
D. Lose electron readily

Q.3 The diagram below is a plot of melting points of elements of second period against their atomic numbers. Lithium and fluorine are placed at the extreme ends of the plot. On the basis of melting points where would you place carbon among the empty slots on the plot?



A. 1
B. 4
C. 2
D. 3

Q.4 Which one remains same along a period?

A. Atomic radius
B. Number of shells (orbits)
C. Melting point
D. Electrical conductivity

Q.5 More the ionization energy of an element

A. More the electro positivity
B. Less the metallic character
C. More the reducing power
D. Bigger the atomic radius

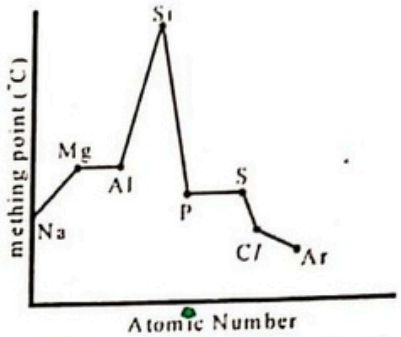
Q.6 Along a period, atomic radius decreases. This gradual decrease in radius is due to:

A. Increase in number of shells
B. Increase in number of protons in the nucleus
C. Melting and boiling points first decrease then increase
D. Melting and boiling points first increase then decrease

Q.7 What is the trend of melting and boiling points of the elements of short periods as we move from left to right in a periodic table?

A. Melting and boiling points decrease gradually
B. Melting and boiling points first decrease then increase
C. Melting and boiling points increase gradually
D. Melting and boiling points first increase then decrease

Q.8 The trends in melting points of the elements of 3rd period are depicted in figure below



The sharp decreases observed from 'Si' to 'P' is due to

A. Decrease in atomic radius from 'Si' to 'P'
B. Change in bonding and structure of two elements
C. Different densities of two elements
D. Increase in electron density from 'Si' to 'P'

Q.9 Arrange the following elements according to the trends of ionization energies C, N, Ne, B

A. Ne < N < C < B
B. B < C < N < Ne
C. B < N < C < Ne
D. Ne < B < C < N

Q.10 Keeping in view the size of atoms, which order is correct?

A. N > C
B. Ar > Cl
C. P > Si
D. Li > Be

Q.11 Which one of the following will have the smallest radius?

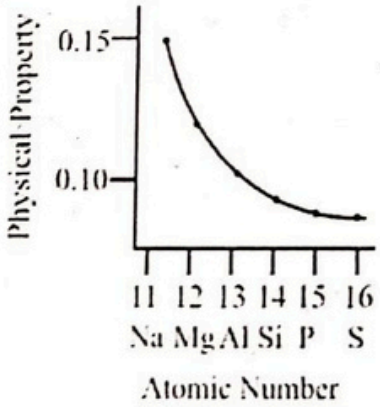
A. Al^{+3}
B. Mg^{+2}
C. Si^{+4}
D. Na^{+1}

Q.12 The ionic radius of fluoride ion is:

A. 72 pm
B. 136 pm
C. 95 pm
D. 157 pm

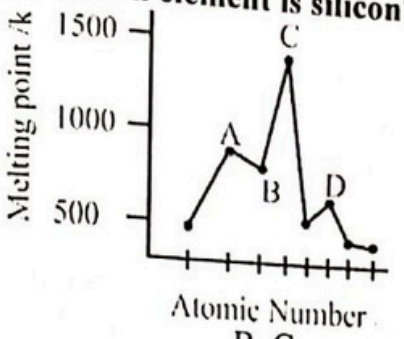
"Actual value of ionic radius of fluoride ion is **133 pm**"

Q.13 Following graph shows a physical property along the period 3 elements. Which physical property is



A. Electron affinity
B. Non-metallic character
C. Atomic radius
D. Melting point up to group IVA

Q.14 The following sketch shows the melting point of eight elements with consecutive atomic numbers. Which element is silicon?



A. A
B. C
C. B
D. D

Q.15 Ionic radius along the period decreases due to:

A. Addition of a new shell
B. High Ionization energy
C. Increase in nuclear charge
D. Decrease in nuclear charge

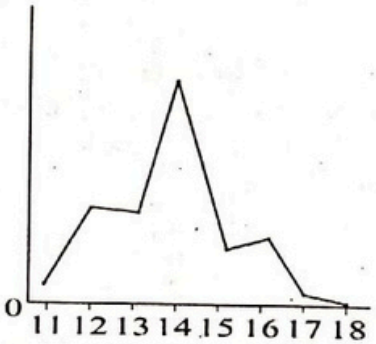
Q.16 Down the group acid-base behavior of metallic oxides of group 2 elements changes to

A. More basic
B. No change
C. Less basic
D. More acidic

Q.17 In period 2 and period 3 maximum melting point shown by elements

A. Lithium and sodium
B. Carbon and silicon
C. Neon and argon
D. Nitrogen and phosphorous

Q.18 The following sketch show the variation in a physical property of third period elements against their number:



What physical property is plotted in this sketch?

A. Ionic radius
B. Melting point
C. Ionization energy
D. Atomic radius

Q.19 The strongest acid among the following is:

A. HF
B. HBr
C. HCl
D. HI

Q.20 When the elements of group 2A are exposed to air, they quickly become coated with layer of oxide. What is the purpose of this oxide layer

A. The oxide layer exposes the metal to atmospheric attack
B. The oxide layer increases the reactivity of metal
C. The oxide layer protects the metal from further attack
D. No layer forms

Q.21 Alkaline earth metal hydroxides decompose on heating. Which of the following reactions is a correct representation of this decomposition?

A. $M(OH)_{2(s)} \longrightarrow MO_{(s)} + H_2O_{(l)}$
B. $2MOH_{(s)} \longrightarrow 2MO_{(s)} + H_2(g)$
C. $MOH_{(s)} \longrightarrow M_2O_{(s)} + H_2O_{(l)}$
D. $4MOH_{(s)} \longrightarrow 4M_{(s)} + H_2O_{(l)} + O_{2(s)}$

Q.22 Melting points of group II-A elements are higher than those of group I-A because:
A. Atoms of II-A elements have smaller size
B. II-A elements are more reactive
C. Atoms of II-A elements provide two binding electrons
D. I-A elements have smaller atomic radius

Q.23 Among the following, which one is least reactive metal:
A. Mg
B. Na
C. Ca
D. Be

Q.24 Melting point of Na & Mg decreases down the group due to:
A. Strong electronegativity
B. Increment in size
C. Strong attractive forces
D. High Ionization energy
"This is actual question given in UHS but statement of this question should be "Melting point of Na & Mg "GROUP"decreases down the group due to"

Q.25 Which element has the highest electron affinity among halogens?
A. F
B. I
C. Cl
D. Br

Q.26 Which one of the following properties decreases across the third period of elements in the periodic table?
A. Electronegatively
B. Ability to act as reducing agent
C. Ionization energy
D. Melting and boiling points

Q.27 In the 3rd period of the periodic table which of following property is decreasing consistently?
A. Electrical conductivity
B. Ionization energy
C. Melting point
D. Atomic radius

Q.28 In the third period of elements, there lies element "X" which is metallic in nature and it can reduce chlorine gas rapidly. To which group of elements does "X" belong?
A. IIA
B. VIIA
C. IVA
D. IA

Q.29 The hydration energy of Mg^{2+} is less than
A. Na^{+1}
B. Ca^{2+}
C. Li^{+1}
D. Al^{3+}

Q.30 Which alkaline earth metal makes peroxides?
A. Ba
B. Be
C. Mg
D. Ca

Q.31 Lithium reacts with air to form
A. Li_2O
B. Li_3N
C. $Li_2O_2 + Li_2CO_3$
D. Both A and B

Q.32 How many elements are there in the 3 period of periodic table?
A. 18
B. 8
C. 32
D. 10

Q.33 Which oxides of "K" contain more oxygen than is normal oxide?
A. Peroxide
B. Super oxide
C. Both contain equal quantity
D. None of the above

Q.34 Modern periodic table is arranged in ascending order of?
A. Atomic mass
B. Mass number
C. Nucleon number
D. Proton number

Q.35 Ionization energy decrease down the group from top to bottom due to:
A. Decrease in atomic size
B. Increase in atomic mass
C. Increase in shielding effect of the intervening electrons
D. Increase in proton number

Q.36 Oxidation number of particular element can be directly or indirectly inferred from its:
A. Physical state
B. Group number
C. Atomic size
D. Atomic mass

Q.37 Potassium, Rubidium, Cesium reacts with oxygen to form which types of oxides?
A. Peroxide
B. Superoxide
C. Suboxide
D. Normal oxide

Q.38 Magnesium reacts with nitrogen to form
A. Mg_2N_2
B. Mg_3N_2
C. MgN_2
D. MgN

Q.39 Densities of alkali metals are low due to
A. Weak intermolecular forces
B. Large atomic volume
C. Smaller size
D. ns^1 configuration

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1	A	6	B	11	C	16	A	21	A	26	B	31	D	36	B
2	D	7	D	12	B	17	B	22	C	27	D	32	B	37	B
3	D	8	B	13	C	18	B	23	D	28	D	33	B	38	B
4	B	9	B	14	B	19	D	24	B	29	D	34	D	39	B
5	B	10	D	15	C	20	C	25	C	30	A	35	C		

HINTS

6. Greater nuclear charge means stronger attraction and smaller size.
8. Si is a covalent solid while P is a molecular solid.
9. On moving from left to right in a period ionization energy increases.
10. Although Ar > Cl is also correct but abnormal increase in the size of noble gases is not discussed in many syllabi so it is not selected as correct option.
11. For isoelectronic cations, size decreases along the period.
16. Increase in metallic character.
22. Binding electrons are greater in no.
24. Greater size means loose packing for metals.
28. Although IIA also does the same but out of IA and IIA, IA is selected due to the highest reactivity with halogens.
39. Density is inversely proportional to atomic volume.

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Q. 1 Addition of second electron to a uni-negative ion always_____?
A. An endothermic process
B. An exothermic process
C. Neutral process
D. Energy wasted

Q. 2 Calcium and magnesium react with _____ to form hydrogen gas
A. Dilute nitric acid
B. Nitrogen dioxide
C. Nitric oxide
D. Nitrous

Q. 3 Shells in calcium are
A. 2
B. 3
C. 4
D. 5

Q. 4 In M shell, which subshells are present
A. s
B. S, p
C. s, p, d
D. S, p, d, f

Q. 5 When Al is burnt in air flame produced will be
A. Blue
B. Violet
C. White
D. None

Q. 6 Choose the most basic oxide
A. SnO_2
B. MgO
C. Na_2O
D. SiO_2

Q. 7 Gypsum is applied to the soil as a source of
A. Ca and P
B. Ca and S
C. S and P
D. We could not apply

Q. 8 The _____ study of composition of pure substance in 17th century clearly shows that few elements are components of many substances
A. Qualitative
B. Quantitative
C. Both A and B
D. Extensive

Q. 9 In periodic table, the period number tells the
A. Number of shell
B. Electronic configuration
C. Metallic character
D. Photon

Q. 10 The ionic radius of an ion is the radius of the ion while considering it to be _____ in sample
A. Oval
B. Rectangular
C. Round
D. Spherical

Q. 11 Sodium is not observed in +2 oxidation state because of its
A. High first ionization potential
B. High second ionization potential
C. High ionic radius
D. High electronegativity

Q. 12 Electron affinity of an atom is the energy released when an electron _____ to an empty or partially filled orbital of an atom to form _____.
A. Removed, cation
B. Added, anion
C. Added, cation
D. Removed, anion

Q. 13 By increasing which of the following factor polarizability increases?
A. Atomic radius
B. Ionization energy
C. Ionic radius
D. Hydration energy

Q. 14 Which of the following family is linked with plant ashes?
A. Nitrogen family
B. Alkali metals
C. Rare earth metals
D. Oxygen family

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Q. 15 Which ion will have a maximum value of the heat of hydration?
A. Al^{+3} B. Cs^{+}
C. Ba^{+} D. Mg^{+2}

Q. 16 Covalent character of hydrides decreases _____?
A. Down the group B. Along period
C. Along d-block D. All of these

Q. 17 Which one is an index to metallic character?
A. Ionization energy B. Atomic radius
C. Electron affinity D. Electronegativity

Q. 18 Which one of the following carbonate is water-insoluble?
A. Na_2CO_3 B. K_2CO_3
C. $(NH_4)_2CO_3$ D. $CaCO_3$

Q. 19 Due to the formation of protective layer of oxides at aluminum oxide surface, it is hard to burn it
A. Completely in air B. Completely in oxygen
C. With carbon D. With nitrogen

Q. 20 Ionization energies of atoms depends upon the factors
A. Atomic radius of atoms B. Nature of orbital
C. Shielding effect of inner electrons D. All of these

Q. 21 Alkali means
A. Base B. Salt
C. Both D. Ash

Q. 22 As far as nuclear charge increases, the decrease in ionic radii will also
A. Large B. Smaller
C. Remains same D. Moderate

Q. 23 Which of the following element has highest electronegativity?
A. Fluorine B. Magnesium
C. Sodium D. Bromine

Q. 24 The most common positive ions are formed by the atoms
A. Non metals B. Metals
C. Noble gases D. Hydrogen

Q. 25 The shielding effect is also called
A. Zee effect B. Screening effect
C. Negative effect D. Reducing effect

Q. 26 Size of molecule depends on
A. No. of atoms B. Shape of atoms
C. Nature of atom D. All of these

ANSWER KEY

1	A	6	C	11	B	16	A	21	D	26	D
2	A	7	B	12	B	17	A	22	A		
3	C	8	B	13	A	18	D	23	A		
4	C	9	A	14	B	19	B	24	B		
5	C	10	D	15	A	20	D	25	B		

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UNIT 12

PRACTICE EXERCISE

TRANSITION ELEMENTS

1. The strength of binding energy of transition elements depends upon:
A. Number of electron pairs
B. Number of unpaired electrons
C. Number of neutrons
D. Number of protons

2. Group VIB of transition elements contains:
A. Zn, Cd, Hg
B. Fe, Ru, Os
C. Cr, Mo, W
D. Mn, Te, Re

3. Stability of Cu-metal is due to _____ filled of d-orbital
A. Half
B. Partially
C. Completely
D. Quarterly

4. Group of element that belong to IIB group
A. Zn, Cd, Hg
B. Sc, Y, La
C. Cu, Ag, Au
D. Ni, Pd, Pt

5. Which of the following shows group IIIB
A. Zn, Cd, Hg
B. Sc, Y, La
C. Cu, Ag, Au
D. Ni, Pd, Pt

6. $[Ti(H_2O)_6]^{3+}$ absorbs
A. Blue light
B. Yellow light
C. Red light
D. Both A& B

7. Which of the following have completely filled d-subshell?
A. Fe, Co, Ni
B. Cu, Ag, Au
C. Ni, Pd, Pt
D. Zn, Cd, Hg

8. Which one of the following belongs to transition elements?
A. Lead
B. Gold
C. Tin
D. Arsenic

9. The maximum oxidation state of Mn is:
A. +6
B. +5
C. +7
D. +4

10. A transition element X has a configuration [Ar] $4s^1 3d^4$ in its +3 oxidation state. Its atomic number is
A. 25
B. 22
C. 26
D. 19

11. Paramagnetic behaviour is caused by the presence of:
A. Unpaired electrons
B. Paired electrons
C. Paired protons
D. Paired electrons in an atom, molecule or ion

12. The number of unpaired electrons present in Fe^{3+} ions is
A. 1
B. 5
C. 2
D. 0

13. Zn has:
A. Zero unpaired electrons
B. Five unpaired electrons
C. Three unpaired electrons
D. One paired electrons

14. **Highest oxidation state of the transition element is**
A. +8 C. +7
B. +5 D. +1

15. **When light is exposed to a typical transition element, then electrons jumps from lower orbitals to higher orbitals in:**
A. f-orbitals C. s-orbitals
B. p-orbitals D. d-orbitals

16. **In $[Ti(H_2O)]^{3+}$ which colour is transmitted**
A. Yellow C. Blue and red
B. Blue and yellow D. red and yellow

17. **Which of the following d blocks element can show the highest oxidation number in its compound:**
A. Chromium C. Copper
B. Iron D. Manganese

18. **Oxidation state of 'Mn' in $KMnO_4$, K_2MnO_4, MnO_2 and $MnSO_4$ is in the order:**
A. +7, +6, +2, +4 C. +7, +6, +4, +2
B. +6, +7, +2, +4 D. +4, +6, +7, +2

19. **Which one of the following belongs to first transition series?**
A. Silver C. Iron
B. Gold D. Mercury

3 4 5 6
Sc Ti V Cr Mn Fe Co Ni

20. **Substance that are repelled by a magnetic field are known as:**
A. Paramagnetic substances
B. Diamagnetic substances
C. Ferromagnetic substances
D. Paramagnetic and Diamagnetic substances

21. **Elements found in d-block of periodic table are termed as:**
A. Main group elements C. Transition elements
B. Normal elements D. Representative elements

22. **Which pair of transition elements shows abnormal electronic configuration?**
A. Sc and Zn C. Zn and Cu
B. Cu and Sc D. Cu and Cr

23. **Which one pair has the same oxidation state of 'Fe'?**
A. $FeSO_4$ and $FeCl_3$ C. $FeSO_4$ and $FeCl_2$
B. $FeCl_2$ and $FeCl_3$ D. $Fe_2(SO_4)_3$ and $FeSO_4$

24. **The transition metal having atomic number 30 has electronic configuration of**
A. $[Ar]\ 3d^8\ 4s^2$ C. $[Ar]\ 3d^{10}\ 4s^1$
B. $[Ar]\ 3d^{10}\ 4s^2$ D. $[Ar]\ 3d^9\ 4s^2$

25. **Electronic configuration of Cu^{+2} is:**
A. $4s^2 3d^9$ C. $4s^1 3d^{10}$
B. $4s^0 3d^9$ D. $5s^0 4d^9$

26. **Which of the elements has seven electrons in d-subshell?**
A. Zn C. Cu
B. Co D. Fe

27. **The most common oxidation states of iron are:**
A. +1 and +2 C. +2 and +3
B. +1 and +3 D. +3 and +4

28. **What is the correct electronic configuration for Ti^{2+} iron?**
A. $[Ar]4s^2 3d^0$ C. $[Ar]4s^0 3d^0$
B. $[Ar]4s^0 3d^2$ D. $[Ar]4s^1 3d^1$

29. **Which ion has maximum number of unpaired electrons in 3d subshell and shows maximum paramagnetic behavior?**
A. Cr^{+3} C. Ni^{+2}
B. Co^{+2} D. Fe^{+3}

30. **The total number of 3d-series transition elements is:**
A. 10 C. 40
B. 14 D. 58

31. **No of unpaired electrons are maximum in**
A. V^{+3} C. Mn^{+3}
B. Cr^{+3} D. Fe^{+3}

32. **Variable Oxidation state of is related to transition elements**
A. empty d – subshells C. Completely filled
B. Partially filled d – subshell D. d – d transition

33. **The number of unpaired electrons in zinc atom is:**
A. 0 C. 2
B. 1 D. 3

34. **Which of the following has the highest magnetic moment?**
A. Cu^{2+} C. Co^{2+}
B. Ni^{2+} D. Mn^{2+}

35. **What is the sequence of electron take up and removal from 4s orbital of a transition metal in 3d series?**
A. enters first, leaves after 3d electrons removal
B. Enters after 3d electrons, leaves after 3d electrons
C. Enters after 3d electrons, leaves first.
D. Enters first and leaves first

36. **If they all show O.S of +2, which of these will release an electron from d – subshell.**
A. Zn C. Sc
B. Cu D. Ti

37. **Which arrangement is true w.r.t. no. of unpaired electrons in an atom of the following**
A. $Cu = Zn < Sc < Ti$ C. $Zn < Cu = Sc < Ti$
B. $Sc < Ti < Cu = Zn$ D. $Ti < Sc < Zn < Cu$

38. $M = [Ar]4s^2 3d^7$ **cannot show 0.S**
A. +2 C. +5
B. +4 D. +6

39. **In $K_4[Fe(NC)_6]$, coordination number of iron is**
A. 2 C. 6
B. 4 D. 8

40. **Give the IUPAC name for $K_3[Fe(CN)_6]$:**
A. Potassium hexacyanoferrate (II) C. Potassium hexacyanoiron (II)
B. Potassium hexacyanoferrate (III) D. Potassium hexacyanoiron (III)

41. **Which of the following possesses least number of unpaired electrons?**
A. Mn^{2+} C. Fe^{3+}
B. Cu^{2+} D. Ti^{+4}

42. **Correct electronic configuration of Mn**
A. [Ar] $3d^3 4s^2$ C. [Ar] $3d^4 4s^2$
B. [Ar] $3d^2 4s^2$ D. [Ar] $3d^5 4s^2$

43. Which of the followings has electronic configuration of [Ar] in +3 oxidation state

A. Sc
B. Ti
C. Mn
D. Zn

44. The oxidation state of vanadium in V_2O_5 is:

A. +2
B. +3
C. +4
D. +5

45. The coordination number of metal atom or ion in a tetrahedral complex is:

A. 2
B. 4
C. 6
D. 8

46. Which one of the following oxides is more acidic?

A. MnO
B. Mn_2O_3
C. MnO_2
D. Mn_2O_7

47. The element which shows highest binding energy

A. V
B. Sc
C. Ti
D. Cr

48. At which oxidation state Cu achieves electronic configuration of Zn^{+2}

A. 0
B. +1
C. +2
D. +3

49. The oxidation state of transition elements is usually

A. Variable
B. Constant
C. Single
D. Infinite

$4s^1, 3d^{10}$
Zn $4s^2, 3d^{10}$
$4s^2, 3d^1$
$4s^2, 3d^2$

50. The minimum oxidation state of manganese is

A. +7
B. +6
C. +2
D. +4

51. Which period starts from scandium to zinc?

A. 2nd period
B. 3rd period
C. 4th period
D. 5th period

52. Which two pairs show same oxidation state of iron

A. Fe_2O_3, FeO
B. $K_3[Fe(CN)_6], K_4[Fe(CN)_6]$
C. $FeCl_3$, $FeSO_4$
D. $Fe_2(SO_4)_3, Fe_2O_3$

53. Catalyst used for ammonia synthesis is

A. Cu
B. Zn
C. Co
D. Fe

54. $TiCl_4$ is used as catalyst for manufacture of

A. Sulphuric acid
B. Ethanol
C. Plastics
D. Tetraethyl lead

55. Which of the following compound is expected to be colored

A. Na_2SO_4
B. MgF_2
C. $ZnCl_2$
D. CuF_2

56. Vanadium pentaoxide is used as a catalyst in the manufacture of

A. HNO_3
B. H_2SO_4
C. NH_3
D. $CO(NH_2)_2$

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57. **Which one of the following acts as a reducing agent?**
A. HNO_3
B. $KMnO_4$
C. $LiAlH_4$
D. $K_2Cr_2O_7$

58. **Which of the following transition metal forms colourless compounds in +4 oxidation state?**
A. Ti
B. Cu
C. Cr
D. Zn

59. **Number of electrons involved in d-d transition of $\left[Ti(H_2O)_6\right]^{+3}$**
A. 1
B. 2
C. 3
D. 4

60. **Ti^{+3} shows minimum absorption (maximum transmittance) at _____ and _____ wavelength**
A. Yellow, Green
B. Blue, Green
C. Red, Yellow
D. Red, Blue

61. **d-d transition cannot be shows by**
A. Cu^{+1}
B. Zn^{+2}
C. Sc^{+3}
D. All of the above

62. **When light is exposed to transition element, then electrons jump from lower orbitals to higher orbitals in**
A. Orbitals of s-subshell
B. Orbitals of p-subshell
C. Orbitals of d-subshell
D. between different shells

63. **Transition compounds which occur as tripositive ions have no**
A. 4s-electron
B. 3s-electron
C. 3p-electron
D. 2s-electron

ANSWER KEY

1	B	11	A	21	C	31	D	41	D	51	C	61	D
2	C	12	B	22	D	32	B	42	D	52	D	62	C
3	C	13	A	23	C	33	A	43	A	53	D	63	A
4	A	14	C	24	B	34	D	44	D	54	C		
5	B	15	D	25	B	35	D	45	B	55	D		
6	B	16	C	26	B	36	B	46	D	56	B		
7	D	17	D	27	C	37	C	47	A	57	C		
8	B	18	C	28	B	38	D	48	B	58	A		
9	C	19	C	29	D	39	C	49	A	59	A		
10	C	20	B	30	A	40	B	50	C	60	D		

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9. $4s^2\ 3d^5$

13. $4s^2\ 3d^{10}$

22. Due to extra stability associated with exactly half-filled and completely filled d-subshell.

29. Five unpaired d – e⁻'s

35. Empty 4s has lesser energy than that of 3d but completely filled 4s has higher energy than that of 3d.

36. It has only one s-e⁻

37. Zn < Cu = Sc < Ti

    0 1 1 2

38. s – e⁻'s + unpaired d-e⁻'s = Max. oxidation state

41. Ti^{+4} = [Ar]

47. Cr has greater no. of unpaired e⁻'s but due to loose packing has lower binding energy

52. +3

58. No unpaired e⁻'s.

61. All have complete or empty d-subshell

63. Electrons leave 4s first.

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Q.1 The paramagnetic character of substances is due to the presence of
A. Bond pairs of electrons
B. Lone pairs of electron
C. Unpaired electrons in the atom or molecule
D. Paired electrons in the valence shell of atoms

Q.2 Which pair of transition elements shows abnormal electronic configuration?
A. Sc and Zn
B. Zn and Cu
C. Cu and Sc
D. Cu and Cr

Q.3 Electronic configuration of manganese (Mn) is
A. $Mn(Ar)$ 3d: ↑ ↑ ↑ ↑ ↑ 4s: ↑↓
B. $Mn(Ar)$ 3d: ↑↓ ↑↓ ↑ ↑ ↑ 4s: ↑↓
C. $Mn(Ar)$ 3d: ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ 4s: ↑
D. $Mn(Ar)$ 3d: ↑↓ ↑↓ ↑↓ ↑ ↑ 4s: ↑

Q.4 Electronic configuration of Gold $[Au_{79}]$ is
A. $[Xe]4f^{14}, 5d^{10}, 6s^1$
B. $[Xe]4f^{14}, 5d^9, 6s^2$
C. $[Xe]4f^{10}, 5d^{10}, 6s^2$
D. $[Xe]4f^{14}, 5d^{10}, 6s^2$

Q.5 The anomalous electronic configuration shown by chromium and copper among 3-d series of elements is due to:
A. Colour of ions of these metals
B. Variable oxidation states of metals
C. Stability associated with this configuration
D. Complex formation tendency of metals

Q.6 Which element of 3-d series of periodic table shows the electronic configuration of $3d^8, 4s^2$?
A. Copper
B. Zinc
C. Cobalt
D. Nickel

Q.7 Scandium has atomic number 21; which one will be its electronic configuration?
A. $1s^2, 2s^2, 2p^6, 3s^2, 3s^6, 3d^3$
B. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^1$
C. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 4p^1$
D. $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1, 4p^2$

Q.8 Which of the following is the electronic configuration of Cr?
A. $[Ar]3d^5 4s^2$
B. $[Ar]3d^4 4s^2$
C. $[Ar]3d^6 4s^0$
D. $[Ar]3d^5 4s^1$

Q.9 Copper is a typical transition metal. Its atomic number is 29. In which oxidation state does it have partially filled orbital in d-subshell?
A. Cu
B. Cu^{2+}
C. Cu^-
D. Cu^+

Q.10 Valence electronic configuration Cu^{2+} is ^{29}Cu
A. $5d^6$
B. $3d^9$
C. $3d^8$
D. $3d^7$

Q.11 The total number of transition element is
A. 58
B. 48
C. 30
D. 25

Q.12 Oxidation state of 'Mn' in $KMnO_4$, K_2MnO_4, MnO_2 and $MnSO_4$ is in the order
A. +7, +6, +2, +4
B. +7, +6, +4, +2
C. +6, +7, +2, +4
D. +4, +6, +7, +2

Q.13 Which one pair has the same oxidation state of 'Fe'?

A. $FeSO_4$ and $FeCl_3$
B. $FeCl_2$ and $FeCl_3$
C. $FeSO_4$ and $FeCl_2$
D. $Fe_2(SO_4)_3$ and $FeSO_4$

Q.14 Identify the element that has maximum oxidation states:

A. Zinc
B. Vanadium
C. Chromium
D. Manganese

Q.15 The geometry of complexes depends upon type of ----------taking place in the valence shell of central metal atom:

A. Protonation
B. Deprotonation
C. Hybridization
D. Dissociation

Q.16 Tick the correct statement

A. Chelates are more stable than ordinary complexes
B. Ordinary complexes are more stable than chelates
C. Monodentate ligand form chelate
D. Chelates have no ring structure

Q.17 Oxidation state of 'Fe' in $K_3[Fe(CN)_6]$ is

A. +2
B. -6
C. -3
D. +3

Q.18 Ligands having two lone pair of electrons for donations to the central transition metal ions are known as

A. monodentate ligand
B. hexadentate ligand
C. bidentate ligand
D. polydentate ligand

Q.19 The shape of $[Co(NH_3)_6]^{3+}$ complex is

A. Square planar
B. Tetrahedral
C. Linear
D. Octahedral

Q.20 What are the coordination number of Fe and Cu in the following compounds $K_4[Fe(CN)_6]$,$[Cu(NH_3)]SO_4$ respectively

A. –6,–4
B. –6, +4(–6,–4)
C. +6,–4
D. +6, +4

Q.21 $\left[Ti(H_2O)_6\right]^{+3}$ transmits

A. Yellow and red light
B. Red and white light
C. Yellow and blue light
D. Red and blue light

Q.22 Violet color of $\left[Ti(H_2O)_6\right]^{+}$ ion is due to the

A. Central metal ion
B. Water molecule
C. Complex ion
D. Outer anion

Q.23 The color of transition metal complexes is due to transition of electron between

A. p to d orbitals
B. d to d orbitals
C. p to p orbitals
D. d to p orbitals

Q.24 The octahedral geometry of complexes $\left[Co(NH_3)_6\right]^{3+}$ has hybridization

A. sp^3d
B. spd^4
C. sp^3d^2
D. sp^2d^3

Q.25 In the complex, potassium hexacyanoferrate (III) $[K_3Fe(CN_6)]$ the coordination number of Fe is:

A. 9
C. 3
C. 6
D. d

Q.26 Co-ordination number of $[Co(en)_2Cl_2]$ is

A. -2 B. 6
C. 4 D. None of the above

Q.27 In 3rd series of transition elements, paramagnetic behavior is maximum for Mn^{+2} and

A. Cr^{3+} B. Ti^{3+}
C. V^{3+} D. Zn^{2+}

Q.28 Electronic configuration of chromium (proton number 24) is:

A. [Ar] $3d^4 4s^2$ B. [Ar] $3d^5 4s^2$
C. [Ar] $3d^5 4s^1$ D. [Ar] $3d^5 4s^2$

Q.29 The transition element which doesn't show variable valency is

A. Cu B. Sc
C. Zn D. Cr

PAST PAPER QUESTIONS

1	C	6	D	11	A	16	A	21	D	26	B
2	D	7	B	12	B	17	D	22	A	27	A
3	A	8	D	13	C	18	C	23	B	28	C
4	A	9	B	14	D	19	D	24	C	29	C
5	C	10	B	15	C	20	D	25	C		

A

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5. Half – filled and completely filled orbitals show extra stability. +2 −2
6. Atomic no. 28
9. $3d^9$
14. No. of s-e^-s + No. of unpaired d-e^-s.
15. For example sp^3= Tetrahedral and dsp^2 = square planar etc.
22. Central metal ion shows d – d transition which forms the basis of colour origin.
25. No. of ligands attached to the central atom / ion.
26. en is a bidentate ligand.
27. 3 unpaired e^-.
29. Complete d.

Sc 1↓ 1
Ti 1↓ 1 1
V 1↓ 1 1 1
Cr 1↓ 1 1 1 1 1

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Q. 1 Which one of the following has more unpaired electrons?
A. Mn B. Cr
C. Cu D. Zn

Q. 2 The total number of transition elements are?
A. 48 B. 58
C. 32 D. 28

Q. 3 Paramagnetic behaviour of transition elements is due to presence of _____?
A. s electrons B. Unpaired electrons
C. Paired electrons D. Outer d electrons

Q. 4 f-Block elements are called
A. Inner transition B. Outer transition
C. Both D. None

Q. 5 Hardness of transition metals is due to _____?
A. More melting point B. More electrons
C. Variable oxidation state D. Higher binding energies

Q. 6 Melting and boiling point of transition elements is higher due to _____?
A: Higher binding energies B. Strong metallic bonding
C. Hardness D. All of these

Q. 7 Colour of Sc^{+3} is
A. Red B. Green
C. Purple D. No color

Q. 8 Coinage metals belong to
A. IB B. IIB
C. IIIb D. IVB

Q. 9 Which transition metal is mostly used in industry?
A. Na B. Mg
C. Fe D. C

Q. 10 The maximum oxidation state gained by Mn is
A. 6 B. -7
C. 7 D. 5

Q. 11 When iron got rusted on sea then surface contain
A. Iron sulphide B. Iron oxides
C. Iron nitride D. Iron chloride

Q. 12 The oxidation number of transition element when d orbital is involved in bonding
A. 2 B. 3
C. 4 D. Both B and C

Q. 13 All transition elements show oxidation state
A. 1 B. 7
C. 2 D. 6

Q. 14 The series of transition elements after lanthanum is known as
A. Inner transition B. Lanthanides
C. Actinides D. Outer transition elements

Q. 15 f-block elements are present in of the periodic table
A. Between s and p block B. Bottom of the periodic table
C. Left of the periodic table D. Right of the periodic table

Q. 16 Which oxidation state give evidence of d orbitals

A. +2 B. +3
C. +4 D. All

Q. 17 The elements having partially filled d and f orbitals are called as _____?

A. Transition elements B. d-block elements
C. f-block elements D. All of these

Q. 18 d Block elements are also called as _____?

A. Rare earth elements B. Outer transitions elements
C. Inner transition elements D. Typical transition elements

Q. 19 Which one of the following is an example of transition element?

A. Na B. Ba
C. Co D. Ra

Q. 20 The colour of $[Ti(H_2O)_6]^{3+}$ is

A. Colourless B. Violet
C. Blue D. None

Q. 21 In transition element after lanthanum what start next

A. lanthanides B. Trans lanthanum
C. Tran uranium D. Actinides

Q. 22 Number of electrons in outermost shell of Scandium

A. 5 B. 3
C. 2 D. 6

Q. 23 Transition elements show colour because of

A. Energy B. Structure
C. d-d transition D. All of these

Q. 24 Transition metal have

A. Low binding B. High binding energy
C. Moderate D. Can't predict

Q. 25 Transition metals forms alloys due to

A. Large size B. Complex formation
C. d-d transition D. None of these

Q. 26 The transition elements belong to group VIB are

A. Zn, Cd, Hg B. Fe, Ru, Os
C. Mn, Te, Re D. Cr, Mo, W

Q. 27 Color emitted by $[Ti(H_2O)_6]^{+3}$

A. Yellow B. Violet
C. Red D. Green

ANSWER KEY

1	B	6	D	11	B	16	B	21	B	26	D
2	B	7	D	12	B	17	A	22	C	27	A
3	B	8	A	13	C	18	B	23	C		
4	A	9	C	14	B	19	C	23	B		
5	D	10	C	15	B	20	B	25	D		

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UNIT 13

PRACTICE EXERCISE

FUNDAMENTAL PRINCIPLES OF ORGANIC CHEMISTRY

1. **The maximum number of cyclic isomers for an alkene with the molecular formula C_4H_8:**
   A. 2
   B. 4
   C. 3
   D. 5

2. **An isomer of ethanol is:**
   A. Methanol
   B. Di ethyl ether
   C. Dimethyl ether
   D. Ethylene glycol

3. **Which one of the following deactivates benzene ring and is o/p-directing?**
   A. $-NH_2$
   B. $-OCH_3$
   C. -OH
   D. – Cl

4. **Nitro alkanes exhibit the:**
   A. Chain isomerism
   B. Functional group
   C. Positional isomerism
   D. Metamerism

5. **Amines exhibit:**
   A. Chain isomerism
   B. Metamerism
   C. Positional isomerism
   D. All of them.

6. **State of hybridization of carbon in the carbocation is:**
   A. sp^3
   B. sp
   C. sp^2
   D. dsp^2

7. **2-propanol shows_____ isomerism with 1-propanol:**
   A. Chain isomerism
   B. Metamerism
   C. Positional isomerism
   D. Geometrical isomerism

8. **Which of the following is not the heterocyclic in nature is:**
   A. Furan
   B. Pyridine
   C. Thiophene
   D. Aniline

9. **If similar groups are attached to the same side, of C=C of alkene then it is:**
   A. Cis isomer
   B. Tautomer
   C. Trans isomer
   D. All

10. **Indicate the number of open chain isomers of C_6H_{14}:**
    A. 4
    B. 6
    C. 5
    D. 7

11. **Type of isomerism shown by fumeric acid and maleic acid is:**
    A. Functional group
    B. Optical
    C. Geometrical
    D. Positional

12. **Ether show the phenomenone of:**
    A. Positional isomerism
    B. Meta merism
    C. Functional group isomerism
    D. Cis.trans isomerism

13. **Which of the following pairs shows isomerism:**
    A. CH_2Cl_2 and $CHCl_3$
    B. C_6H_6 and C_3H_8
    C. C_2H_4 and C_3H_6
    D. CH_3OCH_3 and C_2H_5OH

14. **Which of the following is isolated polycyclic compound**
    A. Anthracene
    B. Phenathrene
    C. Naphthalene
    D. diphenyl methane

15. Which of following is a functional group
A. Group of atom
B. Triple bond
C. Double bond
D. All of these

16. Which of the following is not an organic compound (cyanate) OCN. ↳ Inorganic
A. Ammonium cyanate
B. Urea
C. Glucose
D. Methane

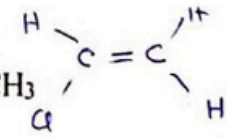
17. As the number of carbon atoms increases the number of isomers also increase. The 5 carbon compound pentane has as many as
2 3 5
A. 3 isomers
B. 6 isomers
C. 5 isomers
D. 10 isomers

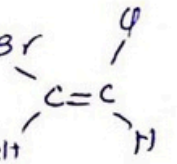
9 **18. Which is the chain isomer of n-pentane**
18
A. Isopentane
B. n-pentene
C. Neopentene
D. Isopentene

35 75 **19. The geometric isomerism is caused by** + cyclic structure
A. The restricted rotation of pi bond
B. The presence of similar groups on a carbon atom
C. Free rotation of a pi bond
D. The presence of a triple bond in a compound

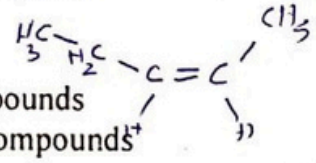
20. 1-chloropropane and 2 chlorpropane are isomers of each other, the type of isomerism in these two is called:
A. Cis-trans isomerism
B. Chain isomerism
C. Position isomerism
D. Functional group isomerism

21. Which one of the following pairs can be cis-trans isomer to each other?
↓
A. $CHCl=CCl_2$ and $CH_2=CH_2$
Two groups attached to a carbon must be different
B. $CHCl=CH_2$ and $CH_2=CHCl$
C. $CH_3-CH=CH-CH_3$ and $H_3C-CH=CH-CH_3$
D. CH_3-CH_3 and $CH_2=CH_2$





22. Name the compound, which shows geometric isomerism:
A. 1-bromo-2-chloropropene
B. 2-pentene
C. 2,3-dimethylpropene
D. Both A & B



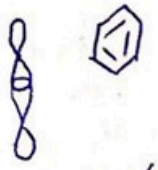
23. Cyclobutane structure is categorized under:
A. Aromatic compounds
B. Alicyclic compounds
C. Aliphatic compounds
D. Heterocyclic compounds

24. Butane molecule can have maximum no of isomers
A. 2
B. 4
C. 5
D. 3

25. Select one which is alcohol
A. $CH_3–O–CH_3$
B. CH_3COOH
C. $CH_3–CH_2–OH$
D. $CH_3–CH_2–Br$

26. Which one of the following compounds is expected to exhibit geometrical isomerism?
A. 1-butene
B. 2-methyl propane
C. 2-butene
D. 2-butyne

27. The overlapping of orbitals in benzene is of the type of
A. $sp - sp$
B. $sp^3 - sp^3$
C. $sp^2 - sp^2$
D. $s - s$



28. When acetylene is treated with HBr, we get. (ethyne)
A. Methyl bromide
B. Ethyl bromide
C. Methyl chloride
D. Ethylene bromide

$HC \equiv CH + HBr \rightarrow H_2C = CH$

29. **Number of tertiary carbon atoms in methyl cyclopropane is:**
A. Zero
B. 2
C. 1
D. 3

30. **Glucose and fructose are isomers:**
A. Chain isomers
B. Functional group isomers
C. Position isomers
D. Metamers

31. **Which of the compounds cannot show positional isomerism?**
A. Alkanes
B. Alkynes
C. Alkenes
D. Alcohols

32. **The number of carbon atoms in toluene is:**
A. 6
B. 7
C. 12
D. 14

33. **Which of the following has a bond formed by the overlap of $sp - sp^3$ hybrid orbitals?**
A. $CH_3 - C \equiv C - H$
B. $CH_2 = CH - CH = CH_2$
C. $CH_3 - CH = CH - CH_3$
D. $HC \equiv CH$

34. **The Compounds $CH_3 - O - C_3H_7$ and $C_2H_5 - O - C_2H_5$ exhibit**
A. Optical isomerism
B. Meta merism
C. Cis – trans isomerism
D. Chain Isomerism

35. **Which of the following represents a homologous series**
A. Ethane, Ethane, Ethyne
B. Methane, Methanol, naphthlene
C. Methane, ethane, propane
D. 1 – hexene, 2 – hexene, 3 – hexane

36. **The compound that belongs to alkyne family**
A. C_7H_{14}
B. $C_{10}H_{22}$
C. C_9H_{16}
D. $C_{16}H_{32}$

37. **What will be the correct name of 2, 3 – diethyl butane**
A. 3, 4 – dimethyl hexane
B. 2, 3 – Dimethyl hexane
C. 2 – Ethyl – 3 – methyl pentane
D. 3 – Ethyl – 2 – methyl pentane

38. **The isomer of chlorobutane with the maximum number of branches is**
A. n-butyl chloride
B. iso-butyl chloride
C. tertiary-butyl chloride
D. secondary-butyl chloride

39. **Which one of the following has three structural isomers?**
A. $(CH_3)_3CH$
B. $(CH_3)_2CHCH_3$
C. $CH_3 - CH_2 - CH_2 - CH_3$
D. $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

40. **$C_6H_5CH_3$ has**
A. sp^2 hybrid orbitals only
B. sp^2, $2p_z$ and sp^3 hybrid orbitals
C. sp and sp^2 hybrid orbitals
D. sp^2 and $2p_z$ orbitals only

41. **The true statement about ethanol and dimethyl ether is**
A. both are polar
B. both have planar structure
C. ethanol is polar while dimethyl ether is non-polar
D. they are chain isomers

42. **Propionaldehyde and acetone show the type of isomerism**
A. geometric
B. positional
C. chain
D. functional group

43. **Alicyclic compounds can be**
A. open chain
B. aromatic
C. homocyclic
D. heterocyclic

44. **The general formula of cycloalkanes is**

A. C_nH_{2n+2}
B. C_nH_{2n+1}
C. C_nH_{2n}
D. C_nH_{2n-2}

45. **How many isomers are possible for C_2H_6O**

A. 2
B. 5
C. 4
D. 8

46. **All are Hydrocarbons except**

A. benzene
B. naphthalene
C. cyclohexene
D. benzoic acid

47. **A compound that has closed ring of carbon atoms but lacks alternate double and single bonds is called**

A. Hetero cyclic
B. Aliphatic
C. Alicyclic
D. aromatic

48. **The maximum no of isomers possible for C_3H_6**

A. 1
B. 2
C. 6
D. 3

49. ***CCl_3CHO* has the *IUPAC* name**

A. 1,1,1 – Trichloroethanal
B. 2,2,2 – Trichloroethanal
C. Trichloro acetaldehyde
D. 1,1,1 – Trichloro acetaldehyde

50. **Which of the following is not an aromatic hydrocarbon**

A. Benzene
B. Toluene
C. Chlorobenzene
D. Ethyl benzene

51. **2-methyl propene is an isomer of**

A. 1-butene
B. 2-butene
C. cis-2-butene
D. all

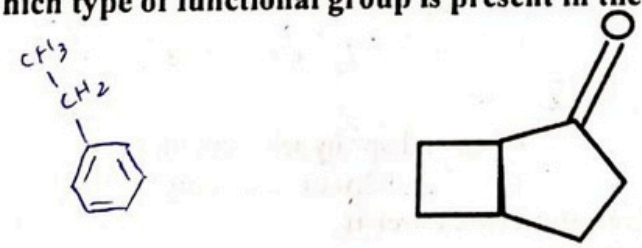
52. **What is true about formyl and carbonyl group**

A. both are found in aldehydes
B. both are found in ketones
C. both are terminal functional groups
D. both have sp^2 hybridized carbon

53. **When carbon undergoes sp^2 hybridization then H – C – H bond angles are:**

A. 120°
B. 109.5°
C. 180°
D. 107.5°

54. **Which type of functional group is present in the given compound**



A. Carboxylic acid
B. Aldehyde
C. Ketone
D. Acid amide

55. **A compound with Molecular formula C_4H_9Cl can't show**

A. Structural isomerism
B. Position isomerism
C. Chain isomerism
D. Metamerism

56. **1 – bromo – 2 – Chloro propene will have which atoms on opposite sides in cis isomer**

A. Br, Cl
B. Cl, H
C. Br, CH_3
D. B,C

57. **Which of these has the highest percentage of carbon**
A. C_4H_8
B. C_3H_8
C. C_6H_6
D. C_5H_{12}

58. **Heterocyclic compounds**
A. are always saturated
B. have atleast six membered ring
C. are always unsaturated
D. have atleast one non-carbon polyvalent atom

59. **The heteroatom in pyridine is**
A. Oxygen
B. Chlorine
C. Nitrogen
D. Sulphur

60. **The hemolytic fission of C – C bond in ethane give an intermediate in which "C" is _____ hybridized.**
A. sp^3
B. sp
C. sp^2
D. sp^2d

61. **Which one of the following compound has planar structure?**
A. Ethane
B. Propyne
C. Ethene
D. Cyclopropane

62. **A doubly bonded carbon**
A. cannot be sp^2 hybridized
B. can attach with three carbons
C. can be sp hybridized
D. can attach with three hydrogens

63. **In homocyclic compounds the ring consists of**
A. Carbon and oxygen atoms
B. Only carbon atoms
C. Carbon and nitrogen atoms
D. Carbon atoms with one heteroatom

64. **Alicyclic compounds are the homocyclic compounds which contain a ring of**
A. 5 or more carbon atoms
B. 3 or more carbon atoms
C. 6 or more carbon atoms
D. 4 or more carbon atoms

65. **The saturated alicyclic hydrocarbons have the general formula**
A. C_nH_{2n+2}
B. C_nH_{2n}
C. C_nH_{2n-1}
D. C_nH_{3n}

66. **Which one of the following is not an alicyclic compound?**
A. Cyclohexene
B. Benzene
C. Cyclohexane
D. Cyclopentane

67. **Which one of the following is an aromatic compound?**
A. Benzene
B. Furan
C. Thiophene
D. All of them

68. **The shortening of bond distance between two carbons in ethyne is due to the**
A. Presence of a σ bond
B. Presence of a σ and two π-bonds
C. Presence of two π-bonds
D. Presence of conjugated double bonds

69. **Which one of the following is the structure of Furan?**
A. 
B. 
C. 
D. None of them

70. **Which one of the following does not show isomerism?**
A. Propane
B. Hexane
C. Butane
D. Pentane

71. Butane has _____ isomeric forms.
A. 3 C. 2
B. 1 D. 4

72. Homologous compounds differ from each other by
A. Alkyl group C. Methine group
B. Methylene group D. Methyl group

73. When hydrogen is removed from alkanes, the product obtained has general formula
A. C_nH_{2n+2} C. C_nH_{2n+1}
B. C_nH_{2n-2} D. C_nH_{2n-1}

74. The structural isomerism arises due to the difference in the
A. Number of atoms in the molecule
B. Arrangements of atoms in the molecule
C. Number as well as arrangement of atoms in the molecule
D. Spatial arrangement of atoms

75. How many secondary carbon atoms are present in Methylcylopropane
A. 1 C. 3
B. 2 D. 0

76. Which is not present as heteroatom in heterocyclic compounds?
A. Sulphur C. Nitrogen
B. Oxygen D. Chlorine

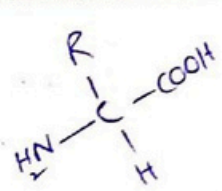
77. Which compounds is alicyclic in nature?
A. Cyclobutane C. Iso-butane
B. n-Butane D. Toluene

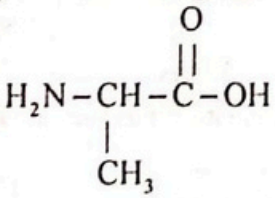
78. Pyridine is an example of
A. Homocyclic compound C. Heterocyclic compound
B. Carbocyclic compound D. Aliphatic compound

79. Anthracene contains _____ number of fused benzene rings
A. 1 C. 2
B. 3 D. 4

80. The isomerism in which the compounds differ with respect to functional group but have same molecular formula is called:
A. Metamerism C. Functional group isomerism
B. Position isomerism D. Chain isomerism

81. Which functional groups are present in the given amino acids:





A. Amino and hydroxyl group C. Amino and carboxylic acid group
B. Amino and alcoholic group D. Amino, carboxylic acid and alkyl group

82. Which of the following compound shows the geometrical isomerism:
A. 2-butene C. 2-butyne
B. 2-butanol D. Butanol

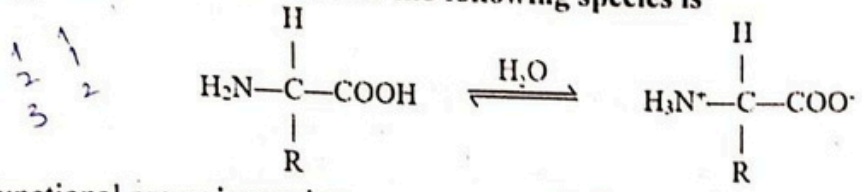
83. Which of the following compounds does not exhibit positional isomerism?
A. Alkynes C. Nitroalkanes
B. Carboxylic acid D. Alcohol

84. **Total number of possible chain and positional isomers of butyl alcohol among alcohols are**
A. Four
B. Two
C. Five
D. Six

85. **Alkanes do not show geometrical isomerism due to**
A. Hyperconjugation
B. Rotation around single bond
C. Resonance
D. Restricted rotation around doubled bond

86. **How many esters are possible for $C_4H_8O_2$**
A. 2
B. 4
C. 3
D. 5

87. **The type of isomerism shown in the following species is**

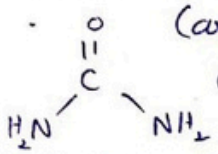


A. Functional group isomerism
B. Metamerism
C. Tautomerism
D. Cis-trans isomerism

88. **Which class of compound cannot show positional isomerism?**
A. Alkanal
B. Alkynes
C. Alkene
D. Alcohol

89. **Which one is thioether**
A. R – O – R
B. R – S – R
C. R – Se – R
D. R – Te – R

90. **Which of the following is functional group of amino functional group?**
A. $-NH_2$
B. $-C \equiv N$
C. $\backslash C = NH$
D. $-C(=O)-NH_2$



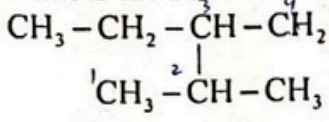
91. **Which of the following is an amide?**
A. $(NH_2)_2CO$
B. $C_6H_5NH_2$
C. NH_2CH_3
D. $N(CH_3)_3$

92. **sp-hybridization takes place by the mixing of orbitals**
A. One 1s, one 2p
B. One 2s, two 2p
C. One 2s, three 2p
D. One 2s, one 2p

93. **The percentage of s character in sp^2 hybrid orbital is**
A. 25%
B. 50%
C. 33.3%
D. 75%

94. **IUPAC name of neopentane**
A. 2,2- Dimethyl pentane
B. 2,2- Dimethyl propane
C. 2,3- Dimethyl pentane
D. 2,2- Dimethyl butane

95. **What is the IUPAC name of this structure?**



A. 3–Ethyl 2–methyl hexane
B. 4–Ethyl 5–methyl hexane
C. Iso propyl hexane
D. 3–Iso propyl hexane

96. **The correct name of 3,5,5-Trimethylhexane is**
A. 3–Ethyl 2–methyl pentane
B. 2,2,4-Trimethylhexane
C. 2,3–Dimethylpentane
D. 2,3,4-Trimethylhexane

97. Which suffix is used for carboxylic acid

A. – al
B. – ol
C. – oic
D. – ene

98. The compound $C_4H_{10}O$ can show

A. Position isomerism
B. Functional isomerism
C. Metamerism
D. All of these type of isomerism

99. Which one of the following is a heterocyclic compound

A. Cyclohexanol
B. Pyridine
C. Phenol
D. Anthracene

100. Which one of the following compound is a ketone?

A. $CH_3 — O — CH_2 — CH_3$
B. $CH_3 — CO — CH_2 — CH_3$
C. $CH_3COCOOH$
D. $CH_3 — CH_2CHO$

101. The compound that contains all 1^o, 2^o, 3^o, 4^0 carbons is

A. 2,3 – dimethyl pentane
B. 2, 3, 3 – Trimethyl pentane
C. 3 – Chloro – 2, 3 – Dimethyl pentane
D. 3, 3 – Dimethyl pentane

102. The rotation of two carbon atoms joined by a double bond could happen only if

A. The pi bond breaks
B. Sigma bond breaks
C. Both pi and sigma bonds break
D. they are in gaseous form

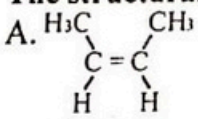
103. Diethyl ether and methyl n-propyl ether are

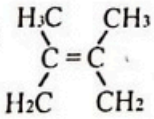
A. Chain Isomers
B. Metamers
C. Position isomers
D. Functional group isomers

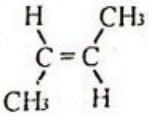
104. The necessary condition for a compound to exhibit geometric isomerism is that the two groups attached to

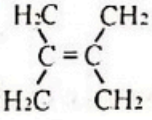
A. Same carbon atom must be similar
B. Different carbon atoms must be same
C. Same carbon atom must be different
D. Different carbon atoms must be different

105. The structural formula of Cis-2-Butene is

A. 

B. 

C. 

D. 

ANSWER KEY

1	A	11	C	21	C	31	A	41	C	51	D	61	C	71	C	81	C	91	A	101	B
2	C	12	B	22	D	32	B	42	D	52	D	62	C	72	B	82	A	92	D	102	A
3	D	13	D	23	B	33	A	43	C	53	A	63	B	73	C	83	B	93	C	103	B
4	C	14	D	24	A	34	B	44	C	54	C	64	B	74	B	84	A	94	A	104	C
5	D	15	D	25	C	35	C	45	A	55	D	65	B	75	B	85	B	95	A	105	A
6	C	16	A	26	C	36	B	46	D	56	D	66	B	76	D	86	B	96	B		
7	C	17	A	27	C	37	A	47	C	57	C	67	D	77	A	87	C	97	C		
8	D	18	A	28	D	38	C	48	B	58	D	68	C	78	C	88	A	98	D		
9	A	19	A	29	C	39	D	49	B	59	C	69	A	79	B	89	B	99	B		
10	C	20	C	30	B	40	B	50	C	60	C	70	A	80	C	90	A	100	B		

CamScanner

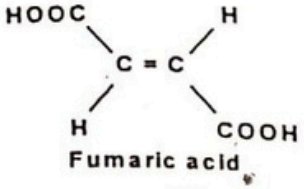
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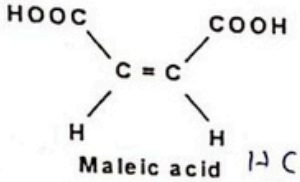
4. 1-nitropropane, 2-nitropropane

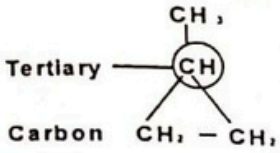
5. Primary amines show chain and position isomerism while secondary amines show metamerism.

8. Nitrogen is outside the ring

10. n-hexane, 2-methyl pentane, 3-methyl pentane, 2, 2-dimethyl butane, 2, 3-dimethyl butane

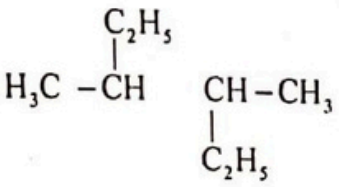
11. 



29. 

31. They lack any functional group

35. They have same general formula

37. 

46. Contains oxygen as heteroatom

49. Priority order: CHO > Cl

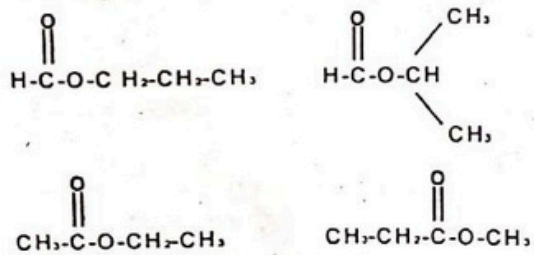
55. Cl can be at position 1

62. O = C = O
sp

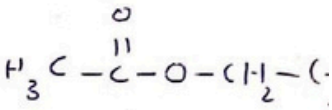
67. All of these follow necessary conditions to show aromaticity

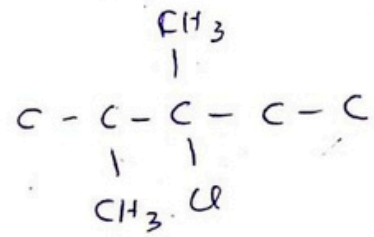
74. Difference in arrangement of atoms leads to structural isomerism.

83. It always occupies terminal position

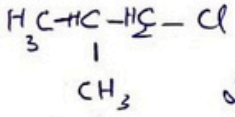
86. 

102. Pi bond has restricted rotation





1 double bond or 1 ring



Degree of unsaturation ②

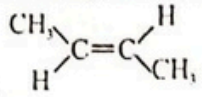
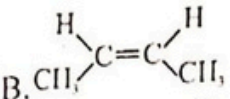
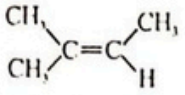
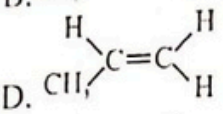
- 1 Tripple bond
- 1 double bond + ring
- 2 rings.
- 2 double bonds.

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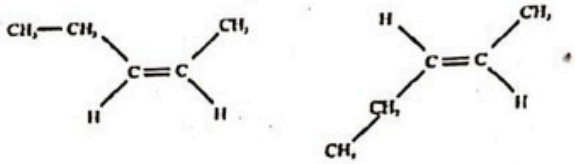
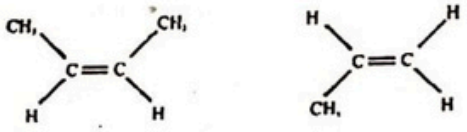
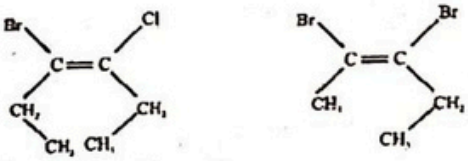
Q.1 1-chloroproane and 2-chloropropane are isomers of each other. The type of isomerism

A. Cis-trans isomerism
B. Chain isomerism
C. Positional isomerism
D. Functional group isomerism

Q.2 The cis-isomerism is shown by

A. 
B. 
C. 
D. 

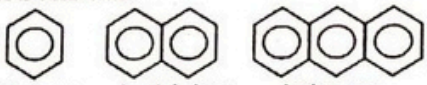
Q.3 Which one of the following pair of compound is cis and trans isomers of each other?

A) 
B) 
C) 
D) 

Q.4 Which one of the following is a ketone?

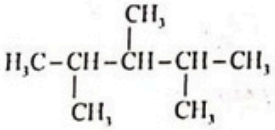
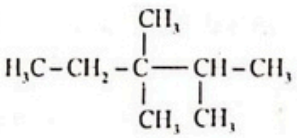
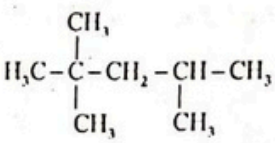
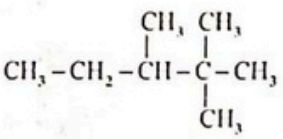
A. $CH_3—O—CH_2—CH_3$
B. $CH_3COCOOH$
C. $CH_3—CO—CH_2—CH_3$
D. $CH_3—CH_2CHO$

Q.5 The given three hydrocarbons are

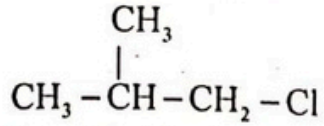


A. Alicyclic hydrocarbons
B. Acyclic Hydrocarbons
C. Aromatic hydrocarbons
D. Heterocyclic hydrocarbons

Q.6 The structural formula of 2,3,4 trimethylpentane is

A. 
B. 
C. 
D. 

Q.7 The IUPAC name of the given compound is



A. 1–Chloro-2-methylpropane
B. Isobutyl chloride
C. 1-Chloro-2-methylbutane
D. 2-Methyl-3-chloropropane

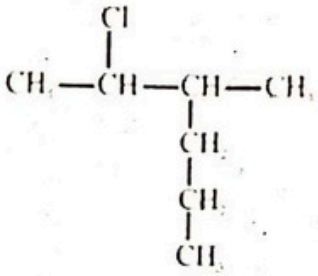
Q.8 Which one of the following pairs can be a cis-trans isomer to each other?

A. $CHCl = CCl_2$ and $CH_2 = CH_2$
C. $CHCl = CH_2$ and $CH_2 = CHCl$
B. CH_3-CH=CH-CH_3 and H_3C-CH=CH-CH_3
D. CH_3-CH_3 and $CH_2 = CH_2$

Q.9 The type of structural isomerism which arises due to the difference in the nature of carbon chain or carbon skeleton is

A. Chain isomerism
B. Cis-Trans isomerism
C. Position isomerism
D. Optical isomerism

Q.10 Which one of the followings is the best name according to IUPAC system for the formula given below?



A. 4-methyl-6-chloro heptane
B. 2-chloro-3-methyl hexane
C. 2-chloro-4n propyl hexane
D. 2-chloro-4-n propyl pentane

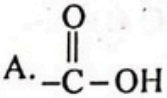
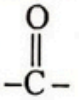
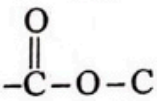
Q.11 Cyclobutane structure is categorized under:

A. Aromatic compounds
B. Aliphatic compounds
C. Alicyclic compounds
D. Heterocyclic compounds

Q.12 Name the compound, which shows geometric isomerism:

A. 1-bromo-2-chloropropene
B. 2,3-dimethylpropene
C. 2-pentene
D. Both A & C

Q.13 Which one is a functional group of carboxylic acid:

A. 
B. 
C. 
D. None of these

Q.14 Butane molecule can have maximum no of isomers

A. 2
B. 5
C. 4
D. 3

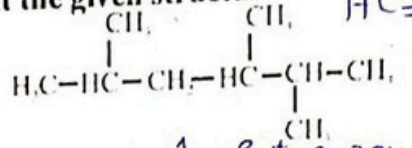
Q.15 Select one which is alcohol

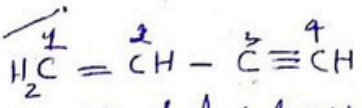
A. CH_3–O–CH_3
B. CH_3–CH_2–OH
C. CH_3COOH
D. CH_3–CH_2-Br

Q.16 **In the following organic compound carbon atoms in all of them undergo both sp^3 and sp^2 hybridization except X, which has all sp^3 hybrid orbitals, identify X**

A. 1-butanol
B. Trans to butene
C. 2-chloro - 2- butene
D. Butanoic acid

Q.17 **Have a critical look at the given structure**





The IUPAC name of this compound is

A. 2-Methyl-4-isopropylpentane
B. 2,3,5-Trimethylhexane
C. 2,4,5-Trimethylhexane
D. 2-Isobutyl-3-methylbutane

Q.18 **IUPAC name of Divinyl acetylene is**

A. 1,5- hexadiene-3-ene
B. 1,5- hexadiene-3-yne
C. 3-Hexane-1,5-diyne
D. 3-Hexyne-1,5-diene

Q.19 **Diethyl ether and n-butanol are**

A. Position isomerism
B. Functional isomerism
C. Chain isomerism
D. Tautomerism

Q.20 **The number of isomers of pentane is**

A. 2
B. 4
C. 5
D. 3

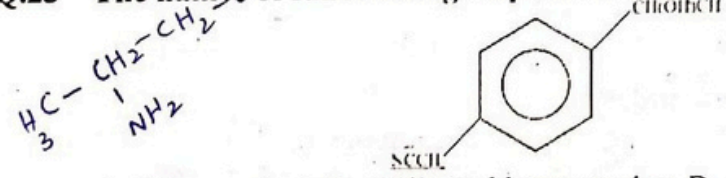
Q.21 **Which of the following is not the major source of organic compound?**

A. Natural gas
B. Petroleum
C. Coal
D. Ammoniacal liqour

Q.22 **$C_4H_{11}N$ gives the type of isomerism**

A. Metamerism
B. Optical isomerism
C. Tautomerism
D. None of the above

Q.23 **The names of functional groups in the following compound X are;**



A. Primary alcohol, nitrile and benzene ring
B. Secondary alcohol, nitrile and aryl ring
C. Secondary alcohol, nitrile and phenol ring
D. Secondary alcohol, amine and benzene ring

Q.24 **Select the organic compound which belongs to arene family:**

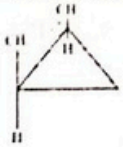
A. $CH_2 = CH_2$
B. $CH_3 - O - CH_3$
C. $CH_3 - NH_2$
D. C_6H_6

Q.25 **The type of isomerism existing in a compound of molecular formula C_2H_6O is:**

A. Functional group
B. Position
C. Chain
D. Metamerism

Q.26 **Which of the following compound show geometric isomerism?**

A. 

B. 

C. 

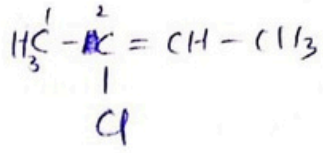
D. 

Q.27 Generic formula of cycloalkane is

A. C_nH_{2n+2} B. C_nH_{2n}
C. C_nH_{2n-1} D. C_nH_{2n-2}

Q.28 In alkanes, each carbon has hybridization

A. sp^3 B. sp
C. sp^2 D. dsp

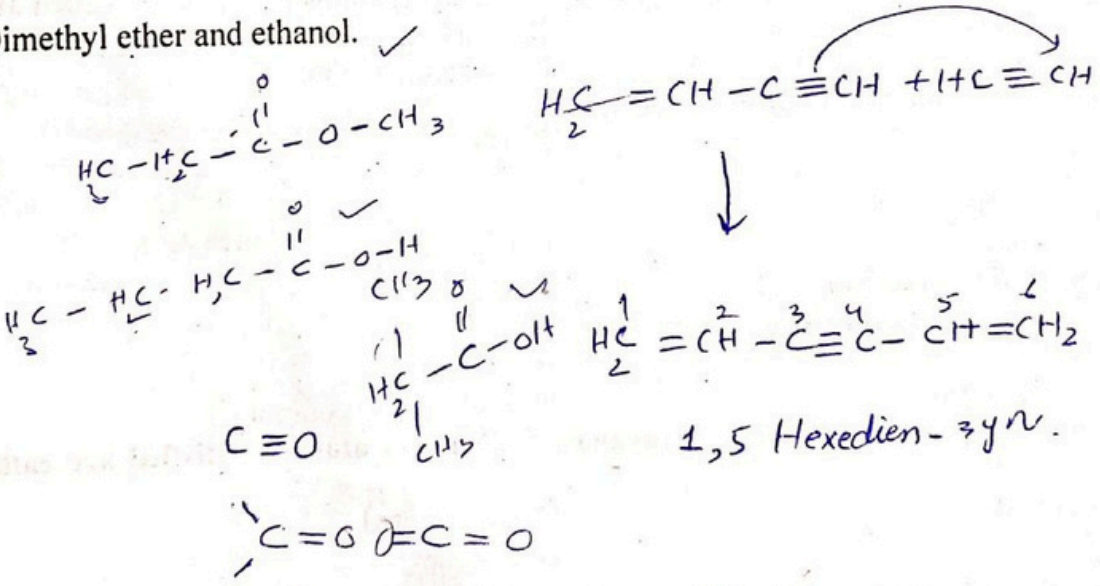


PAST PAPER QUESTIONS

1	C	6	A	11	C	16	A	21	D	26	B
2	B	7	A	12	D	17	B	22	A	27	B
3	A	8	C	13	A	18	C	23	B	28	A
4	C	9	A	14	A	19	C	24	D		
5	C	10	B	15	B	20	D	25	A		

HINTS

8. Both conditions of cis-trans isomerism are fulfilled.
16. All carbon and oxygen atoms are singly bonded.
21. All others are fossil fuels.
22. In case of secondary amine, it shows metamerism.
25. Dimethyl ether and ethanol. ✓



PAST PAPERS 2021

Q. 1 Which of the following does not show metamerism?
A. Ehters B. Secondary amines
C. Ketones D. Aldehydes

Q. 2 What are the products of destructive distillation of coal?
A. Coal tar B. Coke
C. Coal gas D. All of above

Q. 3 What usually does not dissolve in water
A. Lipids B. Benzene
C. Parrafins D. All of these

Q. 4 Which of the following is not heterocyclic?
A. Pyrole B. Furan
C. Thiophene D. Naphthalene

Q. 5 In homologous series, compound differ by
A. CH_2 B. CH_3
C. CH_4 D. All

Q. 6 Pi bonds in ethene is / are
A. 1 B. 2
C. 3 D. 4

Q. 7 Which of the following is not inorganic
A. Diamond B. Graphite
C. Synthetic rubber D. Solid iodine

Q. 8 Which of the following is not a derivative of benzene
A. Pyrrole B. Furan
C. Thiophene D. All

Q. 9 Coal tar contains many organic compounds that can be separated by _____?
A. Destructive distillation B. Fractional distillation
C. Vacuum distillation D. Partial distillation

Q. 10 Large hydrocarbons are converted into smaller hydrocarbons by a process called as?
A. Reforming B. Cracking
C. Distillation D. Decomposition

Q. 11 What is the octane number of Iso-octane?
A. 40 B. 100
C. 0 D. 2

Q. 12 Propene exhibit
A. Cis-isomerism B. Trans-isomerism
C. Geometric isomerism D. None

Q. 13 Cyclic compounds consist of except?
A. Alicyclic B. Aromatic
C. Acyclic compounds D. Carbocyclic compounds

Q. 14 Organic compounds in which tetravalency of carbon atom is satisfied are called as _____?
A. Saturated B. Unsaturated
C. Alkenes D. Alkynes

Q. 15 Which type of organic compounds are present in natural gas?
A. High molecular mass B. Low molecular mass
C. Low boiling point D. Both b and c

Q. 16 Formula of ammonium cyanate
A. NH_4CNO B. $(NH_2)_2CO$
C. $H_2N\text{-}NH_2$ D. NH_4CN

Q. 17 Octane number of n heptane is
A. 0 B. 1
C. 50 D. 100

Q. 18 C-C bond is broken in
A. Hydrogenation B. Cracking
C. Condensation D. Polymerization

Q. 19 Organic compounds are
A. Cyclic and acyclic B. Open chain and acyclic
C. Closed chain and cyclic D. Aliphatic and open chain

Q. 20 The isomerism arising due to different Carbon atom on both sides of functional group is called
A. Metamerism B. Functional group isomerism
C. Chain isomerism D. Tautomerism

Q. 21 Formula of alkane
A. C_nH_{2n+2} B. C_nH_{2n}
C. C_nH_{2n-2} D. $C_nH_{2n-1}OH$

Q. 22 What is the common name of the compound? $CH_3–(CH_2)_3–CH_2–Cl$
A. Chloropentane B. n-Chloropentane
C. n-Pentyl chloride D. 1-Chloropentane

Q. 23 How many chain isomers of Pentane is possible?
A. Two B. Four
C. Three D. Five

$H_3C-HC=CH_2$

Q. 24 Friedrick Wohler prepared UREA from
A. Amino acids B. Ammonium carbonate
C. Ammonium cyanate D. Xanthin

Q. 25 The smallest alkane that shows isomerism is _____?
A. Ethane B. Butane
C. Pentane D. Isopropane

Q. 26 An atom or group of atom that gives specific properties to the compound is called as _____?
A. Functional groups B. Alkane
C. Homologous series D. Atoms

Q. 27 Tetra ethyl lead addition to petrol is example of
A. Positive catalysis B. Negative catalysis
C. Both A and B D. None

(Anti-knocking agent)

Q. 28 Mineral oil in its refined form is called?
A. Kerosene oil B. Crude oil
C. Petroleum D. Reforming

ANSWER KEY

1	D	8	D	15	B	22	C
2	A	9	B	16	A	23	C
3	D	10	B	17	A	24	C
4	D	11	B	18	B	25	B
5	A	12	D	19	A	26	A
6	A	13	C	20	A	27	B
7	C	14	A	21	A	28	C

CamScanner

UNIT 14 PRACTICE EXERCISE

CHEMISTRY OF HYDROCARBON

1. **The C—C bond length in the acetylene is:**
   A. 1.35A°
   B. 1.39A°
   C. 1.54A°
   D. 1.20A°

2. **Which of the following compound does not have sp^3 hybridization state:**
   A. Water
   B. Ethene
   C. Ethane
   D. Methane

3. **Dehydrohalogenation of alkyl halide is carried out in presence of ____.**
   A. Zn dust
   B. Alcoholic KOH
   C. H_2SO_4
   D. aqueous KOH

4. **The number of sigma and pi bond in the 1-buten-3-yne is:**
   A. 6 σ and 3 π
   B. 7 σ and 3 π
   C. 5 σ and 5 π
   D. 8 σ and 2 π

5. **The carbon atom of the ethene are:**
   A. sp hybridized
   B. sp^3 hybridized
   C. sp^2 hybridized
   D. Not hybridized

6. **The IUPAC name of $CH_2=CH-CH(CH_3)_2$ is:**
   A. 2-vinylpropane
   B. 1-isopropylethylene
   C. 3-methyl but-1-ene
   D. 1,1-dimethylprop-2-ene

7. **The hybridization of carbon atoms in C – C single bond of $H-C\equiv C-CH=CH_2$ is:**
   A. sp^2-sp^3
   B. sp-sp^2
   C. sp^3-sp^3
   D. sp^3-sp

8. **Ethene and Ethyne can be distinguished by**
   A. Anh. $AlCl_3$
   B. Cold. H_2SO_4
   C. Br_2 in CCl_4
   D. $AgNO_3$ in NH_4OH

9. **In the following reaction $C_6H_6 + Cl_2 \xrightarrow{AlCl_3} C_6H_5Cl+HCl$, what type of reaction has taken?**
   A. Electrophilic substitution
   B. Friedel-craft's alkylation
   C. Electrophilic addition
   D. None of these

10. **The compound buta-1,2-diene has:**
    A. Only sp^2 hybridised carbon atoms
    B. Both sp and sp^2 hybridised carbon atoms
    C. sp, sp^2 and sp^3 hybridised carbon atoms
    D. Only sp hybridised carbon atoms

11. **Nitrobenzene reacts with chlorine in presence of $AlCl_3$. The product obtained is:**
    A. o-chloro nitrobenzene
    B. p-chloro nitrobenzene
    C. m-chloronitrobenzene
    D. All of them

12. **The number of π-bonds present in acrylonitrile is:**
    A. 1
    B. 3
    C. 2
    D. 4

13. **Free radicals are characterized by:**
    A. Paramagnetism
    B. Loss of Electrons
    C. Diamagnetism
    D. Low reactivity

14. **Ethene on polymerization, gives the product polyethene. This reaction may be called as**
    A. Addition
    B. Condensation
    C. Substitution
    D. Pyrolysis

15. **Which one of the following is a powerful electrophile used to attack on the electrons of benzene ring?**
A. $FeCl_2$
B. $FeCl_4^-$
C. Cl^+
D. Cl_2

16. **The heat of hydrogenation of most of the alkene is about:**
A. 120 kJ/mol
B. 140 kJ/mol
C. 100 kJ/mol
D. 105 kJ/mol

17. **The structure of ethyne is:**
A. Angular
B. Linear
C. Trigonal
D. Trigonal planner

18. **Two unhybridized p orbital on a carbon atom overlap separately with two p-orbitals of the other carbon atom to give two bonds perpendicular to the sigma frame work in:**
A. Ethane
B. Ethyne
C. Ethene
D. None

19. **Dehydrohalogenation of alkyl halides happens in the presence of:**
A. Pd
B. Zn
C. Ni
D. KOH/alcohol /NaNH

20. **Carbocation is formed as a result of:**
A. Homolytic fission
B. Propagation
C. Heterolytic fission
D. Initiation

21. **Baeyer's reagent is mixture of:** dilute 1:/ alkaline
A. HCl & $ZnCl_2$
B. Alkaline $KMnO_4$
C. Aqeous bromine
D. Mix of Br_2 & $KMnO_4$

22. **The compound used to distinguish the ethyne and ethene is:**
A. Alkaline $KMnO_4$
B. Bromine water
C. Ammonical $AgNO_3$
D. Fehling's solution

23. **Ethylene polymerizes at 100 atm pressure and 400 °C to give:** / Polythen
A. Polybenzene
B. Polypropylene
C. Polyalcohol
D. Polyethylene

24. **Aromatic hydrocarbon are the derivatives of:**
A. Normal series of paraffin
B. Benzene
C. Alkene
D. Cyclohexane

25. **During the nitration of benzene the nitrating agent is:**
A. NO_3
B. NO_2^-
C. NO_2^+
D. HNO_3

26. **The most reactive compound is:**
A. Benzene
B. Ethane
C. Ethene
D. Ethyne

27. **C—H bond length in the benzene is:**
A. 0.99A°
B. 1.12A°
C. 1.09A°
D. 1.34A°

28. **The π-electrons in the styrene are:**
A. 12
B. 8
C. 10
D. 6

29. **C—C bond distance in the benzene is:**
A. 1.392°A
B. 1.54°A
C. 1.345°A
D. 1.4 4°A

30. **In early days, the compounds were named on the basis of:**
A. History
B. Name of person
C. Method of preparation
D. All of these

31. **How many *Pi* bonds are present in ethane molecule**
A. Two
B. Three
C. One
D. No Pi bond

32. **In the following, which one is free radical?**
A. Cl^-
B. Cl^+
C. Cl_2
D. Cl^0

33. **The ratio of σ and π electron in the benzene is:**
A. 4:1
B. 6:1
C. 8:3
D. 2:1

34. **Aromaticity of benzene ring is due to:**
A. Presence of sigma bond
B. Ring structure
C. Delocalization of pi electrons
D. Three double bond

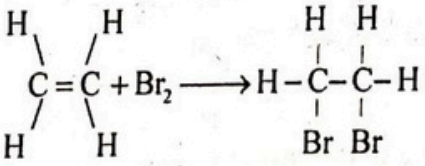
35. **Among the following the polycyclic aromatic compound is:**
A. Styrene
B. Naphthalene
C. Toluene
D. Acetophenone

36. **Benzene has π electron:**
A. 2
B. 6
C. 4
D. 8

37. **The substitution of a '-H' by '-NO_2' group in benzene is called:**
A. Nitration
B. Ammunolusis
C. Sulphonation
D. Reduction of benzene

38. **Addition of unsymmetrical reagent to an unsymmetrical alkene is governed by:**
A. Cannizzaro's Reaction
B. Kirchhoff Rule
C. Aldol Condensation
D. Markownikov's Rule

39. **Bromination of alkene is shown in the following reaction. This reaction is used for**



A. Identification of primary and secondary alcohols
B. Detection of double bond
C. Detection of aldehydes
D. Detection of ketones

40. **Ethene is produced from ethyl chloride by reacting with alcoholic KOH. The process is called:**
A. Hydrogenation
B. Dehydrohalogenation
C. Dehydrogenation
D. Oxidation

41. **Reaction mechanism of alkanes with halogens is known as**
A. Addition
B. Free radical substitution
C. Elimination
D. Propagation

42. **Bromination of Ethene involves:**
A. Electrophilic addition
B. Trans addition
C. Proceed through halogenonium ion
D. Nucleophilic Addition

43. **2-Propenol, on rearrangement, yields:**
A. Propanal
B. 2-propanol
C. Propanone
D. Both A and B

44. **When 1-butene reacts with bromine, the product formed will be:**
A. 1, 3-dihydroxy butane
B. 1, 3-dihydroxy butan-diol
C. But-1, 2-diol
D. 1,2-dibromo butane

45. **Which of the following tests helps to distinguish between alkyne and alkene?**
A. Lucas test
B. Baeyer's test
C. Tollen's reagent test
D. Fehling's solution test

46. **Which of the following addition does not take place according to Markownikov's rule?**
A. $CH_3CH = CH_2 + HCl \longrightarrow$
B. $CH_3CH_2CH = CH_2 + HI \longrightarrow$
C. $CH_3CH = CH_2 + HBr \longrightarrow$
D. $CH_3CH = CHCH_3 + HBr \longrightarrow$

47. **Naphthalene has two fused aromatic ring of carbon atom the molecular formula is:**
A. $C_{10}H_8$
B. $C_{10}H_{14}$
C. $C_{10}H_{10}$
D. $C_{12}H_{12}$

48. **Which of the following decolourizes $KMnO_4$ solution?**
A. C_3H_8
B. C_2H_6
C. C_4H_{10}
D. $C_6H_5CH_3$

49. **Nitration of benzene by HNO_3 and H_2SO_4 is:**
A. Electrophilic substitution
B. Nucleophilic substitution
C. Electrophilic addition
D. Free radical substitution

50. **In which reaction is a carbocation (carbonium ion) an intermediate:**
A. $CH_2 = CH_2 + Br_2 \longrightarrow CH_2BrCH_2Br$
B. $CH_3CH_3 + Cl_2 \longrightarrow CH_3CH_2Cl + HCl$
C. $(CH_3)_3CBr + NaOH \longrightarrow (CH_3)_3COH + NaBr$
D. $CH_3CHO + HCN \longrightarrow CH_3CH(OH)CN$

51. **The total number of sigma bonds between C – H in benzene are:**
A. 6
B. 3
C. 12
D. 8

52. **Benzene cannot undergo the _____ directly:**
A. Substitution reaction
B. Oxidation reaction
C. Addition reaction
D. Elimination reaction

53. **Aniline is the derivative of the benzene containing the:**
A. Hydroxyl group
B. Amido group
C. Amino group
D. Imido group

54. **The benzene molecule contains:**
A. Six sp^2 hybrid carbons
B. Three sp^3 hybrid carbons
C. Six sp^3 hybrid carbons
D. Three sp^2 carbons

55. **Which of the following is not an electrophilic substitutional reaction of benzene?**
A. Chlorination of benzene in sunlight
B. Sulphonation
C. Friedel Craft alkylation
D. Nitration

56. **Which of the following Grignard reagents react to form alkanes?**
A. Ammonia
B. Water
C. Methanol
D. All of these

57. **In benzene molecule c-atom is**
A. dsp^2 hybridized
B. sp hybridized
C. sp^2
D. sp^3

58. **The angle between the unhybridized $2p_z$ orbital and the three sp^2 hybrid orbitals in ethene is**
A. 180°
B. 90°
C. 120°
D. 60°

59. **2,5-dimethyl-1-hexene has**
A. Two sp^2 hybridized carbons
B. Two double bonds
C. Six sp^2 hybrid carbons
D. Four pi electrons

60. **Acetylide can give back ethyne upon treatment with**
A. water
B. dil. Acid
C. strong base
D. weak base

61. **The addition of HCl to ethene gives?**
A. Chloroethane
B. 1,1-dichloroethane
C. 1,2-dichloroethane
D. 2-chloroethane

62. **Which of the following compound reacts slower than benzene in the electrophilic substitution:**
A. Phenol
B. Nitrobenzene
C. Toluene
D. Aniline

63. **A compound that has a nucleophilic carbon?**
A. C_2H_2
B. C_3H_8
C. C_2H_4
D. C_6H_6

64. **The origin of acidic nature of alkyne is?**
A. small size of C
B. polarity of triple bond
C. Small size of H
D. sp hybridization

65. **Ethane when completely halogenated in excess of chlorine can form:**
A. Hexachloroethane
B. Pentachloroethane
C. Dichloroethane
D. 1,1,2,2-terachloroethane

66. **Glyoxal molecule has?**
A. two carbonyl groups
B. Two aldehydic groups
C. One aldehydic and one carbonyl group
D. Two carboxyl groups

67. **With the increase in unsaturation in a molecule:**
A. Number of sigma bonds increase
B. Number of pi bonds decrease
C. Number of lone pairs increase
D. Number of unhybridized orbitals increase

68. **Ethene can give all of the following reactions except**
A. Addition
B. Hydrohalogenation
C. Free radical substitution
D. Hydration

69. **Benzene reacts with Ethyl chloride in presence of $AlCl_3$ to give:**
A. Benzalchloride
B. Ethyl benzene
C. Benzyl chloride
D. Benzotrichloride

70. **Which group activates the benzene ring:**
A. – COOH
B. –CHO
C. –COR
D. –OH

71. **Tertiary alcohols are the easiest to dehydrate because:**
A. They form stable carbocation
C. They have bigger size
C. They have less hydrogens
D. They are polar

72. **Benzene in the presence of $AlCl_3$ produces acetophenone when reacts with:**
A. Acetyl chloride
B. Acetic acid
C. Ethyl benzene
D. Ethanoic acid

73. **Which of the following is electrophile for alkylation?**
A. NO^+_2 C. SO_3
B. R^+ D. Both a & b

74. **If ethyl and methyl groups are equidistant in a chain, the preference is given to?**
A. Ethyl B. methyl
C. both ethyl and methyl D. methyl mostly

75. **Hydration of ethene is an example of**
A. Electrophilic addition B. Electrophilic substitution
C. Nucleophilic addition D. Nucleophilic substitution

76. **The correct sequence of events for hydration of ethene is?**
A. Sulphuric acid. water C. Boiling water, sulphuric acid
B. Water, sulphuric acid D. Sulphuric acid, boiling water

77. **The reagent that fails to distinguish between ethene and ethyne?**
A. Ammonical silver nitrate C. Ammonical cuprous chloride
B. Aqueous bromine D. Sodium metal

78. **Gemminal dihalide is the product of?**
A. Hydrohalogenation of alkyne C. Halogenation of alkyne
B. Hydrohalogenation of alkene D. Halogenation of alkene

79. **Free radical addition of halogens to benzene is governed by:**
A. Delocalization of pi-electrons C. Sigma framework of benzene
B. Sunlight D. Polarity of solvent

80. **To introduce more than one halogen substituents in alkane, the necessary condition is to?**
A. Increase halogen concentration C. Decrease T
B. Increase Alkane concentration D. use some solvent

81. **1,2-dichlorobutane when dehydrohalogenated gives:**
A. Butene C. 2-butene
B. 1-butyne D. 2-butyne

82. **The reaction of chlorine with methane is carried out in the presence of light. What is the function of the light:**
A. To break the C – H bonds in methane
C. To break up the chlorine molecules into ions
B. To heat up the mixture
D. To break up the chlorine molecules into free radicals.

83. Identify Y in the sequence $CH_2 = CH_2 \xrightarrow{HBr} X \xrightarrow{KOH_{(aq)}} Y$
A. CH_3OH C. $HOCH_2CH_2OH$
B. CH_3CH_2OH D. C_2H_4

84. **Both alkanes and alkenes:**
A. are saturated C. are electrophiles
B. give free radical reaction D. have triangular planar structure

85. **When acetylene adds one molecule of hydrogen, the bond angle:**
A. increases C. decreases by 60°
B. becomes 90° D. increases 120°

86. **The carbon atoms of which compound show maximum electronegativity:**
A. Ethene C. Propene
B. Ethyne D. benzene

87. **The order of reactivity of halogens with alkanes shows that the most reactive halogen is:**
A. Fluorine C. Chlorine
B. Bromine D. Iodine

88. IUPAC name of $H_3C-CH_2-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$

A. 2-Methyl butane
B. 3-Methyl butane
C. 1-Methyl butane
D. Pentane

89. IUPAC name of $H_3C-CH_2-CH_2-\underset{\displaystyle CH_3}{\underset{|}{\underset{\displaystyle CH_2}{\underset{|}{CH}}}}-CH_3$ is

A. 3-Methylheptane
B. 3-Methylpentane
C. 3-Methylhexane
D. 3-Methyl butane

90. IUPAC name of $H_3C-\underset{\displaystyle H_3C}{\underset{|}{C}}-\underset{\displaystyle CH_3}{\underset{|}{C}}-CH_3$ is

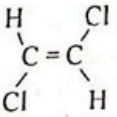
A. 2, 2, 3, 3 – Tetramethyl butane
B. 2, 2, 4, 4 – Tetramethyl butane
C. 2, 2, 3, 3 – Tetramethyl propane
D. 2,3 dimethyl butane

91. **The ease of dehydration of various alcohols is in the order**

A. ter. alcohol > sec alcohol > pri. Alcohol
B. pri. Alcohol > sec. alcohol > ter. Alcohol
C. sec, alcohol > pri. Alcohol > ter. Alcohol
D. None of them

92. $CH\equiv CH+?\xrightarrow[Heat]{Ni}H_2C=CH_2$

A. H_2
B. HCl
C. H_2O
D. H_2SO_4

93. $CH\equiv CH+Cl_2\xrightarrow{?}$ 

A. CCl_4
B. H_2SO_4
C. HCl
D. Ni

ANSWER KEY

1	D	11	C	21	B	31	D	41	B	51	C	61	A	71	A	81	B	91	A
2	B	12	B	22	C	32	D	42	A	52	D	62	B	72	A	82	D	92	A
3	B	13	A	23	D	33	A	43	C	53	C	63	A	73	B	83	B	93	A
4	B	14	A	24	B	34	C	44	D	54	A	64	D	74	A	84	B		
5	C	15	C	25	C	35	B	45	C	55	A	65	A	75	A	85	C		
6	C	16	A	26	C	36	B	46	D	56	D	66	B	76	D	86	B		
7	B	17	B	27	C	37	A	47	A	57	C	67	D	77	B	87	A		
8	D	18	B	28	B	38	D	48	D	58	B	68	C	78	C	88	A		
9	A	19	D	29	A	39	B	49	A	59	A	69	B	79	B	89	A		
10	C	20	C	30	D	40	B	50	C	60	B	70	D	80	A	90	A		

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4. $H_2C = CH - C \equiv CH$

10. $H_2C = C = CH - CH_3$

12. $H_2C = CH - CN$

19. β-elimination

22. Acidic nature of alkyne

33. 12 σ and 3 π bonds

43. $H_2C = \underset{\underset{OH}{|}}{C} - CH_3 \rightarrow H_3C - \underset{\underset{O}{\|}}{C} - CH_3$

46. Symmetrical alkene

48. Oxidation of alkyl benzene

50. S_N1 reaction

59. $H_2C = \underset{\underset{CH_3}{|}}{C} - CH_2 - CH_2 - \underset{\underset{CH_3}{|}}{CH} - CH_3$

63. $H - C \equiv \overset{-\delta}{C} - H$

65. $H_3C - CH_3 + 6Cl_2 \rightarrow Cl_3C - CCl_3 + 6HCl$

67. $H_3C - CH_3$ — No unhybridized orbital; $HC \equiv CH$ — 4 unhybridized orbitals

74. E comes first alphabetically

75. 1st step is S_E

77. Both are unsaturated

84. Alkanes = Halogenation; Alkenes = Polymerization

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Q.1 When hydrogen atom is removed from benzene, group left is called:

A. Alkyl group
B. Phenyl group
C. Benzyl group
D. Methyl group

Q.2 The introduction of NO_2 group in the benzene ring is called nitration. The nitration of benzene takes place when it is heated with a 1:1 mixture of ----------at 50-55°C

A. Conc. HNO_3 and Conc. H_2SO_4
B. Conc. HNO_3 and Conc. HCl
C. Conc. HNO_3 and Conc. Acetic acid
D. Conc. HNO_3 and Conc. H_3PO_4

Q.3 Ethyne molecule is formed when two carbon atoms joined together to form a sigma bond only:

A. sp-s overlap
B. sp-sp overlap
C. sp^2-sp^2 overlap
D. 2py-2py overlap

Q.4 Hydrogenation of unsaturated oils is done by using

A. Finely divided nickel
B. Finely divided iron
C. Vanadium pentaoxide
D. Copper

Q.5 The substitution of –H group by $–NO_2$ group in benzene is called

A. Nitration
B. Ammonolysis
C. Sulphonation
D. Reduction of benzene

Q.6 Benzene in presence of $AlCl_3$ gives acetophenone when reacts with

A. Acetyl chloride
B. Acetic acid
C. Ethyl benzene
D. Ethanoic acid

Q.7 In the reaction of ethene with bromine the intermediate formed is

A. CH_2-CH_2 with ^+Br
B. CH_2-CH_2 with Br
C. CH_2-CH_2 with Br
D. CH_2-CHBr

Q.8 Ethene on polymerization, give the product polyethene, this reaction may be called as

A. Addition
B. Substitution
C. Condensation
D. Pyrolysis

Q.9 The introduction of R - C(=O) group in benzene is called

A. Acylation
B. Alkylation
C. Carbonyl reduction
D. Formylation

Q.10 What is the product formed when propene reacts with HBr?

A. $CH_3-CH_2-CH_2Br$
B. $CH_2(Br)-CH(Br)-CH_3$
C. $BrCH_2-CH=CHBr$
D. $CH_3-CH(Br)-CH_3$

Q.11 The introduction of an alkyl group in benzene takes place in the presence of $AlCl_3$ and:

A. $R-\overset{\overset{O}{\|}}{C}-OH$

B. $R-\overset{\overset{O}{\|}}{C}-Cl$

C. $R-Cl$

D. $R-\overset{\overset{O}{\|}}{C}-O-$

Q.12 Addition of unsymmetrical reagent to an unsymmetrical alkene is governed by:

A. Cannizzaro's Reaction
B. Aldol condensation
C. Krichoff Rule
D. Markownikov's Rule

Q.13 Order of reactivity of alkenes with hydrogen halide is

A. HBr > HI > HCl
B. HF > HI > HCl
C. HI > HBr > HF
D. HI > HBr > HCl

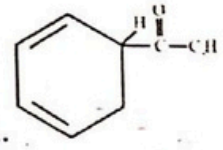
Q.14 Which one of the following is a powerful electrophile used to attack on the electrons of benzene ring?

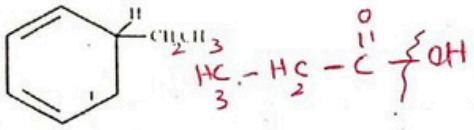
A. $FeCl_2$
B. Cl^+
C. $FeCl_4^-$
D. Cl_2

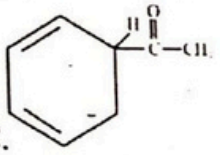
Q.15 The reaction of benzene with bromine in the presence of $FeBr_3$ follows the mechanism of _____ reaction

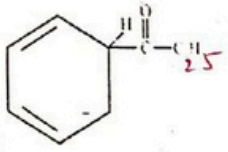
A. Electrophilic addition
B. Electrophilic substitution
C. Nucleophilic substitution
D. Nucleophilic addition

Q.16 Intermediate product formed when propanoyl chloride reacts with benzene is

A. 

B. 

C. 

D. 

Q.17 When benzene reacts with Acetyl chloride (CH_3COCl) in the presence of $AlCl_3$ acetophenone is formed. The electrophile in this reaction will be

A. CH_3C^+O
B. C^+H_3
C. $AlCl_3$
D. CH_3COCl

Q.18 Which of the following species are 3,5(meta directing groups when second group is introduced into the benzene ring

I = $-NH_2$ II = $-CHO$ III = $-COOH$ IV = $-CH_3$

A. II, III and IV
B. I and IV
C. II and III
D. I, II and IV

Q.19 For halogenation of benzene, which reagent is used:

A. H_2SO_4
B. HNO_3
C. $AlCl_3$
D. HCl

Q.20 Chlorination and Bromination mostly uses:

A. Radiowaves
B. Infrared radiation
C. Visible light
D. U.V light

Q.21 Among the following, which one has electron withdrawing effect:

A. $-NH_2$ B. -CHO

C. $-N(CH_3)_2$ D. $-I$

Q.22 Reaction mechanism of alkanes with halogens is known as

A. Addition B. Elimination

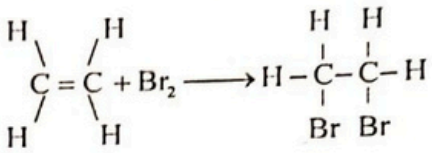
C. Free radical substitution D. Propagation

Q.23 Which compound is obtained by the elimination of bromopropane?

A. Butene B. Propene

C. Ethene D. Propane

Q.24 Bromination of alkene is shown in the following reaction. This reaction is used for:



A. Identification of primary and secondary alcohols

B. Detection of double bond

C. Detection of aldehydes

D. Detection of ketones

Q.25 Which one of the following acts as a electrophile in the electrophilic substitution of benzene with bromine

A. Br^+ B. $FeCl_4^-$

C. Fe^{+3} D. Fe^{+2}

Q.26 In Friedal Craft's Chlorination of Benzene, Iron III chloride acts as a catalyst, which is the initial reaction in the generation of an electrophile?

A. $Cl_2 + FeCl_3 \rightarrow Cl^+ + FeCl_3^-$ B. $Cl_2 + FeCl_3 \rightarrow 2Cl^+ + FeCl_2^-$

C. $Cl_2 + FeCl_3 \rightarrow Cl^- + FeCl_4^+$ D. $Cl_2 + FeCl_3 \rightarrow Cl^+ + FeCl_4^-$

Q.27 Which of the options show all possible products of combustion of Butene?

A. $CO+CO_2+H_2O$ B. CO_2+H_2O

C. $C+CO+CO_2$ D. $C+CO+CO_2+H_2O$

Q.28 In the reaction sequence given here

$H_3C-CH_3 + Br_2 \xrightarrow{hu} A \xrightarrow{AlcKOH} B$ **The end product is an unsaturated hydrocarbon. Identify the nature of reaction in the two steps.**

A. Step I is a nucleophilic substitution and step II is elimination

B. Step I is addition and step II is nucleophilic substitution

C. Step I is free radical substitution and step II nucleophilic substitution

D. Step I is free radical substitution and step II is elimination

Q.29 Homolysis of a covalent bond yields a very reactive species with incomplete octet in its valence shell. What is this species?

A. A complex ion B. An electrophile

C. A free radical D. A nucleophile

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Q.30 Order of reactivity of halogen toward alkane is

A. $F_2 > I_2 > Br_2 > Cl_2$
B. $F_2 > Br_2 > Cl_2 > I_2$
C. $F_2 > Cl_2 > Br_2 > I_2$
D. $F_2 > Cl_2 > I_2 > Br_2$

Q.31 Acetone can be obtained by ozonolysis

A. 2-Batyne
B. 2-Butene
C. iso-butene
D. 1-butene

Q.32 Which catalyst is used in oxidation of benzene ring?

A. $FeBr_3$
B. V_2O_5
C. $Fe+Al_2O_3$
D. Raney Ni

Q.33 Which of the following compound react slower than benzene in electrophilic substitution reaction

A. Nitrobenzene
B. Phenol
C. Aniline
D. Toulene

Q.34 The correct order of the reactivity of hydrocarbon given below is

A. $C_2H_4 > C_2H_2 > C_6H_6$
B. $C_6H_6 > C_2H_4 > C_2H_2$
C. $C_2H_4 > C_2H_4 > C_6H_6$
D. $C_2H_2 > C_6H_6 > C_2H_4$

Q.35 Select meta directing group of the following?

A. –OH
B. $-NR_2$
C. –CN
D. –OR

Q.36 A gas decolorizes alkaline $KMnO_4$ solution but does not give any PPT with ammonical $AgNO_3$

A. Methane
B. Ethylene
C. Ethane
D. None of the above

Q.37 An olefin "X" on ozonolysis gives $CH_3CH_2COCH_3$ and CH_3COCH_3. The IUPAC name of X is:

A. 2-butane
B. 2-3 di methyl-2-pentene
C. 2-pentene
D. 1-Hexene

Q.38 Treatment of ethene with cold sulphuric acid followed by reaction with boiling water yields:

A. Ethyne
B. Ethane
C. Ethanal
D. Ethanol

Q.39 Alkenes undergo:

A. Nucleophilic substitution
B. Electrophilic Addition
C. Nucleophilic addition
D. Electrophilic substitution

Q.40 Which of the following molecule shows cis – trans isomers?

A. C_2HCl_3
B. $C_2H_2Cl_4$
C. C_2H_4
D. $C_2H_2Br_2$

Q.41 In the reaction sequence:

$$H_3C\text{-}CH_2\text{-}CH_2\text{-}Br + AlcKOH \longrightarrow C \xrightarrow[H_2O]{H_2SO_4} D$$

Product D will be

A. Mixture of methanol and ethanol
B. 2-propanol
C. 1-Propanol
D. Propanoic acid

Q.42 Which of the following reactions is used for the production of alcohols on industrial scale?

A. Hydrohalogenation of alkenes
B. Hydration of alkenes
C. Hydroxylation of alkenes
D. Hydrogenation of alkenes

Q.43 Which derivative of benzene shows maximum reactivity in electrophilic substitution reactions?

A. Benzaldehyde
B. Methyl benzene
C. Benzoic acid
D. Nitrobenzene

Q.44 Electrophile in sulphonation of benzene is

A. HSO_4
B. H_2SO_4
C. SO_3
D. HSO_3

Q.45 Acetophenone can be formed by which of the following reaction of benzene?

A. Alkylation
B. Acylation
C. Halogenation
D. Nitration

Q.46 When CH_3 is attached with the benzene ring, it makes the ring:

A. Good electrophile
B. Good nucleophile
C. Resonance hybrid
D. Extraordinary stable

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1	B	6	A	11	C	16	D	21	B	26	D	31	C	36	B	41	B	46	B
2	A	7	A	12	D	17	A	22	C	27	D	32	B	37	B	42	B		
3	B	8	A	13	D	18	C	23	B	28	D	33	A	38	D	43	B		
4	A	9	A	14	B	19	C	24	B	29	C	34	A	39	B	44	C		
5	A	10	D	15	B	20	D	25	A	30	C	35	C	40	D	45	B		

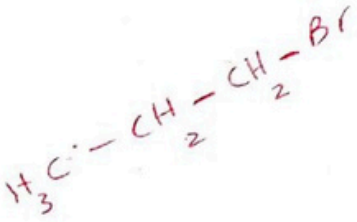
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7. Electrophilic addition reaction.

9. $R-\overset{\overset{O}{\|}}{C}-$ is acyl group

10. Markonikov's addition.



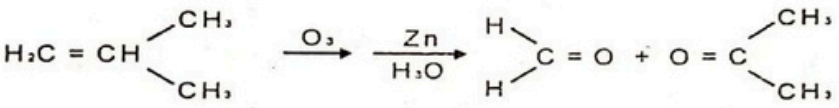
16. $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-Cl$

Propanoyl chloride

18. Both of these can accumulate electrons of benzene ring.

27. In case of complete combustion, CO_2, and H_2O are formed while in case of incomplete combustion, C and CO may also be produced.

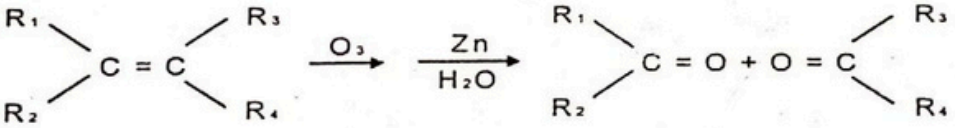
28. In I, H is replaced by halogen atoms.
In II, HBr molecule is eliminated.

31. 

33. Electron withdrawing group attached.

34. C_2H_4 (Exposed e^-), C_2H_2 (less exposed e^-) C_6H_6 (dėlocalized e^-)

36. Double bond but no acidic hydrogen.

37. 

38. Addition of water.

41. C = Propene D = 2 – Propanol.

43. Electron donating group.

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Q. 1 Alkanes are called as _____?

A. Olefines B. Paraffins
C. Reactive D. All of these

Q. 2 Ethene has pi bonds?

A. 1 B. 2
C. 3 D. 4

Q. 3 If two substituents are present at 1,4 positions then the isomer is called as _____?

A. Ortho B. Meta
C. Para D. None of these

Q. 4 Benzene does not show

A. Addition reactions B. Substitution receptions
C. Elimination reactions D. Oxidation reactions

Q. 5 General formula of alkanes is

A. $C_nH_{2n}O_2$ B. C_nH_{2n+2}
C. C_nH_{2n-2} D. C_nH_{2n}

Q. 6 Benzene gives how many Monosubstituted products?

A. 2 B. 1
C. 4 D. 3

Q. 7 Hydrocarbon X has higher boiling point, Hydrocarbon Y has lower boiling point

A. X is more flammable than Y B. X is more viscous than Y
C. X has more no. of carbon atoms than Y D. X is a large molecule than Y

Q. 8 The formation of vegetable ghee from vegetable oil is called

A. Hydrogenation B. Dehydrogenation
C. Hardening of oil D. Both A and C

Q. 9 When carbon atoms increase in chain

A. Boiling point low B. Volatility high
C. More viscous D. More flammable

Q. 10 When one vinyl chloride reacts with other two vinyl chloride they will give us

A. Divinyl chloride B. Polyvinyl chloride
C. Trivinyl chloride D. Tetra vinyl chloride

Q. 11 Which of the following is marsh gas

A. Methane B. Ethane
C. Propane D. Butane

Q. 12 Number of pi bonds in ethene is / are

A. 1 B. 2
C. 3 D. 4

Q. 13 In conversion of alkene to alcohol,reagent is

A. KOH B. KCl
C. H_2SO_4 D. HNO_3

Q. 14 Which of the following is produced in propagation

A. Cl
B. CH_3Cl
C. Cl_2
D. CH_2

Q. 15 Hydrogenation of alkenes takes place in the presence of _____?

A. Nickel
B. Palladium
C. Gold
D. Raney nickel

Q. 16 Which one of the following is correct value of resonance energy of benzene?

A. 155.5 kJ/mol
B. 150.5 kJ/mol
C. 170 kJ/mol
D. 140.5 kJ/mol

Q. 17 Which of the following group is ortho-para directing group _____?

A. -COOH
B. -CN
C. -COR
D. -OH

Q. 18 Aromatic benzene ring is

A. Saturated
B. Unsaturated
C. Cyclohexane
D. B and C both

Q. 19 Free radical mechanism is used in:

A. Addition reactions
B. Elimination reactions
C. Electrophilic substitution
D. Free radical substitution

Q. 20 The organic compounds having double bond

A. Alkanes
B. Alkenes
C. Alkynes
D. Alkyl halides

Q. 21 Alkenes can be prepared from alcohols by:

A. Dehydration
B. Dehalogenation
C. Dehydrohalogenation
D. All of these

Q. 22 The reaction in which benzene is reacted with alkyl or acyl halide in the presence of $AlCl_3$ is called as _____?

A. Aldol condensation
B. Wittig reaction
C. Wolf kishner reaction
D. Friedel and craft reaction

Q. 23 The two pi bonds in ethyne molecule are:

A. Parallel to the sigma bond
B. At 19.5° to the sigma bond
C. At 45° to the sigma bond
D. Perpendicular to the sigma bond

Q. 24 Which of the following gives Markovnikov's product with propene?

A. HBr
B. H_2SO_4/H_2O
C. HBr
D. All of these

Q. 25 Which of the following has one acidic hydrogen in it?

A. Acetylene
B. 2-propene
C. 2-pentyne
D. 1-pentyne

Q. 26 Polymerization of ethene produces which of the following polymer?

A. Polyvinyl
B. Polethyl
C. Polyethylene
D. Polyethoxy

CamScanner

Q. 27 An aromatic compound that can obtained from coal tar is

A. Benzene
B. Toluene
C. Phenol
D. Diphenylmethane

Q. 28 Which of the following method is used to prepare ethylene glycol from ethene?

A. Dehydration
B. Hydroxylation
C. Hydration
D. Lucas test's

Q. 29 The presence of double bond in a compound shows that the compound has _____?

A. Saturation
B. All signal bonds
C. Unsaturation
D. Substitution

Q. 30 Which of the following act as electrophile during nitration of benzene?

A. NO^+
B. NO_2^+
C. NO_3^+
D. HNO_2^+

ANSWER KEY

1	B	6	B	11	A	16	B	21	D	26	C
2	A	7	B	12	A	17	D	22	D	27	B
3	C	8	D	13	C	18	B	23	D	28	B
4	C	9	C	14	B	19	D	24	D	29	C
5	B	10	C	15	B	20	B	25	D	30	B

UNIT 15

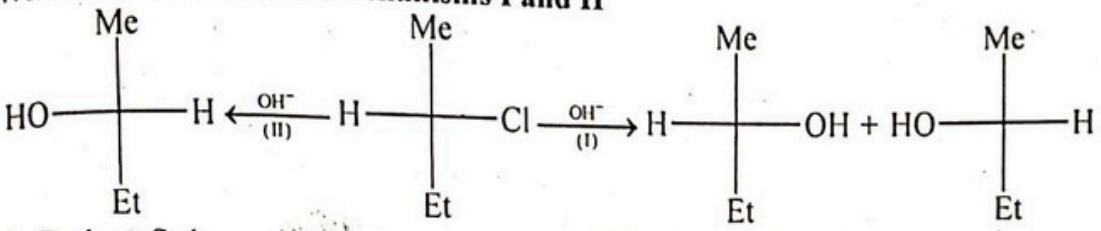
PRACTICE EXERCISE

ALKYL HALIDE

1. **The average bond energy of C-Br is:**
   A. 228 $kJmol^{-1}$
   B. 200 $kJmol^{-1}$
   C. 250 $kJmol^{-1}$
   D. 290 $kJmol^{-1}$

2. **RCH_2X is the general formula of:**
   A. Primary alkyl halide
   B. Secondary alkyl halide
   C. Tertiary alkyl halide
   D. Aryl halide

3. **What is true about the mechanisms I and II**



C-F 467
C-H 413
C-Cl 346
C-Br 290
C-I 228

   A. Both are S_N1
   B. (I) is S_N1, (II) is S_N2
   C. Both are S_N2
   D. (I) S_N2 (II) S_N1

4. **What is the correct IUPAC name of the structure** $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-\underset{\displaystyle Br}{\underset{|}{CH}}-CH_3$
   A. 2-bromo-3-methylbutane
   B. 2-methyl-3-bromobutane
   C. 3-methyl-2-bromobutane
   D. 2-bromo isobutane

5. **Elimination bimolecular reactions usually obey:**
   A. First order kinetics
   B. Third order kinetics
   C. Second order kinetics
   D. Zero order kinetics

6. **For which mechanisms, the first step involved is the same**
   A. E1 and E2
   B. E2 and E1
   C. E2 and S_N2
   D. E1 and S_N1

7. **The rate of E_1 reaction depends upon**
   A. The concentration of substrate
   B. The concentration of substrate as well as nucleophile
   C. The concentration Nucleophilic
   D. Nature of Catalyst

8. **The elimination of hydrogen halide from adjacent carbon atoms is called**
   A. Dehydrogenation
   B. Dehydrohalogenation
   C. Hydrogenation
   D. Hydrohalogenation

9. **Alkyl halides are considered to be very reactive compounds towards nucleophiles, because**
   A. The have an electrophilic carbon
   B. They have an electrophilic carbon and a bad leaving group
   C. They have an electrophilic carbon and a good laving group
   D. They have a nucleophilic carbon and a good leaving group

10. **Alkyl halides undergo a type of reaction**
    A. Nucleophilic substitution
    B. Elimination
    C. Nucleophilic addition
    D. Both A and B

CamScanner

11. **S_N2 – reactions can be usually observed in:**
A. Primary alkyl halide
B. Tertiary alkyl halide
C. secondary alkyl halide
D. Both A. and B.

12. **Which one of the following is the least stable carbocation?**
A. CH_3^+
B. $(CH_3)_2CH^+$
C. $CH_3-CH_2^+$
D. $(CH_3)_3C^+$

13. **The S_N1 mechanism for the hydrolysis of an alkyl halide to an alcohol involves the formation of:**
A. Carbocation
B. Carbanion
C. Free radical
D. Pentavalent carbon in the transition state

14. **An amine is produced in the following reaction.**
$C_2H_5I + 2NH_3 \rightarrow C_2H_5NH_2 + NH_4I$. What is mechanism?
A. Electrophilic addition.
B. Nucleophilic addition
C. Electrophilic substitution
D. Nucleophilic substitution

15. **Which one of the following is not monohaloalkane:**
A. 2-chloropropane
B. 2-bromobutane
C. 1,2-dibromoethane
D. 3-chloro pentane

16. **Which is a good nucleophile as well as a good leaving group?**
A. F^-
B. Br^-
C. Cl^-
D. I^-

17. **Chloroform ($CHCl_3$) is?**
A. Primary alkyl halide
B. Tertiary alkyl halide
C. Secondary alkyl halide
D. a liquid

18. **Which of the following alkyl halide is the most reactive towards the attacking nucleophile:**
A. CH_3F
B. CH_3Br
C. CH_3Cl
D. CH_3I

19. **In the transition state of S_N2 mechanism reaction with alkyl halides, which of the following orbital hybridization is involved:**
A. sp^3
B. sp
C. sp^2
D. dsp^3

20. **The alkyl halide on which a nucleophile attacks is known as;**
A. Reagent
B. Substrate
C. Electrophile
D. Both reagent and substrate

21. **Which statement is correct about carbocations?**
A. They are reactive species
B. They are stable species
C. They are electron rich species
D. They have filled orbitals

22. **Which of the following factors does not affect the S_N1 rate is:**
A. Nucleophilicity of the attacking nucleophile
B. Solvent system
C. Stability of the carbonium ion
D. The nature of leaving group

23. **Which one of the following is not associated with S_N2 mechanism:**
A. 100 % inversion of configuration
B. Tertiary alkyl halides
C. 2^{nd} order kinetics
D. Change of hybridization from sp^3 to sp^2 in transition state

24. **Which statement is true about bases?**
A. They are electron pair acceptor species
B. They can accept electrons from hydrogen
C. Their strength is measured by rate constant
D. Their strength is measured by base dissociation constant

25. **Which of the following is primary alkyl halide:**
A. Isopropyl halide
B. Tert-butyl halide
C. Sec-butyl halide
D. Neo-pentyl halide

26. **Out of monochloro, monobromo and monoiodo derivatives of ethane, the most reactive compound towards nucleophilic substitution will be:**
A. C_2H_5Br
B. C_2H_5I
C. C_2H_5Cl
D. All are equally reactive

27. **The reaction C_2H_5Cl + aqueous KOH$\rightarrow$ C_2H_5OH + KCl is:**
A. Electrophilic addition
B. Nucleophilic addition
C. Electrophilic substitution
D. Nucleophilic substitution

28. **Correct order for the reactivity of alkyl halide in S_N reactions:**
A. R – I > R – F > R – Cl
B. R – I > R – Cl > R – F
C. R – F > R – Cl > R – I
D. R – Cl > R – I > R – F

29. **When purely alcoholic solution of sodium/potassium hydroxide and halogenoalkanes a re reacted an alkene is formed, what is the mechanism of reaction?**
A. Elimination
B. Dehydration
C. Debromination
D. Reduction

30. **In S_N1 reactions, the rate of reaction depends upon the concentration of:**
A. One reactant molecule
B. Two reactant molecules
C. Nucleophile
D. Both nucleophile and electrophile

31. **The S_N2 reactions can be best performed with:**
A. Primary alkyl halides
B. Secondary alkyl halides
C. Tertiary alkyl halides
D. Aryl halide

32. **Primary alcohol is obtained by the reaction of Grignard's reagent with:**
A. Aldehydes other than formaldehyde
B. Acetone
C. Formaldehyde
D. Ethyl formate

33. **The alkaline hydrolysis of bromoethane shown below gives alcohol as the product:**
$H_3C—CH_2—Br \xrightarrow{KOH} H_3C—CH_2—OH$
The reagent and the condition used in this reaction may be:
A. H_2O at room temperature
B. Ethanol, heat
C. KOH in alcohol
D. Dilute NaOH(aq) warm

34. **If halogenoalkanes are mixed with an excess of ethanolic ammonia and heated under pressure, amine are formed. Which amine is formed in the following reaction?**
$CH_3CH_2Br + NH_3 \longrightarrow$ Amine
A. $CH_3—CH_2—NH—CH_2—CH_3$
B. $CH_3—CH_2—NH_2$
C. $CH_3—CH_2—CH_2—NH_2$
D. $H_2N—CH_2—CH_2—NH_2$

35. **Which one of the following is NOT a nucleophile:**
A. NH_2^-
B. H_2O
C. BF_3
D. CH_3^-

36. **Which is an intermediate in S_N1:**
A. Ethoxide ion
B. Alkyl halide
C. Alkene
D. Carbocation

37. **Among the following, which one is nucleophile:**
A. H^+ C. Ca^{2+}
B. OH^- D. Na^+

38. **In elimination reaction i.e, in the formation of alkene, the reactivity of alkyl halide is in the order:**
A. Cl > Br > I C. I > Br > Cl
B. Br > Cl > I D. I > Cl > Br

39. **Which one of the following halide is most reactive towards nucleophilic substitution reaction?**
A. C_2H_5Br C. C_2H_5Cl
B. C_2H_5I D. none of these

40. **All electron deficient species are classified as:**
A. Nucleophiles C. Electrophiles
B. Bases D. All of these

41. **$R_2 - CH - X$ is an example of**
A. Primary alkyl halide C. Secondary alkyl halide
B. Isopropyl halide D. Both (a) and (b)

42. **The carbon atom carrying positive charge and attached to three other atoms or groups is called:**
A. Carbonium ion C. Carbon ion
B. Oxonium ion D. Carbanion

43. **A mixture of 1-chloropropane and 2-chloro-propane when treated with alcoholic KOH, gives:**
A. Prop–2ene C. Isopropylene
B. Propene D. A mixture of prop–1–ene

44. **Which of the following alkyl halides undergoes S_N1 reaction fastest:**
A. Methyl chloride C. Isobutyl chloride
B. Ethyl chloride D. Tertiary butyl chloride

45. **When 2-bromobutane reacts with alcoholic KOH, the reaction is called:**
A. Chlorination C. Halogenation
B. Dehydrohalogenation D. Hydrogenation

46. **Which compound is obtained by the elimination reaction on bromoethane?**
A. Butene C. Propene
B. Ethene D. Propane

47. **An electron pair donor is classified as:**
A. Lewis acid C. Lewis base
B. Bronsted acid D. Bronsted base

48. **Which among $MeX, RCH_2X, R_2CHX, R_3CX$ is reactive towards S_N2 reaction:**
A. R_3CX C. RCH_2X
B. R_2CHX D. MeX

49. **In nucleophilic substitution bimolecular reaction the order of reaction with respect to substrate:**
A. 2nd order C. 3rd order
B. 1st order D. Zero order

50. **Which one among the following is not a good leaving group:**
A. HSO_4^- C. Cl^-
B. OH^- D. Br^-

51. **Dehydrohalogenation of secondary butyl bromide will give**
A. Propene
B. Butene
C. 1 – Butene
D. 2 – Butene

52. **In primary alkyl halides the carbon atom to which the halo group is attached is in tum bonded directly to:**
A. one other carbon
B. three other carbons
C. two other carbons
D. four other carbons

53. **Which pair gives same dehydrohalogenation product**
A. 1 – Chlorobutane, 2 – Chlorobutane
B. 1 – Chloropropane, 2 – Chloropropane
B. 1 – Bromopentane, 3 – Bromopentane
D. iso – butyl chloride, 2° – butyl chloride

54. $CH_3 - \overset{3}{C}H - \overset{2}{C}H_2 + Br^- \rightarrow$ **Product**

Br^- Can attack at
A. 1 only
B. 1 or 2
C. 2 or 3
D. 3 or 1

55. **A structure of protein has**
1. **Twisted structure**
2. **Covalent bonds**
3. **H – bonds**

it is
A. 1° structure
B. 2° structure
C. 3° structure
D. 4° structure

56. **Which is an intermediate in S_N1 reaction**
A. Ethoxide ion
B. alkyl halide
C. Carbocation
D. alkene

57. **In beta elimination reaction**
A. carbon number changes
B. hybridization of C remains same
C. unsaturated compound is formed
D. pi bonds are decreased

58. **The carbon atom of an alkyl group attached with halogen atom is called:**
A. Electrophile
B. Nucleophile
C. Free radical
D. Nucleophilic centre

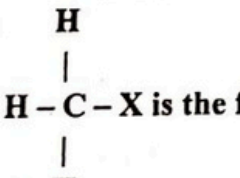
59. **Which of the following decides the reactivity of alkyl halides?**
A. C – C bond strength
B. C – X bond strength
C. C – H bond strength
D. Electronegativity difference

60. **Reaction of ethyl bromide with ammonia**
A. completes in a single step
B. continues till N is left with no lone pair
C. completes in two steps
D. is reversible

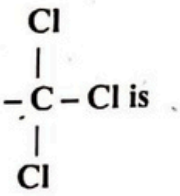
61. **To prepare ethane by Wurtz synthesis the suitable alkyl halide is**
A. Ethyl iodide
B. Ethyl chloride
C. any alkyl iodide
D. Methyl bromide

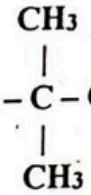
62. **Which of the following reactions does not involve formation of carbocation?**
A. S_N1 and E1
B. S_N1 and S_N2
C. E1 and E2
D. E2 and S_N2

63. **Alkyl halides with bulky alkyl groups tend to follow**
A. bimolecular kinetics
B. unimolecular kinetics
C. addition mechanism
D. second order kinetics

64.  **is the formula for**
A. Monohaloalkane
B. Trihaloalkane
C. Dihaloalkane
D. Aryl halide

65. **In tertiary halides, halogen atom is attached to a carbon which is further attached to _____ carbon atoms directly.**
A. One
B. Two
C. Three
D. Four

66.  **IUPAC name is**
A. Chloromethane
B. Trichloromethane
C. Methane chloride
D. Chloroform

67.  **IUPAC name is**
A. 5-chloro-methyl propane
B. Chloro-methyl – propane
C. 2-Chloro-2-methyl propane
D. iso-butyl chloride

68. **____ bond has the least bond energy than other C – X bonds.**
A. C – F
B. C - I
C. C - Cl
D. C - Br

69. **A specie which attracts electrons (electron loving) is called**
A. Electrophile
B. Substrate
C. Leaving group
D. Nucleophile

70. **The alkyl halide molecule on which a nucleophile attacks is called.**
A. nucleophilic centre
B. Polar centre
C. Substrate
D. Leaving group

71. **In S_N1 mechanism _____ molecule takes part in rate determining step.**
A. Only one
B. Four
C. two
D. Three

72. **The rate equation of S_N2 reactions can be written as follows: rate =**
A. [Alkyl halide]
B. k [Alkyl halide]^2
C. k [Alkyl halide] [Nucleophile]
D. k[Nucleophile]

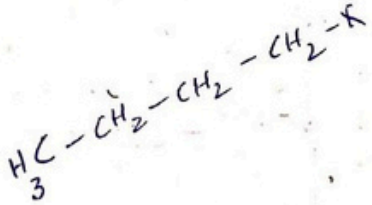
73. $CH_3\text{-}CH_2\text{-}CH_2\text{-}Cl + \_\_\_\_ \xrightarrow{Zn/HCl} CH_3\text{-}CH_2\text{-}CH_3 + HCl$
A. H_2
B. [H]
C. HCl
D. 2[H]

74. **The type of isomerism shown by alkyl halides is**
A. geometric
B. positional
C. functional
D. metamerism

unequal distribution of carbon atoms on either on polyvalent atom

ANSWER KEY

1	D	11	A	21	A	31	A	41	C	51	A	61	D	71	A
2	A	12	A	22	D	32	C	42	A	52	A	62	D	72	C
3	B	13	A	23	B	33	D	43	B	53	B	63	B	73	D
4	A	14	D	24	C	34	B	44	D	54	C	64	A	74	B
5	C	15	C	25	D	35	C	45	B	55	B	65	C		
6	D	16	D	26	B	36	D	46	B	56	C	66	B		
7	A	17	D	27	D	37	B	47	C	57	C	67	C		
8	B	18	D	28	B	38	C	48	D	58	A	68	B		
9	C	19	C	29	A	39	B	49	B	59	B	69	A		
10	D	20	B	30	A	40	C	50	B	60	B	70	C		



HINTS

3. I = 50% inversion + 50% retention

   II = 100% inversion

6. Carbocation is formed

9. Halogens are good leaving groups

12. Least no. of electron donating moieties

17. Monohaloalkanes are called alkyl halides

22. Only substrate appears in rate equation

25. $H_3C-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\underset{|}{\overset{|}{C}}}}-CH_2-X$

33. Aqueous base leads to substitution

43. $H_3C-CH=CH_2$
    1-Propene or Propene

48. Primary alkyl halide with smallest alkyl group

50. Comes from a weak acid

51. More substituted alkene

53. Propene

$CH_3-CH_2-Br+NH_3 \rightarrow CH_3CH_2NH_2$ attacked to single or no carbon

60.

61. $CH_3-Br+2Na+Br-CH_3 \rightarrow CH_3-CH_3$

PAST PAPERS 2009-2020

Q.1 **During S_N2 reaction, configuration of alkyl halide molecule is:**
A. Remains same
B. Depends upon carbon atom
C. Gets inverted
D. Depends upon electronegativity of halide

Q.2 **When purely alcoholic solution of sodium/potassium hydroxide and halogen alkane are refluxed an alkene is formed:**
CH_3-CH_2-Br (in presence of alcoholic KOH)$\rightarrow$ CH_2=CH_2
What is the mechanism of the reaction
A. Elimination
B. Dehydration
C. Debromination
D. Nucleophilic substitution

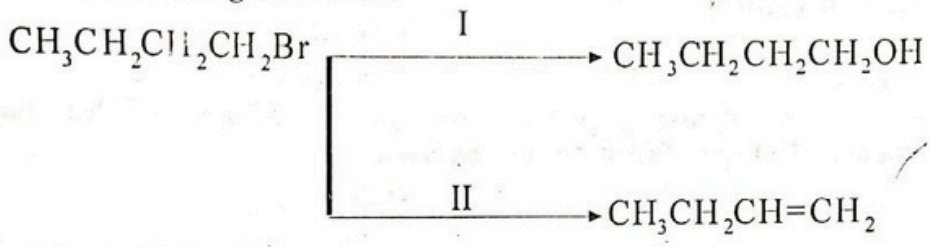
Q.3 **The alkaline hydrolysis of bromoethane shown below gives alcohol as the product**

$$CH_3-CH_2-Br \longrightarrow CH_2CH_2OH$$

The reagent and the condition used in this reaction may be
A. H_2O at room temperature
B. KOH is alcohol
C. Ethanol, heat
D. Dilute $NaOH_{(aq)}$, warm

Q.4 **In substitution reaction, secondary halogenoalkane give/show**
A. S_N1 mechanism
B. Both E_1 and E_2
C. S_N2 mechanism
D. Both S_N1 and S_N2

Q.5 **Consider the reaction given below:**



which statement is true?
A. Reagent for I is KOH in alcohol
B. Reagent for II is KOH in aqueous medium
C. Reaction II is elimination
D. Reaction I is debromination

Q.6 **If halogenalkanes are mixed with an excess of ethanoic ammonia and heated under pressure amine are formed. Which amine is formed in the following reaction?**

$$CH_3CH_2Br + NH_3 \longrightarrow \text{Amine}$$

A. CH_3—CH_2—NH—CH_2—CH_3
B. CH_3—CH_2—CH_2—NH_2
C. CH_3—CH_2—NH_2
D. H_2N—CH_2—CH_2—NH_2

Q.7 **Consider the reaction given below:**

$$CH_3-CH_2Br \xrightarrow[alcohol]{KOH} H_2C=CH_2 + HBr$$

Mechanism followed by the reaction is:
A. E2
B. S_N1
C. E1
D. S_N2

Q.8 **During the S_N1 reaction, the fast reaction involves**
A. Breakage of covalent bond
B. Transition state
C. Formation of carbocation
D. Attack of nucleophile

Q.9 **In elimination reaction, alcoholic KOH is used. OH^- in this case will act as**
A. Electrophile
B. Leaving group
C. Base
D. Acid

Q.10 Which is an intermediate compound in S_N1:
A. Ethoxide ion
B. Alkene
C. Alkyl halied
D. Carbocation

Q.11 Among the alkyl halides, which always follows S_N2 mechanism:
A. Primary alkyl halides
B. Tertiary alkyl halide
C. Secondary alkyl halides
D. Both A & C

Q.12 In elimination reaction, _____ is used:
A. Acidic $K_2Cr_2O_7$
B. Acidic NaOH
C. $CuCl_2$
D. Alcoholic KOH

Q.13 Which halide ion has the capacity to act as both very good nucleophile and good leaving group in nucleophilic substitution reactions?
A. I–
B. Br^+
C. F^-
D. Cl^-

Q.14 Which one is not nucleophile?
A. BF_3
B. NH_3
C. $-NH_2$
D. –OR

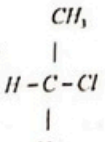
Q.15 Which type of alkyl halides gives SN_2 mechanism?
A. Secondary alkyl halides
B. Tertiary alkyl halides
C. Vinyl halides
D. Primary alkyl halides

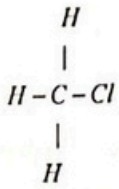
Q.16 The compound which has the highest boiling point in the following is
A. Methyl chloride
B. Methyl iodide
C. Methyl bromide
D. Both a and b

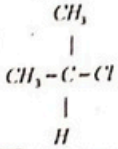
Q.17 Which product is obtained by the hydrolysis of 1–chlorobutane with the aqueous sodium hydroxide?
A. 1-butanol
B. 1-butanal
C. 1-butene
D. Butanone

Q.18 Alkyl halides involving –C-X bond breakage and –C-Nu bond formation simultaneously would follow the mechanism:
A. S_N1
B. S_N2
C. E_1
D. E_2

Q.19 Secondary alkyl halide is:

A. 

B. 

C. 

D. CH_3Cl

Q.20 R-X on reaction with alcohols forms:
A. R-OH
B. ROR
C. R-X OH
D. RH

PAST PAPER QUESTIONS

1	C	6	C	11	A	16	B
2	A	7	A	12	D	17	A
3	D	8	D	13	A	18	B
4	D	9	C	14	A	19	C
5	C	10	D	15	D	20	B

HINTS

3. Aq. Base carries out substitution reaction on alkyl halide molecule.

5. I is S_N reaction and II is β-elimination reaction.

6. If ammonia is in excess, mono substitution takes place, if alkyl halide is in excess, polysubstituted amine is produced.

7. Primary alkyl halide gives E2 reaction.

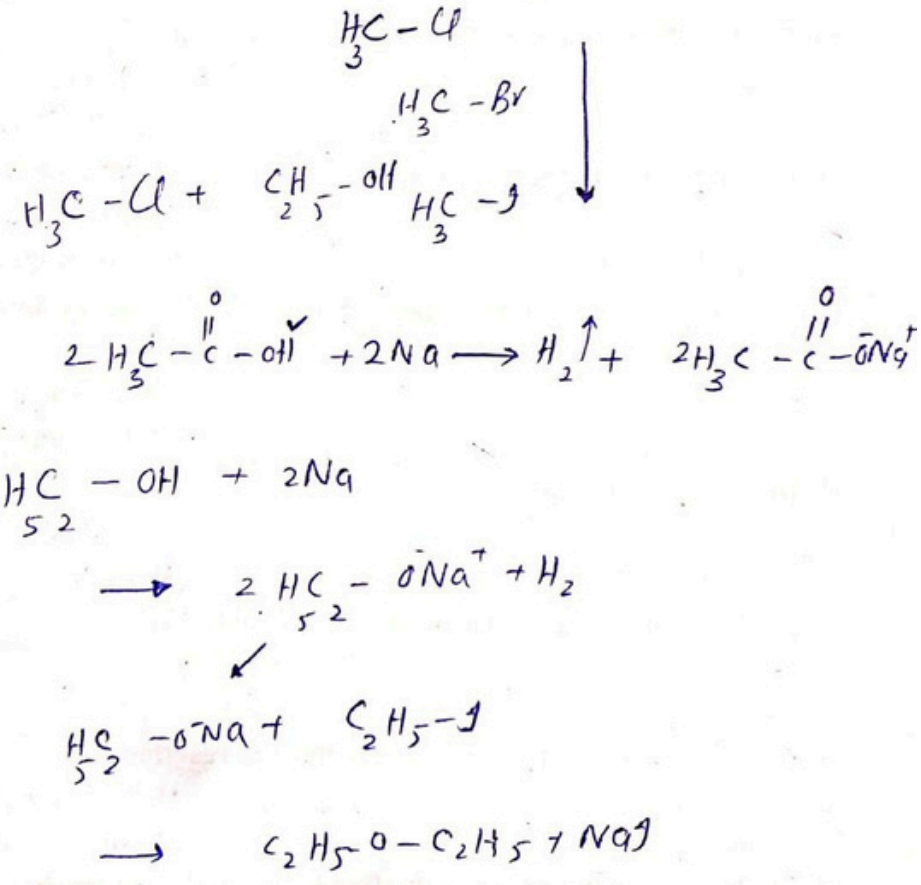
8. Formation of carbocation is slow step.

9. OH^- attacking at β-H behaves as base.

14. e^- deficient specie.

16. Iodine is large sized with high polarizability.

20. Firstly alcohol is reacted with metal to form alkoxide and then reacted with R – X, (Williamson's synthesis)



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Q. 1 **In IUPAC nomenclature, alkyl halides are named as _____?**

A. Alkyl halogens
B. Halogenoalkanes
C. Haloalkanes
D. Alkyl halides

Q. 2 **Grignard reagent is reactive due to:**

A. polarity of C-Mg bond
B. presence of C-Mg bond
C. presence of Mg
D. Polarity of Mg-Cl bond

Q. 3 **Grignard reagents are made in the presence of __**

A. dry ether
B. hydrated ether
C. Acetone
D. Chloroform

Q. 4 **What is the correct order of reactivity of alkyl halides**

A. R-Cl>R-Br>R-F>R-I
B. R-I>R-Br>R-Cl>R-F
C. R-I>R-Cl>R-Br>R-F
D. None of these

Q. 5 **S_N1 reactions have which of the following specie formed and consumed in the reaction**

A. Transition state
B. Intermediate
C. Carbanion
D. Carbene

Q. 6 **Which of the following is a poor leaving group in nucleophilic substitution reactions?**

A. Cl^-
B. Br^-
C. I^-
D. OH^-

Q. 7 **In which phase, S_N2 reactions are favored?**

A. Solid
B. Liquid
C. Gas
D. All of these

Q. 8 **Grignard reagent reacts with _____ to form alkane**

A. Water
B. Ammonia
C. Alcohol
D. All of these

Q. 9 **Alkyl halide in which halogen is attached to one carbon atom such carbon which is not attached to further carbon**

A. Primary
B. Secondary
C. Tertiary
D. Quaternary

Q. 10 **Same first step**

A. E_1, S_N1
B. E_2, S_N2
C. E_1, S_N2
D. E_2, S_N1

Q. 11 **Reaction followed by primary alkyl halide is**

A. S_N1
B. S_N2
C. Both
D. E_1

Q. 12 **Alkyl halides show which of following reaction**

A. Electrophile
B. Polymerization
C. Nucleophilic substitution
D. Nucleophilic elimination

Q. 13 **In a reaction having both alkyl halide and base, the base will attack on _____?**

A. Electrophilic carbon
B. Nucleophilic carbon
C. Beta-hydrogen
D. None of these

Q. 14 In S_N2 reaction, nucleophile attacks on the electrophilic carbon?

A. From the side of leaving group
B. Opposite to leaving group
C. In front of leaving group
D. Below leaving group

Q. 15 The rate of S_N1 reaction becomes double if _____?

A. Concentration of nucleophile doubled
B. Concentration of substrate doubled
C. Concentration of substrate tripled
D. Concentration of substrate remain same

Q. 16 Which one of the following is an electrophile?

A. Br^+
B. CH_4
C. NH_3
D. H_2O

Q. 17 Which alkyl halide gives S_N1 reactions

A. Secondary
B. Primary
C. Tertiary
D. All of these

Q. 18 Which of the following compete with each other

A. E_1, E_2
B. E_1, S_2
C. E_2, S_1
D. E_2, S_2

Q. 19 Alkyl halides give.

A. Nucleophilic substitution reaction
B. Nucleophilic addition reaction
D. Electrophilic substitution
D. Electrophilic addition

Q. 20 In beta elimination, nucleophile attack on

A. Alpha hydrogen
B. Beta Hydrogen
C. Alpha carbon
D. None of these

Q. 21 Which one of the following is not a secondary alkyl halide?

A. 2-Chloropropane
B. 3-Bromobutane
C. 2,3-Dichloropentane
D. 2-Chloro-2-methylpentane

Q. 22 Reactivity of alkyl halides can be determined by

A. carbon-halogen bond
B. carbon-carbon bond
C. carbon-hydrogen bond
D. halogen-halogen bond

Q. 23 Elimination reaction for ethyl chloride is

A. S_N2
B. E_2
C. S_N1
D. E_1

Q. 24 Alkyl halides generally give which type of elimination reactions?

A. Alpha-elimination
B. Gamma-elimination
C. Beta-elimination
D. Syn-elimination

Q. 25 Which is the best method for production of alkyl halide

A. Alcohol+PCl_5 PBr_3
B. Alcohol+$SOCl_2$ pyridine
C. Alcohol +HX
D. All of these

Q. 26 Alkyl halide is formed from alcohol by

A. Nucleophilic substitution
B. Nucleophilic addition
C. Nucleophilic addition
D. Elimination

Q. 27 Which of the following is more reactive

A. C_2H_5F
B. C_2H_5Br
C. C_2H_5I
D. C_2H_5Cl

Q. 28 Which are not directly prepared

A. RCl
B. RI
C. RF
D. RBr

Q. 29 Good nucleophile as well as good leaving group is

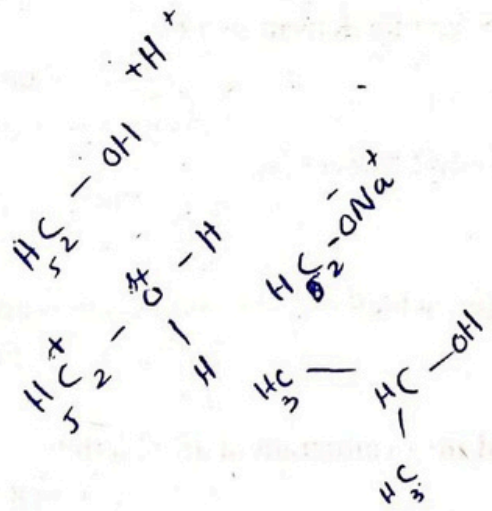
A. Br^-
B. Cl^-
C. I^-
D. F^{-1}

Q. 30 Reaction of alkyl halide with aqueous KOH

A. Elimination
B. Substitution reaction
C. Both
D. None

ANSWER KEY

1	A	11	B	21	D
2	A	12	C	22	C
3	A	13	C	23	B
4	B	14	B	24	C
5	B	15	B	25	B
6	C	16	A	26	A
7	B	17	C	27	C
8	D	18	D	28	B
9	A	19	A	29	C
10	A	20	B	30	B



UNIT 16 PRACTICE EXERCISE

ALCOHOLS AND PHENOLS

1. **2,4,6-Trinitrophenol is commonly called as:**
   A. Phthalic acid
   B. Malonic acid
   C. Tartaric acid
   D. Picric acid

2. **The reaction of alcohol with sodium produces**
   A. Ethane
   B. Alkoxide
   C. Ethene
   D. Aldehyde

3. **Tertiary alcohols produce _____ with acidified $KMnO_4$**
   A. Ketones
   B. Malonic acid
   C. Aldehydes
   D. Alkene

4. **Oxidation of secondary alcohol gives:**
   A. Organic acid
   B. Aldehyde
   C. Ether
   D. Ketone

5. **A compound 'z' decolorizes bromine water and produces white ppt. The compound 'z' is:**
   A. Alkane
   B. Phenol
   C. Alcohol
   D. Benzene

6. **Which alcohol is most reactive towards sodium metal?**
   A. Ter.Butyl alcohol
   B. n-Propyl alcohol
   C. Isopropyl alcohol
   D. Have same reactivity

7. **Which is most acidic?**
   A. H_2O
   B. C_2H_5OH
   C. C_4H_9OH
   D. $CH_3\text{-}CH_2\text{-}CH_2OH$

8. **Alcohols of low molecular weight are:**
   A. Soluble in water
   B. Insoluble in water
   C. Soluble in water on heating
   D. Insoluble in all solvents

9. **The intermediate in acid catalysed dehydration of alcohol is:**
   A. Carbene
   B. Carbocation
   C. Carbanion
   D. Free radical

10. **Which of the following is the weakest acid:**
    A. Phenol
    B. Carboxylic acid
    C. Alcohol
    D. Water

11. **Which of the following is more reactive where O – H bonds break:**
    A. P° alcohol
    B. T° alcohol
    C. S° alcohol
    D. Cannot be predicated

12. **Ethanol reacts with sodium metal to liberate:**
    A. CO_2 gas
    B. CO gas
    C. H_2 gas
    D. Steam

13. **The starting substance for the preparation of iodoform is any of the following, except:**
    A. $CH_3CH(OH)CH_3$
    B. HCH_2OH
    C. CH_3CH_2OH
    D. CH_3COCH_3

14. **Which of the following alcohols is least reactive with respect to O – H bond:**
    A. $CH_3\text{-}OH$
    B. $H_3C.\text{-}CH_2\text{-}OH$
    C. $CH_3\text{-}CH_2\text{-}OH$
    D. $(CH_3)_3OH$

15. **The compound which gives the most stable carbonium ion on dehydration is:**
A. $CH_3CH_2CH_2CH_2OH$
B. $(CH_3)_2CHCH_2OH$
C. $(CH_3)_3COH$
D. $CH_3CHOHCH_2CH_3$

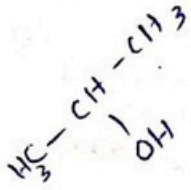
16. **Which of the substance is not going to react the sodium metal:**
A. Di methyl ether
B. Methanol
C. Acetic acid
D. Ethanol

17. **Phenol can be distinguished from ethyl alcohol by all of the following reagents except:**
A. Na
B. Br_2 / H_2O
C. Iodoform test
D. NaOH

18. **Phenol is completely soluble in water above:**
A. 25°C
B. 68.5°C
C. 62.3°C
D. 66.50°C

19. **Alcohols are hydroxy derivatives of:**
A. Alkane
B. Alkene
C. Benzene
D. Alkyne

20. **Which of the following alcohol is more soluble in H_2O:**
A. Propanol
B. Pentanol
C. Butanol
D. Hexanol



21. **Which one of the following is more acidic:**
A. Phenol
B. Alcohols
C. Carboxylic acid
D. Amines

22. **The compound 'x' when treated with sodium metal and the product formed is reacted with alkyl halide forms ether. Compound 'x' is**
A. Alcohol
B. Alkyl halide
C. Phenol
D. Ether

23. **Phenol on hydrogenation with H_2 in presence of Ni catalyst gives**
A. Benzene
B. Cyclohexanol
C. Toluene
D. Aldehyde

24. **Which of the following is soluble in water?**
A. CH_3OH
B. $CHCl_3$
C. CCl_4
D. CS_2

25. **In ethyl alcohol, the bond that undergoes heterolytic cleavage most readily is**
A. C – C
B. C – H
C. C – O
D. O – H

26. **Denatured alcohol is known as:**
A. Absolute alcohol
B. Methylated spirit
C. Wood spirit
D. Rectified sprit

27. **An example of aromatic alcohol is:**
A. Benzyl alcohol
B. Benzene
C. Phenol
D. A,C

28. **When ethanol is warmed with ethanoic acid in the presence of strong acid catalyst, an ester ethyl ethanoate is formed.**
$CH_3CH_2OH + CH_3CO_2H \longrightarrow CH_3CO_2CH_2CH_3$ During this reaction:
A. Alcohol is reduced
B. O–H bond in ethanoic acid is broken
C. O–H bond in ethanol is broken
D. Acid is oxidized

29. **Which one of the following is an appropriate indication of positive iodoform test?**
A. Formation of H_2O
B. Release of H_2 gas
C. Brick red precipitate
D. Yellow precipitate

30. **Reaction of alcohol with hydrogen chloride, in the presence of Zinc chloride yields _____:**
A. Ketone
B. Carboxylic
C. Alkyl halide
D. Ester

31. **The secondary alcohols undergo nucleophilic substitution reaction by**
A. S_N1
B. Either S_N1 and S_N2
C. S_N2
D. Both S_N1 and S_N2

32. **Alcohols are prepared by the:**
A. Hydration of alkenes
B. Hydrogenation of alkenes
C. Halogenation of alkenes
D. Oxidation of alkenes

33. **The protonated ether is called:**
A. Oxide ion
B. Carbon ion
C. Hydronium ion
D. Oxonium ion

34. **The acidity of phenol is due to its _____:**
A. Nature of Benzene
B. Double bond in benzene ring
C. Nature of phenoxide ion
D. Hydroxyl group

35. **One of the following can produce greater number of moles of ethyl chloride on reacting with excess of ethanol**
A. PCl_5
B. PCl_3
C. $HCl/ZnCl_2$
D. $SOCl_2$

36. **The strongest conjugate base is**
A. OH^-
B. $C_6H_5O^-$
C. CH_3O^-
D. CH_3COO^-

37. **The number of resonating structures of phenoxide ion are**
A. 3
B. 5
C. 4
D. 6

38. **Which statement is true about phenol?**
A. It is more acidic than acetic acid
B. It is more acidic than ethyl alcohol
C. It turns red litmus blue.
D. It does not react with sodium

39. **Which one of the following is the isomer of dimethyl ether?**
A. CH_3CH_2OH
B. CH_3CHO
C. CH_3COOH
D. $HCOOCH_3$

40. **$CH_3CH_2CH_2OH \xrightarrow{PCl_5} A \xrightarrow{Alc.KOH} B$ Here B is**
A. Propyne
B. Propanal
C. Propene
D. Propane

41. **1, 3, 5 – Pentanetriol has secondary carbons**
A. 3
B. 2
C. 1
D. Zero

42. **What forces operate between ethyl group of ethyl alcohol and oxygen of water**
A. H-bonding
B. repulsive forces
C. attractive forces
D. dipole forces

43. **Identify the reaction of alcohol in which O – H bond breaks.**
A. $CH_3CH_2OH + SOCl_2 \xrightarrow{Pyidine}$
B. $CH_3CH_2OH + NH_3 \xrightarrow{ThO_2}$
C. $CH_3CH_2OH + CH_3COOH \xrightarrow{H^+}$
D. $CH_3CH_2OH + PCl_5 \longrightarrow$

44. Which reaction shows the acidic nature of alcohol

A. $C_2H_5OH + SOCl_2$
B. $C_2H_5OH + NH_3$
C. $C_2H_5OH + Na$
D. $C_2H_5OH + CH_3MgI$

45. Esterification of CH_3COOH is _____ reaction.

A. Acid base
B. Redox
C. Electrophilic
D. Nucleophilic

46. The compound that reacts the slowest in Lucas test

A. 1 – Pentanol
B. 3 – Pentanol
C. sec-butyl alcohol
D. ter – butyl alcohol.

47. Which of the following undergoes easy dehydration?

A. 3-Methylbutan-2-ol
B. 2-Methylpropan-2-ol
C. Ethanol
D. Methanol

48. Ethyl alcohol reacts with PCl_3 and produces:

A. Haloalkane
B. Alkyl halide & $POCl_3$
C. Alkyl halide & H_3PO_3
D. Alkyl halides &H_3PO_4

49. Which reactant does not liberate water on reaction with alcohol?

A. NH_3
B. HCl
C. $K_2Cr_2O_7 / H_2SO_4$
D. PCl_3

50. Temperature required for the dehydration of ethanol into ethene in the presence of H_2SO_4 is:

A. 130°C
B. 175°C
C. 170°C
D. 180°C

51. An electron with drawing group attached to o-position in phenol

A. makes it basic
B. decreases its basicity
C. Stabalises the phenoxide ion
D. allows it to precipitate in aqueous solution

52. Alcohol is less acidic than phenol due to

A. higher ka value
B. stability of carbocation
C. Instability of alkoxide ion
D. Stability of phenol

53. Role of $ZnCl_2$ in the reaction Is to

$$CH_3CH_2OH + HCl \xrightarrow{ZnCl_2} CH_3CH_2Cl + H_2O$$

A. increase acidic character of C_2H_5OH
B. increase basic character of C_2H_5OH
C. Make Cl a good nucleophile
D. Make – OH a better leaving group

54. The dehydration of ethyl alcohol with concentrated H_2SO_4 at 140°C gives:

A. Ethene
B. Diethyl ether
C. Alcohol
D. Carboxylic acid

55. What is not true for R in R – OH?

A. If R = phenyl, it is phenol.
B. In phenol $R = \bar{e}$ with drawing
C. If $R = \bar{e}$ withdrawing H^+ removal is easier.
D. If $R = H$, it is more acidic than phenol.

56. Which will not react with phenol

A. NaOH
B. $KMnO_4/OH^-$
C. Br_2
D. Na

57. Phosphorus tri halides or phosphorus penta halides react with alcohols to replace _____ group by a halo group.

A. -OH
B. $-NO_2$
C. -COOH
D. $-SO_3H$

58. $CH_3-CH(OH)-CH_3$ is the example of
A. Primary alcohol
B. Tertiary alcohol
C. Secondary alcohol
D. None of them

59. The formula of benzyl alcohol is
A. C_6H_5OH
B. $C_6H_5CH_2OH$
C. $C_6H_5C_2H_4OH$
D. C_6H_5COOH

60. $CH_2(OH)-CH_2(OH)$ In IUPAC system is named as
A. 1,2 – Ethanol
B. 1,2 -Ethanediol
C. Ethanediol
D. Diethanol

61. The order of reactivity of alcohols when C – O bonds break:
A. Tertiary > Primary
B. Tertiary < Secondary < Primary
C. Tertiary < Secondary
D. Tertiary = Secondary = Primary

62. $C_2H_5OH + HCl \xrightarrow{ZnCl_2} \_\_\_\_ + H_2O$
A. C_2H_5Cl
B. HCl
C. C_2H_5OH
D. C_2H_6

63. Which one of the following alcohol is indicated by formation of yellow crystals in Iodoform test?
A. Methanol
B. Ethanol
C. Butanol
D. Propanol

64. Oxidation of alcohols covert them into
A. Aldehydes
B. Acids
C. Alkanes
D. Ethers

65. The best regent for the oxidation of alcohols is
A. $ZnCl_2$
B. Acid dichromate
C. Ether
D. Pyridine

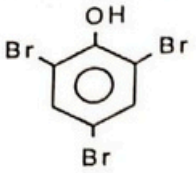
66. _____ alcohols are resistant to oxidation.
A. Primary
B. Tertiary
C. Secondary
D. Long chain

ANSWER KEY

1	D	11	A	21	C	31	B	41	A	51	C	61	A
2	B	12	C	22	A	32	A	42	B	52	C	62	A
3	D	13	B	23	B	33	D	43	C	53	D	63	B
4	D	14	D	24	A	34	C	44	C	54	B	64	A
5	B	15	C	25	C	35	B	45	D	55	D	65	B
6	B	16	A	26	B	36	C	46	A	56	B	66	B
7	A	17	A	27	A	37	B	47	B	57	A		
8	A	18	B	28	C	38	B	48	C	58	C		
9	B	19	A	29	D	39	A	49	D	59	B		
10	C	20	A	30	C	40	C	50	D	60	B		

HINTS

3. Dehydration

5. 

White precipitate

10. Alkoxides are less stable conjugate bases

13. Alcohols with β-CH_3 and ketones with α-CH_3 give this test

16. No acidic hydrogen

24. Hydrogen bonding

25. Electronegativity difference

28. S_E reaction of alcohol

34. Phenoxide ion is resonance stabilised

40. $A = CH_3\,CH_2\,CH_2\,Cl$ (S_N) $\qquad B = CH_3 - CH = CH_2$ (β-elimination)

49. HCl is released

51. e^- withdrawing groups stabilize negative charge

55. If R = H it will be water

64. Aldehydes or ketones are produced

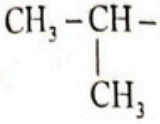
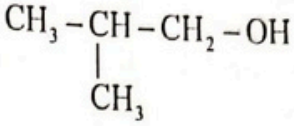
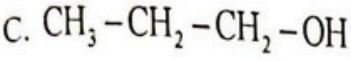
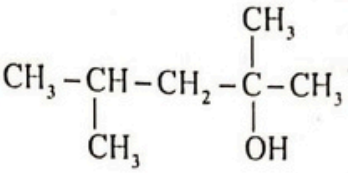
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Q.1 **Dissociation constant of phenol is:**

A. 1.2×10^{-10}
B. 1.2×10^{10}
C. 1.3×10^{10}
D. 1.3×10^{-10}

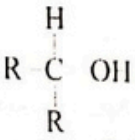
Q.2 **Which of the following is secondary alcohol?**

A. 
B. 
C. 
D. 

Q.3 **An alcohol is converted into an aldehyde with same number of carbon atoms in the presence of K_2CrO_4/H_2SO_4. the alcohol is**

A. $CH_2C(CH)_2OH$
B. $CH_3CH_2CH_2OH$
C. $(CH_3)_3COH$
D. $(CH_3)_2CHOH$

Q.4 **The following structure is of:**



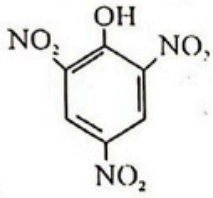
A. Secondary alcohol
B. Tertiary alcohol
C. Primary alcohol
D. Carboxylic acid

Q.5 **Consider the following reaction**

$$C_2H_5OH + PCl_5 \rightarrow ?$$

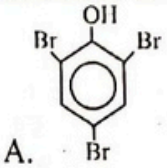
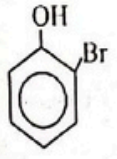
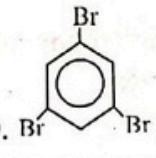
What product (s) may be formed?

A. C_2H_5Cl, $POCl_3$ and HCl
B. C_2H_5Cl and HCl
C. C_2H_5Cl only
D. C_2H_5Cl and $POCl_3$

Q.6 _____ **is named as**  **UHS (2013,2016)**

A. Nitro phenol
B. Malonic acid
C. Benzoic acid
D. Picric acid

Q.7 **Aqueous phenol decolorizes bromine water to form a white precipitate. What is the structure of the white precipitate formed?**

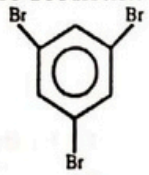
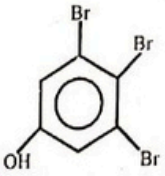
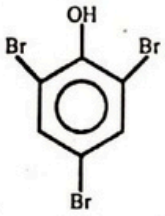
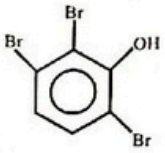
A. 
B. 
C. 
D. 

Q.8 **Primary, secondary and tertiary alcohols can be identified and distinguished by**
A. Lucas test
B. Bayer's test
C. Iodoform test
D. Silver mirror test

Q.9 **Which one of the following groups is indicated when HCl is formed by reaction of ethanol with phosphorus pentachloride?**
A. Amino group
B. Halide group
C. Hydroxyl group
D. Hydride group

Q.10 **Which one of the following alcohol is indicated by formation of yellow crystals in iodoform tests?**
A. Methanol
B. Butanol
C. Ethanol
D. Proponal

Q.11 **The formula of 2, 4, 6-Tribromophenol is**

A. 
B. 
C. 
D. 

Q.12 **How will you distinguish between methanol and ethanol?**
A. By lucas test
B. By oxidation
C. By silver mirror test
D. By iodoform test

Q.13 **Which one of the following is an appropriate indication of positive iodoform test?**
A. Formation of H_2O
B. Brick red precipitate
C. Release of H_2 gas
D. Yellow crystal

Q.14 **$(CH_3)_3C$-OH Which one of the following is proper classification of the above formula?**
A. Primary
B. Tertiary
C. Secondary
D. Polyhydric

Q.15 $C_2H_5\text{-}SO_4H \xrightarrow[\text{Warm}]{H_2O} C_2H_5\text{-}OH + H_2SO_4$ **choose the correct type for this reaction from the following?**
A. Reduction
B. Hydroxylation
C. Oxidation
D. Hydration

Q.16 $CH_3-CH_2-OH+PCl_5 \longrightarrow CH_3-CH_2Cl+POCl_3+HCl$ **formation of HCl is test for the presence of ___ in a compound**
A. Alkyl group
B. Saturated alkyl group
C. Hydroxyl group
D. Acid H^+ ion

Q.17 $C_2H_5OH + CH_3\text{-}COOH \rightleftharpoons^{H_2SO_4}$ **? what will be the exact product**
A. Diethyl ether
B. Ethyl acetate
C. Methyl propyl ether
D. Butyl alcohol

Q.18 **At 25^0C with phenol 2-4 Dinitrophenol is formed by the reaction of:**
A. (HNO_3+H_2SO_4) with benzene
B. NaOH with Benzene sulphonic acid
C. (HNO_3+H_2SO_4) with phenol
D. Sodium phenoxide with HCl

Q.19 The phenoxide ion is more stable than ethoxide ion as
A. Lone pair on O-atom overlaps with the delocalized π-bonding system in benzene
B. Oxygen atom is directly bonded with benzene ring in phenoxide ion
C. The negative charge is localized on oxygen atom of phenoxide ion
D. The negative charge is delocalized on oxygen atom of ethoxide ion

Q.20 The acidity of phenol is due to its_____:
A. Nature of Benzene
B. Nature of phenoxide
C. Double bond in benzene ring
D. Hydroxyl group

Q.21 Alcohol in which carbon atom bonded to –OH group is further attached with three alkyl group is
A. Aromatic alcohol
B. Primary alcohol
C. Secondary alcohol
D. Tertiary alcohol

Q.22 Which one the following compounds is known as tertiary alcohol?
A. 2-Methyl-1-propanol
B. 2-Methyl-2-propanol
C. 2-Propanol
D. 1-Propanol

Q.23 Ethanol, ethanoic acid and phenol all contain acidic functional groups, the order of the acidic strength is Ethanoic acid> phenol>ethanol This is mainly due to
A. Electron releasing (donating) effect of ethanoic acid is greater than that of ethanol
B. Electron releasing (donating) effect of phenol is greater than that of ethanol
C. Electron with drawing effect of phenol is greater than that of ethanol
D. Electron with drawing effect of ethanoic acid is greater than that of phenol

Q.24 Distinction between ethanol and phenol can be ascertained by
A. Lucas test
B. Tollen's test
C. Iodoform test
D. Reaction with bromine

Q.25 Choose a primary alcohol among the following
A. 2-methyl-2-propanol
B. 2,2-dimethyl-1-propanol
C. 2-propanol
D. 3-methyl-2butanol

Q.26 Dehydration of ethanol at 180°C in the presence of conc-H_2SO_4 gives
A. Ethene
B. Ethane
C. Ethyne
D. Ether

Q.27 Industrially water gas is converted into methanol by using catalyst
A. CuO + ZnO
B. CuO + Cr_2O_3
C. Al_2O_3 +ZnO
D. ZnO + Cr_2O_3

Q.28 Phenol react with CH_3COCl to give
A. Acid
B. Ester
C. Aldehyde
D. Ketone

Q.29 Choose reaction that does not require $ZnCl_2$ Catalyst:
A. $CH_3CH_2OH+HCl \longrightarrow CH_3CH_2Cl+H_2O$
B. $CH_3CH_2OH + HBr \longrightarrow CH_3CH_2Br + H_2O$
C. $CH_3CH_2OH+HI \longrightarrow CH_3CH_2I+H_2O$
D. Both B & C

Q.30 Tertiary alcohols are not oxidized into carbon compounds because
A. They contain more alkyl group
B. They have no alpha-hydrogen
C. Suitable oxidizing agent is not available
D. None of the above

Q.31 Ketones can be made by oxidation of
A. Primary Alcohols
B. Secondary Alcohols
C. Tertiary Alcohols
D. Aldehydes

Q.32 Select the reagent X from the following choices for this conversation;

$$CH_3CH(OH)CH(CH_3)_2 \xrightarrow{Reagent\ X} CH_3COCH(CH_3)_2$$

A. Acidified Phosphoric acid
B. Acidified Potassium dichromate (VI)
C. Acidified Potassium hydroxide
D. Acidified Oxalic acid

Q.33 IUPAC name of $C_6H_5O(CH_3)_2$ is

A. 2-Methyl-3-hexanone
B. 2,6-Dimethyl cyclohexanone
C. 3-Methyl cyclohexanone
D. 4-Methy l-3-hexanone

(NOTE: this is the original NMDCAT question, its correct formula must be $C_6H_8O(CH_3)_2$ then B option will be right)

Q.34 Phenol is known as:

A. Carpolic acid
B. Carbonylic acid
C. Carbolic acid
D. Carbolylic acid

Q.35 Phenol is more acidic than alcohols because of the following reason

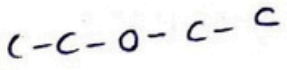
A. Delocalization of negative charge in the OH group
B. Delocalization of positive charge on the carbon atom in ring
C. Delocalization of negative charge in the ring
D. Delocalization of positive charge in the OH group

PAST PAPER QUESTIONS

1	D	6	D	11	C	16	C	21	D	26	A	31	B
2	A	7	A	12	D	17	B	22	B	27	D	32	B
3	B	8	A	13	D	18	C	23	D	28	B	33	B
4	A	9	C	14	B	19	A	24	D	29	D	34	C
5	A	10	C	15	D	20	B	25	B	30	B	35	C

C_nH_{2n+2}

C_nH



HINTS

3. Primary alcohols are oxidised to aldehydes.

6. 2, 4, 6 – Trinitrophenol

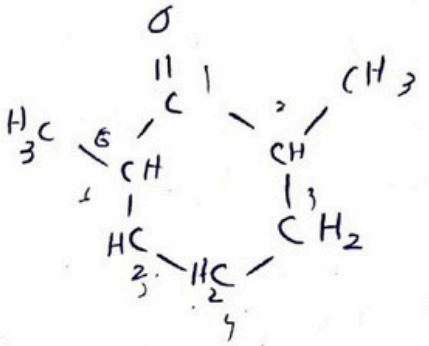
9. It is a confirmatory test for alcohols.

12. CH_3OH does not give this test.

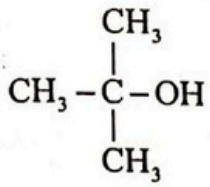
13. CHI_3

17. $CH_3\,COOC_2\,H_5$

19. Resonance stabilization.



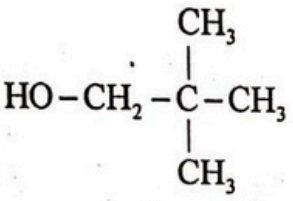
22.



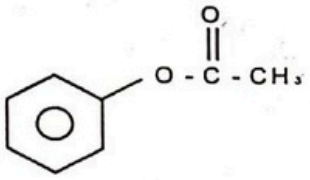
23. Benzene molecule withdraws electrons from oxygen atom to make phenol more acidic.

24. Both A and C can be used for this purpose. Only B can't be used.

25.



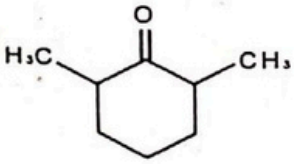
28.



29. Only alkyl chlorides are produced by this process.

30. α-H is necessary for alcohol oxidation.

33.



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Q. 1 1-propanol gives Lucas test on a heating

A. 5-10 minutes
B. Immediately
C. On heating
D. No reaction

Q. 2 The compounds which are formed by the replacement of one of the H of water by a alkyl group are called as _____?

A. Ethers
B. Phenols
C. Alcohols
D. Carboxylic acids

Q. 3 Dehydration of alcohols at low temperature and high acid concentration results in?

A. Alkene
B. Ether
C. Carboxylic acid
D. Aldehydes

Q. 4 Who first extracted phenol?

A. Wohler
B. Runge
C. Wittig
D. Wurtz

Q. 5 How many hydrogen atoms are attached to tertiary carbon in tertiary butyl alcohol?

A. 3
B. 2
C. 1
D. 0

Q. 6 Ethanol forms yellow crystal with iodine in the presence of

A. KOH
B. Conc H_2SO_4 at 14°C
C. NaOH
D. Both A and C

Q. 7 Phenol reacts with calcium carbonate and evolve ____?

A. H_2 gas
B. CO_2 gas
C. O_2
D. None of these

Q. 8 Which of following is an example of electrophilic attack on alcohols?

A. $C_2H_5OH+CH_3COOH \longrightarrow CH_3COOC_2H_5+H_2O$

B. $2C_2H_5OH+2Na \longrightarrow 2C_2H_5ONa+H_2$

C. $C_2H_5OH+HCl \longrightarrow ZnCl_2+C_2H_5Cl+H_2O$

D. Both A and B

Q. 9 Which of the following does not react with bases?

A. Carboxylic acids
B. Ethanol
C. Phenol
D. HCl

Q. 10 Which of the following catalyst is used in the industrial preparation of methanol?

A. Zinc oxide and alumina
B. Alumina and silica
C. Silica and chromium oxide
D. Zinc oxide and chromium oxide

Q. 11 Bakelite is

A. Phenol + Methanal
B. Phenol + Formaldehyde
C. Phenol + Acetaldehyde
D. Both A and B

Q. 12 Optimum temperature range for the process of fermentation is

A. 2–3 °C
B. 25–35 °C
C. 27 – 33°C
D. 4– 45°C

Q. 13 Which of the following compound shows strong H-bonding with water?

A. C_2H_6 B. CH_3Br

C. CH_3OCH_3 D. C_2H_5OH

Q. 14 Which of the following is easily formed during S_N1 reactions?

A. Secondary carbocation B. Primary carbocation

C. Tertiary carbocation D. Methyl carbocation

Q. 15 Phenol is _____ solid

A. Dense B. Hard

C. Deliquescent D. Intermittent

Q. 16 How phenol is produced from the chlorobenzene?

A. Using Kolb's method B. Using Dow's method

C. Using Zn dust D. All of above

Q. 17 Propanol reacts with HCl / $ZnCl_2$ to give a alkyl halide

A. On heat B. After 5 minutes

C. Never D. Immediately

Q. 18 Conc. HNO_3 react with phenol to form

A. o-Nitrophenol B. p-Nitrophenol

C. Picric acid D. m-Nitrophenol

Q. 19 Bakellite is formed by combination of

A. Aldehyde and phenol B. Formaldehyde and phenol

C. Formaldehyde and ethanol D. Acetaldehyde and ethanol

Q. 20 Phenol and alcohol react with Na metal to form salt and _ both form hydrogen gas

A. Both form water B. Ethanol form H_2 and phenol form water

C. Both form H_2 gas D. Both form H_2O

Q. 21 Ethanol is prepared on a large scale by

A. Hydration of alkanes B. Fermentation

C. Distillation of wood D. Williamson's synthesis

Q. 22 The alcohols having one hydroxyl group attached to the alkyl group are called as _____?

A. Monohydric alcohols B. Dihydric alcohols

C. Trihydric alcohols D. Polyhydric alcohols

Q. 23 Alcohol and phenol on reaction with metal gives

A. H_2 B. O_2

C. N_2 D. SO_2

Q. 24 Phenol gives benzene on heating with

A. Zn B. Mn

C. Fe D. Ag

Q. 25 Lucas test is used to distinguish

A. Alcohols B. Alkenes

C. Carbonylic acids D. Phenols

Q. 26 Reactivity of phenol is due to

A. Benzene ring
B. OH group
C. C–H polarity
D. Both A and B

Q. 27 Picric acid is

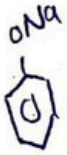
A. Monocarboxylic
B. Dicarboxylic acid
C. Tricarboxylic acid
D. Acidic phenol

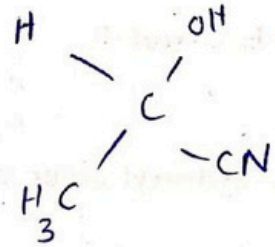
Q. 28 Phenol reacts with NaOH to form

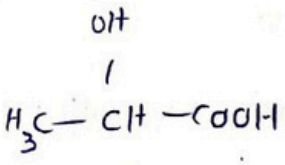
A. Acid
B. Base
C. Salt
D. Ester

ANSWER KEY

1	C	11	D	21	B
2	C	12	B	22	A
3	B	13	D	23	A
4	B	14	C	24	A
5	D	15	C	25	A
6	D	16	B	26	D
7	D	17	A	27	D
8	D	18	C	28	C
9	B	19	B		
10	D	20	C		







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UNIT 17

PRACTICE EXERCISE

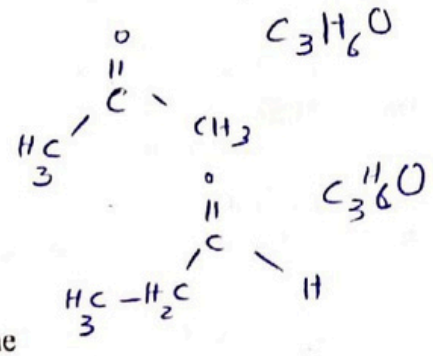
ALDEHYDES AND KETONS

1. **The general formula of homologous series of both aldehydes and ketones is:**
   A. $C_{2n}H_nO$
   B. $C_nH_{2n}O$
   C. $C_nH_{2n}OH$
   D. $C_nH_nO_{2n}$

2. **Which of the following will undergo nucleophilic addition reaction more easily?**
   A. Aldehyde
   B. Alkene
   C. Aldehyde & ketone equally
   D. Neither aldehyde nor alkenes

3. **Formalin contains _____ % alcohol:**
   A. 80
   B. 8
   C. 37
   D. 52

4. **Carbonyl compounds undergo nucleophilic addition because of:**
   A. More stable anion with negative charge on oxygen and less stable carbocation
   B. Electro negativity difference and pi bond
   C. Electronegative character of carbonyl carbon
   D. None of these



5. **Suitable reducing agent for aldehyde is:**
   A. Na_2CO_3
   B. $NaBH_4$
   C. $KMnO_4$
   D. $NaBH_2$

6. **Which of the following will not give iodoform test:**
   A. Ethanol
   B. Pentan-3-one
   C. Ethanal
   D. Pentan-2-one

7. **Acetaldehyde cyanohydrin upon hydrolysis produces:**
   A. Tartaric acid
   B. Malonic acid
   C. Formic acid
   D. Lactic acid

8. **Acetone reacts with HCN to form a cyanohydrin. It is an example of:**
   A. Electrophilic addition
   B. Electrophilic substitution
   C. Nucleophilic addition
   D. Nucleophilic substitution

9. **Which one of the followings is resistant to oxidation under normal conditions:**
   A. Methyl alcohol
   B. Acetaldehyde
   C. Ethyl alcohol
   D. Acetone

10. **Which of the following reagent will react with both aldehydes and ketones:**
    A. Fehling reagent
    B. Tollen's reagent
    C. Hydrazine
    D. Sodium nitroprusside

11. **Fehling solution is a complex of:**
    A. Cupric and oxalate
    B. Cuprous tartrate
    C. Cupric amine
    D. Cupric tartrate

12. **Formalin is used as:**
    A. Fungicide
    B. Sterilizing of surgical instruments
    C. Germicide
    D. All three

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13. **Mild oxidizing agent among the following is:**
A. $K_2Cr_2O_7$ (acidified).
B. Ammonical $AgNO_3$
C. $KMnO_4$ (Acidified)
D. Conc. HNO_3

14. **C = O and C = C bonds are differentiated by:**
A. Hybridization of C-atom
B. Bond length
C. Planar structures
D. Bond angles

15. **Reactivity of carbonyl compounds is due to:**
A. Electrophilic carbon
B. Unsaturation of C = O
C. Less stearic hindrance
D. Polarity of bond

16. **Which is a mixed ketone:**
A. Acetone
B. Diethyl Ketone
C. Benzophenone
D. Acetophenone

17. **Which of the following is not a symmetrical ketone:**
A. 4-heptanone
B. Butanone
C. Propanone
D. 3-pentanone

18. **The red brown ppt. of Fehling solution and benedict solution tests are of:**
A. Ag
B. Cu_2O
C. CuO
D. AgBr

19. **Which of the following test is not given by aldehyde:**
A. 2, 4 DNPH test
B. Tollen's test
C. $NaHSO_3$ test
D. Sodium nitroprusside test

20. **Which of the following compound is least reactive towards oxidation**
A. HCHO
B. CH_3COCH_3
C. CH_3CHO
D. CH_3CH_2CHO

21. **Which of the following does not give yellow precipitate with I_2 + NaOH:**
A. Acetone
B. Acetaldehyde
C. Benz aldehyde
D. Acetophenone

22. **Which of the following does not give brick red precipitate with Fehling's solution:**
A. Acetaldehyde
B. Propionaldehyde
C. Formalin
D. Acetone

23. **Which is most difficult to oxidize:**
A. HCHO
B. CH_3CHO
C. CH_3COCH_3
D. CH_3CH_2OH

24. **Which of the following gives silver mirror with ammonical $AgNO_3$:**
A. Benzyl alcohol
B. Benzoic acid
C. Benzene
D. Benz aldehyde

25. **In which of the following types of reactions are the carbonyl compounds and alkenes are similar in behaviour:**
A. Nucleophilic addition
B. Nucleophilic substitution
C. Electrophilic addition
D. Catalytic hydrogenation

26. **Which of the following ketone will not give iodoform test:**
A. Methyl isopropyl ketone
B. Ethyl isopropyl ketone
C. Dimethyl ketone
D. 2-hexanone

27. **Which of the following alcohol cannot be produced by treatment of aldehydes or ketones with $NaBH_4$:**
A. 1propa nol
B. 2propa nol
C. 2Met hyl–2propa nol
D. Ethanol

28. **Which of the following reagents react in same manner with HCHO, CH_3CHO and CH_3COCH_3:**
A. HCN
B. Ammonical $AgNO_3$
C. $Cu(OH)_2$ / NaOH
D. $Cu(OH)_2$ only

29. **Propanone does not undergo:**
A. Oxime formation
B. Hydrazone formation with hydrazine
C. Reduction with Fehling solution
D. Reaction with HCN

30. **The reaction of formaldehyde with HCN is:**
A. Nucleophilic substitution
B. Nucleophilic addition
C. Electrophilic substitution
D. Free radical addition

31. **The addition compound obtained by reacting acetaldehyde and HCN, when hydrolyzed gives:**
A. Ethyl alcohol
B. 2-Hydroxypropanoic acid
C. Methyl cyanide
D. Ethyl cyanide

32. **The reagent used to distinguish between ethanal and propanal is**
A. I_2 / NaOH
B. $LiAlH_4$
C. Benedict's reagent
D. sodium nitroprusside

33. **Which of the following gives positive haloform test and positive Fehling solution test**
A. Acetone
B. Acetaldehyde
C. Ethanol
D. Formaldehyde

34. **When calcium formate and calcium acetate are dry heated they form:**
A. HCOOH
B. CH_3CHO
C. C_2H_5OH
D. HCHO

35. **In aldehydes and ketones carbon of carbonyl group is:**
A. sp^3 hybridized
B. sp hybridized
C. sp^2 hybridized
D. un hybridized

36. **Acetaldehyde and ketone form addition product with:**
A. Phenyl hydrazine
B. Hydrazine
C. Hydroxylamine
D. Hydrogen cyanide

37. **Consider the following reaction:**
$R—CHO + 2[Ag(NH_3)_2]OH + R—COONH_4 + 2Ag + 2NH_3 + H_2O$
This reaction represents:
A. Fehling test
B. Benedict test
C. Ninhydrin test
D. Tollen's test

38. **A student mixed ethyl alcohol with small amount of sodium dichromate and added it to the hot solution of dilute sulphuric acid. A vigorous reaction took place. He distilled the product formed immediately. What was the product?**
A. Acetone
B. Acetic acid
C. Dimethyl ether
D. Acetaldehyde

39. **Which one of the following is also called silver mirror test?**
A. Fehling's solution test
B. Iodoform test
C. Tollen's reagent test
D. Benedict's solution test

40. **Both aldehydes and ketones are planar to the neighborhoods of carbonyl (C=O) group. Which one of the following bonds is distorted towards the oxygen atoms?**
A. π-bond of C and O
B. Sigma bond of C and H
C. Sigma bond of C and O
D. Sigma bond of C and C

41. **Which one of the following test is given by both aldehyde and ketone?**
A. Silver mirror test
B. Fehling's solution test
C. 2, 4 DNPH test
D. Benedict's solution test

42. **Which reagent is responsible for the conversion of ketone to secondary alcohol:**
A. $NaCO_3$
B. $NaBH_4$
C. Al
D. Red P

43. **To distinguish aldehyde from ketone which solution is used:**
A. Alkaline solution
B. Fehling's solution
C. A solution containing $K_2Cr_2O_7$
D. A solution containing acid only

44. **Identify the compound, which give iodoform test:**
A. Methanol
B. Methyl ketone
C. 3- Hexanol
D. Propionaldehyde

45. **2-propanol on oxidation yield:**
A. Propionaldehyde
B. Propanal
C. Propanone
D. Butanal

46. **Oxidation of secondary alcohol produces:**
A. Aldehyde
B. Alkyl halide
C. Ketone
D. Ester

47. **When wine is put in air, it becomes sour due to:**
A. Oxidation of C_2H_5OH
B. Formation of $C_2H_5NH_2$
C. Reduction of C_2H_5OH
D. Dissolution of CO_2

48. **The conversion of tertiary alcohols into alkenes in the presence of $K_2Cr_2O_7 + H_2SO_4$ is**
A. Addition reaction
B. C – H bond cleavage
C. Elimination reaction
D. Combustion reaction

49. **The oxidation of 1 – propanol in the presence of $H_2SO_4 + K_2Cr_2O_7$ produces final product**
A. Acetaldehyde
B. Acetone
C. Propanal
D. Propanoic acid

50. **An alcohol is converted to an aldehyde with same number of carbon atoms as that of alcohol in the presence of $K_2Cr_2O_7/H_2SO_4$ the alcohol is:**
A. $CH_3C(CH_3)_2OH$
B. $CH_3CH_2CH_2OH$
C. $(CH_3)_3COH$
D. $(CH_3)_2CHOH$

51. **2-propanol on Oxidation gives _____**
A. Aldehyde
B. Ketone
C. Carboxylic Acid
D. Alcohol

52. **The oxidation of which of the following compound gives ethyl methyl ketone:**
A. Propan–2ol
B. Butan–2ol
C. Butan–1ol
D. 2me thyl butan–2ol

53. **One of the following is application of iodoform reaction:**
A. Iodine is separated from reaction mixture
B. Carboxylic acid are formed by methyl ketones
C. Ketone are formed from this reaction
D. Identification of methanol

54. **2-Methylbutanal, upon reduction with hydrazine and KOH, produces:**
A. Butane
B. Pentane
C. Isobutanol
D. Isopentanol

55. **Dry distillation of calcium acetate results in the formation of:**
A. Formaldehyde
B. Acetaldehyde
C. Methyl ethyl ketone
D. Acetone

56. **From formaldehyde we get formalin which is powerful:**
A. Painkiller
B. Preservative and disinfectant
C. Bleaching and whitening agent
D. Deodorant

57. **Which of these conditions is mismatched?**

A. $CH_3OH + O_2 \xrightarrow[Pt+Asbestos]{300^oC} HCHO$

B. $CH_3OH + O_2 \xrightarrow[500^oC]{FeO/Mo_2O_3} HCHO$

C. $CH_3OH + [O] \xrightarrow[H_2SO_4]{Na_2Cr_2O_7} CH_4$

D. $CH_3CH_2OH \xrightarrow[180^oC]{H_2SO_4} H_2C=CH_2$

58. **Which compound is the easiest to oxidise**
A. Alkane
B. Alcohol
C. Aldehyde
D. Ketone

59. $CH_3CH_2OH + [O] \xrightarrow{\Delta} CH_3CHO$ (Dehydrogenation)

The main reason to heat the reaction mixture is
A. to break H – bonding (No H-bonding)
B. to increase collision frequency
C. to distil product
D. to avoid any alcohol unreacted

60. **Ketones are less reactive in nucleophilic substitution because**
A. Aldehydes are more crowded
B. Aldehydes have less polar $>C=O$ bond
C. Aldehyde H is $\bar{e}$ donating
D. ketones have $\bar{e}$ donating environment

61. **A substance that gives positive iodoform test will most probably not give which reaction**
A. Addition of HCN
B. Addition of $NaHSO_3$
C. Aldol condensation
D. Cannizaro's reaction

62. $A + HCN \rightarrow B \xrightarrow{H_3O^+}$ **Lactic acid. True statement about this reaction is**
A. A=Acetone
B. There is no change in no of carbons during reaction
C. B=Propane nitrile
D. There is change is hybridization

63. **Bisulphite adduct can regenerate carbonyl compounds under what conditions**
A. $NaOH + \Delta$ C. $HCl + \Delta$
B. Na_2CO_3 D. $Ag + \Delta$

64. **During aldol condensation – OH group appears at**
A. $\propto -C$ C. $\gamma - C$
B. $\beta - C$ D. $\delta - C$

65. $CH_3 - \overset{\alpha}{\underset{\underset{O}{\|}}{C}} - OH$ **has acetyl group but does not give iodoform test because**
A. it has $\bar{e}$ with drawing – OH group. C. H of – OH is more acidic than $\propto -H$
B. – OH group is $\bar{e}$ donating D. It can't be further oxidized

66. **Which reagent gives the same visible change for propanol and Propanal**
A. 2, 4 - DNPH C. Conc H_2SO_4
B. $K_2Cr_2O_7/H^+$ D. Ag mirror test

67. **The change in O.N of Cu^{+2} in Fehling's test is**
A. Zero C. – 2
B. +2 D. 1

68. **Which of the following reacts with Tollen's reagent but does not form silver mirror**
A. Acetaldehyde C. Formic acid
B. Acetylene D. Formaldehyde

69. **The color of solution changes from orange → green when aldehyde is treated with**
A. Ag – mirror test C. $K_2Cr_2O_7/H^+$
B. HCN D. $NaHSO_3$

70. **The characteristic reactions of carbonyl compounds are?**
A. Electrophilic reactions C. Nucleophilic addition reactions
B. Nucleophilic substitution reactions D. Electrophilic substitution reactions

71. **Formation of lactic acid from acetaldehyde involves** → To change CN with COOH
A. Substitution and hydrolysis C. Addition and hydrolysis
B. Addition and oxidation D. Addition and oxidation

72. **During the oxidation of ethanol, the alpha carbon changes**
A. methyl group C. functional group carbon
B. methylene group D. beta carbon

73. **To prepare acetic acid and formic acid by the oxidation of ketones, an appropriate starting material is**
A. Propanone + Tollen's reagent
B. Butanone + Tollen's reagent
C. Butanone+ Acidified potassium dichromate
D. Propanone + Acidified potassium dichromate

$H_3C - CH_2 - OH + [O] \rightarrow H_3C - \overset{O}{\overset{\|}{C}} - H + H_2O$

74. **Propionaldehyde does not give iodoform test because**
A. It is non-polar C. It lacks alpha methyl
B. it lacks alpha carbon D. It lacks alpha hydrogen

75. **The product formed by the reaction of formaldehyde with hydroxyl amine is known as**
A. imine C. hydrazone
B. osazone D. oxime

76. **CH_3-CH(OH)-CN when hydrolysed forms lactic acid, the reaction takes place exclusively at**

A. Alpha carbon
B. Beta Carbon
C. Alpha hydroxyl group
D. Functional group Carbon

77. **A strong base is needed for Cannizaro's reaction as**

A. there is no functional group
B. there are two functional groups in reactant
C. base acts as nucleophile as well
D. base takes functional group H

78. **Aldol condensation is possible because**

A. aldehydes are good oxidizing agents
B. alpha hydrogens in carbonyls are acidic
C. aldehydes are good reducing agents
D. aldehydes can easily dehydrate

79. **Sodium nitroprusside test can differentiate**

A. Aldehyde from alcohol
B. Aldehyde from phenol
C. Ketones from aldehydes
D. Ketones from methyl ketones

80. **Which reagent can distinguish ketones from methyl ketones**

A. 2, 4 - DNPH
B. sodium bisulphite
C. Sodium nitroprusside
D. hydrogen cyanide

81. **In Benedict's solution test, aldehydes produce brick red color by reducing**

A. Silver ions
B. tartarate ions
C. Citrate ions
D. Copper ions

82. **Number of alpha hydrogens in Benzaldehyde are**

A. 3
B. zero
C. 1
D. 2

83. **Which of these cannot discharge the color of Acidified potassium permanganate**

A. Acetaldehyde
B. Acetone
C. Ethanoic acid
D. Ethanol

ANSWER KEY

1	B	11	D	21	C	31	B	41	C	51	B	61	D	71	A	81	D
2	A	12	D	22	D	32	A	42	B	52	B	62	D	72	C	82	B
3	B	13	B	23	C	33	B	43	B	53	B	63	C	73	D	83	C
4	B	14	B	24	D	34	B	44	B	54	D	64	A	74	C		
5	B	15	D	25	D	35	C	45	C	55	D	65	C	75	D		
6	B	16	D	26	B	36	D	46	C	56	B	66	B	76	D		
7	D	17	B	27	C	37	D	47	A	57	C	67	D	77	C		
8	C	18	B	28	A	38	D	48	C	58	C	68	B	78	B		
9	D	19	D	29	C	39	C	49	D	59	C	69	C	79	C		
10	C	20	B	30	B	40	A	50	B	60	D	70	C	80	B		

HINTS

4. Δ EN makes carbonyl carbon susceptible to attack by nucleophile and C – O pi bond allows addition.

6. No acetyl group

9. No $-\overset{\overset{O}{\|}}{C}-H$ group with easily oxidisable C – H bond

14. C = O bond length is shorter as compared to C = C bond length

25. Carbonyl compounds give nucleophilic addition while alkenes give electrophilic addition

27. Carbonyl compounds can't be reduced to tertiary alcohols

36. All others form addition elimination products

38. If not distilled, aldehyde will be oxidized to corresponding carboxylic acid

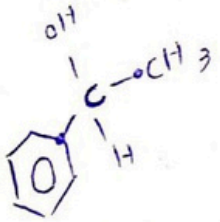
50. Primary alcohols produce aldehydes upon oxidation

53. $$CH_3-\overset{\overset{O}{\|}}{C}-CH_3+I_2+NaOH\rightarrow CHI_3+CH_3COONa\,(\text{Carboxylic acid})+H_2O+NaI$$

54. $$CH_3-CH_2-\underset{\underset{CH_3}{|}}{CH}-\underset{\underset{O}{\|}}{C}-H\xrightarrow{NaBH_4}CH-3CH_2-\underset{\underset{CH_3}{|}}{CH}-CH_2-OH$$

59. Aldehydes are easily oxidisable

61. Iodoform test needs $\alpha-H$



62. $A = CH_3CHO$ (sp^2)

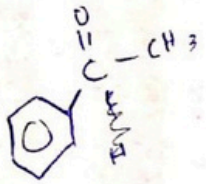
$B = CH_3-\underset{\underset{OH}{|}}{CH}-CN$ (sp^3)

65. More acidic hydrogen reacts with base

66. Orange color discharged

68. Acidic nature of alkynes

75. $>C=N-OH$ (Oxime)



78. $$OH^- + H-CH_2-\overset{\overset{O}{\|}}{C}-H\rightarrow \overset{\ominus}{CH_2}-\overset{\overset{O}{\|}}{C}-H+H_2O$$

Base Acid

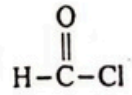
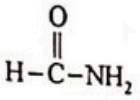
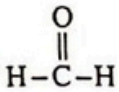
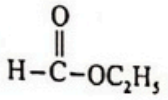
83. Most difficult to oxidise

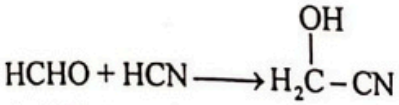
PAST PAPERS 2009-2020

Q.1 **Brick red precipitate are formed when aldehyde reacts with:**

A. Sodium borohydride
B. Fehling solution
C. Sodium bisulphate
D. Formaldehyde

Q.2 **Which of the following compounds belong to homologous series of aldehydes**

A. 
B. 
C. 
D. 

Q.3  **in the above reaction nucleophile is**

A. CN^-
B. HCl
C. Cl^-
D. OH^-

Q.4 **Consider the following reaction:**

$R\text{-}CHO + 2[Ag(NH_3))_2]OH$ ----- > $RCOONH_4 + 2Ag + 2NH_3 + H_2O$

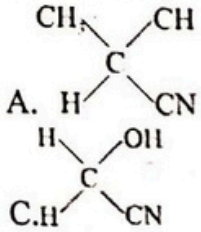
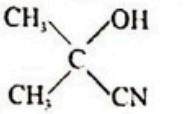
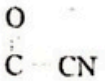
this reaction represents which of the following tests

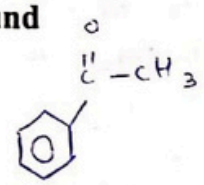
A. Fehling test
B. Benedict test
C. Ninhydrin test
D. Tollen's test

Q.5 **With acidified $Na_2Cr_2O_7$, what the product will be, when secondary alcohols are oxidized in same conditions?**

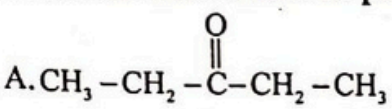
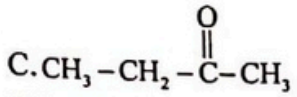
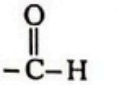
A. Alkenes
B. Alkyl halides
C. Alkynes
D. Ketones

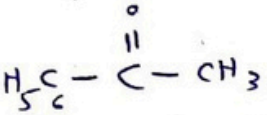
Q.6 **Formaldehyde reacts with HCN (NaCN + HCl) to give a compound**

A. 
B. 
C.
D. 

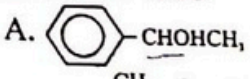
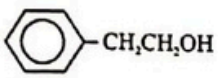
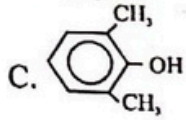
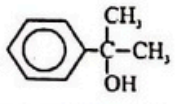


Q.7 **Iodoform test will not be positive with**

A. 
B. C_2H_5OH
C. 
D. 



Q.8 **What is the structure of alcohol which on oxidation with acidified $Na_2Cr_2O_7$ gives $C_6H_5\text{-}CO\text{-}CH_3$.**

A. 
B. 
C. 
D. 

Q.9 Which of the following is the structure of a ketone?

A. $CH_3-\overset{\overset{O}{\|}}{C}-OH$

B. $CH_3-\overset{\overset{O}{\|}}{C}-NH_2$

C. $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$

D. $CH_3-\overset{\overset{O}{\|}}{C}-Cl$

Q.10 Which group gives a yellow precipitate of triiodomethane when warmed with alkaline aqueous iodine?

A. An amide group, $CH_3-\overset{\overset{O}{\|}}{C}-NH_2$

B. Ethyl ketone group, $C_2H_5-\overset{\overset{O}{\|}}{C}-NH_2$

C. A primary alcohol group as in propanol, $CH_3CH_2CH_2OH$

D. Methyl ketone group, $CH_3-\overset{\overset{O}{\|}}{C}-$

Q.11 A student mixed ethyl alcohol with small amount of sodium dichromate and added it to the hot solution of dilute sulphuric acid. A vigorous reaction took place. He distilled the product formed immediately. What was the product?

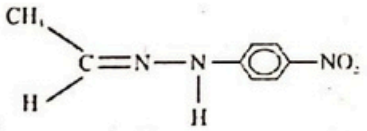
A. Acetone

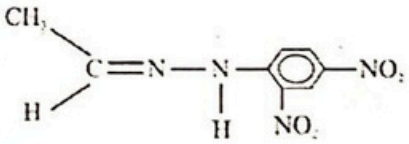
B. Dimethyl ether

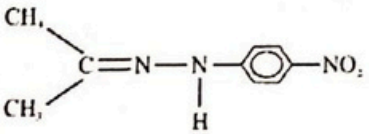
C. Acetic acid

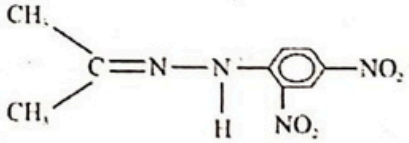
D. Acetaldehyde

Q.12 The structure of formula of the product of reaction of acetone with 2, 4-dinitrophenyl hydrazine is

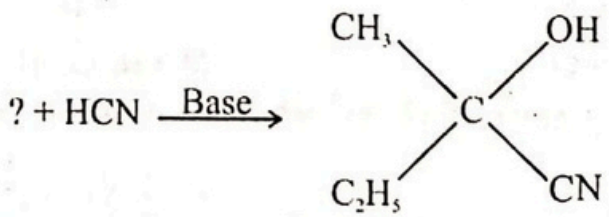
A. 

B. 

C. 

D. 

Q.13 For the reaction:



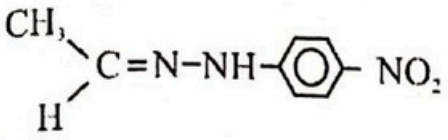
A. $C_2H_5COCH_3$

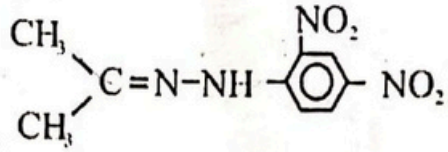
B. CH_3COCH_3

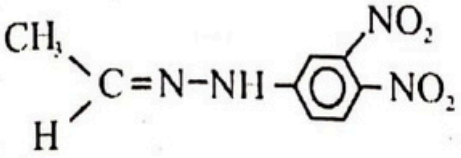
C. $C_2H_5CH(CH_3)OH$

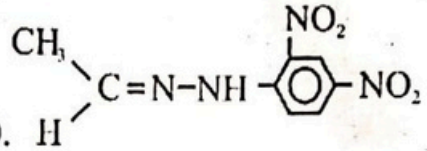
D. $C_2H_5CH_2CHO$

Q.14 When acetaldehyde reacts with 2,4–dinitrophenylhydrazine (2,4-DNPH), which one of the following products is formed

A. 

B. 

C. 

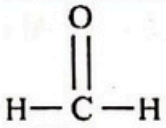
D. 

Q.15 Both aldehydes and ketones are planer to the neighborhoods of carbonyl $(\overset{\diagdown}{\underset{/}{C}}=O)$ group. Which one of the following bonds is distorted towards the oxygen atoms?

A. π bond of C and O
B. Sigma bond of C and O
C. Sigma bond of C and H
D. Sigma bond of C and C

Q.16 Which one of the following is also called silver mirror test

A. Fehling's solution test
B. Tollen's reagent
C. Iodoform test
D. Benedict's solution tests

Q.17 

Which one of the following is IUPAC name of the above given structure?

A. Proopanaldehyde
B. Acetaldehyde
C. Methanone
D. Methanal

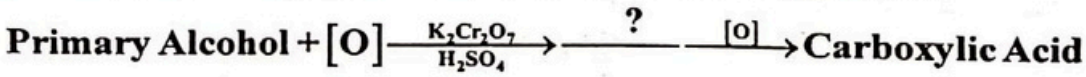
Q.18 $R-CH=N-NH-C_6H_3(NO_2)_2$ It is a general formula of:

A. 2,4 dinitrophenyl hydrazine
B. Phenyl hydrazone
C. 1,3 dinitrophenyl hydrazone
D. 2,4 dinitrophenyl hydrazone

Q.19 Which one of the following test is given by both aldehyde and ketone?

A. Silver mirror test
B. 2,4 DNPH test
C. Fehling's solution test
D. Benedict's solution test

Q.20 In the reaction, "?" represents which one of the following products:



A. Ketone
B. Formic acid
C. Aldehyde
D. Ether

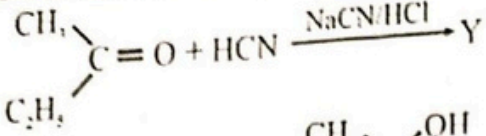
Q.21 The reaction of aldehydes and ketones with ammonia derivative $G-NH_2$ to form compounds containing the group $\overset{\diagdown}{\underset{/}{C}}=N-G$ and water is known as _____ reaction.

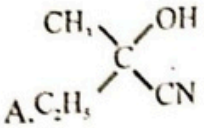
A. Nucleophilic addition
B. Electrophilic addition
C. Nucleophilic substitution
D. Addition Elimination

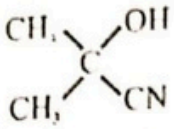
Q.22 Ethanal reacts with HCN to form cyanohydrin. It is an example of

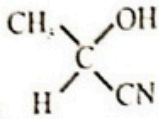
A. Nucleophilic addition
B. Electrophilic substitution
C. Electrophilic addition
D. Nucleophilic substitution

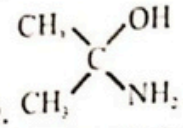
Q.23 What will be the product of the reaction given below?



A. 

B. 

C. 

D. 

Q.24 Which one of the following compounds will give iodoform test on treatment with aqueous iodine?

A. 3-pentanone
B. Propanal
C. Propanone
D. Butanal

Q.25 2-propanol on Oxidation gives _____:

A. Aldehyde
B. Carboxylic Acid
C. Ketone
D. Alcohol

Q.26 Both aldehyde and ketones give _____:

A. Tollen's Test
B. Benedict's solution test
C. 2,4-DNPH test
D. Sodium nitroprusside test

Q.27 Which reagent is responsible for the conversion of ketone to secondary alcohol:

A. $NaAlH_4$
B. Al
C. $NaBH_4$
D. Red P

Q.28 To distinguish aldehyde from ketone which solution is used:

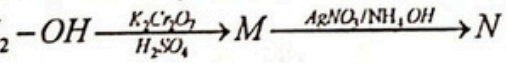
A. Alkaline solution
B. A solution containing $K_2Cr_2O_7$
C. Fehling's solution
D. A solution containing acid only

Q.29 Identify the compound, which give iodoform test:

A. Methanol
B. 3- Hexanol
C. Methyl ketone
D. Propionaldehyde

Q.30 Why is it necessary to distill aldehyde formed from oxidation of primary alcohol through acidified per dichromate (VI) solution or acidified sodium dichromate (VI) solution?

A. Aldehyde formed is unstable and decompose back to original precursor i.e. primary alcohol
B. Aldehyde formed may react with primary alcohol, the original reactant
C. Aldehyde may be oxidized further to a ketone
D. Aldehyde formed may be oxidized further to carboxylic acid

Q.31 

What is the final indication in given reaction

A. Blue precipitate
B. Silver mirror
C. Red precipitate
D. White precipitate

Q.32 Which of the following compounds will produce a yellow precipitate with I_2 dissolved in $NaOH_{(aq)}$?

A. $HCOOCH_2CH_2$
B. $CH_3CH_2CO\,CH_3$
C. CH_3OH
D. CH_3CH_2CHO

Q.33 **Which of the following reagent is used distinguished between $CH_3CH_2CHOHCH_2OH$ and $CH_3CH_2CHOHCH_2CHO$**

A. 2,4-DNPH (dinitrophenyl hydrazine)
B. Dilute sulfuric acid
C. Potassium maganate
D. Tollen's reagent

Q.34 **Which one of the following reagents can be used to detect an aldehyde ?**

A. Tetraethyl lead
B. Alcoholic KOH
C. Acidified Cu_2Cl_2
D. Tollen's reagent

Q.35 **Hybridization of carbon in –CHO group is**

A. sp
B. sp^2
C. sp^3
D. dsp

Q.36 **Carbonyl group undergo**

A. Electrophilic addition reaction
B. Nucleophilic addition reaction
C. Electrophilic substitution reaction
D. Nucleophilic substitution reaction

Q.37 **The compound Aldehyde hydrazine is**

A. $\frac{R}{H}>CH=N-NH_2$
B. $\frac{R}{H}>CH-NH-O-NH_2$
C. $\frac{R}{H}>CH-NG-O-NH_2$
D. $\frac{R}{H}>CH-O-N=NH$

Q.38 **Which one is more reactive?**

A. HCHO
B. CH_3CHO
C. $(CH_3)_2CO$
D. Have equal reactivity

Q.39 **Hydration of hydrocarbon give carbonyl compound, the general formula of that hydrocarbon is**

A. C_nH_{2n+2}
B. C_nH_{2n}
C. C_nH_{2n-2}
D. Both b and c

Q.40 **Identification test for functional groups of organic compounds are associated with specific observations. Tollen's reagent is ammonical silver nitrate solution, which is used for the identification of a functional group X with an observation O. Identify X and O.**

A. X = Aldehyde O = red precipitate
B. X = Ketone O = Silver mirror
C. X = Aldehyde O = Silver mirror
D. X = Ketone O = grey precipitate

Q.41 **Which of the following will give a positive test with Tollen's reagent?**

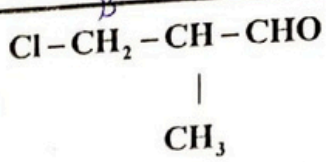
A. Tertiary Alcohols
B. Ketones
C. Aldehydes
D. Carboxylic Acids

Q.42 **Which type of reaction takes place when a carbonyl compound is treated with a mixture of NaCN and an acid?**

A. Electrophilic addition reaction
B. Displacement reaction
C. Nucleophilic addition reaction
D. Substitution reaction

Q.43 **Which of the following compounds will give a secondary alcohol after reaction with $NaBH_4$?**

A. CH_3COCH_3
B. CH_3CH_2CHO
C. CH_3CH_2COOH
D. CH_3COOCH_3



Q.44 The common name of following aldehyde is

A. α-Methyl-γ-Chloro propionaldehyde
B. β-Chloro-γ-Methyl propionaldehyde
C. β-Chloro-α-Methyl propionaldehyde
D. β-Methyl-α-Chloro propionaldehyde

Q.45 Which of the following reagent is use to separate and purify carbonyl and non-carbonyl compounds?

A. HCN
B. $BrMgCH_2$
C. $NaHSO_3$
D. H_2O

PAST PAPERS QUESTIONS

1	B	6	C	11	D	16	B	21	D	26	C	31	B	36	B	41	C
2	C	7	A	12	D	17	D	22	A	27	C	32	B	37	A	42	C
3	A	8	A	13	A	18	D	23	A	28	C	33	A	38	A	43	A
4	D	9	C	14	D	19	B	24	C	29	C	34	D	39	C	44	C
5	D	10	D	15	A	20	C	25	C	30	D	35	B	40	C	45	C

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HINTS

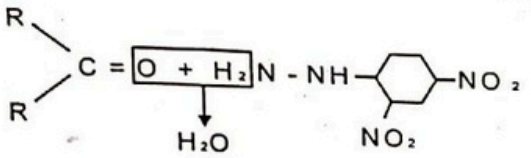
7. No acetyl group

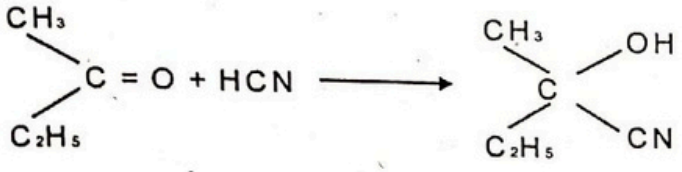
8. Functional group H and α-H are removed.

10. $CH_3-\overset{\overset{O}{\|}}{C}-$ group of aldehydes and ketones only give this test.

11. $CH_3CH_2OH \rightarrow CH_3CHO \rightarrow CH_3COOH$

If distilled If not distilled

12. 

13. 

28. Mild oxidising agent.

30. $-\overset{\overset{O}{\|}}{C}-H$ group is easier to oxidise than is $-OH$ group

31. M=Aldehyde

33. One molecule contains aldehydic group while the second molecule doesn't.

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Q. 1 During catalytic reduction of carbonyl compounds, hydrogen adds across

A. C = C
B. C – H
C. C = O
D. All of these

Q. 2 Which of the following show positive iodoform test

A. Butanol
B. Acetaldehyde
C. 3-Pentanone
D. Formaldehyde

Q. 3 Symmetrical ketone

A. Propanone
B. 3-hexanone
C. Butanone
D. Acetophenone

Q. 4 Reduction of aldehydes give

A. Primary alcohol
B. Secondary alcohol
C. Tertiary alcohol
D. None

Q. 5 Which is not the use of acetaldehyde?

A. Making phenolic resins
B. Silvering of mirrors
C. Used as antiseptic Inhalant
D. Used in vat dying

Q. 6 How many carbon attached to carbonyl carbon in ketone

A. 2
B. 3
C. 4
D. 1

Q. 7 Acetals are

A. Aldehydes
B. Ketones
C. Alcohols
D. Ether

Q. 8 Formaldehyde have formyl group

A. Inside the chain
B. Middle of chain
C. At the terminal
D. At any position of the chain

Q. 9 In aldol condensation carbanion acts as

A. Acid
B. Base
C. Nucleophile
D. Electrophilic

Q. 10 Which aldehyde is gas at room temperature

A. Formaldehyde
B. Acetaldehyde
C. Propanol
D. Benzaldehyde

Q. 11 During canizaro's reaction, which of the following act as nucleophile

A. Hydride ion
B. Methoxide ion
C. Hydroxide ion
D. Both A and C

Q. 12 Addition of HCN to the carbonyl compound results in ___ hybridization.

A. sp^3
B. sp^2
C. sp
D. dsp^2

Q. 13 Ketones do not give:

A. Addition of $NaHSO_3$
B. formation of oxime
C. reduction of Fehling solution
D. Reaction with 2,4 DNPH

Q. 14 Ketones can be prepared by the oxidation of:
A. Pri. Alcohol
B. Sec. alcohol
C. Ter. Alcohol
D. none

Q. 15 Cyanohydrin reacts with acetaldehyde to form
A. Lactic acid
B. Sali-cyclic acid
C. Benzoic acid
D. Malonic acid

Q. 16 In IUPAC nomenclature, aldehydes are named as _____?
A. Alkanol
B. Alkanal
C. Alkanone
D. Alkaldehyde

Q. 17 The carbonyl compound which is attached with at least one H atom at one side is called as _____?
A. Ketones
B. Aldehydes
C. Ethers
D. Alkyl halides

Q. 18 What is the color of iodoform precipitates?
A. White
B. Reddish
C. Black
D. Yellow

Q. 19 $NaBH_4$ causes reduction of aldehyde and ketones into _____?
A. Alcohols
B. Alkenes
C. Phenols
D. Alkanes

Q. 20 Aldehydes and ketones react with hydroxyl amine and produce?
A. Imine
B. Oxime
C. Aldol
D. Nitrile

Q. 21 From which of the following ketone can be prepared?
A. Propyne
B. Secondary alcohol
C. Ca Acetate
D. All of these

Q. 22 Before giving condensation product, ammonia and its derivatives produces _____ when react with carbonyls?
A. Alcohols
B. Carboxyl alcohol
C. Amino alcohol
D. None of these

Q. 23 Carbonyl system having no alpha hydrogen undergoes _____?
A. Aldol condensation
B. Cannizzaro reaction
C. Haloform reaction
D. Oxidation reaction

Q. 24 Geometry of acetal
A. Tetrahedral
B. Hexagonal
C. Trigonal
D. Angular

Q. 25 In aldehyde group, carbonyl group is attached to at least
A. One hydrogen atom
B. one carbon atom
C. Two hydrogen atoms
D. Two carbon atom

Q. 26 Bulky ketones do not react with
A. Sodium bisulphite
B. HCl
C. Grignard reagent
D. HCN

Q. 27 Which of the following test is not given by aldehyde?

A. Benedict test
B. Tollen's test
C. Nitroprusside test
D. Fehling's test

Q. 28 Acetaldehyde undergoes polymerization with conc. H_2SO_4 and form _____?

A. Acetylides
B. Paraldehyde
C. Bakelite
D. Meta Acetaldehyde

Q. 29 General formula of aldehyde and ketone

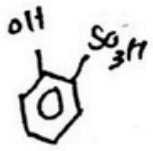
A. $C_nH_{2n}O$
B. C_nH_nO
C. $C_nH_nO_2$
D. $C_nH_{2n}O_2$

Q. 30 Sodium nitroprusside test is shown by

A. Aldehyde
B. Ketone
C. Alcohol
D. Phenol

ANSWER KEY

1	C	11	D	21	D
2	B	12	A	22	D
3	A	13	C	23	B
4	A	14	B	24	A
5	A	15	A	25	A
6	A	16	B	26	A
7	D	17	B	27	C
8	C	18	D	28	B
9	C	19	A	29	A
10	A	20	B	30	B



UNIT 18

PRACTICE EXERCISE

CARBOXYLIC ACID

1. **An organic compound made from oxidation of ethanol is:**
   A. Formic acid
   B. Acetic acid
   C. Malonic acid
   D. Citric acid

2. **Carboxylic acids reacts with sodium carbonate, gas evolved in this reaction**
   A. CO
   B. H_2
   C. CO_2
   D. Both a & b

3. **Acetic acid reacts with thionyl chloride to form acetyl chloride, which species acts as nucleophile in the reaction**
   A. SO_2
   B. Cl^{-1}
   C. SO_3
   D. No nucleophile is formed

4. **Ester with raspberry flavour is**
   A. Amyl acetate
   B. Amyl butyrate
   C. Isobutyl formate
   D. Octyl acetate

5. **Ethyl butyrate has flavour like**
   A. Banana
   B. Pineapple
   C. Jasmine
   D. Orange

6. **The most reactive derivative of carboxylic acid is**
   A. Acid amide
   B. Acid anhydride
   C. Acid chloride
   D. Ester

7. **The derivatives that cannot be prepared directly from the acetic acid**
   A. Acetamide
   B. Acetic anhydride
   C. Acetyl chloride
   D. Ethyl acetate

8. **Which of the following metal cannot evolve hydrogen from the acetic acid**
   A. Sodium
   B. Magnesium
   C. Potassium
   D. Copper

9. **Which of the following acid is unsaturated carboxylic acid**
   A. Malonic acid
   B. Succinic acid
   C. Oxalic acid
   D. Maleic acid

10. **Which compound is not formed as a result of reaction between acetic acid & HI & red phosphorous**
    A. Ethanol
    B. Iodine
    C. Water
    D. Ethane

11. **In the esterification, first attack is due to _____on carboxylic acid**
    A. Hydrogen ion
    B. Water
    C. Alcohols
    D. All

12. **Jasmine flavour is due to ester**
    A. Octyl acetate
    B. Amyl acetate
    C. Ethyl butyrate
    D. None of these

13. **Acetic acid is synthesized on commercial scale from**
    A. Acetylene
    B. Alcohols
    C. Ethylene
    D. Aldehyde

14. **Which of the following is a strong acid**
    A. CH_3COOH
    B. HCOOH
    C. C_2H_5OH
    D. Phenol

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15. **Which of the following is derivative of carboxylic acid**
A. Ester
B. Acid amide
C. Acid halide
D. All

16. **Compound X & Y give effervesce with Na_2CO_3 solution, X gives a silver mirror with ammonical $AgNO_3$ while Y gives sweet smell compound on heating with alcohol. X & Y are**
A. Formic acid & acetic acid
B. Acetic acid & acetic acid
C. Acetone & formic acid
D. Acetic acid & acetone

17. **Ethanoic acid reacts with PCl_5 to give ethanoyl chloride, HCl and a third compound. What is the third compound**
A. H_3PO_3
B. SO_2
C. $POCl_3$
D. $COCl_2$

* Oils & fats are esters.

18. **Oils and fats belong to the class of**
A. Alcohols
B. Hydrocarbons
C. Acids
D. Esters

→ glycerol & fatty acids (room temp)

19. **A compound X has all of the properties below. It is a liquid at 25 °C it mixes completely with water it reacts with aqueous sodium hydroxide. What could X be?**
A. Ethanoic acid
B. Ethene
C. Ethanol
D. Ethyl ethanoate

are obtained by their reaction with NaOH. ↓ Saponification

20. **Reaction of acetic acid with $LiAlH_4$ gives:**
A. Ethanol
B. Ethanal
C. Ethane
D. Ethyl acetate

21. **Slight oxidation of primary alcohol gives:**
A. Ketone
B. Aldehyde
C. Organic acid
D. An ester

$H_3C-\overset{O}{\overset{\|}{C}}-OH$

22. **Which of the following has the lowet solubility in water:**
A. HCOOH
B. CH_3-CH_2-COOH
C. CH_3COOH
D. C_3H_7-COOH

23. **Which one of the following will react with both ethanol and ethanoic acid at room temperature:**
A. $CaCO_3$
B. Na-metal
C. CuO
D. CH_3OH

$H_3C-CH_2-CH_2-OH$

24. **The general formula of monocarboxylic acid:**
A. $C_nH_{2n}O$
B. $C_nH_{2n}COOH$
C. $C_nH_{2n+1}COOH$
D. $C_nH_{2n-2}COOH$

+ $H_3C-CH_2-\overset{O}{\overset{\|}{C}}-OH$

25. **The specie that develops strongest hydrogen bonding with water:**
A. HCOOH
B. CH_3COOH
C. CH_3CH_2COOH
D. $ClCH_2COOH$

$NaHCO_3$

26. **Ethanoic acid reacts with all of these to produce water except:**
A. Ethanol
B. Caustic soda
C. Sodium
D. Sodium hydrogen carbonate

NaOH

27. **One of the following compound reacts with its own oxidation product (an oxidation involves no loss of carbon) to give sweet odour liquid**
A. Propanal
B. 1-propanol
C. Propanone
D. Propanoic acid

28. **In the presence of hot alkaline potassium permanganate solution 2-butene will give**
A. Formic acid + acetic acid
B. Two moles of methanoic acid
C. Two moles ethanoic acid
D. Ethylene glycol

29. **All are dicarboxylic acids except**
A. Oxalic acid
B. Picric acid
C. Malonic acid
D. Tartaric acid

30. **Esters have fruity smell and are used as artificial flavours. Amyl acetate gives flavour of**
A. Banana
B. Pineapple
C. Jasmine
D. Orange

31. **The Complete oxidation of ethanol produces first Ethanal than**
A. Ethanal
B. Ethanoic acid
C. Propanone
D. Benzoic acid

32. **Velaric acid is obtained from a herb velarian, its IUPAC name is**
A. Propionic acid
B. Butyric acid
C. Pentanoic acid
D. Caporic acid

33. **An acid that exists as a cyclic dimer in benzene and shows a molar mass of 120g/mol is:**
A. CH_3COOH
B. $Cl_2CHCOOH$
C. $HCOOH$
D. Cl_3CCOOH

34. **The weakest oxidizing agent that can be used in the reaction**

$$\underset{\text{Ethanal}}{CH_3CHO} + [O] \xrightarrow{?} \underset{\text{Ethanoic acid}}{CH_3COOH}$$

A. $K_2Cr_2O_7\ H_2SO_4$
B. $Na_2Cr_2O_7/H_2SO_4$
C. $KMnO_4/H_2SO_4$
D. $AgNO_3/NH_4OH$

35. **The O-H bond breaks in carboxylic acid when product is**
A. Salt
B. Acid chloride
C. Ester
D. Amide

36.

$$CH_3\text{-}COOH + NH_3 \xrightarrow{X} CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}NH_2 \xrightarrow{Y} CH_3COO^- + NH_4^+$$

The "X" and "Y" are
A. X = Heat , Y = H_2O
B. X = Alcohol, Y = H_2O/HCl
C. X = Heat , Y = H_3O^+
D. X = Cold , Y = $KMnO_4$ / OH^-

37. **$CH_3COOH + PCl_3 \longrightarrow$?**
The products of the above reaction are:
A. $CH_3COCl + H_3PO_3$
B. $CH_3Cl + POCl_3 + HCl$
C. $CH_3COCl + POCl_2 + HCl$
D. $CH_3COCl + POCl_3 + H_2$

38. **$CH_3CN + HCl \longrightarrow A + B$ (in the presence of water)**
In the above reaction, A and B are:
A. Acetic acid and acid amide
B. Acetic acid and methyl chloride
C. Acetic acid and ammonia
D. Acetic acid and ammonium chloride

39. **Consider the following reaction:**
$CH_3COOH + Mg$ (metal) $\longrightarrow$?
What product will form?
A. Magnesium formate
B. Magnesium ion
C. Magnesium acetate
D. Carboxylate ion

40. **Primary alcohols normally give us aldehydes when oxidized in the presence of acidified $Na_2Cr_2O_7$, what will be the product, when the secondary alcohols are oxidized in same conditions?**
A. Alkenes
B. Alkyl halides
C. Alkynes
D. Ketones

41. **The formation of ester from acetic acid in presence of acid and ethanol is a:**
A. Nucleophilic substitution reaction
B. Electrophilic substitution reaction
C. Nucleophilic addition reaction
D. Electrophilic addition reaction

42. **Methyl cyanide, on boiling with mineral acids yield:**
A. Acetic acid
B. Propanoic acid
C. Formic acid
D. Butanoic acid

43. **Octyl acetate has the flavor of**
A. Orange
B. Pineapple
C. Banana
D. Apple

44. **Formamide is formed by the reaction of which acid with ammonia**
A. Oxalic acid
B. Formic acid
C. Ethanoic acid
D. Propanoic acid

45. **An organic acid 'z' reacts separately with sodium bicarbonate, sodium hydroxide and sodium carbonate. Which one of the following represent the structure of 'z'?**
A. $HCOOC_2H_5$
B. CH_3CH_2OH
C. $CH_3—CH=CH_2$
D. $H_3C—CH_2—COOH$

46. $CH_3COOH + CH_3CH_2OH \longrightarrow CH_3COOC_2H_5 + H_2O$
Which one of the following will act as a catalyst in above reaction?
A. $NaNO_3$
B. Acidified potassium dichromate
C. H_2SO_4
D. $SOCl_2$

47. **Which one of the following reaction of carboxylic acid is reversible?**
A. Esterification
B. Reaction with PCl_5
C. Salt formation
D. Reaction with $SOCl_2$

48. **Identify the product X in the following reaction:**
$CH_3COOH + SOCl_2 \rightarrow X + SO_2 + HCl$
A. CH_3COCl
B. CH_3COCl_2
C. $CH_3COCH_2Cl_2$
D. CH_2COCl_2

49. **Which one is a functional group of carboxylic acid:**
A. $-\overset{\overset{O}{\|}}{C}-OH$
B. $-\overset{\overset{O}{\|}}{C}-O-C$
C. $-\overset{\overset{O}{\|}}{C}-$
D. None of these

50. **Final product of hydrolysis of nitrile is:**
A. Ketone
B. Aldehyde
C. Alcohol
D. Carboxylic acid

51. **The highest melting point is observed by**
A. Butanoic acid 4C
B. Pentanoic acid 5C
C. Propanoic acid (3C)
D. HCl

52. **Ethanenitrile can be converted into ethanoic acid through _____ intermediate**
A. Ethyl alcohol
B. Acetamide
C. Acetyl chloride
D. Methyl cyanide

53. **Identify B**

$CH_3COOH + NH_3 \longrightarrow A \xrightarrow{Heat} B$

A. Acetic acid
B. Ethane nitrile
C. Acetic anhydride
D. Acetamide

54. **Propanoic acid is functional group isomer of**
A. Methyl acetate
B. Propanal
C. Ethyl acetate
D. Propanone

55. **Which compound shows the highest melting point**
A. water
B. Propanoic acid
C. Methanoic acid
D. Ethanoic acid

56. **Solubility of carboxylic acids decreases in water with increase in molar mass because**
A. Bigger molecules are more polar
B. bigger molecules have bigger non-polar groups
C. bigger molecules make more hydrogen bonds
D. bigger molecules can form lesser hydrogen bonds/molecule

57. **In esterification, the OH of carboxylic acid is replaced by**
A. OR^+
B. R^+
C. R
D. OR

58. **The formation of acetic anhydride from acetic acid follows the mechanism**
A. S_N
B. A_N
C. S_E
D. A_E

59. **Carboxylic acid is more acidic than phenol because of the greater stability of**
A. carboxylic acid
B. proton
C. phenoxide ion
D. Carboxylate ion

60. **Molar mass of formic acid in benzene comes out to be**
A. 64
B. 46
C. 32
D. 92

61. **When ethyl magnesium bromide is treated with carbon dioxide and the product hydrolyzed we get**
A. formic acid
B. oxalic acid
C. propionic acid
D. acetic acid

62. **CH_3CH_2COOH is named according to IUPAC nomenclature as**
A. Propionic acid
B. 1-propionic acid
C. 1-propanoic acid
D. propanoic acid

63. **When acetic acid reacts with ammonia the attacking nucleophile and the electrophilic center are**
A. O and carbonyl C
B. O and Carbonyl O
C. N and Carbonyl C
D. N and Carbonyl O

64. **In carboxylic acid molecule the bond angle between alkyl group and hydroxyl group is**
A. 90^0
B. 180^0
C. 60^0
D. 120^0

65. **In esterification, the OH group of carboxylic acid departs as?**
A. OH^-
B. OH^+
C. H_3O^+
D. H_2O

66. **Lowest boiling point is shown by**
A. Acetic acid
B. Formic acid
C. Propionic acid
D. Valeric acid

67. **To prepare ethyl alcohol, the ester that can be hydrolysed is?**
A. methyl formate
B. methyl acetate
C. methyl acetate
D. ethyl formate

68. **Propanone on oxidation gives**
A. Acetic acid
B. Formic acid + Acetic acid
C. Formic acid
D. Propionic acid

ANSWER KEY

1	B	11	A	21	B	31	B	41	A	51	B	61	C
2	C	12	D	22	D	32	C	42	A	52	B	62	D
3	B	13	A	23	B	33	A	43	A	53	D	63	C
4	C	14	B	24	C	34	D	44	B	54	A	64	D
5	B	15	D	25	A	35	A	45	D	55	D	65	D
6	C	16	A	26	C	36	A	46	C	56	B	66	B
7	A	17	C	27	B	37	A	47	A	57	D	67	D
8	D	18	D	28	C	38	D	48	A	58	A	68	B
9	A	19	A	29	B	39	C	49	A	59	D		
10	A	20	A	30	A	40	D	50	D	60	D		

HINTS

6. Electron withdrawing halogen atom

8. Less reactive metal

16. Formic acid has formyl group to produce silver mirror and acid group to react with Na_2CO_3

19. Capable of H-bonding and has acidic properties

26. Hydrogen gas is produced

27. Oxidation product of 1-propanol is Propanoic acid

35. All others are examples of S_N reactions

44. $H-\overset{O}{\overset{\|}{C}}-OH + NH_3 \xrightarrow{2\text{steps}} H-\overset{O}{\overset{\|}{C}}-NH_2 + H_2O$

51. Boiling points of carboxylic acids increase with increasing molar mass of carboxylic acids

55. Out of first nine mono carboxylic acids ethanoic acid has the highest melting point.

62. -COOH is usually present at terminal position so it is not named 1 while naming organic compounds

64. sp^2 hybridization

67. $R-\overset{O}{\overset{\|}{C}}-(OR')$ ⟶ Forms alcohol

PAST PAPERS 2009-2020

Q.1 **Hydrolysis of cyano group by an aqueous acid results into:**

A. Acid amide
B. Cyano hydride
C. Carboxylic acid
D. Formaldehyde

Q.2 **Which of the following compounds in the form of aqueous solution will produce CO_2on reaction with sodium carbonate:'**

A. $CH_3COOC_2H_5$
B. $C_2H_5COOC_2H_5$
C. $C_2H_5COOCH_3$
D. $C_2H_5CO\text{-}OH$

Q.3 **$CH_3CN + HCl \rightarrow A + B$ in presence of water in the above reaction A ans B are**

A. Acetic acid and acid amide
B. Acetic acid and methyl chloride
C. Acetic acid and ammonia
D. Acetic acid and ammonium chloride

Q.4 **Consider the following reaction$CH_3COOH + Mg(metal) \rightarrow$?What product will form**

A. Magnesium formate
B. Magnesium ion
C. Magnesium acetate
D. Carboxylate ion

Q.5 **$CH_3COOH + PCl_5 \rightarrow$the products of above reaction are**

A. $CH_3COCl + POCl_2 + HCl$
B. $CH_3Cl + POCl_3 + HCl$
C. $CH_3COCl + POCl_3 + HCl$
D. $CH_3COCl + POCl_3 + H_2$

Q.6 **The –NH-CO group is called**

A. Amide group
B. Amino group
C. Protein linkage
D. Peptide linkage

Q.7 **When $CH_3–CH_2–OH$ is oxidized in the presence of $K_2Cr_2O_7$ and H_2SO_4, the product formed is**

A. $CH_3-\overset{O}{\overset{\|}{C}}-OH$
B. $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$
C. $H-\overset{O}{\overset{\|}{C}}-OH$
D. $CH_3-\overset{O}{\overset{\|}{C}}-OCH_3$

Q.8 **When ethanoyl chloride reacts with methylamine an amide is formed. What is the structure of it amide formed?**

A. $CH_3-CH_2-\overset{O}{\overset{\|}{C}}-NH_2$
B. $CH_3-\overset{O}{\overset{\|}{C}}-NH_2$
C. $CH_3-CH_2-\overset{O}{\overset{\|}{C}}-NHCH_3$
D. $CH_3-\overset{O}{\overset{\|}{C}}-NHCH_3$

Q.9 **Relative acidic strength of alcohol, phenol, water and carboxylic acids is**

A. Carboxylic acid > Alcohol > Phenol > Water
B. Carboxylic acid > Phenol > Water > Alcohol
C. Phenol > Carboxylic acid > Alcohol > Water
D. Water >Phenol > Alcohol > Carboxylic acid

Q.10 **Methyl cyanides, on boiling with mineral acids or alkalies, yield:**

A. Butanoic acid
B. Formic acid
C. Acetic acid
D. Propanoic acid

Q.11 The formation of ester from acetic acid in presence of acid and ethanol is a:

A. Nucleophilic addition reaction
B. Nucleophilic substation reaction
C. Electrophonic substitution reaction
D. Electrophonic addition reaction.

Q.12

$$CH_3-\overset{\overset{O}{\|}}{C}-OH+NH_3 \xrightarrow{Heat} ?$$

The final products formed are:

A. $CH_3-\overset{\overset{O}{\|}}{C}-NH_2+CO_2$

B. $CH_3-\overset{\overset{O}{\|}}{C}-NH_2+H_2O$

C. $CH_3-\overset{\overset{O}{\|}}{C}-NH_2+H_2$

D. $CH_3-\overset{\overset{O}{\|}}{C}-NH_2+HCl$

Q.13 Ethyl butyrate and butyl butanoate are esters with the flavor of

A. Pear
B. Pineapple
C. Banana
D. Apple

"This is actual question given in UHS but there should be Ethyl alcohol instead of ethyl butyrate."

Q.14 Organic compound 'X' and 'Y' both can react with Na-metal to evolve hydrogen gas. 'X' and 'Y' if react with each other form an organic compound 'Z' which gives fruity smell. What types of compounds 'X', 'Y' and 'Z' are?

	X	Y	Z
A.	Alcohol	Ester	Acetic Acid
B.	Alcohol	Ester	Mineral Acid
C.	Alcohol	Acetic Acid	Ester
D.	Alcohol	Mineral Acid	Ester

Q.15 An organic acid 'z' reacts separately with sodium bicarbonate, sodium hydroxide and sodium carbonate. Which one of the following represent the structure of 'z'

A. $HCOOC_2H_5$
B. CH_3CH_2OH
C. $CH_3-CH=CH_2$
D. H_3C-CH_2-COOH

Q.16 $CH_3COOH+CH_3CH_2OH \rightleftharpoons CH_3COOC_2H_5+H_2O$

Which one of the following will act as a catalyst in above reaction?

A. HNO_3
B. Acidified potassium dichromate
C. H_2SO_4
D. $SOCl_2$

Q.17 Which one of the following reaction of carboxylic acid is reversible?

A. Esterification
B. Reaction with PCl_5
C. Salt formation
D. Reaction with $SOCl_2$

Q.18 'Ka' values of few organic acids are given.

Acid	Ka
CH_3COOH	1.85×10^{-5}
CCl_3COOH	2.3×10^{-2}
$CHCl_2COOH$	5.0×10^{-3}
$CH_2ClCOOH$	1.3×10^{-3}

The order of the acid strength is

A. $CCl_3COOH > CHCl_2COOH > CH_2ClCOOH > CH_3COOH$
B. $CH_3COOH > CHCl_2COOH > CCl_3COOH > CH_2ClCOOH$
C. $CHCl_2COOH > CH_3COOH > CCl_3COOH > CH_2ClCOOH$
D. $CCl_3COOH > CH_3COOH > CHCl_2COOH > CH_2ClCOOH$

Q.19 Compounds having — C ≡ N group are called

A. Cyano compounds
B. Nitro compounds
C. Carbon nitrogen molecules
D. Nitriles

Q.20 Final product of hydrolysis of nitrile yield:

A. Ketone
B. Alcohol
C. Aldehyde
D. Carboxylic acid

Q.21 During esterification, the bond from alcohol that breaks is between:

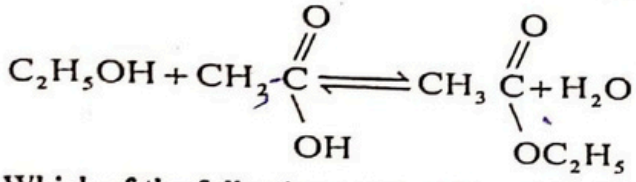
A. Carbon and Oxygen
B. Carbon and carbon
C. Oxygen and hydrogen
D. None of these

Q.22 Identify the product X in the following reaction:

$$CH_3COOH + PCl_5 \xrightarrow{Yields} X + POCl_3 + HCl$$

A. CH_3COCl
B. $CH_3COCH_2Cl_2$
C. CH_3COCl_2
D. CH_2COCl_2

Q.23



Which of the following catalyst is used in the above reaction?

A. Pt
B. Ni
C. Pumice stone
D. Conc. H_2SO_4

Q.24 Which product is formed by the reaction of carboxylic acid with alcohol?

A. Ester
B. Aldehyde
C. Alkane
D. Ether

Q.25 Which one will be act as a strong acid

A. Dichloroethanoic acid
B. Ethanoic acid
C. Trichloethanoic acid
D. Chloroethanoic acid

Q.26 Acetyl chloride (Ethanoyl chloride) is used in the synthesis of organic compounds. It is prepared by treating acetic acid with

A. $SOCl_2$
B. HCl
C. CH_3Cl
D. $ClNH_2$

Q.27 What will be the outcome of reaction of methanol with ethanoic acid in the presence of concentrated sulphuric acid?

A. Propanone is formed
B. Propanoic acid formed
C. Methyl ethanoate is formed
D. Propanol is formed

Q.28 Which one of the following compounds can exist in the form of cyclic dimers?

A. Benzene
B. Acetals
C. Ozonide
D. A carboxylic acid

Q.29 Reagent used to reduce a carboxylic acid to an alkance is

A. Ni/H_2
B. $NaBH_4$
C. P/HI
D. $LiAlH_4$

Q.30 Which of the following is not a fatty acid?
A. Phenyl acetic acid
B. Stearic acid
C. Palmitic acid
D. Oleic acid

Q.31 Select the correct order of the acids strength?
A. $CH_3COOH > CHCl_2COOH > CH_2ClCOOH$
B. $CHCl_2COOH > CH_2ClCOOH > CH_3COOH$
C. $CH_3COOH > CHCl_2COOH > CH_2ClCOOH$
D. $CHCl_2COOH > CH_2COOH > CH_2ClCOOH$

Q.32 Which compound shows the highest boiling point?
A. CH_3COOH
B. C_2H_5OH
C. $C_2H_5-0C_2H_5$
D. $(CH_3CH_2)_3N$

Q.33 Which one is more reactive?
A. Ester
B. Acid halide
C. Amide
D. Acid anhydride

Q.34 Nitriles (RCN) on hydrolysis in the presence of a mineral acid yield:
A. Ethers
B. Aldehydes
C. Alcohols
D. Carboxylic acids

Q.35 Carboxylic acids can be reduced into corresponding alcohols. Which of the following reagent can be used for this purpose?
A. $K_2Cr_2O_4$
B. $LiAlH_4$
C. H_2SO_4
D. $KMnO_4$

Q.36 Which of the following reagent is required for preparation of acyl chloride (CH_3COCl) from ethanoic acid?
A. HCl
B. PCl_5
C. CH_3Cl
D. $POCl_3$

Q.37 Which balance chemical equation show the formation of ethanoyl chloride using thionyl chloride?
A. $CH_3CH_2COOH + 2SOCl \rightarrow CH_3CH_2COCl + SO_2 + HCl$
B. $CH_3COOH + SOCl_2 \rightarrow CH_3COCl + SO_2 + HCl$
C. $HCOOH + SOCl_2 \rightarrow HCOCl + SO_2 + HCl$
D. $CH_3CH_2COOH + 2SOCl \rightarrow CH_3CH_2COCl + SO_3 + HCl$

Q.38 Which of the following is the strongest acid?
A. Propanoic acid
B. Flouroethanoic acid
C. Trichloroethanoic acid
D. Nitroethanoic acid

Q.39 Hydrolysis of acyl chloride results in the formation of
A. Acid anhydride
B. Carboxylic acid
C. Amides
D. Esters

Q.40 The exact reactivity order for carboxylic acid derivatives is
A. Anhydride > Acyl chloride > Ester
B. Ester > Anhydride > Acyl chloride
C. Amide > Acyl chloride > Ester
D. Acyl chloride > Anhydride > Ester

PAST PAPERS QUESTIONS

1	C	6	A	11	B	16	C	21	C	26	A	31	B	36	B
2	D	7	A	12	B	17	A	22	A	27	C	32	A	37	B
3	D	8	D	13	B	18	A	23	D	28	D	33	B	38	C
4	C	9	C	14	B	19	D	24	A	29	B	34	D	39	B
5	C	10	C	15	D	20	D	25	C	30	A	35	B	40	D

HINTS

1. Acid amide is the intermediate but the final product is carboxylic acid.
2. Good acid.
6. In case of proteins, it is known as peptide linkage.
8. $CH_3-\overset{\overset{O}{\|}}{C}-Cl + CH_3-NH_2 \rightarrow CH_3-\overset{\overset{O}{\|}}{C}-NHCH_3$
15. Organic acid can react with all of these.
18. Higher the no. of e^--withdrawing groups, greater will be the acidity.
26. $CH_3COOH + SOCl_2 \rightarrow CH_3COCl + SO_2 + HCl$.
30. Aliphatic monocarboxylic acids are called fatty acids.
32. H – Bonding.
33. e^- withdrawing halogen atom
38. Three chlorines have the highest e^- withdrawing effect.
39. $CH_3-COCl \xrightarrow{H_2O} CH_3COOH$.

Ethanoic

* $H_3C-\overset{\overset{O}{\|}}{C}-NH_2$ Acetamide

$H_3C-\overset{\overset{O}{\|}}{C}-Cl + H-OH$

CamScanner

PAST PAPERS 2021

Q. 1 Fruity smell of organic compounds is because of _____?

A. Alcohols
B. Carboxylic acids
C. Ester
D. Acid halides

Q. 2 From which of the following sources, acetic acid was first isolated?

A. Butter
B. Milk
C. Cheese
D. Vinegar

Q. 3 Acetic acid is used to prepare:

A. acetone
B. acetate
C. esters
D. All

Q. 4 Number of oxygen in cyclic ring of dimer of carboxylic acid are

A. 2
B. 4
C. 5
D. 6

Q. 5 Which of the following is used in perfumes

A. Alcohol
B. Aldehyde
C. Ketone
D. Carboxylic acids

Q. 6 Which is formed when hydrogen is added to the carboxylic group in presence of HI in Phosphorous

A. formaldehyde
B. ketone
C. formic acid
D. ethane

Q. 7 Which is dibasic carboxylic acid

A. Formic acid
B. Acetic Acid
C. Oxalic acid
D. Valeric acid

Q. 8 In benzene, carboxylic acids exist as _____?

A. Polymers
B. Dimers
C. Individually
D. Trimers

Q. 9 Which of the following catalyst is used for the preparation of acidic anhydrides?

A. $K_2Cr_2O_7$
B. P_2O_5
C. H^+/H_2O
D. H_2SO_4

Q. 10 The reaction of carboxylic acids which involve H atom removal of OH group form _____ as major products in all reactions?

A. Esters
B. Nitriles
C. Ketones
D. Salts

Q. 11 Which of the following is most soluble in water?

A. Ethanoic acid
B. Pentonic acid
C. Hexanoic acid
D. Butanoic acid

Q. 12 Formic acid is obtained from _____?

A. Apples
B. Butter
C. Ant's sting
D. Foam

Q. 13 When two carboxylic acids are strongly heated in the presence of P_2O_5, which product is formed?

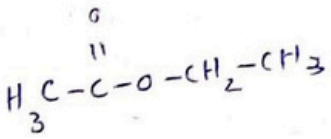
A. Acid halides
B. Dimer
C. Acid anhydride
D. None of these

Q. 14 Which of the following is a carboxylic acid derivative?

A. Alcohol
B. Acetic acid
C. Acyl halide
D. Methyl halide

Q. 15 Which of the following is weaker acid?

A. HCl
B. H_2SO_4
C. CH_3COOH
D. H_3PO_4



Q. 16 How carboxylic acids are formed from alcohol?

A. Hydrolysis
B. Reduction
C. Oxidation
D. Protonation

Q. 17 Acetic acid is also named as _____?

A. Propanoic acid
B. Ethanoic acid
C. Butanoic acid
D. Methanoic acid

Q. 18 All are aliphatic carboxylic acids except

A. Methanoic acid
B. Ethanoic acid
C. Benzoic acid
D. Lactic acid

Q. 19 Which of the following causes complete reduction of carboxylic acid into alkanes?

A. H_2/Ni
B. HI/P
C. Pd/C
D. $LiAlH_4$

Q. 20 Other name of oxalic acid is

A. Ethanoic acid
B. Ethanedioic acid
C. Malonic acid
D. Succinic acid

Q. 21 Which one of the following is not fatty acid

A. Acetic acid
B. Butanoic acid
C. Phthalic acid
D. Steric acid

Q. 22 Carboxylic acid with alcohol is called

A. Esterification
B. Saponification
C. Hardening
D. Rancidity

Q. 23 An amino acid and alcohol is mixed which product will be formed?

A. Ether
B. Ester
C. Carbolic acid
D. Alkane

Q. 24 Phthalic acid is

A. monocarboxylic acid
B. Dicarboxylic acid
C. Unsaturated Monocarboxylic acid
D. Fatty acid

Q. 25 When fat react with NaOH the reaction is called

A. Esterification
B. Saponification
C. Hydrolysis
D. Hardening

Q. 26 Which of the following is used as a coagulant for latex in rubber industry

A. Formic acid
B. Acetaldehyde
C. Acetic acid
D. Acetaldehyde

Q. 27 Glycine is an amino acid which is present in solution as

A. Acid
B. Base
C. Zwitter ion
D. All

Q. 28 Reverse of esterification is

A. Saponification
B. Hydrolysis
C. Bakelite
D. Rancidity

Q. 29 Which one is weak acid

A. Acetic acid
B. Formic acid
C. Propanoic acid
D. Butanoic acid

ANSWER KEY

1	C	11	A	21	C
2	D	12	C	22	A
3	C	13	C	23	B
4	B	14	C	24	B
5	A	15	D	25	B
6	D	16	C	26	C
7	C	17	B	27	C
8	B	18	C	28	B
9	B	19	B	29	D
10	D	20	B		

UNIT 19

PRACTICE EXERCISE

MACROMOLECULES

1. **Primary structure of proteins refers to:**
   A. Coiling and folding in form of specific structure
   B. 3d structure
   C. Sequence of amino acids in a chain
   D. Alpha and Beta sheets

2. **Third order of protein structure refers to**
   A. Bending of protein chain
   B. Number and sequence of amino acids
   C. Three-dimensional structure of protein
   D. Site of disulphide bonds

3. **Second order of protein structure refers to**
   A. Number and sequence of amino acids
   B. Proteins formed of more than one monomer
   C. Three-dimensional structure of protein
   D. Bending of protein molecule

4. **Albumins and globulins are defined as:**
   A. Derived protein
   B. Fibrous protein
   C. Conjugated protein
   D. Simple Protein

5. **In proteins, the alpha-helix and Beta-pleated sheet are examples of**
   A. Primary Structure
   B. Tertiary Structure
   C. Secondary Structure
   D. Quaternary Structure

6. **The most abundant protein in the human body is:**
   A. Collagen
   B. Myosin
   C. Keratin
   D. Albumin

7. **Denaturation of proteins is often characterised by:**
   A. Loss of biological activity
   B. Being greater the lower the temperature
   C. Always being irreversible
   D. Changes in primary structure

8. **Which of the following is not a category of proteins based upon their function?**
   A. genetic
   B. nucleo
   C. regulatory
   D. structural

9. **Which of the following is the element not present in all proteins?**
   A. Carbon
   B. Nitrogen
   C. Hydrogen
   D. Sulphur

10. **Helical structure of proteins is stabilized by**
    A. Peptide bond
    B. Van der Wall's forces
    C. Dipeptide bond
    D. Hydrogen bonding

11. **Enzymes are:**
    A. simple proteins
    B. compound proteins
    C. derived proteins
    D. conjugated proteins

12. **Prosthetic groups are**
    A. helical structures in protein
    B. non-protein parts in compound proteins
    C. sulphur containing parts of protein
    D. sites for hydrogen bonding

13. **Lactoglobulin is found in**
A. nucleus
B. Plants only
C. nerve cells
D. muscles and in plants

14. **An example of simple protein is:**
A. lipoprotein
B. lecithin
C. Cholesterol
D. globulin

15. **The structure of protein helps protein to**
A. be in proper shape
B. perform its function
C. attach substrate
D. A, B

16. **The protein component of enzyme is called:**
A. apoenzyme
B. holoenzyme
C. proenzyme
D. co-enzyme

17. **Fe^{+2} is the co-factor for:**
A. Chrome oxidase
B. Carbonic anhydrase
C. Glucose-6-phosphatase
D. Hydrolase

18. **Enzymes have been classified on the basis of:**
A. protein structure
B. type of reaction they catalyse
C. prosthetic groups
D. bonding in them

19. **Dehydrogenase is an example of**
A. Transferase
B. Lyase
C. Hydrolase
D. Oxido-reductase

20. **The enzymes that bring about exchange of functional groups like phosphate are called:**
A. Ligases
B. Isomerases
C. Lyases
D. Transferases

21. **Collagen is a fibrous protein present most abundantly in:**
A. heart
B. connective tissues
C. nucleus
D. Arteries

22. **The specific substance (metabolite) that fits on the enzyme surface and is converted to products is called**
A. Co-factor
B. Prosthetic group
C. Isoenzyme
D. Substrate

23. **Haemoglobin is a**
A. Genetic protein
B. Building protein
C. Transport protein
D. Structural protein

24. **Phosphoprotein comes under the type of proteins:**
A. Simple protein
B. Conjugated
C. Derived protein
D. Both A & B

25. **An example of hydrolase is:**
A. Amylase
B. Fumarase
C. Lipase
D. A,C

26. **Succinic thiokinase is an enzyme of the type**
A. mutase
B. ligase
C. peroxidase
D. lyase

27. All are examples of different classes of enzymes except
A. Hydrolases
B. Oxido-reductases
C. Isomerases
D. Mutases

28. Increased concentration of enzyme alkaline phosphatase is a sign of:
A. Hemophilia
B. Thrombosis
C. heart disease
D. rickets

29. L-asparginase is helpful in treatment of
A. skin disease
B. heart failure
C. blood cancer
D. obstructive jaundice

30. The enzymes that catalyse the addition or removal of ammonia are:
A. Lyases
B. Transferases
C. Ligases
D. Kinases

31. Alpha helix and beta pleated sheath are secondary structures of protein which are maintained by
A. dipole forces
B. ionic bonds
C. non-polar interactions
D. Hydrogen bonds

32. Which of the following is not a property of enzymes?
A. extraordinary specificity
B. high efficiency
C. reversibility of reactions
D. minimum activity at optimum T

33. Enzymes consist of
A. proteins only
B. fats only
C. proteins and non-protein parts
D. fats and non-fatty components

34. Proteins loose their ability to work
A. by slight heating
B. by slight cooling
C. by change in structure
D. when inside the body

35. The most complex structure a single polypetide can assume is
A. 1° structure
B. 3° structure
C. 2° structure
D. 4° structure

36. An element that is not an essential part of proteins is
A. O
B. H
C. N
D. I

37. Amino acids react together to form the primary structure of proteins which is accompanied by
A. addition of water
B. removal of ammonia
C. addition of ammonia
D. removal of water

38. Proteins have linkage between amino acids
A. imide
B. ester
C. amide
D. ether

39. Oxidase is an example of
A. ligase
B. lyase
C. oxidoreductase
D. hydrolase

40. Simplest Structure of a protein that has only covalent bonding between amino acids is
A. 2° structure
B. 1° structure
C. 3° structure
D. 4° structure

41. **UV rays inactivate enzymes because they**
A. change sequence of amino acids of enzymes
B. They add prosthetic group to them
C. they increase their specificity
D. affect structure of enzymes

42. **An example of regulatory protein is**
A. nucleoprotein
B. lactoglobulin
C. hemoglobin
D. thyroxine

43. **Prosthetic groups are**
A. small molecules attached to enzymes
B. ions attached to enzymes
C. non-protein parts attached to enzymes
D. protein parts attached to enzymes

ANSWER KEY

1	C	11	C	21	B	31	D	41	D
2	C	12	B	22	D	32	D	42	D
3	D	13	D	23	C	33	C	43	C
4	D	14	D	24	B	34	C		
5	C	15	D	25	D	35	D		
6	A	16	A	26	B	36	D		
7	A	17	A	27	D	37	A		
8	B	18	B	28	D	38	C		
9	D	19	D	29	C	39	C		
10	D	20	D	30	A	40	B		

HINTS

7. Protein structure is exclusive for its function.
18. Oxidoreductase, transferase etc.
25. Amylase hydrolyses carbohydrates while lipase hydrolyses lipids.
32. Enzymes show maximum activity at optimum temperature.
38. Also known as peptide linkage.

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Q.1 Collagen and albumin are:

A. Derived proteins
B. Polyamide
C. Simple proteins
D. Polysaccharide

Q.2 A polymer in which the number of amino acid residue is greater than 100 or the molecular mass is greater than 10,000 is called

A. Protein
B. Polypeptide
C. Dipeptide
D. Tripeptide

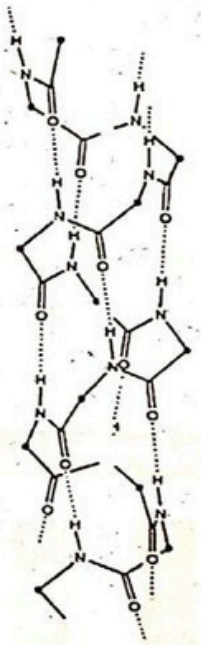
Q.3 Macromolecules are described as large molecules built up from small repeating units called

A. Monomers
B. Metamers
C. Isomers
D. Tautomers

Q.4 Phosphoprotein comes under the type of proteins

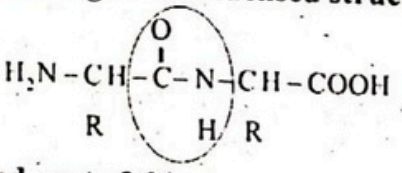
A. Simple protein
B. Derived protein
C. Conjugated
D. Both A & B

Q.5 The stability in the following structure in due to the



A. Disulfide bridges
B. Weak vander Waal's forces
C. Presence of unpaired electron in the structure
D. Hydrogen bonding between NH group of one peptide with another peptide

Q.6 Amino acids react with each other such that –COOH group of one amino acid reacts with the another among acid to give a condensed structure as shown below



What is the name of circled part of this structure?

A. Peptide linkage
B. Azide linkage
C. Ester linkage
D. Carbide linkage

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Q.7 Role of a catalyst in a chemical reaction is to

A. Increase rate of a reaction
B. Decrease rate of a reaction
C. Decrease yield of a reaction
D. Increase yield of product

Q.8 Glucose is converted into ethanol by the enzyme present in the yeast:

A. Urease
B. Zymase
C. Invertase
D. Sucrase

Q.9 The proteins which give an amino acid and non-protein group on hydrolysis are known as:

A. Derived protein
B. Albumins
C. Conjugated simple protein
D. Conjugated protein

Q.10 The enzyme which is found in saliva, accelerates the conversion of starch into sugar is;

A. Pepsin
B. Thrombin
C. Ptyalin
D. Fumarase

Q.11 Which of the following bond is responsible for joining the amino acids in proteins?

A. Metallic Bond
B. Di sulfide bond
C. Peptide Bond
D. Ionic Bond

Q.12 Based on the physico-chemical properties, proteins may be classified into the following types:

A. Simple proteins
B. Compound proteins
C. Derived proteins
D. All of the above

Q.13 Based on function, thyroxin can be classified as:

A. Hormonal protein
B. Structural protein
C. Transport protein
D. Genetic protein

Q.14 L-Asparaginase enzymes has been used for the treatment of:

A. Jaundice
B. Blood cancer
C. Rickets
D. Heat disease

PAST PAPERS QUESTIONS

1	C	6	A	11	C
2	A	7	A	12	D
3	A	8	B	13	A
4	C	9	D	14	B
5	D	10	C		

Don't
Don't

$C_6H_{12}O_6$

↓

$2\,C_3H_4O_3 \xrightarrow{2NADH_2 \rightarrow 2NAD} 2\,C_2H_5OH + CO_2$

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Q. 1 After digestion, proteins change into
A. Amino acids
B. Starch
C. Glycogen
D. Lipids

Q. 2 Nucleoprotein are _____ proteins which transfer heredity information from one generation to other
A. Transport proteins
B. Structural proteins
C. Genetic proteins
D. Regulatory proteins

Q. 3 In which of the following body part, protein is not present?
A. Skin
B. Hair
C. Nails
D. Bones

Q. 4 Protein is a polymer of _____?
A. Nitrogen atoms
B. Amino acids
C. Glucose
D. Nitrogenous base

Q. 5 Globulins protein upon hydrolysis yield amino acids or their derivatives, so they belong to which type of protein
A. Derived proteins
B. Compound proteins
C. Conjugated proteins
D. Simple proteins

Q. 6 Regular coiling and twisting of polypeptide chain caused by H-bonding in between NH and CO occurs _____.
A. Primary structure
B. Secondary structure
C. Tertiary structure
D. Quaternary structure

Q. 7 The substances which reduce the activity of enzyme action are called as _____?
A. Reducers
B. Activators
C. Promotors
D. Inhibitors

Q. 8 Which enzyme is raised in rickets:
A. Alkaline phosphatase
B. LDH-1
C. Acidic phosphatase
D. None

Q. 9 The specific site at which substrate is attached on the enzyme and converted into product is called as _____?
A. Reaction site
B. Active site
C. Binding site
D. None of these

Q. 10 Which of the following is produced by heating of bones?
A. Gelatin
B. Cheese
C. Albumin
D. Gelly

Q. 11 Casein is used in manufacturing of _____.
A. Buttons and Buckles
B. Tanning of leather
C. Gelatin
D. Bakery goods

Q. 12 _____ enzyme catalyzes the conversion of hexoses to 6-phosphate derivatives.
A. Hexokinase
B. Glucokinase
C. Fructokinase
D. Malonic acid

Q. 13 Urease is present in (Bacteria, Yeast and Higher Plant
A. Yeast
B. Grapes
C. Soya sauce
D. Soya bean

Q. 14 Coagulated proteins is
A. Non soluble
B. Non folded
C. Non-functional
D. All

Temperature ↑, Coagulation

Q. 15 Enzyme binds with substrate to form
A. Enzyme substrate complex
B. Substarte
C. Enzyme
D. Products

Q. 16 Which is an inorganic macromolecule?
A. Diamond
B. synthetic fibre
C. plastic
D. proteins

Q. 17 Which of these is a synthetic polymer?
A. Polyester
B. proteins
C. Glucose
D. Starch

Q. 18 Most abundant macromolecule on earth
A. Protein
B. Carbohydrate
C. Lipid
D. Nucleic acid

Q. 19 Which of the following is addition polymer
A. PVC
B. Polyester
C. Both
D. None

Q. 20 Linkage in primary structure of protein
A. Peptide linkage
B. Disulphide
C. Hydrogen bond
D. Ionic bond

ANSWER KEY

1	A	11	A
2	C	12	A
3	D	13	A
4	B	14	C
5	D	15	A
6	B	16	A
7	D	17	A
8	A	18	B
9	B	19	A
10	A	20	A

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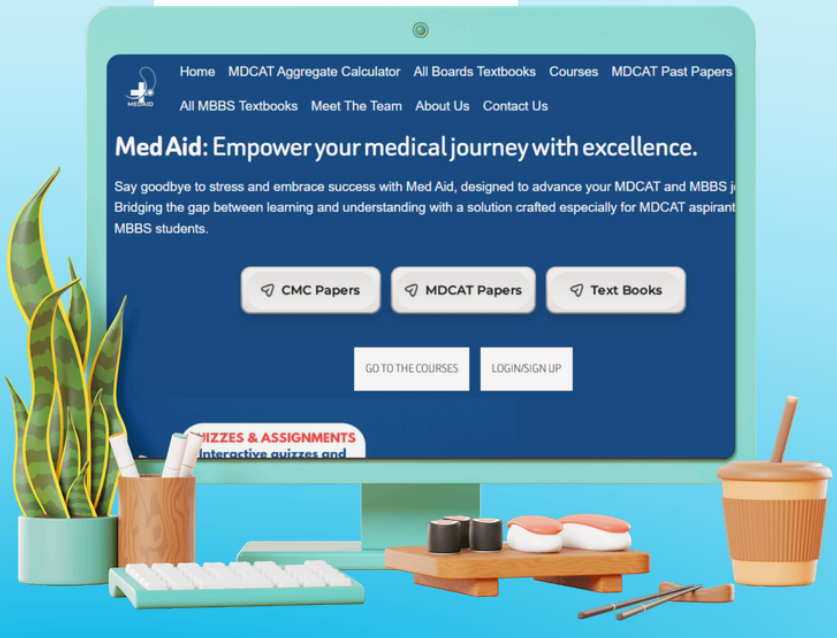
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