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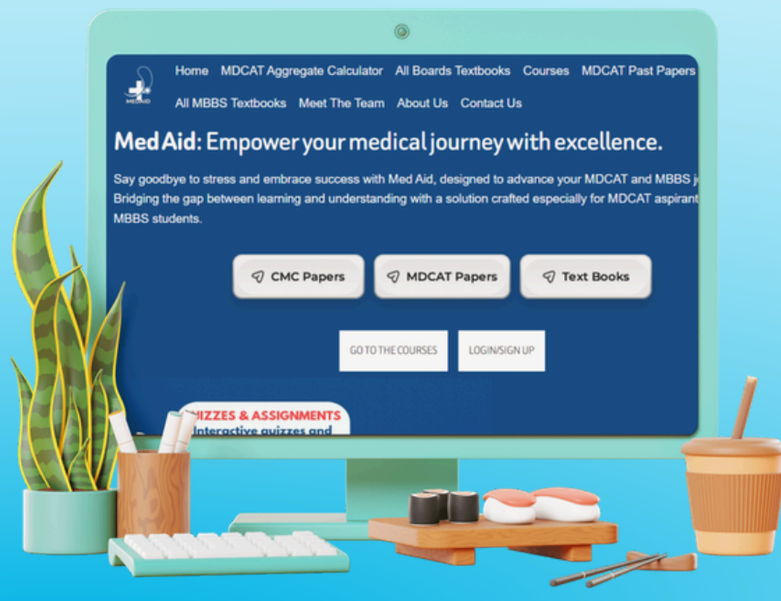

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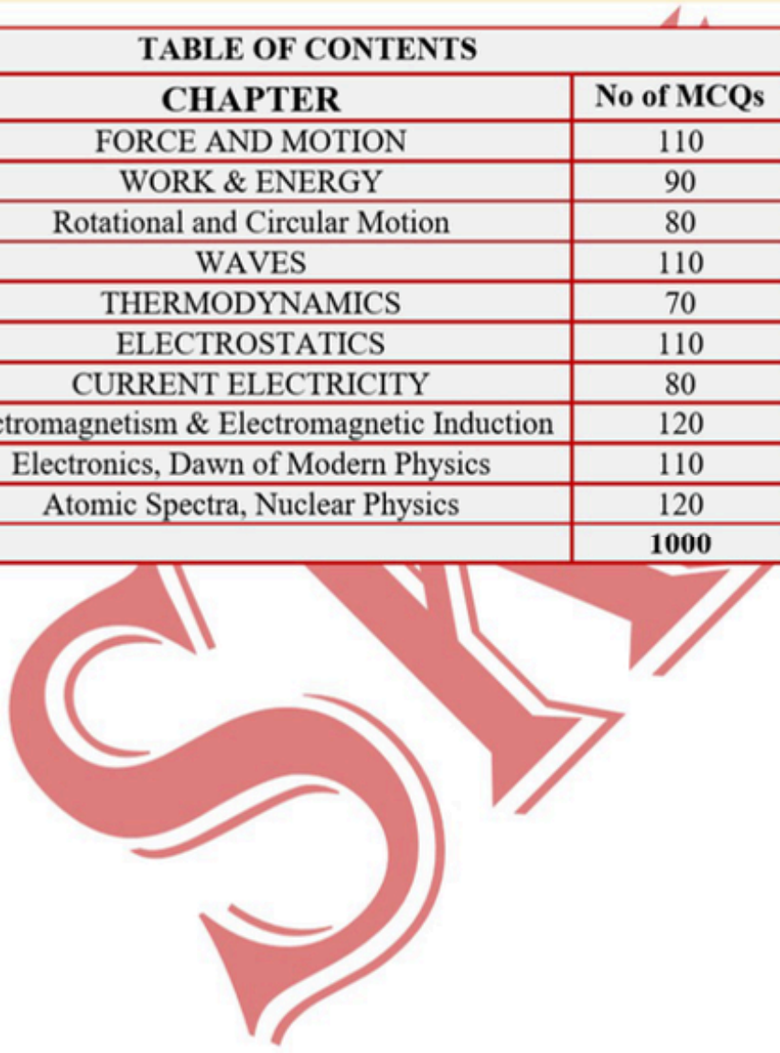

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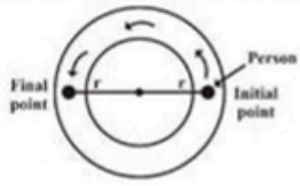
FORCE AND MOTION

Displacement & Velocity

Q. 1 **A person moves along a circular track and covers half of the path as shown in figure. What will be the ratio of its distance to displacement covered?**



A. 2r
B. 4r
C. $\frac{r}{2}$
D. $\frac{\pi}{2}$

Q. 2 **An athlete completes one round of a circular track of radius R in 40 sec. What will be his displacement at the end of 3 min. 20 sec?**

A. Zero
B. $2\pi R$
C. 2R
D. $7\pi R$

Q. 3 **A man leaves his house for a cycle ride. He comes back to his house after half-an-hour after covering a distance of one km. What is his average velocity for the ride?**

A. zero
B. 2 km/h
C. 10 km/h
D. 1/2 km/h

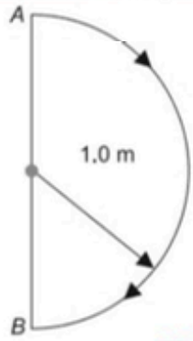
Q. 4 **Stopping distance of a moving vehicle is directly proportional to**

A. Square of the initial velocity
B. Square of the initial acceleration
C. The initial velocity
D. The initial acceleration

Q. 5 **The ratio of displacement along diameter and total distance along circle:**

A. $1 : \pi$
B. $2 : \pi$
C. $\pi : 1$
D. $\pi : 2$

Q. 6 **In 1.0 second a particle goes from point A to point B moving in a semi-circle a radius 1.0 m (figure). The magnitude of the average velocity is**



A. 3-14 m/s
B. 2.0 m/s
C. 1/0 m/s
D. zero

Q. 7 **A car travels equal distance in the same direction with velocities 60 km h^{-1}, 20 km h^{-1} and 10 km h^{-1} respectively. The average velocity of the car over the whole journey of motion is**

A. 8 ms^{-1}
B. 6 ms^{-1}
C. 7 ms^{-1}
D. 5 ms^{-1}

Q. 8 **A train takes 1 hour to go from one station to the other. It travels at a speed of 30 kmh^{-1} for first half hour and at a speed of 50 kmh^{-1} for the next half hour. The average speed of the train is:**

A. 45 kmh^{-1}
B. 35 kmh^{-1}
C. 40 kmh^{-1}
D. 30 kmh^{-1}

Q. 9 **A moves with 65 km/h while B is coming back of A with 80 km/h. The relative velocity of B with respect to A is**

A. 80 km/h
B. 60 km/h
C. 15 km/h
D. 145 km/h

Q. 10 **A boat is sent across a river with a velocity of 8kmh^{-1}. If the resultant velocity of boat is 10kmh^{-1}, then the velocity of the river is**

A. 12.8kmh^{-1}
B. 6kmh^{-1}
C. 8kmh^{-1}
D. 10kmh^{-1}

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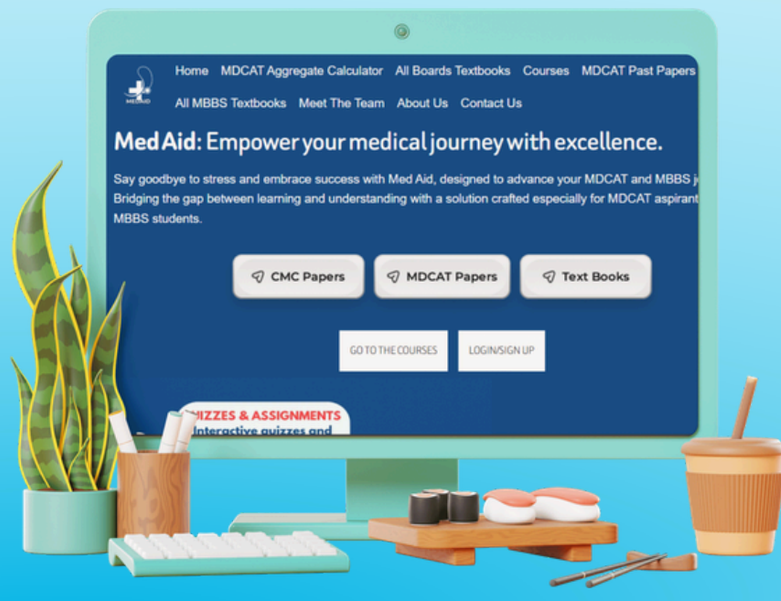

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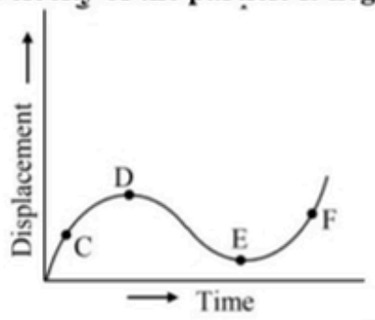
Displacement-time graph

Q. 11 The displacement time graph for a moving particle is given below. The instantaneous velocity of the particle is negative at the point



A. D
B. F
C. C
D. E

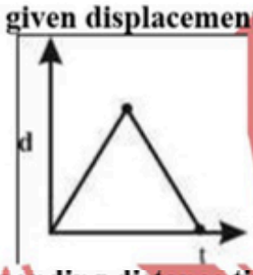
Q. 12 The displacement time graph of a particle moving with uniform velocity is

A. Parabola
B. Straight line
C. Circle
D. Hyperbola

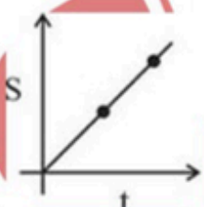
Q. 13 The displacement-time graphs of two particles A and B are straight lines making angles of 30∘and 60∘respectively with the time axis. If the velocity of A is vA and that of B is vB , the value of vA/vB is

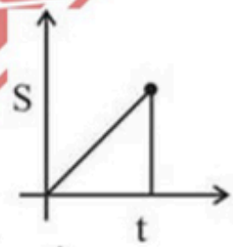
A. 1/2
B. $\frac{1}{\sqrt{3}}$
C. $\sqrt{3}$
D. 1/3

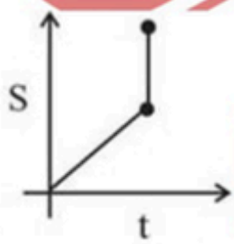
Q. 14 To convert given displacement-time graph into distance time graph,

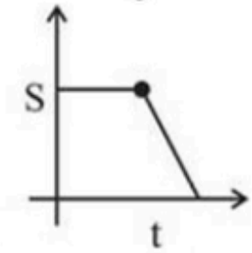


The corresponding distance time graph will be

A. 

B. 

C. 

D. 

Q. 15 The slope of the tangent of a point on d-t graph gives the magnitude of

A. Uniform velocity
B. Instantaneous velocity
C. Average velocity
D. Constant velocity

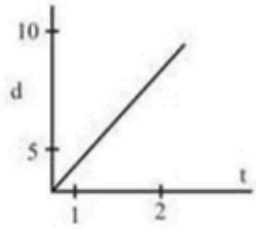
Q. 16 If d-t curve is a straight line, it shows that body is

A. Average velocity
B. Uniform velocity
C. Both '(a)' and '(b)'
D. Instantaneous velocity

Q. 17 If the slope of displacement-time graph increases, then

A. Acceleration decreases
B. Velocity increases
C. Speed decreases
D. None of these

Q. 18 Displacement time graph is shown in figure below acceleration will be



A. 5 ms^{-2} B. 10 ms^{-2}
C. 2.5 ms^{-2} D. 0

Q. 19 Area of d-t graph will provide

A. Displacement B. Velocity
C. Acceleration D. None of above

Q. 20 When slope of d-t graph increases then

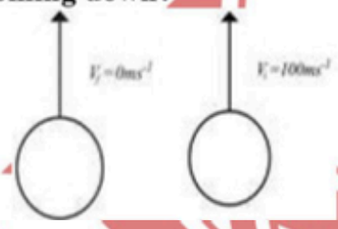
A. Acceleration increases B. Acceleration decreases
C. Velocity increases D. Velocity decreases

Graphical representation of acceleration with velocity time graph

Q. 21 A constant force F changes the velocity of a 80kg sprinter from 3ms-1 to 4ms-1 in 0.5 sec. The acceleration of sprinter will be

A. 1.5ms^{-2} B. 2.5 ms^{-2}
C. 2.0 ms^{-2} D. 3.0 ms^{-2}

Q. 22 A ball is projected upwards with an initial velocity as shown in the figure. It comes back after sometime and strikes ground with the same velocity but pointing downward. What is the angle between acceleration when moving upward to acceleration coming down?



A. 180° B. 90°
C. 60° D. 0°

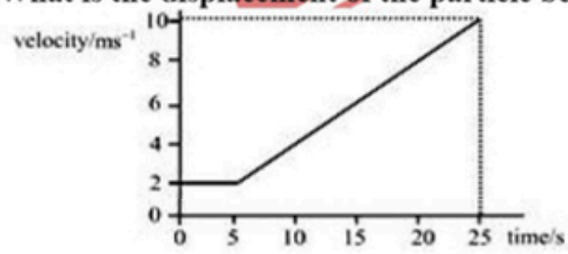
Q. 23 A baseball is thrown vertically into the air. The acceleration of the ball at its highest point is:

A. Zero B. g, up
C. g, down D. 2g, down

Q. 24 A passenger in a moving train tosses a coin. If the coin falls behind him, the train must be moving with

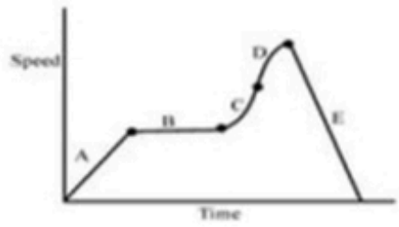
A. An acceleration B. A deceleration
C. A uniform speed D. Any of the above

Q. 25 The diagram shows a velocity-time graph for a particle moving along a straight line. What is the displacement of the particle between 0 s and 25 s?



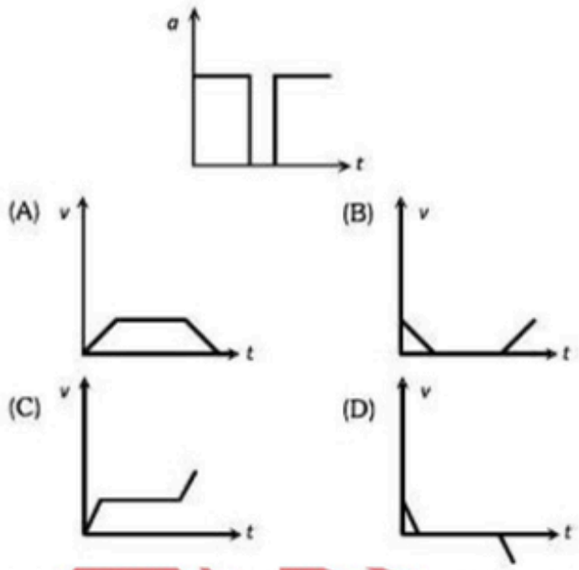
A. 90 m B. 130 m
C. 120 D. 150 m

Q. 26 The graph shows how the speed of an object changes with time. Which section of the graph shows the object moving with an increasing acceleration?

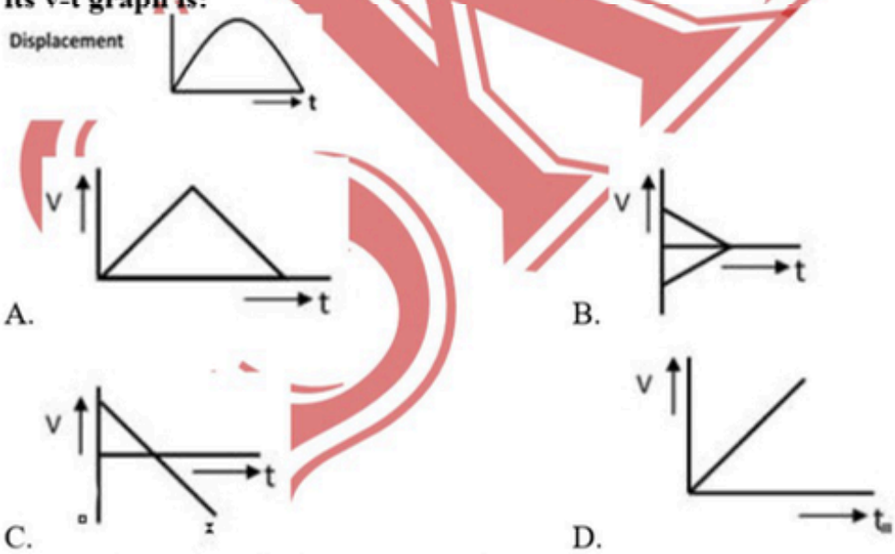


A. A
B. B
C. C
D. D

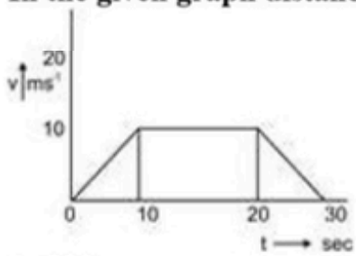
Q. 27 Acceleration-time graph of a body is shown. The Corresponding velocity time graph of the same body is



Q. 28 Displacement time graph of a ball thrown vertically upward is shown in figure then its v-t graph is:

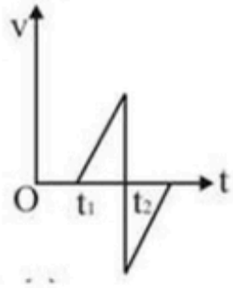


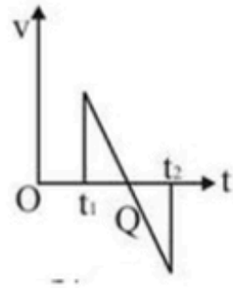
Q. 29 In the given graph distance traveled is:

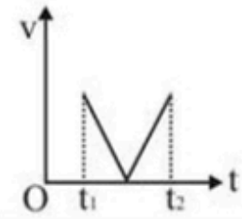


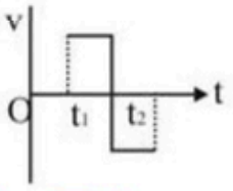
A. 200m
B. 300 m
C. 250 m
D. 400m

Q. 30 A batsman hits a sixer and the ball reaches out of the cricket ground. Which of the following graphs describes the variation of the cricket ball's vertical velocity v with time between (the time of hitting the bat and time (the time of touching the ground)?

A. 

B. 

C. 

D. 

Newton's Laws Of Motion, Linear Momentum & Law Of Conservation Of Momentum

Q. 31 The engine of a car produces an acceleration of 6 ms^{-2} in the car. If this car pulls another car of the same mass, then the acceleration would be

A. 6 ms^{-2} B. 12 ms^{-2}
C. 3 ms^{-2} D. 1.5 ms^{-2}

Q. 32 What is the resultant force shown in fig?

A. 7 N towards B. 17 N in arbitrary direction
C. 3 N toward left D. 10 N towards left

Q. 33 A cricket player catches a ball of mass 100 g and moving with a velocity of 25ms^{-1}. If the ball is caught 0.1s, the force of the ball exerted on the hand of the player is:

A. 4N B. 40N
C. 25N D. 250N

Q. 34 A cricket ball of mass 0.5 kg strikes a bat normally with a velocity of 30 ms^{-1} and rebounds with a velocity of 20 ms^{-1} in the opposite direction. The impulse of the force exerted by the ball on the bat is

A. 0.5 Ns B. 25 Ns
C. 1.0 Ns D. 50 Ns

Q. 35 The rate of change of momentum of a body falling freely under gravity is equal to its

A. Impulse B. Kinetic energy
C. Power D. Weight

Q. 36 When the velocity is doubled:

A. K.E is doubled B. Acceleration is doubled
C. Momentum is doubled D. P.E is doubled

Q. 37 A particle of mass m moving with velocity v strikes a stationary particle of mass 2m and sticks to it. The speed of the system will be?

A. $\frac{v}{2}$ B. 2v
C. $\frac{v}{3}$ D. 3v

Q. 38 A wagon weighing 1000 kg is moving with a velocity 50 km/h on smooth horizontal rails. A mass of 250 kg is dropped into it. The velocity with which it moves now is

A. 40 km/hour B. 50 km/hour
C. 2.5 km/hour D. 20 km/hour

Q. 39 In which of the following cases forces may not be required to keep the

A. Particle going in a circle B. Particle going along a straight line
C. The momentum of the particle constant D. Acceleration of the particle constant

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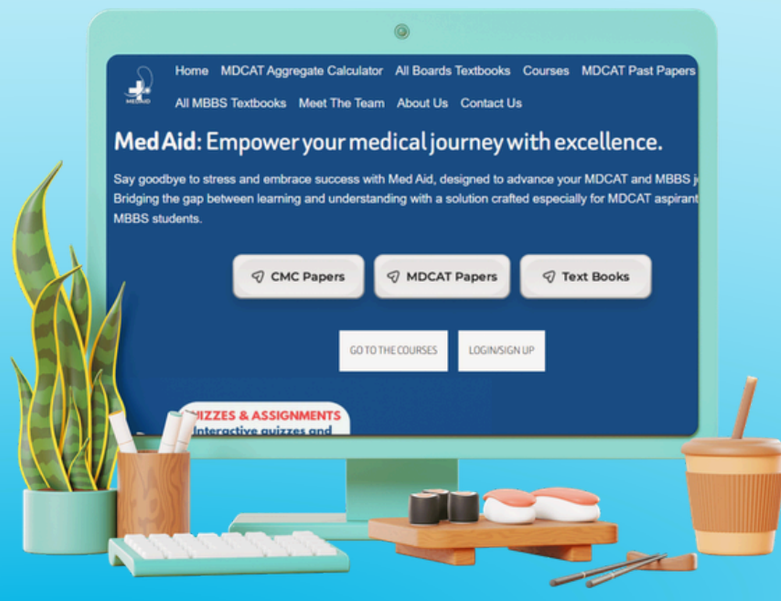

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Q. 40 The motion of a rocket is based on the principle of conservation of

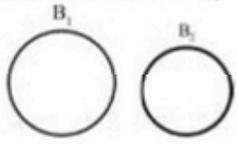
A. Mass
B. Kinetic energy
C. Linear momentum
D. Angular momentum

Collision

Q. 41 A billiard ball moving with a speed of 5 m/s collide with an identical ball, originally at rest. If first ball stops dead after the collision, then second ball will move forward with speed of

A. 10 m/s
B. 5 m/s
C. 2.5 m/s
D. 9 m/s

Q. 42 When a very heavy ball 'B1' collide with a stationary target 'B2' of negligible mass, after collision the final velocity of ball 'B2' will



A. Become zero
B. Become half
C. Become doubled as compared to B1
D. Same as the B1

Q. 43 A 10 kg object collides with stationary 5 kg object and after collision they stick together and move forward with velocity $4ms^{-1}$. What is the velocity with which the 10 kg object hit the second one?

A. $6ms^{-1}$
B. $8ms^{-1}$
C. $12ms^{-1}$
D. $10ms^{-1}$

Q. 44 When a ball bounces back from floot such that sound and heat is produced then collision

A. Must be elastic
B. Must be inelastic
C. Momentum is conserved but K.E is not conserved
D. Both B and C

Q. 45 A ball of mass 2 kg travelling at 8 ms^{-1} strikes a ball of mass 4 kg travelling at 2 ms^{-1}. Both balls are moving along the same straight line as shown

After collision, both balls move at the same velocity v. What is the magnitude of the velocity v?

A. 4 ms^{-1}
B. 5 ms^{-1}
C. 6 ms^{-1}
D. 8 ms^{-1}

Q. 46 Two similar spheres, each of mass m and travelling with speed v, are moving towards each other.

The spheres have a head on elastic collision. Which statement is correct?

A. The spheres stick together on impact
B. The total kinetic energy after impact is mv2
C. The total kinetic energy before impact is zero
D. The total momentum before impact is 2 mv

Q. 47 Two railway trucks of masses m and 3m move towards each other in opposite directions with speeds 2v and v respectively. These trucks collide and stick together. What is the speed of the trucks after the collision?

A. $\frac{V}{4}$
B. $\frac{V}{2}$
C. v
D. $\frac{5V}{4}$

Q. 48 Which one of the following is true in the case of inelastic collision?

	Total energy	Kinetic Energy	Momentum
A	Conserved	Conserved	Conserved
B	Conserved	Not conserved	Conserved
C	Conserved	Conserved	Not conserved
D	Not conserved	Not conserved	Conserved

Q. 49 A ball is dropped from a height of 10 m. It is embedded 1 m in sand and stops. In this process

A. Only momentum is conserved
B. Only kinetic energy is conserved
C. Both momentum and kinetic energy are conserved
D. Neither momentum nor kinetic energy is conserved

Q. 50 When two bodies collide elastically then the quantity conserved is

A. Kinetic energy
B. Momentum
C. Both
D. None

Projectile Motion

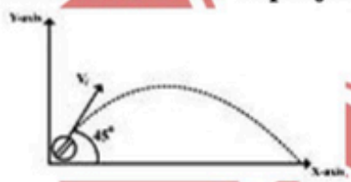
Q. 51 A bomber drops a bomb, when it is vertically above the target. Its misses the target because

A. Vertically component of the velocity of the bomber
B. Force of gravity
C. Acceleration of the bomber
D. Horizontal component of the velocity of the bomber

Q. 52 A parabolic path for a projectile is shown in the figure. At which point acceleration is minimum?

A. B
B. A
C. C
D. Not possible

Q. 53 A projectile is projected upwards with an angle of with x-axis at shown in the figure such that its K.E at projection is. What will be its K.E at the top?



A. 0J
B. 100J
C. 25J
D. 50J

Q. 54 At which point for a projectile its kinetic energy is completely converted into potential energy

A. At point of projection
B. At the highest point
C. Point to hit the ground
D. Not possible

Q. 55 A ball is thrown horizontally from the top of a tower. What happens to the horizontal component of its acceleration?

A. First increases and then decreases
B. Increase
C. Decrease
D. Zero

Q. 56 At maximum height in projectile motion the horizontal component of velocity will

A. Maximum
B. Zero
C. Constant
D. Both (b) and (c)

Q. 57 An aero plane is flying horizontally with a velocity of 10 m/s and at a height of 1960 m. When it is vertically above a point A on the ground, a bomb is released from it. The bomb strikes the ground at point B. The distance AB is (ignoring air resistance)

A. 100 m
B. 200 m
C. 400 m
D. 2 km

Q. 58 A ball is projected horizontally from the top of a cliff on the surface of the earth with a speed of $40ms^{-1}$. Assuming that there is no air resistance, what will its speed be 3 s later?

A. $30ms^{-1}$
B. $40ms^{-1}$
C. $50ms^{-1}$
D. $60ms^{-1}$

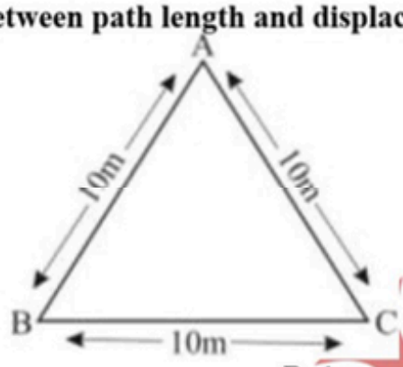
Q. 59 A man projects a coin upwards from the gate of a uniformly moving train. The path of coin for the man will be

A. Parabolic
B. Inclined straight line
C. Vertical straight line
D. Horizontal straight line

Q. 60 For projectile motion in the absence of air resistance:

A. Vertical speed is constant
B. Horizontal force is constant
C. Horizontal acceleration is zero
D. Vertical acceleration is zero

Q. 61 A particle moves from A to B and then it moves from B to C as shown in figure. Calculate the ratio between path length and displacement.



A. 2
B. 1
C. ½
D. Infinity

Q. 62 Imran travels 2m with speed v1 and then 2m with speed v2, his average speed is:

A. $\frac{V_1 + V_2}{2}$
B. $\frac{V_1 V_2}{2}$
C. $\frac{V_1 V_2}{V_1 + V_2}$
D. $\frac{2V_1 V_2}{V_1 + V_2}$

Q. 63 Which law of motion is called law of inertia?

A. 1st
B. 2nd
C. 3rd
D. Law of gravitation

Q. 64 At the highest point, the velocity of projectile is

A. Maximum
B. Zero
C. Minimum
D. Equal to half of x – component of velocity

Q. 65 The distance travelled by a moving car with velocity 15 m/s in 2 seconds, decelerates at $2m/s^2$ is equal to

A. 30m
B. 34m
C. 16m
D. 26m

Q. 66 The magnitude of acceleration produced in an object is inversely proportional with

A. Momentum
B. Mass
C. Velocity
D. Force

Q. 67 A stone thrown horizontally from the top of a tall building follows a path that is:

A. Circular
B. Made of two straight line segments
C. Hyperbolic
D. Parabolic

Q. 68 The magnitude of instantaneous velocity is expressed by

A. $V_{ins} = \lim_{\Delta t \to 0} \frac{\Delta t}{\Delta d}$
B. $V_{ins} = \lim_{\Delta d \to 0} \frac{\Delta d}{\Delta t}$
C. $V_{ins} = \lim_{\Delta d \to 0} \frac{\Delta t}{\Delta d}$
D. $V_{ins} = \lim_{\Delta t \to 0} \frac{\Delta d}{\Delta t}$

Q. 69 If R is the max range of projectile, then greatest height attained is

A. R
B. $\frac{R}{2}$
C. $\frac{R}{4}$
D. 2R

Q. 70 For range to have maximum value, the function sin2θ should have value:

A. 90
B. 45
C. 1
D. 0

Q. 71 A force of 50 dynes is acting on a body of mass 5 gm which is at rest for an interval of 3 sec, then impulse is:

A. 0.16×10^{-3}Ns
B. 0.98×10^{-3}Ns
C. 1.5×10^{-3}Ns
D. 2.5×10^{-3}Ns

Q. 72 If R is the max range of projectile, then greatest height attained is

A. R
B. $\frac{R}{2}$
C. $\frac{R}{4}$
D. 2R

Q. 73 The time in which a force of 2 N produces a change of momentum of 0.4 kg ms^{-1} in the body is:

A. 0.2s
B. 0.02s
C. 0.5s
D. 0.05s

Q. 74 The range of a particle when launched at an angle of 15o with the horizontal is 1.5 km. what is the range of projectile when launched at an angle of 45° to the horizontal:

A. 1.5 km
B. 3.0 km
C. 6.0 km
D. 0.75 km

Q. 75 A body of momentum mv collides with a wall elastically its change in momentum is

A. mv
B. –2 mv
C. 0
D. mv

Q. 76 The area under the velocity time graph gives

A. Force
B. Displacement
C. Acceleration
D. Torque

Q. 77 A man leaves his house for a cycle ride. He comes back to his house after half-an-hour after covering a distance of one km. What is his average velocity for the ride?

A. 0 km h^{-1} or 0 km s^{-1}
B. 2 km h^{-1}
C. 2 km s^{-1}
D. $\frac{1}{2}$ km s^{-1}

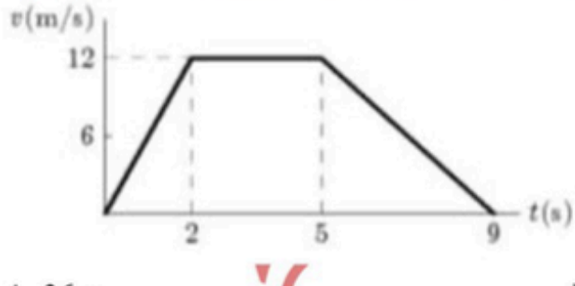
Q. 78 What is the resultant force shown in fig?

A. 7 N towards
B. 17N in arbitrary direction
C. 3N toward left
D. 10N towards left

Q. 79 A 7.0 kg bowling ball experiences a net force of 5.0 N what will be its acceleration?

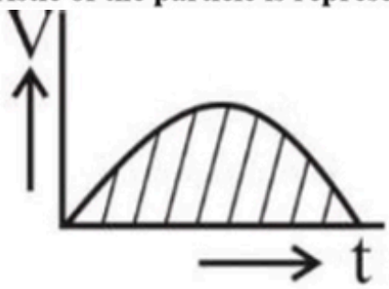
A. 7.1 ms^{-2}
B. 0.71 ms^{-2}
C. 5.0 ms^{-2}
D. 35.0 ms^{-2}

Q. 80 The graph represents the straight-line motion of a car. How far does the car travel between t = 2 s and t = 5 s?



A. 36 m
B. 12 m
C. 4 m
D. 60 m

Q. 81 The Figure shows the velocity time graph of a one-dimensional motion. Which of the following characteristic of the particle is represented by the shaded area?

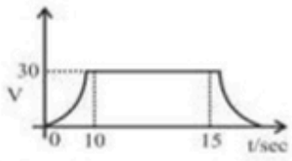


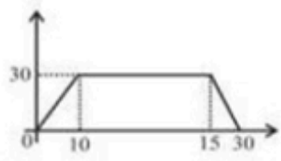
A. Distance covered
B. Speed
C. Momentum
D. Acceleration

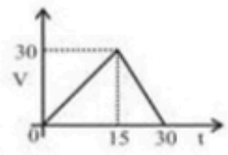
Q. 82 Table shows how the velocity of a motor cyclist changed during speed trial along straight road.

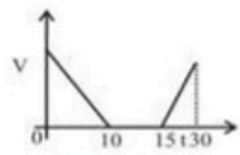
Velocity / m s^{-1}	0	15	30	30	20	10	0
Time / s	0	5	10	15	20	25	30

draw V-t graph for this motion?

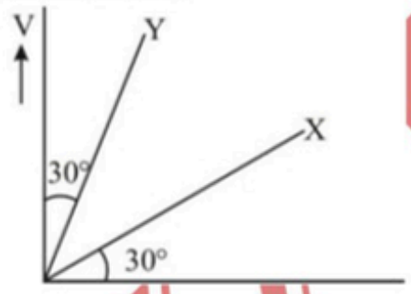
A. 

B. 

C. 

D. 

Q. 83 Velocity time graph of body X and Y is shown in fig. The ratio of the acceleration of Y to acceleration of X is



A. 3:1
B. $1 : \sqrt{3}$
C. 1 :3
D. $\sqrt{3} : 1$

Q. 84 A mass is projected at angle q in air. Which of given statement is correct?
A. Its momentum remains constant
B. Its energy remains constant
C. Velocity become zero at maximum height
D. Acceleration become zero at maximum height

Q. 85 A pendulum of mass m and length l vibrate. The maximum torque in pendulum is at
A. Mean position
B. Extreme position
C. All position torque is same
D. None of these

Q. 86 Two balls have K.E ratio 2:1 and masses ratio 2 : 1. The ratio of their momentum is
A. 2 : 1
B. 1 : 2
C. 4 : 1
D. 1 : 4

Q. 87 A body moves from A (4, 3) to B (–2, 4). Its displacement in magnitude is
A. 6
B. 10
C. $\sqrt{37}$
D. $\sqrt{41}$

Q. 88 A projectile is projected at an angle 45° then ratio of K.E to K.E$_{max}$ at maximum height?
A. 1:2
B. 2:1
C. $1 : \sqrt{2}$
D. $\sqrt{2} : 1$

Q. 89 A body is moving in a circular path with a constant speed, it has
A. A constant velocity
B. A constant acceleration
C. An acceleration of constant magnitude
D. An acceleration which varies with time

Q. 90 When two objects undergo an inelastic collision then
A. Objects comes to rest after collision
B. Momentum of system does not change
C. Momentum of the object's changes
D. The law of conservation of energy is violated

Q. 91 A projectile is fired at 60o with 100m s^{-1}. Velocity at maximum height is
A. 0 ms^{-1}
B. 25 ms^{-1}
C. 50 m s^{-1}
D. 20 ms^{-1}

Q. 92 Which of following changes when particle is moving with uniform velocity?

A. Speed
B. Acceleration
C. Velocity
D. Position vector

Q. 93 The direction of linear velocity of a body moving in a circle is

A. Along the axis of rotation
B. Along the tangent
C. Directed towards the center
D. Directed away from the center

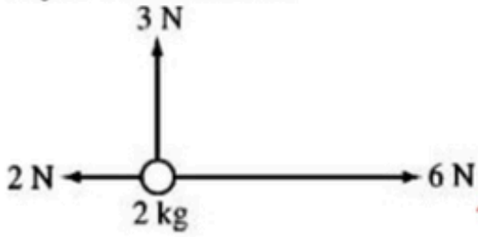
Q. 94 A car is travelling with uniform acceleration along a straight road. The road has marker posts every 100 m. when the car passes one post, it has a speed of 10 ms^{-1} and, when it passes the next one, its speed is 20 ms^{-1}. What is the car's acceleration?

A. 0.67 ms^{-2}
B. 6.0 ms^{-2}
C. 2.5 ms^{-2}
D. 1.5 ms^{-2}

Q. 95 A body is projected at θ = 45° with initial velocity vi=10m/s the range is

A. 10 m
B. 100 m
C. 50 m
D. 25 m

Q. 96 The figure below shows the forces acting on an object of mass 2 kg. What is the object's acceleration?



A. 2 m/s^2
B. 3 m/s^2
C. 2.5 m/s^2
D. 3.5 m/s^2

Q. 97 A child starts from rest at the top of a slides of height 4.0m. What is his speed at the bottom of slide is frictionless?

A. 8.8 ms^{-1}
B. 10 ms^{-1}
C. 6.8 ms^{-1}
D. 5 ms^{-1}

Q. 98 Two masses m1 and m2 are initially at rest with a spring compressed between them. What is the ratio of the magnitude of their velocities after the spring has been released?

A. $\frac{m_2}{m_1}$
B. $\frac{m_1}{m_2}$
C. $\frac{1}{m_1 m_2}$
D. $\frac{m_1 \times m_2}{m_1 \times m_2}$

Q. 99 A 1500 kg car has its velocity reduced from 20 ms^{-1} in 3.0 s. How large was the average retarding force?

A. –2.5 kN
B. 2.5 kN
C 2 kN
D. 3 kN

Q. 100 A body is dropped from a tower reaches ground in 4s, height of tower is

A. 40m
B. 20m
C. 80m
D. 160m

Q. 101 Range of projectile at 30° is R. At what angle R will be same?

A. 60°
B. 50°
C. 30°
D. 20°

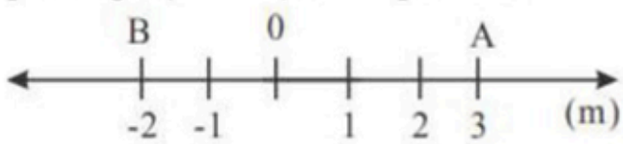
Q. 102 Rocket carries its fuel in the form of

A. Only liquid
B. Only solid
C. Liquid or solid hydrogen and oxygen
D. Liquid and solid

Q. 103 Time taken by an engine of 10 kW to lift a mass of 2 kg to a height of 5m is

A. 10^{-1}sec
B. 10^{-2} sec
C. 10^{-3} sec
D. 10 sec

Q. 104 As shown in the figure a particle moves from 0 to A, and then A to B. Find pathlength (distance) and displacement.



A. 8m, -2m
B. 8m, -8m
C. 2m, -2m
D. 2m, 2m

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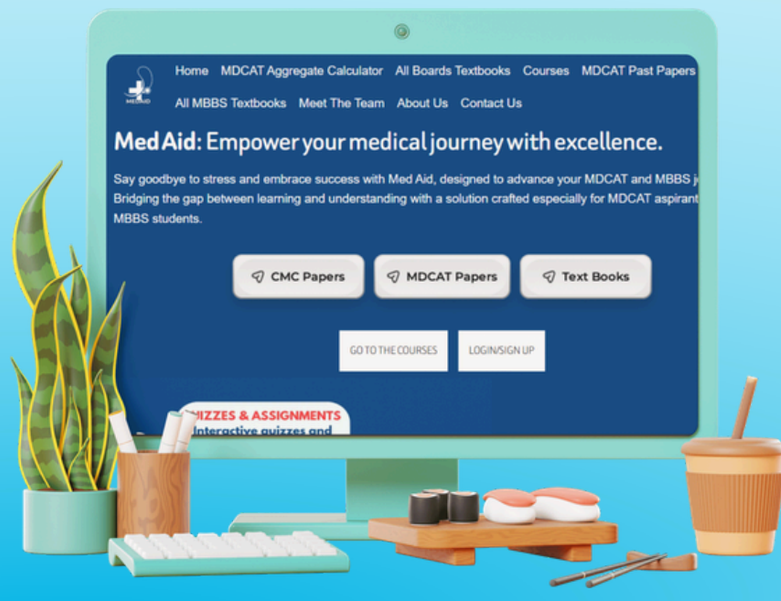

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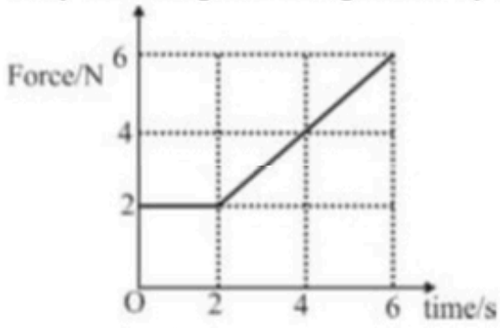
Q. 105 At maximum height in projectile motion $\vec{v}$ and $\vec{a}$ are

A. Parallel
B. Anti-parallel
C. Perpendicular
D. None

Q. 106 The area between velocity time graph and the time axis is numerically equal to

A. Speed of object
B. Average velocity of the object
C. Distance covered by the object
D. Acceleration of the object

Q. 107 The graph shows how the force acting on a body varies with time. Assuming that the body is moving in a straight line, by how much does its momentum change?



A. 40 $kgms^{-1}$
B. 20 $kgms^{-1}$
C. 36 $kgms^{-1}$
D. 16 $kgms^{-1}$

Q. 108 A 7.0 kg bowling ball experiences a net force of 5.0 N what will be its acceleration?

A. 7.0 ms^{-2}
B. 5.0 ms^{-2}
C. 0.71 ms^{-2}
D. 35.0 ms^{-2}

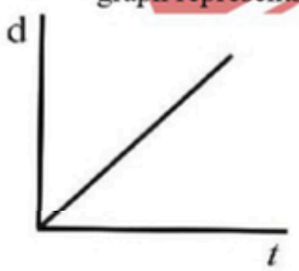
Q. 109 A monkey can jump a maximum horizontal distance of 20 m. Then the velocity of the monkey is

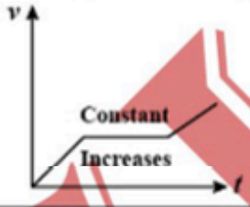
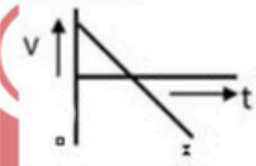
A. 10 ms^{-1}
B. 14 ms^{-1}
C. 20 ms^{-1}
D. 24 ms^{-1}

Q. 110 If displacement of a particle is zero then the distance covered

A. Must be zero
B. Cannot be zero
C. Is negative
D. May or may not be zero

ANSWERS & EXPLANTION: -

Q.1	**D**	$\frac{S}{\lvert\vec{d}\rvert} = \frac{r\theta}{2r} = \frac{\pi}{2}$
Q.2	**A**	Total time of motion is 3 min 20 sec = 20 sec. As time period of circular motion is 40 sec so in 20 sec athletes will complete 5 revolution i.e., he will be at starting point i.e., displacement = zero.
Q.3	**A**	Since displacement is zero.
Q.4	**A**	Let s be the distance travelled by the vehicle before it stops. Final velocity, v =0, initial velocity = u Using equation of motion v2− u2= 2aS 02− u2= 2aS Stopping distance, S = −u2/2a
Q.5	**A**	$\lvert\vec{d}\rvert = 2r$ (along diameter) $S = 2\pi r$ (distance along circle) $\frac{\lvert\vec{d}\rvert}{S} = \frac{2r}{2\pi r} = 1:\pi$
Q.6	**B**	$d = 2r = 2(1) = 2$ $v_{ave} = \frac{\Delta d}{\Delta t} = \frac{2}{1} = 2ms^{-1}$
Q.7	**D**	Average velocity $= \frac{3x}{\frac{x}{60}+\frac{x}{20}+\frac{x}{10}} = \frac{3x}{\frac{x+3x+6x}{60}} = \frac{3x\times 60}{10x} = 18km\,h^{-1} = 5\,ms^{-1}$
Q.8	**C**	As it is the equal time partition case so $V_{av} = \frac{v_1+v_2}{2} = \frac{30+50}{2} = \frac{80}{2} = 40kmh^{-1}$
Q.9	**C**	vB + vA = v B + vA = 80 + 65 = 145 km/hr
Q.10	**B**	$v_r = \sqrt{v_R{}^2 - v_B^2} = \sqrt{10^2 - 8^2} = 6\ km\,h^{-1}$
Q.11	**D**	At point E, the slope is decreasing negatively
Q.12	**B**	$\vec{d} - t$ graph represents that particle is moving with uniform velocity 
Q.13	**D**	$v_A = tan30°$ and $v_B = tan60° \therefore \frac{V_A}{V_B} = \frac{\tan 30°}{\tan 60°} = \frac{1/\sqrt{3}}{\sqrt{3}} = \frac{1}{3}$
Q.14	**A**	
Q.15	**B**	
Q.16	**B**	
Q.17	**B**	

Q.18	**D**	
Q.19	**D**	
Q.20	**C**	
Q.21	**C**	$a = \frac{v_f - v_i}{t} = \frac{4-3}{0.5} = 2ms^{-2}$
Q.22	**D**	Direction of acceleration due to gravity toward earth center.
Q.23	**C**	The acceleration of ball at highest point when thrown vertically upward option (c) g, down.
Q.24	**A**	
Q.25	**B**	Displacement = area under graph $= (2\times5) + \frac{1}{2}(25-5)(2+10)$ $= 130\,m$
Q.26	**C**	
Q.27	**B**	Rate of change of velocity is acceleration. We know that $a = \frac{\Delta v}{\Delta t}$, where a is acceleration and v is velocity. In the given graph acceleration is constant for first part of motion. So, velocity increases uniformly. When a=0 i.e, $0 = \frac{\Delta v}{\Delta t} \Rightarrow$ v = constant Thus, we can draw velocity time graph as: 
Q.28	**C**	It v-t graph is: 
Q.29	**A**	S=Area under the graph, S= Area of trapezium, $S = \frac{1}{2}(30+10)(10) = 200m$
Q.30	**B**	Initially the ball has vertical component of motion upward. It decreases, becomes zero and then begins to increase in downward direction.
Q.31	**C**	Force applied by engine = $6ms^{-2}$. When two cars are pulled, $(m+m)a = 6ms^{-2}$ $2ma = 6ms^{-2}$ or $a = 3ms^{-2}$
Q.32	**C**	According to 2nd law of motion. $F_{net} = 10 + 2 - 5 = 3N$ towards left
Q.33	**C**	$F = \frac{mv}{t} = \frac{(0.1)(25)}{0.1} = 25N$
Q.34	**B**	Impulse = change in momentum $I = mu - m(-v)$ $= m(u+v) = 0.5\ x\ (30+20) = 25\ Ns$
Q.35	**D**	$F = \frac{\Delta p}{\Delta t} = w = mg$

Q.36	**C**	$P = mv,\ P' = m(2v) = 2P$
Q.37	**C**	$mv + 0 = (m + 2m)v'$ $v' = \frac{mv}{3m} = \frac{v}{3}$
Q.38	**A**	$m_1 = 1000\ kg$ $v_1 = 50\ kmph$ $m_2 = 1000 + 250 = 1250\ kg.$ $v_2 = ?$ by principle of conservation of momentum, $m_1 v_1 = m_2\ v_2$ $v_2 = \frac{m_1 v_1}{m_2} = \frac{1000 \times 50}{1250}$ $v_2 = 40\ kmph$
Q.39	**C**	If momentum remains constant then force will be zero because $F = \frac{\Delta p}{\Delta t}$
Q.40	**C**	
Q.41	**B**	When two identical balls collide elastically their velocities are interchange.
Q.42	**C**	$m_1 > > m_2, v_2 = 0$ $v'_1 = v_1, v'_2 = 2v_1$
Q.43	**A**	$m_1 v_1 = (m_1 + m_2)v_c$ $v_1 = (\frac{m_1 + m_2}{m_1})v_c$ $= \frac{15}{10} \times 4 = 6ms^{-1}$
Q.44	**D**	Application of elastic collision
Q.45	**A**	For inelastic collision, momentum is still conserved. Momentum before collision = momentum after collision. $m_1 u_1 + m_2 u_2 = (m_1 + m_2)v$ $(2)(8) + (4)(2) = (2 + 4)v$ $v = 4\ ms^{-1}$
Q.46	**B**	Kinetic energy is conserved for elastic collision. $\frac{1}{2}mv^2 + \frac{1}{2}mv^2 = mv^2$
Q.47	**A**	This is a perfectly inelastic collision.  $m(2v) + 3m(-v) = (m + 3m)v_t$ $-mv = 4mv_1$ $v_1 = -\frac{1}{4}v$
Q.48	**B**	Total momentum and total energy remain conserved in all types pf collision.

Q.49	**A**	During inelastic collision only momentum is conserved
Q.50	**C**	When bodies collide elastically both momentum and K.E remain conserved.
Q.51	**D**	Due to air friction, horizontal velocity of bomb changes
Q.52	**D**	For whole projectile trajectory $a = g$
Q.53	**D**	$K.E = K.E_{max}\cos^2\theta$ $= K.E_{max}(\frac{1}{\sqrt{2}})^2$ $= 100 \times \frac{1}{2}$ $= 50J$
Q.54	**D**	There is no point in the path of a projectile where K.E is completely converted to P.E every point have some amount of K.E and P.E.
Q.55	**D**	For projectile motion: $Fx = 0$, $ax = 0$
Q.56	**C**	In projectile motion the horizontal component of velocity will remain constant
Q.57	**B**	$AB = R = u\sqrt{\frac{2H}{g}} = 10 \times \sqrt{\frac{2 \times 1960}{9.8}}$ $R = 10 \times 20 = 200\,m$
Q.58	**C**	$v = \sqrt{v_x^2 + g^2t^2} = \sqrt{(40)^2 + (10)^2(3)^2}$ $v = \sqrt{1600 + 900} = \sqrt{2500} = 5ms^{-1}$
Q.59	**C**	Because horizontal velocity is same for coin and the observer. So relative horizontal displacement will be zero.
Q.60	**C**	$F_x = ma_x = 0$ $a_x = 0$ $v_x = \text{constant}$

Q.61	**A**	**Q.62**	**D**	**Q.63**	**A**	**Q.64**	**C**	**Q.65**	**D**
Q.66	**D**	**Q.67**	**D**	**Q.68**	**D**	**Q.69**	**C**	**Q.70**	**C**
Q.71	**C**	**Q.72**	**C**	**Q.73**	**A**	**Q.74**	**B**	**Q.75**	**B**
Q.76	**B**	**Q.77**	**A**	**Q.78**	**C**	**Q.79**	**B**	**Q.80**	**A**
Q.81	**A**	**Q.82**	**B**	**Q.83**	**A**	**Q.84**	**B**	**Q.85**	**B**
Q.86	**A**	**Q.87**	**C**	**Q.88**	**A**	**Q.89**	**C**	**Q.90**	**B**
Q.91	**C**	**Q.92**	**D**	**Q.93**	**B**	**Q.94**	**D**	**Q.95**	**A**
Q.96	**C**	**Q.97**	**A**	**Q.98**	**A**	**Q.99**	**A**	**Q.100**	**C**
Q.101	**A**	**Q.102**	**C**	**Q.103**	**B**	**Q.104**	**A**	**Q.105**	**C**
Q.106	**C**	**Q.107**	**B**	**Q.108**	**C**	**Q.109**	**B**	**Q.110**	**D**

WORK & ENERGY

WORK

Q. 1 Work is _____ quantity

A. Vector
B. Scalar
C. Tensor
D. None of these

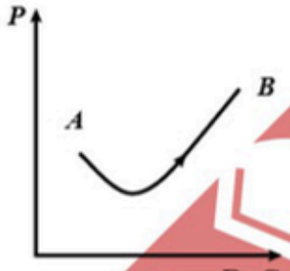
Q. 2 The work done in moving a body against the gravity is taken as

A. Positive
B. Negative
C. 0
D. ∞

Q. 3 If F = 2i + 3j and d= 7k then amount of work done will be

A. 0 J
B. 21 J
C. 7 J
D. 8 J

Q. 4 Consider a process shown in the figure. During this process the work done by the system

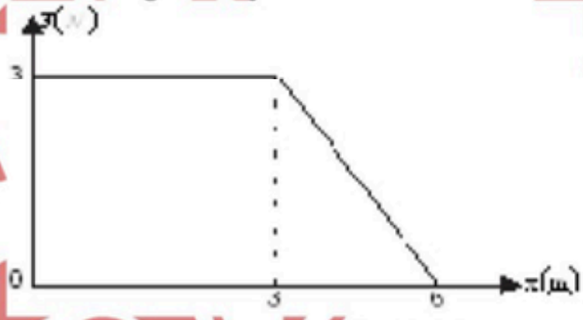


A. Continuously increases
B. Continuously decreases
C. First increases, then decreases
D. First decreases, then increases

Q. 5 The work done in the isochoric process is

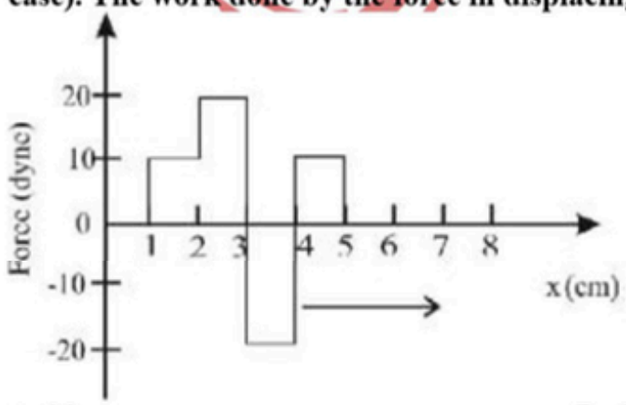
A. Constant
B. Variable
C. Zero
D. Depends on the situation

Q. 6 A force F acting on an object varies with distance x as shown in the figure. The work done by the force in moving the object form x = 0 to x = 6 is



A. 18 J
B. 13.5 J
C. 9 J
D. 4.5 J

Q. 7 The relationship between force and position is shown in figure (in one dimensional case). The work done by the force in displacing a body from x = 1 cm to x = 5 cm is

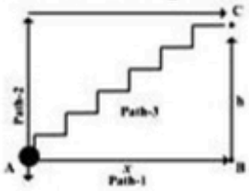


A. 20 ergs
B. 60 ergs
C. 70 ergs
D. 700 ergs

Q. 8 Which of the following expressions does not have the units equal to joule? Where 'P' is the linear momentum and 'm' is the mass of the object moving with velocity 'v'.

A. Fv
B. Fd
C. $\frac{P^2}{2m}$
D. mv^2

Q. 9 **A spherical object has to be taken to the point "C" from "A" through three different paths as shown in the figure. Considering the work to be done in the gravitational field, which path represent least change in energy?**



A. Path-1
B. Path-2
C. Path-3
D. All have same change in energy

Q. 10 **A ball of mass 0.2 kg is thrown vertically upwards by applying a force by hand. If the hand moves 0.2 m which applying the force and the ball goes up to 2 m height further, find the magnitude of the force. Consider g = 10 m/s²**

A. 22N
B. 16N
C. 20N
D. 4N

Q. 11 **A 4 kg body is thrown vertically upward from the ground with a velocity of 5 ms⁻¹. Its kinetic energy just before hitting the ground is**

A. 25 J
B. 50 J
C. 75 J
D. 100 J

Q. 12 **If momentum is increased by two times K.E increases by**

A. Two times
B. 3 times
C. Four times
D. Remains

Q. 13 **A bomb of mass 16 kg at rest explodes into two pieces of masses of 4 kg and 12 kg. The velocity of the 12 kg mass is 4 ms⁻¹. The kinetic energy of the other mass is:**

A. 96J
B. 44J
C. 288J
D. 192J

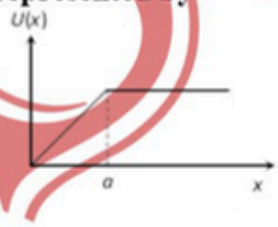
Q. 14 **A car accelerates up a hill what happens to its K.E and to its P.E respectively**

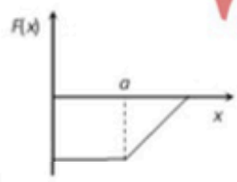
	Kinetic Energy	Potential Energy
A.	Increases	Decreases
B.	Decreases	Increases
C.	Increases	Increases
D.	Unchanged	Increases

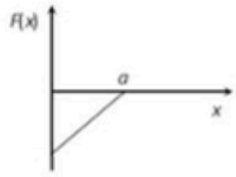
Q. 15 **A 2m tall man standing at a top of a 30m tall tower raises a 1kg mass 0.5m above his head. The potential energy of the raised mass may be considered to be**

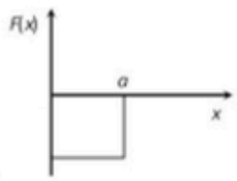
A. 4.9 J
B. 318.5 J
C. 24.5 J
D. None

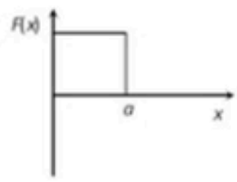
Q. 16 **The potential energy of a system is represented in the first figure. the force acting on the system will be represented by**



A.


B.


C.


D.


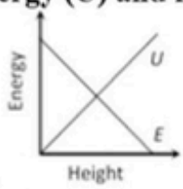
Q. 17 **If a body raised up from the earth's surface, the work done equal to change in the:**

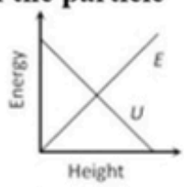
A. Gravitational P.E
B. K.E
C. Air resistance
D. Elastic P.E

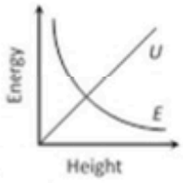
Q. 18 When we raise the body above the surface of the earth its P.E within the gravitational field.

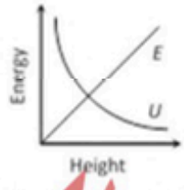
A. Increase
B. Decrease
C. Become zero
D. Remain same

Q. 19 Which of the following graphs is correct between kinetic energy (E), potential energy (U) and height (h) from the ground of the particle

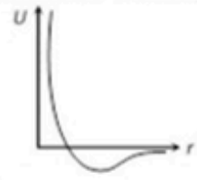
A. 

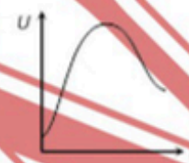
B. 

C. 

D. 

Q. 20 The diagrams represent the potential energy U of a function of the inter-atomic distance r. Which diagram corresponds to stable molecules found in nature.

A. 

B. 

C. 

D. 

Q. 21 How much water a pump of 2 kW can raise in one minute to a height of 10 m (Take $g = 10\ ms^{-2}$)

A. 1000 liters
B. 1200 liters
C. 100 liters
D. 2000 liters

Q. 22 Power of 2238 watt in horse power is

A. 3 kwatt
B. 5 hp
C. 3 hp
D. 2.5 hp

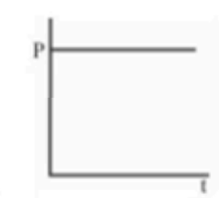
Q. 23 The time taken by an engine of power 10 kW to lift a mass of 200 kg to the height of 40 m is

A. 2 s
B. 4 s
C. 8 s
D. 16 s

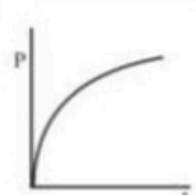
Q. 24 A horse pulls a wagon with a force of 360 N at an angle of 60° E with the horizontal at a speed of 10 km h^{-1}. The power of the horse is

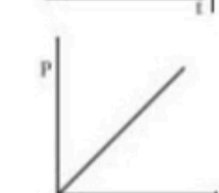
A. 1000 W
B. 2000 W
C. 500 W
D. 750 W

Q. 25 A motor drives a body along a straight line with a constant force. The power P developed by the motor must vary with time t according to

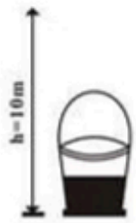
A. 

B. 

C. 

D. 

Q. 26 A bucket full of water having mass of 1000 kg is taken upto height of 10m in 10 seconds. What is the power developed?



A. 1000 W
B. 10 kW
C. 100 Kw
D. 1000 kW

Q. 27 One kilo watt hour is the amount of work done in

A. One day
B. One year
C. One month
D. One hour

Q. 28 The dimension of power is

A. [MLT-2]
B. [MLT-3]
C. [Ml-1T-2]
D. [ML2T-3]

Q. 29 Slope of work time graph is equal to

A. force
B. velocity
C. power
D. energy

Q. 30 Two men with weights in the ratio 5 : 3 run up a staircase (of same height) in times in the ratio 11 : 9. The ratio of power of first to that of second is:

A. 11/15
B. 11/9
C. 15/11
D. 9/11

Q. 31 A automobile travelling with a speed of 60 km h^{-1}, can brake to stop within a distance of 20 m. If the car is going twice as fast i.e., 120 km h^{-1}, the stopping distance will be

A. 60 m
B. 40 m
C. 20 m
D. 80 m

Q. 32 A force of 10N acts on a body at angle such that K.E of body increases to from. What is the work done by the force?

A. 500J
B. 800J
C. 1000J
D. -600J

Q. 33 A body of mass 4kg is moving with a velocity of 4m/sec. How much force is required to stop the body with in a distance of one meter

A. 16N
B. 32N
C. 8N
D. 64N

Q. 34 A constant force F acting through a distance of 10 m changes the kinetic of a body from 30 J to 45 J. The magnitude of force is

A. 15 N
B. 4.5 J
C. 1.5 N
D. 45 N

Q. 35 A lorry and a car moving with same kinetic energy are brought to rest by the application of brakes which provide equal retarding force. Which of them comes to rest in shorter distance?

A. Car
B. Lorry
C. Both travel the same distances before coming to rest
D. Nothing can be static

Q. 36 The actual efficiency of machine is

A. Always greater than 100%
B. Always less than 100%
C. Could be equal to 100%
D. None of these

Q. 37 A machine needed 1000 J of energy to raise a 10 kg block at a distance of 6 m, the efficiency of machine is

A. 59%
B. 69%
C. 54%
D. 83%

Q. 38 The efficiency of ideal machine

A. 80%
B. 70%
C. 90%
D. 100%

Q. 39 If a machine moves a load W through a distance h then the useful work done by the machine is

A. Input
B. Output
C. Efficiency
D. Mechanical advantage

Q. 40 Block and tackle system of pulleys is used to raise a load of 500N through a height of 20 m. The work done against friction is 2000J. Calculate the work done by the effort.

A. 10000 J
B. 12000 J
C. 15000 J
D. 5000 J

Q. 41 A ball is dropped from a height of 10 m.

A. Its potential energy increases and kinetic energy decreases during the falls
B. Its potential energy decreases and the kinetic energy increases during the fall.
C. Its potential energy is equal to the kinetic energy during the fall.
D. Its potential energy and kinetic energy is maximum while it is falling.

Q. 42 Which of the followings is an example of work done against gravitational force?

A. Getting up with the stairs
B. Get down with the stairs
C. Walking on the flat ground
D. Dropping any object down from the top

Q. 43 For a body moving in a circular path, the work done by the centripetal force is:

A. Negative
B. Positive
C. Constant
D. Zero

Q. 44 If a pump can lift 200 kg of water through a height of 6 m in 10 seconds, then its power is:

A. 1100 watts
B. 1000 watts
C. 1300 watts
D. 1200 watts

Q. 45 A body moves a distance of 10 m along a straight line under the action of a force of 5 N. If the work done is 25 joules, the angle which the force makes with the direction of motion of the body:

A. 0°
B. 30°
C. 60°
D. 90°

Q. 46 A force $F = (5\hat{j} + 3\hat{j})$ newton is applied over a particle which displaces it from its origin to the point $r = (2\hat{j} - 1\hat{j})$ metres. The work done on the particle is:

A. -7 joules
B. + 13 joules
C. + 7 joules
D. + 11 joules

Q. 47 Which of the following bodies has the largest kinetic energy?

A. Mass 3M and speed v
B. Mass 2M and speed 3v
C. Mass 3M and speed 2v
D. Mass M and speed 4v

Q. 48 Power can be defined as the product of:

A. Force and displacement
B. Force and time
C. Force and velocity
D. Force and mass

Q. 49 Work done will be maximum when angle between $\vec{F}$ and $\vec{d}$ is:

A. 120°
B. 60°
C. 90°
D. 0°

Q. 50 The P.E of mass m at height 50m above the ground is 100J. At what height from the ground its P.E becomes 200 J

A. 20m
B. 15m
C. 17.5
D. 100m

Q. 51 A particle moves with $\vec{V} = \hat{i} + 3\hat{j} + 2\hat{k}$ under $\vec{F} = 3\hat{i} + 3\hat{j} + 2\hat{k}$ N. the power applied

A. 20 Js^{-1}
B. 14 Js^{-1}
C. 18 Js^{-1}
D. 16 Js^{-1}

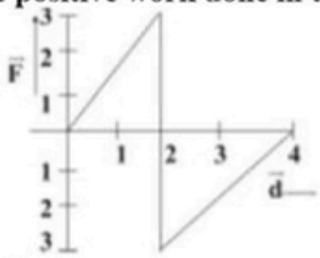
Q. 52 The relative angular velocity of geostationary satellite is:

A. 8.7 kms^{-1}
B. 1.4 kms^{-1}
C. Zero
D. 3.1 kms^{-1}

Q. 53 Electron, proton, deuterium and α-particle have same K.E. Which of them has highest momentum?

A. α-particle
B. Proton
C. Deuterium
D. Electron

Q. 54 The positive work done in the given diagram is:



A. 4J
B. 6J
C. 3J
D. 12J

Q. 55 If K.E of two particles is in ratio 2:1 and their momentum in ratio 4:1. What is the ratio of their masses:

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

Q. 56 A body of 5N falls through 0.25m height its K.E will be:

A. 1.25J
B. 12.5J
C. 125J
D. 0.125J

Q. 57 Find the work done by a force of 10N applied to a lawn roller, when the force acts making an angle of 60° with the horizontal, moving the roller through a horizontal distance of 10m.

A. 50 J
B. 25 J
C. 75 J
D. 100 J

Q. 58 A force of 10N acts on a body of mass 2kg for 1m distance. The K.E. obtained by the body is

A. 20 J
B. 10 J
C. 5 J
D. 2.5 J

Q. 59 Two bodies having kinetic energies in the ratio of 4:1 are moving with equal linear momentum the ratio of their masses is

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

Q. 60 Work done is maximum when angle between force and displacement is

A. 0°
B. 45°
C. 60°
D. 90°

Q. 61 Electron, proton, deuterium and α-particle have same K.E. Which of them has highest momentum?

A. α-particle
B. Proton
C. Deuterium
D. Electron

Q. 62 A motorcycle travelling at 25 m/s develops 3 kW power. What is the resistance experienced by motorcycle?

A. 100 N
B. 120 N
C. 200 N
D. 220 N

Q. 63 A block of mass 100 g slides across a frictionless floor with speed 3 m/s. The block strikes with a wall and bounce back with a speed 3 m/s in opposite direction. Net work done on block is

A. 3 J
B. 6 J
C. Zero
D. – 6 J

Q. 64 According to work energy principal work done on body will equal to change its

A. K.E only
B. P.E only
C. K.E and P.E both
D. All may correct

Q. 65 Slope of work time graph is equal to

A. Displacement
B. Acceleration
C. Power
D. Energy

Q. 66 One megawatt hour is equal to

A. 36×10^{6} J
B. 36×10^{12} J
C. 36×10^{9} J
D. 36×10^{8} J

Q. 67 When arrow is released form its bow, its energy is transformed from

A. Heat energy to K.E.
B. Elastic P.E. to K.E.
C. Chemical energy to elastic P.E.
D. K.E. to elastic P.E.

Q. 68 What will be the speed of electron having an energy of 18.2×10^{-17} Joule?

A. 1.9×10^{18} B. 2×10^{7}

C. 2.197×10^{-25} D. None

Q. 69 The input power to a motor is 300 W. In 20s it lifts a load of 400 N through a height of 6.0 m. What is the efficiency of the motor?

A. 12% B. 40%

C. 25% D. 75%

Q. 70 Three bricks each of mass m & thickness h placed are on floor. Work done to place them over each other is:

A. 2 mgh B. 4 mgh

C. 3 mgh D. 6 mgh

Q. 71 A small motor has an input power rating of 10W and is run for 5.0 minutes. What is the electrical energy input to the motor in this time?

A. 2.0 J B. 50 J

C. 300 J D. 3000 J

Q. 72 A man lifts vertically a weight of 40kg through 1m in 10s; while a child lifts vertically a weight of 10kg through a distance of 1m in 1s. What will be correct inference?

A. Man does more work than child B. Child does more work than man

C. Both do the same amount of work D. It is a foolish question

Q. 73 A ball of mass 0.2 kg is thrown vertically upwards by applying a force by hand. If the hand moves 0.2 m which applying the force and the ball goes upto 2 m height further, find the magnitude of the force. Consider g = 10 m/s^2

A. 22N B. 16N

C. 20N D. 4N

Q. 74 A person of mass 60kg carries a 15kg body on the top of building 10m high in 5 minutes. He puts a power in carrying the body.

A. 10W B. 5W

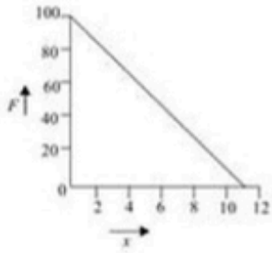
C. 30W D. 15W

Q. 75 When two bodies collide elastically then the quantity conserved is

A. Kinetic energy B. Momentum

C. Both D. None

Q. 76 A toy car moves of mass 5kg up a ramp under the influence of force F plotted against displacement. The maximum height attained is given by



A. $y_{max} = 20m$ B. $y_{max} = 15m$

C. $y_{max} = 15m$ D. $y_{max} = 5m$

Q. 77 The P.E gained by projectile when it reaches at maximum height is expressed by equation

A. K.E$_i$ cosθ^2 B. K.E$_i$ tanθ

C. K.E$_i$ sinθ^2 D. K.E$_i$ cotθ

Q. 78 A particle moves with a velocity $\vec{V} = 5\hat{i} - 3\hat{j} + 6\hat{k}$ ms^{-1} under the influence of a constant force $\vec{F} = 10\hat{i} + 10\hat{j} + 20\hat{k}$ N. The instantaneous power applied to the particle is

A. 200 Js^{-1} B. 40 Js^{-1}

C. 140 Js^{-1} D. 170 Js^{-1}

Q. 79 A person of mass 60kg carries a 15kg body on the top of building 10m high in 5 minutes. He puts a power in carrying the body.

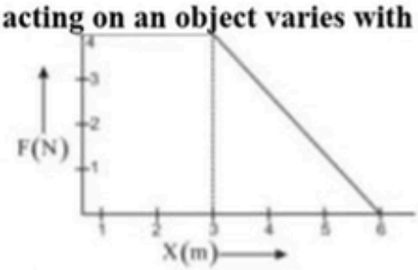
A. 10W B. 30W

C. 5W D. 15W

Q. 80 Force 100N is applied on a wire produces extension 5mm in it. Energy stored in it is

A. 0.125 J
B. 0.250 J
C. 0.50 J
D. 1 J

Q. 81 A force F acting on an object varies with distance X as shown in fig.



Calculate the total work done by the force

A. 18 J
B. 15 J
C. 12 J
D. 9 J

Q. 82 The work done in gravitational field is independent of

A. Force
B. Displacement
C. Angle between $\vec{F}$ and $\vec{d}$
D. Path follow by body

Q. 83 A particle is projected at 60° to the horizontal with a kinetic energy K. The kinetic energy at highest point is ...

A. K/2
B. K
C. Zero
D. K/4

Q. 84 What is the mathematical expression for the K.E of a body of mass m moving with speed v?

A. 2mv2
B. $\frac{1}{2}\frac{m}{v^2}$
C. $\frac{1}{2}\frac{V^2}{m}$
D. $\frac{1}{2}m(\vec{v}.\vec{v})$

Q. 85 A crane can raise a body of mass 120kg vertically upward with a speed of 4.5 ms^{-1}. What is the power of its engine?

A. 5.3 kW
B. 6.3 kW
C. 7.3 kW
D. 8.3 kW

Q. 86 A car of mass 1000 kg moving on a horizontal road with a steady speed of 10 m/sec has total frictional force on it of 400 N. The power due to engine is

A. 40 W
B. 4000 W
C. 400 W
D. 20 W

Q. 87 The momentum of a body having kinetic energy E is doubled. The new kinetic energy is

A. E
B. 4E
C. 16E
D. 32E

Q. 88 The source of energy from tides has its original source

A. Sun
B. Moon
C. Earth
D. All of these

Q. 89 'Duck float' and 'Balance float' are two essential parts of

A. Salter's duck
B. Schrodinger's cat
C. Newton's cage
D. All of these

Q. 90 The relation between escape velocity and critical velocity Vo is

A. $Vesc = \frac{1}{2}Vo$
B. $Vesc = \sqrt{2}\,Vo$
C. Vesc = Vo
D. None

ANSWERS & EXPLANTION: -

Q.1	**B**	
Q.2	**B**	W = Fdcos180 = -Fd
Q.3	**A**	W = F . d = (2i + 3j) . (7k) = 0 J
Q.4	**A**	
Q.5	**C**	
Q.6	**B**	w = Area under F -x graph $W=(9)+\frac{1}{2}3\times3=9+\frac{9}{2}=\frac{27}{2}=13.5$
Q.7	**A**	Work done = (10 + 20 + 10) –20 = 20 ergs
Q.8	**A**	$Fv=Nms^{-1}=\frac{Nm}{s}=\frac{J}{s}$ $Fd=Nm=J$ $\frac{P^2}{2m}=\frac{(Kgms^{-1})^2}{kg}=kgm^2s^{-2}=J$ $mv^2=kg(ms^{-1})^2=kgm^2s^{-2}=J$
Q.9	**D**	Work or energy done by gravitational force is independent of path followed
Q.10	**C**	Work done by hand = Potential energy of the ball $FS=mgh\Rightarrow F=\frac{mgh}{s}=\frac{0.2\times10\times2}{0.2}=20N$
Q.11	**B**	K.E = $\frac{1}{2}mv^2$
Q.12	**C**	$K.E=\frac{P^2}{2m}$ $(K.E)'=(\frac{2P^2}{2m})\Rightarrow4\frac{P^2}{2m}$ $(K.E)'=4K.E$
Q.13	**C**	Linear momentum is conserved $\therefore\ 0=m_1v_1+m_2v_2=(12\times4)+(4\times v_2)\Rightarrow$ $or\ 4v_2=-48\Rightarrow v_2=-12\,m/s$ $\therefore$ Kinetic energy of mass $m2=\frac{1}{2}m_2v_2^2$ $=\frac{1}{2}\times4\times(-12)^2=288J$
Q.14	**C**	As the height increases so the P.E also increases, in this case as a car is moving towards height, then driver has to accelerate the car more to move towards height due to which car speeds up, so its K.E also increases.
Q.15	**B**	$H=2+30+0.5$ $P.E=mgH$ $=1\times9.8\times32.5$ $P.E=318.5\ J$
Q.16	**C**	s slope of problem graph is positive and constant upto certain distance and then it becomes zero. So from $F=-\frac{\Delta U}{\Delta X}$, up to distance a, F = constant (negative) and becomes zero suddenly.

Q.17	**A**	Work done = ΔP.E (in gravitational field) Work done = G.P.E
Q.18	**A**	As Gravitational potential energy = mgh By raising height increases so G.P.E increases.
Q.19	**A**	Potential energy increases and kinetic energy decreases when the height of the particle increases it is clear from the graph.
Q.20	**A**	When the distance between atoms is large then interatomic force is very weak. When they come closer, force of attraction increases and at a particular distance force becomes zero. When they are further brought closer force becomes repulsive in nature. This can be explained by slope of U−x, curve shown in graph.
Q.21	**B**	$P = \frac{W}{t}$
Q.22	**C**	Power in Hp $= \frac{\text{power in watt}}{746}$ $P_{HP} = \frac{2238}{746}$ $\boxed{P = 3HP}$
Q.23	**C**	$P = mgh$ $t = \frac{mgh}{P} = \frac{200 \times 10 \times \cancel{40}}{\cancel{10} \times \cancel{10^1}}$ $t = 8s$
Q.24	**C**	$P = Fv\cos\theta$ $P = 360N \times 10 \times \frac{5}{18} \times \cos 60°$ $P = 360 \times 10 \times \frac{5}{18} \times \frac{1}{2} W$ $P = 500W$
Q.25	**D**	As, $P = Fv$ $P = Fat \because v_f = v_i + at$ $P \propto t$
Q.26	**B**	$P = \frac{W}{t} = \frac{mgh}{t}$ $= \frac{(1000)(10)(10)}{10} = 100$ $= 10000 = 10 \times 10^3 W$ $= 10kW$
Q.27	**D**	$P = \frac{W}{t} \Rightarrow W = P \times t$ where P = kilowatt and t = 1 hour
Q.28	**D**	$[P] = \frac{[w]}{[t]}$ $= \frac{[ML^2T^{-2}]}{[T]} = [ML^2T^{-3}]$

Q.29	**C**	$\text{slope} = \frac{\text{y-axis}}{\text{x-axis}} = \frac{W}{t} = P$
Q.30	**C**	$Power\,(P) = \frac{mgh}{t}\ or\ P \propto \frac{m}{t} \Rightarrow \frac{P_1}{P_2} = \frac{m_1}{m_2}\frac{t_2}{t_1} = \left(\frac{5}{3}\right)\left(\frac{9}{11}\right) = \frac{45}{33} = \frac{15}{11}$
Q.31	**D**	$\frac{1}{2}mv^2 = f \times S$ Since v is doubled therefore S is increased by a factor of 4.
Q.32	**A**	By work energy principle $W = \Delta k.E = 600J - 100J = 500J$
Q.33	**B**	$W = \Delta K.E = K.E_f W = \Delta K.E = K.E_f - K.E_i$ $Fd = \frac{1}{2}m[v_f^2 - v_1^2]$
Q.34	**C**	$F.d = \Delta K.E$
Q.35	**C**	Loss in K.E.=work done against friction $E_k = F_s \Rightarrow s = \frac{E_k}{F}$ As kinetic energy E_k and force F are same; so stopping distance s is same
Q.36	**B**	Any machine can not having equal or greater than 100% efficiency
Q.37	**A**	$efficiency = \frac{output}{input} x100\%$ $output = W = mgh = 10x6x9.8 = 588\ J$ $Effciency = \frac{588}{1000} x100\% = 58.8\%\ or\ 59\%$
Q.38	**D**	
Q.39	**B**	
Q.40	**B**	total work = (weight x height) + work done against friction = (500 x 20) + 2000 = 12000 J

Q.41	**B**	**Q.42**	**A**	**Q.43**	**D**	**Q.44**	**D**	**Q.45**	**C**
Q.46	**C**	**Q.47**	**B**	**Q.48**	**C**	**Q.49**	**D**	**Q.50**	**D**
Q.51	**D**	**Q.52**	**C**	**Q.53**	**A**	**Q.54**	**C**	**Q.55**	**C**
Q.56	**A**	**Q.57**	**A**	**Q.58**	**B**	**Q.59**	**D**	**Q.60**	**A**
Q.61	**A**	**Q.62**	**B**	**Q.63**	**C**	**Q.64**	**D**	**Q.65**	**C**
Q.66	**D**	**Q.67**	**B**	**Q.68**	**B**	**Q.69**	**B**	**Q.70**	**C**
Q.71	**D**	**Q.72**	**A**	**Q.73**	**C**	**Q.74**	**B**	**Q.75**	**C**
Q.76	**C**	**Q.77**	**C**	**Q.78**	**C**	**Q.79**	**C**	**Q.80**	**B**
Q.81	**A**	**Q.82**	**D**	**Q.83**	**D**	**Q.84**	**D**	**Q.85**	**A**
Q.86	**B**	**Q.87**	**B**	**Q.88**	**B**	**Q.89**	**A**	**Q.90**	**B**

Rotational and Circular Motion

Angular displacement& Velocity

Q. 1 **A circle of radius 1m rolls through some distance making an angle 180° at the centre; find the distance**

A. 3.14 m
B. 3.14 rad
C. 5m
D. 2.8m

Q. 2 **An object is moving along a circular path of radius 4m. What will be its angular displacement if it moves 14m on this circular path?**

A. 5.5 radians
B. 3.5 radians
C. 5.0 radians
D. 4.5 radians

Q. 3 **The ratio of angular frequency and linear frequency is:**

A. 2π
B. π
C. $\frac{1}{2\pi}$
D. $\frac{\pi}{2}$

Q. 4 **In uniform circular motion, the factor that remains constant is:**

A. Linear velocity
B. Centripetal force
C. Acceleration
D. Speed

Q. 5 **A constant torque of 500 Nm turns a wheel of moment of inertia 100 kg m^2 about an axis passing through its centre. The gain in angular velocity in 2 second is**

A. 2.5 rad s^{-1}
B. 5 rad s^{-1}
C. 10 rad s^{-1}
D. 15 rad s^{-1}

Q. 6 **If a satellite is orbiting the earth very close to its surface, then the orbital velocity mainly depends on**

A. The mass of the satellite only
B. The radius of the earth only
C. The orbital radius only
D. The mass of the earth only

Q. 7 **The ratio of angular speeds of minute hand and hour hand of a watch is**

A. 6 : 1
B. 1 : 12
C. 12 : 1
D. 1 : 6

Q. 8 **Radian is a unit of angular displacement which can also be measured in degrees. How many radians are equal to one degree?**

A. $\frac{180}{\pi}$
B. $\frac{\pi}{180}$
C. $\frac{2\pi}{180}$
D. $\frac{\pi}{57.3}$

Q. 9 **The shaft of a motor rotates at a constant angular speed of 180rev/min. Angle turned through in 1 sec in radian is**

A. π
B. 3π
C. 6π
D. 12π

Q. 10 **An object is moving along a circular path of radius 2m. What will be its angular displacement if it moves 10m on this circular path?**

A. 5.5 radians
B. 3.5 radians
C. 5.0 radians
D. 4.5 radians

Relation between linear and angular variables

Q. 11 **The length of the second hand of a watch is 1 cm. The velocity vector of the tip of the second hand in cm per second is**

A. 2π
B. $\frac{2\pi}{60}$
C. $\frac{2\pi}{12 \times 60}$
D. $\frac{2\pi}{24 \times 60}$

Q. 12 **If the position vector of a particle is $\vec{r} = (3\hat{i} + 3\hat{j})$ meter and its angular velocity is $\vec{\omega} = (\hat{j} + 3\hat{k})$ rad/sec then its linear velocity is (in m/s).**

A. $-(8\vec{i} - 6\vec{j} + 3\vec{k})$
B. $(3\vec{i} - 6\vec{j} + 8\vec{k})$
C. $-(3\vec{i} - 6\vec{j} + 6\vec{k})$
D. $(6\vec{i} - 8\vec{j} + 3\vec{k})$

Q. 13 A girl sits near the edge of a rotation circular platform. If the girl moves from circumference towards the centre of the platform, then the angular velocity of the platform will

A. Decrease
B. Increase
C. Remain same
D. Becomes zero

Q. 14 The angle between angular velocity and angular acceleration when angular velocity decreases is

A. 30°
B. 45°
C. 180°
D. 90°

Q. 15 An electric fan has blades of length 30 cm as measured from the axis of rotation. If the fan is rotating at 1200 r.p.m. The acceleration of a point on the tip of the blade is about

A. 1600 m/sec^2
B. 2370 m/sec^2
C. 4740 m/sec^2
D. 5055 m/sec^2

Q. 16 For a particle in uniform circular motion the relation a = r a of accelerations hold. The acceleration 'a'

A. Is centripetal acceleration
B. Is radial acceleration
C. Is tangential acceleration
D. Both A and B

Q. 17 A wheel of radius 1 m covers an angular displacement of 180. Its linear displacement is

A. 3.14 m
B. π rad
C. 6.28 m
D. 0.157 m

Q. 18 The shaft of a motor rotates at a constant angular speed of 360rev/min. Angle turned through in 1 sec in radian is

A. π
B. 3π
C. 6π
D. 12π

Q. 19 An object is moving along a circular path of radius 4m. What will be its angular displacement if it moves 14m on this circular path?

A. 5.5 radians
B. 3.5 radians
C. 5.0 radians
D. 4.5 radians

Q. 20 A flywheel gains a speed of 540 rpm in 6 second. Its angular acceleration is

A. 3 p rad s^{-2}
B. 9 p rad s^{-2}
C. 6 p rad s^{-2}
D. 12 p rad s^{-2}

Centripetal force (centripetal acceleration)

Q. 21 The centripetal acceleration of a body is

A. ωr^2
B. $\omega^2 r$
C. $\frac{\omega}{r}$
D. $\frac{\omega^2}{r}$

Q. 22 If a body is moving in circular path with increasing velocity, then the magnitude of resultant acceleration of the body is

A. $a = at + ac$
B. $a = \sqrt{a^2t + a^2c}$
C. $a = at - ac$
D. $a = ac - at$

Q. 23 If radius of circular path of a moving body is half without changing its speed, then, the Fc becomes:

A. Half
B. Doubled
C. One third
D. One forth

Q. 24 The weight of a pilot diving down with an acceleration of 9.8 ms^{-2} will become

A. Double
B. Half
C. Zero
D. None of these

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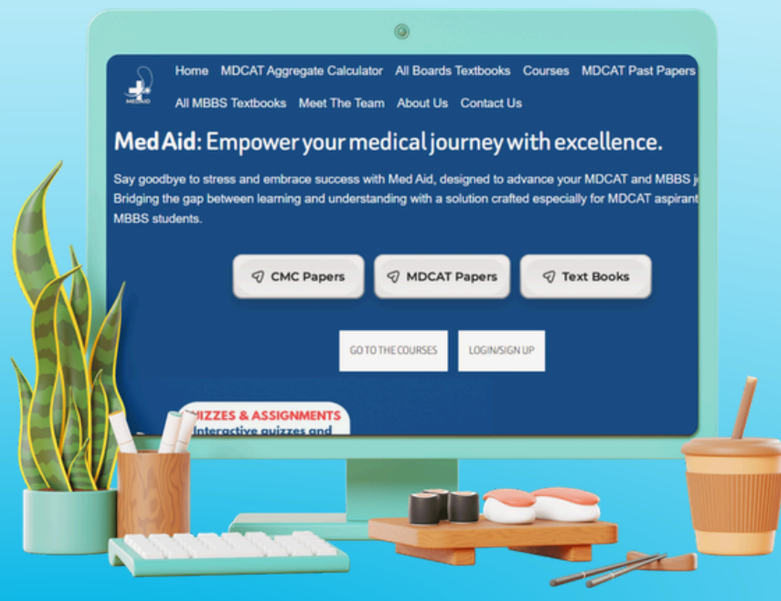

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Q. 25 **An angular ring with inner and outer radii R_1 and R_2 is rolling without slipping with a uniform angular speed. The ratio of the forces experienced by the two particles situated on the inner and outer parts of the ring, $\frac{F_1}{F_2}$ is**

A. 1
B. $\frac{R_2}{R_1}$
C. $\frac{R_1}{R_2}$
D. $\left(\frac{R_2}{R_1}\right)^2$

Q. 26 **When a particle moves with constant speed on a circular path, then its tangential acceleration is**

A. Positive
B. Continuously changing
C. Remains constant
D. Zero

Q. 27 **A stone of mass 16 kg is attached to a string 144 m long and is whirled in a horizontal circle. The maximum tension the spring can withstand is 16 N. the maximum velocity of revolution that can be given to the stone without breaking it, will be:**

A. $20ms^{-1}$
B. $16ms^{-1}$
C. $14ms^{-1}$
D. $12ms^{-1}$

Q. 28 **A ball of radius 5 cm rolls down an inclined plane from rest. After 4.0 s, its angular velocity is 8 $rads^{-1}$. Its angular acceleration and linear acceleration would be respectively**

A. $2rads^{-2}$, $1\ ms^{-2}$
B. $0.2\ rads^{-2}$, $0.1\ ms^{-2}$
C. Zero, $0.1\ ms^{-2}$
D. $2rads^{-2}$, $0.1\ ms^{-2}$

Q. 29 **If $\vec{r} = 4\hat{i}$ and $\vec{\omega} = 4\hat{j}$ then $\vec{V}$ is along**

A. + x – axis
B. + z – axis
C. –z – axis
D. –y – axis

Q. 30 **The earth (mass = 6×10^{24} kg) revolves around the sun with an angular velocity of 2×10^7 rad/s in a circular path of radius 1.5×10^8 km. The force exerted by sun on earth is:**

A. 6×10^{19} N
B. 18×10^{25} N
C. 36×10^{21} N
D. 27×10^{39} N

Q. 31 **A stone tied with a string, is rotated in a vertical circle. The minimum speed with which the string has to be rotated:**

A. Is independent of the mass of the stone
B. Is independent of the length of the string
C. Decreases with increasing mass of the stone
D. Decreases with increasing in length of the string

Q. 32 **A body is moving along a circular path with variable speed. It has:**

A. A radial acceleration
B. Zero acceleration
C. A tangential acceleration
D. Both tangential and radial accelerations

Q. 33 **A geostationary satellite above equator of earth is at a height of:**

A. 36000 km
B. 42300 km
C. 30,000 km
D. 27000 km

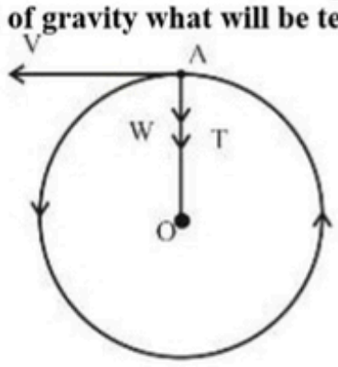
Q. 34 **The expression for the orbital radius is:**

A. $r = \left(\frac{gMT2}{2\pi2}\right)\frac{1}{2}$
B. $r = \left(\frac{GMT2}{4\pi2}\right)\frac{1}{3}$
C. $r = \left(\frac{gMT2}{2\pi2}\right)\frac{1}{3}$
D. $r = \left(\frac{GMT2}{4r\pi2}\right)\frac{1}{3}$

Q. 35 **If a body of mass m is rotating in a circle of radius r with frequency of rotation "f" then centripetal force acting on it is:**

A. $2\pi mrf$
B. $4\pi^2 mrf^2$
C. $4\pi^2 mrf$
D. $\pi^2 mrf^2$

Q. 36 A ball tied to the end of a string is swung in a vertical circle of radius r under the action of gravity what will be tension in string at point A as shown in fig



A. mg

B. $mg + \frac{mv^2}{r}$

C. $\frac{mv^2}{r} - mg$

D. 0

Q. 37 A communication satellite takes 24 hours to orbit earth is replaced by new satellite which has twice mass of first. If new satellite also has an orbit time 24 hours, then ratio radius of $\frac{\text{radius of orbit of new satellite}}{\text{radius of orbit of old satellite}}$

A. 1 : 2

B. $\sqrt{2}$:1

C. 1:1

D. 2:1

Q. 38 A boy angrily throws ring from the top of a building 12 m high towards his friend with an initial horizontal speed of 5 ms^{-1}; the speed with which the ring touches the ground is

A. 5

B. 14.3 ms^{-1}

C. 1.5 ms^{-1}

D. 16.2 ms^{-1}

Q. 39 If a particle moves in a circle, making equal angles in equal time its velocity

A. Remains constant

B. Changes in magnitude only

C. Changes in direction only

D. Changes both in magnitude and direction

Q. 40 A body is moving along the circumference of a circle, completes two revolutions. If the radius of the circular path is R, total angular displacement covered is:

A. πR

B. 2πR

C. Zero

D. 4π

Q. 41 In equation $\vec{a} = \vec{a} \times \vec{r}$ 90° is angle between

A. $\vec{a}$ and $\vec{a}$

B. $\vec{r}$ and $\vec{a}$

C. $\vec{r}$ and $\vec{r}$

D. All of these

Q. 42 A car of mass 1000 kg is moving with speed 72 km/h in a circular track of radius 100 m. The centripetal force acting on it is

A. 4 N

B. 40 N

C. 400 N

D. 4000 N

Q. 43 All particles of a rigid body rotating about a fixed axis may not have same

A. Speed

B. Angular displacement

C. Axis of rotation

D. Direction of angular velocity

Q. 44 A body moves in a circle of radius 4 m with constant speed 8 m/s experiences centripetal force 128 N. What is the mass of body?

A. 2 Kg

B. 4 Kg

C. 8 Kg

D. 16 Kg

Q. 45 What is outward force acting on a mass of 10 kg when rotating at one end on an inelastic string 10m long at speed of 1m/s?

A. 1 N
B. 10 N
C. 2 N
D. 100N

Q. 46 The tension in the string revolving in a vertical circle with a mass m at the end which is at the lowest position.

A. $\frac{mv^2}{r}$
B. $\frac{mv^2}{r} - mg$
C. $\frac{mv^2}{r} + mg$
D. mg

Q. 47 A communication satellite takes 24 hours to orbit earth is replaced by new satellite which has twice mass of first. If new satellite also has an orbit time 24 hours, then ratio radius of $\frac{\text{radius of orbit of new satellite}}{\text{radius of orbit of old satellite}}$

A. 1 : 2
B. $\sqrt{2}$:1
C. 1:1
D. 2:1

Q. 48 An angular ring with inner and outer radii R_1 and R_2 is rolling without slipping with a uniform angular speed. The ratio of the forces experienced by the two particles situated on the inner and outer parts of the ring, $\frac{F_1}{F_2}$ is

A. 1
B. $\frac{R_2}{R_1}$
C. $\frac{R_1}{R_2}$
D. $\left(\frac{R_2}{R_1}\right)^2$

Q. 49 The angular velocity of the minute hand of a clock is:

A. $2\pi\ rad\ s^{-1}$
B. $\frac{\pi}{60}\ rad\ s^{-1}$
C. $\pi\ rad\ s^{-1}$
D. $\frac{\pi}{180}\ rad\ s^{-1}$

Q. 50 When a body moves in a circle, the angle between linear velocity and angular is:

A. 180°
B. 60°
C. 90°
D. 45°

Q. 51 A satellite is in a circular orbit around a planet. Which statement is correct?

A. Its acceleration is constant in direction but not in size.
B. Its acceleration is constant in size but not in direction.
C. Its gravitational potential energy varies
D. Its velocity is constant

Q. 52 If a body of mass m is rotating in a circle of radius r with frequency of rotation "f" then centripetal force acting on it is:

A. $2\pi mrf$
B. $4\pi^2 mrf^2$
C. $4\pi^2 mrf$
D. $\pi^2 mrf^2$

Q. 53 Average density of the earth

A. Does not depend on g
B. Is a complex function of g
C. Is directly proportional to g
D. Is inversely proportional to g

Q. 54 The relation between the linear velocity and angular velocity is.

A. $\vec{\omega} = \vec{r} \times \vec{V}$
B. $\vec{V} = \vec{r} \times \vec{\omega}$
C. $\vec{V} = \vec{\omega} \times \vec{r}$
D. $\vec{\omega} = \vec{V} \times \vec{r}$

Q. 55 A planet has half the mass of earth and half the radius. Compared to the acceleration due to gravity near the surface of earth, the acceleration of gravity near the surface of the other planet is.

A. Twice as much
B. One-fourth as much
C. Half as much
D. The same

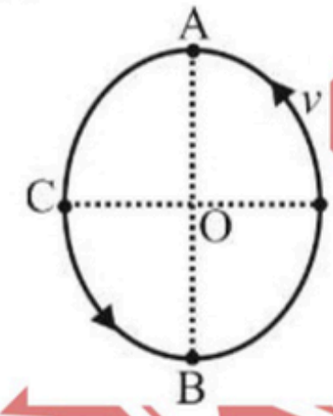
Q. 56 The rate of change of angular momentum of a body is equal to

A. Impulsive force
B. Applied force
C. Moment of inertia
D. The applied torque

Q. 57 A man of weight 100 N standing in an elevator which is moving upward with uniform speed against the gravity then his apparent weight becomes

A. 0
B. Equal to real weight
C. Less than real weight
D. Greater than real weigh

Q. 58 One end of the string of length 1.0 m is tied to a body of mass 0.5 kg. It is whirled in a vertical circle as shown in figure below. If the angular frequency of the body is 4 rad s^{-1}, what is the tension in the string when the body is at the topmost point A? Take g = 10 ms^{-2}.



A. 3N
B. 15N
C. 13 N
D. 18 N

Q. 59 A body is rotating in circle of radius r. Keeping period of rotation constant but radius is doubled (2r) then centripetal force become

A. Half
B. Same
C. Double
D. Four times

Q. 60 A ball tied to a string is swinging along a vertical circle, the tension in the string is minimum at

A. Top
B. Mid-way
C. Bottom
D. Same at each point

Q. 61 1 radian is equal to

A. 57.3°
B. $\frac{1}{2\pi}$ rev
C. 53.7°
D. Both A & B

Q. 62 1 $\frac{\text{rev}}{\text{min}}$ is equal to:

A. $\frac{\pi}{6}$ rad s^{-1}
B. $\frac{\pi}{20}$ rad s^{-1}
C. $\frac{\pi}{15}$ rad s^{-1}
D. $\frac{\pi}{30}$ rad s^{-1}

Q. 63 If a car moves with a uniform speed of 2ms^{-1} in a circle of radius 0.4m. Its angular speed is

A. 4 rad.s^{-1}
B. 1.6 rad.s^{-1}
C. 5 rad.s^{-1}
D. 2.8 ms^{-1}

Q. 64 When a body is moving along a circular path it covers a certain angle in a given internal of time. Such type of motion is

A. Vibratory motion
B. Linear motion
C. Rotatory motion
D. Angular motion

Q. 65 The angular speed of hour's hand of mechanical watch is $radh^{-1}$

A. $\frac{\pi}{2}$
B. $\frac{\pi}{3}$
C. $\frac{\pi}{6}$
D. $\frac{\pi}{12}$

Q. 66 Angular speed of second's hand of mechanical watch in rad/min is

A. 2π
B. $\frac{\pi}{12}$
C. $\frac{\pi}{6}$
D. $\frac{\pi}{30}$

Q. 67 A bucket filled with water is revolved in vertical circle of radius 4m. speed of bucket at highest point just to avoid fall of water is

A. $2m\ s^{-1}$
B. $4m\ s^{-1}$
C. $2.5m\ s^{-1}$
D. $2\pi m\ s^{-1}$

Q. 68 If $\vec{r} = 4\hat{i}$ and $\vec{\omega} = 4\hat{j}$ then $\vec{V}$ is along

A. +x–axis
B. +z–axis
C. –z–axis
D. –y–axis

Q. 69 A satellite moves at constant speed in a circular orbit about the Earth. Which statement about the momentum and kinetic energy of the satellite is correct?

	Momentum	Kinetic energy
A	Constant	Changing
B	Constant	Constant
C	Changing	Changing
D	Changing	Constant

Q. 70 Angular displacement, angular velocity, angular acceleration all are _____ vectors.

A. Aerial
B. Random
C. Tensor
D. Axial

Q. 71 A stone is whirled in a vertical plane. The stone has

A. Radial acceleration only
B. Tangential acceleration only
C. Both radial and tangential accelerations
D. Neither radial nor tangential acceleration

Q. 72 The direction of the angular velocity vector is along

A. The tangent to the circular path
B. The inward radius
C. The outward radius
D. The axis of rotation

Q. 73 The apparent weight of a person of mass m in an elevator is 2mg. the elevator is moving

A. Up with an acceleration of g/2
B. Up with an acceleration of g
C. Up with an acceleration of 2g
D. Down with an acceleration of g

Q. 74 An elevator is moving up with an acceleration g/5. The apparent weight of a 60kg man standing in the lift is [Take $g = 10\ m\ s^{-2}$]

A. 480 N
B. 720 N
C. 6000 N
D. 1000 N

Q. 75 A ball tied to a string is swinging along a vertical circle, the tension in the string is minimum at

A. Top
B. Bottom
C. Mid-way
D. Same at each point

Q. 76 Centrifugal force is a reaction force of

A. Central force
B. Friction force
C. Centripetal force
D. Gravitational force

Q. 77 For same mass and velocity, which one is greater for a disc.

A. K.E rot
B. K.E tran
C. Both are same
D. None of these

Q. 78 Direction of 'ω' is

A. Along
B. Along w
C. Along axis of rotation
D. No direction

Q. 79 What would be the effect on orbital velocity if mass of satellite becomes twice

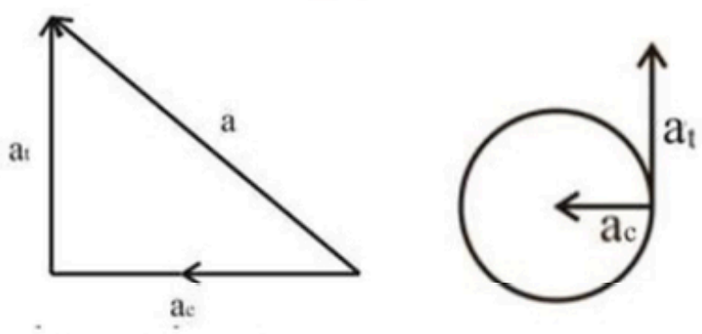
A. 2 times `
B. $\frac{1}{2}$ times
C. $\frac{1}{4}$ times
D. Remain unchanged

Q. 80 A disc and ring have same mass and same radius. If we denote the moment of inertia of disc by Id and that of ring by Ir, then

A. Ir > Id
B. Ir < Id
C. Ir =Id
D. Their relation depends on nature of material

ANSWERS & EXPLANTION: -

Q.1	**A**	$S = r\theta \therefore \theta = 180^{\circ} = \pi\, radian$ $S = 1 \times \pi = 3.14m$
Q.2	**B**	$S = r\theta$ $\theta = \frac{S}{r} = \frac{14}{4} = 3.5\, rad$
Q.3	**A**	$\therefore \omega = 2\pi f \Rightarrow \frac{\omega}{f} = 2\pi$
Q.4	**D**	In uniform circular motion speed is constant.
Q.5	**C**	$\alpha = \frac{500}{100} = 5\, rad\, s^{-2}$ $\Delta\omega = \alpha\Delta t = 5 \times 2\, rad\, s^{-1} = 10\, rads^{-1}$
Q.6	**B**	$v_0 = \sqrt{gR}$
Q.7	**C**	$\frac{\omega_{min hand}}{\omega_{hour.hand}} = \frac{\frac{1rot}{hour}}{\frac{1rot}{12hours}} = 12:1$
Q.8	**B**	$2\pi rad = 360^{\circ}$ $1^{\circ} = \frac{2\pi}{360} rad \Rightarrow 1^{\circ} = \frac{\pi}{180} rad$
Q.9	**C**	$\theta = \omega t = \frac{180 \times 2\pi}{60} \times 1 \Rightarrow \theta = 6\pi\, radian$
Q.10	**C**	$S = r\theta \Rightarrow \theta = \frac{S}{r} = \frac{10}{2} = 5\, rad$

Q.11	**B**	$\therefore v = r\omega = 1cm \times \frac{2\pi}{60s} = \frac{2\pi}{60}\ cms^{-1}$
Q.12	**A**	$\therefore \vec{v} = \vec{\omega} \times \vec{r} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 1 & 2 \\ 3 & 4 & 0 \end{vmatrix} = \hat{i}(-8) - \hat{j}(-6) + \hat{k}(-3) = -(8\hat{i} - 6\hat{j} + 3\hat{k})$
Q.13	**B**	$\therefore v = r\omega \Rightarrow \omega = \frac{v}{r} \Rightarrow \omega \propto \frac{1}{r}$
Q.14	**C**	
Q.15	**C**	$a_c = r\omega^2$ here $\omega = \frac{1200(2\pi)}{60} = 40\pi$ $a_c = \frac{30(40\pi)^2}{100} = 4740 ms^{-2}$
Q.16	**C**	$a_t = r\alpha$ Here a_t is tangential acceleration
Q.17	**A**	$S = r\theta\ \theta = 180^\circ$ $= 1 \times \pi$ $\theta = 180^\circ \times \frac{\pi}{180^\circ} = \pi\ rad$ $= \pi m = 3.14m$
Q.18	**D**	$\theta = \omega t = \frac{360 \times 2\pi}{60} \times 1 \Rightarrow \theta = 12\pi\ radian$
Q.19	**B**	$S = r\theta \Rightarrow \theta = \frac{S}{r} = \frac{14}{4} = 3.5\ rad$
Q.20	**A**	$\alpha = \frac{\Delta\omega}{\Delta t} = \frac{540 \times 2\pi}{60 \times 6} = \frac{540 \times 2\pi}{360} = 3\pi\ rad/s$
Q.21	**B**	$a_c = \frac{v^2}{r}$ $\therefore v = r\omega$ $a_c = \frac{(r\omega)^2}{r} = r\omega^2$
Q.22	**B**	 By using Pythagoras theorem
Q.23	**B**	$F_c = \frac{mv^2}{r} \rightarrow F_c \propto \frac{1}{r}$ If radius is half then centripetal force will double
Q.24	**C**	pilot will be in state of weightlessness
Q.25	**C**	$\frac{F_1}{F_2} = \frac{mR_1\omega^2}{mR_2\omega^2}\omega^2$ Centripetal force on particle = $mR\omega^2$

Q.26	**D**	$a_t = r\alpha \quad \because \Delta\omega = 0$ So, $\alpha = 0$ $a_t = r(0)$ $a_t = 0$
Q.27	**D**	$T = F_c$ $T = \frac{mv^2}{r}$ $16 = \frac{16v^2}{144}$ $144 = v^2$ $v = \sqrt{144}$ $v = 12 ms^{-1}$
Q.28	**D**	$\alpha = \frac{\Delta\omega}{\Delta t} = a_t = r\alpha$
Q.29	**C**	$\vec{v} = \vec{\omega} \times \vec{r}$
Q.30	**C**	$F = mr\omega^2 = 6\times10^{24}\times1.5\times10^{11}\times(2\times10^{-7})^2 = 36\times10^{21} N$

Q.31	**A**	**Q.32**	**D**	**Q.33**	**A**	**Q.34**	**B**	**Q.35**	**B**
Q.36	**C**	**Q.37**	**C**	**Q.38**	**D**	**Q.39**	**C**	**Q.40**	**D**
Q.41	**D**	**Q.42**	**D**	**Q.43**	**A**	**Q.44**	**C**	**Q.45**	**A**
Q.46	**C**	**Q.47**	**C**	**Q.48**	**C**	**Q.49**	**D**	**Q.50**	**C**
Q.51	**B**	**Q.52**	**B**	**Q.53**	**C**	**Q.54**	**C**	**Q.55**	**A**
Q.56	**D**	**Q.57**	**B**	**Q.58**	**A**	**Q.59**	**C**	**Q.60**	**A**
Q.61	**D**	**Q.62**	**D**	**Q.63**	**C**	**Q.64**	**D**	**Q.65**	**C**
Q.66	**A**	**Q.67**	**D**	**Q.68**	**C**	**Q.69**	**D**	**Q.70**	**D**
Q.71	**C**	**Q.72**	**D**	**Q.73**	**B**	**Q.74**	**B**	**Q.75**	**A**
Q.76	**C**	**Q.77**	**B**	**Q.78**	**C**	**Q.79**	**D**	**Q.80**	**A**

WAVES

Progressive Wave

Q. 1 The product of frequency and wavelength is equal to.
A. Speed of wave
B. Time period (T)
C. Force
D. None of these

Q. 2 Velocity of sound wave in vacuum is
A. 330 ms^{-1}
B. 165 ms^{-1}
C. zero
D. 660 ms^{-1}

Q. 3 Half wavelength corresponds to:
A. 0°
B. 90°
C. 180°
D. 360°

Q. 4 For a wave propagating in a medium, identify the property that is independent of the others.
A. Velocity
B. Wavelengths
C. Frequency
D. All these depend on each other

Q. 5 When a sound wave of frequency 300 Hz passes through a medium the maximum displacement of a particle of the medium is 0.1 cm. The maximum velocity of the particle is equal to
A. 60 cm/sec
B. 30 cm/sec
C. 30 cm/sec
D. 60 cm/sec

Q. 6 If velocity of sound in a gas is 360 m/s and the distance between a compression and the nearest rarefaction is 1m, then the frequency of sound is
A. 90 Hz
B. 180 Hz
C. 360 Hz
D. 720 Hz

Q. 7 Which of the following is different from others
A. Velocity
B. Wavelength
C. Frequency
D. Amplitude

Q. 8 The speed of a wave in a certain medium is 960 m/s. If 3600 waves pass over a certain point of the medium in 1 minute, the wavelength is
A. 2 metres
B. 4 metres
C. 8 metres
D. 16 metres

Q. 9 What will be the wave velocity, if the radar gives 54 waves per min and wavelength of the given wave is 10 m
A. 4 m/sec
B. 6 m/sec
C. 9 m/sec
D. 5 m/sec

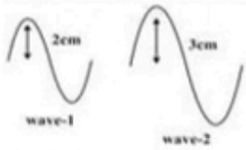
Q. 10 An underwater sonar source operating at a frequency of 60 KHz directs its beam towards the surface. If the velocity of sound in air is 330 m/s, the wavelength and frequency of waves in air are:
A. 5.5 mm, 60 KHz
B. 330 m, 60 KHz
C. 330 m, 60 KHz
D. 330 m, 60 KHz

Speed of sound in air

Q. 11 The ratio of speed of sound in hydrogen to the speed of sound in oxygen is:
A. 1:2
B. 2:1
C. 1:4
D. 4:1

Q. 12 Velocity of sound in vacuum at 0^0C is
A. 340m/sec
B. 332 m/sec
C. 280 m/sec
D. Zero

Q. 13 Two identical waves of different amplitudes are shown in the figure. What will be the ratio of their intensities?



A. 9:4
B. 3:2
C. 5:1
D. 4:9

Q. 14 Two identical waves having intensities 4:9 what will be the ratio of their amplitude?
A. 9:4
B. 2:3
C. 5:1
D. 4:9

Q. 15 The linear distance between any two nearest points of a medium vibrating in phase is

A. $\frac{\lambda}{2}$ B. $\frac{\lambda}{4}$

C. λ D. 2λ

Q. 16 According to Laplace, sound travels in air under

A. Isothermal condition B. Adiabatic condition

C. Isochoric condition D. Isobaric condition

Q. 17 The principle of superposition states that the total displacement due to waves is equal to _____ of the displacement is due to those waves individually.

A. Vector sum B. Scalar product

C. Vector product D. Scalar product

Q. 18 The intensity ratio of two waves is 1 : 16. The ratio of their amplitudes is

A. 1 : 16 B. 1 : 4

C. 4 : 1 D. 2 : 1

Q. 19 If the ratio of amplitude of wave is 2 : 1, then the ratio of maximum and minimum intensity is

A. 9 : 1 B. 1 : 9

C. 4 : 1 D. 1 : 4

Q. 20 Human ears can sense sound waves travel ling in air having wavelength of

A. 10^{-3}m B. 10^{-2}m

C. 1m D. 10^{2}m

Stationary waves in a stretched string/fundamental frequency and harmonics

Q. 21 Only odd harmonics are present in

A. Open pipe only B. Closed pipe only

C. Both open and closed pipes D. Stretched string

Q. 22 A string stretched between two rigid supports is plucked from one half then the number of loops formed are

A. One B. Three

C. Two D. Four

Q. 23 Energy is not carried by:

A. Longitudinal progressive waves B. Electromagnetic waves

C. Transverse progressive waves D. Stationary wave

Q. 24 Which type of wave is produced in a resonance tube?

A. Longitudinal B. Transverse stationary

C. Transverse D. Longitudinal stationary

Q. 25 The distance between the consecutive node and antinode in a stationary wave is

A. λ B. $\lambda/2$

C. $\lambda/4$ D. 2λ

Q. 26 In stationary waves, distance between a node and its nearest antinode is 20 cm. The phase difference between two particles having a separation of 60 cm will be

A. Zero B. $\frac{\pi}{2}$

C. π D. $\frac{3\pi}{2}$

Q. 27 Two sinusoidal waves with same wavelengths and amplitudes travel in opposite directions along a string with a speed 10 ms/s. If the minimum time interval between two instants when the string is flat is 0.5 s, the wavelength of the waves is

A. 25 m B. 20 m

C. 15 m D. 10 m

Q. 28 If you set up the seventh harmonic on a string fixed at both ends, how many nodes and antinodes are set up in it

A. 8, 7 B. 7, 7

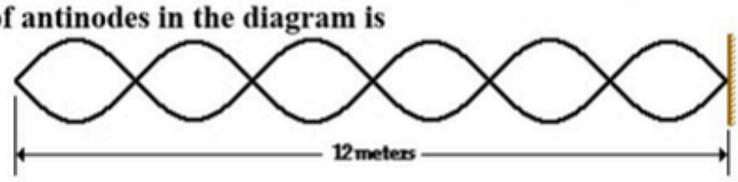
C. 8, 9 D. 9, 8

Q. 29 A node is a point along a medium where there is always

A. A crest meeting a crest B. A trough meeting a trough

C. Constructive interference D. A double rarefaction.

Q. 30 Consider the standing wave pattern shown below. A wave generated at the left end of the medium undergoes reflection at the fixed end on the right side of the medium. The number of antinodes in the diagram is



A. 3.0
B. 5.0
C. 6.0
D. 7.0

Q. 31 The frequency of a string on a musical instrument can be changed by

A. Changing the length
B. Changing the amplitude
C. Changing the tension
D. Either A or C

Q. 32 When the antinodes are all at their extreme displacements, the energy stored is

A. K.E
B. Thermal energy
C. P.E
D. All of these

Q. 33 If frequency of vibration of string is increased by a factor two, then tension in string will be:

A. Half
B. One fourth
C. Double
D. Four times

Q. 34 Standing waves are produced in a 10 m long stretched string. If the string vibrates in 5 segments and the wave velocity is 20 m/s, the frequency n is

A. 2 Hz
B. 4 Hz
C. 5 Hz
D. 10 Hz

Q. 35 A stretched string of length l, fixed at both ends can sustain stationary waves of wavelength λ, given by

A. $\lambda = n^2/2l$
B. $\lambda = l^2 / 2n$
C. $\lambda = 2^l/n$
D. $\lambda = 2l\ n$

Q. 36 A device used for investigating the vibration of a fixed string or wire is

A. Sonometer
B. Barometer
C. Hydrometer
D. None of these

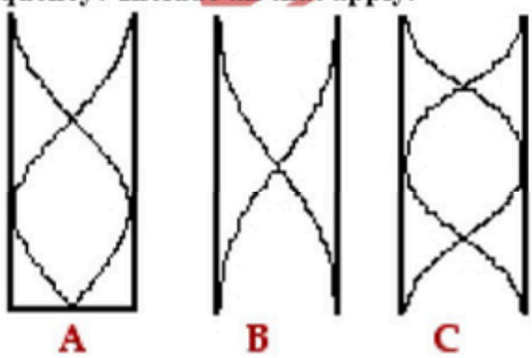
Q. 37 A 20.0-cm long pipe is covered at one end in order to create a closed-end air column. A vibrating tuning fork is held near its open end, forcing the air to vibrate in its first harmonic. The wavelength of the standing wave pattern is

A. 5.00 cm
B. 10.0 cm
C. 40.0 cm
D. 80.0 cm

Q. 38 A 40.-cm long plastic tube is open at both ends and resonating in its first harmonic. The wavelength of the sound which will produce this resonance is

A. 10. Cm
B. 20. Cm
C. 40. Cm
D. 80. Cm

Q. 39 The diagrams below represent four different standing wave patterns in air columns of the same length. Which of the columns is/are vibrating at its/their fundamental frequency? Include all that apply.



D. Both C and D

Q. 40 An air column closed at one end filled with air resonates with a 200.-Hz tuning fork. The resonant length corresponding to the first harmonic is 42.5 cm. The speed of the sound must be

A. 85.0 m/s
B. 170. m/s
C. 340. m/s
D. 470. m/s

Doppler effect

Q. 41 A rocket is going away from earth at a speed 0.2c, where c = speed of light. If emits signals 4×10^7 Hz. Which frequency will be observed by an observer on earth?

A. 4×10^6 Hz
B. 3.2×10^7 Hz
C. 3×10^6 Hz
D. 5×10^7 Hz

Q. 42 If the star is moving away from the earth; the wavelength of the waves emitted from the star have a

A. Longer wavelength
B. Smaller wavelength
C. No shift
D. Yellow shift

Q. 43 Doppler's effect is applicable to

A. Sound waves
B. Electromagnetic waves
C. Radio waves
D. All of these

Q. 44 The apparent wavelength of the light from a star moving away from the earth is 0.01% more than its real wavelength. Then the velocity of star is

A. 60 km/sec
B. 15 km/sec
C. 150 km/sec
D. 30 km/sec

Q. 45 Light coming from a star is observed to have a wavelength of 3737 Å, while its real wavelength is 3700 Å. The speed of the star relative to the earth is [Speed of light 3×10^8m/s]

A. 3×10^5m/s
B. 3×10^6m/s
C. 3.7×10^7m/s
D. 3.7×10^6m/s

Q. 46 When the wavelength of light coming from a distant star is measured it is found shifted towards red. Then the conclusion is

A. The star is approaching the observer
B. The star recedes away from earth
C. There is gravitational effect on the light
D. The star remains stationary

Q. 47 A whistle giving out 450Hz approaches a stationary observer at a speed of 33m/s. The frequency heard by the observer in Hz is (speed of sound = 330m/s).

A. 409
B. 429
C. 517
D. 500

Q. 48 What will be the expression for the observed frequency, if the source is moving towards the observer?

A. $f_o = \left(\frac{v}{v - u_s}\right) f$
B. $f_o = \left(\frac{v}{v + u_s}\right) f$
C. $f_o = \left(\frac{v}{v \pm u_s}\right) f$
D. $f_o = \left(\frac{v}{v - u_s}\right) f_o$

Q. 49 Which one of the following factors determines the pitch of a sound?

A. The amplitude of the sound wave
B. The distance of the sound wave from the source
C. The frequency of the sound wave
D. The phase of different parts of the sound wave

Q. 50 An earth-based receiver is detecting electromagnetic waves from a source in outer space. If the frequency of the waves are observed to be increasing, then the distance between the source and the earth is probably

A. Decreasing.
B. Increasing.
C. Remaining the same.
D. None of these

Simple harmonic motion (SHM) and It's Characteristics

Q. 51 If a spring of force constant k is cut into four equal parts, then the force constant of each part will be

A. $\frac{k}{3}$
B. k
C. 4k
D. 6k

Q. 52 Find effective spring constant

A. $\frac{k}{2}$ B. k

C. $\frac{\sqrt{3}\,k}{2}$ D. $\frac{2k}{3}$

Q. 53 The product of frequency and time period is:

A. 4 B. 1

C. 2 D. 6

Q. 54 In a sinusoidal wave, the time required for a particular point to move from maximum displacement to zero displacement is 0.107sec. The frequency of wave is?

A. 0.73Hz B. 0.36Hz

C. 1.47Hz D. 2.94Hz

Q. 55 At t = 0 a body performing simple harmonic motion is at mean position; when t = T/4, it will be

A. Between mean and extreme position B Again at mean position

C. Beyond extreme position D. At extreme position

Q. 56 Which of the following is a necessary and sufficient condition for S.H.M

A. Constant period

B. Constant acceleration

C. Proportionality between acceleration and displacement from equilibrium position

D. Proportionality between restoring force and displacement from equilibrium position

Q. 57 The phase (at a time t) of a particle in simple harmonic motion tells

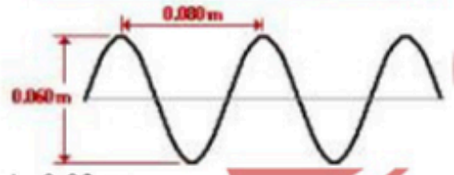
A. Only the position of the particle at time t

B. Only the direction of motion of the particle at time t

C. Both the position and direction of motion of the particle at time t

D. Neither the position of the particle nor its direction of motion at time t

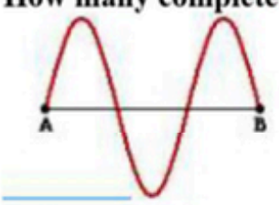
Q. 58 What is the amplitude of the wave in the diagram below?



A. 0.03 m. B. 0.04 m.

C. 0.05 m. D. 0.06 m.

Q. 59 How many complete waves are shown in the diagram?



A. 1 B. 2.5

C. 3 D. 1.5

Q. 60 The number of cycles of a periodic wave occurring per unit time is defined as a wave's

A. Wavelength. B. Period.

C. Amplitude. D. Frequency.

Q. 61 The ratio of frequencies in a stretched string is:

A. 1 : 2 : 3 B. 1 : 3 : 5

C. 2 : 4 : 6 D. 3 : 2 : 1

Q. 62 In a stationary wave the distance between consecutive antinodes is 25 cm. If the wave velocity is 300 ms^{-1}, then the frequency of wave will be

A. 150 Hz B. 300 Hz
C. 600 Hz D. 750 Hz

Q. 63 A metallic wire of 2m length hooked between two points has tension of 10N. If mass per unit length of wire is 0.004 kg/s then fundamental frequency emitted by wire on vibration is:

A. 12.5 Hz B. 48 Hz
C. 24 Hz D. 6.25 Hz

Q. 64 Water waves in the sea are observed to have a wavelength of 300 m and a frequency of 0.07 Hz. The speed of these waves is:

A. 0.00021 m/s B. 2.1 m/s
C. 21 m/s D. 210 m/s

Q. 65 A source of frequency f sends waves of wavelength λ traveling with speed v in some medium. If the frequency is changed from f to 2f, then the new wavelength and new speed are (respectively):

A. 2λ, v B. λ/2, v
C. λ, 2v D. λ, v/2

Q. 66 The velocity of sound in air is 330 ms^{-1}. The fundamental frequency of an organ pipe open at both ends and length 0.3 m will be.

A. 200 Hz B. 275 Hz
C. 300 Hz D. 550 Hz

Q. 67 Which of the following is not an application of superposition principle?

A. Interference B. Stationary waves
C. Beats D. None

Q. 68 A closed organ pipe has fundamental frequency 100 Hz. What frequencies will be produced if its other end is also opened?

A. 200, 300, 400, 500 B. 200, 400, 600, 800
C. 100, 300, 500, 700 D. 100, 200, 300, 400

Q. 69 Two pipes, one is open, and other is closed at one end, having same length the ratio of their fundamental frequency is

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

Q. 70 A source of sound of frequency 450 cycles/sec is moving towards a stationary observer with 34 m/sec speed. If the speed of sound is 340 m/sec, then the apparent frequency will be

A. 410 cycles/sec B. 500 cycles/sec
C. 550 cycles/sec D. 450 cycles/sec

Q. 71 Energy is not carried by

A. Longitudinal progressive waves B. Transverse progressive waves
C. Electromagnetic waves D. Stationary wave

Q. 72 In a closed end organ pipe the fundamental frequency is f. what will be the ratio of frequencies of the next three overtones?

A. 2: 3: 4 B. 3: 7: 11
C. 3: 4: 5 D. 3: 5: 7

Q. 73 Which of the following is the longitudinal wave?

A. Sound waves B. Waves on plucked string
C. Water waves D. Light waves

Q. 74 If the shift of wavelength of light emitted by a star is towards blue, then this shows that star is

A. Stationary B. Moving towards earth
C. Moving away from earth D. Information is incomplete

Q. 75 Which one of the following is the correct?

	Distance between two consecutive nodes	Distance between two consecutive crests	Distance between adjacent crest and trough	Distance between adjacent node and antinode
A	λ	λ	λ/2	λ/2
B	λ/2	λ/2	λ/4	λ/4
C	λ/2	λ	λ/2	λ/4
D	λ/2	λ	λ/4	λ/4

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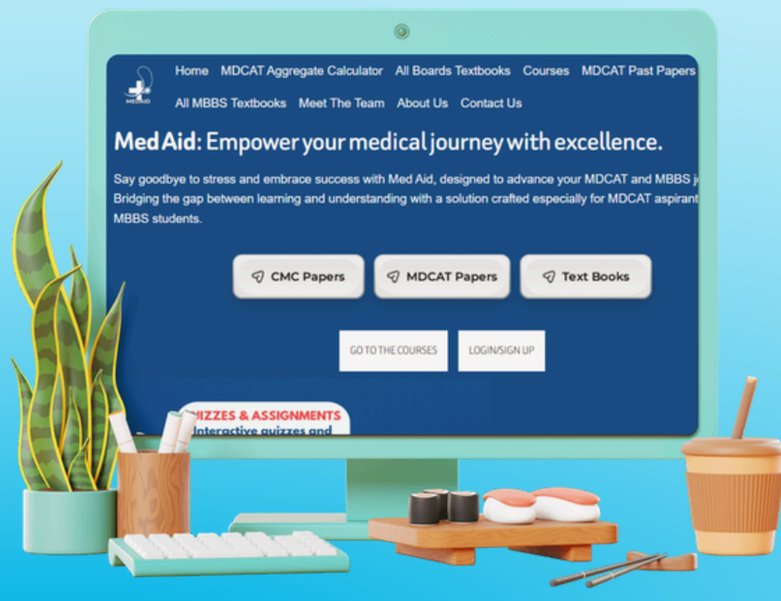

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Q. 76 A sound source is moving towards stationary listener with 1/10th of the speed of sound. The ratio of apparent to real frequency is

A. 9:10 B. 10:9
C. 11:10 D. 10:11

Q. 77 The product of frequency and time period is

A. 4 B. 1
C. 2 D. 6

Q. 78 Bats navigate and find food by

A. Ultrasonic B. Echolocation
C. Refraction D. Beats

Q. 79 10 waves pass through the medium in one second with speed of 10 m/s. The wavelength of waves is:

A. 1m B. 20m
C. 10m D. 100m

Q. 80 Which type of wave is produced in a resonance tube?

A. Longitudinal B. Transverse
C. Transverse stationary D. Longitudinal stationary

Q. 81 The phase difference between the particles vibrating at two consecutive nodes is:

A. Zero B. $\frac{\pi}{2}$
C. π D. 2π

Q. 82 A sitar wire vibrates with frequency of 330 vibrations per second. If its length is increased three times and tension is increased four times, then the frequency of the wire will be

A. 110 Hz B. 220 Hz
C. 330 Hz D. 440 Hz

Q. 83 The wavelength of the sound produced by a source is 0.8m. If the source moves towards the stationary listener at 32 ms^{-1}, what will be apparent wavelength of the sound? The velocity of sound is 320 ms^{-1}.

A. 0.80 m B. 0.72 m
C. 0.40 m D. 0.32 m

Q. 84 A source of sound moves towards a stationary listener with half of the velocity of sound. If the actual frequency of the sound produced by the source be f, then change in frequency will be:

A. f B. f/2
C. f/4 D. None of these

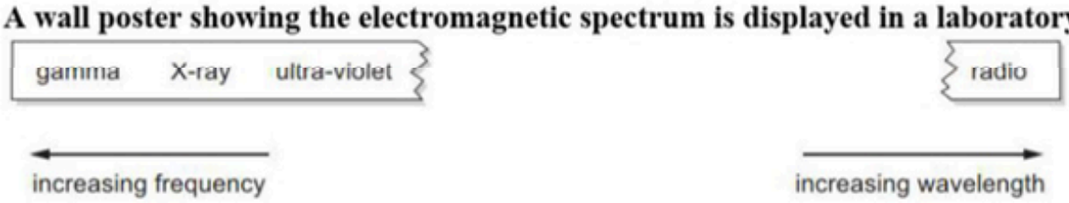
Q. 85 Radio waves of wavelength are sent from RADAR towards an aeroplane. If the aeroplane is moving towards the RADAR station, the wavelength of the radio waves received after reflection from the aeroplane will be

A. Equal to λ
B. Less than λ
C. Greater than λ
D. More or less than λ, depending on the speed of aeroplane

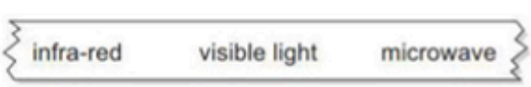
Q. 86 Sonar is used to detect

A. Depth of sea B. Location of submarine
C. Under sea objects D. All of these

Q. 87 A wall poster showing the electromagnetic spectrum is displayed in a laboratory.



A section of the electromagnetic spectrum has been accidentally ripped from this wall poster. Which piece is missing?

A 

B 

C 

D 

Q. 88 The wavelength of sound in air is 10 cm. its frequency is (take velocity of sound=330 ms^{-1})

A. 3.3kHz
B. 330 Hz
C. 330 mHz
D. 3×10^9 Hz

Q. 89 The distance between a node and the next anti node of a stationary wave is 33 cm. If the velocity of sound is 330 m/s. The frequency is

A. 150 Hz
B. 250 Hz
C. 200 Hz
D. 300 Hz

Q. 90 Sound of maximum intensity is heard successively at an interval of 0.2 second on sounding two tuning forks together. What is the difference of frequencies of the two tuning forks?

A. 5Hz
B. 0.2Hz
C. 2.5Hz
D. 10Hz

Q. 91 Standing waves are produced in 10m long stretched string. If string vibrates in 5 segments and wave velocity is 20m/s, what is the frequency?

A. 10Hz
B. 20Hz
C. 5Hz
D. 4Hz

Q. 92 100 waves pass through the medium in one second with speed of 10 m/s. The wavelength of waves is:

A. 1 m
B. 0.1 m
C. 0.01 cm
D. 1 cm

Q. 93 The stationary waves consist of

A. Crests and troughs
B. Nodes and antinodes
C. Compressions and elongations
D. Reflection and rarefaction

Q. 94 If a string is fixed at both ends vibrates in "n" loops, then wave-length in term of length "l" of string is given by

A. $\frac{n\ell}{2}$
B. $\frac{2\ell}{n}$
C. $\frac{\ell}{2n}$
D. $\frac{2\ell}{v}$

Q. 95 When two identical traveling waves are superimposed, velocity of resultant wave

A. Decreases
B. Remains same
C. Increases
D. Becomes zero

Q. 96 The distance between 1st node and 4th antinode is:

A. $\frac{7}{4}\lambda$
B. $13\frac{\lambda}{4}$
C. $5\frac{\lambda}{4}$
D. $11\frac{\lambda}{4}$

Q. 97 In a stationary wave the distance between consecutive antinodes is 25 cm. If the wave velocity is 300 ms^{-1}, then the frequency of wave will be

A. 150 Hz
B. 300 Hz
C. 600 Hz
D. 750 Hz

Q. 98 A source of sound wave emits wave of frequency f. If 'v' is speed of sound waves. Then what will be the wavelength of the wave

A. $\frac{v}{f}$
B. $\frac{v-u}{f}$
C. vf
D. $(v-u)\,f$

Q. 99 The fundamental frequency of a string is proportional to

A. Inverse of the length
B. The diameter
C. Tension
D. Density

Q. 100 The length of a string is 1m, tension in it is 40N and mass of the string is 0.1 kg. Then the velocity of transverse waves produced in the string will be:

A. 400 ms^{-1}
B. 180 ms^{-1}
C. 80 ms^{-1}
D. 20 ms^{-1}

Q. 101 Radio waves of wavelength l are sent from RADAR towards an aeroplane. If the aeroplane is moving towards the RADAR station, the wavelength of the radio waves received after reflection from the aeroplane will be

A. λ
B. $< \lambda$
C. $> \lambda$
D. More or less than λ, depending on the speed of aeroplane

Q. 102 An observer is moving towards a stationary source with a speed one fifth of the speed of sound. The frequency of sound heard by the observer will be if v is the speed and f is the original frequency of the sound waves

A. $\frac{5}{6}f$ B. $\frac{4f}{5}$

C. $\frac{6f}{5}$ D. $\frac{6}{5f}$

Q. 103 The waves produced by a motorboat sailing in water are

A. Transverse B. Longitudinal

C. Longitudinal and transverse D. Stationary

Q. 104 Keeping pressure constant, the temperature is increased by 2 K. What is the effect on the velocity of sound?

A. No effect B. Decreases by 2×0.61 m s^{-1}

C. Increases by 2×0.61 m s^{-1} D. Data is not adequate

Q. 105 Speed of sound in vacuum is

A. 330 m/s B. 332 m/s

C. 0 m/s D. None of these

Q. 106 Shock waves are produced by objects

A. Carrying electric charge and vibrating

B. Vibrating with frequency greater than 20000 Hz

C. Vibrating with very large amplitude

D. Moving with a speed greater than that of sound in the medium.

Q. 107 The velocity of sound in any gas depends upon

A. Wave length of sound only B. Density and elasticity of gas

C. Intensity of sound waves only D. Amplitude and frequency of sound

Q. 108 Newton assumed that sound propagation in a gas taken place under

A. Isothermal conditions B. Adiabatic conditions

C. Isobaric conditions D. Isoenthalpic conditions

Q. 109 In stationary waves when the anti-nodes simultaneously through their equilibrium positions, the energy is wholly

A. K.E B. P.E

C. Heat energy D. None of these

Q. 110 Speed of sound is maximum in

A. Glass B. Copper

C. Water D. Oxygen

ANSWERS & EXPLANTION: -

Q.1	**B**	As, $v = f\lambda$ $v = \frac{\lambda}{T} \because f = \frac{1}{T}$
Q.2	**C**	
Q.3	**C**	$\phi = \frac{2\pi}{\lambda} = \frac{2\pi = \frac{\lambda}{2}}{\lambda}$ $\phi = \pi = 180^{\circ}$
Q.4	**C**	Wave velocity = frequency × wavelength Frequency remains unchanged while velocity and wavelength and interdependent.
Q.5	**A**	$V_{max} = a\omega = a\times 2\pi n = 0.1\times 2\pi\times 300 = 60\pi$ cm/sec
Q.6	**B**	Distance between a compression and the nearest rarefaction is $\lambda/2 = 1$m. Hence; $f = v/\lambda = 360/2 = 180$Hz
Q.7	**D**	
Q.8	**D**	fHz $\lambda = v/f = 960/60 = 16$m

Q.9	**C**	$n = \frac{54}{60} Hz, \lambda = 10m$ $v = n\lambda = 9m/s$
Q.10	**A**	Frequency of waves remains same, i.e., 60 Hz and wavelength $\lambda = \frac{v}{n} = \frac{330}{60\times10^3} =$ 5.5 mm.
Q.11	**D**	$\frac{v_H}{v_o} = \sqrt{\frac{\rho_0}{\rho_H}}$ $\frac{v_H}{v_o} = \sqrt{\frac{16\rho_H}{\rho_H}}$ $v_H : v_o = 4:1$
Q.12	**D**	Sound wave is a mechanical wave. So sound can't propagate through vacuum and its velocity in vacuum is zero.
Q.13	**D**	$\text{Intensity} \propto (\text{amplitude})^2 \Rightarrow \frac{I_1}{I_2} = \frac{A_1^2}{A_2^2} = \frac{(2)^2}{(3)^2} = \frac{4}{9}$
Q.14	**B**	As, $Intensity \propto (amplitude)^2$ $\Rightarrow \frac{I_1}{I_2} = \frac{A_1}{A2} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$
Q.15	**C**	Vibrating in the same phase, the distance between any two nearest particles of the medium is the wavelength.
Q.16	**B**	Laplace suggested that sound waves travel in the air under the adiabatic conditions and not under isothermal conditions
Q.17	**A**	According to Principle of superposition, the resultant displacement at a point due to two or more waves passing through a medium is equal to the vector sum of the individual displacements occuring at that point.
Q.18	**B**	$\frac{I_1}{I_2} = \left(\frac{a_1}{a_2}\right)^2 = \frac{1}{16} \Rightarrow \frac{a_1}{a_2} = \frac{1}{4}$
Q.19	**A**	$\frac{I_{max}}{I_{min}} = \left(\frac{\frac{a_1}{a_2}+1}{\frac{a_1}{a_2}-1}\right)^2 = \left(\frac{2+1}{2-1}\right)^2 = 9/1$
Q.20	**C**	The range of wavelength of audible sound by human beings is (16.5 mm - 16.5 m) Hence 1 m is the correct option.
Q.21	**B**	In closed pipe only odd harmonics are present
Q.22	**A**	
Q.23	**D**	Stationary waves don't transfer energy of momentum.
Q.24	**D**	Longitudinal stationary waves
Q.25	**C**	The distance between the consecutive nodes is $\lambda/2$ so now the distance between consecutive node and antinode in a stationary wave is $\lambda/4$

Q.26	**D**	$\frac{\lambda}{4} = 20 \Rightarrow \lambda = 80cm$ also $\Delta\varphi = \frac{\lambda}{2\pi}.\Delta x$ $\frac{60}{80} \times 2\pi = \frac{3\pi}{2}$
Q.27	**D**	Minimum time interval between two instants when the string is flat = $\frac{T}{2} = 0.5\,\text{sec} \Rightarrow T = 1\,\text{sec}$ Hence $\lambda = v \times T = 10 \times 1 = 10m$
Q.28	**A**	String will vibrate in 7 loops so it will have 8 nodes 7 antinodes. Number of harmonics = Number of loops = Number of antinodes Þ Number of antinodes = 7 Hence number of nodes = Number of antinodes + 1 =7+1=8
Q.29	**D**	A node is a point along the medium of no displacement. The point is not displaced because destructive interference occurs at this point.
Q.30	**C**	An antinode is a point on the medium which oscillates from a large + to a large - displacement. Count the number of these points - there are 6 - but do not count them twice.
Q.31	**D**	$f = \frac{1}{2\ell}\sqrt{\frac{T}{m}}$ (where T is tension) $\Rightarrow f \propto \frac{1}{\ell}$ and $f \propto \sqrt{T}$
Q.32	**C**	
Q.33	**D**	$f = \frac{1}{2l}\sqrt{\frac{F}{m}}$ $f \propto \sqrt{F}$ $F \propto f^2$
Q.34	**C**	String vibrates in five segment so $\frac{5}{2}\lambda = l \Rightarrow \lambda = \frac{2l}{5}$ Hence $n = \frac{v}{\lambda} = 5 \times \frac{v}{2l} = 5 \times \frac{20}{2 \times 10} = 5$
Q.35	**C**	$\lambda = 2l/n$ (n = Number of loops)
Q.36	**A**	Sonometer is used to produce resonance of sound source with stretched vibrating string.
Q.37	**D**	This is a closed-end air column. If you draw the standing wave pattern for the first harmonic, you will notice that the wavelength is four times the length of the air column. Thus take the length of 20.0 cm and multiply by 4.
Q.38	**D**	For an open-end air column, the length of the column is 0.5*wavelength. This becomes evident after drawing the standing wave pattern for this harmonic. Then, plug in 40. cm for length and calculate the wavelength.
Q.39	**D**	The fundamental frequency is the lowest possible frequency for that instrument, and thus the longest possible wavelength. For open tubes, there would be anti-nodes on each end and a node in the middle. For closed end tubes, there would

		be a node on the closed end, an anti-node on the open end, and nothing in the middle. Diagram C is the third harmonic for a closed end tube and diagram D is the second harmonic for an open-end tube.
Q.40	**C**	Draw the standing wave pattern for the first harmonic of a closed-end tube to assist with the length-wavelength relation. Then, L=0.425 m so w=1.70 m. Since f is given as 200. Hz, the speed can be calculated as f*w or 200. Hz*1.7 m. The speed of sound is 340 m/s.
Q.41	**B**	As rocket moving away from Earth $f' = (\frac{c}{c+u_s})f$
Q.42	**A**	
Q.43	**D**	Doppler's effect is applicable to all sound waves and EM waves.
Q.44	**D**	$\frac{\Delta\lambda}{\lambda} = \frac{v}{c} \Rightarrow v = \frac{c}{\lambda}\Delta\lambda = \frac{c}{\lambda}(\lambda' - \lambda) = c \times \frac{0.01}{100} = 3\times10^4 m/s = 30\ km/\sec$
Q.45	**B**	$\Delta\lambda = \lambda\frac{v}{c} \Rightarrow (3737-3700) = 3700 \times \frac{v}{3\times10^8} \Rightarrow v = 3\times10^6 m/s$
Q.46	**B**	The star recedes away from earth
Q.47	**D**	$V' = V\left(\frac{V}{V-V_s}\right) = 450\left[\frac{330}{330-33}\right] = 500Hz$
Q.48	**A**	$f_o = \left(\frac{v}{v-u_s}\right)f$
Q.49	**C**	The pitch of a sound wave is related to the frequency of the sound wave.
Q.50	**A**	The Doppler effect or Doppler shift occurs when a source of waves is moving with respect to an observer. The observer observes a different frequency of waves than that emitted by the source. If the source and observer are approaching, then the observed frequency is higher than the emitted frequency. If the source and observer are approaching, then the distance between them is decreasing.
Q.51	**C**	$K \propto \frac{1}{L}$ $L^{"} = \frac{L}{4}$ Then K`= 4k
Q.52	**D**	$K_{eff} = \frac{2K^2}{3K} = \frac{2}{3}K$
Q.53	**B**	$f = \frac{1}{T}$ $f \times T = 1$
Q.54	**C**	Time taken in moving from maximum displacement to zero displacement is T/4 = 0.170s or T = 0.68s Frequency, v = 1/T = 1/0.67 = 1.47Hz.
Q.55	**D**	T=time period, at $t = \frac{T}{4}$ it will be at extreme position.
Q.56	**D**	F = − kx

Q.57	**C**	Phase determine the position and direction of motion of particle excecuting SHM
Q.58	**A**	The amplitude of a wave is measured from rest to crest or from rest to trough; but not from crest to trough. Thus, take the 0.06 m measurement and "halve it" to get the answer.
Q.59	**D**	From point A to point E is one full wave cycle. After point E, the wave begins to repeat itself, but only for one-half of a cycle. Thus, there are 1.5 waves shown in the diagram.
Q.60	**D**	This is a basic definition which you should know and be able to apply.

Q.61	**A**	**Q.62**	**C**	**Q.63**	**A**	**Q.64**	**C**	**Q.65**	**B**
Q.66	**D**	**Q.67**	**D**	**Q.68**	**B**	**Q.69**	**C**	**Q.70**	**B**
Q.71	**D**	**Q.72**	**D**	**Q.73**	**A**	**Q.74**	**B**	**Q.75**	**C**
Q.76	**B**	**Q.77**	**B**	**Q.78**	**B**	**Q.79**	**A**	**Q.80**	**D**
Q.81	**C**	**Q.82**	**B**	**Q.83**	**B**	**Q.84**	**A**	**Q.85**	**B**
Q.86	**D**	**Q.87**	**D**	**Q.88**	**A**	**Q.89**	**B**	**Q.90**	**A**
Q.91	**C**	**Q.92**	**B**	**Q.93**	**B**	**Q.94**	**B**	**Q.95**	**B**
Q.96	**A**	**Q.97**	**C**	**Q.98**	**A**	**Q.99**	**A**	**Q.100**	**D**
Q.101	**B**	**Q.102**	**D**	**Q.103**	**C**	**Q.104**	**C**	**Q.105**	**C**
Q.106	**D**	**Q.107**	**B**	**Q.108**	**A**	**Q.109**	**A**	**Q.110**	**A**

THERMODYNAMICS

First law of thermodynamics

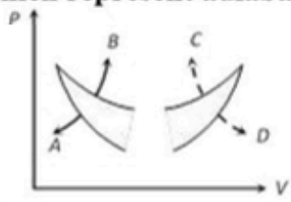
Q. 1 A gas does 10J of external work in adiabatic process while expanding, then the change in internal energy is:

A. 10 J
B. 20 J
C. – 10 J
D. 0 J

Q. 2 In relation PV^{γ} = constant the γ is given by

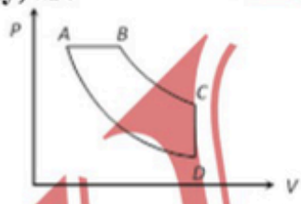
A. $\frac{Cv}{Cp}$
B. $\frac{Cp}{Cv}$
C. Cp – Cv
D. Cv – Cp

Q. 3 Four curves A, B, C and D are drawn in the adjoining figure for a given amount of gas. The curves which represent adiabatic and isothermal changes are



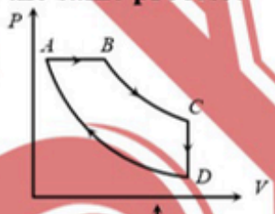
A. C and D respectively
B. D and C respectively
C. A and B respectively
D. B and A respectively

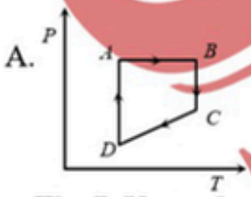
Q. 4 In pressure-volume diagram given below, the isochoric, isothermal, and isobaric parts respectively, are

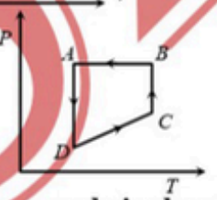


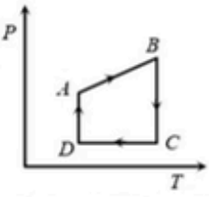
A. BA, AD, DC
B. DC, CB, BA
C. AB, BC, CD
D. CD, DA, AB

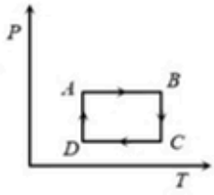
Q. 5 A cyclic process ABCD is shown in the figure P-V diagram. Which of the following curves represent the same process?



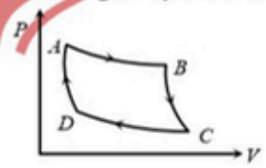
A. 

B. 

C. 

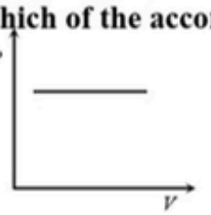
D. 

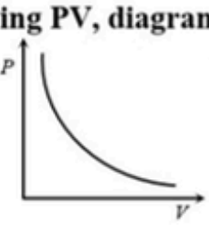
Q. 6 The P-V graph of an ideal gas cycle is shown here as below. The adiabatic process is described by

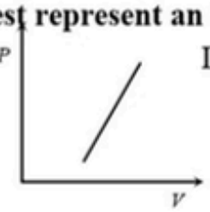


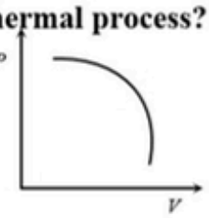
A. AB and BC
B. AB and CD
C. BC and DA
D. BC and CD

Q. 7 Which of the accompanying PV, diagrams best represent an isothermal process?

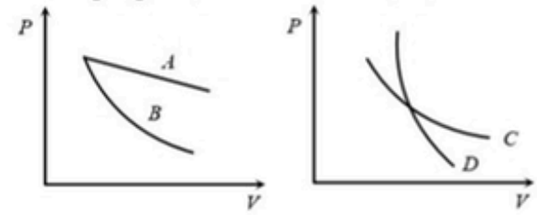
A. 

B. 

C. 

D. 

Q. 8 In the following figure, four curves A, B, C and D are shown. The curves are



A. Isothermal for A and D while adiabatic for B and C
B. Adiabatic for A and C while isothermal for B and D
C. Isothermal for A and B while adiabatic for C and D
D. Isothermal for A and C while adiabatic for B and D

Q. 9 If 150 J of heat is added to a system and the work done by the system is 110 J, then change in internal energy will be

A. 260 J
B. 150 J
C. 110 J
D. 40 J

Q. 10 Which of the following statements is correct for any thermodynamic system?

A. The internal energy changes in all processes
B. Internal energy and entropy are state functions
C. The change in entropy can never be zero
D. The work done in an adiabatic process is always zero

Q. 11 If $C_V = \frac{5}{2} R$ then C_P in

A. $\frac{2}{5} R$
B. $\frac{2R}{7}$
C. $\frac{7}{2} R$
D. $\frac{5}{2} R$

Q. 12 As $C_p - C_V = R$ shows that $C_p > C_V$. What is also true?

A. $\Delta T_p > \Delta T_v$
B. $\Delta T_p > \Delta U_v$
C. Both "A" and "B"
D. $\Delta T_p = \Delta U_v$

Q. 13 In adiabatic process PV^γ = constant the γ is given by

A. $\frac{Cv}{Cp}$
B. $1 - \frac{R}{Cv}$
C. $\frac{R}{Cv} - 1$
D. $1 + \frac{R}{Cv}$

Q. 14 For mono atomic gas $C_V = \frac{3}{2} R$ then C_P in

A. $\frac{5}{2} R$
B. $\frac{1}{2} R$
C. R
D. $\frac{7}{2} R$

Q. 15 Four students found set of CP and CV (in cal/deg mole) as given below. Which of the following set is correct?

A. $C_V = 4, C_P = 2$
B. $C_V = 2, C_P = 1$
C. $C_V = 3, C_P = 3$
D. $C_P = 5, C_V = 3$

Q. 16 For hydrogen gas $C_P - C_V = a$, and for oxygen gas $C_P - C_V = b$, so that relation between a and b given by

A. $a = 16\,b$
B. $a = b$
C. $16\,a = b$
D. $a = 4\,b$

Q. 17 If $C_P - C_V = R$ and $\frac{Cp}{Cv} = y$, then which relation is correct

A. $Cv = \frac{R}{\gamma - 1}$
B. $Cv = \frac{\gamma R}{\gamma - 1}$
C. $Cv = \frac{R^2}{\gamma}$
D. $Cv = \frac{\gamma - 1}{R}$

Q. 18 For mono atomic gas $C_V = \frac{3R}{2}$ then C_P in

A. $\frac{3}{2}$
B. $\frac{5}{3}$

C. $\frac{3}{5}$ D. $\frac{3}{4}$

Q. 19 According to the first law of thermodynamics, applied to a gas, the increase in the internal energy during any process:

A. Equals the heat input minus the work done on the gas
B. Equals the work done on the gas minus the heat input
C. Equals the heat input plus the work done on the gas
D. Is independent of the heat input

Q. 20 The work is maximum at angle of

A. 90-degree B. zero degree
C. 45-degree D. 30 degree

Q. 21 The minimum work is done at angle of

A. 180 degree B. 0 degree
C. 45 degree D. 90 degree

Q. 22 Energy can neither be created nor destroyed in any thermodynamics system, it is known as:

A. Thermal Equilibrium B. Internal Energy
C. 1st law of thermodynamics D. Closed system

Q. 23 Examples of first law of thermodynamics are

A. Working of bicycle pump B. Human metabolism
C. Brakes applied by an automobile D. All of these

Q. 24 The graphical line of isochoric process is parallel to the:

A. Volume axis B. Pressure axis
C. Temperature axis D. All of these

Q. 25 The rapid expansion and compression of air through which a sound wave is passing, obeys

A. Isothermal process B. Isochoric process
C. Adiabatic process D. Isobaric process

Q. 26 In an isothermal change, internal energy

A. Decreases B. Increases
C. Becomes zero D. Remains constant

Q. 27 The graph of an isobaric process is

A. Curve B. Circle
C. Straight line D. Parallel to volume axis

Q. 28 Maximum work can be obtained in the process called

A. Cyclic B. Isothermal
C. Adiabatic D. Isobaric

Q. 29 If the volume of the gas is to be increased by 4 times, then

A. A temperature and pressure must be double
B. At constant P the temperature must be increased by four times
C. At constant T the pressure must be increased by four times
D. It cannot be increased

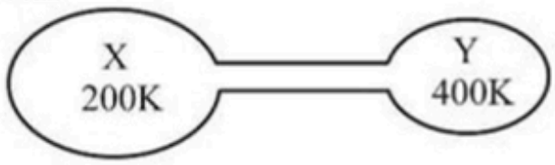
Q. 30 In isothermal process which of the following is not true

A. Temperature remains constant B. Internal energy does not change
C. No heat enters or leaves the system D. None

Q. 31 The work done in moving a body against the gravity is taken as

A. Positive B. Negative
C. 0 D. ∞

Q. 32 In the diagram the volume of bulb 'X' is twice that of bulb 'Y'. The system is filled with an ideal gas and a steady state is established with the bulb held at 200K and 400K.



There are 'x' moles of gas in X. How many moles of gas are in Y?

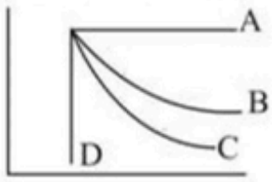
A. $\frac{x}{4}$ B. x

C. $\frac{x}{2}$ D. 2x

Q. 33 If F = 2i + 3j and d= 7k then amount of work done will be

A. 0 J
B. 21 J
C. 7 J
D. 8 J

Q. 34 Which curve shown in fig is adiabatic



A. A
B. B
C. C
D. D

Q. 35 The dimension of work done on the system

A. $[ML^{-1}T^{-2}]$
B. $[ML^{2}T^{-2}]$
C. $[MLT^{-2}]$
D. $[ML^{-1}T^{-1}]$

Q. 36 The process in which the volume of the gas remain same is called

A. Isobaric
B. Isothermal
C. Isochoric
D. Adiabatic

Q. 37 The cloud formation is the example of

A. Isothermal process
B. Adiabatic process
C. Isobaric process
D. Isochoric process

Q. 38 The isothermal process obeys

A. Charle's law
B. Boyle's law
C. Stefen's law
D. Pascal's law

Q. 39 Compressed air coming out of punctured football becomes cooler because of

A. Isothermal expansion
B. Adiabatic expansion
C. Energy dissipation
D. Adiabatic compression

Q. 40 For 1 mole of gas the relation $P\Delta V$ =

A. $R\Delta T$
B. $R\Delta V$
C. $R\Delta P$
D. $P\Delta T$

Q. 41 A force of 10 N is applied on a body and it displace through displacement of 600cm the work done will be

A. 0.6 J
B. 600 J
C. 60 J
D. 6000 J

Q. 42 A force F = 3i+2j+4k N gives displacement of 10j m. The work done is

A. 10 J
B. 20 J
C. 35 J
D. 27 J

Q. 43 First law of thermodynamics for an adiabatic process is

A. $W = -\Delta T$
B. $Q = \Delta U + W$
C. $Q = W$
D. $Q = \Delta U$

Q. 44 Mathematically, the work done is _____ product of Force and time

A. Scalar
B. Vector
C. Both
D. None of these

Q. 45 If a mass of 5kg is lifted upto 5 m height then work done against gravity will be

A. 250 J
B. 210 J
C. 25 J
D. 95 J

Q. 46 At what angle between F and d the work will half of its maximum work done

A. 45°
B. 60°
C. Zer°
D. 30°

Q. 47 At what angle the work is maximum

A. 0 degree
B. 9 degree
C. 45 degree
D. 30 degree

Q. 48 In CGS the unit of work done is

A. joule
B. Nm
C. erg
D. calories

Q. 49 A moving body may has the work done equivalent to

A. P.E
B. Elastic P.E
C. K.E
D. None of these

Q. 50 The SI unit of work done that is joule =

A. 10^{-7} erg
B. 10^{7} erg
C. 10^{5} erg
D. 10^{-5} erg

Q. 51 Heat given to a system is 35 joules and work done by the system is 15 joules. The change in the internal energy of the system will be

A. - 50 J
B. 20 J
C. 30 J
D. 50 J

Q. 52 The work done is taken as negative at an angle of

A. 0 degree
B. 90 degree
C. 180 degree
D. 60 degree

Q. 53 Find the change in internal energy of the system when a system absorbs 2 kilocalorie of heat and at the same time does 500 joule of work

A. 7900 J
B. 8200 J
C. 5600 J
D. 6400 J

Q. 54 110 J of heat is added to a gaseous system, whose internal energy change is 40 J, then the amount of external work done is

A. 150 J
B. 70 J
C. 110 J
D. 40 J

Q. 55 When the amount of work done is 333 cal and change in internal energy is 167 cal, then the heat supplied is

A. 166 cal
B. 333 cal
C. 500 cal
D. 400 cal

Q. 56 First law thermodynamics states that

A. System can do work
B. System has temperature
C. System has pressure
D. Heat is a form of energy

Q. 57 In thermodynamic process, 200 Joules of heat is given to a gas and 100 Joules of work is also done on it. The change in internal energy of the gas is

A. 100 J
B. 300 J
C. 419 J
D. 24 J

Q. 58 A perfect gas contained in a cylinder is kept in vacuum. If the cylinder suddenly bursts, then the temperature of the gas

A. Remains constant
B. Becomes zero
C. Increases
D. Decreases

Q. 59 Which of the following cannot determine the state of a thermodynamic system?

A. Pressure and volume
B. Volume and temperature
C. Temperature and pressure
D. Any one of pressure, volume or temperature

Q. 60 Which of the following is not a thermodynamics co-ordinate?

A. P
B. V
C. T
D. R

Q. 61 Which of the following parameters does not characterize the thermodynamic state of matter?

A. Volume
B. Temperature
C. Pressure
D. Work

Q. 62 A system is provided with 200 cal of heat and the work done by the system on the surrounding is 40 J. Then its internal energy

A. Increases by 600 J
B. Decreases by 800 J
C. Increases by 800 J
D. Decreases by 50 J

Q. 63 In a thermodynamic process, pressure of a fixed mass of a gas is changed in such a manner that the gas molecules gives out 20 J of heat and 10 J of work is done on the gas. If the initial internal energy of the gas was 40 J, then the final internal energy will be

A. 30 J
B. 20 J
C. 60 J
D. 40 J

Q. 64 First law of thermodynamics is a special case of

A. Newton's law
B. Law of conservation of energy
C. Charle's law
D. Law of heat exchange

Q. 65 Temperature is a measurement of coldness or hotness of an object. This definition is based on

A. Zeroth law of thermodynamics
B. First law of thermodynamics

C. Second law of thermodynamics D. Newton's law of cooling

Q. 66 If heat given to a system is 6 kcal and work done is 6 kJ. Then change in internal energy is

A. 19.1 kJ B. 12.5 kJ

C. 25 kJ D. Zero

Q. 67 The amount of work done required to stop a moving object is equal to

A. Velocity of the object B. Mass of object times its velocity

C. K.E of the object D. Mass of object

Q. 68 Work done on a body equals to change in its

A. K.E B. P.E

C. Total energy D. All of these

Q. 69 If $F = 2i + 3j - 4k$ and $d = 2m$ along -z axis then work done is

A. 28 J B. -8 J

C. 16 J D. 8 J

Q. 70 An ideal gas undergoes an expansion in volume from 1.3×10^{-4} m3 to 3.6×10^{-4} m^3 at a constant pressure of 1.3×10^5 pa. During this expansion, 24 J of heat is supplied to the gas. What is the overall change in the internal energy of the gas?

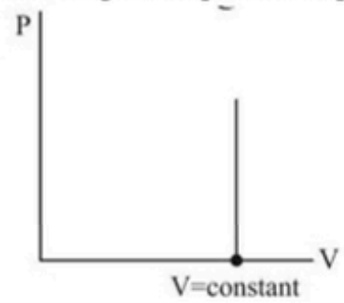
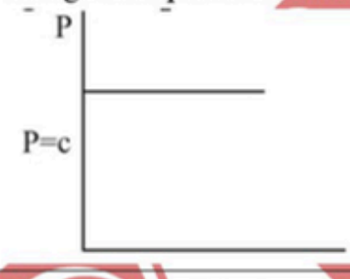
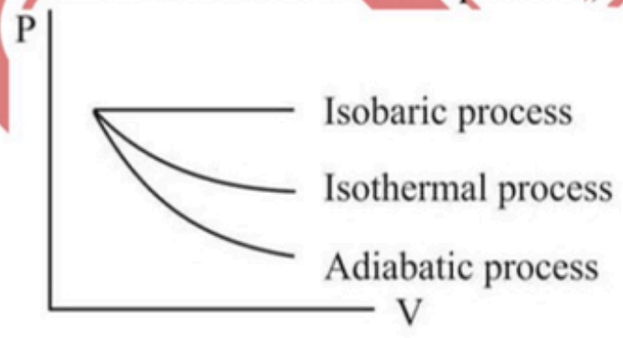
A. Decrease of 54 J B. Decrease of 6 J

C. Increase of 6 J D. Increase of 54 J

ANSWERS & EXPLANTION: -

Q.1	**C**	In adiabatic process $\Delta Q = 0$, so $0 = \Delta U + W$ $0 = \Delta U + 10$ $\boxed{\Delta U = -10J}$

Q.2	**B**	$PV^{\gamma} = constant$ $\gamma = \frac{C_P}{C_V} = \frac{molar\ specific\ heat\ of\ gas\ at\ constant\ pressure}{molar\ specific\ heat\ of\ gas\ at\ constant\ volume}$
Q.3	**C**	As we know that slope of isothermal and adiabatic curves are always negative and slope of adiabatic curve is always greater than that of isothermal curve Hence in the given graph curve A and B represents adiabatic and isothermal changes respectively.
Q.4	**D**	Process CD is isochoric as volume is constant, Process DA is isothermal as temperature constant and Process AB is isobaric as pressure is constant.
Q.5	**A**	AB is isobaric process, BC is isothermal process, CD is isometric process and DA is isothermal process. These processes are correctly represented by graph (a).
Q.6	**C**	AD and BC represent adiabatic process (more slope) AB and DC represent isothermal process (less slope)
Q.7	**B**	In isothermal process $P \propto 1/V$. Hence graph between P and V is a hyperbola.
Q.8	**D**	Adiabatic curves are more stepper than isothermal curves.
Q.9	**D**	$\Delta Q = \Delta U + \Delta W$ $\Rightarrow \Delta U = \Delta Q - \Delta W = 150 - 110 = 40$ J
Q.10	**B**	The internal energy and entropy depend only on the initial and final states of the system and not on the path followed to attain that state.
Q.11	**C**	$C_p - C_v = R$ $\therefore C_p = C_v + R$ $= \frac{5}{2}R + R$ $= \frac{7}{2}R$
Q.12	**D**	
Q.13	**D**	
Q.14	**A**	$C_p - C_v = R$ $\therefore C =_p C_v + R$ $= \frac{3}{2}R + R$ $= \frac{5}{2}R$
Q.15	**D**	Cv cannot be greater than Cp Hence, option A and option B are incorrect. We have the relation Cp − Cv = R (and its value is 2 cal/mole) and hence option C is also incorrect.
Q.16	**B**	Both hydrogen and oxygen are diatomic gases and Cp — Cv = R is same for all gases, hence a = b, provided Cp and Cv are gram molar specific heats.
Q.17	**A**	
Q.18	**B**	
Q.19	**C**	
Q.20	**B**	W = Fdcos0 = Fd which is maximum

Q.21	**D**	W = Fdcos90 = 0, which is minimum
Q.22	**C**	1st law of thermodynamics is the law of conservation of energy.
Q.23	**D**	All the mentioned examples are the examples of 1st law of thermodynamics.
Q.24	**B**	Isochoric process is the one in which volume of the system remain constant. So, graph will be straight line parallel to pressure axis. As shown 
Q.25	**C**	According to LAPLACE it is proved that sound travel adiabatically.
Q.26	**D**	In isothermal process $\Delta T = 0$ As, $\Delta K.E = \Delta U \propto \Delta T$ So, $\boxed{\Delta U = 0}$
Q.27	**D**	Isobaric process is a process in which pressure of system remain constant, so graph will be straight line parallel to volume axis, as shown 
Q.28	**D**	Maximum work is done in isobaric process so, it cover maximum area of PV diagram. 
Q.29	**B**	As, P = constant then If temperature increase 4 times then volume will also increase 4 times at constant pressure?
Q.30	**C**	During isothermal process heat enter or leave system to do work.
Q.31	**B**	W = Fdcos180 = -Fd
Q.32	**A**	$T_1 = 200K$ $T_2 = 400K$ $for\, x V_1 = 2V$ $for\, y V_1 = V$ for x

		$P(2V) = X \times R \times 200$ for y $P(V) = y \times R \times 400$ Dividing eq (i) by eq (ii) $\frac{PV}{2PV} = \frac{400 \times R \times y}{200 \times R \times x}$ $4y = x$ $y = x/4$
Q.33	**A**	W = F . d = (2i + 3j) . (7k) = 0 J
Q.34	**C**	
Q.35	**B**	
Q.36	**C**	The process in which volume remains constant is known as isochoric process.
Q.37	**B**	Could formation is an example of adiabatic process as cloud formation is a rapid process.
Q.38	**B**	In isothermal process T = constant $\Delta T = 0$, so Boyle's Law hold $V \propto \frac{1}{P}$
Q.39	**A**	It is so, because high energy particles leaves the space leaving low energy molecules behind so temperature decrease.
Q.40	**A**	$P\Delta V = nR\Delta T$ $n = 1$ $P\Delta V = R\Delta T$
Q.41	**C**	W = Fx d = 10N x 6m = 60 J
Q.42	**B**	W= F . d = (3i+2j+4k) . 10j = 20 J
Q.43	**A**	$Q = \Delta U + W$ For adiabatic process Q = 0 $W = -\Delta U$
Q.44	**D**	Work done is scaler product of Force and displacement
Q.45	**A**	Work done = mgh = 5x10x5=250J
Q.46	**B**	W=fdcos60=Fd/2 = $W_{max}/2$
Q.47	**A**	Work done = Fdcos0 = Fd since Cos0 = 1
Q.48	**C**	
Q.49	**C**	
Q.50	**A**	
Q.51	**B**	$\Delta U = \Delta Q - W = 35 - 15 = 20$ J
Q.52	**C**	W = Fdcos180 = -Fd
Q.53	**A**	ΔQ = 2kcal=2×103×4.2J = 8400J and ΔW = 500J. Hence from

		$\Delta Q=\Delta U+\Delta W$, $\Delta W=\Delta Q-\Delta U$ $= 8400 - 500 = 7900$ J
Q.54	**B**	$\Delta Q=\Delta U+\Delta W$ Þ $\Delta W=\Delta Q-\Delta U=100-40=70J$
Q.55	**C**	$\Delta Q=\Delta U+\Delta W=167+333=500$ cal
Q.56	**D**	Heat always refers to energy in transit from one body to another because of temperature difference.
Q.57	**B**	$\Delta Q=\Delta U+\Delta W$; $\Delta Q-200J$ and $\Delta W=-100J$ Þ $\Delta U=\Delta Q-\Delta W=200-(-100)=300J$
Q.58	**A**	During free expansion of a perfect gas no, work is done and also no heat is supplied from outside. Therefore, no change in internal energy. Hence, temperature remain constant.
Q.59	**D**	State of a thermodynamic state cannot determine by a single variable (P or V or T)
Q.60	**D**	R is the universal gas constant.
Q.61	**D**	
Q.62	**C**	$\Delta Q=\Delta U+\Delta W$ $\because \Delta Q=200cal=200\times4.2=840J$ and $\Delta W=40J$ Þ $\Delta U=\Delta Q-\Delta W=840-40=800J$
Q.63	**A**	$\Delta Q=\Delta U+\Delta W=(Uf-Ui)+\Delta W$ Þ $-20=(Uf-40)-10$ $Uf=30J$
Q.64	**B**	Heat supplied to a gas raise its internal energy and does some work against expansion, so it is a special case of law of conservation of energy.
Q.65	**A**	
Q.66	**A**	$\Delta Q=\Delta U+\Delta W$ Þ $\Delta U=\Delta Q-\Delta W$ $=6\times4.18-6=19.08kJ$ $\approx19.1kJ$
Q.67	**C**	
Q.68	**D**	work energy principle
Q.69	**D**	$W = Fd = (2i+3j-4k) . (-2k) = 8$ J
Q.70		$Q = \Delta U + W$ $\Delta U = Q - W$ $= 24 - P\Delta V$ $= 24 - 1.3\times10^{5}(3.6\times10^{-4} - 1.3\times10^{-4})$ $= 24 - 1.3\times10^{5}(2.3\times10^{-4})$ $= 24 - 3\times10^{5-4}$ $= 24 - 30 = -6J$

ELECTROSTATICS

Q. 1 **The electric force between two charges placed in air is 2N. When placed in a medium of the force reduces**

A. 0.019 B. 0.029
C. 0.025 D. 0.04

Q. 2 **Two similar charges each of one coulomb placed in air one meter apart repel each other with a force**

A. 9×10^{9}N B. 9.2×10^{4}N
C. 9×10^{-9}N D. 9×10^{7}N

Q. 3 **The leaves of a positively charged electroscope diverge more when an object is brought near the knob of the electroscope. The object must be:**

A. An insulator B. A conductor
C. Negatively charged D. Positively charged

Q. 4 **Two small conducting spheres of equal radius have charges +10μC and −20μC respectively are placed at a distance R from each other experience force F_1. If they are brought in contact and separated to the same distance, they experience force F_2. The ratio of F_1 to F_2**

A. 1 : 8 B. - 8 : 1
C. 1 : 2 D. - 2 : 1

Q. 5 **Two-point charges +3μC and +8μC repel each other with a force of 40N. If a charge of -5μC is added to each other of them, then the force between them will become**

A. -20N B. +20N
C. +10Nq D. -10N

Q. 6 **There are two charges +1μC and +5μC. The ratio of the forces acting on them will be**

A. 1 : 5 B. 1 : 1
C. 5 : 1 D. 1 : 25

Q. 7 **Two charges q_1 and q_2 are placed in vacuum at a distance d and the force acting between them is F. If a medium of dielectric constant 4 is introduced around them, the force now will be**

A. 4F B. 2F
C. F/2 D. F/4

Q. 8 **Two charges each equal to 2μC are 0.5m apart. If both of them exist inside vacuum, then the force between them is**

A. 1.89 N B. 2.44 N
C. 0.144 N D. 3.144 N

Q. 9 **When a body is earth connected, electrons from the earth flow into the body. This means the body is?**

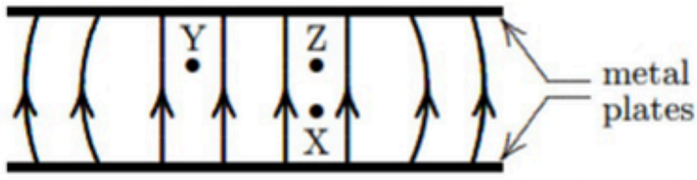
A. Unchanged B. Charged positively
C. Charged negatively D. An insulator

Q. 10 **If a body is charged by rubbing it, its weight**

A. Remains precisely constant
B. Increases slightly
C. Decreases slightly
D. May increase slightly or may decrease slightly

Electric field and its intensity

Q. 11 **The diagram shows the electric field lines due to two charged parallel metal plates. We conclude that:**



A. The upper plate is positive and the lower plate is negative
B. A proton at X would experience the same force if it were placed at Y
C. A proton at X experiences a greater force than if it were placed at Z
D. A proton at X experiences less force than if it were placed at Z

Q. 12 If the distance of the point from the point charge becomes $\frac{1}{2}$, the Electric field intensity becomes

A. Half
B. Double
C. $\frac{1}{4}$ times
D. None of these

Q. 13 Static charges create

A. Electric field
B. Magnetic field
C. Both A and B
D. Gravitational field

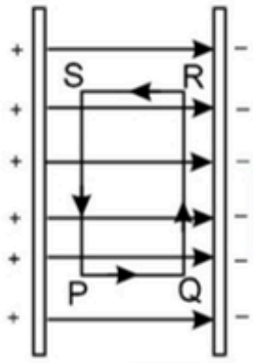
Q. 14 A unit positive charge + q_o placed anywhere in the vicinity of a positive point charge, experiences a repulsive force directed.

A. Radially inward
B. Radially out ward
C. Radially zero
D. None of these

Q. 15 Usually test charge is taken as

A. Negative charge
B. Positive charge
C. Both A and B
D. None of these

Q. 16 The amount of work done in joule in carrying a charge +q along the closed path PQRSP between the oppositely charged metal plates is (where E is electric field between the plates)



A. Zero
B. q
C. Qe (PQ + QR + SR + SP)
D. $\frac{q}{\varepsilon_0}$

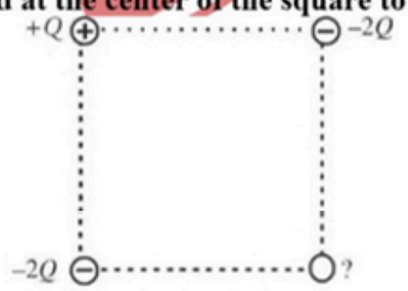
Q. 17 Gaussian surface is

A. Imaginary surface
B. An open surface
C. Curved surface
D. Plane surface

Q. 18 An isolated charged point particle produces an electric field with magnitude E at a point 2m away. At a point 1m from the particle the magnitude of the field is:

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

Q. 19 The figure below shows four-point charges fixed in position at the corners of a square. What charge would have to be present at the bottom right location for the electric field at the center of the square to be zero?

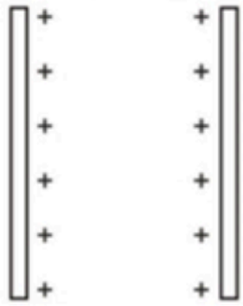


A. +Q
B. +Q
C. +2Q
D. +3Q

Q. 20 The electric field between the oppositely charged plates of surface charge density σ is σ/ε0. If one of the plates is removed then electric field becomes

A. Zero
B. $\frac{2\sigma}{\varepsilon_0}$
C. $\frac{\sigma}{2\varepsilon_0}$
D. $\frac{\sigma}{4\varepsilon_0}$

Q. 21 The value of electric intensity between two similarly charged parallel plates as shown in the figure according to Gauss's law is



A. $+\frac{6}{\varepsilon_0}$ B. $-\frac{6}{\varepsilon_0}$

C. $\pm\frac{6}{\varepsilon_0}$ D. 0

Q. 22 Two thin infinite parallel plates have uniform charge densities $+\sigma$ and $-\sigma$. The electric field in the space between them is

A. $\frac{\sigma}{2\varepsilon_0}$ B. $\frac{\sigma}{\varepsilon_0}$

C. $\frac{\sigma}{60}$ D. zero

Q. 23 The electric field intensity with in a hollow charged conductor is

A. Zero B. Infinite

C. Maximum D. None of these

Q. 24 A rubber balloon is given a positive charge such that at its surface potential is +5V. What will be the value of potential and electric field strength at the centre of rubber balloon?

V	E
–5V	5 NC^{-1}
+5V	5 NC^{-1}
+5V	0 NC^{-1}
–5V	0 NC^{-1}

A. –5V, 5 NC^{-1} B. +5V, 5 NC^{-1}

C. +5V, 0 NC^{-1} D. –5V, 0 NC^{-1}

Q. 25 The electric intensity due to two oppositely charged plates is ___ times due to a single plate.

A. 1/2 B. 1/4

C. 2 D. 3

Q. 26 The vector form of the electric field intensity b/w two oppositely charged plates is

A. $\vec{E}=\frac{\sigma}{\varepsilon_0}\vec{r}$ B. $\vec{E}=\frac{\sigma}{2\varepsilon_0}\vec{r}$

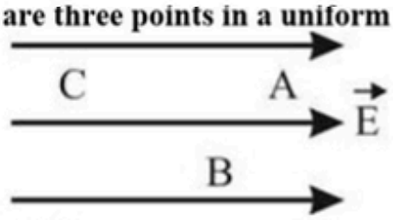
C. $\vec{E}=\frac{\sigma}{\varepsilon_0}\frac{\vec{r}}{r}$ D. $\vec{E}=\frac{\sigma}{2\varepsilon_0}\frac{\vec{r}}{r}$

Q. 27 Electric potential is

A. scalar quantity B. vector quantity

C. tensor quantity D. none of these

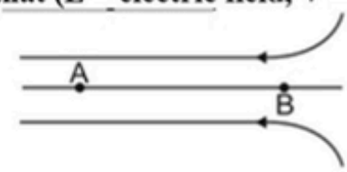
Q. 28 A, B and C are three points in a uniform electric field. The electric potential is



A. Maximum at A B. Maximum at C

C. Maximum at B D. Same at all three points

Q. 29 Fig. shows some of the electric field lines corresponding to an electric field. The fig. suggests that (E = electric field, V = potential

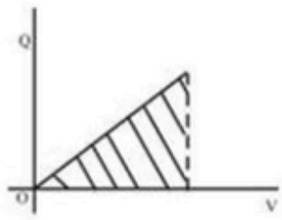


A. $V_A = V_B$
B. $VA > V_B$
C. $V_A < V_B$
D. None of these

Q. 30 Two charges -10C and +10 C are placed 10cm apart potential at the center of line joining two charges is

A. 2 V
B. -2 V
C. 0 V
D. 4 V

Q. 31 The graph shows the growth of charge with potential difference between plates. The slope of the graph shows



A. Capacitance
B. Separation of plates
C. Energy stored
D. Electric intensity

Q. 32 Two capacitors of 1μF and 2μF are connected in series across a 100V supply. The energy stored in the system is

A. 2/300
B. 1/100
C. 1/300
D. 3/100

Q. 33 1 micro-farad =

A. 10^{-6} F
B. 10^{-12} F
C. 10^{-9} F
D. 10^{-15} F

Q. 34 When potential in a capacitor rises from 0 to V, then average potential difference is

A. V
B. –V
C. $\frac{V+V}{2}$
D. $\frac{V}{2}$

Q. 35 Change Q on a capacitor varies with voltage V as shown in the figure, where Q is taken along the X-axis and V along the Y-axis. The area of triangle OAB represents

A. Capacitance
B. Capacitive reactance
C. Magnetic field between the plates
D. Energy stored in the capacitor

Q. 36 The capacity of a parallel plate condenser is 5μF. When a glass plate is placed between the plates of the conductor, its potential becomes 1/8th of the original value. The value of dielectric constant will be

A. 1.6
B. 5
C. 8
D. 40

Q. 37 The energy of a charged capacitor resides in

A. The electric field only
B. The magnetic field only
C. Both the electric and magnetic field
D. Neither in electric nor magnetic field

Q. 38 A 12pF capacitor is connected to a 50V battery. How much electrostatic energy is stored in the capacitor?

A. 1.5×10^{-8}J
B. 2.5×10^{-7}J
C. 3.5×10^{-5}J
D. 4.5×10^{-2}J

Q. 39 If there are n capacitors in parallel connected to V volt source, then the energy stored is equal to

A. CV
B. $\frac{1}{2}$ nCV^2
C. CV2
D. $\frac{1}{2n}$ CV^2

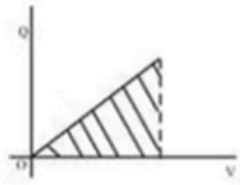
Q. 40 A parallel plate capacitor carries a charge q. The distance between the plates is doubled by application of a force. The work done by the force is

A. Zero
B. q^2/C
C. $q^2/2C$
D. $q^2/4C$

Q. 41 If RC is small, then capacitor will be charged and discharged

A. Slowly
B. Quickly
C. With medium speed
D. With constant speed

Q. 42 The graph shows the growth of charge with potential difference between plates. The area under the graph shows



A. Capacitance
B. Separation of plates
C. Energy stored
D. Electric intensity

Q. 43 Capacitor stores energy in the form of

A. Electric field
B. Magnetic field
C. Both of these
D. Gravitational field

Q. 44 The expression for energy density is

A. $\epsilon_r \epsilon_o \frac{E^2 Ad}{2}$
B. $\epsilon_r \epsilon_o \frac{E^2 Ad}{2}$
C. $\frac{1}{2} \frac{\epsilon_o \epsilon_r E^2}{Ad}$
D. $\frac{1}{2} \epsilon_o \epsilon_r E^2$

Q. 45 The product RC is called

A. Decay constant
B. Constant
C. Time constant
D. Resistance of capacitor

Q. 46 A capacitor of capacitance 'C' has a charge 'Q' and stored energy is 'w'. If the charge is increased to '2Q' The stored energy will be:

A. 4w
B. $\frac{w}{4}$
C. $\frac{w}{2}$
D. 2w

Q. 47 Which of the following depends on charging and discharging rate of a capacitor?

A. Time constant
B. Current
C. Power
D. Voltage

Q. 48 What is the initial current while charging a capacitor?

A. High
B. Low
C. zero
D. Cannot be determined

Q. 49 What is the final current while charging a capacitor?

A. High
B. zero
C. low
D. infinity

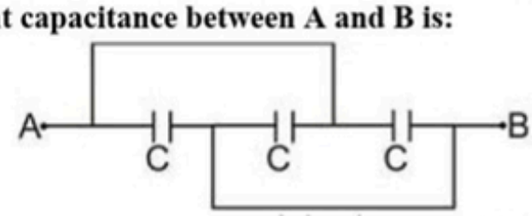
Q. 50 Equivalent capacitance is greater than individual capacitances in

A. series combination
B. Parallel combination
C. Both A and B
D. None of these

Q. 51 Three capacitors of capacitance 12 μF each are available. The minimum and maximum capacitances which may be obtained from these are

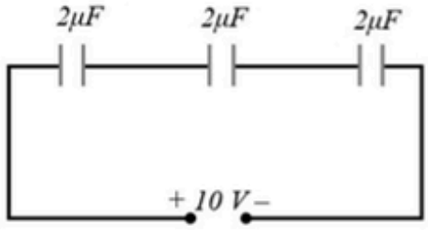
A. 12 μF, 36 μF
B. 4 μF, 12 μF
C. 4 μF, 36 μF
D. 0 μF, ∞μF

Q. 52 Three equal capacitors, each with capacitance C are connected as shown in fig. the equivalent capacitance between A and B is:



A. C
B. C/3
C. 3C
D. 3/2C

Q. 53 In the figure below, the charge on 3μF capacitor is



A. 5 μF
B. 10 μF
C. 3 μF
D. 6 μF

Q. 54 A person uses five capacitors of same value such that he combines them in series and then in parallel combination. What is the ratio of maximum to minimum capacitance be obtained?

A. nC
B. $\frac{C}{n}$
C. n^2C
D. n^2

Q. 55 The capacity of a condenser is 4×10^{-6} farad and its potential are 100 volts. The energy released on discharging it fully will be

A. 0.02 Joule
B. 0.04Joule
C. 0.025Joule
D. 0.05Joule

Q. 56 Can a metal be used as a medium for dielectric?

A. Yes
B. No
C. Depends on its shape
D. Depends on dielectric

Q. 57 A parallel plate air capacitor is charged to a potential difference of V. After disconnecting the battery, distance between the plates of the capacitor is increased using an insulating handle. As a result, the potential difference between the plates

A. Decreases
B. Increases
C. Becomes zero
D. Does not change

Q. 58 The work done in placing a charge of 8×10^{-18} coulomb on a condenser of capacity 100 micro-farad is

A. 32×10^{-32} Joule
B. 16×10^{-32} Joule
C. 3.1×10^{-26} Joule
D. 4×10^{-10} Joule

Q. 59 The potentials of the two plates of capacitor are +10V and -10 V. The charge on one of the plates is 40 C. The capacitance of the capacitor is

A. 2 F
B. 4 F
C. 0.5 F
D. 0.25 F

Q. 60 Two-point charges +3μC and +8μC repel each other with a force of 40N. If a charge of -5μC is added to each of them, then the force between them will become

A. −20N
B. +20N
C. +10N
D. −10N

Q. 61 The electric intensity due to two oppositely charged plates is _____ times due to a single plate.

A. $\frac{1}{2}$
B. $\frac{1}{4}$
C. 2
D. 3

Q. 62 Gaussian surface is

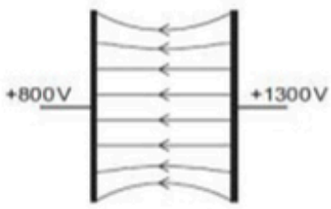
A. Imaginary surface
B. An open surface
C. Curved surface
D. Plane surface

Q. 63 A person uses five capacitors of same value such that he combines them in series and then in parallel combination. What is the ratio of maximum to minimum capacitance be obtained?

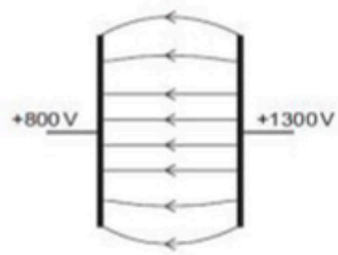
A. nC
B. $\frac{C}{n}$
C. n^2C
D. n^2

Q. 64 Two parallel metal plates are at electric potentials of +800 V and +1300 V. Which diagram best represents the electric field between the metal plates?

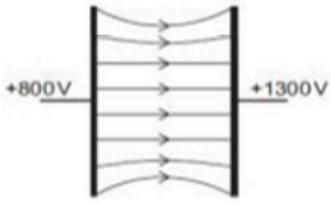
A



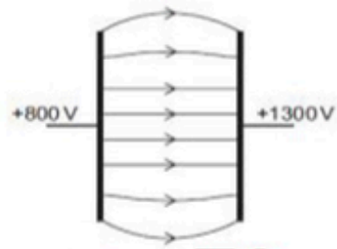
B



C



D



Q. 65 A and B are two spherical conductors of the same extent and size. A is solid and B is hollow Both are charged to the same potential. If the charges on A and B are Q_A and Q_B respectively, then

A. Q_A is less than Q_B
B. Q_A is greater than Q_B but not double
C. $Q_A = Q_B$
D. $Q_A = 2Q_B$

Q. 66 Neutral zone in electric field of two similar charges is region where

A. Both positive and negative charges are present
B. Equal quantity of both positive and negative charges are present
C. An electric dipole exists
D. No electric field line passes

Q. 67 Two lines of force

A. Intersect in non – uniform field
B. Intersect at a far distance from charge
C. Intersect in uniform field
D. Never intersect

Q. 68 Two charged spheres are separated by 2mm. Which of the following would produce the greatest attractive force?

A. + 1q and +4q
B. +2q and +2q
C. – 1q and – 4q
D. +2q and -2q

Q. 69 In bringing an electron towards the second electron the electrostatic potential of the system

A. Increases
B. Remains the same
C. Decreases
D. Becomes zero

Q. 70 The force experienced by unit positive charge placed at a point in electric field is known as

A. Electric field intensity
B. Electric potential
C. Magnetic field intensity
D. Capacitance

Q. 71 The coulomb's law is valid for the charges which are

A. Moving and point charges
B. Stationary and point charges
C. Moving and non-point charges
D. Stationary and large size charges

Q. 72 12J of work is to be done against an existing electric field to take a charge of 0.01C from A to B. Find the potential difference between B and A.

A. 120V
B. 1200V
C. 1.2V
D. 12V

Q. 73 The potential at a point due to a charge is 9 V. If the distance is increased three times, the potential at that point will be

A. 27 V
B. 3 V
C. 12 V
D. 18 V

Q. 74 The electric lines are farther apart where field is

A. Strong
B. Weak
C. Zero
D. None of these

Q. 75 Which of the following is equivalent to SI unit of potential?

A. $N\ m\ C^{-1}$ B. $N^3\ m\ C^{-2}$

C. $N^2\ m\ C^{-1}$ D. N m

Q. 76 Which of the following remains unchanged if a dielectric is placed between a charged capacitor?

A. Q B. E

C. Fe D. V

Q. 77 The value of ϵ_r for various dielectric is always

A. Less than unity B. Larger than unity

C. Equal to unity D. None of the above

Q. 78 A positively charged particle of mass m kg and charge 2 coulomb travels from rest through a P.D of V volt. Its kinetic energy in joule is

A. 2V B. m 2V

C. m/2V D. m^2/V

Q. 79 The potential difference between two points is 100 V. If a particle with a charge of 2 C is transported from one of these points to the other, the magnitude of the work done is:

A. 200 J B. 100 J

C. 50 J D. 100 J

Q. 80 10 V potential difference is applied across the plates of 1 F capacitor. What is the energy stored in capacitor?

A. 0.5 mJ B. 0.05 mJ

C. 5 J D. 50 J

Q. 81 What is the charge stored on a 5mF capacitor charged to the potential difference of 12V?

A. 60mC B. 2.4mC

C. 2.4C D. 60.C

Q. 82 The difference of potential energy per unit charge is called

A. Electric potential B. Potential difference

C. Absolute potential D. All of these

Q. 83 Electric lines of force about a negative point charge are

A. Circular, anticlockwise B. Circular, clockwise

C. Radial inwards D. Radial outwards

Q. 84 In a charged capacitor the energy resides

A. On the positive plate B. On the both positive and negative plates

C. In the field between the plates D. Around the edge of capacitor plates

Q. 85 Two plates are 2cm apart. If a potential difference of 10 volts is applied between the plates. The electric field between the plates will be

A. 20 N/C B. 250 N/C

C. 500 N/C D. 1000 N/C

Q. 86 Two charges 1C and -4C exists in air. What is the direction of force?

A. Away from 1C B. Away from -4C

C. From 1C to -4C D. From -4C to 1C

Q. 87 Law stating that "force is directly proportional to product of charges and inversely proportional to square of separation between them" is called

A. Newton's law B. Coulombs law

C. Gauss's law D. Ohm's law

Q. 88 A capacitor with air as the dielectric is charged to a potential of 100 volts. If the space between the plates is now filled with a dielectric of dielectric constant 10, the potential difference between the plates will be

A. 1000 volts B. 100 volts

C. 10 volts D. Zero

Q. 89 What is the magnitude of a point charge which produces an electric field of 2 N/coulomb at a distance of 60 cm ($\frac{1}{4\pi\varepsilon 0} = 9\times109 N-m^2/C^2$)?

A. $8\times10^{-11}C$ B. $2\times10^{-12}C$

C. $3\times10^{-11}C$ D. $6\times10^{-10}C$

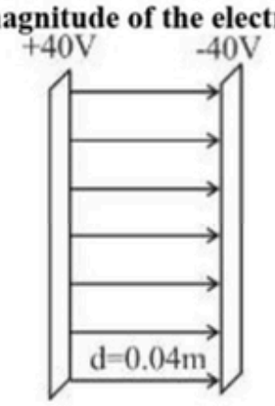
Q. 90 Which of the following will deflect in electric field?

A. Cathode-ray
B. X-rays
C. Ultra-violet rays
D. λ-rays

Q. 91 The capacity of a parallel plate capacitor increases with the

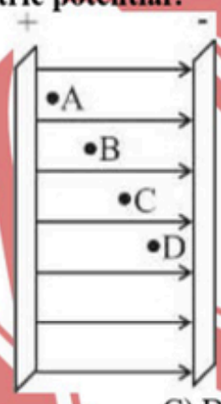
A. Decrease of its area
B. Increase of its distance
C. Increase of its area
D. None of the above

Q. 92 A uniform electric field is created by two parallel plates separated by a distance of 0.04 m. What is the magnitude of the electric field established between the plates?



A. 20 V/m
B. 200 V/m
C. 2,000 V/m
D. 20,000 V/m

Q. 93 An electric field is created by two parallel plates. Which of the following points corresponds to the higher electric potential?



A) A
C) D
B) C
D) The electric potential is the same at all points

Q. 94 If a unit charge is taken from one point to another over an equipotential surface:

A. Work is done on the charge
B. Work is done by the charge
C. Work done on the charge is constant
D. No work is done

Q. 95 A parallel plate capacitor is charged. If the plates are pulled apart

A. The capacitance increases
B. The potential difference decreases
C. The total charge increases
D. The charge remain same

Q. 96 A charge of 0.10 C accelerated through a potential difference of 1000V acquires K.E

A. 200 eV
B. 10 J
C. 100 J
D. 100 eV

Q. 97 The expression for electric potential Vr at a distance 'r' from 'q' is.

A. $Vr = \frac{1}{4\pi\epsilon_0}\frac{q}{r^2}$
B. $Vr = K\frac{q}{r}$
C. $Vr = \frac{1}{4\pi\epsilon_0}\frac{q}{r}$
D. Both B & C

Q. 98 To charge a 1.0 F capacitor with 2 C requires a potential difference of:

A. 2 V
B. 5 V
C. 0.2 V
D. 0.5 V

Q. 99 A charged particle is projected into a region of uniform and parallel, E and B fields. The force on the particle is:

A. Zero
B. Along the field lines
C. Perpendicular to the field lines
D. At some angle $< 90^{\circ}$ with the field lines

Q. 100 Two-point charges +2 coulomb and +6 coulomb repel each other with a force of 12 N. If a charge of -2 coulomb is given to each of these charges, the force will now be

A. Zero
B. 8 N (repulsive)
C. 8 N (attractive)
D. None

Q. 101 Two plates are 2cm apart. If a potential difference of 10 volts is applied between the plates. The electric field between the plates will be

A. 20 N/C
B. 250 N/C
C. 500 N/C
D. 1000 N/C

Q. 102 Uniform electric field exist

A. Near positive charge
B. Near negative charge
C. Between two equal and oppositely charged plates
D. Between two equal and oppositely charged infinite plates

Q. 103 An external agency carries '–5C' of charge from infinity to a point in an electrostatic field and performs 100 joule of work. The potential at the given point is

A. 10 V
B. –10 V
C. 20 V
D. –20 V

Q. 104 A metallic sphere of diameter 30 cm, carries a charge of 600 mC. Find electric field intensity at surface of sphere?

A. $54 \times 10^{3} NC^{-1}$
B. $13.5 \times 10^{3} NC^{-1}$
C. $54 \times 10^{7} NC^{-1}$
D. $2.4 \times 10^{8} NC^{-1}$

Q. 105 A parallel plates capacitor is charged and the charging battery is then disconnected. If the plates of the capacitor are now moved farther by means of insulted handles, then

A. The charge on the capacitor increases
B. The capacitance increases
C. The voltage across the plates decreases
D. The electrostatic energy stored in capacitor increase

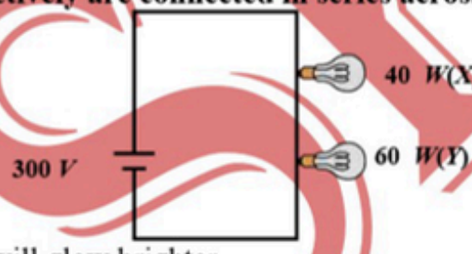
Q. 106 Electric lines of force about a negative point charge are

A. Circular, anticlockwise
B. Circular, clockwise
C. Radial inwards
D. Radial outwards

Q. 107 Two plates are 2cm apart. If a potential difference of 10 volts is applied between the plates. The electric field between the plates will be

A. 20 N/C
B. 250 N/C
C. 500 N/C
D. 1000 N/C

Q. 108 Two bulbs X and Y having same voltage rating and of power 40 watt and 60 watts respectively are connected in series across a potential difference of 300 volt, then



A. X will glow brighter
B. Heat produced in Y will be greater than X
C. Resistance of Y is greater than X
D. Voltage drop in X will be greater than Y

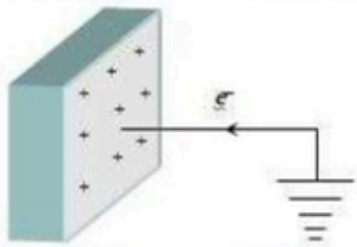
Q. 109 If 4×10^{20} eV of energy in required to move a charge of 1C between two points, the P. D between the points is

A. 4×10^{20} V
B. 64×18^{20} V
C. 64×19^{19} V
D. 64 V

Q. 110 A capacitor is charged by using a battery which is then disconnected. A dielectric slab is then slipped between the plates, which results in

A. Reduction of charge on the plates and increase of potential difference across the plates
B. Increase in the potential difference across the plate, reduction in stored energy, but no change in the charge on the plates
C. Decrease in the potential difference across the plates, reduction in the stored energy, but no change in the charge on the plates
D. None of the above

ANSWERS & EXPLANTION: -

Q.1	**C**	$F_{med} = \frac{F_{vac}}{\varepsilon_r} = \frac{2}{80} = \frac{1}{40} = 0.025\ N$
Q.2	**A**	$F = \frac{Kq_1q_2}{r^2} = \frac{9 \times 10^9(1)(1)}{(1)^2} = 9 \times 10^9 N$
Q.3	**D**	In case of +ve charge leaves will move apart more as compare to –ve charge because disk is positively charge.
Q.4	**B**	$F \propto Q_1Q_2;\ \frac{F_1}{F_2} = \frac{Q_1Q_2}{Q_1Q_2} = \frac{10 \times -20}{-5 \times -5} = -\frac{8}{1}$
Q.5	**D**	In second case, charges will be $-2\mu C$ and $-3\mu C$ Since $F \propto Q_1Q_2$; i.e $\frac{F}{F''} = \frac{Q_1Q_2}{Q''_1Q''_2};\ \frac{40}{F''} = \frac{3 \times 8}{-2 \times 3} = -4;\ F'' = -10N$ (Attractive)
Q.6	**B**	The same force will act on both bodies although their directions will be different.
Q.7	**D**	In the presence of medium force becomes 1/K times
Q.8	**C**	By using $F = 9 \times 10^9 . \frac{Q^2}{r^2} \Rightarrow F = 9 \times 10^9 . \frac{(2 \times 10^{-6})^2}{(0.5)^2} = 0.144N$
Q.9	**B**	When a positively charged body connected to earth, electrons flows from earth to body and body becomes neutral. 
Q.10	**D**	The weight can be increased slightly, if it acquire negative charge & weight can be decreased slightly, if it acquires positive charge.
Q.11	**B**	In uniform electric field electric force between the plates remain same anywhere
Q.12	**D**	$E = k\frac{q}{r^2}$
Q.13	**A**	
Q.14	**B**	
Q.15	**B**	
Q.16	**A**	Electric field is conserved so work done in closed path is zero
Q.17	**A**	Gaussian surface is an imaginary closed surface
Q.18	**C**	$E \propto \frac{1}{r^2}$
Q.19	**A**	Zero zone can be created between the similar charges having same magnitude.

Q.20	**C**	2nd Application of Gauss's law
Q.21	**D**	Flux between similarly charged plates $\phi = 0$ $EA\cos\theta = 0 \because E = 0, A \neq 0$
Q.22	**B**	Formula for Electric field by Gauss's Law
Q.23	**A**	$\vec{E}.\vec{A} = \frac{\theta}{\varepsilon_o} = \frac{0}{\varepsilon_o}$ $\vec{E}.\vec{A} = 0 \qquad \vec{E} = 0,\ \vec{A} \neq 0$
Q.24	**C**	$\bullet V_{inside} = V_{surface} = \text{constant}$ $\bullet E = 0 (q_{inside} = 0)$
Q.25	**C**	For single charged plate $Es = \frac{\sigma}{2\varepsilon_0}$ For two opposite plates $E = \frac{\sigma}{\varepsilon_0}$ It is clear that E for two opposite plates $= 2\times$ Esingle
Q.26	**C**	*As we know* $\vec{E} = \frac{\sigma}{2\epsilon_o}\hat{r}$ *also* $\hat{r} = \frac{\vec{r}}{r}$
Q.27	**A**	
Q.28	**B**	C point is near the high potential so it will experience the maximum potential
Q.29	**C**	Potential decreases in the direction of electric field
Q.30	**C**	*As* $V^+ = k\frac{q}{r^2}$ *and* $V^- = -k\frac{q}{r^2}$ *so* $V = V^+ + V^-$ $V = k\frac{q}{r^2} + \left(-k\frac{q}{r^2}\right) = 0$
Q.31	**A**	$\text{Slope} = \frac{\Delta y}{\Delta x} = \frac{Q}{V} = C$
Q.32	**C**	$E = \frac{1}{2}CV^2 = \frac{1}{2}\left(\frac{(1)(2)}{1+2}\times 10^{-6}\right)(100)^2$ $= \frac{1}{2}\left(\frac{2}{3}\times 10^{-6}\right)(10000)$ $= \frac{1}{3}\times 10^{-2} = \frac{1}{300}$
Q.33	**A**	$1\mu F = 10^{-6}F$
Q.34	**D**	$V_{av} = \frac{0+V}{2} = \frac{V}{2}$
Q.35	**D**	U=1/2QV= Area of triangle OAB
Q.36	**C**	V′=V/8

		V/K=V/8 K = 8
Q.37	**A**	Stationary charge produces electric field only.
Q.38	**A**	$U = \frac{1}{2}CV^2 = \frac{1}{2} \times 12 \times 10^{-12} \times (50)^2 = 1.5 \times 10^{-8} J$
Q.39	**B**	$U = \frac{1}{2}C_{eq}V^2 = \frac{1}{2}(nC)V^2$
Q.40	**C**	Work done appears in the form of energy which is given by $q^2/2C$
Q.41	**B**	t = RC If 'RC' product is small then t (charging time) is quickly
Q.42	**B**	Shaded area = $\frac{1}{2}CV^2 = E$
Q.43	**A**	Capacitor is a device which store energy with the help of stationary charges and stationary charges produce electric field.
Q.44	**D**	$\frac{\text{Energy}}{\text{Volume}} = \frac{1}{2}\varepsilon_o\varepsilon_r E^2$
Q.45	**C**	$RC = (\frac{V}{I})(\frac{Q}{V}) = \frac{Q}{I} \therefore V = IR \rightarrow R = \frac{V}{I}$ As, $I = \frac{Q}{t} \rightarrow t = \frac{Q}{I}$ $Q = CV \rightarrow C = \frac{Q}{V}$ So, $\boxed{RC = \frac{Q}{I} = t}$
Q.46	**A**	$W = \frac{Q^2}{2C}$ It is clear that when Q increase to 2Q then W increase to 4W
Q.47	**A**	The time constant in a circuit consisting of a capacitor is the product of the resistance and the capacitance. Smaller the time constant, faster is the charging and discharging rate and vice versa.
Q.48	**A**	The initial current of a capacitor is very high because the voltage source will transport charges from one plate of the capacitor to the other plate.
Q.49	**B**	The final current is almost equal to zero while charging a capacitor because the capacitor is charged up to the source voltage.
Q.50	**B**	$Ceq = C_1 + C_2 + C_3$ $Ceq > C_1, Ceq > C_2 Ceq > C_3$
Q.51	**C**	• $C_{max} = C_{parallel} = nc = 3(12) = 36\ \mu F$ • $C_{min} = C_{series} = \frac{c}{n} = \frac{12}{3} = 4\ \mu F$
Q.52	**C**	The combination is equivalent to 3 capacitors in parallel. Therefore net capacitance between A and B = 3C

Q.53	**B**	$Q = C_{eq}V$. ....(i) $\frac{1}{C_{eq}} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$ $C_{eq} = 1\mu F$ $Q = (1\mu F)(10V)$ $Q = 10\mu C$
Q.54	**D**	$C_{max} = C_{parallel} = \boxed{nC}$ $C_{min} = C_{series} = \frac{C}{n}$ So, $\frac{C_{max}}{C_{min}} = \frac{nC}{C/n} = n^2$
Q.55	**A**	$U = \frac{1}{2}CV^2 = 12\times4\times10^{-6}\times(100)^2 = 0.02J$
Q.56	**B**	Because metals are good conductor of electricity.
Q.57	**B**	$V = \left\|\frac{Q}{C}\right\| = \left\|\frac{Qd}{\varepsilon_0 KA}\right\| \Rightarrow V \propto d$
Q.58	**A**	$W = \frac{Q^2}{2C} = \frac{(8\times10^{-18})^2}{2\times100\times10^{-6}} = 32\times10^{-32}J$
Q.59	**A**	The potential difference across the parallel plate capacitor is 10V−(−10V) = 20V. Capacitance = Q/V = 40/20 = 2F.
Q.60	**D**	In second case, charges will be $-2\mu C$ and $+3\mu C$ Since $F \propto Q_1Q_2$ i.e. $\frac{F}{F'} = \frac{Q_1Q_2}{Q'_1Q'_2}$; $\frac{40}{F'} = \frac{3\times8}{-2\times3} = -4$; $F' = 10\,N$(Attractive)
Q.61	**C**	For single charged plate $E_s = \frac{\sigma}{2\varepsilon_0}$ For two opposite plates $E_s = \frac{\sigma}{\varepsilon_0}$ It is clear that $E_{\text{for two opposite plates}} = 2 \times E_{single}$
Q.62	**A**	Gaussian surface is an imaginary closed surface
Q.63	**D**	$C_{max} = C_{parallel} = \boxed{nC}$ $C_{min} = C_{series} = \frac{C}{n}$ So, $\frac{C_{max}}{C_{min}} = \frac{nC}{C/n} = n^2$
Q.64	**B**	Electric field strength E = V / d As long as the p.d. V between the plates and the separation d of the plates are constant, the electric field strength is constant between them ideally. The direction of the electric field is drawn from a positive (or relatively more positive) potential to a negative (or relatively less positive) potential. So, the direction of the electric field should be from right to left. [C and D are incorrect]

		When the electric field is constant, the field lines are equally spaced from each other such that in any areas of similar size, the same amount of field lines is seen and they are equally spaced. However, due to imperfection in reality, the electric field is less and varies at the edges of the plates. When a field is weaker in a region, the field lines spacing would be greater in that region. In choice A, the field lines are closer at the edges. [A is incorrect]
Q.65	**C**	Q = CV, C = Capacitance capacitance depends on the size of conductor. As both the conductor have same size, they will have same charge at given potential
Q.66	**D**	In an electric field, a neutral point is said to be a point at which the resultant electrical field is nil or zero. This point is usually obtained if two electrical fields are either equal or opposite.
Q.67	**D**	Electric lines of force never intersect because, at the point of intersection, two tangents can be drawn to the two lines of force. This means two directions of the electric field at the point of intersection, which is not possible.
Q.68	**D**	The only pair of charged bodies that would attract one another is the pair of unlike charged spheres.The rest of the pairs are like charges, which repel one another.
Q.69	**A**	The electron has negative charge. When an electron is approaching towards another electron, then due to same negative charge repulsive force is produced between them. So, to bring them closer a work is done against this repulsive force. This work is stored in the form of electrostatic potential energy. Thus, electrostatic potential energy of system increases
Q.70	**A**	
Q.71	**B**	
Q.72	**B**	
Q.73	**B**	
Q.74	**B**	
Q.75	**A**	
Q.76	**A**	
Q.77	**B**	
Q.78	**A**	
Q.79	**A**	
Q.80	**D**	
Q.81	**A**	
Q.82	**B**	
Q.83	**C**	
Q.84	**C**	
Q.85	**C**	
Q.86	**C**	
Q.87	**B**	
Q.88	**C**	
Q.89	**A**	
Q.90	**A**	
Q.91	**C**	
Q.92	**C**	

Q.93	A	
Q.94	D	
Q.95	D	
Q.96	C	
Q.97	D	
Q.98	A	
Q.99	B	
Q.100	A	
Q.101	C	
Q.102	D	
Q.103	D	
Q.104	D	
Q.105	D	
Q.106	C	
Q.107	C	
Q.108	A	
Q.109	D	
Q.110	C	

CURRENT ELECTRICITY

Ohm's Law

Q. 1 Calculate the amount of charge flowing in 2 minutes in a wire of resistance 10 ohm when a potential difference of 20 V is applied between its ends

A. 4 C
B. 20 C
C. 240 C
D. 120 C

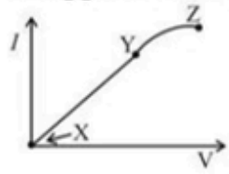
Q. 2 Slope of V-I graph represents

A. Resistance
B. Conductance
C. Resistivity
D. Conductivity

Q. 3 The graphical representation of Ohm's law is

A. Straight line
B. Parabola
C. Hyperbola
D. Ellipse

Q. 4 The diagram shows the current I /voltage V graph for a length of resistance wire. Where can Ohm's law be applied to the wire?

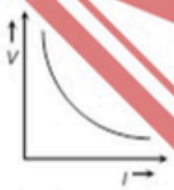


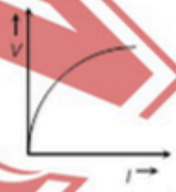
A. at Y only
B. at Z only
C. from X to Y
D. from X to Z

Q. 5 Which of the adjoining graphs represents ohmic resistance?

A.


B.


C.


D


Q. 6 I-V characteristic of a copper wire of length L and area of cross-section A is shown in figure. The slope of the curve becomes

A. More if the experiment is performed at higher temperature
B. More if a wire of steel of same dimension is used
C. More if the length of the wire is increased
D. Less if the length of the wire is increased

Q. 7 Ohm's law is true

A. For metallic conductors at low temperature
B. For metallic conductors at high temperature
C. For electrolytes when current passes through them
D. For diode when current flows

Q. 8 62.5×10^{18} electrons per second are flowing through a wire of area of cross-section 0.1 m^2, the value of current flowing will be

A. 1 A
B. 0.1 A
C. 10 A
D. 0.11 A

Q. 9 The resistance of a discharge tube is

A. Ohmic
B Non-ohmic
C. Both A and B
D. Zero

Q. 10 The current flowing through a lamp marked as 50 W and 250 V is

A. 5 amp
B. 2.5 amp
C. 2 amp
D. 0.2 amp

Resistivity and its dependence upon temperature

Q. 11 A certain wire has a resistance R. The resistance of another wire identical with the first except having twice its diameter is

A. 2R
B. 0.25R
C. 4R
D. 0.5R

Q. 12 The positive temperature coefficient of resistance is for

A. Carbon
B. Germanium
C. Copper
D. An electrolyte

Q. 13 The fact that the conductance of some metals rises to infinity at some temperature below a few Kelvin is called

A. Thermal conductivity
B. Optical conductivity
C. Magnetic conductivity
D. Superconductivity

Q. 14 It is easier to start a car engine on a hot day than on a cold day. This is because the internal resistance of the car battery

A. Decreases with rise in temperature
B. Increases with rise in temperature
C. Decreases with a fall in temperature
D. Does not change with a change in temperature

Q. 15 The resistivity of a wire depends on its

A. Length
B. Area of cross-section
C. Shape
D. Material

Q. 16 A uniform wire of resistance R is uniformly compressed along its length, until its radius becomes n times the original radius. Now resistance of the wire becomes

A. R/n^4
B. R/n^2
C. R/n
D. Nr

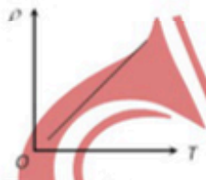
Q. 17 The electric resistance of a certain wire of iron is R. If its length and radius are both doubled, then

A. The resistance will be doubled and the specific resistance will be halved
B. The resistance will be halved and the specific resistance will remain unchanged
C. The resistance will be halved and the specific resistance will be doubled
D. The resistance and the specific resistance, will both remain unchanged

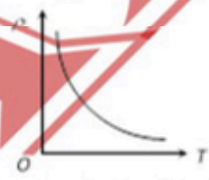
Q. 18 The following four wires are made of the same material and are at the same temperature. Which one of them has highest electrical resistance

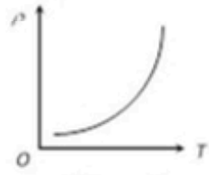
A. Length = 50 cm, diameter = 0.5 mm
B. Length = 100 cm, diameter = 1 mm
C. Length = 200 cm, diameter = 2 mm
D. Length = 300 cm, diameter = 3 mm

Q. 19 The temperature (T) dependence of resistivity (r) of a semiconductor is represented by

A.


B.


C.


D


Q. 20 The resistance of a wire is R. If the length of the wire is doubled by stretching, then the new resistance will be

A. 2R
B. 4R
C. R
D. R/4

Q. 21 At what temperature will the resistance of a copper wire become three times its value at 0°C (Temperature coefficient of resistance for copper = 4×10^{-3} per °C

A. 400°C
B. 450°C
C. 500°C
D. 550°C

Q. 22 If an observer is moving with respect to a stationary electron, then he observes

A. Only magnetic field
B. Only electric field
C. Both A and B
D. None of the above

Q. 23 The resistance of a 5 cm long wire is 10 ohm. It is uniformly stretched so that its length becomes 20 cm. The resistance of the wire is

A. 160-ohm
B. 80 ohm
C. 40-ohm
D. 20 ohm

Q. 24 Two wires that are made up of two different materials whose specific resistance are in the ratio 2 : 3, length 3 : 4 and area 4 : 5. The ratio of their resistances is

A. 6 : 5
B. 6 : 8
C. 5 : 8
D. 1 : 2

Q. 25 Internal resistance is offered by

A. Capacitor
B. Inductor
C. Dry Cell
D. All of these

Q. 26 To have maximum Power output, internal resistance of the supply must be

A. Equal to Load Resistance
B. Less than Load Resistance
C. Greater than Load Resistance
D. Infinity

Q. 27 If internal resistance of the cell is zero then in a closed circuit

A. Vt > emf
B. Vt < emf
C. Vt = emf
D. Vt = 0

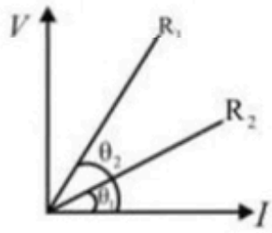
Q. 28 Internal resistance of an ideal current source is

A. Very high
B. Very low
C. Zero
D. Infinity

Q. 29 By a cell a current of 0.9 A flows through 2-ohm resistor and 0.3 A through 7-ohm resistor. The internal resistance of the cell is

A. 0.5-ohm
B. 1.2 ohm
C. 1.0-ohm
D. 2.0 ohm

Q. 30 The V-I graph of a conductor at two different temperatures as shown in Fig. The relation between resistance will be



A. $R_1 > R_2$
B. $R_2 > R_1$
C. $R_1 = R_2$
D. $R_1 = 2\,R_2$

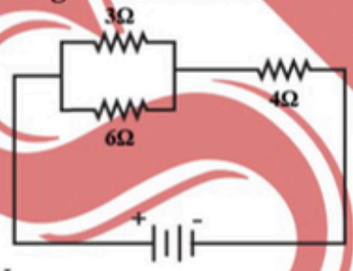
Q. 31 A wire of resistance R is cut into n equal parts. These parts are then connected in parallel. The equivalent resistance of the combination is

A. nR
B. $\frac{n}{R}$
C. $\frac{R}{n}$
D. $\frac{R}{n^2}$

Q. 32 A piece of copper and another of germanium are cooled from room temperature to 77K. The resistance of

A. Each of them increases
B. Each of them decreases
C. Cu increases, Ge decreases
D. Cu decreases and Ge increases

Q. 33 In the following figure, current through 3Ω resistor is 0.8 amp; then the potential drop through 4Ω resistor is:

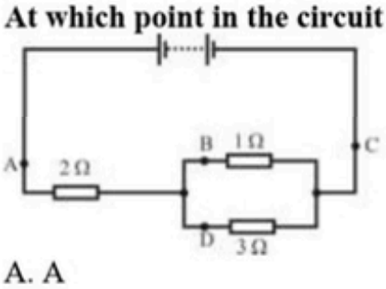


A. 9.6 V
B. 2.6 V
C. 4.8 V
D. 1.2 V

Q. 34 The electric current in conductor is due to the flow of

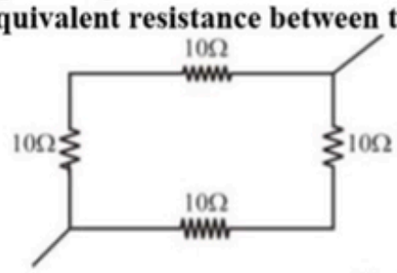
A. Positive charges only
B. Negative charges only
C. Both positive and negative charges
D. Neutral particles only

Q. 35 At which point in the circuit is the current the smallest?



A. A
B. C
C. B
D. D

Q. 36 Four wires of equal length and of resistance 10 W each are connected in the form of a square. The equivalent resistance between two opposite corners of the square is



A. 10 Ω
B. 40 Ω
C. 20 Ω
D. 5/2 Ω

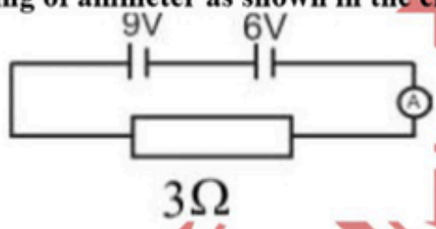
Q. 37 A wire of uniform area of cross-section is cut into 2 halves; the resistance of each part is,

A. Doubled
B. Remains the same
C. Halved
D. One

Q. 38 A flat iron is marked "120 V, 600 W". In normal use, the current in it is:

A. 2 A
B. 4 A
C. 5 A
D. 7.2 A

Q. 39 What is the reading of ammeter as shown in the circuit diagram?



A. 1A
B. 15A
C. 5A
D. 10A

Q. 40 Two resistance R_1 and R_2 are connected with two identical batteries 9 volt if $R_1 = 2R_2$ then current through R_1 is

A. Twice that through R_2
B. Half than that R_2
C. Equal to that through R_2
D. One fourth of R_2

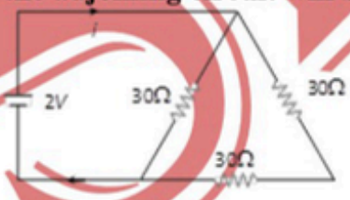
Q. 41 In a semiconductor, an electric current flow due to

A. Free electrons
B. Free electrons and holes
C. Positive and negative ions
D. Protons

Q. 42 The resistances of a wire at temperatures t °C and 0 °Care related by

A. $Rt = R_0(1 + \alpha t)$
B. $Rt = R_0(1 - \alpha t)$
C. $Rt = R_02(1 + \alpha t)$
D. $Rt = R_02(1 - \alpha t)$

Q. 43 The current in the adjoining circuit will be



A. 14/5ampere
B. 1/15ampere
C. 1/10ampere
D. 1/5ampers

Q. 44 The equivalent resistance of resistors connected in series is always

A. Equal to the mean of component resistors
B. Less than the lowest of component resistors
C. In between the lowest and the highest of component resistors
D. Equal to sum of component resistors

Q. 45 Two bulbs are working in parallel order. Bulb A is brighter than bulb B. If R_A and R_B are their resistance respectively then

A. $R_A > R_B$
B. $R_A < R_B$
C. $R_A = R_B$
D. None of these

Q. 46 Two unequal resistances are connected in parallel. Which one of the statements is correct?

A. The current flow is same in both
B. More current will flow form high resistance
C. The potential drop is same in both
D. All of above

Q. 47 Which of following is not same as watt?

A. $\frac{A}{V}$ B. $\frac{J}{s}$

C. AV D. $A^2\Omega$

Q. 48 The electrical resistance of metals

A. Increases with increase in temperature

B. Is independent of temperature

C. Decreases with increase in temperature

D. Increases for some metals and decreases for others

Q. 49 For a metallic wire, the ratio V/I (V= the applied potential difference, I = current flowing) is

A. Independent of temperature

B. Increases as the temperature rises

C. Decreases as the temperature rises

D. Increases or decreases as temperature rises, depending upon the metal

Q. 50 A current flow for 30 seconds in a wire, transfer of charge will be

A. 2×10^{-4} C B. 4×10^{-4} C

C. 6×10^{-4} C D. 8×10^{-4} C

Q. 51 If the current through a resistance is halved, then the

A. Power is halved B. Potential difference is halved

C. Heat dissipated is halved D. Resistance is doubled

Q. 52 Which of the following statements is not true?

A. Conductance is the reciprocal of resistance and is measured in Siemen

B. Ohm's law is not applicable at very low and very high temperatures

C. Ohm's law is applicable to semiconductors

D. Ohm's law is not applicable to electron tubes, discharge tubes and electrolytes

Q. 53 Emf is most closely related to

A. Mechanical force B. Potential difference

C. Electric field D. Magnetic field

Q. 54 Which expression is the best to compare the power dissipation in different resistors which are connected in parallel?

A. I^2R B. IV

C. $\frac{V^2}{R}$ D. Any of these may be used

Q. 55 If a source of emf is traversed from positive to negative the potential change will be

A. Positive B. Negative

C. Zero D. Constant

Q. 56 The charge on an electron is known to be 1.6×10^{-19} coulomb. In a circuit the current flowing is 1 A. How many electrons will be flowing through the circuit in a second?

A. 1.6×10^{19} B. 1.6×10^{-19}

C. 0.625×10^{19} D. 0.625×10^{-19}

Q. 57 Two resistance R_1 and R_2 give combined resistance of 4.5 ohms when in series and 1 ohm when in parallel. The resistance are

A. 3 ohms and 6 ohms B. 3 ohms and 9 ohms

C. 1.5 ohms and 3 ohms D. 1.5 ohms and 0.5 ohms.

Q. 58 Find the terminal potential difference of emf of the battery is 8Volt and its internal resistance 0.5 ohm and current is 4A

A. 4 volt B. 10 volt

C. 6 volt D. 8 volt

Q. 59 Which expression is the best to compare the power dissipation in different resistors which are connected in parallel?

A. I^2R B. IV

C. $\frac{V^2}{R}$ D. Any of these may be used

Q. 60 The product of resistance and conductance of a resister is equal to

A. 1 B. Conductivity

C. Resistivity D. Zero

Q. 61 Three elements having conductance G_1, G_2 and G_3 are connected in parallel. Their combined conductance will be

A. $\dfrac{1}{\frac{1}{G_1}+\frac{1}{G}+\frac{1}{G_3}}$

B. $\dfrac{G_1G_2+G_2G_3+G_3G_1}{G_1+G_2+G_3}$

C. $\dfrac{1}{G_1+G_2+G_3}$

D. $G_1+G_2+G_3$

Q. 62 A battery of emf 10V and internal resistance 0.5Ω is connected across a variable resistance R. The value of RΩ for which the power delivered in it is maximum and is given by

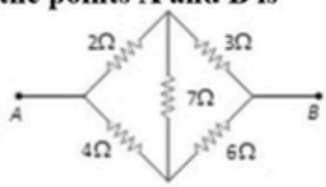
A. 20Ω

B. 1.0Ω

C. 0.25Ω

D. 0.5Ω

Q. 63 Five resistances are connected as shown in the figure. The effective resistance between the points A and B is



A. $\frac{10}{3}\ \Omega$

B. $\frac{20}{3}\ \Omega$

C. 15 Ω

D. 6 Ω

Q. 64 Kirchhoff's first law is based on the law of conservation of;

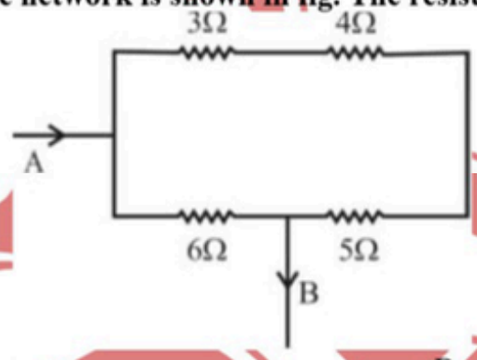
A. Charge

B. Energy

C. Momentum

D. Sum of mass and energy

Q. 65 An electric network is shown in fig. The resistance across AB will be:



A. 12 Ω

B. 6 Ω

C. 4 Ω

D. 18 Ω

Q. 66 The internal resistance of cell of e.m.f. 2V is 0.1 Ω. It is connected to a resistance of 3.9 Ω. The voltage across the cell is

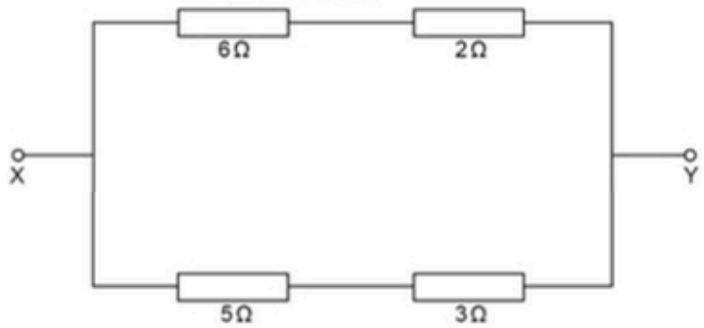
A. 2.71 V

B. 1.95 V

C. 1.68V

D. 0.52V

Q. 67 In the circuit shown, a potential difference of 3 V is applied across XY.



What is the current through the 5 W resistor?

A. $\frac{15}{8}$ A

B. $\frac{3}{4}$ A

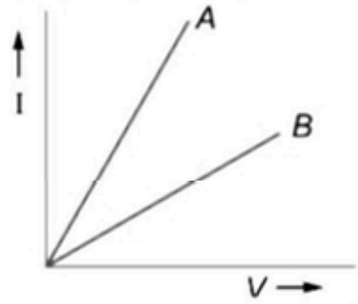
C. $\frac{3}{5}$ A

D. $\frac{3}{8}$ A

Q. 68 When 2 Ohm, 4 Ohm and 6 Ohm resistance are connected in parallel, their resultant resistance will be

A. 12 Ohm
B. $\frac{12}{11}$ Ohm
C. $\frac{11}{12}$ Ohm
D. 11 Ohm

Q. 69 V-I graph for parallel and series combination of two metallic resistor are as shown in figure. Which graph represent parallel combination?



A. A
B. B
C. A and B both
D. Neither A not B

Q. 70 Two bulbs of 500 W and 300 W are manufactured to operate on a 220V line. If their resistances are R_1 and R_2 respectively, the value of R_1/R_2 is,

A. $\frac{5}{3}$
B. $\frac{25}{9}$
C. $\frac{3}{5}$
D. $\frac{9}{25}$

Q. 71 A 5-ampere fuse wire can withstand a maximum power of 1 watt in the circuit. The resistance of the fuse wire is:

A. 0.4 Ω
B. 0.04 Ω
C. 5 Ω
D. 0.2 Ω

Q. 72 The substance having negative temperature co-efficient is:

A. Carbon
B. Tungsten
C. Iron
D. Gold

Q. 73 What would be the equivalent resistance of a circuit having three resistances of 9 each, connected in parallel

A. 6 Ω
B. 27 Ω
C. 3 Ω
D. 1 Ω

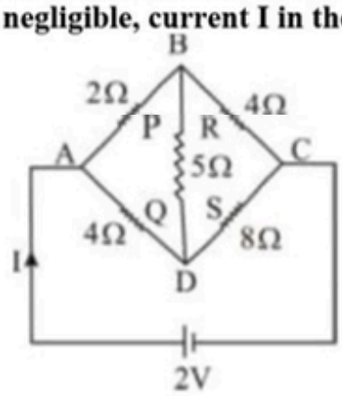
Q. 74 A wire of resistance 4is bent in the form a circle. The resistance between the ends of any diameter is

A. 1 Ω
B. 2 Ω
C. 4 Ω
D. 8 Ω

Q. 75 What is the current in a 2×10^6-ohm resistors having a potential difference of 2×10^3 volts?

A. 10^{-1} A
B. 10^{-4} A
C. 10^{-2} A
D. 1 m A

Q. 76 Figure shows a network of resistances connected to a 2V battery. If the internal resistance of the battery is negligible, current I in the circuit is.



A. 0.25 A
B. 0.75 A
C. 0.5 A
D. 1.0 A

Q. 77 A 90V P.D is applied across 10and 20resistor in series the current in the 20 resistor is _____.

A. 2A B. 3A
C. 4A D. None of these

Q. 78 Two resistances are connected in A) series B) in parallel. The effective resistance in two cases 9and 2respectively. The value of resistance will be

A. 2 Ω and 7 Ω B. 3 Ω and 9 Ω
C. 3 Ω and 6 Ω D. 5 Ω and 4 Ω

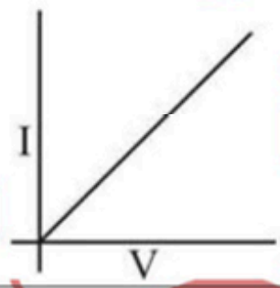
Q. 79 An electric room radiator, which operates at 50V has resistance of 50 Ω. Power of the radiator is approximately,

A. 100 W B. 50W
C. 450 W D. 1000 W

Q. 80 We are able to obtain fairly large currents in a conductor because

A. The electron drift speed is usually very large
B. The number density of free electrons is very high and this can compensate for the low values of the electron drift speed and the very small magnitude of the electron charge
C. The number density of free electrons as well as the electron drift speeds are very large and these compensate for the very small magnitude of the electron charge
D. The very small magnitude of the electron charge has to be divided by the still smaller product of the number density and drift speed to get the electric current

ANSWERS & EXPLANTION: -

Q.1	**C**	$I = \frac{V}{R} = \frac{Q}{t} \Rightarrow Q = \frac{Vt}{R} = \frac{20\times2\times60}{10} = 240C$
Q.2	**A**	V= I R or R = V / I
Q.3	**A**	$I \propto V$ 
Q.4	**C**	Ohm law is $I \propto V$ is a straight line and will obey from X to Y only.
Q.5	**A**	For ohmic resistance V ∝ I V=IR ∴ (here R is constant)
Q.6	**D**	Slope of V-i curve = R(= ρl/A) But in given curve axis of i and V are interchanged. So slope of given curve =1/R(=A/ρl) i.e. with the increase in length of the wire. Slope of the curve will decrease.
Q.7	**A**	Because with rise in temperature resistance of conductor increase, so graph between V and i becomes nonlinear.
Q.8	**C**	$i = \frac{ne}{t} = \frac{62.5\times10^{18}\times1.6\times10^{-19}}{1} = 10\,ampere$
Q.9	**B**	This is because of secondary ionization which is possible in the gas filled in it
Q.10	**D**	$I = \frac{P}{V} = \frac{50}{250} = 0.2$ amp.
Q.11	**B**	$R \propto \frac{1}{A} \Rightarrow R \propto \frac{1}{r^2} \propto \frac{1}{d^2}$ where d is diameter of wire
Q.12	**C**	For metallic conductors, temperature co-efficient of resistance is positive.
Q.13	**D**	

Q.14	**A**	Internal resistance ∝ 1/Temperature
Q.15	**D**	Resistivity depends only on the material of the conductor.
Q.16	**A**	$\frac{R_1}{R_2} = \left(\frac{r_2}{r_1}\right)^4 \Rightarrow \frac{R}{R_2} = \left(\frac{nr}{r}\right)^4 \Rightarrow R_2 = \frac{R}{n^4}$
Q.17	**B**	$R \propto \frac{l}{r^2} \Big\vert \therefore \frac{R_2}{R_1} = \frac{l_2}{l_1} \times \frac{{r_1}^2}{{r_2}^2} \Big\vert = \left(\frac{2}{1}\right) \times \left(\frac{1}{2}\right)^2 \Big\vert = \frac{1}{2} \Big\vert \therefore R_2 = \frac{R_1}{2}$ specific resistance doesn't depend upon length, and radius.
Q.18	**A**	R ∝ l/r2 For highest resistance l/r2 should be maximum, which is correct for option
Q.19	**C**	With rise in temperature, resistivity of semiconductors decreases exponentially.
Q.20	**B**	R ∝ l^2, If l doubled then R becomes 4 times.
Q.21	**C**	By using $R_t = R_0(1 + \alpha t)$ $3 \times R_0 = R_0(1 + 4 \times 10^{-3} t)$ $\Rightarrow t = 500°C$
Q.22	**C**	Magnetic field and Electric field are independent of motion or frame of reference. so observer would observe both field.
Q.23	**A**	$\frac{R_1}{R_2} = \left(\frac{l_1}{l_2}\right)^2 \Big\vert \Rightarrow \frac{10}{R_2} = \left(\frac{5}{20}\right)^2 = \frac{1}{16} = R_2 = 160\Omega$
Q.24	**C**	$\text{Resistance} = \rho \frac{l}{A} \Big\vert$ $\frac{R_1}{R_2} = \frac{\rho_1}{\rho_2} \times \frac{l_1}{l_2} \times \frac{A_2}{A_1} = \frac{2}{3} \times \frac{3}{4} \times \frac{5}{4} = \frac{5}{8}$
Q.25	**C**	Internal resistance is offered by Battery or Dry cell
Q.26	**A**	For maximum power output r = R
Q.27	**C**	Vt = E − Ir Vt = E − I(0) Vt = E
Q.28	**C**	ideal source don't cause the drop of voltage within it
Q.29	**A**	0.9 (2 + r) = 0.3 (7 + r) 18 + 9r = 21 + 3r r = 0.5
Q.30	**A**	
Q.31	**D**	
Q.32	**D**	
Q.33	**C**	
Q.34	**B**	
Q.35	**D**	

Q.36	A	
Q.37	C	
Q.38	C	
Q.39	C	
Q.40	B	
Q.41	B	
Q.42	A	
Q.43	C	
Q.44	D	
Q.45	B	
Q.46	C	
Q.47	A	
Q.48	A	
Q.49	B	
Q.50	C	
Q.51	B	
Q.52	C	
Q.53	B	
Q.54	C	
Q.55	B	
Q.56	C	
Q.57	C	
Q.58	C	
Q.59	C	
Q.60	A	
Q.61	D	
Q.62	D	
Q.63	A	
Q.64	A	
Q.65	C	
Q.66	B	
Q.67	D	
Q.68	B	
Q.69	A	
Q.70	C	
Q.71	B	
Q.72	A	

Q.73	C	
Q.74	A	
Q.75	D	
Q.76	C	
Q.77	B	
Q.78	C	
Q.79	B	
Q.80	B	

Electromagnetism & Electromagnetic Induction

Magnetic field, Magnetic Flux and Magnetic Flux Density

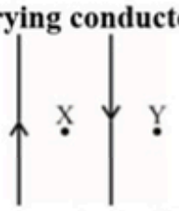
Q. 1 The Weber is unit of measure of

A. Conductance
B. Electric current
C. Magnetic flux
D. Electric flux

Q. 2 The relationship between Tesla and smaller unit Gauss of magnetic induction is given by

A. $1T = 10^3$ G
B. $1T = 10^{-4}$ G
C. $1T = 10^{-2}$ G
D. $1T = 10^4$ G

Q. 3 Two current carrying conductors are placed parallel as shown in figure.



Which point will experience the strong magnetic field?

A. X
B. Both experience same magnetic field
C. Y
D. None of these

Q. 4 If a current flows through the wire directed out of the paper, the magnetic field is represented by

A. clockwise circular lines
B. Anticlock wise circular lines
C. lines parallel to the wire
D. lines perpendicular to the wire

Q. 5 The direction of magnetic field due to current carrying conductor can be determined by

A. left hand rule
B. right hand rule
C. palm right hand rule
D. Fleming's left hand rule

Q. 6 The diagram shows a straight wire carrying a flow of electrons into the page. The wire is between the poles of a permanent magnet. The direction of the magnetic force exerted on the wire is

A. ↓
B. →
C. ←
D. ↑

Q. 7 The study of magnetism produced by electric current and electric current produced by changing magnetic field is called

A. magnetic field
B. electric current
C. electric and magnetic field
D. electromagnetism

Q. 8 Magnetic flux and flux density are related by _____

A. Magnetic flux = flux density / area
B. Magnetic flux = flux density × area
C. Flux density = magnetic flux area
D. Flux density = magnetic flux × area

Force acting on a charged particle in a uniform magnetic field.

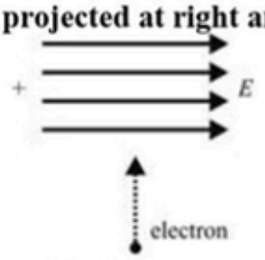
Q. 9 The charged particle enters the uniform magnetic field in such a way that its initial velocity is not perpendicular to the field, the orbit will be _____

A. A circle
B. A spiral
C. An ellipse
D. A helix

Q. 10 The magnitude of force experienced by a stationary charged particle in a uniform magnetic field is

A. $q(\vec{V} \times \vec{B})$
B. Minimum
C. Zero
D. Maximum

Q. 11 An electron is projected at right angles to a uniform electric field E. It will deflect:



A. Into the plane of the paper
B. Out of the paper
C. To the left
D. To the right

Q. 12 A charge of 1C is moving in a magnetic field of 0.5Tesla with a velocity of 10m/sec Perpendicular to the field. Force experienced is

A. 5 N
B. 10 N
C. 0.5 N
D. 0 N

Q. 13 A uniform electric field and a uniform magnetic field are produced, pointed in the same direction. An electron is projected with its velocity pointing in the same direction

A. The electron will turn to its right
B. The electron will turn to its left
C. The electron velocity will increase in magnitude
D. The electron velocity will decrease in magnitude

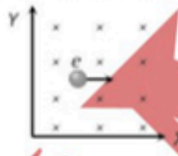
Q. 14 A charge moving with velocity v in X-direction is subjected to a field of magnetic induction in the negative X-direction. As a result, the charge will

A. Remain unaffected
B. Start moving in a circular path Y-Z plane
C. Retard along X-axis
D. Move along a helical path around X-axis

Q. 15 An electron is travelling in east direction and a magnetic field is applied in upward direction then electron will deflect in

A. South
B. North
C. West
D. East

Q. 16 In the given figure, the electron enters into the magnetic field. It deflects in .....direction



A. + ve X direction
B. - ve X direction
C. + ve Y direction
D. -ve Y direction

Q. 17 An electron moving with a uniform velocity along the positive x-direction enters a magnetic field directed along the positive y-direction. The force on the electron is directed along

A. Positive y-direction
B. Negative y-direction
C. Positive z-direction
D. Negative z-direction

Q. 18 A very high magnetic field is applied to a stationary charge. Then the charge experiences

A. A force in the direction of magnetic field
B. A force perpendicular to the magnetic field
C. A force in an arbitrary direction
D. No force

Path followed by charge particle magnetic field

Q. 19 When a charged particle moves through a magnetic field, the effect of the field changes the particles

A. Speed
B. Mass
C. Energy
D. Direction

Q. 20 Which of the following is positively charge particle?

A. A
B. B
C. C
D. Undetermined

Q. 21 Two ions having masses in the ratio 1:1 and charges 1:2 are projected into uniform magnetic field perpendicular to field with speeds in the ratio 2:3 the ratio of the radii of circular parts along which the two particles move is

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

Q. 22 If the direction of the initial velocity of the charged particle is neither along nor perpendicular to that of the magnetic field, then the orbit will be

A. A straight line
B. An ellipse
C. A circle
D. A helix

Q. 23 An electron is travelling horizontally towards east. A magnetic field in vertically downward direction exerts a force on the electron along

A. East
B. West
C. North
D. South

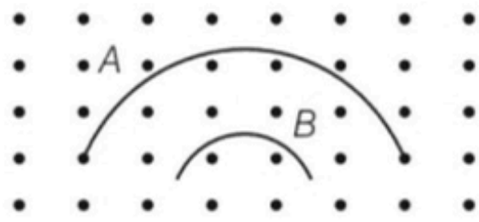
Q. 24 An electron enters a magnetic field whose direction is perpendicular to the velocity of the electron. Then

A. The speed of the electron will increase
B. The speed of the electron will decrease
C. The speed of the electron will remain the same
D. The velocity of the electron will remain the same

Q. 25 A charged particle enters a magnetic field B with its initial velocity making an angle of 45∘ with B. The path of the particle will be

A. A straight line
B. A circle
C. An ellipse
D. A helix

Q. 26 Two particles A and B of masses m_A and m_B respectively and having the same charge are moving in a plane. A uniform magnetic field exists perpendicular to this plane. The speeds of the particles are v_A and v_B respectively, and the trajectories are as shown in the figure. Then



A. $m_Av_A < m_Bv_B$
B. $m_Av_A > m_Bv_B$
C. $m_Av_A = m_Bv_B$
D. None of these

Q. 27 Motion of a moving electron is not affected by

A. An electric field applied in the direction of motion
B. Magnetic field applied in the direction of motion
C. Electric field applied perpendicular to the direction of motion
D. Magnetic field applied perpendicular to the direction of motion

Q. 28 At a specific instant emission of radioactive compound is deflected in a magnetic field. The compound can emit

I. Electrons
II. Protons
III. He^{2+}
IV. Neutrons The emission at the instant can be

A. I, II, III
B. I, II, III, IV
C. IV
D. II, III

Electromagnetic induction, Faraday's Law, Application in seismometer

Q. 29 When the magnetic flux changes from 20 Wb to 50 Wb in 3 sec through coil of 50 turns then induce emf will be

A. 500 V
B. 400 V
C. 300 V
D. 200 V

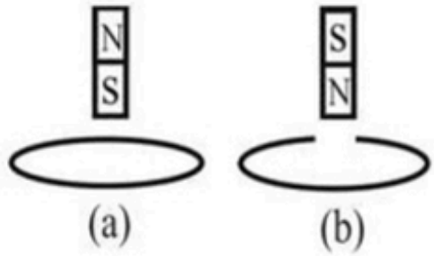
Q. 30 Which of the following does not affect the magnitude of the induced emf in electromagnetic induction?

A. Magnetic field strength
B. Resistance of coil
C. Speed of coil
D. Number of turns in the coil

Q. 31 A copper rod of length l is rotated about the end perpendicular to the uniform magnetic field B with constant angular velocity. The induced emf between its two ends is

A. Zero
B. $B\omega\ell^2$
C. $\frac{1}{2}B\omega\ell^2$
D. $\frac{1}{4}B\omega\ell$

Q. 32 In a closed ring (a) and in open ring (b) magnets are falling along the axis of the ring. The current generated in a and b have directions



A. Clockwise, Zero
B. Anticlockwise, clockwise
C. Anticlockwise, zero
D. Zero, zero

Q. 33 A coil of wire is arranged with its plane perpendicular to a uniform magnetic field of flux density B. when the radius of the coil increases from r_1 to r_2 in time Δt, then what is the emf induced in the coil?

A. $\frac{\pi B(r_2^2 - r_1^2)}{\Delta t}$
B. $\frac{\pi B(r_2 - r_1)^2}{\Delta t}$
C. $\frac{B(r_2^2 - r_1^2)}{\Delta t}$
D. $\frac{\pi B(r_2^2 + r_1^2)}{\Delta t}$

Q. 34 The emf induced in a conductor of unit length moving with unit velocity at right angles to a magnetic field is equal to

A. Magnetic flux density
B. Torque
C. Mutual induction
D. Motional emf

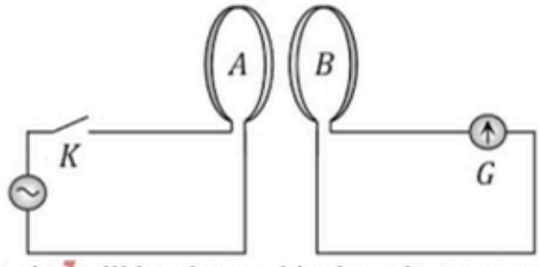
Q. 35 A coil having an area $2m^2$ is placed in a magnetic field which changes from $1Wb/m^2$ to $4Wb/m^2$ in a interval of 2 second. The e.m.f. induced in the coil will be

A. 3 V
B. 1.5V
C. 2 V
D. 4V

Q. 36 In a circuit with a coil of resistance 2 ohms, the magnetic flux changes from 2.0 Wb to 10.0 Wb in 0.2 second. The charge that flows in the coil during this time is

A. 5.0 coulomb
B. 4.0 coulomb
C. 1.0 coulomb
D. 0.8 coulomb

Q. 37 The diagram below shows two coils A and B placed parallel to each other at a very small distance. Coil A is connected to an ac supply. G is a very sensitive galvanometer. When the key is closed



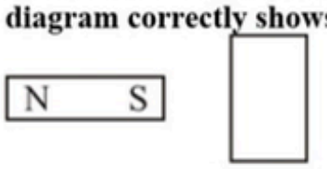
A. Constant deflection will be observed in the galvanometer for 50 Hz supply
B. Visible small variations will be observed in the galvanometer for 50 Hz input
C. Oscillations in the galvanometer may be observed when the input ac voltage has a frequency of 1 to 2 Hz
D. No variation will be observed in the galvanometer even when the input ac voltage is 1 or 2 Hz

Q. 38 An infinitely long cylinder is kept parallel to an uniform magnetic field B directed along positive z axis. The direction of induced current as seen from the z axis will be

A. Clockwise of the +ve z axis
B. Anticlockwise of the +ve z axis
C. zero
D. Along the magnetic field

Lenz's Law

Q. 39 An iron bar is placed near a magnet and iron bar is moving away as shown, which diagram correctly shows the induced magnetism of the iron bar?



A. 

B. 

C. 

D. 

Q. 40 In a step-up transformer the number of turns in

A. Primary are less
B. Primary are more
C. Primary and secondary are equal
D. Primary are infinite

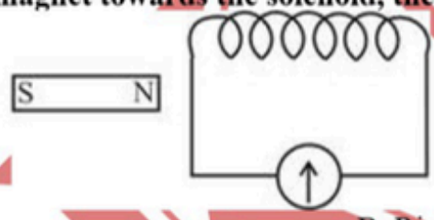
Q. 41 emf induced in a circuit according to Faraday's law depends on the _____

A. Maximum magnetic flux
B. Rate of change of Electric flux
C. Change in magnetic flux
D. Time rate of change of magnetic flux

Q. 42 Faraday's law states that an induced emf is proportional to:

A. The rate of change of the magnetic field
B. The rate of change of the electric field
C. The rate of change of the magnetic flux
D. The rate of change of the electric flux

Q. 43 In pushing the magnet towards the solenoid, the meter shows deflection towards



A. Left
B. Right
C. No deflection
D. Vibration

Q. 44 A cylindrical bar magnet is kept along the axis of a circular coil. If the magnet is rotated about its axis, then

A. A current will be induced in a coil
B. No current will be induced in a coil
C. Only an e.m.f. will be induced in the coil
D. An e.m.f. and a current both will be induced in the coil

Q. 45 The current flowing in two coaxial coils in the same direction. On increasing the distance between the two, the electric current will

A. Increase
B. Decrease
C. Remain unchanged
D. The information is incomplete

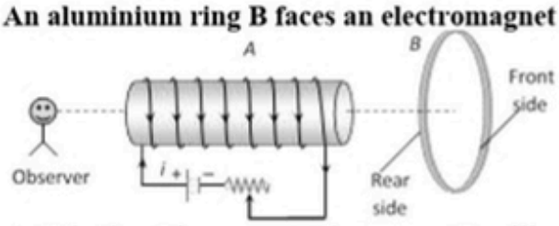
Q. 46 The direction of induced current is such that it opposes the very cause that has produced it. This is the law of

A. Lenz
B. Faraday
C. Kirchhoff
D. Fleming

Q. 47 If a coil of metal wire is kept stationary in a non-uniform magnetic field, then

A. An e.m.f. is induced in the coil
B. A current is induced in the coil
C. Neither e.m.f. nor current is induced
D. Both e.m.f. and current is induced

Q. 48 An aluminium ring B faces an electromagnet A. The current I through A can be altered



A. Whether I increase or decreases, B will not experience any force
B. If I decrease, A will repel B
C. If I increase, A will attract B
D. If I increase, A will repel B

Alternating Current Generator

Q. 49 The stator consists of group of _____

A. coils
B. bar magnets
C. electromagnets
D. rings

Q. 50 When the polarity of stator poles changes then it forces rotor to rotate at an angle of _____

A. 30°
B. 45°
C. 60°
D. 90°

Q. 51 The back emf of motor can be _____

A. $\varepsilon = V - IR$
B. $V = \varepsilon - IR$
C. $V = \varepsilon + IR$
D. Both "A" and "C"

Q. 52 The expression of current generated by A.C generator

A. $I_0 = I\sin(2\pi ft)$
B. $I = I_0\sin(2\pi ft)$
C. $I = \frac{I_0}{\sqrt{2}}$
D. $I = I_0\cos(2\pi ft)$

Q. 53 A coil of area 80 cm^2 and 50 turns is rotating with 2000 revolutions per minute about an axis perpendicular to a magnetic field of 0.05 T. The maximum value of the emf developed in it is

A. $200\pi V$
B. $\frac{10\pi}{3}$ V
C. $\frac{4\pi}{3}$ V
D. $\frac{2}{3}$ V

Q. 54 A sinusoidal current is represented by the equation. Which equation represents the sinusoidal current with both its frequency and amplitude doubled?

A. $I = I_0\sin(2\theta t)$
B. $I_0 = I\sin(2\theta t)$
C. $I = 2I_0\sin(2\theta t)$
D. $I = I_0\sin(\frac{1}{2}\theta t)$

Q. 55 When the motor is loaded then

A. speed of motor decrease
B. back emf decrease
C. flow of current increase
D. All of above

Q. 56 An electric motor has a back emf of 110 V and armature current of 90 A. The armature is making 24.5 revolutions per second. The torque on the armature is

A. $\frac{110 \times 90}{2\pi \times 24.5}$ Nm
B. $\frac{2\pi \times 24.5}{110 \times 90}$ Nm
C. $\frac{\pi \times 24.5}{110}$ Nm
D. $\frac{90\pi}{110 \times 24.5}$ Nm

Q. 57 A generator produces 100V when rotated at certain speed. If its speed of rotation is doubled what will be the output voltage,

A. 100V
B. 200V
C. 50V
D. None of these

Q. 58 In A.C the inductors behave like

A. Capacitors
B. Resistors
C. Insulators
D. Transistors

Transformers

Q. 59 In an ideal transformer the output voltage is _____ to the input voltage.

A. less than
B. equal
C. greater than
D. may have any value

Q. 60 Step up transformer has transformation ratio of 3 :2 what is voltage in secondary if voltage in primary is 30 V?

A. 45V
B. 15V
C. 90V
D. 300V

Q. 61 Transformers work on the principle of

A. self-induction
B. electrostatic induction
C. mutual induction
D. none of these

Q. 62 The efficiency of a transformer is given by

A. $efficiency = \frac{Input\ power}{Output\ Power} \times 100$

B. $efficiency = \frac{Output\ power}{Input\ Power} \times 100$

C. $efficiency = Input\ power \times Output\ Power \times 100$

D. $efficiency = \frac{Output\ power}{Input\ Power} \times \frac{1}{100}$

Q. 63 The coils of a step-down transformer have 500 and 5000 turns. In the primary coil an AC of 4 A at 2200 volts is sent. The value of the current and potential difference in the secondary will be.

A. 20 A, 22V
B. 0.4 A, 22000 A
C. 40 A, 220V
D. 40 A, 22000V

Q. 64 The turn ratio of a transformer is $\frac{1}{2}$ If a dry cell of emf 1.5 volt is connected with primary then emf establish in secondary is

A. 0.75 V
B. 3 V
C. 1.5 V
D. Zero

Q. 65 The output voltage of a transformer is 3 times the input voltage then turns ratio will be_____

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

Q. 66 A transformer is employed to reduce 220 V to 11 V. The primary draws a current of 5 A and the secondary 90 A. The efficiency of the transformer is

A. 20%
B. 40%
C. 70%
D. 90%

Q. 67 If electron is moving from A to B in wire Ab, then current induced in the coil is

A. Anticlockwise
B. Clockwise
C. No current will be induced
D. Arbitrary direction

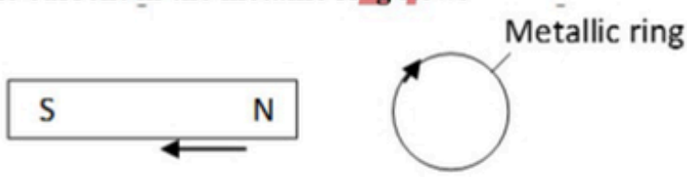
Q. 68 A step-up transformer is used on a 120 V line to provide a potential difference of 2400 V. If the primary coil has 75 turns, the number of turns in the secondary coil is

A. 1500
B. 150
C. 1200
D. 1575

Q. 69 The magnetic flux linked with a coil is changed from 1 weber to 0.1 weber in 0.1 sec. the induced e.m.f is:

A. 9V
B. 10V
C. 0.009V
D. 1/9V

Q. 70 The north pole of a magnet is moved away from a metallic ring as shown in figure. The current in the metallic ring flows



A. Anticlockwise
B. First anticlockwise then clockwise
C. Clockwise
D. First clockwise then anticlockwise

Q. 71 Laminated core in a transformer is used to reduce

A. Eddy current losses
B. Iron losses
C. Hysteresis losses
D. Heat losses due to resistance

Q. 72 The power loss in transformer is due to

A. Eddy current
B. Resistance of coils
C. Magnetic hysteresis
D. All

Q. 73 The root mean square (rms) values of current and voltage are

A. Always positive
B. Related to the amplitude of the instantaneous sinusoidal values.
C. Known as effective values
D. All of the above

Q. 74 V_{rms} **is** _____ **percent of peak value**

A. 30% B. 70%

C. 141% D. 41%

Q. 75 In transformer when the voltage in the secondary is increased the current in the secondary

A. Increases B. Remain same

C. Decreases D. Becomes zero

Q. 76 Such a transformer in which voltage across secondary is less than the primary voltage, is called

A. Step up transformer B. Ideal transformer

C. Step down transformer D. None of these

Q. 77 The angular frequency of rotation of an A.C. generator is given by:

A. $\omega = \frac{2\pi}{T}$ B. $\omega = 2\pi T$

C. $\omega = \frac{2\pi}{f}$ D. $\omega = \frac{2\pi f}{T}$

Q. 78 The sum of positive and negative peak values are usually written as:

A. Peak Value B. Rms Value

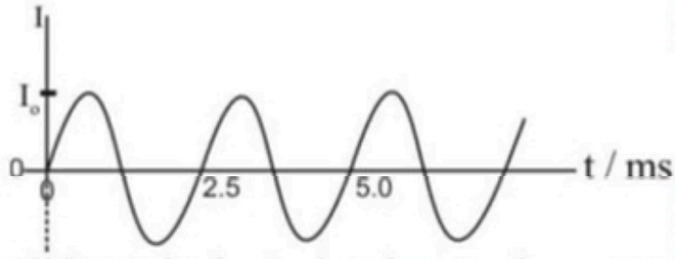
C. Peak to Peak Value D. Average Value

Q. 79 The phase of A.C at the positive peak from origin is:

A. $\frac{\pi}{2}$ B. π

C. $\frac{\pi}{4}$ D. $\frac{3\pi}{2}$

Q. 80 The graph shows how an alternating current I of peak value I_o varies with time



Which expression gives the alternating current I?

A. $I = I_o \sin(5\pi t)$ B. $I = I_o \sin\left(\frac{2\pi t}{2.5}\right)$

C. $I = I_o \sin\left(\frac{\pi t}{0.0025}\right)$ D. $I = I_o \sin(800\pi t)$

Q. 81 The unit of magnetic flux is:

A. tesla B. henry

C. weber D. Rutherford

Q. 82 In a step-up transformer the turn ratio is 1:2. A Leclanche cell (emf = 1.5 V) is connected across the primary. The voltage across the secondary is:

A. 3 V B. 1.5 V

C. 0.75 V D. Zero

Q. 83 A wire of length 2m carries a current of 10 A. What is the force acting on it when it is placed at an angle of 30° to the uniform magnetic field of 0.15 T?

A. 1.5 N B. 3.2 N

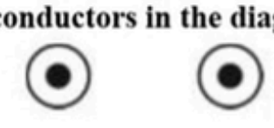
C. 2.5 N D. $\frac{3}{\sqrt{2}}$ N

Q. 84 Which of the following have smallest e/m ratio?

A. Electron B. – particle

C. Proton D. α – particle

Q. 85 Will the two conductors in the diagram given below repel or attract?



A. Repel B. Attract

C. Neither repel nor attract D. Insufficient data

Q. 86 Electron and proton of equal momentum enter a uniform magnetic field normal to the lines of force. If the radii of curvature of circular paths be r_e and r_p respectively, then

A. $\frac{r_e}{r_p} = \frac{1}{1}$ B. $\frac{r_e}{r_p} = \frac{m_p}{m_e}$

C. $\frac{r_e}{r_p} = \sqrt{\left(\frac{m_p}{m_e}\right)}$ D. $\frac{r_e}{r_p} = \sqrt{\left(\frac{m_e}{m_p}\right)}$

Q. 87 A particle of charge q is stationary at a place where the magnetic field is B along the x-axis. The force on the charge due to B is:

A. Proportional to qB along x-direction B. Proportional to q2B along x-direction

C. Zero D. Proportional to $q\sqrt{B}$ in y-z plane

Q. 88 Which of the following quantities is not affected by a magnetic field?

A. Stationary charge B. Change in magnetic field

C. Moving charge D. Current flowing in a conductor s

Q. 89 A proton is moving with a velocity of 3×10^7 m / s in the direction of a uniform magnetic field of 0.5 Tesla. The force acting on proton is.

A. 2 N B. 6 N

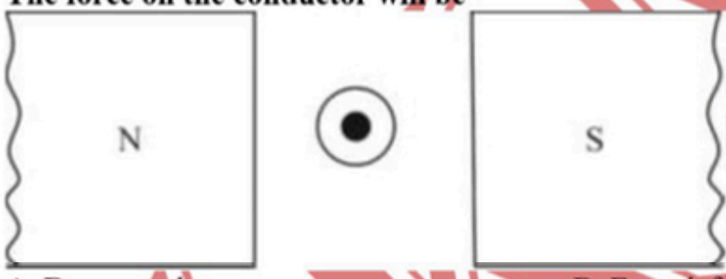
C. 4 N D. Zero

Q. 90 If a particle is moving in a region of both electric & magnetic fields then the total force acting on it is.

A. Sum of electric & magnetic force B. No force will act on it

C. Difference of electric & magnetic force D. None of above

Q. 91 The force on the conductor will be



A. Downward B. From left to right

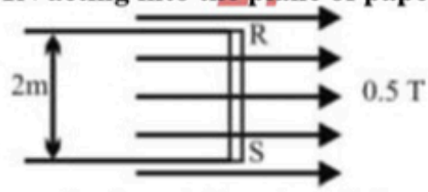
C. From right to left D. Upward

Q. 92 A current is flowing in a wire C as shown in the figure. The force on this conducting wire will be

A. Towards right B. Downwards

C. Towards left D. Upwards

Q. 93 The diagram shows a current carrying conductor RS of length 2m placed perpendicular to a magnetic field of flux density 0.5 tesla. The resulting force on the conductor is 1N acting into the plane of paper



What is the magnitude and direction of the current?

A. 1 A from R to S B. 2A from R to S

C. 1A from S to R D. 2A form S to R

Q. 94 To construct a step-up transformer:

A. Ns < Np B. Ns = Np

C. Np < Ns D. Ns . Np = 1

Q. 95 According to Faraday's law of electromagnetic induction

A. Electric field is produced by time varying magnetic flux

B. Magnetic field is produced by time-varying electric flux

C. Magnetic field is associated with a moving charge

D. Magnetic field is not associated with a constant charge

Q. 96 In step up transformer, voltage in the secondary increases and power in secondary

A. Remain same B. Decreases because voltage increases

C. Increases because current decreases D. May increases if voltage remain same

Q. 97 A coil having 500 square loops, each of side 10 cm, is placed normal to a magnetic field which increases at the rate of 1.0T/s. The induced emf in volts is

A. 0.1 B. 0.5
C. 0.1 D. 5.0

Q. 98 A step-up transformer operates on a 230-volt line and supplies to a load of 2 amp. The ratio of primary to secondary windings is 1:25. Determine the primary current.

A. 12.5 amp B. 50 amp
C. 8.8 amp D. 25 amp

Q. 99 An induced emf is produced when a magnet is plugged into a coil. The magnitude of the induced emf is independent of

A. The strength of the magnet
B. The speed with which the magnet is moved
C. The resistivity of the wire of the coil
D. The number of turns in the coil

Q. 100 An electron moves at 2×10^2m/sec perpendicular to magnetic field of 2T. What is the magnitude of magnetic force?

A. 2×10^{-6}N B. 3.6×10^{-24}N
C. 6.4×10^{-17}N D. 4×10^{6}N

Q. 101 An electron is injected into a uniform magnetic field with components of velocity parallel to and normal to the field direction. The path of the electron is a

A. Helix B. Circle
C. Parabola D. Straight line

Q. 102 If the current flowing through the conductor is made two times. Magnetic field strength due to it will increase;

A. Two times B. Three times
C. Remain same D. Four times

Q. 103 The unit of magnetic flux is equal to;

A. Weber B. Tesla
C. N/C D. Wb/A

Q. 104 The force experienced by a conductor of length 'L' carrying current I, placed perpendicular in uniform magnetic field 'B' is

A. $\vec{F} = ILB\hat{n}$ B. $\vec{F} = I(\vec{L} \cdot \vec{B})$
C. $\vec{F} = (\vec{L} \times \vec{B})$ D. $F = ILB\cos\theta$

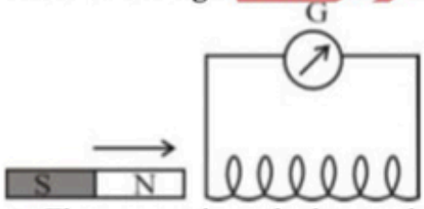
Q. 105 One Wbm^{-2} is equal to

A. 10^4 gauss B. 10^2 gauss
C. 10^{-2} gauss D. 10^{-4} gauss

Q. 106 The magnetic field outside a long straight current-carrying wire depends on the distance R from the wire axis according to:

A. $1/R$ B. $1/R^2$
C. $1/R^3$ D. $1/R^{3/2}$

Q. 107 Refer to the figure maximum deflection in the galvanometer occurs when



A. The magnet is pushed toward the coil
B. The magnet is stationary at the center of coil
C. The magnet is rotated about the axis of the coil
D. The number of turns in the coil is reduced

Q. 108 No force acts on a current carrying conductor when it is placed.

A. Perpendicular to the magnetic field B. Parallel to the magnetic field
C. Far away from the magnetic field D. Inside a magnetic field

Q. 109 The branch of physics which deals with the magnetic effect of electric current is known as

A. Magnetism B. Electromagnetism
C. Electrical engineering D. Electronics engineering

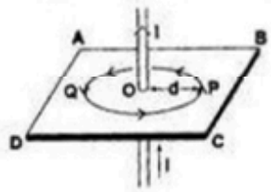
Q. 110 The magnetic flux through a wire loop in a magnetic field does not depend on

A. The area of the loop
B. The magnitude of the field
C. The shape of the loop
D. The angle between the plane of the loop and the direction

Q. 111 The energy stored in an electrostatic field or electromagnetic field is called

A. Electromagnetic energy
B. Kinetic energy
C. Potential energy
D. Rest energy

Q. 112 A straight conductor carries a current vertically upwards. Points P and Q respectively lie to the east and west of the conductor at the same distance as shown below. How is P related to Q in terms of magnetic field?



A. P has more magnitude than Q
B. Q has more magnitude than P
C. P and Q have the same magnitude
D. P and Q may have different magnitude

Q. 113 A straight wire of length 0.5 metre and carrying a current of 1.2 ampere placed in a uniform magnetic field of induction 2 Tesla. The magnetic field is perpendicular to the length of the wire. The force on the wire

A. 2.4 N
B. 1.2 N
C. 3.0 N
D. 2.0 N

Q. 114 Diagram shows three parallel wires carrying equal currents. The resultant force on the middle wire is

A. To the left
B. Zero
C. To the right
D. Remain stationary

Q. 115 To construct a step-down transformer:

A. $N_s < N_p$
B. $N_s = N_p$
C. $N_p < N_s$
D. $N_s . N_p = 1$

Q. 116 Lenz's law gives

A. The magnitude of the induced e.m.f.
B. Both the magnitude and direction of the induced current
C. The direction of the induced current
D. The magnitude of the induced current

Q. 117 The primary winding of a transformer has 100 turns and its secondary winding has 200 turns. The primary is connected to an ac supply of 120 V and the current flowing in it is 10 A. The voltage and the current in the secondary are

A. 240 V, 5 A
B. 240 V, 10 A
C. 60 V, 20 A
D. 120 V, 20 A

Q. 118 The alternating voltage induced in the secondary coil of a transformer is mainly due to

A. A varying electric field
B. A varying magnetic field
C. The vibrations of the primary coil
D. The iron core of the transformer

Q. 119 The maximum emf generated by A.C generator is

A. $N\omega AB \cos\theta$
B. $N\omega AB \sin\theta$
C. $N\omega AB$
D. $n\omega AB \tan\theta$

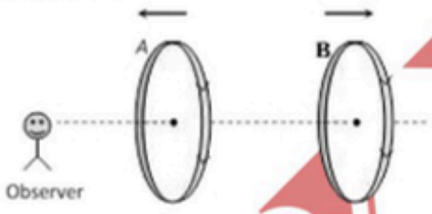
Q. 120 Which of the following quantities remain constant in step up transformer?

A. Current
B. Voltage
C. Power
D. Heat

ANSWERS & EXPLANTION: -

Q.81	**C**	Weber is the SI unit of magnetic flux
Q.82	**D**	$1T = 10^4G$
Q.83	**A**	The magnetic field due to these two currents carrying conductors will reinforce each other at the center. So, the point of strong magnetic field will be X.
Q.84	**B**	
Q.85	**B**	Right hand rule.
Q.86	**D**	Right hand palm rule. $\vec{F} = I(\vec{L} \times \vec{B})$ Cross product of L and B
Q.87	**D**	Definition
Q.88	**B**	$\phi = BA$
Q.89	**D**	At acute angle, the path will be helix.
Q.90	**C**	$F = qvB\sin\theta$ $v = 0$ $\Rightarrow F = 0$
Q.91	**C**	Electron will move toward positive side i.e. towards left.
Q.92	**A**	$F = qBv = 1 \times 0.5 \times 10 = 5\ N$
Q.93	**D**	Since electron is moving is parallel to the magnetic field, hence magnetic force on it Fm=0  The only force acting on the electron is electric force which reduces it's speed.
Q.94	**A**	Fm−=q(v×B) When the angle between v and B is 180o, Fm = 0
Q.95	**B**	By Fleming left hand rule. The electron moving along East will experience the force towards North direction. In the presence of an electric field, the charged particles would experience an electric force regardless of their state i.e. stable or in motion. Another force that the charged particles experience in the absence of an electric field is the magnetic force but they have to be in motion. The magnetic field produces induced electric field. Since electrons movement is always opposite to current so we can use left hand rule and get the direction of force.
Q.96	**D**	By Fleming's left-hand rule.
Q.97	**D**	use Palm rule or Fleming's left-hand rule.
Q.98	**D**	$Fm = qvB\sin\theta$, if $v = 0 \Rightarrow Fm = 0$
Q.99	**D**	Magnetic field is just deflection field that is able to change the direction only.
Q.100	**A**	As we know positive charged particle obeys right hand rule so, "A" particle is positive.
Q.101	**A**	As we know that $\frac{e}{m} = \frac{v}{Br}$

		$r=\frac{mv}{qB}$ $\Rightarrow \frac{r_1}{r_2}=\frac{m_1}{m_2}.\frac{v_1}{v_2}(\frac{q_2}{q_1})=1\times(\frac{2}{3})(\frac{2}{1})=\frac{4}{3}$
Q.102	**C**	
Q.103	**D**	Fleming's left hand rule is used to the determine the direction of force.
Q.104	**C**	Force acts perpendicular to the velocity in a magnetic field, so speed of electron will remain same.
Q.105	**D**	The component of velocity perpendicular to B will make the motion circular while that parallel to H will make it move along a straight line. The two together will make the motion helical.
Q.106	**B**	$r=\frac{mv}{qB}\Rightarrow r\propto mv$ (q and B are constant) $\because r_A>r_B\Rightarrow m_Av_A>m_Bv_B$
Q.107	**B**	When field is parallel to the direction of motion of charge, magnetic force on it is zero.
Q.108	**A**	Charged particles deflects in magnetic field.
Q.109	**A**	As, $\varepsilon=-\frac{N\Delta\phi}{\Delta t}=-(50)\frac{50-20}{3}$ $=-500V$
Q.110	**B**	As, $\varepsilon=-N\frac{\Delta\phi}{\Delta t}$ From above relation it is clear that the induced emf does not depends upon resistance of coil.
Q.111	**B**	Average emf $=\frac{0+Bv\ell}{2}=\frac{1}{2}Bv\ell=\frac{1}{2}B(\ell\omega)\ell=\frac{1}{2}B\ell^2\omega$
Q.112	**A**	According to Lenz's law the current generated in ring (a) develop South pole to oppose the cause producing it. Therefore current is clockwise. In (b) the circuit is open. Therefore no current will flow.
Q.113	**A**	$\varepsilon=\frac{N\Delta\phi}{\Delta t}=\frac{B.\Delta A}{\Delta t}=\frac{B.\pi(r_2^2-r_1^2)}{\Delta t}$ $\varepsilon=vBL\sin\theta$ $\sin\theta=1$
Q.114	**A**	$v=1ms^{-1}$ $L=1m$ $\varepsilon=B$
Q.115	**A**	$\varepsilon=-N\frac{\Delta\phi}{\Delta t}=-N\frac{\Delta B.A}{\Delta t}$ $=-(1)\frac{(4-1)}{2}2=3V$
Q.116	**B**	$\Delta Q=\Delta\varphi/R=(10-2)/2=4C$
Q.117	**C**	At low frequency of 1 to 2 Hz, oscillations may be observed as our eyes will be able to detect it.

Q.118	**C**	Since the magnetic field is uniform therefore there will be no change in flux hence no current will be induced.
Q.119	**C**	Lenz's law
Q.120	**A**	As $V_s \propto N_s$ So, in step up transformer, no of turns in primary coil will be less and secondary turns will be more.
Q.121	**D**	$\varepsilon = -\frac{N\Delta\phi_B}{\Delta t}$
Q.122	**C**	$\varepsilon = -\frac{N\Delta\phi_B}{\Delta t} \Rightarrow \varepsilon \propto \frac{\Delta\phi_B}{\Delta t}$
Q.123	**B**	When magnet push toward solenoid, flux change with respect to time induces the induced current. Induced current, Shows deflection of meter towards right.
Q.124	**B**	Because there is no change in flux linked with coil
Q.125	**A**	Induced current in both the coils assist the main current so current through each coil increases. 
Q.126	**A**	
Q.127	**C**	E.m.f. or current induces, only when flux linked with the coil changes.
Q.128	**D**	If current through A increases, crosses (X) linked with coil B increases, hence anticlockwise current induces in coil B. As shown in figure both the current produces repulsive effect. 
Q.129	**C**	Book line
Q.130	**C**	Book line
Q.131	**D**	As, $I = \frac{V-\varepsilon}{R}$ $IR = V - \varepsilon$ $\Rightarrow V = \varepsilon + IR$ $\varepsilon = V - IR$
Q.132	**B**	As, $I = I_o \sin\theta$ $= I_o \sin(2\pi ft) \quad \because \theta = \omega t = 2\pi ft$
Q.133	**C**	$E_o = NBA\omega = 50 \times 0.05 \times 80 \times 10^{-4} \times 2\pi \frac{2000}{60} = \frac{4\pi}{3}$ volt
Q.134	**C**	Now, $I = I\sin(\theta t) = I_0\sin(2\pi ft)$ where f is the frequency. Since f and I_o are both doubled, the corresponding sinusoidal current is thus

		$I = (2I_0)\sin[2\pi(2f)t] = 2I_0\sin[2(2\pi f)t]$ $= 2I_0\sin(2\theta t)$
Q.135	**D**	Basic concept
Q.136	**A**	The rotational power is $P = \tau\omega$. ..... (1) As we know that $P = VI = \varepsilon I$. ..... (2) Equating equation (1) and (2) $\tau = \frac{EI}{\omega} = \frac{110 \times 90}{2\pi \times 24.5}$ Nm
Q.137	**B**	As, $\varepsilon = N\omega AB\sin\theta$ $\Rightarrow \varepsilon \propto \omega$ $\Rightarrow \frac{\varepsilon_1}{\varepsilon_2} = \frac{\omega_1}{\omega_2}$ $\frac{100}{\varepsilon_2} = \frac{\omega}{2\omega} = \frac{1}{2}$ $\Rightarrow \varepsilon_2 = 200\,V$
Q.138	**B**	Inductors resist the passage of A.C
Q.139	**D**	A transformer is a device which changes alternating voltage into small or larger alternating voltage.
Q.140	**A**	As, $\frac{N_s}{N_p} = \frac{V_s}{V_p}$ $\frac{3}{2} = \frac{V_s}{30}$ $\Rightarrow V_s = 45V$
Q.141	**C**	Working principle of transformer is mutual induction.
Q.142	**B**	$\text{Efficiency} = \frac{P_{output}}{P_{inpnt}} \times 100$
Q.143	**C**	$\frac{E_s}{E_p} = \frac{N_s}{N_p}$ $\Rightarrow E_s = \frac{N_S}{N_p}E_p = \frac{500}{5000} \times 2200$ $= 220V$ As $E_s i_s = E_p i_p \Rightarrow i_s = \frac{E_p}{E_s} i_p$ Or $i_s = \frac{N_p}{N_s} i_p = \frac{5000}{500} \times 4 = 40A$
Q.144	**D**	Transformer does not operate on D.C. So, emf establish in secondary is zero

Q.145	**B**	$V_S = 3V_P$ $\frac{V_S}{V_P} = \frac{3}{1}$ $\frac{N_S}{N_P} = \frac{V_S}{V_P} = \frac{3}{1}$
Q.146	**D**	$\eta = \frac{V_s i_s}{V_p i_p} \times 100 = \frac{11 \times 90}{220 \times 5} \times 100 = 90$
Q.147	**C**	current will be induced if change in flux take place
Q.148	**A**	$\frac{N_S}{N_P} = \frac{V_S}{V_P}$ $\frac{N_S}{75} = \frac{2400}{120}$ $N_S = 20 \times 75 = 1500$
Q.149	**A**	
Q.150	**C**	
Q.151	**A**	
Q.152	**D**	
Q.153	**D**	
Q.154	**B**	
Q.155	**C**	
Q.156	**C**	
Q.157	**A**	
Q.158	**C**	
Q.159	**A**	
Q.160	**D**	
Q.161	**C**	
Q.162	**D**	
Q.163	**A**	
Q.164	**D**	
Q.165	**B**	
Q.166	**A**	
Q.167	**C**	
Q.168	**A**	
Q.169	**D**	
Q.170	**A**	
Q.171	**D**	
Q.172	**D**	

Q.173	C	
Q.174	C	
Q.175	A	
Q.176	A	
Q.177	D	
Q.178	B	
Q.179	C	
Q.180	C	
Q.181	A	
Q.182	A	
Q.183	A	
Q.184	A	
Q.185	A	
Q.186	A	
Q.187	A	
Q.188	B	
Q.189	B	
Q.190	C	
Q.191	C	
Q.192	C	
Q.193	B	
Q.194	A	
Q.195	A	
Q.196	C	
Q.197	A	
Q.198	B	
Q.199	C	
Q.200	C	

Electronics, Dawn of Modern Physics

Rectification

Q. 1 The process in which A.C is converted into D.C is called

A. Amplification
B. Rectifier
C. Rectification
D. Magnification

Q. 2 Rectification is possible by

A. Transistor
B. Diode
C. Amplifier
D. Capacitor

Q. 3 The electrical circuit used to get smooth DC output from a rectifier circuit is called

A. Filter
B. Oscillator
C. Logic gates
D. Amplifier

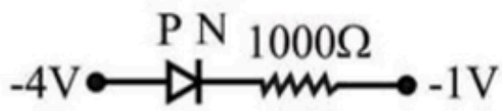
Q. 4 If a full wave rectifier circuit is operating from 50 Hz mains, the fundamental frequency in the ripple will be

A. 25 Hz
B. 50 Hz
C. 70.7 Hz
D. 100 Hz

Q. 5 The voltage which appears across load resistance R is called

A. Input voltage
B. zero voltage
C. reverse voltage
D. None of these

Q. 6 What is the current in the circuit shown below?



A. 0 amp
B. 10−2amp
C. 1 amp
D. 0.10 amp

Q. 7 In the process of rectification the current received across the load resistance is

A. A.C
B. D.C
C. Both A & B
D. None of these

Q. 8 Inverter converts

A. Alternating current into direct current
B. Direct current into alternating current
C. Current at low voltage to current at high voltage
D. None of these

Q. 9 Function of rectifier is

A. to convert A. C. into D.C.
B. to convert D.C. into A.C.
C. Both [a] and [b]
D. None of these

Q. 10 In full wave rectification by bridge the number of diodes required are

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

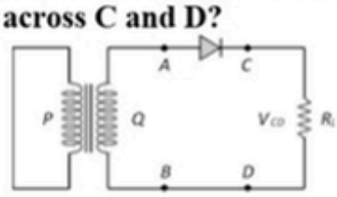
Q. 11 The simplest type of rectification known as half wave rectification is obtained by _____

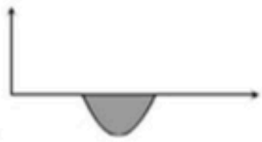
A. Using a transistor
B. Suppressing the harmonics in A.C voltage
C. Suppressing half wave of A.C supply by using diode
D. Using a Coolidge tube

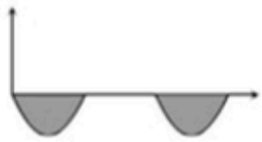
Q. 12 In full wave rectification, the output D.C. voltage across the load is obtained for_____

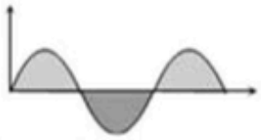
A. The positive half cycle of input A.C.
B. The negative half cycle of input A.C.
C. The complete cycle of input A.C.
D. All of the above.

Q. 13 In the half-wave rectifier circuit shown. Which one of the following wave forms is true for VCD, the output across C and D?



A. 

B. 

C. 

D. 

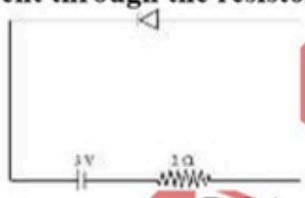
Q. 14 Rectification is possible by

A. Transistor
B. Diode
C. Amplifier
D. Capacitor

Q. 15 In a semiconductor diode, the barrier offers opposition to only

A. Majority carries in both regions
B. Minority carries in both regions
C. B, C
D. Holes in the p-regions

Q. 16 In the given figure the current through the resistor is practically.

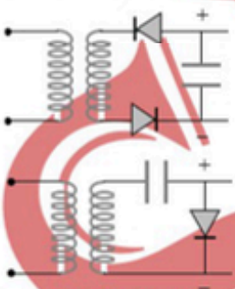


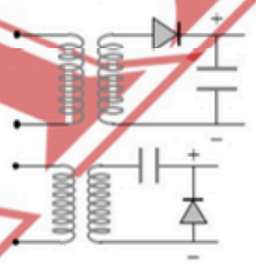
A. 5 A
B. 2 A
C. Zero
D. 1 A

Q. 17 What is the current in the circuit shown below?

A. 0 amp
B. 10^{-2} amp
C. 1 amp
D. 0.10 amp

Q. 18 Which is the correct diagram of a half-wave rectifier

A. 

B. 

C.

D.

Q. 19 An alternating current can be converted into direct current by a

A. Rectifier
B. Transformer
C. Dynamo
D. Motor

Photon

Q. 20 The frequency of light beam A is twice that of light beam B. The ratio EA/EB of photon energies is

A. 1
B. 4
C. ½
D. 2

Q. 21 Which one of the following radiations has the strongest photon?

A. T.V waves
B. Micro waves
C. X-rays
D. γ-rays

Q. 22 Planck's work was connected with

A. Wave nature of matter
B. Photoelectric effect
C. Structure of atom
D. Quantum nature of radiation

Q. 23 The curve drawn between velocity and frequency of photon in vacuum will be a:

A. straight line parallel to velocity axis
B. hyperbola
C. straight line passing through origin and making an angle of 45° with frequency axis
D. straight line parallel to frequency axis

Q. 24 The speed of photon:

A. May be greater than speed of light
B. Must be equal to speed of light
C. May be less than speed of light
D. Must be less than speed of light

Q. 25 A photon is _____

A. A unit of energy
B. A positively charged particle
C. A quantum of electromagnetic radiation
D. A unit of wavelength

Q. 26 If n number of photon are striking on a metal surface, then total momentum exerted is ____

A. nh/λ
B. $2nh\lambda$
C. zero
D. n f×t

Q. 27 The momentum of a photon is3.3×10^{-29} kg−m/sec. Its frequency will be

A. 7.5×10^{12} Hz
B. 6×10^{3} Hz
C. 3×10^{3} Hz
D. 1.5×10^{13} Hz.

Q. 28 The momentum of a photon is2×10^{-16} gm-cm/sec. Its energy is

A. 6×10−8 erg.
B. 6×10^{-6} erg
C. 2.0×10^{-26} erg
D. 0.61×10^{-26} erg

Q. 29 An AIR station is broadcasting the waves of wavelength 300 metres. If the radiating power of the transmitter is 10 kW, then the number of photons radiated per second is

A. 1.5×10^{29}
B. 1.5×10^{33}.
C. 1.5×10^{31}
D. 1.5×10^{35}

Basic Concept of Photo electric effect, Compton's effect, Pair Production

Q. 30 Stopping potential for a metal surface in case of photoelectric emission depends on

A. The threshold frequency for the metal surface
B. The intensity of incident light
C. The frequency of incident light and work function of the metal surface
D. All of the above

Q. 31 If the wavelength of incident radiation in a photoelectric experiment is decreased then

A. The photoelectric current will decrease
B. The photoelectric current will increase
C. The stopping potential will decrease
D. The stopping potential will increase

Q. 32 In a photoelectric effect experiment the stopping potential is:

A. The electric potential that causes the electronic current to vanish
B. The photon energy
C. The kinetic energy of the most energetic electron ejected
D. The energy required to remove an electron from the sample

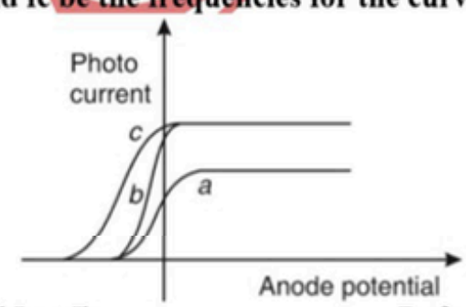
Q. 33 X-rays and gamma-rays both are electromagnetic waves. Which of the following statements is correct?

A. The wavelength of X-rays is less than that of gamma-rays
B. The wavelength of X-rays is greater than that of gamma-rays
C. The frequency of gamma-rays is less than that of X-rays.
D. The frequency and wavelength of X-rays are more than those of gamma-rays.

Q. 34 The reverse process of photo electric effect is

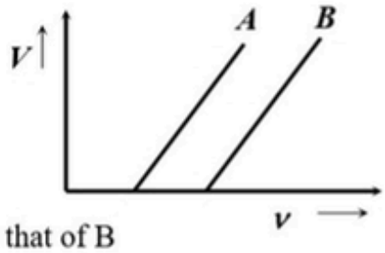
A. annihilation of matter
B. pair production
C. production of x-rays
D. nuclear fission

Q. 35 The figure shows the variation of photocurrent with anode potential for a photo-sensitive surface for three different radiations. Let Ia, Ib and Ic be the intensities and fa, fb and fc be the frequencies for the curves a, b and c respectively



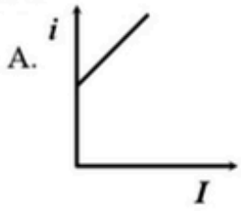
A. fa = fb and Ia ≠ Ib
B. fa = fc and Ia = Ic
C. fa = fb and Ia = Ib
D. None of these

Q. 36 The stopping potential as a function of the frequency of the incident radiation is plotted for two different photoelectric surfaces A and B. The graphs show that work function of A is

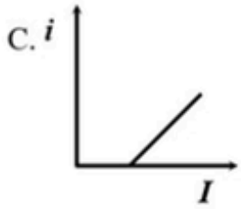


A. Greater than that of B
B. Smaller than that of B
C. Equal to that of B
D. No inference can be drawn about their work functions from the given graphs

Q. 37 The graph between intensity of light falling on a metallic plate (I) with the current (i) generated is

A. 

B. 

C. 

D. 

Q. 38 Particle nature and wave nature of electromagnetic waves and electrons can be shown by
A. Electron has small mass, deflected by the metal sheet
B. x-ray is diffracted, reflected by thick metal sheet
C. light is refracted and diffracted
D. photo electricity and electron microscopy

Q. 39 As intensity of incident light increases
A. Photoelectric current increase
B. K.E. of emitted photoelectron increases
C. Photo electric current decreases
D. K.E. of emitted photoelectrons decreases

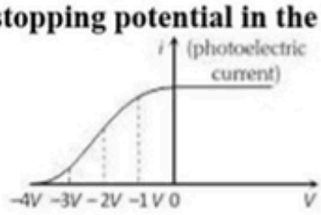
Q. 40 A device based on photoelectric effect is called
A. Photo sensitive detection
B. Photo cell
C. Photosynthesis
D. Photo diode

Q. 41 Stopping potential for a metal surface in case of photoelectric emission depends on
A. The threshold frequency for the metal surface
B. The intensity of incident light
C. The frequency of incident light and work function of the metal surface
D. All of the above

Q. 42 In a photoelectric effect experiment at a frequency above cut off, the number of electrons ejected is proportional to
A. The frequency of the incident light
B. Their potential energy
C. The number of photons that hit the cathode
D. Their kinetic energy

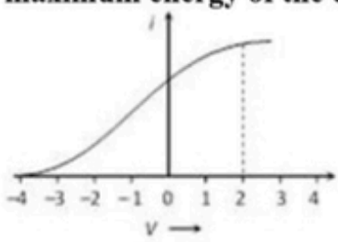
Q. 43 The maximum energy of the electrons released in a photo cell is independent of
A. frequency of incident light
B. Intensity of incident light
C. Nature of cathode rays
D. None of these

Q. 44 The value of stopping potential in the following diagram



A. – 2V
B. –3V
C. – 4V
D. –1V

Q. 45 Figure represents the graph of photo current I versus applied voltage (V). The maximum energy of the emitted photoelectrons is

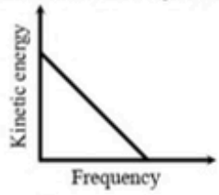


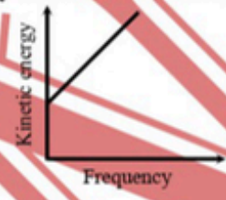
A. 2ev
B. 0 eV
C. 4 eV
D. 4 J

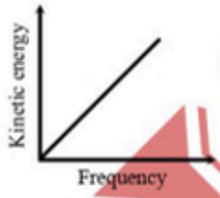
Q. 46 In photoelectric effect, work function of metal is 3.5 eV. By applying - 1.2V potential, photo electric current becomes zero, so

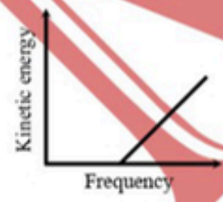
A. Energy of incident photon is 4.7 eV
B. Energy of incident photon is 2.3 eV
C. If photon having higher frequency is used, photo electric current is produced
D. When energy of photon is 2.3 eV, photo electric current becomes maximum

Q. 47 According to Einstein's photoelectric equation, the graph between the kinetic energy of photoelectrons ejected, and the frequency of incident radiation is

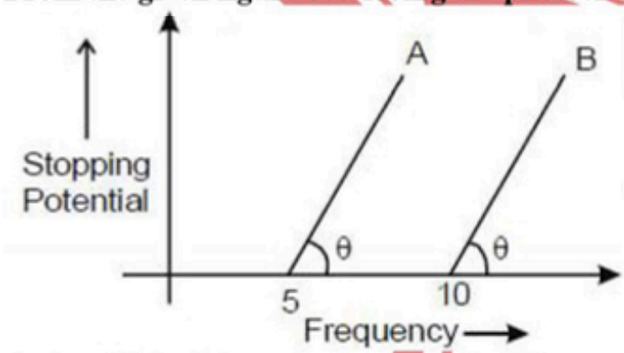
A.


B.


C.


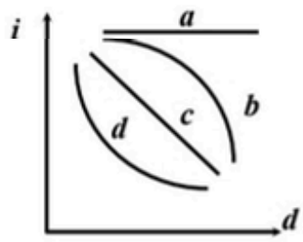
D.


Q. 48 From the given figure describing the photoelectric effect it may be inferred that



A. A and B both have the same threshold frequency
B. Maximum kinetic energy for both metals depend linearly on frequency both A
C. Stopping potential are different for A and B for some change in frequency
D. B is better photosensitive material than A

Q. 49 A point source of light is used in an experiment on photoelectric effect. Which of the following curves best represents the variation of photo current (i) with distance of the source from the emitter?



A. a
B. d
C. b
D. c

Q. 50 Dual nature of radiation is shown by

A. photoelectric effect alone
B. refraction and diffraction
C. photoelectric effect and diffraction
D. diffraction and reflection

The wave-particle duality

Q. 51 **If E_1, E_2, E_3 are the respective kinetic energies of an electron, an alpha-particle and a proton, each having the same de-Brogile wavelength then**

A. $E_1 > E_3 > E_2$ B. $E_2 > E_3 > E_1$

C. $E_1 > E_2 > E_3$ D. $E_1 = E_2 = E_3$

Q. 52 **The momentum of a photon is 2×10^{-16} gcms^{-1}. Its energy is**

A. 0.61×10^{-26} erg. B. 2.0×10^{-26} erg.

C. 6×10^{-6} erg. D. 6×10^{-8} erg.

Q. 53 **A proton and an α- particle are accelerated through the same kinetic energy. The ratio of their de-Brogile wavelength $(\lambda_p / \lambda_\alpha)$.**

A. 1:1 B. $\sqrt{2}$:1

C. 2:1 D. 4:1

Q. 54 **According to De-Broglie, an electron can be regarded as:**

A. particle only B. are negligible

C. particle and wave both D. none of these

Q. 55 **The wavelength of matter waves is independent of:**

A. Mass B. Velocity

C. Momentum D. Charge

Q. 56 **A body of mass 200 g moves at the speed of 5 m/hr. So de-Broglie wavelength related to it is of the order ($h = 6.26 \times 10^{-34}$ Js)**

A. 10^{-10} m B. 10^{-30} m

C. 10^{-20} m D. 10^{-40} m

Q. 57 **Ratio of momentum of photons having wavelength 4000 angstrom and 8000 angstrom is**

A. 2 : 1 B. 1 : 2

C. 20 : 1 D. 1 : 20

Q. 58 **Wave is associated with matter**

A. when it is stationary

B. when it is in motion with the velocity of light only

C. when it is in motion with any velocity

D. none of these

Q. 59 **The kinetic energy of electron and proton is 10^{-32}J. Then the relation between their de-Broglie wavelengths is**

A. $\lambda p = \lambda e$ B. $\lambda p > \lambda e$

C. $\lambda p < \lambda e$ D. $\lambda p = 2\lambda e$

Q. 60 **The voltage gain of Op-amplifier is expressed as**

A. $\frac{Vo}{Vi}$ B. $\frac{Vo}{V_+ - V_-}$

C. $\frac{Vi}{Vo}$ D. Both A and B

Q. 61 **When a signal is applied at the (+) terminal then after amplification, it appears at the output with a phase shift of**

A. 90° B. 360°

C. 0° D180°

Q. 62 **The process in which A.C is converted into D.C is**

A. Amplification B. Rectification

C. Modulation D. Magnification

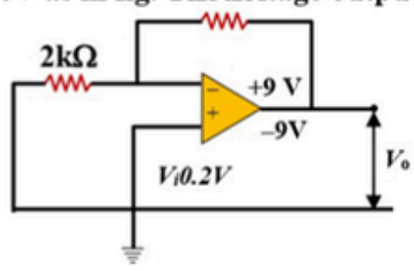
Q. 63 **The voltage supplied to input is $V_i = 0.20V$ as in fig. The voltage output is**

A. 1.2 V

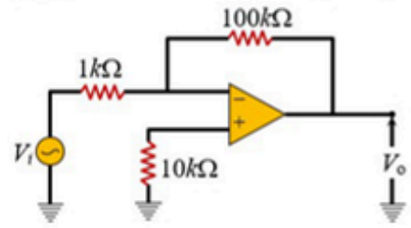
B. 20 V

C. 1 V

D. 60 V

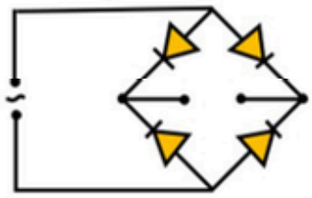


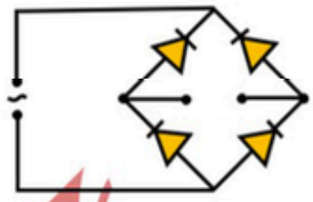
Q. 64 The voltage gain of the following amplifier is

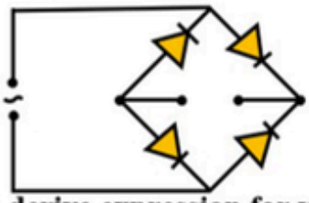


A. 10
B. –100
C. 1000
D. 101

Q. 65 Which diagram is the correct circuit for-full-wave rectification?

A.


B.


C.


D.


Q. 66 To derive expression for voltage gain of inverting op amplifier we apply

A. Virtual ground principle
B. Kirchhoff current rule
C. Kirchhoff voltage rule
D. Virtual ground principle and Kirchhoff's current rule

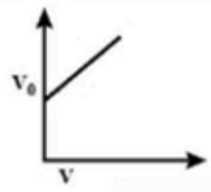
Q. 67 Photon of energy 5eV incident on a metal surface liberate electrons, which are stopped by a negative potential of 3.5V. the work function of metal is

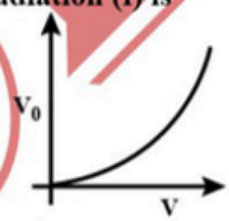
A. 5Ev
B. 7eV
C. 1.5eV
D. 8.5eV

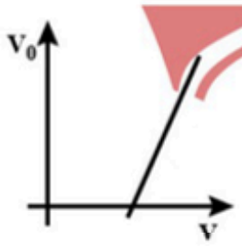
Q. 68 The work function of a metal is 6.63 eV, its threshold frequency is:

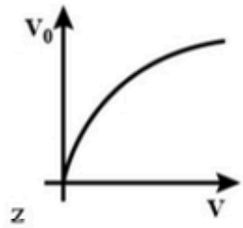
A. 1.6×10^{15} Hz
B. 6.63×10^{-34} Hz
C. 1.6×10^{12} Hz
D. 1.6×10^{-19} Hz

Q. 69 In photoelectric effect. the graph showing the variation of cut — off voltage (V_0) with the frequency of incident radiation (f) is

A.


B.


C.


D.


Q. 70 The unit of De-Broglie wavelength is

A. per meter
B. meter
C. $meter^2$
D. $per\ meter^2$

Q. 71 Indivisible tiny bundles of energy in electromagnetic radiation is named as

A. γ-ray
B. Photon
C. Spectrum
D. β-rays

Q. 72 The energy of a photon in a beam of infrared radiation of wave length 1240 nm is about

A. 1.5 MeV
B. 1 MeV
C. 1 eV
D. 1.5 eV

Q. 73 Photoelectric effect is reverse process of

A. Compton's effect
B. Pair production
C. X-rays production
D. All of these

Q. 74 Photoelectric effect can be explained by

A. Electromagnetic wave theory
B. Quantum theory
C. Wave theory
D. Corpuscular theory

Q. 75 The experimental value of Rydberg constant is

A. $1.097 \times 10^{-8}\ m^{-1}$
B. $1.097 \times 10^{8}\ m^{-1}$
C. $1.097 \times 10^{7}\ m^{-1}$
D. $1.097 \times 10^{-7}\ m^{-1}$

Q. 76 The minimum energy required to remove an electron from metal surface is called

A. Stopping potential
B. Work function
C. Kinetic energy
D. None of these

Q. 77 The maximum energy of the electrons released in a photo cell is independent of

A. Frequency of incident light
B. Intensity of incident light
C. Nature of cathode rays
D. None of these

Q. 78 A photosensitive plate is illuminated by green light and photoelectrons are emitted with maximum kinetic energy 4 eV. If the intensity of the incident radiation is reduced to one-fourth of the original value, then the maximum K.E. of the photoelectrons will be

A. 0.1 eV
B. 1 eV
C. 4 eV
D. 16 eV

Q. 79 Indivisible tiny bundles of energy in electromagnetic radiation is named as

A. γ-ray
B. Spectrum
C. Photon
D. β-rays

Q. 80 To detect a signal of radio wave_____ of photons are needed.

A. One
B. Few hundred
C. Infinite no
D. Millions

Q. 81 Which of given is correct Einstein's photoelectric equation

A. $hf = \phi o$
B. $hf = \frac{1}{2} mV^2_{max}$
C. $hf = \frac{1}{2} mV^2_{max} - \phi$
D. $hf = \frac{1}{2} mV^2_{max} + \phi$

Q. 82 When light falls on the metal surface, the energies of the emitted electrons vary with

A. speed of light
B. intensity of light
C. frequency of light
D. remain unchanged

Q. 83 Op-amp consist of dozens of transistor, capacitors and resistors due to this reason is known as

A. IC (Integrated circuit)
B. A.C
C. D.C
D. Black box approach

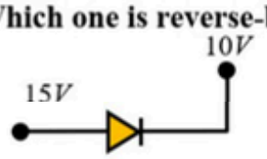
Q. 84 In full wave rectification by bridge the number of diodes required are

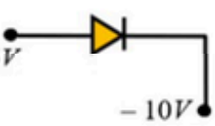
A. 3
B. 2
C. 5
D. 4

Q. 85 For single phase supply frequency of 50 Hz, ripple frequency in full wave rectifier is

A. 25 Hz
B. 50 Hz
C. 100 Hz
D. 200 Hz

Q. 86 Which one is reverse-biased?

A.


B.


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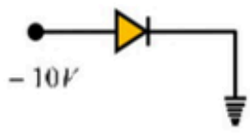
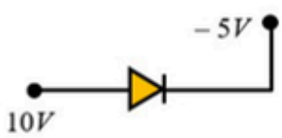


D.


Q. 87 A semi-conductor can be used as a rectifier because

A. It has low resistance to the current flow when forward biased
B. It has low resistance to the current flow when reversed biased
C. It has low resistance to the current flow when forward biased and high resistance when reversed biased
D. None of above

Q. 88 The work function of a photoelectric material is 3.3 eV. The threshold frequency will be equal to

A. 8×10^{4} Hz
B. 8×10^{56} Hz
C. 8×10^{10} Hz
D. 8×10^{14} Hz

Q. 89 A particle which has zero rest mass and non-zero energy and momentum must travel with a speed

A. Equal to c, the speed of light in vacuum
B. Greater than c
C. Less than c
D. Tending to infinity

Q. 90 Frequency of photon having energy 66 eV is

A. 8×10^{-15} Hz
B. 12×10^{-15} Hz
C. 16×10^{15} Hz
D. None of these

Q. 91 Kinetic energy with which the electrons are emitted from the metal surface due to photoelectric effect is

A. Independent of the intensity of illumination
B. Independent of the frequency of light
C. Inversely proportional to the intensity of illumination
D. Directly proportional to the intensity of illumination

Q. 92 Stopping potential for photoelectrons

A. Does not depend on the frequency of the incident light
B. Does not depend upon the nature of the cathode material
C. Depends on both the frequency of the incident light and nature of the cathode material
D. Depends upon the intensity of the incident light

Q. 93 If in a photoelectric experiment, the wavelength of incident radiation is reduced from 6000 Å to 4000 Å then

A. Stopping potential will decrease
B. Stopping potential will increase
C. K.E of emitted electrons will decrease
D. The value of work function will decrease

Q. 94 When yellow light is incident on a surface, no electrons are emitted while green light can emit. If red light is incident on the surface, then

A. No electrons are emitted
B. Photons are emitted
C. Electrons of higher energy are emitted
D. Electrons of lower energy are emitted

Q. 95 The work function of aluminium is 4.2 eV. If two photons, each of energy 3.5 eV strike an electron of aluminium, then emission of electrons will be

A. Possible
B. Not possible
C. Data is incomplete
D. Depend upon the density of the surface

Q. 96 If the energy of the photon is increased by a factor of 4, then its momentum

A. Does not change
B. Decreases by a factor of 4
C. Increases by a factor of 4
D. Decreases by a factor of 2

Q. 97 The light rays having photons of energy 1.8 eV are falling on a metal surface having a work function 1.2 eV. What is the stopping potential to be applied to stop the emitting electrons?

A. 3 eV
B. 1.2 eV
C. 0.6 eV
D. 1.4 eV

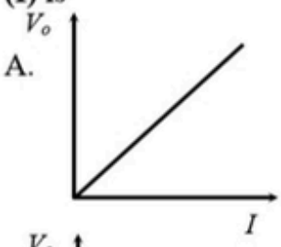
Q. 98 Wavelength of a 1 keV photon is 1.24×10^{-9} m. What is the frequency of 1 MeV photon?

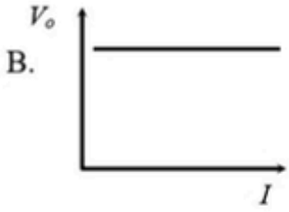
A. 1.24×10^{15} Hz
B. 2.4×10^{20} Hz
C. 1.24×10^{18} Hz
D. 2.4×10^{23} Hz

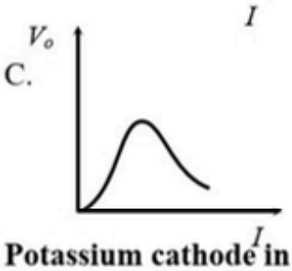
Q. 99 Energy of photon whose frequency is 10^{12} MHz, will be

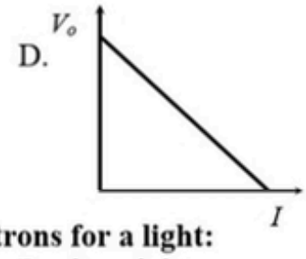
A. 4.14×10^{3} keV
B. 4.14×10^{2} eV
C. 4.14×10^{3} MeV
D. 4.14×10^{3} eV

Q. 100 The correct curve between the stopping potential (V) and intensity of incident light (I) is

A. 

B. 

C. 

D. 

Q. 101 Potassium cathode in photocell emit electrons for a light:

A. visible
B. ultra violet
C. infra-red
D. x-rays

Q. 102 Which of the following electromagnetic radiations has photons with the greatest energy?

A. blue light
B. yellow light
C. x rays
D. radio waves

Q. 103 Which of the following electromagnetic radiations has photons with the greatest momentum?

A. blue light
B. yellow light
C. x rays
D. radio waves

Q. 104 A lens of focal length 30 cm is used to focus sunlight on photocell causes current I. If another lens of 15cm focal length but has same aperture is used, the photo electric current will be

A. I
B. 2I
C. I/2
D. 4I

Q. 105 Which gas is filled in photocell?

A. Neon
B. Helium
C. Hydrogen
D. No gas

Q. 106 Threshold frequency depends upon

A. Intensity of light
B. Frequency of light
C. Nature of metal surface
D. Nature of gas in photo cell

Q. 107 In an operational amplifier potential at inverting input is V – and at non-inverting terminal is V+ while output voltage is Vo then $\frac{Vo}{V_+ - V_-}$ is called

A. Voltage gain
B. Open loop gain
C. Closed loop gain
D. Power factor

Q. 108 A diode rectifier converts

A. A.C into D.C
B. D.C into A.C
C. Varying D.C into constt. D.C
D. High voltage A.C into low voltage A.C

Q. 109 In which of given case the output of operational amplifier is 180° out of phase with input

A. Inverting amplifier
B. Non-inverting amplifier
C. Comparator
D. All of these

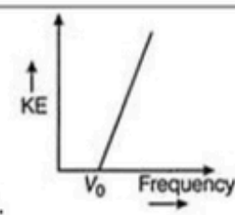
Q. 110 In full wave rectification the output D.C voltage across the load is obtained for_____?

A. Positive half cycle of input A.C
B. Negative half cycle of input A.C
C. Complete cycle of input A.C
D. All of the above

ANSWERS & EXPLANTION: -

Q.1	**C**	Rectification is the process in which A.C convert into D.C.
Q.2	**B**	Semi-conductor is used for rectification.
Q.3	**A**	'Filter' filters out the fluctuations in the output of the rectifier.
Q.4	**D**	In a full wave rectifier, the fundamental frequency in ripple is twice of input frequency.
Q.5	**C**	Load resistance appears as reverse voltage
Q.6	**A**	The potential of P-side is more negative that of N-side, hence diode is in reverse biasing. In reverse biasing it acts as open circuit, hence no current flows
Q.7	**B**	Rectification converts AC to DC so current across load will be DC
Q.8	**B**	Inverter converts a.c. into d.c.
Q.9	**A**	AC→Rectifier→DC
Q.10	**D**	In full wave rectification bridge circuit requires 4 diodes.
Q.11	**C**	Diode conduct during one half cycle.
Q.12	**C**	In full wave rectification, complete cycle of A.C is rectified.
Q.13	**D**	Half wave rectifier, rectifies only the half cycle of input ac signal and it blocks the other half
Q.14	**B**	Diode is used to rectify the current
Q.15	**A**	
Q.16	**C**	
Q.17	**A**	The potential of P-side is more negative that of N-side, hence diode is in reverse biasing. In reverse biasing it acts as open circuit, hence no current flows.
Q.18	**B**	
Q.19	**A**	
Q.20	**D**	$E \propto f \rightarrow \frac{E_A}{E_B} = \frac{f_A}{f_B} = \frac{2f_B}{f_B}$ $\frac{E_A}{E_B} = 2$
Q.21	**D**	Energy of γ-rays is the largest $E = hf$
Q.22	**D**	Plank's work is related with quantum nature of light and he gave the idea of quanta
Q.23	**D**	Information
Q.24	**B**	Information
Q.25	**C**	Photon is energy packet of energy which are integral part of all electromagnetic radiations which cannot be subdivided according to Einstein.
Q.26	**A**	As, $\frac{h}{\lambda}$ for 1 photon $\therefore p = \frac{nh}{\lambda}$ for n photon

Q.27	**D**	$p = \frac{h}{\lambda} = \frac{h}{\frac{v}{f}} = \frac{hf}{v}$ $f = \frac{pv}{h} = \frac{(3.3\times10^{-29})(3\times10^{8})}{(6.64\times10^{-34})}$ $f = 1.5\times10^{13}\,Hz$
Q.28	**B**	$p = \frac{E}{C} \Rightarrow E = p\times c = 2\times10^{-16}\times(3\times10^{10}) = 6\times10^{-6}\,erg$
Q.29	**C**	$P = \frac{W}{t} = \frac{nhc}{\lambda t} \Rightarrow (\frac{n}{t}) = \frac{P\lambda}{hc} = \frac{10\times10^{3}\times300}{6.6\times10^{-34}\times3\times10^{8}} = 1.5\times10^{31}$
Q.30	**C**	Stopping potential depend upon work function and frequency of incident light.
Q.31	**D**	$V_0 \propto f_0$ Hence $V_0 \propto \frac{1}{\lambda_0}$
Q.32	**C**	At stopping potential the photo electric current becomes zero.
Q.33	**B**	$E_Y > E_X \rightarrow f_Y > f_X \Rightarrow \lambda_Y < \lambda_X$
Q.34	**C**	In photoelectric effect photons produce electrons. But in X-ray production electrons produce photons.
Q.35	**A**	The stopping potential for curves a and b is same $fa = fb$ saturation current is $Ia = Ib$ proportional to intensity
Q.36	**B**	From the given graph it is clear that if we extend the given graph for A and B, intercept of the line A on V axis will be smaller as compared to line B means work function of A is smaller than that of B.
Q.37	**A**	Photo current (i) directly proportional to light intensity (I) falling on a photosensitive plate. $i \propto I$.
Q.38	**D**	In photoelectric effect particle nature of electron is shown. While in electron microscope, beam of electron is considered as electron wave..
Q.39	**A**	Because when intensity of incident light increases, it means that number of photons increases in incident light. If number of incident photons increases, then number of emitted photo electrons also increases, consequently the photo electric current increases
Q.40	**B**	Photocell is a device based on photoelectric effect
Q.41	**C**	Stopping potential depend upon work function and frequency of incident light.
Q.42	**B**	Photoelectric current ∝ intensity of light
Q.43	**B**	Energy of electron does not depend upon intensity of light
Q.44	**C**	Stopping potential is that negative potential for which photo electric current is zero..
Q.45	**C**	From the graph stopping potential $\|Vs\| = V0$ Also $K.Emax = (\|V0\|)e = (4V)e = 4eV$
Q.46	**A**	$E_K = hf - \phi$ $hf = \phi + E_K = 3.5 + 1.2 = 4.7\ eV$
Q.47	**D**	The maximum kinetic energy of photoelectron ejected is given by KE=hν−W=hν−hν0

		 where, work function depends on the type of material. If the frequency of incident radiation is greater than ν0 only then the ejection of photoelectrons start. After that as frequency increases kinetic energy also increases.
Q.48	**B**	The graph between stopping potential and frequency is a straight line so maximum kinetic energy of photoelectrons depends linearly on frequency also threshold frequency and work function of material B s greater than material A. So, A is better photosensitive material than B.
Q.49	**B**	$I \propto \frac{I}{d^2}$ and photo current $i \propto I = I \propto \frac{I}{d^2}$
Q.50	**C**	
Q.51	**A**	$\lambda = \frac{h}{\sqrt{2mE}} \propto \frac{1}{\sqrt{mE}}$ $\therefore E \propto \frac{1}{m} \Rightarrow E_1 > E_3 > E_2$
Q.52	**C**	$E = pc$ $E = 2 \times 10^{-16} \times 3 \times 10^{10} erg$ $E = 6 \times 10^{-6} erg$
Q.53	**C**	$\lambda = \frac{h}{\sqrt{m_p E_k}} \propto \frac{1}{\sqrt{m}} \therefore \frac{\lambda_p}{\lambda_\alpha} = \sqrt{\frac{m_\alpha}{m_p}} = \sqrt{\frac{4m_p}{m_p}} = \frac{2}{1}$
Q.54	**C**	$\lambda = \frac{h}{p}$ De-Broglie assumed that electron can be regarded a s particle and as a well. Davisson and Germer proved the wave nature of electron.
Q.55		$\lambda = \frac{h}{mv}$ According to wavelength is independent of charge.
Q.56	**B**	$m = 200\,g = 0.2\,kg, v = 5\,\frac{m}{hr} = \frac{5}{3600}\,\frac{m}{s}$ $p = \frac{h}{\lambda} = mv$ $\therefore \lambda = \frac{h}{mv} = \frac{6.626 \times 10^{-34} \times 3600}{0.2 \times 5}$ $= 23.85 \times 10^{-31}$ $- 2.385 \times 10^{-30}$ $= 10^{-30} m$
Q.57	**A**	$P = \frac{h}{\lambda} \quad \therefore P \propto \frac{1}{\lambda}$ $\therefore \frac{P_1}{P_2} = \frac{\lambda_2}{\lambda_1} = \frac{8000}{4000} = \frac{2}{1}$ $\therefore \frac{P_1}{P_2} = 2:1$

Q.58	**C**	According to de-Broglie hypothesis $\lambda = \frac{h}{mv}$
Q.59	**C**	By using $\lambda = \frac{h}{\sqrt{2mE}}$ $\therefore E = 10^{-32} J$ = constant Hence $\lambda \propto \frac{1}{\sqrt{m}}$ Since $m_p > m_e$ So $\lambda_p < \lambda_e$.

Q.60	**D**	**Q.61**	**C**	**Q.62**	**B**	**Q.63**	**C**	**Q.64**	**B**
Q.65	**C**	**Q.66**	**D**	**Q.67**	**C**	**Q.68**	**A**	**Q.69**	**C**
Q.70	**B**	**Q.71**	**B**	**Q.72**	**C**	**Q.73**	**C**	**Q.74**	**B**
Q.75	**C**	**Q.76**	**B**	**Q.77**	**B**	**Q.78**	**C**	**Q.79**	**C**
Q.80	**D**	**Q.81**	**D**	**Q.82**	**C**	**Q.83**	**A**	**Q.84**	**D**
Q.85	**C**	**Q.86**	**C**	**Q.87**	**C**	**Q.88**	**D**	**Q.89**	**A**
Q.90	**C**	**Q.91**	**A**	**Q.92**	**C**	**Q.93**	**B**	**Q.94**	**A**
Q.95	**B**	**Q.96**	**C**	**Q.97**	**C**	**Q.98**	**B**	**Q.99**	**D**
Q.100	**B**	**Q.101**	**A**	**Q.102**	**D**	**Q.103**	**C**	**Q.104**	**A**
Q.105	**D**	**Q.106**	**C**	**Q.107**	**B**	**Q.108**	**A**	**Q.109**	**A**
Q.110	**C**								

Atomic Spectra, Nuclear Physics

Atomic Spectra/Line Spectrum & Production of X-rays and Characteristics X-rays

Q. 1 The Balmer series contain wavelengths in the _____ of the hydrogen spectrum.

A. visible portion
B. infrared portion
C. ultra violet portion
D. all of these

Q. 2 X – Rays can not produce

A. Photo Electric Effect
B. Compton's Effect
C. Pair Production
D. All of these

Q. 3 In an X-ray tube, electrons each of charge e are accelerated through V potential difference allowed to hit a metal target. The wavelength of the X-rays emitted is_____

A. hc/eV
B. he/Vc
C. eV/h
D. impossible to predict

Q. 4 Paschen series contains the wavelength in the:

A. visible region
B. ultraviolet region
C. infrared region
D. none of these

Q. 5 Which of the following has the simplest spectrum?

A. oxygen
B. hydrogen
C. nitrogen
D. neon

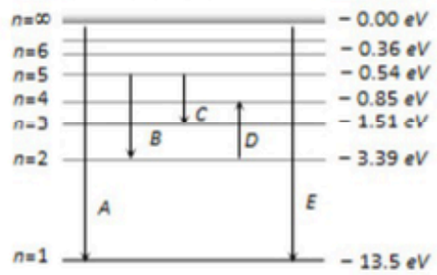
Q. 6 The characteristics x-rays appear as discrete lines on a

A. discrete spectrum
B. continuous spectrum.
C. band spectrum
D. all of these

Q. 7 X-rays can cause

A. cancer
B. damage the living tissues
C. both a and b
D. none of these

Q. 8 The energy levels of the hydrogen spectrum is shown in figure. There are some transitions A, B, C, D and E. Transition A, B and C respectively represent



A. First member of Lyman series, third spectral line of Balmer series and the second spectral line of Paschen series
B. Ionization potential of hydrogen, second spectral line of Balmer series and third spectral line of Paschen series
C. Series limit of Lyman series, third spectral line of Balmer series and second spectral line of Paschen series
D. Series limit of Lyman series, second spectral line of Balmer series and third spectral line of Paschen series

Q. 9 Which of the following is true

A. Lyman series is a continuous spectrum
B. Paschen series is a line spectrum in the infrared
C. Balmer series is a line spectrum in the ultraviolet
D. The spectral series formula can be derived from the Rutherford model of the hydrogen atom

Q. 10 A metal block is exposed to beams of X-ray of different wavelength. X-rays of which wavelength penetrate most

A. 2 Å
B. 4 Å
C. 6 Å
D. 6 Å

Biological effects of Radiation & Biological and Medical Uses of Radiation

Q. 11 The cosmic radiation consists of

A. High energy particles
B. Electromagnetic radiation
C. Both A & C
D. Low energy charged particles

Q. 12 1 Gy =?

A. J kg
B. N/kg
C. $J\ kg^{-1}$
D. $J^{-1}\ kg^{-1}$

Q. 13 If mass of the body is 80 kg who receive a lethal whole body equivalent dose of 400 Gy. Then how much is absorbed.

A. 300 J
B. 480 J
C. 320 J
D. 350 J

Q. 14 The size and location of tumour in brain determined by

A. γ-rays
B. X-rays
C. Visible rays
D. All of these

Q. 15 For skin cancerous cells diagnostic, the radio isotopes used is

A. Phosphorus-32
B. Strontium-90
C. Carbon-12
D. Both A and B

Q. 16 Pu remains dangerous for about

A. 1 year
B. 19 year
C. 192 year
D. 192000 year

Q. 17 For better, understanding of plants photosynthesis process, the radioactive tracer used is:

A. C – 12
B. C – 14
C. U – 234
D. Rn – 222

Q. 18 A 75 kg person receive a whole-body radiation dose of 24 m-rad delivered by alpha particle for which RBE factor is 12. The energy absorbed is

A. 18 mJ
B. 28 mJ
C. 1.8 mJ
D. 24 mJ

Q. 19 The RBE factor of neutron and proton below 10 MeV for eyes is:

A. 10
B. 20
C. 30
D. 40

Q. 20 Thyroid gland cancer can be cured by:

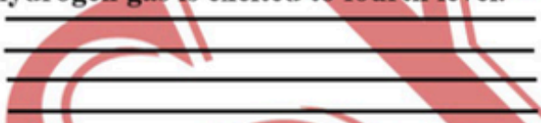
A. Iodine – 131
B. Carbon – 12
C. Strontium – 90
D. Phosphorus – 32

Atomic Spectra/Line Spectrum

Q. 21 Value of n for the largest wavelength photon emitted in the Balmer series:

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

Q. 22 First four lowest energy levels are shown. How many transitions are possible if hydrogen gas is excited to fourth level.



A. 1
B. 2
C. 4
D. 6

Q. 23 Molecular spectra are examples of:

A. Line spectra
B. Solar spectra
C. Continuous spectra
D. Band spectra

Q. 24 The total energy of the electron in nth orbit of hydrogen atom around the nucleus is given by:

A. $E_n = -\frac{1}{n^2}\left[\frac{2\pi^2 k^2 me^4}{h^2}\right]$

B. $E_n = -\frac{1}{n^2}\left[\frac{h^2}{2\pi^2 k^2 me^4}\right]$

C. $E = -\frac{1}{n^2}\left[\frac{2\pi kme^2}{h^2}\right]$

D. $E = -\frac{1}{n^2}\left[\frac{h^2}{2\pi kme^2}\right]$

Q. 25 Hydrogen atom does not emit X-rays because _____

A. Its energy levels are too close to each other
B. Its energy levels are too far apart
C. It is too small in size
D. It has a single electron

Q. 26 Which of the following is true?

A. Lyman series is a continuous spectrum
B. Paschen series is a line spectrum in the infra-red
C. Ballmer series is a line spectrum in the ultraviolet
D. The spectral series formula can be derived from the Rutherford model of the hydrogen atom

Q. 27 Which one of the series of hydrogen spectrum is in the visible region?

A. Lyman series
B. Balmer series
C. Paschen series
D. Bracket series

Q. 28 The wavelength of the first line of Balmer series is 6563 angstrom. The Rydberg constant for hydrogen is about

A. 1.09×10^{7} per m
B. 1.09×10^{8} per m
C. 1.09×10^{9} per m
D. 1.09×10^{5} per m

Q. 29 Whenever a hydrogen atom emits a photon in the Balmer series

A. It need not emit any more photon
B. It may emit another photon in the Paschen series
C. It must emit another photon in the Lyman series
D. It may emit another photon in the Balmer series

Q. 30 The Bohr model of atoms

A. Assumes that the angular momentum of electrons is quantized
B. Uses Einstein's photo-electric equation
C. Predicts continuous emission spectra for atoms
D. Predicts the same emission spectra for all types of atoms

Q. 31 The Rydberg constant 'R' in per meter is

A. 1.0274×10^{7}
B. 1.04274×10^{7}
C. 1.0674×10^{7}
D. 1.0974×10^{7}

Q. 32 The electric P.E of an electron in an orbit at a distance of rn from the positive charge

A. $\frac{Ke^2}{r_n^2}$
B. $\frac{Ke}{r_n^2}$
C. $-\frac{Ke^2}{r_n}$
D. $\frac{Ke^2}{r_n}$

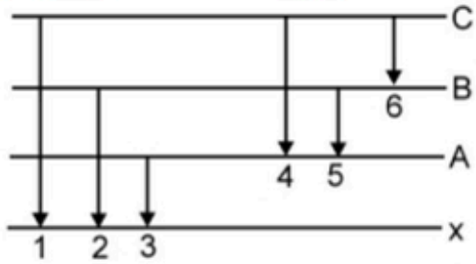
Q. 33 The ratio of minimum wavelength for Balmer and Lyman series

A. 4
B. $\frac{1}{4}$
C. $\frac{1}{16}$
D. 16

Q. 34 Bracket series is obtained when all transition of electron terminate on _____

A. 4th orbit
B. 5th orbit
C. 3rd orbit
D. 2nd orbit

Q. 35 The figure indicates the energy level diagram of an atom and the origin of six spectral lines in emission (e.g. line no. 5 arises from the transition from level B to A). The following spectral lines will also occur in the absorption spectrum



A. 1, 2, 3
B. 1, 2, 3, 4, 5, 6
C. 1, 4, 6
D. 4, 5, 6

Q. 36 According to Bohr's theory the moment of momentum of an electron revolving in second orbit of hydrogen atom will be

A. $2\pi h$
B. πh
C. h/π
D. $2h/\pi$

Q. 37 The ratio of the largest to shortest wavelengths in Lyman series of hydrogen spectra is

A. 25/9
B. 17/6
C. 9/5
D. 4/3

Q. 38 According to the Rutherford?s atomic model, the electrons inside the atom are

A. Stationary
B. Not stationary
C. Centralized
D. None of these

Q. 39 Which of the following is true for number of spectral lines in going form Layman series to Pfund series?

A. Increases
B. Decreases
C. Unchanged
D. May decreases or increases

Q. 40 An electron changes its position from orbit n=4 to the orbit n=2 of an atom. The wavelength of the emitted radiation?s is (R = Rydberg?s constant)

A. 16/R
B. 16/3R
C. 16/5R
D. 16/7R

The atom to include protons, neutrons and electrons.(Atomic Nucleus)

Q. 41 The nucleus was discovered by

A. Fermi
B. Stransman
C. Rutherford
D. Ottohan

Q. 42 How many neutrons are there in the nuclide Zn_{30}^{66} ?

A. 22
B. 30
C. 36
D. 66

Q. 43 Which of the following statement is correct?

A. Two isobars always have the same mass number
B. Two isotopes always have the same mass number
C. Two isotones always have the same mass number
D. Two isobars always have the same atomic number

Q. 44 Atoms P and Q are isotopes. How does the composition of neutral atom P compare with neutral atom Q?

Option	Number of Protons	Number of neutrons	Number of electrons
A.	Different	Different	Different
B.	Different	Different	Same
C.	Same	Different	Same
D.	Same	Same	Different

Q. 45 Deuterium and tritium are two isotopes of hydrogen. Compared to a deuterium atom, how many protons and neutrons does a tritium atom have?

	Number of protons	Number of neutrons
A.	More	More
B.	More	Same
C.	Same	More
D.	Same	Same

Q. 46 What are the number of neutrons, protons and electrons in a neutral atom of $^{235}_{92}U$?

A. 92, 143, 143
B. 92, 235, 235
C. 143, 92, 92
D. 235, 92, 92

Q. 47 Both Xenon and cesium each have

A. 13 isotopes
B. 34 isotopes
C. 36 isotopes
D. 10 isotopes

Q. 48 The number of neutrons in the nucleus of $_3Li^4$ are

A. 4
B. 3
C. 1
D. 7

Q. 49 The uranium atom $_{92}U^{238}$ emits an α-particle to become thorium, which then emits a β-particles to become protactinium. What is the proton number of protactinium?

A. 89
B. 91
C. 95
D. 85

Q. 50 Which of the following nuclides has equal number of neutrons and protons?

A. $_1H^1$
B. $_4Be^9$
C. $_2He^4$
D. $_3Li^7$

Spontaneous and random nuclear decay/ the Law of Radioactive Decay

Q. 51 When nucleus emits alpha particle, its charge number decreases by

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

Q. 52 Radiations emitted by a radioactive element are

A. visible
B. invisible
C. sometimes visible
D. none of these

Q. 53 Magnetic field can cause deflection in

A. α-rays
B. β-rays
C. γ-rays
D. A and B

Q. 54 In which of the following decays the element reduce does not change?

A. α-rays
B. β-rays
C. γ-rays
D. not possible

Q. 55 In the nuclear decay

$$ {}^{A}_{Z}X \rightarrow {}^{A}_{Z+1}Y \rightarrow {}^{A-4}_{Z-1}B^{*} \rightarrow {}^{A-4}_{Z-1}B $$

The particle emitted in the sequence are

A. α, β, γ
B. β, α, γ
C. γ, α, β
D. β, γ, α

Q. 56 Which one of the following radiations possesses maximum velocity?

A. α-rays
B. β-rays
C. γ-rays
D. All of above have same speed

Q. 57 A radioactive nucleus $_{92}X^{235}$ decays to $_{91}Y^{231}$. Which of the following particles are emitted?

A. Two deuterons and one positron
B. One alpha and one electron
C. One alpha and one proton
D. One proton and four neutrons

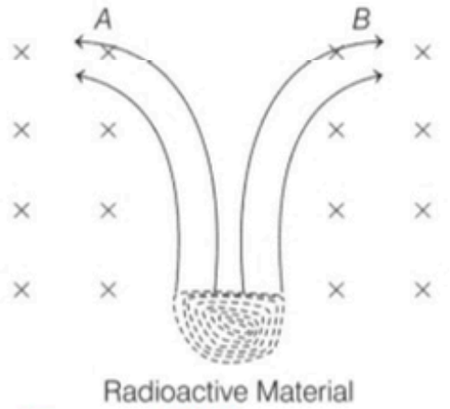
Q. 58 A α-particle can produce fluorescence in _____

A. ZnS
B. Barium platinocyanide
C. Sodium iodide
D. All of above

Q. 59 Which one of the following is not a mode of radioactive decay?

A. Proton emission
B. Electron emission
C. Alpha decay
D. Gamma emission

Q. 60 The radiations emitted from a radioactive material separated into two groups A and B when a magnetic field is directed into the plane of the paper. According to figure, names of radiation A and B are respectively



A. γ, α
B. α, γ
C. β, γ
D. α, β

Half Life and rate of decay

Q. 61 The radioactivity of a certain radioactive element drops to 1/64 of its initial value in 30 seconds. Its half-life is

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

Q. 62 The percentage of radioactive nucleus that remains undecayed after 5 half-lives is nearly:

A. 3%
B. 5 %
C. 10%
D. 20%

Q. 63 The half-life period of a radioactive substance is 5 min. The amount of substance decayed in 20 min will be

A. 75%
B. 25%
C. 93.75%
D. 6.25%

Q. 64 The activity of a radioactive sample is 1.6 curie and its half-life is 2.5 days. Its activity after 10 days will be:

A. 0.8 curie
B. 0.4 Curie
C. 0.1 curie
D. 0.16 Curie

Q. 65 The half-life of the isotope $^{24}_{11}Na$ is 15 hours. How much times does it take for $\frac{7}{8}$ th of a sample of this isotope to decay?

A. 75 h
B. 65 h
C. 55 h
D. 45 h

Q. 66 What fraction of a radioactive material will get disintegrated in a period of two half-lives?

A. whole
B. half
C. one-fourth
D. three-fourth

Q. 67 The half-life of radon is

A. 4 days
B. 4 months
C. 4 years
D. 4 weeks

Q. 68 The half-life of a radioactive element which has only $\frac{1}{32}$ of its original mass left after a lapse of 60 days is:

A. 12 days
B. 32 days
C. 60 days
D. 64 days

Q. 69 The S.I unit of decay constant is

A. m
B. m^{-1}
C. s^{-1}
D. ms^{-1}

Q. 70 When an animal dies each gram of carbon in its body emits about 16b particles each minute. Each gram of carbon from same animal remains is found to emit 4b particles per minute. How old is the animal (Half-life of radioactive carbon is 6000 years)?

A. 3000 years
B. 6000 years
C. 12000 years
D. 18000 years

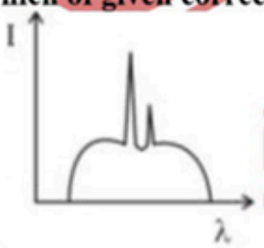
Q. 71 Which of the following is true?

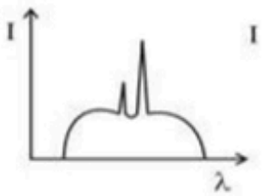
A. The Lyman series is a continuous spectrum
B. The Balmer series is a line spectrum in the ultraviolet region
C. The Paschen series is a line spectrum in the infrared region
D. The spectral series formula can be derived from Rutherford's model of the hydrogen atom

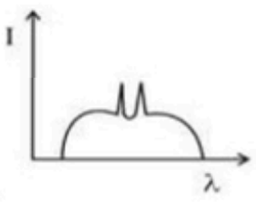
Q. 72 The total number of spectral lines for an electron transition form n = 5 to n = 1 states is

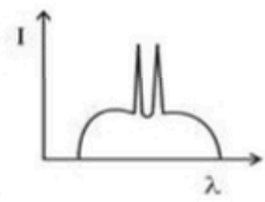
A. 1
B. 7
C. 5
D. 10

Q. 73 Which of given correctly shown intensity wavelength graph for X-rays

A. 

B. 

C. 

D. 

Q. 74 In Bohr's model, the atomic radius of the first orbit is r_o; then the radius of the third orbit is:

A. $\frac{r_0}{9}$
B. r_0
C. $9r_0$
D. $3r_0$

Q. 75 Energy order of characteristics x-rays

A. $K_\gamma > K_\beta > K_\alpha$ B. $K_\gamma = K_\beta = K_\alpha$

C. $K_\gamma < K_\beta < K_\alpha$ D. $K_\gamma > K_\beta < K_\alpha$

Q. 76 In the Bohr's hydrogen atom model, the radius of the stationary orbit is directly proportional to (n = principle quantum number)

A. β B. n^{-2}

C. n D. n^2

Q. 77 X-rays are not used in RADAR, because

A. X – rays are not reflected by target B. X – rays are completely absorbed by air

C. X – rays damage the target D. All of these

Q. 78 The nuclei which have different atomic numbers but equal number of neutrons are called:

A. Isobars B. Isotones

C. Isotopes D. Isomers

Q. 79 In 420 days, the activity of a sample of polonium (Po) fell to one – eight of its initial value. The half – life of polonium is:

A. 140 days B. 280 days

C. 70 days D. 210 days

Q. 80 Nuclear fission experiments show that the neutrons split the uranium nuclei into two fragments of about the same size. This process is accompanied by the emission of several

A. Protons and positrons B. α – particles

C. Neutrons D. Protons and – particles

Q. 81 The relationship between decay constant and half-life T1/2 of the radioactive substance is

A. $\lambda T_{1/2} = \ell n(2)$ B. $\lambda T_{1/2} = \ell n\left(\frac{1}{2}\right)$

C. $\frac{\lambda}{T_{1/2}} = \ell n(2)$ D. $\lambda = \ell n(2)$

Q. 82 The particles equal in mass or greater than mass of protons are called

A. Leptons B. Mesons

C. Baryons D. Quarks

Q. 83 Half-life of sample A is 2 hour and that of sample B is 1 hour. If they have same No. of atoms at t = 0 what is ratio of atoms in A to B after 2 hours NA : NB

A. 1 : 2 B. 2 : 1

C. 3 : 2 D. 2 : 3

Q. 84 A pair of quark and antiquark makes

A. Photon B. Meson

C. Electron D. Neutron

Q. 85 Radium and polonium were discovered by:

A. Rutherford B. Becquerel

C. Pierre curie and Marie curie D. Irene curie and Joliot

Q. 86 Range of γ-ray in air obey.

A. Square law B. Cube law

C. Linear law D. Inverse square law

Q. 87 A neutron decays within the nucleus into

A. One P, one n and one β^+ B. One, one β^+ and neutrino

C. One proton, one β^+ and one anti-neutrino D. All of above

Q. 88 What percentage of radioactive substance is left after three half-lives?

A. 87.5 % B. 25%

C. 12.5 % D. 75%

Q. 89 The half-life of radium is about 1600 years. If 100g radium existing now, 25g will remain un decayed after

A. 4800 years B. 6400 years

C. 6400 years D. 3200 years

Q. 90 What is the charge on a-particles emitted during the phenomena of radioactivity?

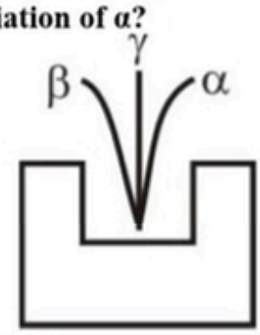
A. –e B. –2e

C. +e D. +2e

Q. 91 The rate of decay of radioactive element at a given instant of time is 10^3 disintegration/second. If the half-life of this element is 1 second, then the rate of decay after 2 second will be

A. 12 disintegration per sec
B. 250 disintegration per sec
C. 500 disintegration per sec
D. 125 disintegration per sec

Q. 92 In a radioactive phenomenon, observation shown in figure where deviates lesser than b in same electric or magnetic field (not shown in the figure). What is the reason of less deviation of α?



A. α is a lighter particle
B. α is very fasting moving particle
C. α is heavier particle
D. None of these

Q. 93 According to the equation $^{A}_{Z}X \rightarrow Y + 3\alpha$ particles, what are the atomic and mass numbers of 'Y'?

A. Z–6, A–12
B. Z–2, A–4
C. Z+1, A
D. Z+3, A

Q. 94 A certain radioactive nuclide of mass number 'x' decay by β–emission and α–emission to a second nuclide of mass number 't', which of the following correctly relates 'x' and 't'?

A. x = t – 4
B. x = t + 4
C. x + 3 = t
D. x –1 = t

Q. 95 Consider a photon of continuous X-rays coming from a Coolidge tube. Its energy comes from

A. KE of the striking electron
B. KE of free electron of the target
C. KE OF the ions of the target
D. An atomic transition in the target

Q. 96 Cut off wavelength of X rays coming from a Coolidge tube depends on the

A. Target material
B. Separation between the target and the filament
C. Accelerating voltage
D. Temperature of the filament

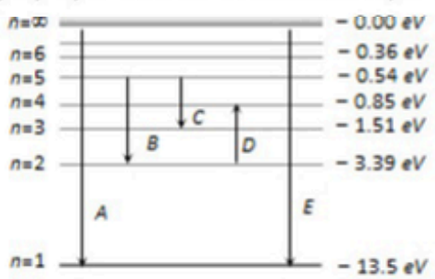
Q. 97 X rays and γ-rays both are electromagnet waves. Which of the following statements is correct?

A. The wavelength of x-rays is greater than that of γ-rays
B. The wavelength of X-rays is less than that of γ-rays
C. The frequency of γ-rays is less than that of X-rays
D. The frequency and wavelength of X-rays are more than that of γ –rays

Q. 98 Which one of the series of hydrogen spectrum is in the visible region?

A. Lyman series
B. Balmer series
C. Paschen series
D. Bracket series

Q. 99 The energy levels of the hydrogen spectrum is shown in figure. There are some transitions A, B, C, D and E. Transition A, B and C respectively represent



A. First member of Lyman series, third spectral line of Balmer series and the second spectral line of Paschen series
B. Ionization potential of hydrogen, second spectral line of Balmer series and third spectral line of Paschen series

C. Series limit of Lyman series, third spectral line of Balmer series and second spectral line of Paschen series

D. Series limit of Lyman series, second spectral line of Balmer series and third spectral line of Paschen series

Q. 100 According to Bohr's theory the moment of momentum of an electron revolving in second orbit of hydrogen atom will be

A. $2\pi h$ B. πh

C. h/π D. $2h/\pi$

Q. 101 The de-Broglie wavelength of an electron in the first Bohr orbit is

A. Equal to one fourth the circumference of the first orbit

B. Equal to half the circumference of the first orbit

C. Equal to twice the circumference of the first orbit

D. Equal to the circumference of the first orbit

Q. 102 Which of the following transition will have highest emission wavelength?

A. n=2 to n=1 B. n=1 to n=2

C. n=2 to n=5 D. n=5 to n=2

Q. 103 Bottom quark carries charge:

A. $\frac{2}{3}e$ B. $\frac{+1}{3}e$

C. $\frac{-2}{3}e$ D. $\frac{-1}{3}e$

Q. 104 Emission of a neutrino is occupied by the emission of:

A. α^+ B. β

C. β^+ D. All of these

Q. 105 The fusion process is possible at high temperatures because at high temperatures

A. The nucleus disintegrates

B. Molecules disintegrate

C. Atoms become ionized

D. The nuclei get sufficient energy so as to overcome the Coulomb repulsive force

Q. 106 Hydrogen atom does not emit X-rays because

A. Its energy levels are too close to each other B. Its energy levels are too apart

C. It is too small in size D. It has a single electron

Q. 107 X – rays were discovered by

A. Becquerel B. Roentgen

C. Marie Curie D. Von Laue

Q. 108 The products of the fission reaction of uranium namely barium and krypton have binding energy per nucleon about

A. 8.5 MeV B. 7.6 MeV

C. 8.6 MeV D. 7.5 MeV

Q. 109 For continuous X-rays produced wavelength is

A. Inversely proportional to the energy of the electrons hitting the target

B. Inversely proportional to the intensity of the electron beam

C. Proportional to intensity of the electron beam

D. Proportional to target temperature

Q. 110 Binding energy for deuteron nucleus is given by:

A. 2.8 MeV B. 2.23 MeV

C. 2.28 MeV D. 2.25 MeV

Q. 111 The penetrating power of X-rays increases with the

A. Increase in its velocity B. Increase in its frequency

C. Increase in its intensity D. Decrease in its velocity

Q. 112 X-rays cannot be deflected by means of an ordinary grating due to

A. Large wavelength B. High speed

C. Short wavelength D. None of these

Q. 113 The voltage applied across an X-rays tube is nearly

A. 10 V B. 100 V

C. 10000 V D. 10^6 V

Q. 114 Molybdenum is used as a target element for production of X-rays because it is

A. A heavy element and can easily absorb high velocity electrons
B. A heavy element with a high melting point
C. An element having high thermal conductivity
D. Heavy and can easily deflect electrons

Q. 115 Paschen series is obtained when all the transitions of electron terminate on.

A. 2nd orbit
B. 4th orbit
C. 3rd orbit
D. 5th orbit

Q. 116 The value of Rydberg's constant is:

A. 1.0974×10^{-7} m
B. $1.0986 \times 10^{-7}\ m^{-1}$
C. $1.0974 \times 10^{7}\ m^{-1}$
D. $1.0874 \times 10^{7}\ m^{-1}$

Q. 117 Mass No. of a nucleus will change only if it emits

A. α – particle
B. γ – rays
C. β – radiation
D. β – positive radiation

Q. 118 The size of nucleus is of the order of

A. 10^{-13} m
B. 10^{-15} m
C. 10^{-12} m
D. 10^{-10} m

Q. 119 The half-life of radioactive substance is six years. The time taken by 12grams of the substance to decay completely will be?

A. ∞
B. 18 years
C. 48 years
D. 72 years

Q. 120 The absorption transitions between the first and the fourth energy states of hydrogen atom are 3. The emission transitions between these states will be

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

ANSWERS & EXPLANTION: -

Q.111	**A**	Ballmer series lie in visible region.
Q.112	**C**	X-ray cannot produce pair production, because for pair production high energy photon gamma ray photons are required.
Q.113	**A**	$K.E_e = eV = hf = \frac{hc}{\lambda}$ $\lambda = \frac{hc}{eV}$
Q.114	**C**	Information
Q.115	**B**	
Q.116	**B**	
Q.117	**C**	
Q.118	**C**	The correct option is C Series limit of Lyman series, third spectral line of Balmer series and second spectral line of Paschen series Transition A(n= ∞ to 1) : Series limit of Lyman series Transition B(n=5 to n=2) : Third spectral line of Balmer series Transition C(n=5 to n=3) : Second spectral line of Paschen series
Q.119	**B**	Paschen series lies in the infrared region.
Q.120	**A**	Penetrating power is greater for lower wavelength.
Q.121	**C**	Consmic radiation are considered electromagnetic radiations as well as high energy charged particles.
Q.122	**C**	1 Gy = J kg^{-1}
Q.123	**C**	$D = \frac{\varepsilon}{m} \Rightarrow E = 4 \times 80 = 320$
Q.124	**A**	Book line.
Q.125	**A**	Book line.

Q.126	**D**	Side information pg#252 **Do You Know?** It is very difficult to dispose off radioactive waste safety due to their long half lives e.g., 'Pu' half life is 24,000 years, therefore, it remains dangerous for about 1,92,000 years.
Q.127	**B**	C – 14 emits β – radiation , can't harm plants.
Q.128	**A**	$D = \frac{De}{RBE}$
Q.129	**C**	**Table 21.2** **Relative Biological Effectiveness (RBE)** Radiation — RBE X-rays, γ-rays and α-particles of 30 keV or more — 1.0 α-particles of less than 30 keV — 1.7 Neutrons and protons below 10 MeV — 10 (body), 30 (eyes) α-particles from natural radioactivity — 10 Heavy recoil nuclei — 20
Q.130	**A**	Radioactive iodine-131 is used to combat cancer of the thyroid gland
Q.131	**C**	For largest wavelength n is minimum value and plus one. n = 2 + 1 = 3
Q.132	**D**	short cut for spectral lines $= \frac{n(n-1)}{2} = \frac{4(4-1)}{2} = 6$
Q.133	**D**	Molecules specter are band specter (Book lines)
Q.134	**A**	
Q.135	**A**	For production of X-Rays high atomic no metal used but energy gap for hydrogen is too close.
Q.136	**A**	
Q.137	**B**	Balmer series lies in the visible region.
Q.138	**A**	$\frac{1}{\lambda} = R\left[\frac{1}{4} - \frac{1}{9}\right] = \frac{5R}{36}$ $\quad \therefore R = \frac{36}{5\lambda} = \frac{36}{5 \times 6563 \times 10^{-10}}$
Q.139	**C**	Since in spectral series of hydrogen atom, Lymen series lies lower Balmer series.
Q.140	**A**	
Q.141	**D**	$R_H = \frac{E_o}{hc} = \frac{13.6eV}{(6.63\times10^{-34}Js)(3\times10^{8}ms^{-1})}$ $R_H = \frac{13.6\times1.6\times10^{-19}J}{(6.63\times10^{-34}Js)(3\times10^{8}ms^{-1})}$ $R_H = 1.0974\times10^{7}m^{-1}$

Q.142	**C**	$P.E = qV$ $= (e)(\frac{k(-e)}{r})$ $= \frac{-ke^2}{r}$
Q.143	**A**	$\because \frac{1}{\lambda} = R(\frac{1}{p^2} - \frac{1}{n^2})$ For $\lambda_{min}, n = \infty$ $\frac{1}{\lambda_{min}} = \frac{R}{p^2} \Rightarrow \lambda_{min} = \frac{p^2}{R}$ So, $\frac{\lambda_{balmer}}{\lambda_{lymen}} = (\frac{2}{1})^2 = 4$
Q.144	**A**	For bracket series electron must jump into 4^{th} shell.
Q.145	**A**	The absorption lines are obtained when the electron jumps from ground state (n = 1) to the higher energy states. Thus only 1, 2 and 3 lines will be obtained.
Q.146	**C**	Angular momentum $L = n(h/2\pi)$ For this case n=2, hence $L = 2\times h/2\pi = h/\pi$
Q.147	**D**	For Lyman series $\frac{1}{\lambda_{max}} = R\left[\frac{1}{1^2} - \frac{1}{2^2}\right] = \frac{3}{4}R$ and $\frac{1}{\lambda_{min}} = R\left[\frac{1}{1^2} - \frac{1}{\infty^2}\right] = \frac{R}{1} \Rightarrow \frac{\lambda_{max}}{\lambda_{min}} = \frac{4}{3}$
Q.148	**B**	
Q.149	**B**	Maximum number of spectral lines are observed in Lymen series.
Q.150	**B**	$\frac{1}{\lambda} = R\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right] = R\left[\frac{1}{(2)^2} - \frac{1}{(4)^2}\right]$ $\lambda = \frac{16}{3R}$
Q.151	**C**	Rutherford first discover nucleus.
Q.152	**C**	No of neutrous =A – Z = 66 – 30 = 36
Q.153	**A**	Isobars have same mass number and different atomic number.
Q.154	**C**	Isotopes has same Z and different A so number of protons and electrons are same but N are different.
Q.155	**C**	Deutrium: Z = 1 , A = 2 , N = A – Z = 1 Tritium: Z = 1, A = 3, N = A – Z = 2
Q.156	**C**	$^{235}_{92}U$. Number of proton = Z = 9 Number of electron = Number of proton = 92 Number of neutron = N = A–Z = 143
Q.157	**C**	Book information

Q.158	**C**	$N = A - Z = 4 - 3 = 1$
Q.159	**B**	When 1α 1β emits 1 Mass reduce = 4 Charge reduce = 1 So, Charge = 92 – 1 = 91
Q.160	**C**	$_2He^4$ Protons = 2 Neutrons = 4-2=2
Q.161	**A**	As alpha ^4_2He is Helium Nucleus, so, when alpha emit mass of resultant Nucleus decrease by 4 and charge decrease by 2.
Q.162	**B**	α, β and γ are invisible.
Q.163	**D**	A and β consist of charged particles
Q.164	**C**	γ- rays are EM and have speed 3×10^8 ms^{-1}.
Q.165	**B**	Charge number increases by 1, so it is β – emission Charge number decreases by 2, so it is α – emission No change in charge number so it is γ – emission
Q.166	**C**	$V_\gamma > V_\beta > V_\alpha$ γ – rays are EM and have speed 3×10^8 ms^{-1}.
Q.167	**B**	$_{92}X^{235} \xrightarrow{\alpha} {}_{90}X^{231} \xrightarrow{-1e} {}_{91}Y^{231}$
Q.168	**D**	α, β, γ produce fluorescent on all elements mentioned.
Q.169	**A**	Book Information regarding decay equations
Q.170	**D**	α–particles are positively charged whereas β–particles are negatively charged. So by Fleming?s left hand rule which states that if we stretch the first finger, central finger and thumb of our right hand in mutually perpendicular directions then, first finger shows the direction of magnetic field, second finger shows the direction of current and thumb shows the movement of the wire hence, correct choice is D
Q.171	**C**	$\frac{1}{64} = \frac{1}{2^6}$ $n = 6$ $T_{1/2} = \frac{t}{n} = \frac{30}{6} = 5sec$
Q.172	**A**	$N = \frac{N_\circ}{2^\circ} = \frac{1}{2^5} = \frac{1}{32} = 0.03 \Rightarrow 3\%$
Q.173	**C**	Number of half lives in 20 min = n = $\frac{20}{5} = 4$ fraction of material remains after four half lives = $\frac{1}{16}$ Hence fraction that decays $= 1 - \frac{1}{16} = \frac{15}{16} = 93.75$
Q.174	**C**	$T_{1/2} = \frac{10}{2.5} = 4$ $A = \frac{A_o}{2^n} = \frac{1.6}{16} = 0.1$
Q.175	**D**	$= \frac{7}{8} \Rightarrow n = 3$ $t = nT_{1/2} = 3x15 = 45\ hours$

Q.176	**D**	Decayed $= N_o(1-\frac{1}{2^n})$
Q.177	**A**	Half-life of radon is 3.8 days
Q.178	**A**	From $\frac{1}{32} = \frac{1}{2^5}$ $n = 5, T_{1/2} = \frac{t}{n} = \frac{60}{5} \Rightarrow T_{1/2} = 12$
Q.179	**C**	
Q.180	**C**	Activity reduce $16\beta \rightarrow 4\beta$ So $n = 2$ $t = nT^{1/2} = 2(6000)$ $= 12000$ years

Q.181	**C**	**Q.182**	**D**	**Q.183**	**B**	**Q.184**	**C**	**Q.185**	**A**
Q.186	**D**	**Q.187**	**A**	**Q.188**	**B**	**Q.189**	**A**	**Q.190**	**C**
Q.191	**A**	**Q.192**	**C**	**Q.193**	**B**	**Q.194**	**B**	**Q.195**	**C**
Q.196	**D**	**Q.197**	**C**	**Q.198**	**C**	**Q.199**	**D**	**Q.200**	**D**
Q.201	**B**	**Q.202**	**C**	**Q.203**	**A**	**Q.204**	**B**	**Q.205**	**A**
Q.206	**C**	**Q.207**	**A**	**Q.208**	**B**	**Q.209**	**C**	**Q.210**	**C**
Q.211	**D**	**Q.212**	**B**	**Q.213**	**D**	**Q.214**	**B**	**Q.215**	**D**
Q.216	**A**	**Q.217**	**B**	**Q.218**	**A**	**Q.219**	**A**	**Q.220**	**B**
Q.221	**B**	**Q.222**	**C**	**Q.223**	**C**	**Q.224**	**B**	**Q.225**	**C**
Q.226	**C**	**Q.227**	**A**	**Q.228**	**B**	**Q.229**	**A**	**Q.230**	**D**

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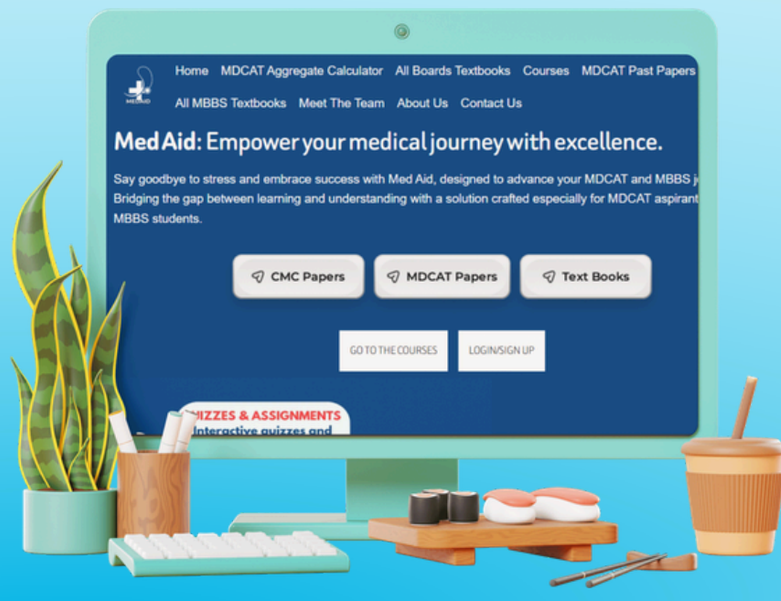

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