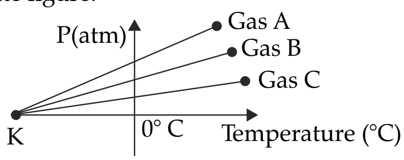
JEE (Main) PHYSICS SOLVED PAPER

2023
01st Feb Shift 2

Section A

Q. 1. For three low density gases A, B, C pressure versus temperature graphs are plotted while keeping them at constant volume, as shown in the figure.



The temperature corresponding to the point 'K' is:
(1) $-273°C$ **(2)** $-100°C$ **(3)** $-40°C$ **(4)** $-373°C$

Q. 2. Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: For measuring the potential difference across a resistance of 600 Ω, the voltmeter with resistance 1000 Ω will be preferred over voltmeter with resistance 4000 Ω.
Reason R: Voltmeter with higher resistance will draw smaller current than voltmeter with lower resistance.
In the light of the above statements, choose the most appropriate answer from the options given below.
(1) Both A and R are correct and R is the correct explanation of A
(2) Both A and R are correct but R is not the correct explanation of A
(3) A is not correct but R is correct
(4) A is correct but R is not correct

Q. 3. Figures (a), (b), (c) and (d) show variation of force with time.

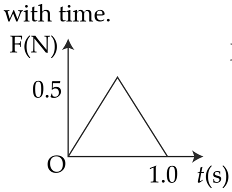


Fig (a)

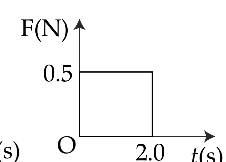


Fig (b)

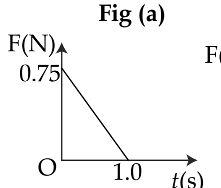


Fig (c)

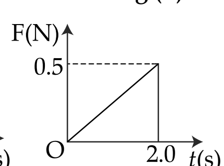


Fig (d)

The impulse is highest in figure:
(1) Fig (c) **(2)** Fig (b) **(3)** Fig (d) **(4)** Fig (a)

Q. 4. An electron of a hydrogen like atom, having $Z = 4$, jumps from 4^{th} energy state to 2^{nd} energy state. The energy released in this process, will be:
(Given $Rch = 13.6$ e V)
where, R = Rydberg constant
c = Speed of light in vacuum
h = Planck's constant
(1) 40.8 e V **(2)** 3.4 e V
(3) 10.5 e V **(4)** 13.6 e V

Q. 5. The ratio of average electric energy density and total average energy density of electromagnetic wave is:
(1) 3 **(2)** $\frac{1}{2}$ **(3)** 1 **(4)** 2

Q. 6. Two objects A and B are placed at 15 cm and 25 cm from the pole in front of a concave mirror having radius of curvature 40 cm. The distance between images formed by the mirror is _______.
(1) 100 cm **(2)** 60 cm **(3)** 160 cm **(4)** 40 cm

Q. 7. Equivalent resistance between the adjacent corners of a regular n-sided polygon of uniform wire of resistance R would be:
(1) $\frac{n^2R}{n-1}$ **(2)** $\frac{(n-r)R}{n}$
(3) $\frac{(n-1)R}{n^2}$ **(4)** $\frac{(n-1)R}{(2n-1)}$

Q. 8. A carnot engine operating between two reservoirs has efficiency $\frac{1}{3}$. When the temperature of cold reservoir raised by x, its efficiency decreases to $\frac{1}{6}$. The value of x, if the temperature of hot reservoir is 99°C, will be:
(1) 66 K **(2)** 62 K **(3)** 33 K **(4)** 16.5 K

Q. 9. Given below are two statements: One is labelled as Assertion A and the other is labelled as Reason R.
Assertion A: Two metallic spheres are charged to the same potential. One of them is hollow and another is solid, and both have the same radii. Solid sphere will have lower charge than the hollow one.
Reason R: Capacitance of metallic spheres depend on the radii of spheres.
In the light of the above statements, choose the correct answer from the options given below.
(1) Both A and R are true and R is the correct explanation of A
(2) A is true but R is false
(3) A is false but R is true
(4) Both A and R are true but R is not the correct explanation of A

Q. 10. If the velocity of light c, universal gravitational constant G and Planck's constant h are chosen as fundamental quantities. The dimensions of mass in the new system is:
(1) $\left[h^{1/2}\, c^{-1/2}\, G^{1}\right]$ **(2)** $\left[h^{-1/2}\, c^{1/2}\, G^{1/2}\right]$
(3) $\left[n^{1/2}\, c^{1/2}\, G^{-1/2}\right]$ **(4)** $\left[h^{1}\, c^{1}\, G^{-1}\right]$

Q. 11. Choose the correct statement about Zener diode :

(1) It works as a voltage regulator in forward bias and behaves like simple *pn* junction diode in reverse bias.

(2) It works as a voltage regulator only in forward bias.

(3) It works as a voltage regulator in both forward and reverse bias.

(4) It works as a voltage regulator in reverse bias and behaves like simple *pn* junction diode in forward bias.

Q. 12. The Young's modulus of a steel wire of length 6 m and cross-sectional area 3 mm^2, is 2×10^{11} N m^{-2}. The wire is suspended from its support on a given planet. A block of mass 4 kg is attached to the free end of the wire. The acceleration due to gravity on the planet is $\frac{1}{4}$ of its value on the earth.

The elongation of wire is (Take g on the earth = 10 m s^{-2}):

(1) 0.1 cm **(2)** 0.1 mm **(3)** 1 cm **(4)** 1 mm

Q. 13. In an amplitude modulation, a modulating signal having amplitude of X volt is superimposed with a carrier signal of amplitude Y volt in first case. Then, in second case, the same modulating signal is superimposed with different carrier signal of amplitude 2Y volt. The ratio of modulation index in the two cases respectively will be:

(1) 2 : 1 **(2)** 1 : 2 **(3)** 4 : 1 **(4)** 1 : 1

Q. 14. The threshold frequency of a metal is f_0. When the light of frequency $2f_0$ is incident on the metal plate, the maximum velocity of photoelectrons is v_1. When the frequency of incident radiation is increased to $5f_0$, the maximum velocity of photoelectrons emitted is v_2. The ratio of v_1 to v_2 is:

(1) $\frac{v_1}{v_2} = \frac{1}{8}$ **(2)** $\frac{v_1}{v_2} = \frac{1}{8}$ **(3)** $\frac{v_1}{v_2} = \frac{1}{16}$ **(4)** $\frac{v_1}{v_2} = \frac{1}{2}$

Q. 15. A coil is placed in magnetic field such that plane of coil is perpendicular to the direction of magnetic field. The magnetic flux through a coil can be changed:

A. By changing the magnitude of the magnetic field within the coil.

B. By changing the area of coil within the magnetic field.

C. By changing the angle between the direction of magnetic field and the plane of the coil.

D. By reversing the magnetic field direction abruptly without changing its magnitude.

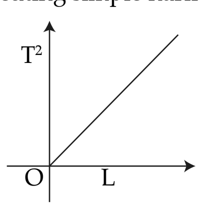
Choose the most appropriate answer from the options given below:

(1) A and B only **(2)** A, B and D only

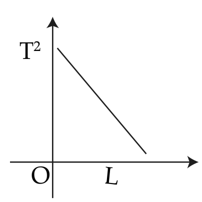
(3) A, B and C only **(4)** A and C only

Q. 16. Choose the correct length (L) versus square of time period (T^2) graph for a simple pendulum executing simple harmonic motion.

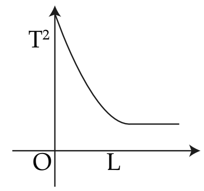
(1)



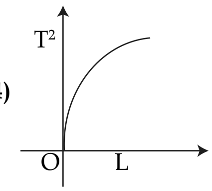
(2)



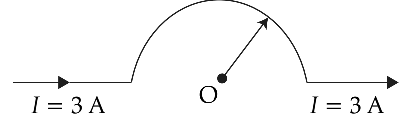
(3)



(4)



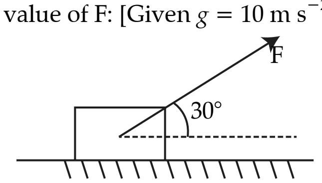
Q. 17. As shown in the figure, a long straight conductor with semicircular arc of radius $\frac{\pi}{10}$ m is carrying current I = 3 A. The magnitude of the magnetic field at the center O of the arc is: (The permeability of the vacuum = $4\pi \times 10^{-7}$ N A^{-2})



(1) 1 μT **(2)** 3 μT

(3) 4 μT **(4)** 6 μT

Q. 18. As shown in the figure a block of mass 10 kg lying on a horizontal surface is pulled by a force F acting at an angle 30°, with horizontal. For μ_s = 0.25, the block will just start to move for the value of F: [Given g = 10 m s^{-2}]



(1) 20 N **(2)** 33.3 N **(3)** 25.2 N **(4)** 35.7 N

Q. 19. The escape velocities of two planets A and B are in the ratio 1 : 2. If the ratio of their radii respectively is 1 : 3, then the ratio of acceleration due to gravity of planet A to the acceleration of gravity of planet B will be:

(1) $\frac{3}{2}$ **(2)** $\frac{2}{3}$ **(3)** $\frac{3}{4}$ **(4)** $\frac{4}{3}$

Q. 20. For a body projected at an angle with the horizontal from the ground, choose the correct statement.

(1) The vertical component of momentum is maximum at the highest point.

(2) The Kinetic Energy (K.E.) is zero at the highest point of projectile motion.

(3) The horizontal component of velocity is zero at the highest point.

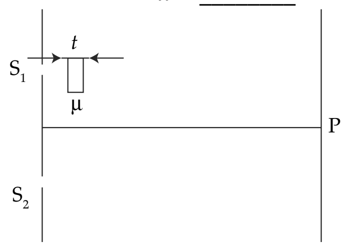
(4) Gravitational potential energy is maximum at the highest point.

Section B

Q. 21. A block is fastened to a horizontal spring. The block is pulled to a distance x = 10 cm from its equilibrium position (at x = 0) on a frictionless surface from rest. The energy of the block at x = 5 cm is 0.25 J. The spring constant of the spring is ________ N m^{-1}.

Q. 22. A square shaped coil of area 70 cm^2 having 600 turns rotates in a magnetic field of 0.4 Wb m^{-2}, about an axis which is parallel to one of the side of the coil and perpendicular to the direction of field. If the coil completes 500 revolutions in a minute, the instantaneous emf when the plane of the coil is inclined at 60° with the field, will be ________ V. (Take $\pi = \frac{22}{7}$)

Q. 23. As shown in the figure, in Young's double slit experiment, a thin plate of thickness t = 10 μm and refractive index μ = 1.2 is inserted infront of slit S_1. The experiment is conducted in air (μ = 1) and uses a monochromatic light of wavelength λ = 500 nm. Due to the insertion of the plate, central maxima is shifted by a distance of $x\beta_0$. β_0 is the fringe-width before the insertion of the plate. The value of the x is ________.



Q. 24. Moment of inertia of a disc of mass M and radius 'R' about any of its diameter is $\frac{MR^2}{4}$. The moment of inertia of this disc about an axis normal to the disc and passing through a point on its edge will be, $\frac{x}{2}MR^2$. The value of x is ________.

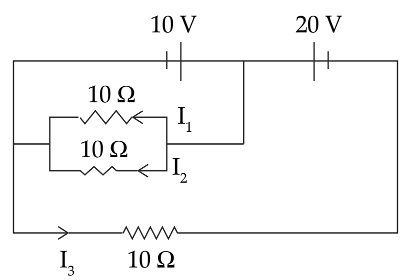
Q. 25. For a train engine moving with speed of 20 m s^{-1}, the driver must apply brakes at a distance of 500 m before the station for the train to come to rest at the station. If the brakes were applied at half of this distance, the train engine would cross the station with speed $\sqrt{x}$ m s^{-1}. The value of x is ________. (Assuming same retardation is produced by brakes).

Q. 26. A cubical volume is bounded by the surfaces $x = 0, x = a, y = 0, y = a, z = 0, z = a$. The electric field in the region is given by $\vec{E} = E_0 x\hat{i}$. Where $E_0 = 4 \times 10^4$ N C^{-1} m^{-1}. If a = 2 cm, the charge contained in the cubical volume is $Q \times 10^{-14}$ C. The value of Q is ________. (Take $\varepsilon_0 = 9 \times 10^{-12}$ C^2 N^{-1} m^{-2})

Q. 27. A force $F = (5 + 3y^2)$ acts on a particle in the y-direction, where F is in newton and y is in meter. The work done by the force during a displacement from y = 2 m to y = 5 m is ______ J.

Q. 28. The surface of water in a water tank of cross section area 750 cm^2 on the top of a house is h m above the tap level. The speed of water coming out through the tap of cross section area 500 mm^2 is 30 cm s^{-1}. At that instant, $\frac{dh}{dt}$ is $x \times 10^{-3}$ m s^{-1}. The value of x will be ________.

Q. 29. In the given circuit, the value of $\left|\frac{I_1 + I_3}{I_2}\right|$ is _______.



Q. 30. Nucleus A having Z = 17 and equal number of protons and neutrons has 1.2 Me V binding energy per nucleon. Another nucleus B of Z = 12 has total 26 nucleons and 1.8 Me V binding energy per nucleons. The difference of binding energy of B and A will be _______ Me V.

Answer Key

Q. No.	Answer	Topic Name	Chapter Name
1	(1)	Properties of liquid and calorimeters	Properties of solid and liquid
2	(2)	Kirchoffs law and electrical instruments	Current electricity
3	(2)	Impulse	Laws of motion
4	(1)	Bohrs Atomic model	Atoms and nuclei
5	(2)	Rectilinear propagation of light	Optics
6	(3)	Rectilinear propagation of light	Optics
7	(3)	Electric resistance	Current electricity
8	(2)	Carnot engine and PV diagrams	Thermodynamics
9	(3)	Capacitors	Electrostatics
10	(3)	Dimensional Analysis	Physics and measurement
11	(1)	Zener Diode	Electronic devices
12	(2)	Elasticity	Properties of solids and liquids
13	(1)	Modulation	Principle of communication
14	(4)	Photo electric effect	Dual nature of matter and radiation
15	(3)	Electromagnetic induction	Electromagnetic induction and alternating current

16	**(1)**	Simple harmonic motion	Oscillations and waves
17	**(20**	Magnetic effect of current	Magnetic effect of current and magnetism
18	**(3)**	Friction force	Laws of motion
19	**(3)**	Motion of satellites and escape velocity	Gravitation
20	**(4)**	Motion in two dimensions	Kinematics
21	**[50]**	Simple harmonic motion	Oscillation and waves
22	**[44]**	Electromagnetic induction	Electromagnetic induction and alternating current
23	**[4]**	Wave optics	Optics
24	**[3]**	Centre of mass and moment of inertia	Rotational motion
25	**[200]**	Motion in a straight line	Kinematics
26	**[288]**	Electrostatic Force, Electric Field and 1 Electrostatic Potential	Electrostatics
27	**[132]**	Work energy and power	Work energy and power
28	**[2]**	Propertiese of liquid and calorimetry	Properties of Solids and Liquids
29	**[2]**	Electric Current, Ohm's Law, Electric Resistance	Current Electricity
30	**[6]**	Bohr' s Atomic Model	Atoms and Nuclei

SOLUTIONS

Section A

1. **Option (1) is correct.**
At constant volume, $P \propto T$
Pressure will be zero at T = 0 hence temperature will be 0 K or –273°C.

2. **Option (3) is correct.**
Error in reading of voltmeter decreases with increase in its resistance that's why resistance & voltmeter should be maximum as much as possible.
So, assertion is wrong and reason is correct.

3. **Option (2) is correct.**
Impulse of force = Area under F–t graph.
Area of fig (b) is maximum.

4. **Option (1) is correct.**
Energy released = $E_4 - E_2$

$$= \frac{-13.6z^2}{16}\text{ e V} - \left(\frac{-13.6z^2}{4}\right)\text{ e V}$$

$$= -13.6\text{ e V} + 54.4\text{ e V} = 40.8\text{ e V}$$

5. **Option (2) is correct.**
Average electric field energy density of emw by, $= \frac{1}{4}\varepsilon_0 E_0^2$
E_0 = Amplitude of electric field.
Average total energy density of emw $= \frac{1}{2}\varepsilon_0 E_0^2$
On diving two we get ratio as $\frac{1}{2}$

6. **Option (3) is correct.**
For object A,

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{v_A} = \frac{-1}{20} + \frac{1}{15} \qquad (f = -20\text{ cm}, u_A = -15\text{ cm})$$

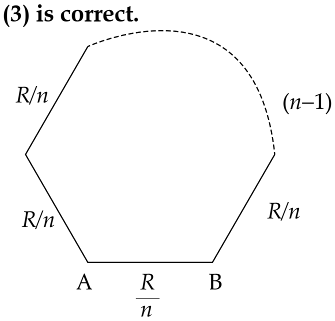
$$\frac{1}{v_A} = \frac{-3+4}{60} \Rightarrow v_A = 60\text{ cm.}$$

for object B,

$$\frac{1}{v_B} = \frac{-1}{20} + \frac{1}{25} = \frac{-5+4}{100} \Rightarrow v_B = -100\text{ cm.}$$

Distance between images.= $|-60 - 100|$ = 160 cm

7. **Option (3) is correct.**



Let we are taking resistance between A and B.
Then $\frac{R}{n}$ and $(n-1)\frac{R}{n}$ will be in parallel.

$$R_{AB} = \frac{\frac{R}{n} \times (n-1)\frac{R}{n}}{\frac{R}{n} + (n-1)\frac{R}{n}} \Rightarrow R_{AB} = \frac{(n-1)R}{n^2}$$

8. **Option (2) is correct.**
Efficiency of Carnot engine is,

$$\eta = 1 - \frac{T_2}{T_1}$$

T_1 = temp of hot reservoir
T_2 = temp of cold reservoir

$$\frac{1}{3} = 1 - \frac{T_2}{T_1} \Rightarrow \frac{T_2}{T_1} = \frac{2}{3}$$

And $$1 - \frac{T_2 + x}{T_1} = \frac{1}{6} \Rightarrow \frac{T_2 + x}{T_1} = \frac{5}{6}$$

Here, $T_1 = 372 \text{ K} \;\&\; T_2 = \frac{2}{3}T_1 = 248 \text{ K}$

$$248 + x = \frac{5}{6} \times 372 = 310$$
$$x = 310 - 248 = 62 \text{ K}$$

9. Option (3) is correct.

Charge on a conductor resides only on its outer surface, so both conductor will have same charge as both have same radii.

Now, capacitance of spherical conductor,

$$C = 4\pi\varepsilon_0 r \Rightarrow C \propto r$$

10. Option (3) is correct.

$$[C] = LT^{-1}$$
$$[G] = \frac{\text{Nm}^2}{\text{kg}^2} = \frac{MLT^{-2}L^2}{M^2} = M^{-1}L^3T^{-2}$$
$$[h] = \frac{\varepsilon}{\upsilon} = \frac{ML^2T^{-2}}{T^{-1}} = ML^2T^{-1}$$
$$M \propto C^p G^q h^r$$
$$ML^0T^0 = [LT^{-1}]^P [M^{-1}L^3T^{-2}]^q [ML^2T^{-1}]^r$$
$$ML^0T^0 = M^{-q+r} L^{p+3q+2r} T^{-p-2-r}$$
$$-q + r = 1 \qquad \text{...(i)}$$
$$p + 3q + 2r = 0 \qquad \text{...(ii)}$$
$$-p - 2q - r = 0 \qquad \text{...(iii)}$$
$$q + r = 0 \qquad \text{...(iv)}$$

From Equation (i) & (iv),

$$r = \frac{1}{2} \Rightarrow q = -\frac{1}{2}$$
$$p = -3q - 2r = +\frac{3}{2} - 1 = \frac{1}{2} \Rightarrow M \propto \sqrt{\frac{hc}{G}}$$

11. Option (4) is correct.

Zener diode works as a voltage regulator in reverse bias and behaves like simple *pn* junction diode in forward bias.

12. Option (2) is correct.

As per hooke' law

By $\quad Y = \frac{Fl}{A(\Delta l)} \Rightarrow \Delta l = \frac{Fl}{AY}$

$$\Delta l = \frac{10 \times 6}{3 \times 10^{-6} \times 2 \times 10^{11}} = 0.1 \text{ mm}$$

13. Option (1) is correct.

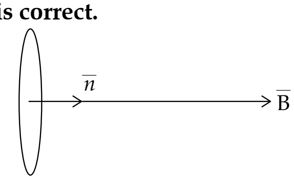
Let μ is modulation index

$$\mu = \frac{A_m}{A_c} \Rightarrow \mu_1 = \frac{x}{y} \Rightarrow \mu_2 = \frac{x}{2y} \Rightarrow \frac{\mu_1}{\mu_2} = 2:1$$

14. Option (4) is correct.

$$\frac{1}{2}mv_{max}^2 = h\upsilon - h\upsilon_0 \Rightarrow \frac{1}{2}mv_1^2 = 2hf_0 - hf_0 = hf_0$$
$$\frac{1}{2}mv_2^2 = 5hf_0 - hf_0 \Rightarrow \frac{1}{2}mv_2^2 = 4hf_0 \Rightarrow \frac{v_1^2}{v_2^2} = \frac{1}{4} \Rightarrow \frac{v_1}{v_2} = \frac{1}{2}$$

15. Option (3) is correct.



As plane is perpendicular to magnetic field, normal of area is parallel to magnetic field.

∴ Magnetic flux through the coil, $\phi = BA\cos\theta$

16. Option (1) is correct.

Time period of simple pendulum is given by,

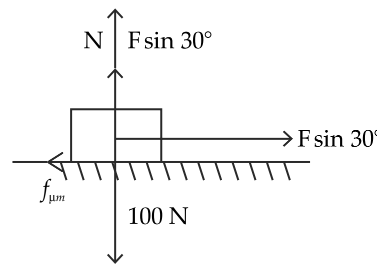
$$T = 2\pi\sqrt{\frac{l}{g}} \Rightarrow T^2 \propto l$$

17. Option (2) is correct.

$$B = \frac{\mu_0 i}{4r}$$
$$B = \frac{4\pi \times 10^{-7} \times 3}{4 \times \frac{\pi}{10}} = 3 \times 10^{-6} = 3\ \mu\text{T}$$

18. Option (3) is correct.

Just before starting of motion, block will be in limiting Equilibrium.



$$\frac{\sqrt{3}F}{2} = \mu N \text{ and } N + \frac{F}{2} = 100$$
$$N = 100 - \frac{F}{2}$$

Hence, $\quad \frac{\sqrt{3}F}{2} = \frac{1}{4}\left(100 - \frac{F}{2}\right) \Rightarrow \frac{\sqrt{3}F}{2} + \frac{F}{8} = 25$

$$\left(4\sqrt{3} + 1\right)\frac{F}{8} = 25$$
$$F = \frac{200}{4\sqrt{3} + 1} = \frac{50}{\sqrt{3} + 0.25} = 25.2 \text{ N}$$

19. Option (3) is correct.

$$\frac{V_{e_1}}{V_{e_2}} = \frac{1}{2} \Rightarrow \frac{r_1}{r_2} = \frac{1}{3} \Rightarrow v_e = \sqrt{2gr}$$
$$\frac{V_{e_1}}{V_{e_2}} = \sqrt{\frac{g_1}{g_2} \times \frac{r_1}{r_2}} \Rightarrow \frac{1}{2} = \sqrt{\frac{g_1}{g_2} \times \frac{1}{3}} \Rightarrow \frac{1}{4} = \frac{g_1}{g_2} \times \frac{1}{3}$$
$$\frac{g_1}{g_2} = \frac{3}{4}$$

20. Option (4) is correct.

In oblique projectile motion, vertical component of velocity becomes zero at highest point and horizontal component of velocity remains constant throughout the motion.

As gravitational potential energy is given by

$$U = mgh$$

At highest point, gravitational potential Energy is maximum.

Section B

21. The correct answer is [50].

Total Energy of block with spring $= \frac{1}{2}KA^2$

$0.25 = \frac{1}{2}KA^2 \Rightarrow A = 10\text{ cm} = \frac{1}{10}\text{m}$

$0.25 = \frac{1}{2}K \times \frac{1}{100} \Rightarrow K = 50\text{ N m}^{-1}$

22. The correct answer is [44].

Magnetic flux linked with coil is given by,

$$\phi = NBA\cos\omega t$$

$$e = \frac{-d\phi}{dt} \Rightarrow e = NBA\omega\sin\omega t$$

$$\omega = 2\pi f \Rightarrow f = \frac{500}{60}\text{ rev s}^{-1}$$

$$e = 600 \times 0.4 \times 70 \times 10^{-4} \times 2\pi \times \frac{500}{60} \times \sin 30°$$

(Plane makes angle 60° with magnetic field, so angle between normal of coil and magnetic field is 30°)

$$e = 600 \times 0.4 \times 70 \times 10^{-4} \times 2 \times \frac{22}{7} \times \frac{500}{60} \times \frac{1}{2}$$

$$= 44\text{ volt}$$

23. The correct answer is [4].

On insertion of slab in front of any one slit,

Shift in the pattern $= \frac{D}{d}(\mu - 1)t \Rightarrow x\beta_0 = \frac{D}{d}(\mu-1)t$

$$x\frac{\lambda D}{d} = \frac{D}{d}(\mu - 1)t$$

$$x \times 500 \times 10^{-9} = (1.2 - 1)10 \times 10^{-6}$$

$$x = \frac{0.2}{5} \times 10^{-5} \times 10^{7} \Rightarrow x = \frac{20}{5} = 4$$

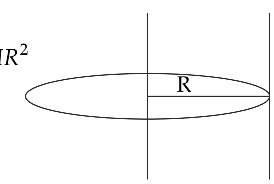
24. The correct answer is [3].

By parallel axis theorem,

$$I = I_{cm} + MR^2$$

$$= \frac{1}{2}MR^2 + MR^2$$

$$I = \frac{3}{2}MR^2$$



On comparison, $x = 3$.

25. The correct answer is [200].

By $\quad v^2 = u^2 - 2as \Rightarrow a = \frac{u^2}{2s} \Rightarrow a = \frac{400}{2 \times 500}$

$a = 4 \times 10^{-3} = 0.4\text{ m s}^{-2}$

Now, $\quad v^2 = 400 - 2 \times 0.4 \times 250$

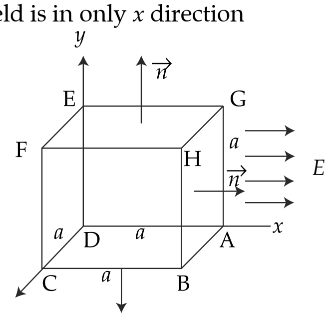
$v^2 = 200 \Rightarrow v = \sqrt{200}$

On comparison, $x = 200$

26. The correct answer is [288].

$$E = E_0 x\hat{i}$$

Electric field is in only x direction



$\therefore \quad \phi_{EFGH} = \phi_{ABCD} = \phi_{ADEG} = \phi_{BCFH} = 0$

$\phi_{ABHG} = E_0 a \times a^2 = E_0 a^3$

$\phi_{CDEF} = 0$, as $x = 0$, $E = 0$

$\phi_{total} = E_0 a^3 = 4 \times 10^4 \times 8 \times 10^{-6}$

$\frac{q_{in}}{\varepsilon_0} = 32 \times 10^{-2}$

$q_{in} = 32\varepsilon_0 \times 10^{-2} = 32 \times 9 \times 10^{-12} \times 10^{-2}$

$= 288 \times 10^{-14}$

$Q = 288$

27. The correct answer is [132].

$$W = \int_2^5 F.dy \Rightarrow W = [5y + y^3]_2^5$$

$$W = 25 + 125 - 10 - 8 = 132\text{ J}$$

28. The correct answer is [2].

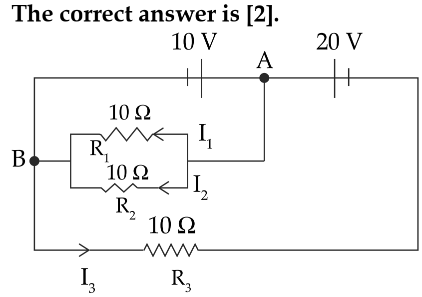
$$A\frac{dh}{dt} = av$$

$$750 \times 10^{-4}\frac{dh}{dt} = 500 \times 10^{-6} \times 30 \times 10^{-2}$$

$$\frac{dh}{dt} = \frac{15 \times 10^{-2}}{75} = 2 \times 10^{-3}$$

Hence, $\quad x = 2$

29. The correct answer is [2].



Between A & B ideal battery of 10 V is connected.

$\therefore \quad I_1 = 1$ amp

$I_2 = 1$ amp

Potential difference across $R_3 = 10$ Volt

$\therefore \quad I_3 = 1$ amp

$$\therefore \quad \left|\frac{I_1 + I_3}{I_2}\right| = \left|\frac{1+1}{1}\right| = 2$$

30. The correct answer is [6].

Binding Energy of nucleus A

= 1.2 (Me V) × 34

= 40. 8 Me V

Binding Energy of nucleus B.

= (1.8 Me V) × 26

= 46. 8 Me V

Difference in BE = 6 Me V