



Resonance[®]
Educating for better tomorrow

JEE

(Main)

PAPER-1 (B.E./B. TECH.)

2021

COMPUTER BASED TEST (CBT) Memory Based Questions & Solutions

Date: 22 July, 2021 (SHIFT-2) | TIME : (3.00 p.m. to 6.00 p.m)

Duration: 3 Hours | Max. Marks: 300

SUBJECT: PHYSICS

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555  7340010333  facebook.com/ResonanceEdu  twitter.com/ResonanceEdu  www.youtube.com/resowatch  blog.resonance.ac.in

This solution was download from Resonance JEE (MAIN) 2021 Solution portal

PART : PHYSICS

1. If length of simple pendulum is made $\frac{1}{16}$ times, then time period of simple pendulum changes by

- (1) $\frac{1}{3}$ times (2) $\frac{1}{4}$ times (3) $\frac{1}{5}$ times (4) $\frac{1}{6}$ times

Ans. (2)

Sol. $T = 2\pi\sqrt{\frac{l}{g}}$

$T' = 2\pi\sqrt{\frac{l}{16g}} = \frac{T}{4}$

2. Ring, solid sphere and solid cylinder rolls an inclined plane without slipping then order of velocity at lowest point of inclined will be :

- (1) $V_{\text{Ring}} > V_{\text{Solid sphere}} > V_{\text{Solid cylinder}}$ (2) $V_{\text{Solid sphere}} > V_{\text{Solid cylinder}} > V_{\text{Ring}}$
 (3) $V_{\text{Solid cylinder}} > V_{\text{Solid sphere}} > V_{\text{Ring}}$ (4) $V_{\text{Ring}} > V_{\text{Solid cylinder}} > V_{\text{Solid sphere}}$

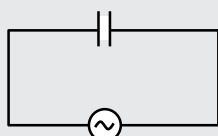
Ans. (2)

Sol. $mgh = \frac{1}{2}I_{\text{cm}}\omega^2 + \frac{1}{2}mv^2$

$V = \sqrt{\frac{2gh}{1 + \frac{I_{\text{cm}}}{mR^2}}}$

$I \uparrow \quad V \downarrow$

3. In given ac circuit correct phase diagram will be :



$V = V_0 \sin \omega t$

- (1) (2) (3) (4)

Ans. (2)

Sol. In pure capacitive circuit current leads with voltage.

Resonance Eduventures Ltd.

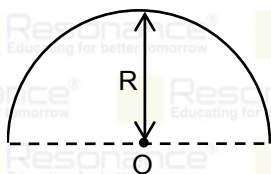
Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 7340010333 facebook.com/ResonanceEdu twitter.com/ResonanceEdu www.youtube.com/resowatch blog.resonance.ac.in

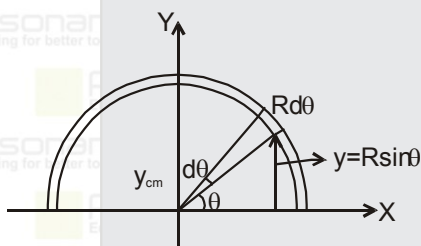
4. Distance of center of mass from point O is given by $\frac{\lambda R}{\pi}$ for uniform semi-circular ring final value of λ .



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

Ans. (2)

Sol.



To find y_{cm} we use $y_{cm} = \frac{1}{M} \int dmy$ (i)

Here for dm we consider an elemental arc of the ring at an angle θ from the x-direction of angular width $d\theta$. If radius of the ring is R then its y coordinate will be $R \sin\theta$, here dm is given as

$$dm = \frac{M}{\pi R} \times R d\theta$$

So from equation(i), we have

$$y_{cm} = \frac{1}{M} \int_0^\pi \frac{M}{\pi R} R d\theta (R \sin\theta) = \frac{R}{\pi} \int_0^\pi \sin\theta d\theta$$

$$y_{cm} = \frac{2R}{\pi} \quad \text{.....(ii)}$$

$$\therefore \lambda = 2$$

5. Find the ratio of De-Broglie wavelength of an electron and a proton when accelerated through same potential difference ?

- (1) $\sqrt{1803}$ (2) $\sqrt{1621}$ (3) $\sqrt{1417}$ (4) $\sqrt{1230}$

Ans. (1)

Sol. $\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mqV}}$

$$\frac{\lambda_e}{\lambda_p} = \sqrt{\frac{m_p \times 1}{m_e \times e}} = \sqrt{1803}$$

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 7340010333 facebook.com/ResonanceEdu twitter.com/ResonanceEdu www.youtube.com/resowatch blog.resonance.ac.in

6. For an iron rod temperature is increased by 10°C . Given $\alpha = 10^{-5}$ per $^\circ\text{C}$, $Y = 10^{11}$ N/m^2 , area cross section $A = 10^{-2}$ m^2 . Find energy stored per unit length

- (1) 5 J/m (2) 10 J/m (3) 15 J/m (4) 20 J/m

Ans. (1)

Sol. $U = \frac{1}{2} \times \text{stress} \times \text{strain} \times \text{volume}$

$$U = \frac{1}{2} \times \text{stress} \times \text{strain} \times \text{volume} \times A \ell$$

$$\frac{U}{\ell} = \frac{1}{2} \times \text{stress} \times \text{strain} \times \text{volume} \times A$$

$$= \frac{1}{2} \times Y \times (\text{strain})^2 \times A$$

$$= \frac{1}{2} \times Y \left(\frac{\Delta \ell}{\ell} \right)^2 \times A$$

$$= \frac{1}{2} Y \left(\frac{\ell \alpha \Delta t}{\ell} \right)^2 \times A$$

$$= \frac{1}{2} Y \alpha^2 \Delta t^2 A$$

$$= \frac{1}{2} \times 10^{11} \times 10^{-10} \times 10 \times 10 \times 10^{-2}$$

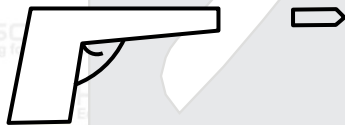
$$= 5 \text{ Joule/m}$$

7. A gun of mass 4 kg fire a bullet of mass 4g with muzzle velocity equal to 50 m/s. Find the velocity of bullet.

- (1) 48.59 m/s (2) 49.95 m/s (3) 45.59 m/s (4) 40.59 m/s

Ans. (2)

Sol.



Initial momentum = final momentum

$$0 = m_G V_G + M_B V_b$$

$$\Rightarrow 0 = 4 \times V_G + \frac{4}{1000} V_b$$

$$\Rightarrow V_G = - \frac{V_b}{1000} \quad \dots(1)$$

$$V_{bG} = V_b - V_G$$

$$\Rightarrow 50 = V_b - V_G \quad \dots(2)$$

$$\Rightarrow 50 = \frac{+V_b}{1000} + V_b$$

$$\Rightarrow V_b = \frac{50 \times 1000}{1001} \quad \Rightarrow V_b = 49.95 \text{ m/s}$$

Resonance Eduventures Ltd.

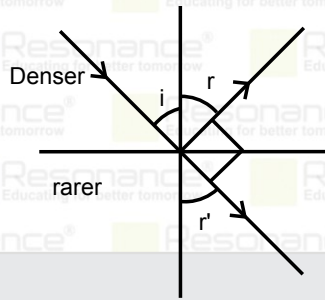
Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

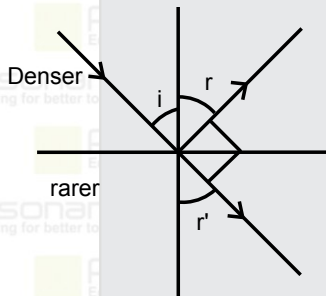
Toll Free : 1800 258 5555 7340010333 facebook.com/ResonanceEdu twitter.com/ResonanceEdu www.youtube.com/resowatch blog.resonance.ac.in

8. A ray incident from denser medium to rarer medium. If angle between reflected and refracted ray is 90° then angle of reflection r and angle of refraction r' will be respectively:



- (1) $i, \sin^{-1}(\sin i)$ (2) $\sin^{-1}(\cos i), i$ (3) $i, \sin^{-1}(\cos i)$ (4) $i, \sin^{-1}(\tan i)$

Ans. (3)
Sol.



$$\begin{aligned} r' + 90^\circ + r &= 180^\circ \\ r' + 90^\circ + i &= 180^\circ \\ r' &= 90 - i = \sin^{-1}(\cos i) \end{aligned}$$

9. The average kinetic energy of a molecule of a monoatomic gas is :

- (1) $5/2 kT$ (2) $3/2 kT$ (3) $7/2 kT$ (4) $1/2 kT$

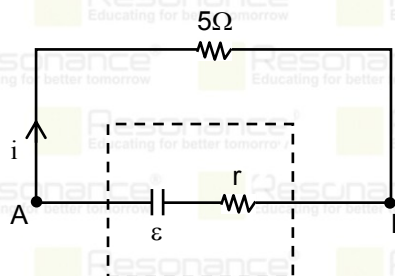
Ans. (2)

10. A cell first connected across 5Ω resistance develops a potential difference of 1.25 V across it. Same cell again connected across 2Ω resistance develops 1V potential difference across it find the emf of cell :

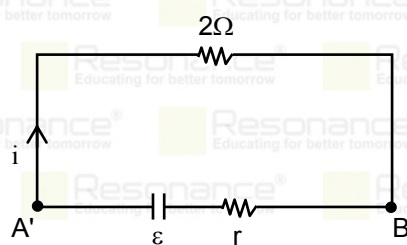
- (1) 5 V (2) 15 V (3) 7 V (4) 4 V

Ans. (2)

Sol.



(1)



(2)

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | twitter.com/ResonanceEdu | www.youtube.com/resovatch | blog.resonance.ac.in

$$(1) \quad I = \frac{1.25}{5} = 0.25 \text{ A}$$

$$V_{AB} = 5V = \varepsilon - ir$$

$$1.25 = \varepsilon - 0.25r \quad \dots(1)$$

$$(2) \quad I = \frac{1}{2} = 0.5 \text{ A}$$

$$V_{A'B'} = 1 = \varepsilon - 0.5r \quad \dots(2)$$

Solving (1) & (2)

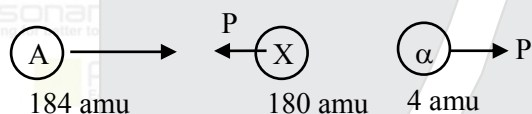
$$\varepsilon = 15 \text{ v}$$

11. An element of mass number 184 decays by emitting an α -particle. If Q-value of the reaction is 5.5 MeV, then find the Kinetic energy of α -particle. Assume that there is no γ emission

- (1) 5.0 MeV (2) 5.38 MeV (3) 3.60 MeV (4) 2.10 MeV

Ans. (2)

Sol.



$$k_{\alpha} = \left(\frac{A-4}{A} \right) Q = 5.38 \text{ MeV}$$

12. If $\vec{A} = \hat{i} + \hat{j} + \hat{k}$

$$\vec{B} = \hat{i} + \hat{j}$$

Find the projection of \vec{A} on \vec{B} ?

- (1) $\sqrt{2}$ (2) $2\sqrt{3}$ (3) $\frac{2}{\sqrt{3}}$ (4) $\frac{3}{\sqrt{2}}$

Ans. (1)

Sol. Projection of \vec{A} on $\vec{B} = \vec{A} \cdot \vec{B}$

$$= (\hat{i} + \hat{j} + \hat{k}) \cdot \left(\frac{\hat{i} + \hat{j}}{\sqrt{2}} \right) = \frac{1+1}{\sqrt{2}} = \sqrt{2}$$

13. In a room of temperature 25°C , a body in initial temperature of 75°C cools down to 65°C in 5 min. After 5 more minutes, the final temperature of body will be?

- (1) 60°C (2) 58°C (3) 57°C (4) 55°C

Ans. (3)

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 7340010333 facebook.com/ResonanceEdu twitter.com/ResonanceEdu www.youtube.com/resowatch blog.resonance.ac.in

Sol. $\frac{\Delta T}{t} = K \left(\frac{T_1 + T_2}{2} - T_0 \right)$

$$\frac{75 - 65}{5} = K \left(\frac{75 + 65}{2} - 25 \right) \quad \dots(1)$$

$$\frac{65 - T}{5} = K \left(\frac{T + 65}{2} - 25 \right) \quad \dots(2)$$

Eq(2)/Eq(1)

$$\frac{65 - T}{75 - 65} = \frac{\frac{T + 65}{2} - 25}{\frac{75 + 65}{2} - 25}$$

$$\frac{65 - T}{10} = \frac{T + 15}{90}$$

$$90 \times 65 - 90 T = 10 T + 10 \times 15$$

$$100 T = 90 \times 65 - 15 \times 10$$

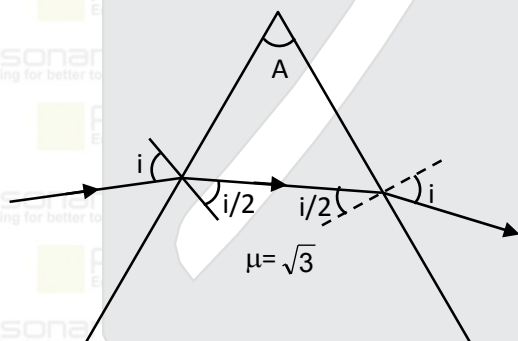
$$T = 57^\circ\text{C}$$

14. A ray is incident on prism of refractive index $\mu = \sqrt{3}$. If angle of incident is twice of angle of refraction when deviation of ray is minimum. Then find the prism angle.

- (1) 30° (2) 60° (3) 45° (4) 90°

Ans. (2)

Sol.



$$A = \frac{i}{2} + \frac{i}{2} = i$$

$$1 \sin i = \mu \sin \frac{i}{2}$$

$$2 \sin \frac{i}{2} \cos \frac{i}{2} = \sqrt{3} \sin \frac{i}{2}$$

$$\cos \frac{i}{2} = \frac{\sqrt{3}}{2}$$

$$\frac{i}{2} = 30^\circ$$

$$i = 60^\circ$$

$$\therefore A = i = 60^\circ$$

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | twitter.com/ResonanceEdu | www.youtube.com/resowatch | blog.resonance.ac.in

15. Find height of antenna if coverage of signals from Antenna is 150 km and radius of earth is 6400 km.

Also find the total population covered by antenna signal, if population density is 200 people/km²

(1) $\frac{625}{124} \times 10^3$ m ; 6.057×10^6 people

(2) $\frac{225}{128} \times 10^3$ m ; 14.13×10^6 people

(3) $\frac{125}{84} \times 10^3$ m ; 8.057×10^9 people

(4) $\frac{725}{72} \times 10^3$ m ; 10.057×10^7 people

Ans. (2)

Sol. Radius of earth = 6400 km

$$d = 150 \text{ km}$$

height of Antena = ?

$$d = \sqrt{2Rh}$$

$$h = \frac{d^2}{2R} = \frac{150 \times 150 \times 10^6}{2 \times 6400 \times 10^3} = \frac{225}{128} \times 10^8 = \frac{225}{128} \times 10^3 \text{ m}$$

Population covered $\Rightarrow 2\pi Rh \times \text{density}$

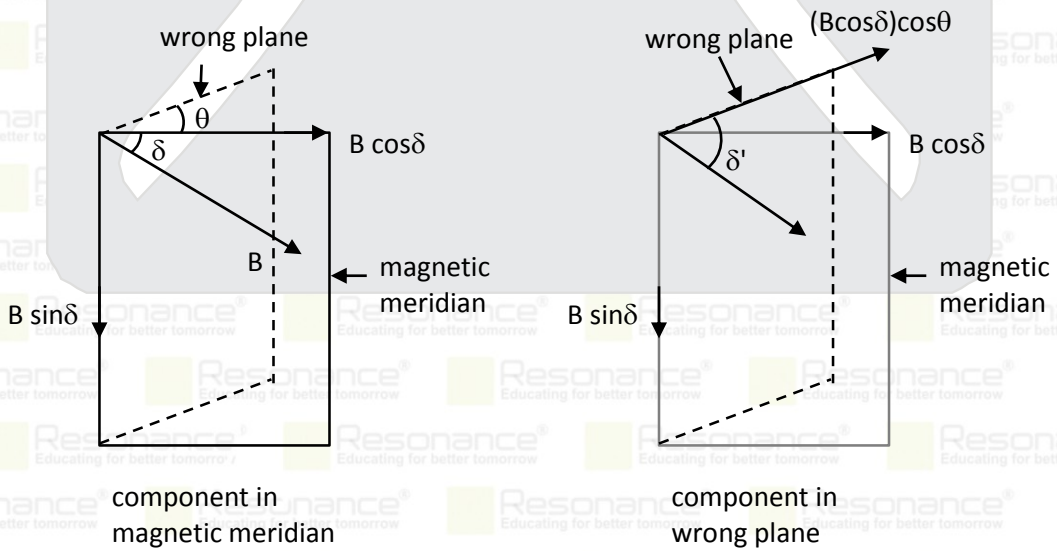
$$= 2\pi \times 6400 \times \frac{225}{128} \times 200 = 14.13 \times 10^6$$

16. A magnetic needle is placed vertically but in a wrong plane, which is at an angle θ with the magnetic meridian. If apparent dip in this wrong plane is δ' , then find the real dip angle.

- (1) $\tan^{-1}(\tan\delta' \sec\theta)$ (2) $\tan^{-1}(\tan\delta' \cos\theta)$ (3) $\tan^{-1}(\tan\delta' \sin\theta)$ (4) $\tan^{-1}(\tan\delta' \operatorname{cosec}\theta)$

Ans. (2)

Sol.



$$\tan\delta' = \frac{B \sin\delta}{(B \cos\delta) \cos\theta}$$

$$\Rightarrow \tan\delta = \tan\delta' \cos\theta$$

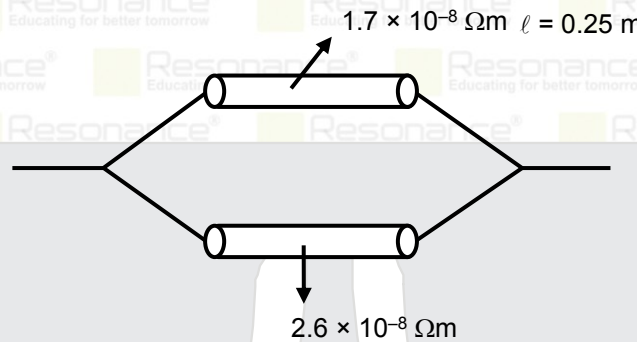
Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005
Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029
Toll Free : 1800 258 5555 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | twitter.com/ResonanceEdu | www.youtube.com/resowatch | blog.resonance.ac.in

$$\delta = \tan^{-1}(\tan\delta \cos\theta)$$

17. Two rods of length 0.25 m and area 3 mm^2 are connected as shown in figure & their resistivities are $1.7 \times 10^{-8} \Omega\text{m}$ & $2.6 \times 10^{-8} \Omega\text{m}$. Find the equivalent resistance ?



- (1) 0.85 mΩ (2) 0.95 mΩ (3) 0.80 mΩ (4) 0.75 mΩ

Ans. (1)

Sol.
$$R_{\text{eq}} = \frac{R_1 R_2}{R_1 + R_2} = \frac{\rho_1 \frac{l}{A} \rho_2 \left(\frac{l}{A}\right)}{\rho_1 \left(\frac{l}{A}\right) + \rho_2 \left(\frac{l}{A}\right)}$$

$$= \frac{l}{A} \left(\frac{\rho_1 \rho_2}{\rho_1 + \rho_2} \right) = \frac{0.25}{3 \times 10^{-6}} \left(\frac{1.7 \times 10^{-8} \times 2.6 \times 10^{-8}}{1.7 \times 10^{-8} + 2.6 \times 10^{-8}} \right)$$

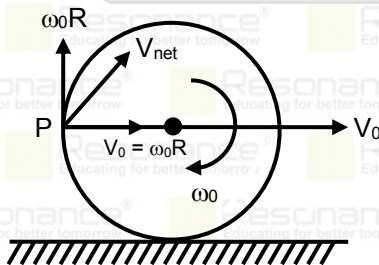
$$= 0.085 \times 10^{-2} = 0.85 \text{ m}\Omega$$

18. A ring is rolling without sliding, such that the velocity of its centre of mass is V_0 . Find the speed of a point, which is in the same horizontal level as the centre of mass.

- (1) V_0 (2) $2V_0$ (3) $\sqrt{2}V_0$ (4) zero

Ans. (3)

Sol.



$$(V_P)_{\text{net}} = \sqrt{V_0^2 + (\omega_0 R)^2} = \sqrt{V_0^2 + V_0^2} = \sqrt{2}V_0$$

Resonance Eduventures Ltd.

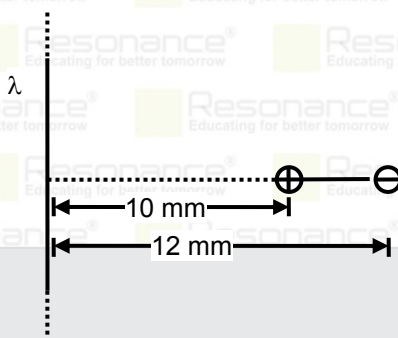
Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | [7340010333](https://www.facebook.com/ResonanceEdu) | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | twitter.com/ResonanceEdu | www.youtube.com/resowatch | blog.resonance.ac.in

19. A dipole is kept near the infinite linear charge of density $3 \times 10^{-6} \text{ C/m}$ along its perpendicular direction as shown in figure. The dipole is experiencing a force of 4 N then find charge of dipole.



- (1) $2.14 \mu\text{C}$ (2) $2.24 \mu\text{C}$ (3) $4.44 \mu\text{C}$ (4) $3.14 \mu\text{C}$

Ans. (3)

Sol. Let charge be Q

$$\text{Net force} = \frac{2k\lambda Q}{r_1} + \frac{2k\lambda(-Q)}{r_2}$$

$$4\text{N} = 2k\lambda Q \left[\frac{1}{r_1} - \frac{1}{r_2} \right]$$

$$4\text{N} = 2 \times 9 \times 10^9 \times 3 \times 10^{-6} Q \left[\frac{1}{10} - \frac{1}{12} \right] \times 10^3$$

$$4\text{N} = 54 \times 10^6 Q \times \frac{1}{60}$$

$$Q = 4.44 \times 10^{-6} \text{ C} = 4.44 \mu\text{C}$$

20. A photo diode activeness when photon of wavelength 612 nm incident on it. Then depletion layer voltage of photodiode will be : (Given $hc = 1224 \text{ eV} - \text{nm}$)

- (1) 2 volt (2) 1 volt (3) 4 volt (4) 3 volt

Ans. (1)

Sol. $E = \frac{hc}{\lambda} = eV$

$$V = \frac{hc}{\lambda e}$$

$$= \frac{1224 \text{ eV} - \text{nm}}{e \times 612 \text{ nm}}$$

$$= 2 \text{ volt}$$

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | twitter.com/ResonanceEdu | www.youtube.com/resowatch | blog.resonance.ac.in

21. \vec{p} is vector perpendicular to both $\vec{a} = \hat{i} + \hat{j}$ & $\vec{b} = \hat{j} + \hat{k}$ vector along $\vec{a} \times \vec{b}$. \vec{q} is a vector perpendicular to both $\vec{b} = \hat{j} + \hat{k}$ and $\vec{c} = -\hat{i} + \hat{j}$ vector along $\vec{b} \times \vec{c}$. Find the angle between \vec{p} and \vec{q}

- (1) $\cos^{-1}\left(\frac{-1}{3}\right)$ (2) $\pi - \cos^{-1}\left(\frac{2}{3}\right)$ (3) $\pi - \cos^{-1}\left(\frac{3}{4}\right)$ (4) $\pi - \cos^{-1}\left(\frac{1}{2}\right)$

Ans. (1)

Sol. $\vec{p} = \vec{a} \times \vec{b}$

$$\begin{bmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

$$= \hat{i} - \hat{j} + \hat{k}$$

$$\vec{q} = \vec{b} \times \vec{c}$$

$$\begin{bmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 1 & 1 \\ -1 & 1 & 0 \end{bmatrix}$$

$$= -\hat{i} + \hat{j} + \hat{k}$$

$$\cos\theta = \frac{\vec{p} \cdot \vec{q}}{|\vec{p}| |\vec{q}|} = \frac{-1-1+1}{3} = \frac{-1}{3}$$

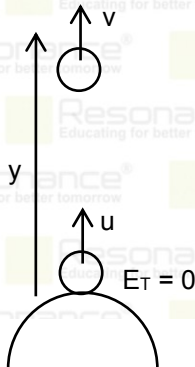
$$\theta = \cos^{-1}\left(\frac{-1}{3}\right)$$

22. An object is projected from earth surface to reach infinity. Find expression for time required to reach y height

- (1) $\frac{2}{3} \left[\frac{(R-y)^3}{2} + R^2 \right] \sqrt{Gm}$ (2) $\frac{2}{3} \left[\frac{(R+y)^3}{2} - R^2 \right] \sqrt{2Gm}$ (3) $\frac{2}{3} \left[\frac{(R+y)^3}{2} + R^2 \right] \sqrt{2Gm}$ (4) $\frac{2}{3} \left[\frac{(R-y)^3}{2} + R^2 \right] \sqrt{2Gm}$

Ans. (2)

Sol.



Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 7340010333 facebook.com/ResonanceEdu twitter.com/ResonanceEdu www.youtube.com/resowatch blog.resonance.ac.in

$$\frac{1}{2}mv^2 - \frac{GMm}{R+y} = 0$$

$$\Rightarrow v = \sqrt{\frac{2GM}{R+y}}$$

$$\Rightarrow \frac{dy}{dt} = \sqrt{\frac{2GM}{R+y}}$$

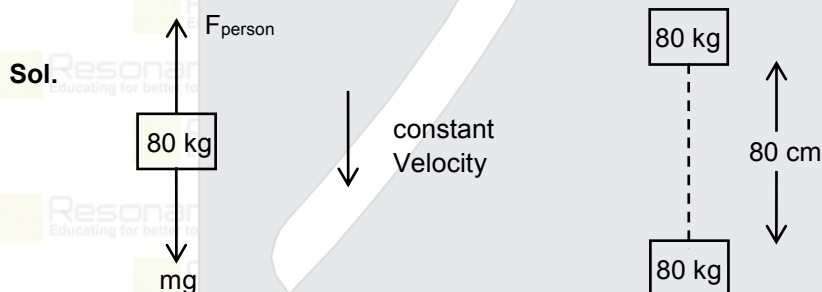
$$\Rightarrow \int_0^y \sqrt{R+y} dy = \sqrt{2GM} \int_0^t dt \quad \Rightarrow \left[\frac{2(R+y)^{\frac{3}{2}}}{3} \right]_0^y = \sqrt{2GM} t$$

$$\Rightarrow \frac{2}{3} \left[(R+y)^{\frac{3}{2}} - R^{\frac{3}{2}} \right] = \sqrt{2GM} t \quad \Rightarrow t = \frac{\frac{2}{3} \left[(R+y)^{\frac{3}{2}} - R^{\frac{3}{2}} \right]}{\sqrt{2GM}}$$

23. A man is standing on horizontal platform carrying a heavy box of mass 80 kg. Suddenly he lowered heavy box with constant velocity downward by 80 cm find the work done by person?

- (1) - 640 J (2) 640 J (3) 740 J (4) 840 J

Ans. (1)



$$F_{\text{person}} = mg = 800 \text{ N}$$

$$W_{\text{person}} = F_{\text{ps}} \cos 180^\circ = -800 \times 80 \times 10^{-2} = -640 \text{ J}$$

24. If Intensity of sunlight at a point is 92 W/m^2 , then find Amplitude of magnetic field at this point?

(Given $\mu_0 = 4\pi \times 10^{-7}$)

- (1) 100 T (2) 200 T (3) 352 T (4) 500 T

Ans. (3)

Sol.
$$I = \frac{1}{2} \frac{B_0^2}{\mu_0} C$$

$$B_0 = \sqrt{\frac{2\mu_0 I}{C}} = \sqrt{\frac{2 \times 4\pi \times 10^{-7} \times 92}{3 \times 10^8}} = 351.5 \approx 352$$

Resonance Eduventures Ltd.

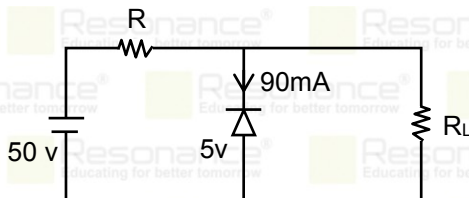
Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | [7340010333](https://www.facebook.com/ResonanceEdu) | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | twitter.com/ResonanceEdu | www.youtube.com/resowatch | blog.resonance.ac.in

25. If current through diode is 90 mA Find the maximum value of R?



- (1) 200 Ω (2) 500 Ω (3) 300 Ω (4) 400 Ω

Ans. (2)

Sol. $\frac{45}{R} \geq 90\text{mA}$

$$R \leq \frac{45}{90} \times 10^3$$

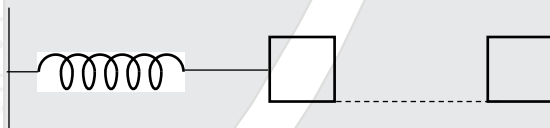
$$R \leq 500 \Omega$$

26. A block is doing SHM, its displacement from mean position is given by

$$x(t) = A \sin \omega t + B \cos \omega t$$

if at $t = 0, x = 0$

displacement $x(t) = C \cos(\omega t - \phi)$ then find value of C and ϕ .

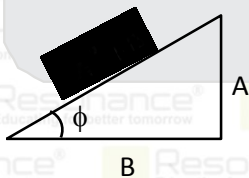


- (1) $\sqrt{A^2 + B^2}, \frac{\pi}{2}$ (2) $\sqrt{A^2 + B^2}, 0$ (3) $A^2 + B^2, \frac{\pi}{2}$ (4) $A^2 + B^2, 0$

Ans. (1)

Sol. $x(t) = A \sin \omega t + B \cos \omega t$

$$= \sqrt{A^2 + B^2} \cos(\omega t - \phi)$$



At $t = 0, x(t) = 0$ given

$$0 = \cos(\phi)$$

$$\therefore \phi = \frac{\pi}{2}$$

$$C = \sqrt{A^2 + B^2} \text{ and } \phi = \frac{\pi}{2}$$

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | twitter.com/ResonanceEdu | www.youtube.com/resowatch | blog.resonance.ac.in

27. **Statement-1:** On increase in temperature ferromagnetic material converts into paramagnetic material.

Statement-2: At high temperature, random ness of domains ferromagnetic material increases

- (1) Statement 1 & 2 both are true
 (2) Statement-1 & 2 both are true statement -2 is correct explant of statement-1
 (3) Statement-1 is false Statement -2 is true
 (4) Statement-2 is true Statement-1 is false.

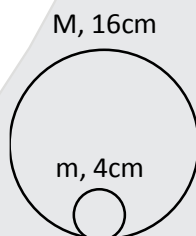
Ans. (1)

28. Match the column

- | | |
|---------------------------------------|----------------------------|
| (i) $\omega C > \frac{1}{\omega L}$ | (a) Current lag behind EMF |
| (ii) $\omega C = \frac{1}{\omega L}$ | (b) EMF lag behind current |
| (iii) $\omega C < \frac{1}{\omega L}$ | (c) Same phase |
| (iv) Resonant frequency | (d) Minimum current |
- (1) (i) – a, (ii)– c, (iii) – b, (iv) – c
 (2) (i) – c, (ii)– a, (iii) – b, (iv) – c
 (3) (i) – a, (ii)– c, (iii) – c, (iv) – b
 (4) (i) – c, (ii)– c, (iii) – b, (iv) – a

Ans. (1)

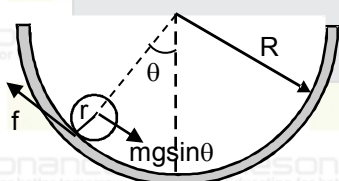
29. Find the time period of oscillation of ring of mass m while ring of mass M always remains at rest ,if r = 4 cm and R = 16 cm.



- (1) 0.7 second (2) 0.8 second (3) 1 second (4) 0.9 second

Ans. (3)

Sol.



$$mg \sin \theta - f = ma$$

$$f \times r = mr^2 \times \frac{a}{r} \quad \left[\sin \theta = \theta = \frac{x}{R-r} \right]$$

$$f = ma$$

$$\Rightarrow mg \sin \theta = 2ma$$

$$\Rightarrow a = \frac{gx}{2(R-r)} \Rightarrow T = 2\pi \sqrt{\frac{2(R-r)}{g}} = 2\pi \sqrt{\frac{0.12}{5}} \approx 1 \text{ second}$$

Resonance Eduventures Ltd.

Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222

To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029

Toll Free : 1800 258 5555 | [facebook.com/ResonanceEdu](https://www.facebook.com/ResonanceEdu) | twitter.com/ResonanceEdu | www.youtube.com/resowatch | blog.resonance.ac.in



Resonance®
Educating for better tomorrow

**RESULT: JEE (Advanced),
JEE (Main), NEET**

≡ **HIGHEST** No. of Classroom Selections ≡
in JEE (Advanced) 2020 from any Institute of Kota

5 AIRs in TOP-50 in JEE (Adv.) 2020 from Classroom

**AIR-2
(GEN-EWS)**
AIR-15
**DHANANJAY
KEJRIWAL**
With us Since Class 9th

**Zonal Topper
IIT-Kharagpur**
AIR-25
**SAMARTH
AGARWAL**
With us Since Class 11th

**2nd Rank in
IIT-Kharagpur Zone**
AIR-29
**SANKALP
PARASHAR**
With us Since Class 11th

AIR-30
**AARYAN K.
GUPTA**
With us Since Class 9th

AIR-41
**UTKARSH P.
SINGH**
With us Since Class 10th

Total Selections in JEE (Advanced) 2020

4505

Classroom: 3441 | Distance: 1064

Eligible for JEE (Advanced) Through JEE (Main) 2020

14755

Classroom: 11047 | Distance: 3708

NEET 2020

2646

Classroom: 1833 | Distance: 813

ADMISSION OPEN for Session 2021-22

ONLINE + OFFLINE PROGRAMS

CLASS 11, 12 & 12+

Target: JEE (Main+Adv.) | JEE (Main) | NEET

Scholarship Upto 90%*

Toll Free: 1800 258 5555 | Visit us: www.resonance.ac.in

