JEE MAIN April'19

PAPER WITH SOLUTION

8 April 2019 _ Evening _ Physics

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1. In a line of sight radio communication, a distance of about 50 km is kept between the transmitting and receiving antennas. If the height of the receiving antenna is 70 m, then the minimum height of the transmitting antenna should be :- (Radius of the earth = 6.4×10^6 m).

(1) 32 m (2) 40 m (3) 20 m (4) 51 m

Sol. **1**

range = $\sqrt{2Rhr} + \sqrt{2RH_T}$

$\sqrt{2 \times 6.4 \times 10^6 hr} + \sqrt{2 \times 6.4 \times 10^6 h_T}$

On solving we get

H_T= 32 m

2. The temperature at which the root mean square velocity of hydrogen molecules equals their escape velocity from the earth, is closest to :

[Boltzmann Constant $k_B = 1.38 \times 10^{-23}$ J/K

Avogadro Number $N_A = 6.02 \times 10^{26}$/kg

Radius of earth : 6.4×10^6 m

Gravitational accelration on earth= 10 ms^{-2}]

(1) 10^4 K (2) 650 K (3) 3×10^5 K (4) 800 K

Sol. **1**

$$\sqrt{\frac{3RT}{M}} = \sqrt{2gRe}$$

$$\sqrt{\frac{3RT}{M}} = 11.2 \text{ km/s}$$

$$\sqrt{\frac{3 \times 1.38 \times 10^{-23} \times 6.02 \times 10^{26}}{2}} = 11.2 \text{ km/s}$$

T = 10^4 K

3. Calculate the limit of resolution of a telescope objective having a diameter of 200 cm, if it has to detect light of wavelength 500 nm coming from a star.

(1) 305×10^{-9} radian (2) 475.5×10^{-9} radian

(3) 610×10^{-9} radian (4) 152.5×10^{-9} radian

Sol. **1**

$$RL = \frac{1.22\lambda}{d}$$

$$= \frac{1.22 \times 500 \times 10^{-9}}{200 \times 10^{-2}} = 305 \times 10^{-9} \text{ Radian}$$

4. Let $|\vec{A_1}| = 3$, $|\vec{A_2}| = 5$ and $|\vec{A_1} + \vec{A_2}| = 5$. The value of $(2\vec{A_1} + 3\vec{A_2}) \cdot (3\vec{A_1} - 2\vec{A_2})$ is :

(1) –106.5 (2) –118.5 (3) –112.5 (4) –99.5

Sol. **2**

$(\vec{A}_1 + \vec{A}_2)(\vec{A}_1 + \vec{A}_2) = |A_1 + A_2|^2$

$A_1^2 + A_2^2 + 2A_1.A_2 = 5^2$

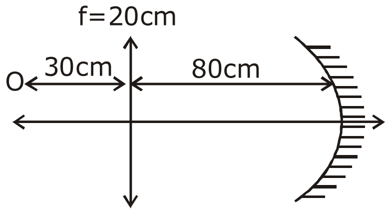
$9 + 25 + 2 \times \vec{A_1}\vec{A_2} = 25$

$$\vec{A_1}\vec{A_2} = \frac{-9}{2}$$

$\left(2\vec{A}_1 + 3\vec{A}_2\right) \cdot \left(3\vec{A}_1 - 2\vec{A}_2\right)$
$6A_1^2 - 4A_1A_2 + 9A_1A_2 - 6A_2^2$
54+18-81/2-150=-118.5

5. A convex lens (of focal length 20 cm) and a concave mirror, having their principal axes along the same lines, are kept 80 cm apart from each other. The concave mirror is to the right of the convex lens. When an object is kept at a distance of 30 cm to the left of the convex lens, its image remains at the same position even if the concave mirror is removed. The maximum distance of the object for which tihs concave mirror, by itself would produce a virtual image would be -
(1) 30 cm (2) 20 cm (3) 10 cm (4) 25 cm

Sol. **3**



$\frac{1}{v} - \frac{1}{u} = \frac{1}{5}$

$\frac{1}{v} - \frac{-1}{30} = \frac{1}{20}$

v = +60 cm
Image should be at COC of mirror
R = 20 cm
$2f_m = 20$
$f_m = 10$ cm

6. The electric field in a region is given by $\vec{E} = (Ax + B)\hat{i}$, where E is in NC^{-1} and x is in metres. The values of constants are A = 20 SI unit and B = 10 SI unit. If the potential at x = 1 is V_1 and that at x = –5 is V_2, then $V_1 - V_2$ is -
(1) –520 V (2) –48 V (3) 320 V (4) 180 V

Sol. **4**

$v_i - v_f = \int_{ri}^{at} edr$

$v_1 - v_2 = \int_1^{-5} E.dr = \int_1^{-5} E.dr$

$v_1 - v_2 = \int_1^{-5} (Ax + B)dx$

$v_1 - v_2 = \left[\frac{Ax^2}{2}\right]_1^{-5} + [Bx]_1^{-5}$

$v_1 - v_2 = 180$ V

7. A damped harmonic oscillator has a frequency of 5 oscillations per second. The amplitude drops to half its value for every 10 oscillations. The time it will take to drop to $\frac{1}{1000}$ of the original amplitude is close to -

(1) 100 s (2) 50 s (3) 10 s (4) 20 s

Sol. **4**

$A = A_0 e^{-\lambda t}$

$\frac{A_0}{2} = A_0 e^{-\lambda(2)}$

(A = $A_0/2$ after 2 sec.)

$\lambda = \frac{\ln 2}{2}$ ...(1)

$A = A_0 e^{-\lambda t}$

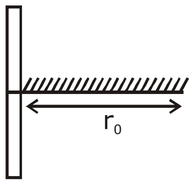
$\frac{A_0}{1000} = A_0 e^{-\lambda t}$

$\ln 1000 = \lambda t$

$\ln 10^3 = \frac{\ln 2}{2} t$

$t = \frac{6 \ln 10}{\ln 2} = 19.9 \text{ sec} = 20 \text{ sec.}$

8. A positive point charge is released from rest at a distance r_0 from a positive line charge with uniform density. The speed (υ) of the point charge, as a function of instantaneous distance r from line charge, is proportional to -



(1) $\upsilon \propto e^{+r/r_0}$ (2) $\upsilon \propto \sqrt{\ln\left(\frac{r}{r_0}\right)}$ (3) $\upsilon \propto \left(\frac{r}{r_0}\right)$ (4) $\upsilon \propto \ln\left(\frac{r}{r_0}\right)$

Sol. **4**

$E = \frac{2K\lambda}{R}$

$\therefore F = qE$

$a = \frac{qE}{m} = \frac{q2k\lambda}{mr}$

$\frac{vdv}{dr} = \frac{2kq\lambda}{mr}$

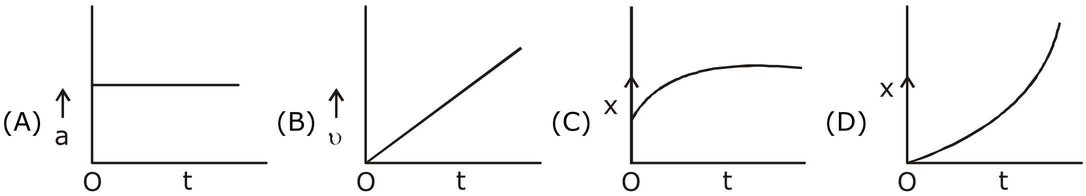
$\int_0^v vdv = \int_{r_0}^r \frac{2q\lambda}{mr} dr$

$$\frac{v^2}{2} = \frac{2k\lambda q}{m} \ln\left(\frac{r}{r_0}\right)$$

$$v = 2\sqrt{\frac{kq\lambda}{m}\ln\left(\frac{r}{r_0}\right)}$$

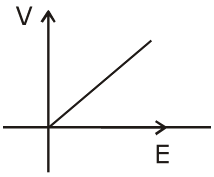
$$v \propto \sqrt{\ln\left(\frac{r}{r_0}\right)}$$

9. A particle starts from origin O from rest and moves with a uniform acceleration along the positive x-axis. identify all figures that correctly represent the motion qualitatively (a = acceleration, υ = velocity, x = displacement, t = time)

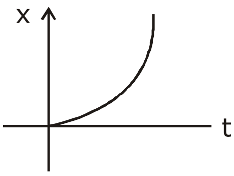


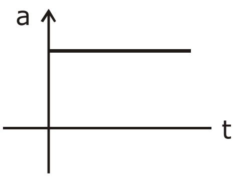
(1) (B), (C) (2) (A), (B), (C) (3) (A) (4) (A), (B), (D)

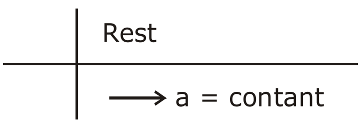
Sol. **4**



a = constant







v = u + at, u = 0
v = at
straight Line

$x = ut + \frac{1}{2}at^2$, u = 0

$x = \frac{1}{2} at^2$

(Parabola)

10. An electric dipole is formed by two equal and opposite charges q with separation d. The charges have same mass m. It is kept in a uniform electric field E. If it is slightly rotated from its equilibrium orientation, then its angular frequency ω is -

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

Sol. **4**

$\tau = PE\theta$

$I\propto = PE\theta$

$\propto = \frac{PE\theta}{I}$

$\omega^2 = PE/I$

$\omega = \sqrt{\frac{PE}{I}}$ ....(1)

$I = m\left(\frac{d}{2}\right)^2 + m\left(\frac{d}{2}\right)^2 = \frac{md^2}{2}$ ....(2)

$\therefore$ p = q × d ....(3)

(2) and (3) in to (1)

we get

$\omega = \sqrt{\frac{2qE}{md}}$

11. A circuit connected to an ac source of emf $e = e_0 \sin(100t)$ with t in seconds, gives a phase difference of $\frac{\pi}{4}$ beween the emf e and current i. Which of the following circuits will exhibit this ?

(1) RL circuit with R = 1 kΩ and L = 1 mH

(2) RC circuit with R = 1 kΩ and C = 10 μF

(3) RL circuit with R = 1 kΩ and L = 10 mH

(4) RC circuit with R = 1 kΩ and C = 1 μF

Sol. **2**

$\theta = \pi/4$

For LR circuit

$\tan\theta = \frac{X_L}{R}$

$X_L = R$

$\theta = \pi/4$

$\tan\theta = \frac{X_C}{R}$ for RC Circuit

$X_C = R$

R=1kΩ, L=10H

C=10F

For option (2) $R = X_C = \frac{1}{\omega_C}$

Is satisfied

12. If surface tension (S), Moment of Inertia (I) and Planck's constant (h), were to be taken as the fundamental units, the dimensional formula for linear momentum would be :

(1) $S^{1/2}I^{3/2}h^{-1}$ (2) $S^{1/2}I^{1/2}h^{0}$ (3) $S^{1/2}I^{1/2}h^{-1}$ (4) $S^{3/2}I^{1/2}h^{0}$

Sol. **2**

$\{P\} = [s^a\ I^b\ h^c]$

$$[mv] = \left[\frac{MLT^{-2}}{L}\right]^a [ML^2]^b [ML^2T^{-1}]^c$$

$[MLT^{-1}] = [M^{a+b+c}\ L^{2b+2c}\ T^{-2a-C}]$

a+b+c=1

2b+2c=1

-2a-c=-1

$a = \frac{1}{2}$

$b = \frac{1}{2}$

$c = 0$

13. The magnetic field of an electromagnetic wave is given by :

$$\vec{B} = 1.6 \times 10^{-6} \cos(2 \times 10^7 z + 6 \times 10^{15} t)\ (2\hat{i} + \hat{j})\ \frac{Wb}{m^2}$$

The associated electric field will be :

(1) $\vec{E} = 4.8 \times 10^2 \cos(2 \times 10^7 z + 6 \times 10^{15}t)\ (\hat{i} - 2\hat{j})\ \frac{V}{m}$

(2) $\vec{E} = 4.8 \times 10^2 \cos(2 \times 10^7 z - 6 \times 10^{15}t)\ (2\hat{i} + \hat{j})\ \frac{V}{m}$

(3) $\vec{E} = 4.8 \times 10^2 \cos(2 \times 10^7 z + 6 \times 10^{15}t)\ (-\hat{i} + 2\hat{j})\ \frac{V}{m}$

(4) $\vec{E} = 4.8 \times 10^2 \cos(2 \times 10^7 z - 6 \times 10^{15}t)\ (-2\hat{i} + \hat{j})\ \frac{V}{m}$

Sol. **1**

$C = \frac{E_0}{B_0}$

$E_0 = CB_0$

$E_0 = 3 \times 10^8 \times 1.6 \times 10^{-6}$

$E_0 = 4.8 \times 10^2$

$\vec{E}.\vec{B} = 0$ as $\vec{E} \perp \vec{B}$

Check by Options (1)

Also wave propagation direction is parallel to

$\vec{E} \times \vec{B}$ which is $-\hat{k}$

14. A rocket has to be launched from earth in such a way that it never returns. If E is the minimum energy delivered by the rocket launcher, what should be the minimum energy that the launcher should have if the same rocket is to be launched from the surface of the moon ? Assume that the density of the earth and the moon are equal and that the earth's volume is 64 times the volume of the moon.

(1) $\frac{E}{4}$ (2) $\frac{E}{32}$ (3) $\frac{E}{16}$ (4) $\frac{E}{64}$

Sol. **3**

$\rho_e = \rho_m$ (given)

$V_e = 64\ V_m$

$\frac{4}{3}\pi R_e^3 = 64 \times \frac{4}{3}\pi R_m^3$

$R_e = 4R_m$ ....(1)

$m_e = 64\ (M_m)$ ....(2)

$E_E = \frac{Gm_e m}{R_e}$

$E_m = \frac{GM_m m}{R_m}$

$\therefore E_m = \left(\frac{E_e}{16}\right)$

15. Young's moduli of two wires A and B are in the ratio 7 : 4. Wire A is 2 m long and has radius R. Wire B is 1.5 m long and has radius 2 mm. If the two wires stretch by the same length for a given load, then the value of R is close to :

(1) 1.3 mm (2) 1.9 mm (3) 1.7 mm (4) 1.5 mm

Sol. **3**

$Y = \frac{F/A}{\frac{\Delta L}{L}}$

$\left(\frac{YA}{L}\right) = \left(\frac{F}{\Delta L}\right)$

$\left(\frac{F_1}{\Delta L_1}\right) = \left(\frac{F_2}{\Delta L_2}\right)$

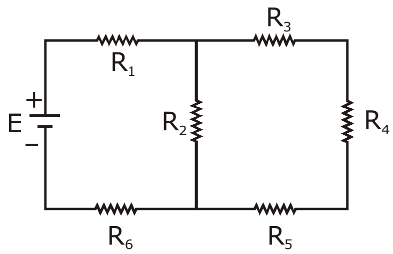
$\frac{Y_1A_1}{L_1} = \frac{Y_2A_2}{L_2}$

$\frac{Y_1\pi R_1^2}{L_1} = \frac{Y_2\pi R_2^2}{L_2}$

on solve we get

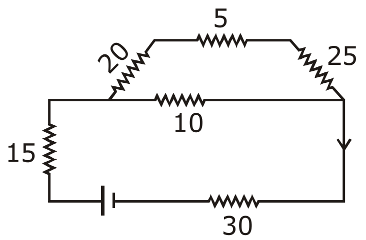
R = 1.7 mm

16. In the figure shown, what is the current (in Ampere) drawn from the battery ? You are given : R_1 = 15 Ω, R_2 = 10 Ω, R_3 = 20 Ω, R_4 = 5 Ω, R_5 =25Ω, R_6 = 30 Ω, E = 15 V



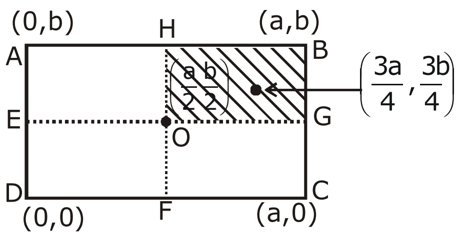
(1) 20/3 (2) 9/32 (3) 7/18 (4) 13/24

Sol. **2**



$$i = \frac{V}{R_{eq.}} = \frac{15}{R_{eq}} = \frac{15}{160/3} = 9/32$$

17. A uniform rectangular thin sheet ABCD of mass M has length a and breadth b, as shown in the figure. If the shaded portion HBGO is cut-off, the coordinates of the centre of mass of the remaining portion will be :



(1) $\left(\frac{5a}{12}, \frac{5b}{12}\right)$ (2) $\left(\frac{3a}{4}, \frac{3b}{4}\right)$ (3) $\left(\frac{5a}{3}, \frac{5b}{3}\right)$ (4) $\left(\frac{2a}{3}, \frac{2b}{3}\right)$

Sol. **1**

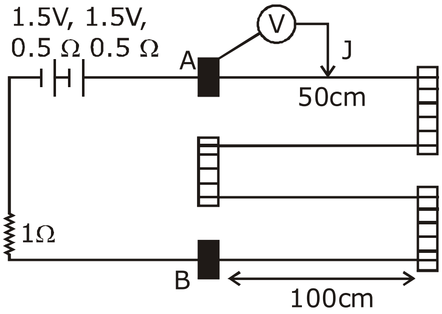
$$x_{cm} = \frac{\sigma(ab)\frac{a}{2} - \sigma\left(\frac{ab}{4}\right)\left(\frac{3a}{4}\right)}{(\sigma ab) - \sigma\left(\frac{ab}{4}\right)}$$

$$x_{cm} = \frac{5a}{12}$$

Similarly

$$y_{cm} = \frac{5b}{12}$$

18. In the circuit shown, a four-wire potentiometer is made of a 400 cm long wire, which extends between A and B. The resistance per unit length of the potentiometer wire is r = 0.01 Ω/cm. If an ideal voltmeter is connected as shown with jockey J at 50 cm from end A, the expected reading of the voltmeter will be :-



(1) 0.50 V (2) 0.25 V (3) 0.20 V (4) 0.75 V

Sol. **2**

$$I = \frac{E}{R + r + l_R}$$

$$I = \frac{3}{1+1+4} = \frac{3}{6}$$

$$I = \frac{1}{2} \text{ A}$$

$$V = E - Ir$$

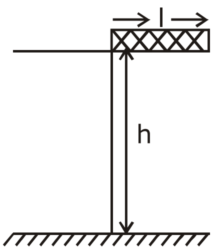
$$= 3 - \frac{1}{2} \times 2$$

$$= 2 \text{ volt}$$

$$k = \frac{2}{400} \text{ volt/cm}$$

$$\therefore V = kl = \frac{2}{400} \times 50 = \frac{2}{8} \text{ volt} = 0.25\text{volt}$$

19. A rectangular solid box of length 0.3 m is held horizontally, with one of its sides on the edge of a platform of height 5 m. When released, it slips off the table in a very short time τ = 0.01s, remaining essentially horizontal. The angle by which it would rotate when it hits the ground will be (in radians) close to :



(1) 0.3 (2) 0.02 (3) 0.28 (4) 0.5

Sol. **4**

angular impulse = $L_f - L_i$

$\tau\Delta t = I\omega$

$$\left(Mg\frac{L}{2}\right) \times 0.01 = \frac{ML^2}{3}\omega$$

$\omega = 0.5$ rad/sec

$t = \sqrt{\frac{2h}{g}}$ (time taken to hit the ground)

$t = 1$ sec

$\therefore \theta = \omega t$

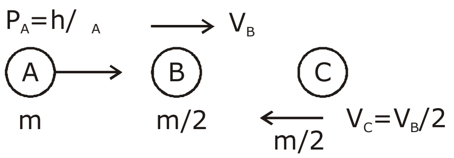
$= 0.5 \times 1$

$= 0.5$ radian

20. A nucleus A, with a finite de-broglie wavelength λ_A, undergoes spontaneous fission into two nuclei B and C of equal mass. B flies in the same direction as that of A, while C flies in the opposite direction with a velocity equal to half of that of B. The de-Broglie wavelengths λ_B and λ_C of B and C are respectively :

(1) $\lambda_A, 2\lambda_A$ (2) $\lambda_A, \frac{\lambda_A}{2}$ (3) $2\lambda_A, \lambda_A$ (4) $\frac{\lambda_A}{2}, \lambda_A$

Sol. **4**



$P_i = P_f$

$$mv = \frac{m}{2}v_B - \frac{m}{2}\left(\frac{v_B}{2}\right)$$

$$mv = \frac{m}{4}v_B$$

$v_B = 4v$

$$v_A = \frac{v_B}{4} \qquad ....(1)$$

$$\lambda_B = \frac{h}{m_B v_B} = \frac{h}{\frac{m}{2}(4V_A)} = \frac{h}{2mv_A} = \left(\frac{\lambda_A}{2}\right)$$

$$\lambda_C = \frac{h}{m_C V_C} = \frac{h}{\left(\frac{m}{2}\right)\frac{V_B}{2}} = \frac{4h}{mv_B}$$

$$\lambda_B = \lambda_{A/2}, \lambda_C = \lambda_A = \frac{4h}{m \times 4v_A} = (\lambda_A)$$

21 The ratio of mass densities of nuclei of ^{40}Ca and ^{16}O is close to -

(1) 0.1 (2) 1 (3) 5 (4) 2

Sol. **1**

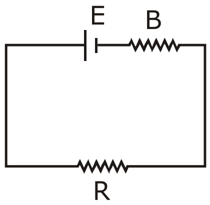
Independent of A

22. A cell of internal resistance r drives current through an external resistance R. The power delivered by the cell to the external resistance will be maximum when :

(1) R = r (2) R = 0.001 r (3) R = 1000 r (4) R = 2 r

Sol. **1**

For maximum Power r = R (maximum, power transfer theorem)



23. A parallel plate capacitor has 1μF capacitance. One of its two plates is given +2μC charge and the other plate, +4μC charge. The potential difference developed across the capacitor is -

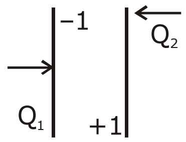
(1) 3 V (2) 5 V (3) 2 V (4) 1 V

Sol. **4**

C = 1 μF

$$Q = \frac{Q_1 - Q_2}{2}$$

$$= \frac{4-2}{2} = 1\mu C$$



$$V = \frac{Q}{C} = \frac{1}{1} = 1 \text{ volt}$$

24. A body of mass m_1 moving with an unknown velocity of $\upsilon_1\hat{i}$, undergoes a collinear collision with a body of mass m_2 moving with a velocity $\upsilon_2\hat{i}$. After collision, m_1 and m_2 move with velocities of $\upsilon_3\hat{i}$ and $\upsilon_4\hat{i}$, respectively. If $m_2 = 0.5\ m_1$ and $\upsilon_3 = 0.5\ \upsilon_1$, then υ_1 is -

(1) $\upsilon_4 - \frac{\upsilon_2}{2}$ (2) $\upsilon_4 - \upsilon_2$ (3) $\upsilon_4 + \upsilon_2$ (4) $\upsilon_4 - \frac{\upsilon_2}{4}$

Sol. **2**

$m_1v_1 + m_2v_2 = m_1v_3 + m_2v_4$

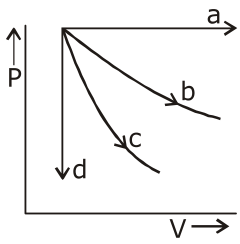
$m_1 (v_1 - v_3) = m_2 (v_4 - v_2)$

$$m\left(v_1 - \frac{v_1}{2}\right) = \frac{m}{2}(v_4 - v_2)$$

$$\frac{v_1}{2} = \frac{1}{2}(v_4 - v_2)$$

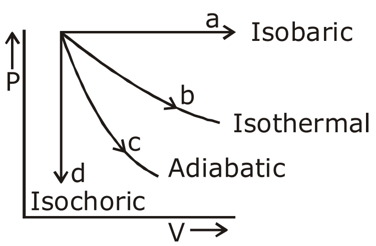
$v_1 = v_4 - v_2$

25. The given diagram shows four processes i.e., isochoric, isobaric, isothermal and adiabatic. The correct assignment of the processes, in the same order is given by :



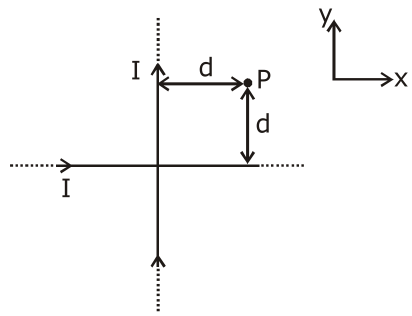
(1) a d b c (2) a d c b (3) d a b c (4) d a c b

Sol. **3**



Order : d a b c

26. Two very long, straight, and insulated wires are kept at 90° angle from each other in xy-plane as shown in the figrue. These wires carry currents of equal magnitude I, whose directions are shown in the figrue. The net magnetic field at point P will be :



(1) $\frac{\mu_0 I}{2\pi d}(\hat{x}+\hat{y})$ (2) zero (3) $\frac{+\mu_0 I}{\pi d}(\hat{z})$ (4) – $-\frac{\mu_0 I}{2\pi d}(\hat{x}+\hat{y})$

Sol. **2**

$B_1 = \frac{\mu_0}{2\pi d}\left(-\hat{k}\right)$

$B_2 = \frac{\mu_0}{2\pi d}\left(\hat{k}\right)$

$B = 0$

27. In a simple pendulum experiment for determination of acceleration due to gravity (g), time taken for 20 oscillations is measured by using a watch of 1 second least count. The mean value of time taken comes out to be 30 s. The length of pendulum is measured by using a meter scale of least count 1 mm and the value obtained is 55.0 cm. The percentage error in the determination of g is clsoe to -

(1) 0.2 % (2) 6.8 % (3) 0.7 % (4) 3.5 %

Sol. **2**

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

$$T^2 = 4\pi^2 \frac{l}{g}$$

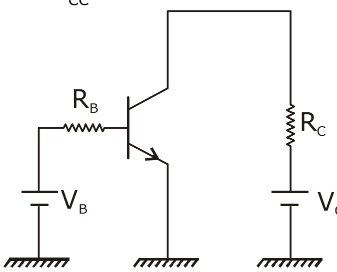
$$g = \frac{4\pi^2 l}{T^2}$$

$$\frac{dg}{g} = \frac{dl}{l} - \frac{2dT}{T}$$

$$\text{error} \Rightarrow \frac{dg}{g} = \frac{dl}{l} + 2\left(\frac{dT}{T}\right)$$

$$= \left(\frac{0.1}{55} + 2 \times \frac{1}{30}\right) \times 100 = \frac{226}{33} = 6.84\%$$

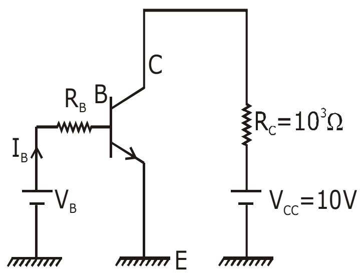
28. A common emitter amplifier circuit, built using an npn transistor, is shown in the figrue. Its dc current gain is 250, R_C = 1 kΩ and V_{CC} = 10 V. What is the minimum base current for V_{CE} to reach saturation ?



(1) 7 μA (2) 10 μA (3) 100 μA (4) 40 μA

Sol. **4**

B = 50
R_C = 1 kΩ
V_{CC} = 10 V
i_B = ?



$$\beta = 250 = \frac{I_C}{I_B} \quad ....(1)$$

$$I_B = \frac{I_C}{250}$$

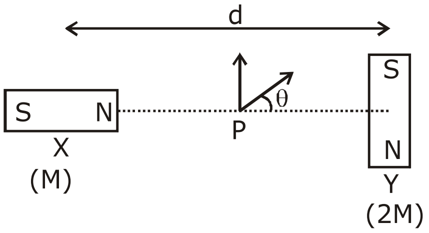
for saturation current $V_{CC} = I_C R_C$ .....(2)

$$I_C = \frac{10}{10^3} \ 10^{-2} \text{ A}$$

$$= \frac{10^{-2}}{25 \times 10}$$

= 40 μA

29. Two magnetic dipoles X and Y are placed at a separation d, with their axes perpendicualr to each other. The dipole moment of Y is twice that of X. A particle of charge q is passing through their midpoint P, at angle $\theta = 45°$ with the horizontal line, as shown in figure. What would be the magnitude of force on the particle at that instant ? (d is much larger than the dimensions of the dipole)



(1) $\left(\frac{\mu_0}{4\pi}\right)\frac{M}{\left(\frac{d}{2}\right)^3}\times q\upsilon$ (2) 0 (3) $\sqrt{2}\left(\frac{\mu_0}{4\pi}\right)\frac{M}{\left(\frac{d}{2}\right)^3}\times q\upsilon$ (4) $\left(\frac{\mu_0}{4\pi}\right)\frac{2M}{\left(\frac{d}{2}\right)^3}\times q\upsilon$

Sol. **2**

Due to X

$$B_1 = 2\left(\frac{\mu_0}{4\pi}\right)\frac{m}{\left(\frac{d}{2}\right)^3}$$

Due to Y

$$B_2 = \frac{\mu_0}{4\pi}\frac{(2M)}{\left(\frac{d}{2}\right)^3}$$

$B_1 = B_2$

$B_{net} = B\sqrt{2}$

at 45° Angle

Motion of charge is along the direction B_{net} Hence it will not Exp. no force.

30. A solid sphere and solid cylidner of identical radii approach an incline with the same linear velocity (see figure). Both roll without slipping all throughout. The two climb maximum heights h_{sph} and h_{cyl} on the incline. The ratio $\frac{h_{sph}}{h_{cyl}}$ is given by :

(1) $\frac{2}{\sqrt{5}}$ (2) $\frac{14}{15}$ (3) 1 (4) $\frac{4}{5}$

Sol. **2**

From energy conservation

KE = P.E.

$$\frac{1}{2} I_{AOR} \omega^2 = Mgh_{cm}$$

For solid Sphere

$$\frac{1}{2}\left(\frac{1}{2}+1\right) mR^2 \omega^2 = mgh_{cm} \qquad ....(1)$$

For cylinder

$$\frac{1}{2}\left(\frac{1}{2}+1\right) mR^2 \omega^2 = mgh\ (cylinder)$$

(1)/(2)

$$\therefore \frac{hs}{hc} = \left(\frac{14}{15}\right)$$

मोशन ने बनाया साधारण को असाधारण

JEE Main Result Jan'19

4 RESIDENTIAL COACHING PROGRAM (DRONA) STUDENTS ABOVE 99.9 PERCENTILE

Total Students Above 99.9 percentile - **17**

Total Students Above 99 percentile - **282**

Total Students Above 95 percentile - **983**

% of Students Above 95 percentile $\frac{983}{3538} = 27.78\%$

Scholarship on the Basis of 12th Class Result

Marks PCM or PCB	Hindi State Board	State Eng OR CBSE
70%-74%	30%	20%
75%-79%	35%	25%
80%-84%	40%	35%
85%-87%	50%	40%
88%-90%	60%	55%
91%-92%	70%	65%
93%-94%	80%	75%
95% & Above	90%	85%

New Batches for Class 11th to 12th pass
17 April 2019 & 01 May 2019

हिन्दी माध्यम के लिए पृथक बैच

Scholarship on the Basis of JEE Main Percentile

Score	JEE Mains Percentile	English Medium Scholarship	Hindi Medium Scholarship
225 Above	Above 99	Drona Free (Limited Seats)	
190 to 224	Above 97.5 To 99	100%	100%
180 to 190	Aboev 97 To 97.5	90%	90%
170 to 179	Above 96.5 To 97	80%	80%
160 to 169	Above 96 To 96.5	60%	60%
140 to 159	Above 95.5 To 96	55%	55%
74 to 139	Above 95 To 95.5	50%	50%
66 to 73	Above 93 To 95	40%	40%
50 to 65	Above 90 To 93	30%	35%
35 to 49	Above 85 To 90	25%	30%
20 to 34	Above 80 To 85	20%	25%
15 to 19	75 To 80	10%	15%

सैन्य कर्मियों के बच्चो के लिए 50% छात्रवृत्ति | प्री-मेडिकल में छात्राओं को 50% छात्रवृत्ति