



JEE Main Online Exam 2019

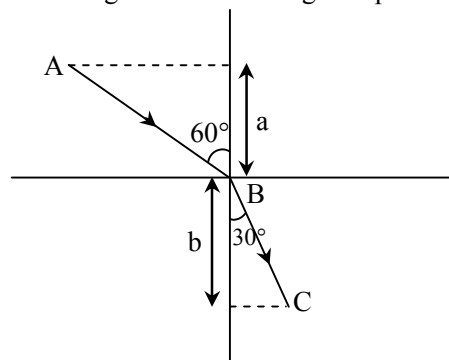
Questions & Solutions

10th April 2019 | Shift - I

(Memory Based)

PHYSICS

Q.1 Path of a light ray is given as shown in figure. Find the length of path-



(1) $2a + \frac{2b}{\sqrt{3}}$

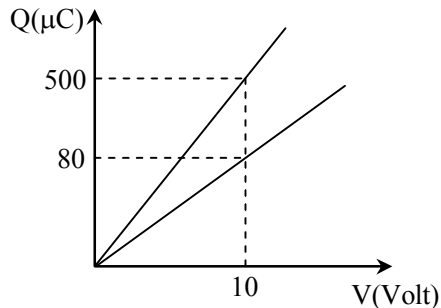
(2) $a + \sqrt{3} b$

(3) $\frac{a}{2} + \sqrt{3} b$

(4) $\sqrt{3} b + \frac{b}{2}$

Ans. [1]

Q.2 Graph of total charge vs voltage is given for two combinations series and parallel respectively -



(1) 10, 40

(2) 20, 30

(3) 25, 25

(4) 5, 45

Ans. [1]

Q.3 A stationary sound source produce frequency of 500 Hz. Velocity of sound is 300 m/s on observer receive frequency 480 Hz and 530 Hz when move away and towards. Find velocity in both cases -

(1) 30, 12

(2) 12, 18

(3) 15, 30

(4) 30, 15

Ans. [2]

Q.4 67.2 lit of He is filled in a closed container at STP then find amount of heat supplied to raise the temperature by 20°C -

- (1) 90 R (2) 100 R (3) 120 R (4) 200 R

Ans. [1]

Q.5 Equation of a damped oscillation is given by $x = e^{-0.1t} \cos(10\pi t + \phi)$ find time in which amplitude become half of initial amplitude -

- (1) 7 (2) 14 (3) 21 (4) 2

Ans. [1]

Q.6 Two disc of moment of inertia of I and I/2 are rotating co-axially with angular speed ω & $\omega/2$ respectively in same direction. If they comes in contact start rotating with same ' ω '. Find change in K.E -

- (1) $\frac{I\omega^2}{12}$ (2) $\frac{I\omega^2}{24}$ (3) $\frac{I\omega^2}{32}$ (4) $\frac{I\omega^2}{6}$

Ans. [2]

Q.7 Surface mass density of a disc is given by $\sigma = kr^2$ (where r is distance from centre) find moment of inertia about axis passing through the centre and perpendicular to plane -

- (1) $\frac{k\pi r^6}{3}$ (2) $\frac{k\pi r^6}{6}$ (3) $\frac{2k\pi r^6}{5}$ (4) $\frac{3k\pi r^6}{5}$

Ans. [1]

Q.8 Three particles proton, α -particle and electrons are projected in magnetic field with same kinetic energy, then which of the following option is correct regarding radius of circular path -

- (1) $r_p = r_\alpha = r_e$ (2) $r_p = r_\alpha > r_e$ (3) $r_p = r_\alpha < r_e$ (4) $r_p > r_\alpha > r_e$

Ans. [2]

Sol.

Q.9 A plano convex and a planoconcave lens of refractive index μ_1 and μ_2 are placed in contact. Radius of all curved faces is R. Find effective focal length - [Given that $\mu_1 > \mu_2$]

- (1) $\frac{R}{\mu_1 - \mu_2}$ (2) $\frac{3R}{\mu_1 - \mu_2}$ (3) $\frac{2R}{\mu_1 - \mu_2}$ (4) $\frac{4R}{\mu_1 - \mu_2}$

Ans. [1]

Q.10 A ring of charge Q and radius 3a is placed at a distance of 4a from a charge particle Q on its axis. Find minimum speed of particle with which it should be projected towards the centre of ring so that it can reach to its centre - [K \rightarrow electrostatic constant]

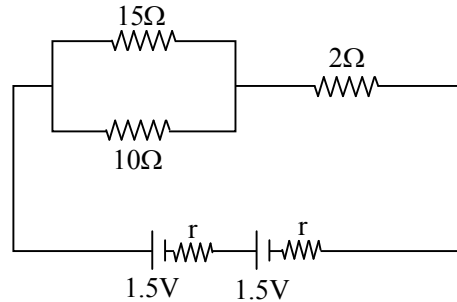
- (1) $\sqrt{\frac{4KQ^2}{15ma}}$ (2) $\sqrt{\frac{KQ^2}{15ma}}$ (3) $\sqrt{\frac{KQ^2}{3ma}}$ (4) $\sqrt{\frac{KQ^2}{6ma}}$

Ans. [1]

- Q.11** The gravitational acceleration at height h from the surface of Earth is 4.9 m/s^2 . Then height of particle is -
 ($R = 6400 \text{ km}$)
 (1) 2649.6 km (2) 3640.2 km (3) 5234.2 km (4) 6400 km

Ans. [1]

- Q.12** Find the internal resistance of cell. Potential difference across 10Ω & 15Ω is $2V$ -



- (1) 0.5Ω (2) 1Ω (3) 0.25Ω (4) 4Ω

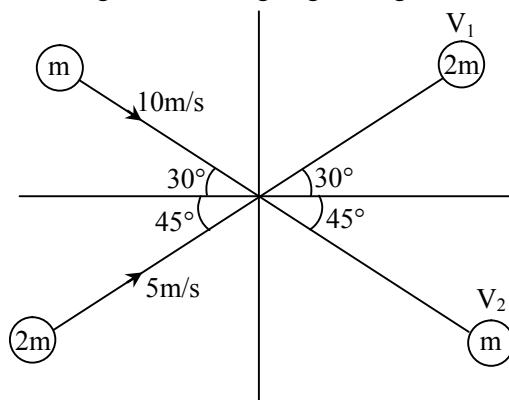
Ans. [1]

- Q.13** Two radioactive substance A and B have same number of nuclei initially decay constant are λ and 10λ respectively. Calculate the time after which the ratio of becomes $\frac{1}{e}$.

- (1) $\frac{1}{10\lambda}$ (2) $\frac{1}{6\lambda}$ (3) $\frac{1}{9\lambda}$ (4) $\frac{1}{5\lambda}$

Ans. [3]

- Q.14** Two particle collides as shown in figure, according to given figure find V_1 & V_2 after collision-



- (1) $V_1 = 6.3 \text{ m/s}$; $V_2 = 6.5 \text{ m/s}$ (2) $V_1 = 10.2 \text{ m/s}$; $V_2 = 10.5 \text{ m/s}$
 (3) $V_1 = 5 \text{ m/s}$; $V_2 = 7 \text{ m/s}$ (4) $V_1 = 7 \text{ m/s}$; $V_2 = 5 \text{ m/s}$

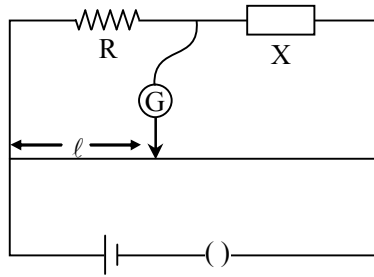
Ans. [1]

- Q.15** A current of $5A$ flows in a conducting wire of radius $r = 5 \text{ mm}$. The resistivity of conductor is $2 \times 10^{-8} \Omega\text{-m}$. Find mobility - (Given that drift velocity is $1.1 \times 10^{-3} \text{ m/s}$)

- (1) $86.35 \times 10^{-2} \text{ m}^2/\text{v-s}$ (2) $40.23 \times 10^{-4} \text{ m}^2/\text{v-s}$
 (3) $26.45 \times 10^{-3} \text{ m}^2/\text{v-s}$ (4) $40.23 \times 10^{-2} \text{ m}^2/\text{v-s}$

Ans. [1]

Q.16 In a meter bridge, the jockey is placed as shown, then which of the following state is inconsistent -



- | $R(\Omega)$ | $\ell(\text{cm})$ | | |
|-------------|-------------------|-------|-------|
| (a) 1000 | 60 cm | | |
| (b) 100 | 13 cm | | |
| (c) 10 | 1.5 cm | | |
| (d) 1 | 1 cm | | |
| (1) a | (2) b | (3) c | (4) d |

Ans. [4]

Q.17 Power gain of NPN transistor is 10^6 output resistance is 10000 & input resistance is 1000. Find current gain -

- | | | | |
|---------|---------|---------|---------|
| (1) 150 | (2) 200 | (3) 100 | (4) 300 |
|---------|---------|---------|---------|

Ans. [3]

Q.18 An ideal gas undergoes an isobaric process at constant volume specific heat is C_v , number of mole is n the find ratio of work done and heat given -

- | | | | |
|-------------------------|-------------------------|--------------------------|---------------|
| (1) $\frac{R}{C_v + R}$ | (2) $\frac{C_v + R}{R}$ | (3) $\frac{nR}{C_v + R}$ | (4) $C_v + R$ |
|-------------------------|-------------------------|--------------------------|---------------|

Ans. [1]

Q.19 A modulating wave of frequency 100 MHz and amplitude 100V is modulated on a carrier wave of amplitude 400V and frequency 300 GHz. Find the bandwidth and modulation index -

- | | | | |
|------------------------------|-----------------------------|-----------------------------|------------------------------|
| (1) 2×10^8 Hz, 0.25 | (2) 1×10^8 Hz, 0.5 | (3) 2×10^8 Hz, 0.5 | (4) 3×10^8 Hz, 0.25 |
|------------------------------|-----------------------------|-----------------------------|------------------------------|

Ans. [1]

Q.20 If the wavelength of incident wave is 260 nm and cut off wavelength is 380 nm then find maximum kinetic energy [$hc = 1237 \text{ nm-eV}$]

- | | | | |
|------------|------------|-------------|------------|
| (1) 1.5 eV | (2) 2.6 eV | (3) 10.2 eV | (4) 5.9 eV |
|------------|------------|-------------|------------|

Ans. [1]

Q.21 If \vec{E} in em wave is $\vec{E} = E_0 \cos(kz) \cos(\omega t) \hat{i}$ then find \vec{B} (magnetic field vector)

- | | | | |
|---|---|---|---|
| (1) $\frac{E_0}{c} \sin kz \sin \omega t$ | (2) $\frac{E_0}{c} \cos kz \cos \omega t$ | (3) $\frac{E_0}{c} \cos kz \sin \omega t$ | (4) $\frac{E_0}{c} \sin kz \cos \omega t$ |
|---|---|---|---|

Ans. [1]

Q.22 A particle is thrown with speed v_0 in upward direction & it is acted by a drag force $f_{\text{drag}} = m\gamma v^2$. How much time will it take to reach at maximum height

(1) $\frac{1}{\sqrt{g\gamma}} \tan^{-1} \left(\sqrt{\frac{\gamma}{g}} v_0 \right)$

(2) $\sqrt{g\gamma} \tan^{-1} \left(\sqrt{\frac{\gamma}{g}} v_0 \right)$

(3) $\frac{\sqrt{g\gamma}}{v_0} \tan^{-1} \left(\sqrt{\frac{g}{\gamma}} v_0 \right)$

(4) $\frac{v_0}{\sqrt{g\gamma}} \tan^{-1} \left(\sqrt{\frac{g}{\gamma}} v_0 \right)$

Ans. [1]

Q.23 In step down transformer the ratio of turns $N_1 : N_2 = 1 : 2$ and output power is 2.2 kW. If current in secondary is 10 A then find input voltage and current -

(1) 440 V, 5A

(2) 220 V, 10 A

(3) 200 V, 5 A

(4) 440 V, 10 A

Ans. [1]

Q.24 If depression of Hg in a capillary tube of radius R_1 is same as rise of water in another capillary of radius R_2 . If $S_{\text{Hg}} : S_{\text{water}} = 135^\circ$, $\rho_{\text{Hg}} : \rho_{\text{H}_2\text{O}} = 13.6$ with $\theta_{\text{Hg}} = 135^\circ$ and $\theta_{\text{H}_2\text{O}} = 0^\circ$, find R_1/R_2 -

(1) 0.4

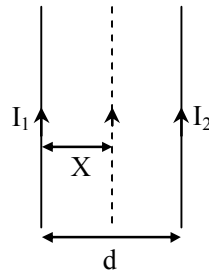
(2) 0.7

(3) 0.9

(4) 1.0

Ans. [1]

Q.25 Two parallel infinite wires separated by 'd' carrying currents I_1 & I_2 . Find the distance of third infinite long wire kept parallel to both wires so that it can stay in equilibrium - ($X = ?$)



(1) $\frac{I_2}{I_2 - I_1} d$

(2) $\frac{I_1}{I_2 + I_1} d$

(3) $\frac{2I_2}{I_2 - I_1} d$

(4) $\frac{2I_1}{I_2 - I_1} d$

Ans. [2]