CAREER POINT

JEE Main Online Exam 2019

[Memory Based Paper]

Questions & Answer

9th January 2019 | Shift - I

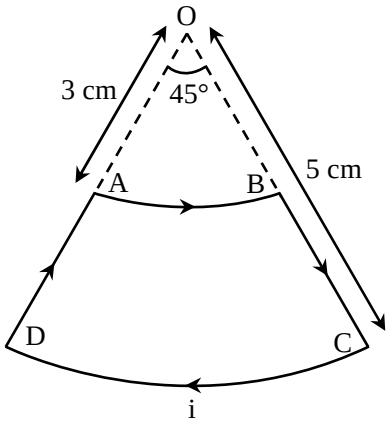
PHYSICS

Q.1 Determine the Ratio of root mean square speed of Helium to Argon gas at the same temperature (M_{He} = 4U & M_{Ar} = 40 U)

(1) $\frac{1}{\sqrt{10}}$ (2) $\sqrt{10}$ (3) $\sqrt{20}$ (4) $\frac{1}{\sqrt{20}}$

Ans. **[2]**

Q.2 A Loop ABCD have current i = 10A as shown in figure. AB & CD are arc of radius 3cm & 5cm Respectively determine magnetic field intensity at O.



(1) $\frac{200\pi}{3}\times10^{-7}$T (2) $\frac{100\pi}{3}\times10^{-7}$T (3) $100\pi\times10^{-7}$T (4) $200\pi\times10^{-7}$T

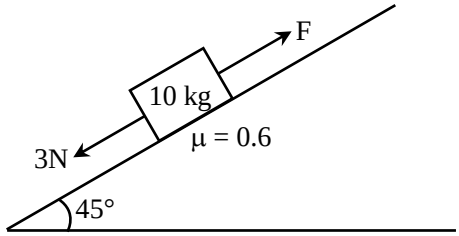
Ans. **[2]**

Q.3 A point object is placed in front of a lens at distance 10 cm from convex lens. Lens produces a sharp image at screen located at 10 cm from lens. Now a glass slab of refractive index 1.5 & thickness 1.5 cm is placed in contact with lens at its left side. Now in order to get sharp image again on the screen by what distance screen should be shifted.

(1) 0.5 (2) 0.55 (3) 0.4 (4) None

Ans. **[2]**

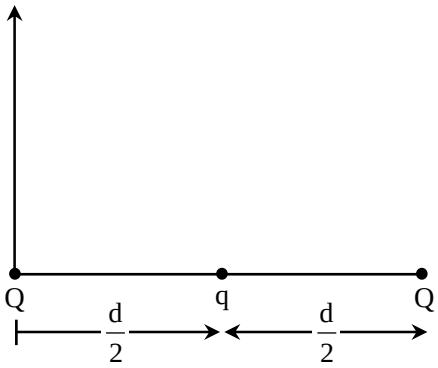
Q.4 Determine minimum value of force F required to keep block in equilibrium.



(1) 25 N (2) 28 N (3) 31 N (4) 35 N

Ans. **[3]**

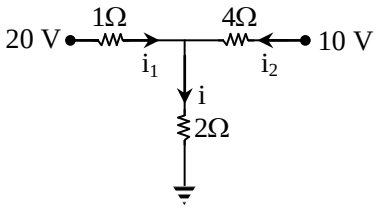
Q.5 Point charge Q in fixed on (d, 0, 0) another charge Q is placed at (0, 0, 0). What should be the value of q so that Q at origin will be in equilibrium.



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

Ans. **[4]**

Q.6 In the given circuit determine the value of i ?



(1) 4A (2) 5A (3) 10 A (4) 2A

Ans. **[2]**

Q.7 A loop whose area is $5 \times 10^{-3} m^2$ and resistance is 10 Ω. Magnetic field 0.4 sin (50πt) T is present perpendicular to loop then induced charge flow in loop in time t = 0 to t = 10 ms will be

(1) 1×10^{-4} (2) 3×10^{-4} (3) 2×10^{-4} (4) None

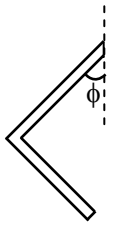
Ans. **[3]**

Q.8 In Interference between two light waves of intensity I_1 & I_2, the ratio of maximum and minimum intensity in Interference pattern is 16 : 1. Determine the ratio $I_1 : I_2$

(1) $\frac{23}{9}$ (2) $\frac{24}{7}$ (3) $\frac{25}{9}$ (4) $\frac{16}{9}$

Ans. **[3]**

Q.9 L shaped rod is hinged from O in vertical plane at its one end as shown in figure. Rod is in equilibrium position then. Determine ϕ.



(1) $\tan^{-1}\left(\frac{1}{3}\right)$ (2) $\tan^{-1}\left(\frac{1}{2}\right)$ (3) $\frac{\pi}{4}$ (4) None

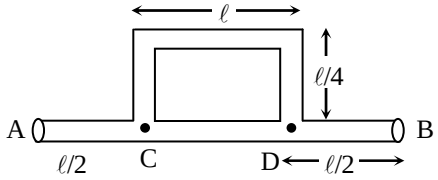
Ans. **[1]**

Q.10 Light of wavelength $\lambda_1 = 350$ nm and $\lambda_2 = 540$ nm is incident one by one on a metal plate. The ratio of maximum speed of ejected photoelectron is $v_1 : v_2 = 2 : 1$. Determine the work function of metal

(1) 1.2 eV (2) 1.9 eV (3) 5.6 eV (4) 2.5 eV

Ans. **[2]**

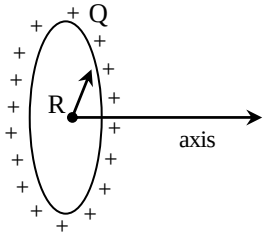
Q.11 A conductor of given shape has temperature difference of 120°C across ends A & B. Whole conductor is of uniform cross sectional area and uniform thermal conductivity. Find the temperature between C & D at steady state.



(1) 30 (2) 60 (3) 45 (4) 55

Ans. **[3]**

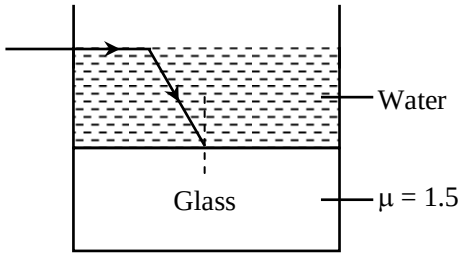
Q.12 Uniformly charge insulating ring of radius R is given as shown in figure. Determine the distance h from centre along the axis of ring at which electric field intensity is maximum.



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

Ans. **[1]**

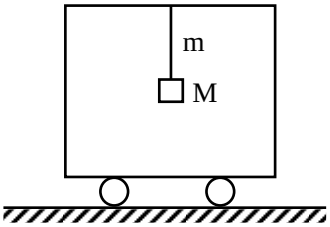
Q.13 Light is incident at water air interface as shown in figure. Refractive index of slab is $\mu = 1.5$. Determine the minimum value of refractive index of water for which after striking at water slab interface final emergent light is completely polarised light.



(1) $\frac{4}{\sqrt{5}}$ (2) $\frac{7}{\sqrt{5}}$ (3) $\frac{3}{\sqrt{5}}$ (4) $\frac{6}{\sqrt{5}}$

Ans. **[3]**

Q.14 A block of mass M is suspended with a uniform string of mass m at celling of a cart as shown in figure. Velocity of wave pulse in string at its lowest point string is 60 m/s. Now car moves with acceleration a m/s^2 in horizontal direction then velocity of wave pulse at same point is 60.5 m/s. Find the value of acceleration.



(1) $\frac{g}{\sqrt{20}}$ (2) $\frac{g}{\sqrt{30}}$ (3) $\frac{g}{\sqrt{15}}$ (4) $\frac{g}{\sqrt{40}}$

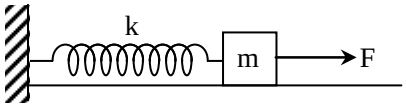
Ans. **[2]**

Q.15 Length of a conducting wire is increased by 0.5% keeping its volume constant. Determine the percentage change in resistance of wire.

(1) 1% (2) 2% (3) 3% (4) 4%

Ans. **[1]**

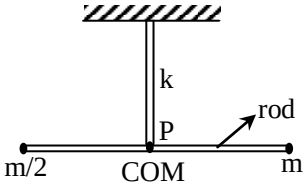
Q.16 A block rest on smooth surface attached with spring as shown spring is in natural length, if a constant force F applied on block in rightward direction then find maximum velocity of block ?



(1) $\frac{F}{\sqrt{km}}$ (2) $\sqrt{\frac{m}{k}}F$ (3) $\sqrt{\frac{mF}{k}}$ (4) $\frac{F}{mk}$

Ans. **[1]**

Q.17 A rod of torsional constant k is attached to centre of masses of two point mass connected by massless rod at point P as shown in fig. If rod is twisted by small angle $\Delta\theta$ and released, find its angular frequency ?



(1) $3\sqrt{\frac{k(\Delta\theta)^2}{2m\ell^2}}$ (2) $\sqrt{\frac{3}{2}\frac{k(\Delta\theta)^2}{m\ell^2}}$ (3) $\sqrt{\frac{3k(\Delta\theta)^2}{m\ell^2}}$ (4) $\sqrt{\frac{6k(\Delta\theta)^2}{m\ell^2}}$

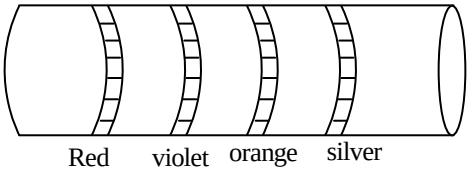
Ans. **[3]**

Q.18 Earth is revolving around sun with angular momentum L then determine the aerial velocity of earth. (mass of earth is m kg)

(1) $\frac{L}{m}$ (2) $\frac{L}{2m}$ (3) $\frac{L}{3m}$ (4) $\frac{L}{4m}$

Ans. **[2]**

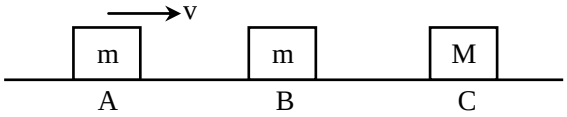
Q.19 Four colour band resistor with colours of band is given in figure. What is the value of resistance of resistor.



(1) $27 \times 10^3 \pm 5\%$ (2) $36 \times 10^3 \pm 5\%$ (3) $27 \times 10^3 \pm 10\%$ (4) $36 \times 10^3 \pm 10\ \%$

Ans. **[3]**

Q.20 Initially Block 'A' is given a horizontal velocity V and other block B & C are at rest. All possible collision are perfectly inelastic collision. Total energy loss after all collisions is $\frac{5}{6}$ times of initial kinetic energy of system. Find m : M.



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

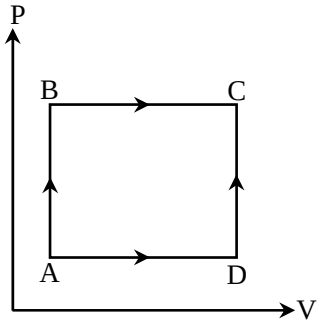
Ans. **[1]**

Q.21 A particle is moving in xy plane with velocity $\vec{v} = y\hat{i} + x\hat{j}$. Determine equation of path of particle.

(1) Hyperbola (2) Ellipse (3) Parabola (4) Straight line

Ans. **[1]**

Q.22 A Ideal gas is taken from state A to state C By two different processes ABC & ADC as shown in PV graph. Heat supplied to the gas in ABC process is 60 Joule while work done by gas in same process is 30 joule. If work done by gas in ADC process is 10 joule. Determine heat supplied to gas in process ADC.



(1) 40 J (2) 30 J (3) 60 J (4) 10 J

Ans. **[1]**

Q.23 An infinitely long straight wire carrying current I_1 is placed in the plane of a circular coil of radius a carrying current I_2. If wire is at a distance d from centre of coil (d >> a), then the force exerted by wire on coil is proportional to -

(1) $\frac{d^3}{a^2}$ (2) $\frac{d^2}{a^3}$ (3) $\frac{a^2}{d^2}$ (4) zero

Ans. **[3]**

Q.24 A wire of material of cross sectional area A and length ℓ is heated to increase its temperature By ΔT. Temperature coefficient of linear expansion of material = $\alpha\ ^\circ C^{-1}$. Force F is applied at the ends of wire so that it length do not increase on heating. Determine young modulus of material of wire.

(1) $\frac{F}{3\alpha\Delta TA}$ (2) $\frac{2F}{\alpha A\Delta T}$ (3) $\frac{F}{A\alpha\Delta T}$ (4) $\frac{F}{2A\alpha\Delta T}$

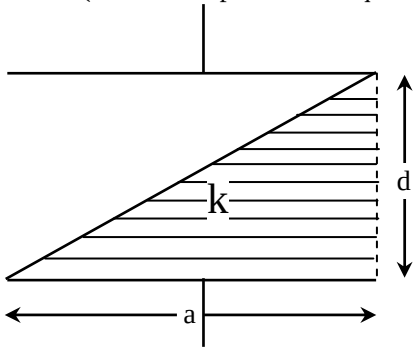
Ans. **[3]**

Q.25 In a electromagnetic wave, electric field vector $\vec{E} = 6\,\hat{j}$ N/C is given. Determine magnetic field intensity vector $\vec{B}$. Frequency of Electro magnetic wave = 50 MHz.

(1) $10^{-8}\,\hat{k}T$ (2) $2\times10^{-8}\,\hat{k}T$ (3) $3\times10^{-8}\,\hat{k}T$ (4) $4\times10^{-8}\,\hat{k}T$

Ans. **[2]**

Q.26 Dielectric of dielectric constant k is present between the plates of capacitor as shown in figure. Determine the capacitance of parallel plate capacitor. (Plates of capacitor are square of width a)



(1) $\frac{\varepsilon_0 ka^2}{d(k-1)}\ell n\,k$ (2) $\frac{\varepsilon_0 ka^2}{2d(k-1)}\ell n\,k$ (3) $\frac{\varepsilon_0 a^2}{d(k-1)}\ell n\,k$ (4) $\frac{\varepsilon_0 ka^2}{3d(k-1)}\ell n\,k$

Ans. **[1]**

Q.27 There is a current of 1.344 amp in a copper wire whose area of cross section normal to the length of the wire is 1 mm^2. If the number of free electrons per cm^3 is 8.4×10^{22}, then the drift velocity would be

(1) 1.0 mm/s (2) 1.0 m/s (3) 0.1 mm/s (4) 0.01 mm/s

Ans. **[3]**

Q.28 If the electron density of N-type semiconductor is 10^{13} per cm^3 and the mobility of the electron as μ_e = 1200 cm^2/V-S. The value of resistivity of n-type semiconductor is -

(1) 5.2 Ω-cm (2) 5.2 Ω-m (3) 2.5 Ω-cm (4) 2.5 Ω-m

Ans. **[2]**

Q.29 A radio active sample S_1 having an activity of 5μCi has twice the number of nuclei as another sample S_2 which has an activity of 10μCi. The half lives of S_1 & S_2 can be

(1) 20 days and 5 days respectively

(2) 20 days and 10 years , respectively

(3) 10 years each

(4) 5 years each

Ans. **[1]**

Q.30 The coercivity of a small magnet where the ferromagnet gets demagnetized is 3×10^3 Am^{-1}. The current required to be passed in a solenoid of length 10 cm and number of turns 100, so that the magnet gets demagnetized when inside the solenoid, is -

(1) 60 mA (2) 3 A (3) 6 A (4) 30 mA

Ans. **[2]**