

NEET(UG)-2019 (ODISHA) FINAL EXAMINATION
(Held On Monday 20th MAY, 2019)

PHYSICS

TEST PAPER WITH ANSWER & SOLUTION

136. Two metal spheres, one of radius R and the other of radius 2R respectively have the same surface charge density σ . They are brought in contact and separated. What will be the new surface charge densities on them ?

(1) $\sigma_1 = \frac{5}{6}\sigma, \sigma_2 = \frac{5}{2}\sigma$

(2) $\sigma_1 = \frac{5}{2}\sigma, \sigma_2 = \frac{5}{6}\sigma$

(3) $\sigma_1 = \frac{5}{2}\sigma, \sigma_2 = \frac{5}{3}\sigma$

(4) $\sigma_1 = \frac{5}{3}\sigma, \sigma_2 = \frac{5}{6}\sigma$

Ans. (4)

Sol. (A) (B)

R	2R
σ	σ

Total charge = $\sigma \times 4\pi R^2 + \sigma \times 4\pi (2R)^2 = 20 \sigma\pi R^2$

$\frac{Q_A}{Q_B} = \frac{1}{2}$

$Q_A = \frac{20}{3}\sigma\pi R^2$ and $Q_B = \frac{40}{3}\sigma\pi R^2$

$\sigma_A = \frac{Q_A}{\text{area}} = \frac{20}{3} \frac{\sigma\pi R^2}{4\pi R^2} = \frac{5\sigma}{3}$

$\sigma_B = \frac{40\sigma\pi R^2}{4\pi(2R)^2} = \frac{5\sigma}{6}$

137. The distance covered by a particle undergoing SHM in one time period is (amplitude = A) :-

(1) zero

(2) A

(3) 2A

(4) 4A

Ans. (4)

Sol. Distance in one oscillation = 4A

138. A mass falls from a height 'h' and its time of fall 't' is recorded in terms of time period T of a simple pendulum. On the surface of earth it is found that $t = 2T$. The entire set up is taken on the surface of another planet whose mass is half of that of earth and radius the same. Same experiment is repeated and corresponding times noted as t' and T' .

(1) $t' = \sqrt{2} T'$

(2) $t' > 2 T'$

(3) $t' < 2 T'$

(4) $t' = 2 T'$

Ans. (4)

Sol. Time of flight = $\sqrt{\frac{2h}{g}} \propto \frac{1}{\sqrt{g}}$

Time period of pendulum = $2\pi\sqrt{\frac{l}{g}} \propto \frac{1}{\sqrt{g}}$

Ratio of time of flight & time period of pendulum is independent of g. Hence $t' = 2T'$

139. A tuning fork with frequency 800 Hz produces resonance in a resonance column tube with upper end open and lower end closed by water surface. Successive resonance are observed at length 9.75 cm, 31.25 cm and 52.75 cm. The speed of sound in air is :-

- (1) 500 m/s (2) 156 m/s (3) 344 m/s (4) 172 m/s

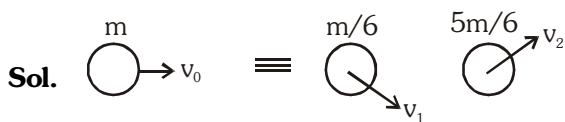
Ans. (3)

Sol. Here $\lambda = 2(l_2 - l_1)$
 where $l_1 = 9.75$ cm, $l_2 = 31.25$ cm
 so $v = 2n(l_2 - l_1) = 2 \times 800(31.25 - 9.75) = 344$ m/s

140. An object flying in air with velocity $(20\hat{i} + 25\hat{j} - 12\hat{k})$ suddenly breaks in two pieces whose masses are in the ratio 1 : 5. The smaller mass flies off with a velocity $(100\hat{i} + 35\hat{j} + 8\hat{k})$. The velocity of the larger piece will be :-

- (1) $4\hat{i} + 23\hat{j} - 16\hat{k}$ (2) $-100\hat{i} - 35\hat{j} - 8\hat{k}$ (3) $20\hat{i} + 15\hat{j} - 80\hat{k}$ (4) $-20\hat{i} - 15\hat{j} - 80\hat{k}$

Ans. (1)



Conservation of linear momentum, $m\vec{v}_0 = \frac{m}{6}\vec{v}_1 + \frac{5m}{6}\vec{v}_2$
 $\Rightarrow m(20\hat{i} + 25\hat{j} - 12\hat{k}) = \frac{m}{6}(100\hat{i} + 35\hat{j} + 8\hat{k}) + \frac{5m}{6}\vec{v}_2 \Rightarrow \vec{v}_2 = 4\hat{i} + 23\hat{j} - 16\hat{k}$

141. An object kept in a large room having air temperature of 25°C takes 12 minutes to cool from 80°C to 70°C. The time taken to cool for the same object from 70°C to 60°C would be nearly :-

- (1) 10 min (2) 12 min (3) 20 min (4) 15 min

Ans. (4)

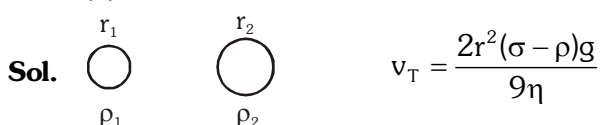
Sol. $\frac{T_1 - T_2}{t} = K \left(\frac{T_1 + T_2}{2} - T_s \right)$
 $\frac{80 - 70}{12} = K \left(\frac{80 + 70}{2} - 25 \right) \dots(1)$
 $\frac{70 - 60}{t} = K \left(\frac{70 + 60}{2} - 25 \right) \dots(2)$

on solving : $t = 15$ min

142. Two small spherical metal balls, having equal masses, are made from materials of densities ρ_1 and ρ_2 ($\rho_1 = 8\rho_2$) and have radii of 1mm and 2mm, respectively. They are made to fall vertically (from rest) in a viscous medium whose coefficient of viscosity equals η and whose density is $0.1\rho_2$. The ratio of their terminal velocities would be :-

- (1) $\frac{79}{72}$ (2) $\frac{19}{36}$ (3) $\frac{39}{72}$ (4) $\frac{79}{36}$

Ans. (4)



$\frac{v_1}{v_2} = \left(\frac{r_1}{r_2} \right)^2 \frac{(\sigma_1 - \rho)}{(\sigma_2 - \rho)} = \left(\frac{1}{2} \right)^2 \frac{(8\rho_2 - 0.1\rho_2)}{(\rho_2 - 0.1\rho_2)} = \frac{79}{36}$

143. A particle starting from rest, moves in a circle of radius 'r'. It attains a velocity of V_0 m/s in the n^{th} round. Its angular acceleration will be :-

- (1) $\frac{V_0}{n}$ rad / s² (2) $\frac{V_0^2}{2\pi nr^2}$ rad / s² (3) $\frac{V_0^2}{4\pi nr^2}$ rad / s² (4) $\frac{V_0^2}{4\pi nr}$ rad / s²

Ans. (3)

Sol. $\theta = (2\pi n)$, $\omega_0 = 0$, $\omega = V_0/r$

$$\alpha = \frac{\omega^2 - \omega_0^2}{2\theta} = \frac{(V_0/r)^2 - 0}{2(2\pi n)} = \frac{V_0^2}{4\pi nr^2}$$

144. A person standing on the floor of an elevator drops a coin. The coin reaches the floor in time t_1 if the elevator is at rest and in time t_2 if the elevator is moving uniformly. Then :-

- (1) $t_1 < t_2$ or $t_1 > t_2$ depending upon whether the lift is going up or down
 (2) $t_1 < t_2$
 (3) $t_1 > t_2$
 (4) $t_1 = t_2$

Ans. (4)

Sol. $t = \sqrt{\frac{2h}{a_{\text{rel}}}}$

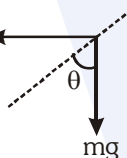
In both cases $a_{\text{rel}} = g - 0 = g$. Hence $t_1 = t_2$

145. A truck is stationary and has a bob suspended by a light string, in a frame attached to the truck. The truck, suddenly moves to the right with an acceleration of a . The pendulum will tilt :-

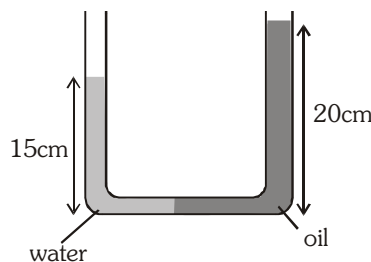
- (1) to the left and angle of inclination of the pendulum with the vertical is $\sin^{-1}\left(\frac{g}{a}\right)$
 (2) to the left and angle of inclination of the pendulum with the vertical is $\tan^{-1}\left(\frac{a}{g}\right)$
 (3) to the left and angle of inclination of the pendulum with the vertical is $\sin^{-1}\left(\frac{a}{g}\right)$
 (4) to the left and angle of inclination of the pendulum with the vertical is $\tan^{-1}\left(\frac{g}{a}\right)$

Ans. (2)

Sol. $F_{\text{pseudo}} = ma$ $\tan \theta = \frac{F_{\text{pseudo}}}{mg} = \frac{a}{g}$ towards left



146. In a U-tube as shown in figure, water and oil are in the left side and right side of the tube respectively. The heights from the bottom for water and oil columns are 15 cm and 20 cm respectively. The density of the oil is :- [take $\rho_{\text{water}} = 1000 \text{ kg/m}^3$]



- (1) 1200 kg/m^3 (2) 750 kg/m^3 (3) 1000 kg/m^3 (4) 1333 kg/m^3

Ans. (2)

Sol. $\rho_{\text{oil}} h_{\text{oil}} = \rho_{\text{water}} h_{\text{water}} \Rightarrow \rho_{\text{oil}} = \frac{1000(15)}{20} = 750 \text{ kg m}^{-3}$

147. A deep rectangular pond of surface area A , containing water (density = ρ , specific heat capacity = s), is located in a region where the outside air temperature is at a steady value of -26°C . The thickness of the frozen ice layer in this pond, at a certain instant is x .

Taking the thermal conductivity of ice as K , and its specific latent heat of fusion as L , the rate of increase of the thickness of ice layer, at this instant would be given by :-

- (1) $26K/\rho r(L-4s)$ (2) $26K/(\rho x^2-L)$ (3) $26K/(\rho xL)$ (4) $26K/\rho r(L+4s)$

Ans. (3)

Sol. $KA \frac{[0 - (-26)]}{x} dt = A(dx) \rho L \Rightarrow \frac{dx}{dt} = \frac{26K}{\rho L x}$

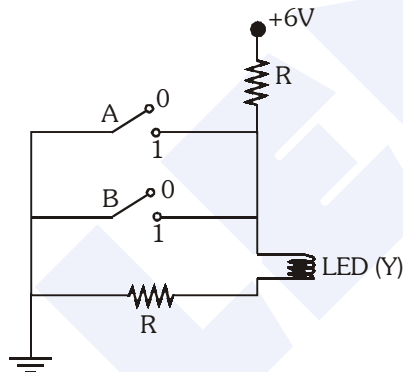
148. An LED is constructed from a p-n junction diode using GaAsP. The energy gap is 1.9 eV . The wavelength of the light emitted will be equal to :-

- (1) $10.4 \times 10^{-26} \text{ m}$ (2) 654 nm (3) 654 \AA (4) $654 \times 10^{-11} \text{ m}$

Ans. (2)

Sol. $\lambda = \frac{1240 \text{ nm}}{1.9} = 652.6 \text{ nm} \approx 654 \text{ nm}$

149. The circuit diagram shown here corresponds to the logic gate,



- (1) NOR (2) AND (3) OR (4) NAND

Ans. (1)

Sol.

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

150. The value of $\gamma \left(= \frac{C_p}{C_v} \right)$, for hydrogen, helium and another ideal diatomic gas X (whose molecules are not rigid but have an additional vibrational mode), are respectively equal to :-

- (1) $\frac{7}{5}, \frac{5}{3}, \frac{9}{7}$ (2) $\frac{5}{3}, \frac{7}{5}, \frac{9}{7}$ (3) $\frac{5}{3}, \frac{7}{5}, \frac{7}{5}$ (4) $\frac{7}{5}, \frac{5}{3}, \frac{7}{5}$

Ans. (1)

Sol. Hydrogen $\rightarrow 7/5$ (diatomic), Helium $\rightarrow 5/3$ (monoatomic), X $\rightarrow 9/7$

151. An equiconvex lens has power P . It is cut into two symmetrical halves by a plane containing the principal axis. The power of one part will be :

- (1) 0 (2) $\frac{P}{2}$ (3) $\frac{P}{4}$ (4) P

Ans. (4)

Sol. Focal length do not change \rightarrow Power do not change

152. In a Young's double slit experiment if there is no initial phase difference between the light from the two slits, a point on the screen corresponding to the fifth minimum has path difference.

- (1) $5\frac{\lambda}{2}$ (2) $10\frac{\lambda}{2}$ (3) $9\frac{\lambda}{2}$ (4) $11\frac{\lambda}{2}$

Ans. (3)

Sol. Path difference for n^{th} minima = $(2n - 1)\frac{\lambda}{2}$

For fifth minima ($n=5$) = $\frac{9\lambda}{2}$

153. A double convex lens has focal length 25 cm. The radius of curvature of one of the surfaces is double of the other. Find the radii if the refractive index of the material of the lens is 1.5 :

- (1) 100 cm, 50 cm (2) 25 cm, 50 cm (3) 18.75 cm, 37.5 cm (4) 50 cm, 100 cm

Ans. (3)

Sol. $\frac{1}{f} = \left(\frac{\mu_2 - \mu_1}{\mu_1}\right) \left(\frac{1}{R_1} - \frac{1}{R_2}\right) \Rightarrow \frac{1}{25} = \left(\frac{1.5 - 1}{1}\right) \left(\frac{1}{R} - \frac{1}{-2R}\right) \Rightarrow \frac{2}{25} = \frac{3}{2R} \Rightarrow R = \frac{75}{4} = 18.75$

154. Two bullets are fired horizontally and simultaneously towards each other from roof tops of two buildings 100 m apart and of same height of 200m with the same velocity of 25 m/s. When and where will the two bullets collide. ($g = 10 \text{ m/s}^2$)

- (1) after 2s at a height 180 m (2) after 2s at a height of 20 m
(3) after 4s at a height of 120 m (4) they will not collide

Ans. (1)

Sol. $t = \frac{d}{v_{\text{rel}}} = \frac{100}{50} = 2$

$s_y = -\frac{1}{2}gt^2 = -\frac{1}{2} \times 10 \times 4 = -20$

\therefore Height = 180 m

155. The stress-strain curves are drawn for two different materials X and Y. It is observed that the ultimate strength point and the fracture point are close to each other for material X but are far apart for material Y. We can say that materials X and Y are likely to be (respectively)

- (1) ductile and brittle (2) brittle and ductile (3) brittle and plastic (4) plastic and ductile

Ans. (2)

156. A body of mass m is kept on a rough horizontal surface (coefficient of friction = μ) A horizontal force is applied on the body, but it does not move. The resultant of normal reaction and the frictional force acting on the object is given by F , where F is :

- (1) $|\vec{F}| = mg + \mu mg$ (2) $|\vec{F}| = \mu mg$ (3) $|\vec{F}| \leq mg\sqrt{1 + \mu^2}$ (4) $|\vec{F}| = mg$

Ans. (3)

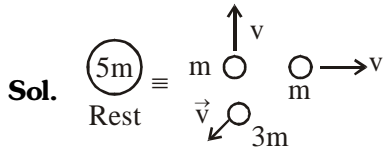
Sol. $N = mg, F = f$

Resultant = $\sqrt{N^2 + f^2} = \sqrt{(mg)^2 + f^2} \leq mg\sqrt{1 + \mu^2}$

157. A particle of mass $5m$ at rest suddenly breaks on its own into three fragments. Two fragments of mass m each move along mutually perpendicular direction with speed v each. The energy released during the process is :

- (1) $\frac{3}{5}mv^2$ (2) $\frac{5}{3}mv^2$ (3) $\frac{3}{2}mv^2$ (4) $\frac{4}{3}mv^2$

Ans. (4)

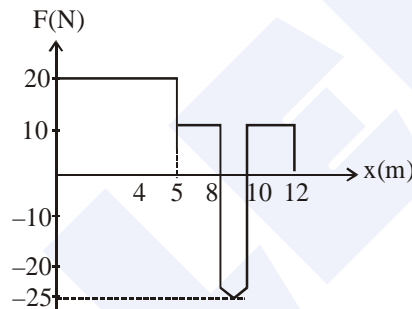


$$3m\vec{v} + m\vec{v}_1 + m\vec{v}_2 = 0$$

$$\Rightarrow \vec{v} = -\frac{v}{3}\hat{i} - \frac{v}{3}\hat{j} \quad |\vec{v}| = \sqrt{2}\frac{v}{3}$$

$$\text{Energy released} = \frac{1}{2}mv^2 + \frac{1}{2}mv^2 + \frac{1}{2}(3m)\left(\frac{2v^2}{9}\right) = \frac{4}{3}mv^2$$

158. An object of mass 500g , initially at rest acted upon by a variable force where X component varies with X in the manner shown. The velocities of the object at point $X = 8\text{ m}$ and $X = 12\text{ m}$, would be the respective values of (nearly)



- (1) 18 m/s and 24.4 m/s (2) 23 m/s and 24.4 m/s
 (3) 23 m/s and 20.6 m/s (4) 18 m/s and 20.6 m/s

Ans. (3)

Sol. $W = \Delta KE$

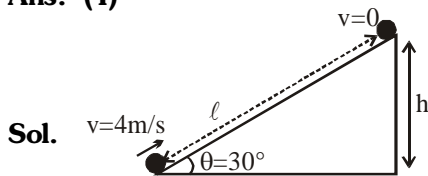
$$\text{At } x=8 : 130 = \frac{1}{2}\left(\frac{1}{2}\right)v^2 \Rightarrow v = 2\sqrt{130} = 22.8\text{ ms}^{-1}$$

$$\text{For } x=12 : v = 20.6\text{ ms}^{-1}$$

159. A solid cylinder of mass 2 kg and radius 50 cm rolls up an inclined plane of angle inclination 30° . The centre of mass of cylinder has speed of 4 m/s . The distance travelled by the cylinder on the incline surface will be : (Take $g = 10\text{ m/s}^2$)

- (1) 2.2 m (2) 1.6 m (3) 1.2 m (4) 2.4 m

Ans. (4)



$$\frac{1}{2}mv^2 \left(1 + \frac{K^2}{R^2}\right) = mgh \Rightarrow 8 \left(1 + \frac{1}{2}\right) = 10h \Rightarrow h = 1.2\text{ m}$$

$$\frac{h}{l} = \sin 30^\circ \Rightarrow l = 2.4\text{ m}$$

- 163.** The radius of the first permitted Bohr orbit for the electron, in a hydrogen atom equals 0.51 \AA and its ground state energy equals -13.6 eV . if the electron in the hydrogen atom is replaced by muon (μ^-) [charge same as electron and mass $207 m_e$], the first Bohr radius and ground state energy will be :
- (1) $0.53 \times 10^{-13} \text{ m}$, -3.6 eV (2) $25.6 \times 10^{-13} \text{ m}$, -2.8 eV
 (3) $2.56 \times 10^{-13} \text{ m}$, -2.8 eV (4) $2.56 \times 10^{-13} \text{ m}$, -13.6 eV

Ans. (3)

Sol. $m_\mu = 207m_e$, $q_\mu = q_{e^-}$, $M_{\text{nucleus}} = 1836 m_e$
 Reduced mass

$$\mu = \frac{mM}{M+m} = \frac{207m_e \times 1836m_e}{207m_e + 1836m_e} = 186m_e$$

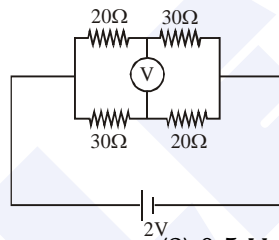
$$\therefore r_1 = \frac{n^2 t_0}{\pi m_e e^2} = 0.51 \text{ \AA} \text{ (Given in Question)}$$

Radius of first orbit of new atom

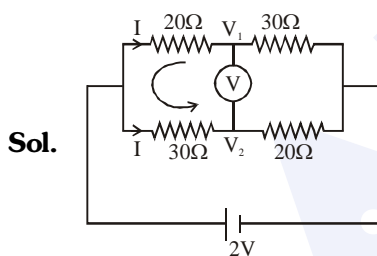
$$r_1' = \frac{m_e r_1}{\mu} = \frac{m_e}{186m_e} \times 0.51 \text{ \AA} = 2.56 \times 10^{-13} \text{ m}$$

$$E_1' = \frac{\mu}{m} E_1 = \frac{186 m_e}{m_e} (-13.6 \text{ eV}) = -2.8 \text{ keV}$$

- 164.** The reading of an ideal voltmeter in the circuit shown is :

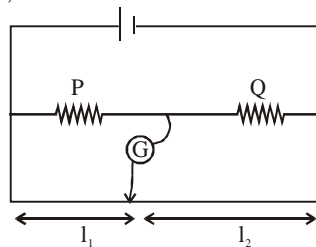


- (1) 0.6 V (2) 0 V (3) 0.5 V (4) 0.4 V
- Ans. (4)**



$$(V_1 - V_2) = \frac{30}{25} - \frac{20}{25} = \frac{10}{25} = \frac{2}{5} = 0.4 \text{ V}$$

- 165.** The metre bridge shown is in balanced position with $\frac{P}{Q} = \frac{l_1}{l_2}$. If we now interchange the positions of galvanometer and cell, will the bridge work ? If yes, what will be balance condition ?



- (1) yes, $\frac{P}{Q} = \frac{l_2 - l_1}{l_2 + l_1}$ (2) no, no null point (3) yes, $\frac{P}{Q} = \frac{l_2}{l_1}$ (4) yes, $\frac{P}{Q} = \frac{l_1}{l_2}$

Ans. (4)

Sol. Interchanging cell and galvanometer do not effect balance condition.

171. For a transparent medium relative permeability and permittivity, μ_r and ϵ_r are 1.0 and 1.44 respectively. The velocity of light in this medium would be,
 (1) 2.5×10^8 m/s (2) 3×10^8 m/s (3) 2.08×10^8 m/s (4) 4.32×10^8 m/s

Ans. (1)

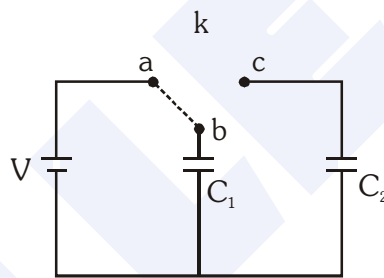
Sol. $v = \frac{1}{\sqrt{\mu \epsilon}} = \frac{1}{\sqrt{\mu_r \epsilon_r \mu_0 \epsilon_0}} = \frac{3 \times 10^8}{\sqrt{1.44}} = \frac{30}{12} \times 10^8 = 2.5 \times 10^8 \text{ ms}^{-1}$

172. A sphere encloses an electric dipole with charge $\pm 3 \times 10^{-6}$ C. What is the total electric flux across the sphere ?
 (1) $-3 \times 10^{-6} \text{ Nm}^2/\text{C}$ (2) zero (3) $3 \times 10^{-6} \text{ Nm}^2/\text{C}$ (4) $6 \times 10^{-6} \text{ Nm}^2/\text{C}$

Ans. (2)

Sol. $\phi = \frac{q_{\text{in}}}{\epsilon_0} = 0$

173. Two identical capacitors C_1 and C_2 of equal capacitance are connected as shown in the circuit. Terminals a and b of the key k are connected to charge capacitor C_1 using battery of emf V volt. Now disconnecting a and b the terminals b and c are connected. Due to this, what will be the percentage loss of energy ?



- (1) 75% (2) 0% (3) 50% (4) 25%

Ans. (3)

Sol. $U_{\text{initial}} = \frac{1}{2} CV^2$, $\text{Loss} = \frac{C \cdot C}{2(C + C)} (V - 0)^2 = \frac{1}{4} CV^2$

$\% \text{ Loss} = \frac{\frac{1}{4} CV^2}{\frac{1}{2} CV^2} \times 100 = 50\%$

174. The main scale of a vernier calliper has n divisions/cm. n divisions of the vernier scale coincide with (n - 1) divisions of main scale. The least count of the vernier calliper is,

- (1) $\frac{1}{(n+1)(n-1)}$ cm (2) $\frac{1}{n}$ cm (3) $\frac{1}{n^2}$ cm (4) $\frac{1}{n(n+1)}$ cm

Ans. (3)

Sol. $n(\text{VSD}) = (n - 1)\text{MSD} \Rightarrow 1 \text{ VSD} = \frac{(n - 1)}{n} \text{MSD}$

$\text{Least count} = 1 \text{ MSD} - 1 \text{ VSD} = \left[1 - \frac{(n - 1)}{n} \right] \text{MSD} = \frac{1}{n} \text{MSD} = \frac{1}{n} \left(\frac{1}{n} \right) \text{cm} = \frac{1}{n^2} \text{cm}$

175. A person travelling in a straight line moves with a constant velocity v_1 for certain distance 'x' and with a constant velocity v_2 for next equal distance. The average velocity v is given by the relation

(1) $\frac{1}{v} = \frac{1}{v_1} + \frac{1}{v_2}$ (2) $\frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$ (3) $\frac{v}{2} = \frac{v_1 + v_2}{2}$ (4) $v = \sqrt{v_1 v_2}$

Ans. (2)

Sol. Average velocity = $\frac{\text{Total distance}}{\text{Total time}} = \frac{x+x}{\frac{x}{v_1} + \frac{x}{v_2}} \Rightarrow v = \frac{2}{\frac{1}{v_1} + \frac{1}{v_2}} \Rightarrow \frac{2}{v} = \frac{1}{v_1} + \frac{1}{v_2}$

176. Assuming that the gravitational potential energy of an object at infinity is zero, the change in potential energy (final – initial) of an object of mass m , when taken to a height h from the surface of earth (of radius R), is given by,

(1) $-\frac{GMm}{R+h}$ (2) $\frac{GMmh}{R(R+h)}$ (3) mgh (4) $\frac{GMm}{R+h}$

Ans. (2)

Sol. $\Delta U = -GMm \left[\frac{1}{r_f} - \frac{1}{r_i} \right] = -GMm \left[\frac{1}{R+h} - \frac{1}{R} \right] = \frac{GMmh}{R(R+h)}$

177. 1g of water, of volume 1 cm^3 at 100°C , is converted into steam at same temperature under normal atmospheric pressure ($\approx 1 \times 10^5 \text{ Pa}$). The volume of steam formed equals 1671 cm^3 . If the specific latent heat of vaporisation of water is 2256 J/g , the change in internal energy is,

(1) 2423 J (2) 2089 J (3) 167 J (4) 2256 J

Ans. (2)

Sol. $Q = \Delta U + W \Rightarrow mL = \Delta U + P(V_2 - V_1)$
 $\Rightarrow 1(2256) = \Delta U + 1 \times 10^5 (1670 \times 10^{-6}) \Rightarrow \Delta U = 2089 \text{ J}$

178. Angular width of the central maxima in the Fraunhofer diffraction for $\lambda = 6000 \text{ \AA}$ is θ_0 . When the same slit is illuminated by another monochromatic light, the angular width decreases by 30%. The wavelength of this light is,

(1) 1800 Å (2) 4200 Å (3) 6000 Å (4) 420 Å

Ans. (2)

Sol. Angular width $\propto \frac{\lambda}{d} \Rightarrow \frac{\lambda}{0.7\theta_0} = \frac{6000 \text{ \AA}}{\frac{\lambda}{d}} \Rightarrow \lambda = 4200 \text{ \AA}$

179. The work function of a photosensitive material is 4.0 eV. This longest wavelength of light that can cause photon emission from the substance is (approximately)

(1) 3100 nm (2) 966 nm (3) 31 nm (4) 310 nm

Ans. (4)

Sol. $\phi = \frac{hc}{\lambda} \Rightarrow 4 \text{ eV} = \frac{1240}{\lambda} \Rightarrow \lambda = \frac{1240}{4} = 310 \text{ nm}$

180. A proton and an α -particle are accelerated from rest to the same energy. The de Broglie wavelengths λ_p and λ_α are in the ratio,

(1) 2 : 1 (2) 1 : 1 (3) $\sqrt{2} : 1$ (4) 4 : 1

Ans. (1)

Sol. $\lambda = \frac{h}{\sqrt{2mE_k}}$ ($\because E_k$ is same for both)

$\Rightarrow \frac{\lambda_p}{\lambda_\alpha} = \sqrt{\frac{4m}{m}} = 2 : 1$