NEET-UG – 2013 TEST PAPER WITH SOLUTIONS
(HELD ON SUNDAY 05th MAY, 2013)

91. In Young's double slit experiment, the slits are 2mm apart and are illuminated by photons of two wavelengths $\lambda_1 = 12000Å$ and $\lambda_2 = 10000Å$. At what minimum distance from the common central bright fringe on the screen 2m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other ?

(1) 3 mm (2) 8 mm (3) 6 mm (4) 4 mm

Ans. (3)

Sol. According to question $n_1\lambda_1 = n_2\lambda_2$

$$\text{So } \frac{n_1}{n_2} = \frac{\lambda_2}{\lambda_1} = \frac{10000}{12000} = \frac{5}{6}$$

so minimum n_1 and n_2 are 5 and 6 respectively.

$$X_{min} = \frac{n_1\lambda_1 D}{d} = \frac{5(12000\times10^{-10})(2)}{2\times10^{-3}}$$

$$= 6 \times 10^{-3}\text{ m} = 6\text{ mm}$$

92. In a common emitter (CE) amplifier having a voltage gain G, the transistor used has transconductance 0.03 mho and current gain 25. If the above transistor is replaced with another one with transconductance 0.02 mho and current gain 20, the voltage gain will be :

(1) $\frac{5}{4}G$ (2) $\frac{2}{3}G$ (3) 1.5 G (4) $\frac{1}{3}G$

Ans. (2)

Sol. Voltage gain $A_V = \frac{\Delta V_C}{\Delta V_B} = \frac{R_L \Delta I_C}{\Delta V_B} = g_m R_L$

$$\frac{A_{V_1}}{A_{V_2}} = \frac{g_{m_1}}{g_{m_2}} \Rightarrow \frac{G}{A_{V_2}} = \frac{0.03}{0.02} \Rightarrow A_{V_2} = \frac{2}{3}G$$

93. A certain mass of Hydrogen is changed to Helium by the process of fusion. The mass defect in fusion reaction is 0.02866 u. The energy liberated per u is : (given 1u = 931 MeV)

(1) 13.35 MeV (2) 2.67 MeV

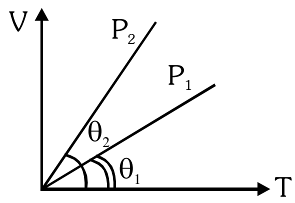
(3) 26.7 MeV (4) 6.675 MeV

Ans. (4)

Sol. Energy released per u

$$= \left(\frac{0.02866}{4}\right)(931\text{MeV}) = 6.675\text{ MeV}$$

94. In the given (V – T) diagram, what is the relation between pressure P_1 and P_2 ?



(1) Cannot be predicted

(2) $P_2 = P_1$

(3) $P_2 > P_1$

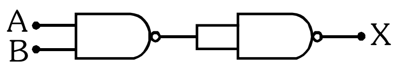
(4) $P_2 < P_1$

Ans. (4)

Sol. $PV = nRT \Rightarrow V = \left(\frac{nR}{P}\right)T \Rightarrow \text{slope} = \frac{nR}{P}$

As $\theta_2 > \theta_1$ so $\frac{1}{P_2} > \frac{1}{P_1} \Rightarrow P_1 > P_2$

95. The output (X) of the logic circuit shown in figure will be :



(1) $X = \overline{A+B}$ (2) $X = \overline{\overline{A}}.\overline{\overline{B}}$

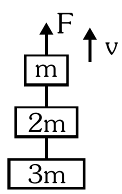
(3) $X = \overline{A.B}$ (4) X = A.B

Ans. (2) or (4)

Sol. $X = \overline{\overline{A.B}} = A.B$

96. Three blocks with masses m, 2m and 3m are connected by strings, as shown in the figure. After an upward force F is applied on block m, the masses move upward at constant speed v. What is the net force on the block of mass 2m?

(g is the acceleration due to gravity)



(1) 6 mg (2) zero (3) 2 mg (4) 3 mg

Ans. (2)

Sol. As block of mass 2m moves with constant velocity so net force on it is zero.

97. In a n-type semiconductor, which of the following statement is true:

(1) Holes are majority carriers and trivalent atoms are dopants.

(2) Electrons are majority carriers and trivalent atoms are dopants.

(3) Electron are minority carriers and pantavalent atoms are dopants

(4) Holes are minority carriers and pentavalent atoms are dopants.

Ans. (4)

98. The half life of a radioactive isotope 'X' is 20 years. It decays to another element 'Y' which is stable. The two elements 'X' and 'Y' were found to be in the ratio 1 : 7 in a sample of a given rock. The age of the rock is estimated to be:

(1) 100 years (2) 40 years

(3) 60 years (4) 80 years

Ans. (3)

Sol. X ⟶ Y (stable)

N_x N_y

$$\frac{N_x}{N_y} = \frac{1}{7} \Rightarrow \frac{N_x}{N_x + N_y} = \frac{N}{N_0} = \frac{1}{8}$$

By using $N = N_0 e^{-\lambda t}$ we have

$$\frac{N_0}{8} = N_0 e^{-\lambda t} \Rightarrow t = 3 \times 20 \text{ years} = 60 \text{ years}$$

99. The molar specific heats of an ideal gas at constant pressure and volume are denoted by C_P and C_V, respectively. If $\gamma = \frac{C_P}{C_V}$ and R is the universal gas constant, then C_V is equal to :

(1) γR (2) $\frac{1+\gamma}{1-\gamma}$

(3) $\frac{R}{(\gamma - 1)}$ (4) $\frac{(\gamma - 1)}{R}$

Ans. (3)

Sol. $C_P - C_V = R$ and $\gamma = \frac{C_P}{C_V} \Rightarrow C_V = \frac{R}{\gamma - 1}$

100. The wavelength λ_e of an electron and λ_P of a photon of same energy E are related by:

(1) $\lambda_P \propto \frac{1}{\sqrt{\lambda_e}}$ (2) $\lambda_P \propto \lambda_e^2$

(3) $\lambda_P \propto \lambda_e$ (4) $\lambda_P \propto \sqrt{\lambda_e}$

Ans. (2)

Sol. $\lambda_P = \frac{h}{p} = \frac{hc}{E}$ and $\lambda_e = \frac{h}{p} = \frac{h}{\sqrt{2mE}}$

$$\Rightarrow \lambda_p \propto \lambda_e^2$$

101. Ratio of longest wavelengths corresponding to Lyman and Balmer series in hydrogen spectrum is:-

(1) $\frac{9}{31}$ (2) $\frac{5}{27}$ (3) $\frac{3}{23}$ (4) $\frac{7}{29}$

Ans. (2)

Sol. $$\left(\frac{\lambda_{Lyman}}{\lambda_{Balmer}}\right)_{max} = \frac{\left(\frac{1}{2^2} - \frac{1}{3^2}\right)}{\left(\frac{1}{1^2} - \frac{1}{2^2}\right)} = \frac{5/36}{3/4} = \frac{5}{27}$$

102. A current loop in a magnetic field :-

(1) Can be in equilibrium in two orientations, one stable while the other is unstable.

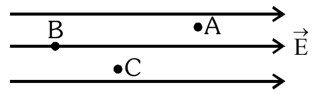
(2) Experiences a torque whether the field is uniform or non uniform in all orientations

(3) Can be in equilibrium in one orientation

(4) Can be in equilibrium in two orientations, both the euilibrium states are unstable

Ans. (1)

103. A, B and C are three points in a uniform electric field. The electric potential is :-



(1) Same at all the three points A,B and C

(2) Maximum at A

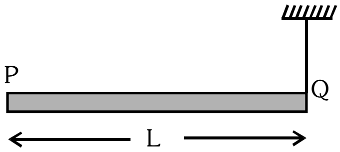
(3) Maximum at B

(4) Maximum at C

Ans. (3)

Sol. Electric potential decreases in the direction of electric field.

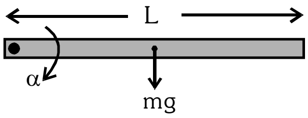
104. A rod PQ of mass M and length L is hinged at end P. The rod is kept horizontal by a massless string tied to point Q as shown in figure. When string is cut, the initial angular acceleration of the rod is :-



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

Ans. (2)

Sol.



$$\tau = I\alpha \Rightarrow mg\left(\frac{L}{2}\right) = \left(\frac{m\ell^2}{3}\right)\alpha \Rightarrow \alpha = \frac{3g}{2L}$$

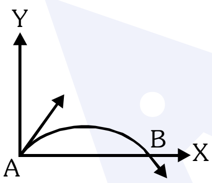
105. A wire of resistance 4Ω is stretched to twice its original length. The resistance of stretched wire would be :-

(1) 16 Ω (2) 2Ω (3) 4Ω (4) 8Ω

Ans. (1)

Sol. $R = \frac{\rho\ell}{A} = \frac{\rho\ell^2}{A\ell} \Rightarrow R \propto \ell^2$

106. The velocity of a projectile at the initial point A is $(2\hat{i} + 3\hat{j})$ m/s. It's velocity (in m/s) at point B is :-



(1) $2\hat{i} + 3\hat{j}$ (2) $-2\hat{i} - 3\hat{j}$

(3) $-2\hat{i} + 3\hat{j}$ (4) $2\hat{i} - 3\hat{j}$

Ans. (4)

107. A body of mass 'm' is taken from the earth's surface to the height equal to twice the radius (R) of the earth. The change in potential energy of body will be :-

(1) $\frac{1}{3}$ mgR (2) mg2R

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

Ans. (3)

Sol. Change in PE = $-\frac{GMm}{3R} - \left(-\frac{GMm}{R}\right)$

$$= \frac{2}{3}\frac{GMm}{R} = \frac{2}{3}mgR$$

108. A stone falls freely under gravity. It covers distances h_1, h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is :-

(1) $h_1 = h_2 = h_3$

(2) $h_1 = 2h_2 = 3h_3$

(3) $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$

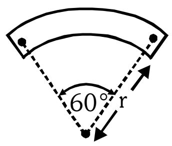
(4) $h_2 = 3h_1$ and $h_3 = 3h_2$

Ans. (3)

Sol. $h_1 = \frac{1}{2}g(5)^2, h_2 = \frac{1}{2}g(10)^2$ and $h_3 = \frac{1}{2}g(15)^2$

$$\Rightarrow h_1 = \frac{h_2}{3} = \frac{h_3}{5}$$

109. A bar magnet of length 'ℓ' and magnetic dipole moment 'M' is bent in the form of an arc as shown in figure. The new magnetic dipole moment will be



(1) $\frac{M}{2}$ (2) M

(3) $\frac{3}{\pi}M$ (4) $\frac{2}{\pi}M$

Ans. (3)

Sol. Let magnetic pole strength be m then

$M = m\ell$

In new situation

$$M' = (m)\left(2r\sin\frac{60^\circ}{2}\right) \text{ where } r\left(\frac{\pi}{3}\right) = \ell$$

$$M' = 2m\left(\frac{2\ell}{\pi}\right)\left(\frac{1}{2}\right) = \frac{3m\ell}{\pi} = \frac{3M}{\pi}$$

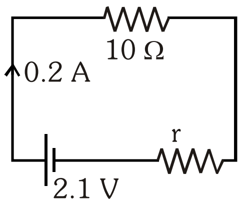
110. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is

(1) 1.0 Ω (2) 0.2 Ω

(3) 0.5 Ω (4) 0.8 Ω

Ans. (3)

Sol.



$$I = \frac{E}{r+R} \Rightarrow 0.2 = \frac{2.1}{r+10} \Rightarrow r = 0.5\Omega$$

111. For photoelectric emission from certain metal the cutoff frequency is ν. If radiation of frequency 2ν impinges on the metal plate, the maximum possible velocity of the emitted electron will be (m is the electron mass) :-

(1) $2\sqrt{h\nu/m}$ (2) $\sqrt{h\nu/(2m)}$

(3) $\sqrt{h\nu/m}$ (4) $\sqrt{2h\nu/m}$

Ans. (4)

Sol. $h(2\nu) = h\nu + \frac{1}{2}mv_{max}^2 \Rightarrow v_{max} = \sqrt{\frac{2h\nu}{m}}$

112. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its temperature. The ratio of $\frac{C_p}{C_v}$ for the gas is :-

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

Ans. (1)

Sol. $P \propto T^3$ and $PV = nRT$ gives $PV^{3/2}$ = constant

$$\Rightarrow \gamma = \frac{C_p}{C_v} = \frac{3}{2}$$

113. The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied ?

(1) length = 300cm, diameter = 3mm

(2) length = 50 cm, diameter = 0.5 mm

(3) length = 100 cm, diameter = 1mm

(4) length = 200 cm, diameter = 2mm

Ans. (2)

Sol. $Y = \frac{F/A}{\Delta\ell/\ell} \Rightarrow \Delta\ell = \frac{F\ell}{YA} = \frac{F\ell}{Y\pi r^2} \Rightarrow \Delta\ell \propto \frac{\ell}{r^2}$

Which is maximum

for ℓ = 50 cm & diameter = 0.5 mm

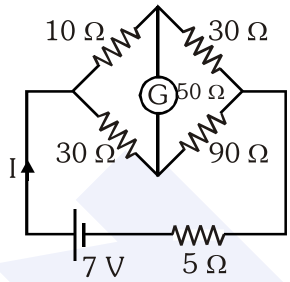
114. The resistances of the four arms P,Q, R and S in a Wheatstone's bridge are 10 ohm, 30 ohm, 30 ohm and 90 ohm, respectively. The e.m.f. and internal resistance of the cell are 7 volt and 5 ohm respectively. If the galvanometer resistance is 50 ohm, the current drawn from the cell will be :-

(1) 2.0 A (2) 1.0 A

(3) 0.2 A (4) 0.1 A

Ans. (3)

Sol.



Total resistance of Wheatstone bridge

$$= \frac{(40)(120)}{40+120} = 30\Omega$$

Current through cell = $\frac{7V}{(5+30)\Omega} = \frac{1}{5}A = 0.2$ A

115. The amount of heat energy required to raise the temperature of 1 g of Helium at NTP, from T_1 K to T_2 K is :-

(1) $\frac{3}{4} N_a k_B \left(\frac{T_2}{T_1}\right)$ (2) $\frac{3}{8} N_a k_B (T_2 - T_1)$

(3) $\frac{3}{2} N_a k_B (T_2 - T_1)$ (4) $\frac{3}{4} N_a k_B (T_2 - T_1)$

Ans. (2)

Sol. Number of moles in 1g He = $\frac{1}{4}$

Amount of heat energy required to raise its temepratre from T_1K to T_2K

$$= nC_v \Delta T$$

$$= \left(\frac{1}{4}\right)\left(\frac{3}{2}R\right)(T_2 - T_1)$$

$$= \frac{3}{8}k_B N_A (T_2 - T_1)$$

116. A piece of iron is heated in a flame. It first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observation is possible by using :-

(1) Newton's Law of cooling

(2) Stefan's Law

(3) Wien's displacement Law

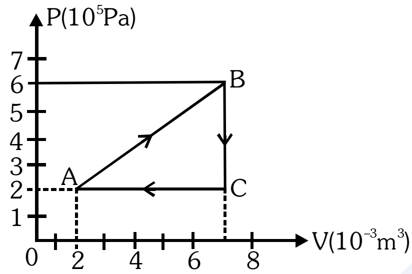
(4) Kirchoff's Law

Ans. (3)

Sol. We can explain this observation by using $\lambda_m T = b$

Which is Wien's displacement law.

117. A gas is taken through the cycle A→B→C→A, as shown, What is the net work done by the gas ?



(1) –2000 J (2) 2000 J

(3) 1000 J (4) Zero

Ans. (3)

Sol. Net work done = Area of triangle ABC

$$= \frac{1}{2} \times [(7-2) \times 10^{-3}][(6-2) \times 10^5]$$

$$= 1000 \text{ J}$$

118. The condition under which a microwave oven heats up a food item containing water molecules most efficiently is :-

(1) Infra-red waves produce heating in a microwave oven

(2) The frequency of the microwaves must match the resonant frequency of the water molecules

(3) The frequency of the microwaves has no relation with natural frequency of water molecules

(4) Microwaves are heat waves, so always produce heating

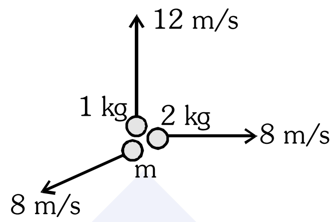
Ans. (2)

119. An explosion breaks a rock into three parts in a horizontal plane. Two of them go off at right angles to each other. The first part of mass 1 kg moves with a speed of 12 ms^{-1} and the second part of mass 2 kg moves with 8 ms^{-1} speed. If the third part files off with 4 ms^{-1} speed, then its mass is :-

(1) 17 kg (2) 3 kg
(3) 5 kg (4) 7 kg

Ans. (3)

Sol.



From conservation of momentum

$$m(4) = \sqrt{(1 \times 12)^2 + (2 \times 8)^2} \quad \Rightarrow \quad m = 5 \text{ kg}$$

120. In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows

$$P = \frac{a^3 b^2}{cd}$$

% error in P is :-

(1) 4% (2) 14%
(3) 10% (4) 7%

Ans. (2)

Sol. $P = \frac{a^3b^2}{cd} \Rightarrow \frac{\Delta P}{P} = \pm\left(3\frac{\Delta a}{a} + 2\frac{\Delta b}{b} + \frac{\Delta c}{c} + \frac{\Delta d}{d}\right)$

$= \pm (3 \times 1 + 2 \times 2 + 3 + 4)$

$= \pm 14\%$

121. A small object of uniform density rolls up a curved surface with an initial velocity 'v'. It reaches upto a maximum height of $\frac{3v^2}{4g}$ with respect to the initial position. The object is

(1) Disc (2) Ring
(3) Solid sphere (4) Hollow sphere

Ans. (1)

Sol. From conservation of mechanical energy

$$\frac{1}{2}mv^2\left(1 + \frac{K^2}{R^2}\right) = mgh$$

$$\Rightarrow \frac{1}{2}mv^2\left(1 + \frac{K^2}{R^2}\right) = mg\left(\frac{3v^2}{4g}\right)$$

$$\Rightarrow \frac{K^2}{R^2} = \frac{1}{2} \quad \Rightarrow \text{The object is disc}$$

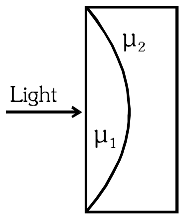
122. A plano convex lens fits exactly into a plano concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of refractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then the focal length of combination is

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

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

Ans. (4)

Sol.



Equivalent focal length is given by $\frac{1}{f_{eq}} = \frac{1}{f_1} + \frac{1}{f_2}$

$$\frac{1}{f_{eq}} = (\mu_1 - 1)\left(\frac{1}{\infty} - \frac{1}{-R}\right) + (\mu_2 - 1)\left(\frac{1}{-R} - \frac{1}{\infty}\right)$$

$$\Rightarrow f_{eq} = \frac{R}{\mu_1 - \mu_2}$$

123. A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statements is correct ?

(1) The angular width of central maximum will be unaffacted.

(2) Diffraction pattern is not observed on the screen in the case of electrons.

(3) The angular width of the central maximum of the diffraction pattern will increase.

(4) The angular width of the central maximum will decrease.

Ans. (4)

Sol. As speed of electrons is increased so wavelength of electrons will decreases. Therefore the angular width ($\propto \lambda$) of the central maximum of diffrection pattern will decrease.

124. For a normal eye, the cornea of eye provides a converging power of 40 D and the least converging power of the eye lens behind the cornea is 20 D. Using this information, the distance between the retina and the cornea -eye lens can be estimated to be -

(1) 1.5 cm (2) 5 cm

(3) 2.5 cm (4) 1.67 cm

Ans. (4)

Sol. For a normal eye, rays coming from infinity should go the retina without effort when we look at infinity, lens offers minimum power and hence combination gives 40D + 20D = 60D.

Distance between the retina and the cornea eye has must be equal to focal length.

$$f = \frac{1}{60} m = 1.67 \text{ cm}$$

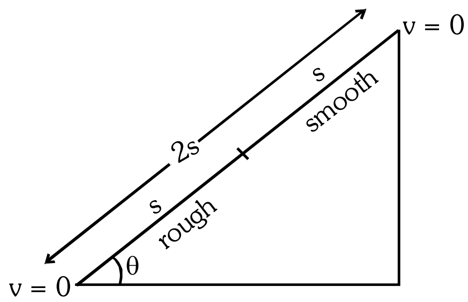
125. The upper half of an inclinded plane of inclination θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between the block and lower half of the plane is given by:-

(1) $\mu = \tan\theta$ (2) $\mu = \frac{1}{\tan\theta}$

(3) $\mu = \frac{2}{\tan\theta}$ (4) $\mu = 2\tan\theta$

Ans. (4)

Sol.



From work energy theorem (W = ΔKE)

$(mg \sin\theta)(2s) - (\mu mg \cos\theta)(s) = 0 - 0 \Rightarrow \mu = 2\tan\theta$

126. A wave travelling in the +ve x-direction having displacement along y-direction as 1m, wavelength 2π m and frequency of $\frac{1}{\pi}$ Hz is represented by :

(1) $y = \sin(2\pi x + 2\pi t)$

(2) $y = \sin(x - 2t)$

(3) $y = \sin(2\pi x - 2\pi t)$

(4) $y = \sin(10\pi x - 20\pi t)$

Ans. (2)

Sol. $k = \frac{2\pi}{\lambda} = \frac{2\pi}{2\pi} = 1$ and $\omega = 2\pi f = (2\pi)\left(\frac{1}{\pi}\right) = 2$

So equation of wave $y = \sin(kx - \omega t) = \sin(x - 2t)$

127. A source of unknown frequency gives 4 beats/s, when sounded with a source of known frequency 250 Hz, The second harmonic of the source of unknown frequency gives five beats per second, when sounded with a source of frequency 513 Hz, The unknown frequency is

(1) 260 Hz (2) 254 Hz

(3) 246 Hz (4) 240 Hz

Ans. (2)

Sol. Frequency of unknown source = 246 Hz or 254Hz

Second harmonic of this source = 492Hz or 508 Hz

Which gives 5 beats per second, when sounded with a source of frequency 513 Hz.

Therefore unknown frequency = 254 Hz

128. A coil is self-inductance L is connected in series with a bulb B and an AC source. Brightness of the bulb decreases when :

(1) an iron rod is inserted in the coil.

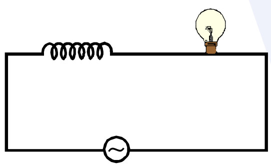
(2) frequency of the AC source is decreased.

(3) number of turns in the coil is reduced.

(4) A capacitance of reactance $X_C = X_L$ is included in the same circuit.

Ans. (1)

Sol.



Brightness of the bulb

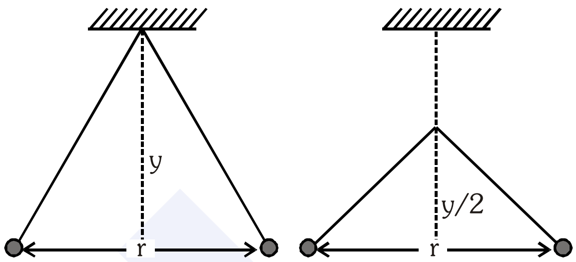
• decreases when an iron rod is inserted in the coil as impedance of circuit increases.

• increases when frequency of the AC source is decreased as impedance of circuit decreases.

• Increases when number of turns in the coil is reduced as impedance of circuit decreases.

• increases when a capacitance of reactance $X_C = X_L$ is included in the circuit as impedance of circuit decreases.

129. Two pith balls carrying equal charges are suspended from a common point by strings of equal length, the equilibrium separation between them is r. Now the strings are rigidly clamped at half the height. The equilibrium separation between the balls now become :

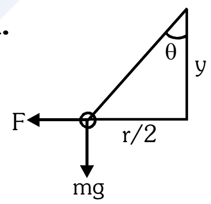


(1) $\left(\frac{2r}{3}\right)$ (2) $\left(\frac{1}{\sqrt{2}}\right)^2$

(3) $\left(\frac{r}{\sqrt[3]{2}}\right)$ (4) $\left(\frac{2r}{\sqrt{3}}\right)$

Ans. (3)

Sol.



$\tan\theta = \frac{F}{mg}$

$\Rightarrow \frac{r/2}{y} = \frac{kq^2}{r^2 mg} \Rightarrow y \propto r^3$

Therefore $\left(\frac{r'}{r}\right)^3 = \frac{y/2}{y} \Rightarrow r' = r\left(\frac{1}{2}\right)^{1/3}$

130. If we study the vibration of a pipe open at both ends, then the following statement is not true :

(1) Pressure change will be maximum at both ends

(2) Open end will be antinode

(3) Odd harmonics of the fundamental frequency will be generated

(4) All harmonics of the fundamental frequency will be generated

Ans. (1)

Sol. Pressure change will be minimum at both open ends.

131. When a proton is released from rest in a room, it starts with an initial acceleration a_0 towards west. When it is projected towards north with a speed v_0 it moves with an initial acceleration $3a_0$ towards west. The electric and magnetic fields in the room are:

(1) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ down

(2) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ up

(3) $\frac{ma_0}{e}$ west, $\frac{2ma_0}{ev_0}$ down

(4) $\frac{ma_0}{e}$ east, $\frac{3ma_0}{ev_0}$ up

Ans. (3)

Sol. Acceleration of charged particle $\vec{a} = \frac{q}{m}(\vec{E} + \vec{v} \times \vec{B})$

Released from rest $\Rightarrow \vec{a} = \frac{q}{m}\vec{E} = a_0$ (west)

$$\Rightarrow \vec{E} = \frac{ma_0}{e} \text{ (west)}$$

when it is projected towards north, acceleration due to magnetic force = $2a_0$

Therefore magnetic field = $\frac{2ma_0}{ev_0}$ (down)

132. A wire loop is rotated in magnetic field. The frequency of change of direction of the induced e.m.f. is :

(1) Six times per revolution

(2) Once per revolution

(3) twice per revolution

(4) four times per revolution

Ans. (3)

133. A uniform force of $(3\hat{i} + \hat{j})$ newton acts on a particle of mass 2kg. Hence the particle is displaced from position $(2\hat{i} + \hat{k})$ meter to position $(4\hat{i} + 3\hat{j} - \hat{k})$ meter. The work done by the force on the particle is :-

(1) 15 J (2) 9 J (3) 6 J (4) 13 J

Ans. (2)

Sol. W $= \vec{F}.\vec{S} = (3\hat{i} + \hat{j}).[(4-2)\hat{i} + (3-0)\hat{j} + (-1-1)\hat{k}]$

$= (3\hat{i} + \hat{j}).(2\hat{i} + 3\hat{j} - 2\hat{k})$

$= 3(2) + 1(3) + 0(-2) = 9$ J

134. The wettability of a surface by a liquid depends primarily on :-

(1) angle of contact between the surface and the liquid

(2) viscosity

(3) surface tension

(4) density

Ans. (1)

135. Infinite number of bodies, each of mass 2 kg are situated on x-axis at distance 1m, 2m, 4m, 8m, ..., respectively, from the origin. The resulting gravitational potential due to this system at the origin will be :

(1) –4G (2) –G

(3) $-\frac{8}{3}G$ (4) $-\frac{4}{3}G$

Ans. (1)

Sol. $V = -G\,(2)\left[\frac{1}{1} + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + ...\right]$

$$= -2G\left[\frac{1}{1-1/2}\right] = -4G$$