46. A Young's double slit experiment uses a monochromatic source. The shape of the interference fringes formed on a screen is

1) circle 2) hyperbola 3) parabola 4) straight line

Sol: 2)

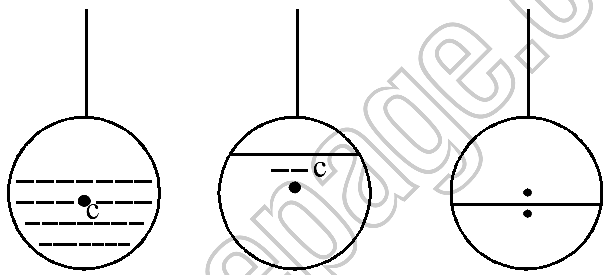
47. The bob of simple pendulum is a spherical hollow ball filled with water. A plugged hole near the bottom of the oscillating bob gets suddenly unplugged. During observation, till water is coming out, the time period of oscillation would

1) first decrease and then increase to the original value
2) first increase and then decrease to the original value
3) increase towards a saturation value
4) remain unchanged

Sol: 2)

Centre of mass of comformation of liquid and hollow portion, first increases and when total water is drained out, centre of mass regain its orginal position

$\therefore$ 'T' first increases and there decreases to orginal value



48. If I_0 is the intensity of the principal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled?

1) $4\,I_0$ 2) $4\,I_0$ 3) $\frac{I_0}{2}$ 4) I_0

Sol: 4)

$$I = I_0\left(\frac{\sin\phi}{\phi}\right)^2$$

and $\phi = \frac{\pi}{\lambda}\left(\frac{ay}{D}\right)$

For principal maxima y = 0

$\therefore \quad \phi = 0$

Hence intensity will remains same

$\therefore$ (4) is correct

49. When two tuning forms (fork 1 and fork 2) are sounded simultaneously, 4 beats per second are heard. Now, some tape is attached on the prong of the fork 2. When the tuning forks are sounded again, 6 beats per second are heard. If the frequency of fork 1 is 200 Hz, then what was the original frequency of fork 2?

1) 202 Hz 2) 200 Hz 3) 204 Hz 4) 196 Hz

Sol: 4)

When n_2 is taped,

$n_1 \sim n_2 = 6$ instead of 4 as previous

$\therefore n_1 - n_2 = 6 ; 200 - n_2 = 6$

$n_2 = 1944z.$

50. If a simple harmonic motion is represented by $\frac{d^2x}{dt^2} + \alpha x = 0$, its time period is

1) $\frac{2\pi}{\sqrt{\alpha}}$ 2) $\frac{2\pi}{\alpha}$ 3) $2\pi\sqrt{\alpha}$ 4) $2\pi\alpha$

Sol: 1)

$\frac{d^2x}{dt^2} = dx = -\omega^2 x \quad \Rightarrow \omega = \sqrt{\alpha}$

$= T = \frac{2\pi}{\omega} = \frac{2\pi}{\sqrt{\propto}}$

51. An observer moves towards a stationary source of sound, with a velocity one-fifth of the velocity of sound. What is the percentage increase in the apparent frequency?

1) 0.5% 2) zero 3) 20% 4) 5%

Sol: 3)

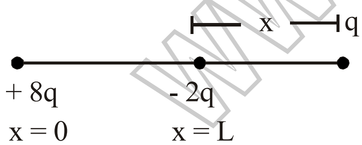
$n^2 = n\left[\frac{v + vo}{v}\right] = n\left[\frac{v + \frac{v}{5}}{v}\right] = n\left[\frac{6}{5}\right]$

$\frac{n^1}{n} = \frac{6}{5}; \quad \frac{n - n}{n} = \frac{6-5}{5} \times 100 = 20\%$

52. Two point charges +8q and -2q are located at x = 0 and x = L respectively. The location of a point on the x axis at which the net electric field due to these two point charges is zero is

1) $\frac{L}{4}$ 2) 2 L 3) 4 L 4) 8 L

Sol: 2)



$\frac{8q \times q}{(l + x)^2} = \frac{q \times 2q}{x^2}$

$\frac{2}{L + n} = \frac{1}{x} \qquad 2x = L + x \quad x = L$

from x = 0, total distance = L + L = 2L

53. When an unpolarized light of intensity I_0 is incident on a polarizing sheet, the intensity of the light which does not get transmitted is

1) $\frac{1}{4}I_0$ 2) $\frac{1}{2}I_0$ 3) I_0 4) zero

Sol: (2)

$I = I_o \cos^2 \theta$

Intensity of polarized light $= \frac{I_o}{2}$

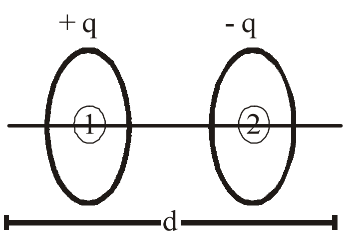
$\Rightarrow$ Intensity of untransmitted light $= I_o - \frac{I_o}{2} = \frac{I_o}{2}$

$\therefore$ (2) is correct

54. Two thin wire rings each having a radius R are placed in a distance d apart with their axes coinciding. The charges on the two rings are +q and -q. The potential difference between the centres of the two rings is

1) $\frac{Q}{2\pi \in_0}\left[\frac{1}{R} - \frac{1}{\sqrt{R^2+d^2}}\right]$ 2) $QR/4\pi \in_0 d^2$ 3) $\frac{Q}{4\pi \in_0}\left[\frac{1}{R} - \frac{1}{\sqrt{R^2+d^2}}\right]$ 4) zero

Sol: 1)



At (1) using, potential $(V_1) = V_{self} + V_{due\ to\ 2\ using}$

$= \frac{1}{4\pi\varepsilon_0}\frac{q}{R} - \frac{q}{\varepsilon_0\sqrt{R^2+d^2}}$

At (2) using potential $(V_2) = V_{self} + V_{due}$ to 1 using

$\frac{1}{4\pi\varepsilon_0}.\frac{-q}{R}\frac{q}{\varepsilon_0\sqrt{R^2+d^2}}$

$\Delta v = v_1 - v_2 = \frac{1}{4\pi\varepsilon_0}.\frac{q}{R} + \frac{1}{4\pi\varepsilon_0}\frac{q}{R} - \frac{q}{\varepsilon_o\sqrt{R^2+d^2}} - \frac{q}{\varepsilon_0\sqrt{R^2+d^2}}$

$= \frac{1}{2\pi\varepsilon_0}.\frac{q}{R} - \frac{2q}{\varepsilon_0\sqrt{r^2+d^2}}$

55. A parallel plate capacitor is made by stacking n equally spaced plates connected alternatively. If the capacitance between any two adjacent plates is 'C' then the resultant capacitance is

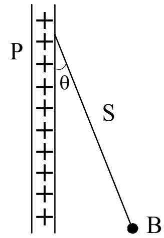
1) (n + 1)C 2) (n - 1)C 3) nC 4) C

Sol: 2)

(n-1) spacing between n capcities

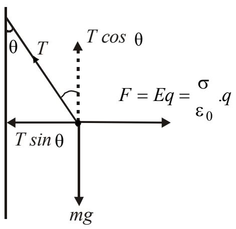
$\therefore$ resultant capacity (n-1) c

56. A charged ball B hangs from a silk thread S, which makes an angle θ with a large charged conducting sheet P, as shown in the figure. The surface charge density σ of the sheet is proportional to



1) $\cot\theta$ 2) $\cos\theta$ 3) $\tan\theta$ 4) $\sin\theta$

Sol: 3)

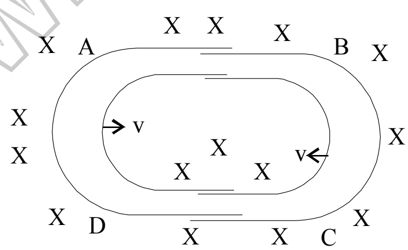


$$\frac{T\sin\theta = \dfrac{\sigma}{\varepsilon_0}.q}{T\cos\theta = mg}$$

$$\tan\theta = \frac{\sigma q}{\varepsilon_0 . mg}$$

$\therefore \sigma$ is $\propto$ $\tan\theta$

57. One conducting U tube can slide inside another as shown in figure, maintaining electrical contacts between the tubes. The magnetic field B is perpendicular to the plane of the figure. If each tube moves towards the other at a constant speed V, then the emf induced in the circuit in terms of B, l and V where l is the width of each tube, will be



1) -Blv 2) Blv 3) 2 Blv 4) zero

Sol: 3)

Relative velocity = V + V = 2V

$\therefore$ emf. = B.L (2V)

58. A fuly charged capacitor has a capacitance ‘C’. It is discharged through a small coil of resistance wire embedded in a thermally insulated block of specific heat capacity ‘s’ and mass ‘m’. If the temperature of the block is raised by ‘ΔT’, the potential difference ‘V’ across the capacitance is

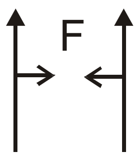
1) $\frac{mC\Delta T}{s}$ 2) $\sqrt{\frac{2mC\Delta T}{s}}$ 3) $\sqrt{\frac{2ms\Delta T}{C}}$ 4) $\frac{ms\Delta T}{C}$

Sol: 3) $\frac{1}{2}CV^2 = m.s\,\Delta t\,;\,V = \sqrt{\frac{2.m.s.\,\Delta t}{c}}$

59. Two thin, long, parallel wires, separated by a distance ‘d’ carry current of ‘i’ a in the same direction. They will

1) repel each other with a force of $\mu_0 i^2/(2\pi d)$
2) attract each other with a force of $\mu_0 i^2/(2\pi d)$
3) repel each other with a force of $\mu_0 i^2/(2\pi d^2)$
4) attract each other with a force of $\mu_0 i^2/(2\pi d^2)$

Sol: 2)



$$\frac{F}{light} = \frac{\mu_0 i, i_2}{2\,\pi d}(\text{attractive})$$

$$= \frac{\mu_0\, i^2}{2\,\pi d}(\text{attractive})$$

60. A heater coil is cut into two equal parts and only one part is now used in the heater. The heat generated will now be

1) four times 2) doubled 3) halved 4) one fourth

Sol: 2)

$H = \frac{V^2 t}{R\,J}$ (as the same heater is used this formula has to be adopted, because it works at same voltage)

Resestance of part $\rightarrow \frac{R}{2}$

$\therefore$ ‘H’ will be doubled.