IIT-JEE-2007

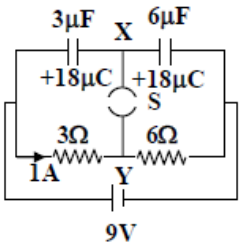
PAPER-I

PHYSICS

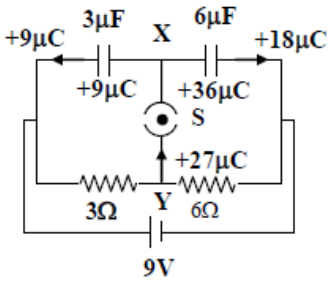
SECTION – I

1. Solution : (C)

$27\mu C$



Initial charge distribution (when switch S is open)



Final charge distribution (when switch S is closed)

2. Solution : (A)

$dV = -\vec{E} \cdot d\vec{r}$

$and\ E = \dfrac{\lambda}{2\pi\varepsilon_0 r}$

where r is distance from the axis of cylindrical charge distribution (r is equal to or greater than radius of cylindrical charge distribution).

3. Solution : (A)

Rest mass energy of U will be greater than the rest mass energy of the nucleus in which it breaks (as conservation of momentum is always followed)

4. Solution : (B)

Due to parallax

5. Solution : (B)

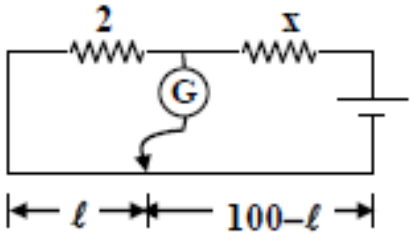
Transition from $\infty to n=3$ will produce smallest wavelength in infrared region.

6. Solution : (A)

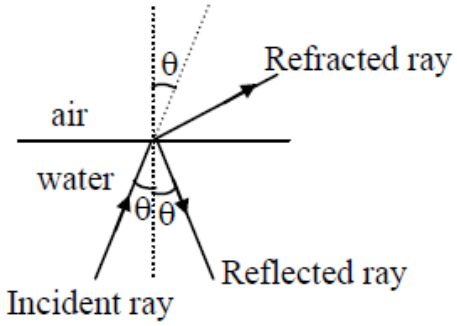
$$\frac{x}{2}=\frac{l}{100-l} \quad K(1)$$

$$\frac{x}{2}=\frac{l+20}{80-l} \quad K(2)$$

Solving (i) *and* (ii) $x=3\Omega$



7. Solution : (C)



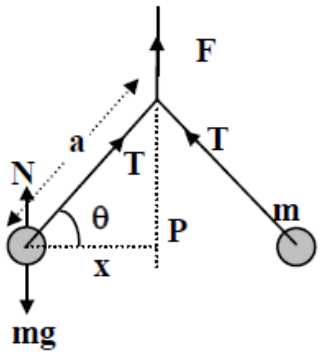
8. Solution : (B)

$$2T\sin\theta = F$$

$$T\cos\theta = mF$$

$$2\tan\theta = \frac{F}{mf}$$

$$A = \frac{F}{mf}\left(\frac{x}{\sqrt{a^2 - x^2}}\right)$$



9. Solution : (D)

SECTION – II

10. Solution : (C)

11. Solution : (B)

12. Solution : (C)

13. Solution : (B)

SECTION – III

14. Solution : (A)

15. Solution : (D)

$$Mg + P\left(\pi R^2\right) = P_0 \pi R^2$$

$$P_0\left(2L\pi R^2\right) = P\left(x\pi R^2\right) \quad \left(P_1, V_1 = P_2 V_2 \text{ for isothermal process}\right)$$

$$x = \left(\frac{P_0 \pi R^2}{\pi R^2 P_0 - Mg}\right)(2L)$$

16. Solution : (C)

$$\pi R^2 P_0 L_0 = P(L_0 - H)\pi R^2 \quad \text{K}\,(i)$$

$$P = P_0 + \rho g(L_0 - H) \quad \text{K}\,(ii)$$

Solving (i) & (ii), we get the answer.

17. Solution : (C)

$$\frac{1}{2}kx_1^2 = \frac{1}{2}I(2\omega)^2$$

$$\frac{1}{2}kx_2^2 = \frac{1}{2}(2I)(\omega)^2$$

$$\frac{x_1}{x_2} = \sqrt{2}$$

18. Solution : (A)

Applying conservation of angular momentum

$$\omega' = \frac{1(2\omega)2I(\omega)}{3I} = \frac{4\omega}{3} \quad \text{K}(1)$$

$$\omega' = \omega + \frac{\tau}{2I}t \quad \text{K}(2)$$

$$From\ (1)\&(2),\ \tau = \frac{2I\omega}{3t}$$

19. Solution : (B)

SECTION – IV

20. Solution : A → (p) & (r), B → (q) & (s), C → (p), D → (q)

22. Solution : A → (q), B → (r) & (s), C → (r) & (s), D → (p), (q) & (r)