JEE MAIN-2008

PHYSICS

23. **Sol. (B)**

$P_1 =$ pressure just inside the bubble at the end $2 = P_0 + \frac{4T}{R}$

$P_2 =$ pressure just inside the bubble at the end $1 = P_0 + \frac{4T}{r}$

$R > r \Rightarrow P_2 < P_1 \Rightarrow$ Air will flow from end 1 to end 2

24. **Sol. (C)**

$\frac{1}{2}kx^2 = \frac{1}{2}4ky^2 \Rightarrow y = x/2$

25. **Sol. (D)**

$\frac{1}{2}5mg\ell = \frac{1}{2}m\frac{5g\ell}{4} + mg\ell(1-\cos\theta)$

$\cos\theta = -\frac{7}{8}$

Hence, $3\pi/4 < \theta < \pi$

26. **Sol. (A)**

$$C_{\text{equivalent}} = \frac{\frac{2\varepsilon_0}{\frac{d}{3}-vt}\cdot\frac{\varepsilon_0}{\frac{2d}{3}+vt}}{\frac{2\varepsilon_0}{\frac{d}{3}-vt}+\frac{\varepsilon_0}{\frac{2d}{3}+vt}}$$

$$\therefore \tau = C_{\text{equivalent}} R$$

27. **Sol. (B)**

Total internal reflection occurs at the interface of region III and IV.

Because mediums are parallel

$$n_0 \sin\theta = \frac{n_0}{8}\sin\left(\frac{\pi}{2}\right)$$

$$\sin\theta = 1/8$$

28. **Sol. (A)**

$$n_s = \frac{3}{4}\left(\frac{340}{0.75}\right) = n-4$$

$$\therefore n = 344\,\text{Hz}$$

29. **Sol. (A)**

$$5\mu\text{Ci} = \frac{\ln 2}{T_1}(2N_0)$$

$$10\mu\text{Ci} = \frac{\ln 2}{T_2}(N_0)$$

Dividing we get $T_1 = 4T_2$

30. **Sol. (A)**

$y = 5\,\text{cm}\,\text{and}\,V = +ve$

$y = A\sin(\omega t \pm \phi) V = A\omega\cos(\omega t \pm \phi)$

We get $\omega t \pm \phi = 30°$

$$\omega = 2\pi\frac{v}{\lambda} = \frac{2\pi}{5}$$

$$v = A\omega\cos(\omega t + \phi) = \left(\frac{10}{100}\right)\times\left(\frac{2\pi}{5}\right)\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi\sqrt{3}}{50}\,\text{m/s}$$

31. **Sol. (C)**

$$F_{BC} = \frac{1}{4\pi\varepsilon_0}\frac{\left(\frac{q}{3}\right)\left(\frac{2q}{3}\right)}{\left(R\sqrt{3}\right)^2} = \frac{q^2}{54\pi\varepsilon_0 R^2}$$

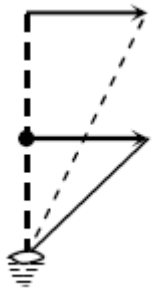
32 **Sol. (B)**

33 **Sol. (B)**

In pushing Normal contact force is greater than in pulling.

34 **Sol. (B)**

Distance appeared to move depends upon angle subtended on eye.



35 **Sol. (C)**

36. **Sol. (A)**

37. **Sol. (B)**

$$q = \int_0^R \frac{d}{R}(R-x)4\pi x^2 dx = Ze$$

$$d = \frac{3Ze}{\pi R^3}$$

38. **Sol. (C)**

If within a sphere ρ is constant $E \propto r$

39. **Sol. (D)**

$$2kx - f = ma$$

$$\Rightarrow \quad f.R = I\alpha$$

$$a = R\alpha$$

$$\Rightarrow \quad ma = \frac{4kx}{3}$$

40. **Sol. (D)**

$$-(2kx)R = I_P\alpha$$

$$\alpha = -\frac{4kR}{3mR^2}(R\theta) = -\frac{4k}{3m}\theta$$

41. **Sol. (C)**

$$2kx - f_{max} = ma$$

$$2kx.r = I_P\alpha$$

$$f_{max} = \mu mg$$

$$\Rightarrow \quad x = \frac{3}{2}\frac{\mu mg}{k}$$

$$\Rightarrow \quad \frac{1}{2}(2k)x^2 = \frac{1}{2}I_P\omega^2$$

$$\Rightarrow \quad \gamma = \mu g\sqrt{\frac{3m}{k}}$$