Sample Paper-05

Dropper NEET (2024)

PHYSICS

ANSWER KEY

1.	(3)	26.	(2)
2.	(4)	27.	(4)
3.	(4)	28.	(2)
4.	(2)	29.	(2)
5.	(4)	30.	(3)
6.	(1)	31.	(2)
7.	(2)	32.	(1)
8.	(2)	33.	(2)
9.	(2)	34.	(3)
10.	(2)	35.	(4)
11.	(3)	36.	(2)
12.	(3)	37.	(2)
13.	(4)	38.	(2)
14.	(1)	39.	(3)
15.	(2)	40.	(2)
16.	(1)	41.	(1)
17.	(2)	42.	(1)
18.	(1)	43.	(4)
19.	(2)	44.	(1)
20.	(2)	45.	(3)
21.	(2)	46.	(2)
22.	(4)	47.	(1)
23.	(3)	48.	(2)
24.	(2)	49.	(3)
25.	(4)	50.	(1)

HINTS AND SOLUTION

1. **(3)**
As per conservation of momentum

$\therefore \frac{h}{\lambda} = mv \quad \therefore \frac{h}{\lambda} = mv$

$\therefore v = \frac{h}{\lambda m} = \frac{h}{m} RZ^2 \left[\frac{1}{1^2} - \frac{1}{5^2}\right]$

$\therefore v = \frac{hR}{25} \frac{24}{m}$

2. **(4)**

$K.E.$ of electron $= \frac{13.6Z^2}{n^2}$ eV

1st excited state, $n = 2$, $Z = 1$

$\therefore \quad K.E = \frac{13.6}{2^2} = 3.4\,\text{eV}$

3. **(4)**
Pascal second (Ns/m^2) has dimension.
$= [ML^{-1}T^{-1}]$

4. **(2)**

$\frac{1}{\lambda} = R\left(\frac{1}{2^2} - \frac{1}{3^2}\right)$

$f = Rc\left(\frac{1}{4} - \frac{1}{9}\right)$

$f = \frac{Rc5}{36} = \frac{5Rc}{36}$

5. **(4)**

$L = \frac{nh}{2\pi}$

6. **(1)**

Time average speed $= \frac{v_1 + v_2}{2} = \frac{80 + 40}{2} = 60$ km/h

7. **(2)**
When body goes vertically upwards, reaches at the highest point, then it is momentarily at rest and it then reverses its direction. At the highest point of motion, its velocity is zero but its acceleration is equal to acceleration due to gravity.

8. **(2)**

$V \propto \frac{1}{n}$ and $r \propto n^2$

$\frac{r}{V} \propto n^3$

9. **(2)**
If v becomes double, then F (tendency to overturn) will become four times.

10. **(2)**

$B_0 = \frac{E_0}{c} = \frac{36}{3 \times 10^8} = 12 \times 10^{-8}\,\text{T}$

11. **(3)**

$I = q\frac{\omega}{2\pi} = \frac{q^5 m}{4n^3 h^3 \epsilon_0^2}$

$B = \frac{\mu_0 I}{2r} = \frac{\mu_0 q^7 m^2 \pi}{8n^5 h^5 \epsilon_0^3}$

$\therefore \quad B \propto \frac{Z^3}{n^5}$

12. **(3)**
Neutron is unstable outside a nucleus.

13. **(4)**

Number of half-times, $n = \frac{\text{Time decay}}{\text{Half life}} = \frac{t}{T} = \frac{6400}{1600}$

Fraction undecayed $\quad \Rightarrow n = 4$

$= \frac{N}{N_0} = \left(\frac{1}{2}\right)^n = \left(\frac{1}{2}\right)^4 = \frac{1}{16}$

14. **(1)**

$\frac{N}{N_0} = \left(\frac{1}{2}\right)^{\frac{t}{T_{half}}}$

$= \frac{1}{16} = \left(\frac{1}{2}\right)^{\frac{40}{T_{half}}}$

$\left(\frac{1}{2}\right)^4 = \left(\frac{1}{2}\right)^{\frac{40}{T_{half}}}$

$\Rightarrow \quad 4 = \frac{40}{T_{half}}$

$\Rightarrow \quad T_{half} = 10$ days.

15. **(2)**
Capacitance of capacitor $C = 20\mu F$
$= 20 \times 10^{-6} F$

Rate of change of potential $\left(\frac{dV}{dt}\right) = 3\text{V/s}$

$q = CV$

$\frac{dq}{dt} = C\frac{dV}{dt}$

$i_d = i_c = 20 \times 10^{-6} \times 3 = 60 \times 10^{-6}\text{A} = 60\mu\text{A}$

16. **(1)**

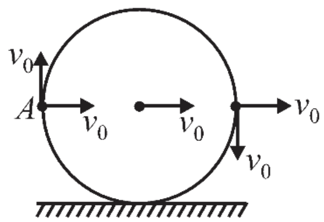
As work done = 0

$\Delta U = mc\Delta T$

$= 100 \times 10^{-3} \times 4184 \times (50 - 30)$

= 8.4 kJ

17. **(2)**



$v_{AB} = 2v_0$

$\omega_{AB} = \frac{v_{AB}}{2R} = \frac{2v_0}{2R} = \frac{v_0}{R}$

18. **(1)**

Nuclear densities are always roughly same.

19. **(2)**

Since aperture of lens reduces so brightness will reduce but their will be no effect on size of image.

20. **(2)**

In adiabatic process $\Delta U = -\Delta W$. In compression ΔW is negative, so ΔU is positive *i.e.* internal energy increases

21. **(2)**

$\frac{\omega_1}{\omega_2} = \frac{I_1}{I_2} = \frac{1}{25}$

$$\frac{I_{max}}{I_{min}} = \left(\frac{\sqrt{\frac{I_1}{I_2}}+1}{\sqrt{\frac{I_1}{I_2}}-1}\right)^2 = \left(\frac{5+1}{5-1}\right)^2 = \frac{36}{16} = \frac{9}{4}$$

22. **(4)**

Boolean expression of the given circuit is

$Y = \overline{\overline{A+B} + \overline{A+B}} = A + B$

23. **(3)**

The potential in depletion layer is due to ions. It appears as if some fictitious battery is connected across the junction with its negative pole connected to p-region and positive pole connected to n-region. The potential difference developed across the junction due to migration of majority charge carries in potential barrier

24. **(2)**

In half wave rectifier, we get the output only in one half cycle of input AC therefore, the frequency of the ripple of the output is same as that of input AC *ie,* 50 Hz.

25. **(4)**

Reading of spring balance $= T = \frac{2m_1 m_2 g}{m_1 + m_2}(N)$

26. **(2)**

$Q = \frac{\text{Resonant frequency}}{\text{Band width}}$

$\Delta\omega = \frac{600}{4} = 150 \text{ Hz}$

27. **(4)**

Work done always depends on path.

28. **(2)**

$F = mg(\sin\theta + \mu\cos\theta)$

$= 10 \times 9.8 (\sin 30° + 0.5 \cos 30°)$

$= 91.4\ N$

29. **(2)**

$a = \frac{\text{Applied force} - \text{Kinetic friction}}{\text{mass}}$

$= \frac{100 - 0.5 \times 10 \times 10}{10} = 5\text{m/s}^2$

30. **(3)**

$n = \frac{1}{2\pi}\sqrt{\frac{k}{m}} \Rightarrow n \propto \frac{1}{\sqrt{m}} \Rightarrow \frac{n_1}{n_2} = \sqrt{\frac{m_2}{m_1}}$

$\frac{n_1}{n_2} = \sqrt{\frac{4m}{m}} \Rightarrow n_2 = \frac{n}{2}$

31. **(2)**

Here, $y_1 = \frac{1}{2}\sin\omega t + \frac{\sqrt{3}}{2}\cos\omega t$

$\cos\frac{\pi}{3}\sin\omega t + \sin\frac{\pi}{2}\cos\omega t$

$\therefore \quad y_1 = \sin\left(\omega t + \frac{\pi}{3}\right)$

Similarly, $y_2 = \sqrt{2}\sin\left(\omega t + \frac{\pi}{4}\right)$

$\therefore$ Phase difference $\Delta\phi = \frac{\pi}{3} - \frac{\pi}{4} = \frac{\pi}{12}$

32. **(1)**

The rotational kinetic energy of the disc is

$$K_{rot} = \frac{1}{2}I\omega^2 = \frac{1}{2}\left(\frac{1}{2}MR^2\right)\omega^2 = \frac{1}{4}MR^2\omega^2$$

The translational kinetic energy is

$$K_{\text{trans}} = \frac{1}{2}Mv^2{}_{\text{CM}}$$

Where v_{CM} is the linear velocity of its centre of mass.

Now, $v_{CM} = R\omega$

Therefore, $K_{\text{trans}} = \frac{1}{2}MR^2\omega^2$

Thus, $K_{\text{total}} = \frac{1}{4}MR^2\omega^2 + \frac{1}{2}MR^2\omega^2 = \frac{3}{4}MR^2\omega^2$

$$\frac{K_{\text{rot}}}{K_{\text{total}}} = \frac{\frac{1}{4}MR^2\omega^2}{\frac{3}{4}MR^2\omega^2} = \frac{1}{3}$$

33. **(2)**

We know that $R = \frac{u^2 \sin 2\theta}{g}$ and $H = \frac{u^2 \sin^2\theta}{2g}$

Given H = R

$$\frac{u^2(2\sin\theta\cos\theta)}{g} = \frac{u^2\sin^2\theta}{2g}$$

$\Rightarrow \quad 4\cos\theta = \sin\theta$

$\tan\theta = 4$

$\theta = 76°$

34. **(3)**

Maximum potential energy position y = ± a and maximum kinetic energy position is y = 0

35. **(4)**

This is the case of freely falling lift and in free fall of lift effective g for pendulum will be zero.

So, $T = 2\pi\sqrt{\frac{l}{0}} = \infty$

36. **(2)**

$$\frac{3}{2}MR^2 = \frac{3}{2}\times 2\times(0.1)^2 = 0.03\,\text{kgm}^2$$

37. **(2)**

There is no friction between the body B and surface of the table. If the body B is pulled with force F then

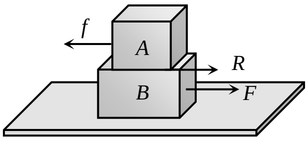
$F = (m_A + m_B)a$

Due to this force upper body A will feel the pseudo force in a backward direction.

$f = m_A \times a$

Due to this force upper body A will feel the pseudo force in a backward direction.

$f = m_A \times a$



But due to friction A and B, body will not move. The body A will start moving when pseudo force is more than friction force

i.e. for slipping, $m_A\, a = \mu m_A\, g$

$\therefore\ a = \mu g$

38. **(2)**

Here, $r = 0.5\ m$, $m = 2$ kg

Rotational KE $= \frac{1}{2}I\omega^2 = \frac{1}{2}\times\left(\frac{1}{2}mr^2\right)\omega^2$

$$4 = \frac{1}{4}mv^2 = \frac{1}{4}\times 2v^2$$

$$v = \sqrt{8} = 2\sqrt{2}\ \text{ms}^{-1}$$

39. **(3)**

$$\frac{1}{2}I\omega^2 = 360 \Rightarrow I = \frac{2\times 360}{(30)^2} = \frac{2\times 360}{30\times 30} = 0.8 kg\times m^2$$

40. **(2)**

$$\lambda = \frac{h}{p} = \frac{h}{mv} = \frac{h}{\sqrt{2mK}}$$

41. **(1)**

We know that $\frac{1}{\lambda} = RZ\left(\frac{1}{{n_f}^2} - \frac{1}{{n_i}^2}\right)$

$$= 109677\left(\frac{1}{1^2} - \frac{1}{2^2}\right)$$

= 1216 Å

42. **(1)**

$$\lambda = \frac{h}{p}$$

$$P = \frac{h}{\lambda}$$

43. **(4)**

$U = -2K$

44. **(1)**

Maximum extension of spring = x

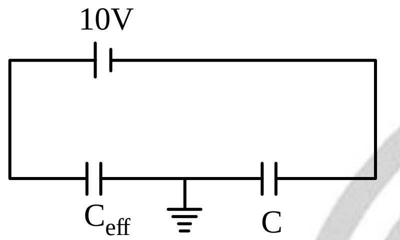
$$\frac{1}{2}Kx^2 = qEx$$

$$= \frac{2qE}{K}$$

Extension in equilibrium $x' = \frac{qE}{K}$

Amplitude of oscillation $A = x - x' = \frac{qE}{K}$

45. **(3)**



In series $\frac{1}{C_{eff}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} = \frac{1}{2C} + \frac{1}{2C} + \frac{1}{2C}$

$$= C_{eff} = \frac{2C}{3}$$

Charge is same in series.

$$Q = \frac{2C}{3}(V_A - 0) = C(0 - V_B)$$

$$\Rightarrow \frac{2C}{3}V_A = -CV_B$$

$\Rightarrow V_A = -\frac{3V_B}{2}$ Also, $V_A - V_B = 10V$

$$= \frac{-3V_B}{2} - V_B = 10$$

$$\left(\frac{-3-2}{2}\right)V_B = 10$$

$\Rightarrow V_B = \frac{20}{5} = -4\,V$ and $V_A = 6V$

46. **(2)**

$C' = C$

$$\frac{\varepsilon_0 A}{(d' - t) + \frac{t}{k}} = \frac{\varepsilon_0 A}{d}$$

or $d = d' - t + \frac{t}{k}$

$$= 4 + 3 - \frac{3}{3} = 6 \text{ mm}$$

47. **(1)**

$B_1 = B_{end} = \frac{\mu_0 ni}{2}$

$B_2 = B_{center} = \mu_0 ni$

$\frac{B_2}{B_1} = \frac{1 \times 2}{1} \Rightarrow B_1 : B_2 = 1 : 2$

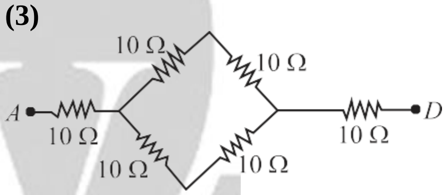
48. **(2)**

$$\mu_r = \frac{\mu}{\mu_0} = \frac{\mu H}{\mu_0 H} = \frac{B}{\mu_0 H} = \frac{6\pi}{4\pi \times 10^{-7} \times H}$$

Here, $H = 3 \times 10^3\ Am^{-1}$

$$\therefore \mu_r = \frac{6\pi}{4\pi \times 10^{-7} \times 3 \times 10^3} = \frac{6}{12} \times 10^4 = 5000$$

49. **(3)**



$R_{net} = 10 + 10 + 10 = 30\Omega$

50. **(1)**

Rate of heat produced in the wire = i^2R

$$= i^2 \rho \frac{l}{\pi r^2}$$

Rate of heat produced in the wire

= rate of heat convected/radiated out of the wire

$i^2R = hA\Delta T$ ($\because A = 2\pi rl$)

$i^2 \propto r^3$

$i \propto r_2^3$