NEET (UG) 2025 CODE 45

1. Radius of curvature of the curvature is given by $\frac{1}{r} = \frac{d^2y}{dx^2}$. Excess pressure is given by $\Delta P = \frac{2S}{r}$ $r = \frac{2S}{\Delta P} = \frac{2S}{\rho g y}$ $\frac{d^2y}{dx^2} = \frac{1}{r} = \frac{\rho g y}{S}$ (2)
2. $m = m_o m_e = \frac{LD}{f_o f_e} = \frac{40\times25}{2\times4} = 125$ (2)
3. Path of the electron will not be deflected if the force on it due to electric and magnetic fields are equal and opposite. E should be perpendicular to B. $F_e = F_m$ $Ee = Bev$ $E = \frac{9\times10^{-4}}{100} \times 3 \times 10^8 = 27 \times 10^2\ V/m$ (2)
4. Acceleration on rough inclined plane $a = g(\sin\theta - \mu_k \cos\theta)$ time $t_r = \frac{2l}{g(\sin\theta - \mu_k\cos\theta)}$, l is length of the inclined plane (4)

   Acceleration on smooth inclined plane $a = g\sin\theta$ $t_s = \frac{2l}{g\sin\theta}$

   Taking ratio of equations (1) and (2) $\mu_k = 1 - \frac{1}{n^2} = 1 - \frac{1}{4} = 0.75$ where $n = \frac{t_r}{t_s}$
5. Stopping distance is obtained by work energy theorem. $-Fr = \frac{1}{2}mv^2 - \frac{1}{2}mu^2$ $Fs = \frac{1}{2}mu^2 = K$ since final velocity v is zero. $F \propto \frac{K}{s}$ $\frac{F_A}{F_B} = \frac{K_A}{K_B}\frac{s_B}{S_A} = \frac{100}{225}\frac{1500}{1000} = \frac{2}{3}$ (2)
6. ABCDEF forms a balanced wheat stone bridge. The equivalent resistance is $\frac{8}{3}$. Total resistance $R = \frac{8}{3} + \frac{1}{3} + 1.5 + 5.5 = 10$ $i = \frac{V}{R} = \frac{5}{10} = 0.5\ A$ (2)
7. At point P equation of motion for the particle is $mg\cos(90-\theta) - T = \frac{mv^2}{l}$----(1). When the string is slack T=0. From equation (1) $v = \sqrt{gl\sin\theta}$. by conservation of energy at the bottom and point P $K_i + U_i = K_f + K_i$ $\frac{1}{2}mv_o^2 = mgl + mgl\sin\theta + \frac{1}{2}mv^2$ $v_o^2 = 2gl + 2gl\sin\theta + 2v^2 = 2gl + 3gl\sin\theta$ $v_o = \sqrt{2gl + 3gl\sin\theta}$

   $\frac{v}{v_o} = \left(\frac{\sin\theta}{2+3\sin\theta}\right)^{\frac{1}{2}}$ (4)
8. Different inputs are given to A and B and output is found.

A	B	$\overline{A+B}$	$\overline{A.B}$	A.B		
0	0	1	1	1		
1	0	0	1	0		
0	1	0	1	0		
1	1	0	0	0		

   NOR gate (4)

9. Magnetic field is perpendicular to electric field $E_z = 60\sin(5x + 1.5\times10^9 t)$. Also $c = \frac{E_o}{B_o}$ $B_o = \frac{60}{3\times10^8} = 2\times10^{-7}$. Since wave is propagating in x direction and

electric field is in z direction, the magnetic field is in the y direction. Hence $B_y = 2 \times 10^{-7} \sin(5x + 1.5 \times 10^9 t)$ (1)

10. Impulse =change in momentum $\vec{I} = m\vec{v} - m\vec{u}$ $u = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 40} = 28.$ $v = \sqrt{2gh} = \sqrt{2 \times 9.8 \times 10} = 14$ $\vec{I} = 0.5\left(14\hat{j} - (-28\hat{j})\right) = 21\ Ns$ (1)

11. Applying Kirchoff's voltage law $V_A - 1 \times 1 - 5 - 2 \times 2 = V_B$ $V_A - V_B = 10\ V$ (4)

12. Magnetic moment $M = iA = i\,\pi r^2$ $M \propto r^2$ $\frac{M_1}{M_2} = \frac{r_1^2}{r_2^2} = \frac{1}{4}$ (1)

13. Power $p = p_1 + p_2 + p_3 + p_4 = 4p$ and magnification $m = m_1 m_2 m_3 m_4 = m^4$(3)

14. Gauge pressure is the pressure difference between pressure of the gas and atmospheric pressure. No of moles $n = \frac{PV}{RT} = \frac{12 \times 1.01 \times 10^5 \times 30 \times 10^{-3}}{\frac{100}{12} \times 300} = 14.54$ no. of moles of gas escaped =18.20-14.544=3.656. $3.656 \times 32g = 116.9\ g$ (3)

15. Differentiating with respect to time $1 = (2x+1)\frac{dx}{dt}$ $v = \frac{1}{2x+1}$ $a = v\frac{dv}{dx} = v(-1\left(\frac{1}{2x+1}\right)^{-2} 2) = -\frac{2}{(2x+1)^3}$ (2)

16. Impedance $Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{20^2 + (45-25)^2} = 20\sqrt{2}\,\Omega$ $i = \frac{V}{Z} = \frac{220}{20\sqrt{2}} = 7.8\ A$ $\tan\phi = \frac{X_L - X_C}{R} = \frac{(45-25)}{20} = 1$ $\phi = 45°$ (2)

17. Angular momentum is conserved since there is no external torque. $L = I\omega = \frac{\frac{2}{5}MR^2 2\pi}{T}$ $T \propto R^2$ $\frac{T_2}{T_1} = \frac{R_2^2}{R_1^2} = 4$ $T_2 = 4T_1 = 4 \times 27 = 108\ days$ (4)

18. Magnetic moment of electrons is given by $\mu_l = \frac{e}{2m} l$ but angular momentum is $l = I\omega = \frac{mr^2 Be}{m} = \frac{\pi r^2 Be}{\pi} = \frac{e\phi}{\pi} = \frac{e}{\pi}\frac{h}{e} = \frac{h}{\pi}$ $\mu_l = \frac{\frac{e}{2m}h}{\pi} = \frac{eh}{2\pi m}$ (2)

19. Rate of flow of heat $H = \frac{Q}{t} = \frac{KA(\theta_1 - \theta_2)}{l}$ $H \propto K(\theta_1 - \theta_2)$ For the three rods $2K(3T - T_1) = K(T_1 - T_2) = 2K(T_2 - T)$ solving $2K(3T - T_1) = 2K(T_2 - T)$ $T_2 = 4T - T_1$ substituting T_2 in $2K(3T - T_1) = K(T_1 - T_2)$ we get $T_1 = \frac{5}{2}T$. $T_2 = 4T - \frac{5T}{2} = \frac{3T}{2}$ $\frac{T_1}{T_2} = \frac{5}{3}$ (3)

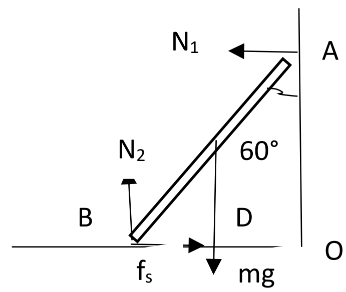
20. Effective capacity $C' = \frac{\epsilon_o A}{d - (t_1 + t_2) + \frac{t_1}{k_1} + \frac{t_2}{k_2}} = \frac{\epsilon_o A}{d - \left(\frac{3d}{8} + \frac{d}{2}\right) + \frac{3d}{8k_1} + \frac{d}{2k_2}} = \frac{\epsilon_o A}{\frac{d}{8} + \frac{3d}{8k_1} + \frac{d}{2k_2}}$ $C = \frac{\epsilon_o A}{d}$ $\frac{C'}{C} = \frac{d}{\frac{d}{8} + \frac{3d}{8k_1} + \frac{d}{2k_2}} = \frac{1}{\frac{1}{8} + \frac{3}{8k_1} + \frac{1}{2k_2}} = 2$ solving K_1=2.66 (1)

21. Relative velocity of bus from x $v_x = v - v_g$ v_x is velocity of bus from with respect to the girl's velocity v_g. $v_y = v - v_g = v - (-60) = v + 60$. Distance $d = v_x t_x = \frac{(v-60)30}{60} = v_y t_y = \frac{(v+60)}{60}10$

$(v - 60)3 = v + 60$ v=120 Km.

$d = \frac{(120-60)30}{60} = 30\ Km$

$T = \frac{30}{120} = \frac{1}{4} hr = 15\ min$ 4



22. Applying torque equation $\sum T_z = 0$.
clockwise torque= anticlockwise torque.
$N_1(OA) = mg(BD)\ N_1(5\cos 60) = 20 \times 10 \times (\frac{5}{2}\sin 60)$
$N_1 = 100\tan 60 = 100\sqrt{3}\quad \sum F_x = 0\ \ N_1 = f_s = 100\sqrt{3}\ N$ 2

23. Option 2. Angular frequency $\omega = \sqrt{\frac{k}{m}}$. as the mass decreases angular frequency increases. $v = A\omega = A\sqrt{\frac{k}{m}}$. as the mass decreases amplitude decreases. 2

24. Option 3.

25. $Diameter\ D = M.S.R + V.S.R \times L.C + CORRECTION = 5\ cm + 8 \times 0.01\ cm - 0.1\ cm = 4.98\ cm$ 3

26. Option 3

27. Option 1. At Brewster's angle reflected light is completely polarized and angle of reflection is close to 60°. 1

28. When the third sphere is in contact with the first one, by conservation of charge $q = 2q'\ \ q' = \frac{q}{2}$. When the third sphere is in contact with the second one, $2q'' = q + \frac{q}{2}\ \ q'' = \frac{3q}{4}$. By coulomb's law $F \propto q_1q_2$, $\frac{F'}{F} = \frac{q_1'q_2'}{q_1q_2} = \frac{\frac{q}{2}\frac{3q}{4}}{q\,q} = \frac{3}{8}\ \ F' = \frac{3F}{8}$ 4

29. When the gases are mixed the total energy is conserved. $PV = \frac{1}{3}mnVv_{rms}^2 = \frac{2}{3}\frac{1}{2}mNv_{rms}^2 = E = total\ energy\ of\ all\ molecules\ P_1V_1 = \frac{2}{3}E_1\ \ P_2V_2 = \frac{2}{3}E_2\ \ PV = \frac{2}{3}E\quad E = E_1 + E_2\ \ \frac{3}{2}P(V_1 + V_2) = \frac{3}{2}(P_1V_1 + P_2V_2)\ P = \frac{P_1V_1 + P_2V_2}{V_1 + V_2} = \frac{1\times 2 + 2\times 3}{2+3} = 1.6\ atm$ 2

30. The necessary centripetal force is provided by F. $F = \frac{mv^2}{r}$. According to Bohr quantization condition angular momentum $L = mvr = \frac{nh}{2\pi}$. $mv\left(\frac{mv^2}{F}\right) = \frac{nh}{2\pi}$. $v^3 \propto n$. $v \propto n^{\frac{1}{3}}$. $r \propto \frac{n}{v} \propto \frac{n}{n^{\frac{1}{3}}} \propto n^{\frac{2}{3}}$ 3

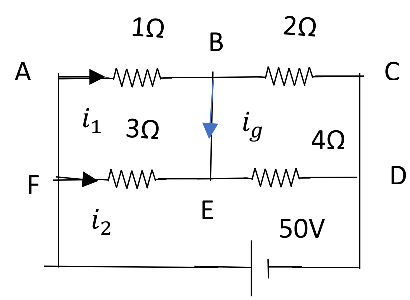
31. According to Kepler's law of periods $T^2 \propto a^3$. $\frac{T_2^2}{T_1^2} = \frac{a_2^3}{a_1^3} = \left(\frac{a_2}{4a_2}\right)^3 = \frac{1}{64}$. $\frac{T_2}{T_1} = \frac{1}{8}$. $T_2 = \frac{T_1}{8} = \frac{687}{8} = 88\ days$ 1

32. Variation of g with height is $\frac{W\prime}{W} = \left(\frac{R}{R+h}\right)^2 = \left(\frac{R}{R+\frac{R}{3}}\right)^2 = \frac{9}{16}$. $W' = \frac{9}{16}(48) = 27\ N$ 2

33. Resistance of each piece is $\frac{R}{8}$. Resistance of 4 pieces when connected in parallel is $\frac{R}{32}$. Resistance of two sets of four pieces when connected in series is $2\left(\frac{R}{32}\right) = \frac{R}{16}$. 3

34. Radius of the Bohr orbit $r \propto n^2$. $r_2 = 4r_1 = 4(.052nm) = 0.208\ nm$. $n\lambda = 2\pi r$. $\lambda = \frac{2\times3.14\times.208}{2} = 0.67\ nm$ 2

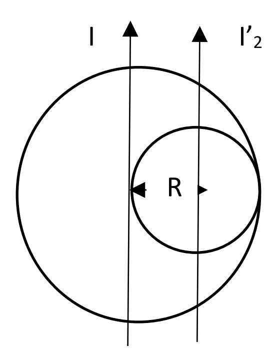
35. Work done to rotate the dipole is equal to change in potential energy. $W = pE(\cos\theta_2 - \cos\theta_1) = 5\times10^{-6}\times4\times10^5\times(\cos 0 - \cos 60) = 1.0\ J$ 2



36. Applying Voltage law for loop ABEF $-i_1 + 3i_2 = 0$—(1) $i_1 = 3i_2$ $-i_1 - 2(i_2 - i_g) + 50 = 0$ ---(2) $-3i_2 - 4(i_2 + i_g) + 50 = 0$ ---(3) solving for i_2 we get i_2= 6A. Putting i2 in equation(3) i_g=2A 2

37. Momentum of photon is $E = mc^2 = \frac{hc}{\lambda}$. $\lambda_{photon} = \frac{h}{mc} = \frac{hc}{E}$. Momentum of electron is $\lambda_{electron} = \frac{h}{p} = \frac{h}{\sqrt{2mE}} . \frac{\lambda_{photon}}{\lambda_{electron}} = \frac{hc}{E}\frac{\sqrt{2mE}}{h} = c\sqrt{\frac{2m}{E}}$ 3

38. Photoelectric current is directly proportional to the intensity of light. 1



39. Let M be the mass of the sphere. Mass of the small sphere $m' = \rho\frac{4}{3}\pi R^3 = \frac{M}{\frac{4}{3}\pi 8R^3}\frac{4}{3}\pi R^3 = \frac{M}{8}$. M.I of the small sphere about its own axis is $I_2' = \frac{2}{5}m'R^2 = \frac{2}{5}\frac{M}{8}R^2 = \frac{2MR^2}{40}$ M.I about the centre $I_2 = \frac{2MR^2}{40} + \frac{MR^2}{8} = \frac{7MR^2}{40}$ $I = \frac{2}{5}M4R^2$ M.I of

the remaining portion $I_1 = I - I_2 = \frac{8MR^2}{5} - \frac{7MR^2}{40} = \frac{57MR^2}{40}$ $\frac{I_2}{I_1} = \frac{7}{57}$ 3

40. Option 2. Time period $T = \frac{2\pi}{\omega} = \frac{2\pi}{100\pi} = \frac{1}{50} s$ the phase angle $\theta = \omega t = 100\pi \times 15 \times 10^{-3} = \frac{3}{2}\pi$. The upper end of the transformer is positive and the lower end is negative. So D_1 is reverse biased and D_2 is forward biased. 2

41. From first law of thermodynamics $dQ = dU + dW$ since dQ and dU are same, the work done in both cases is same. $dW = PA\,dx = P\pi r^2\,dx = constant$. $r^2 \propto 1/dx$ $r \propto \frac{1}{\sqrt{dx}}$ $\frac{r_A}{r_B} = \sqrt{\frac{dx_B}{dx_A}} = \sqrt{\frac{9\,cm}{16\,cm}} = \frac{3}{4}$ 2

42. Percentage error in p is $\frac{\Delta p}{p} \times 100 = 3\frac{\Delta a}{a} \times 100 + 2\frac{\Delta b}{b} \times 100 + \frac{\Delta c}{c} \times 100 + \frac{1}{2}\frac{\Delta d}{d} \times 100 = 3 \times 1 + 2 \times 3 + 2 + \frac{1}{2} \times 4 = 13\%$ 3

43. According to Malus law $I_3 = I_o \cos^2\theta \sin^2\theta = \frac{4I_o \cos^2\theta \sin^2\theta}{4} = \frac{I_o \sin 2\theta}{4} = \frac{I_o \sin 45}{4} = \frac{I_o}{8}$ 3

44. The maximum speed of the particle is $v_{max} = A\omega = A\sqrt{\frac{K}{m}}$ $A\sqrt{k} = const.$ $\frac{A_Q}{A_P} = \sqrt{\frac{K_P}{K_Q}} = \sqrt{\frac{K_1}{K_2}}$ 4

45. For open pipe $f_o = \frac{v}{2l_o}$. For closed pipe $f_c = \frac{v}{4l_c}$. But $l_c = \frac{l_o}{2}$. $\frac{v}{4f_o} = \frac{v}{2(2f)}$ $f_o = f$ 2