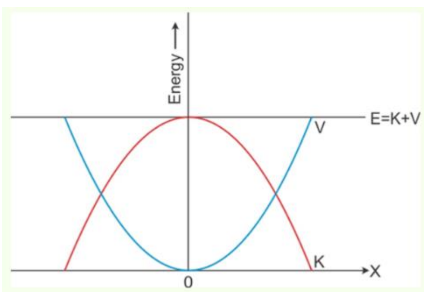
INDIAN SCHOOL AL WADI AL KABIR
CLASS XI
PHYSICS
ASSESSMENT 2 (2024 - 25)
ANSWER KEY-SET II

Q.NO.	ANSWERS	MARKS
1	(b) (i) and (iv)	1
2	(c) km/s^2	1
3	c) E	1
4	(d) 90°	1
5	(a) 15°	1
6	(b)0.4 kg	1
7	(b)(1) - (R), (2) – (P), (3) – (S), (4) – (Q)	1
8	(b)π/18 Nm	1
9	(c) $E_1 < E_2$	1
10	(c)3125 J	1
11	(a)Young's modulus of elasticity	1
12	(a) Length =50 cm, diameter =0.5 mm	1
13	a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.	1
14	b) If both Assertion and Reason are true and Reason is not the correct explanation of Assertion.	1
15	a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.	1
16	c) If assertion is true but reason is false	1
17	i)  ii) Force per unit length SI unit – Nm^{-1}	1 ½ ½
18	Statement Any example with explanation	1 1
19	Consideration / Diagram $F= GMm/ (R+h)^2$ $F = mv^2/ R+h$ Equating and final answer v=√GM/R+h	½ ½ ½ ½
20	E=1/2 (stress)(strain)(volume) Strain = change in dimension/ original dimension = 6×10^{-3} Volume = 2.5×10^{-4} For two legs, the total volume V_{total} is: $V_{total} = 2 \times 2.5 \times 10^{-4}\,m^3 = 5 \times 10^{-4}\,m^3$	½ ½

	$$E = \frac{1}{2} \times \text{Stress} \times \text{Strain} \times V_{\text{total}}$$ Substitute the known values: $$E = \frac{1}{2} \times (0.9 \times 10^8) \times (6.43 \times 10^{-3}) \times (5 \times 10^{-4})$$ $$E = 0.5 \times 0.9 \times 10^8 \times 6.43 \times 10^{-3} \times 5 \times 10^{-4}$$ $$E = 0.5 \times 0.9 \times 6.43 \times 5 \times 10^1 \times 10^{-4}$$ $$E = 0.5 \times 0.9 \times 6.43 \times 5 \times 10^{-3}$$ $$E = 0.5 \times 28.935 \times 10^{-3}$$ $$E \approx 14.467 \times 10^{-3}\,\text{J} = 0.0145\,\text{J}$$	½ ½
21	$$F_e = \frac{GM_e m}{x^2}$$ $$F_s = \frac{GM_s m}{(d-x)^2}$$ For the forces to balance, we set $F_e = F_s$: $$\frac{GM_e m}{x^2} = \frac{GM_s m}{(d-x)^2}$$ Given that $M_s = 3.24 \times M_e$ $$\frac{M_e}{x^2} = \frac{3.24 M_e}{(d-x)^2}$$ $$x = \frac{1.5 \times 10^{10}}{571.6} \approx 2.62 \times 10^7\,\text{km}$$ OR g_h= g (1-2h/R) g_d=g (1-d/R) R = 6400 km, d= 100 km Ratio = 0.98	½ ½ ½ ½ ½ ½ ½ ½

22	$T \propto p^a \rho^b E^c$ or, $T = k p^a \rho^b E^c$ k, is a dimensionless constant, According to homogeneity of dimensions, LHS =RHS $\therefore \quad [T] = [ML^{-1}T^{-2}]^a [ML^{-3}]^b [ML^2T^{-2}]^c$ $[T] = [M^{a+b+c}][L^{-a-3b+2c}][T^{-2a-2c}]$ Comparing the powers, we obtain $a + b + c = 0$ $-a - 3b + 2c = 0$ $-2a - 2c = 1$ On solving, we get $a = -\frac{5}{6},\ b = \frac{1}{2}, c = \frac{1}{3}.$	½+1/2 +1/2 ½+1/2 +1/2
23	Graph Area under the graph gives displacement Steps Final answer	1 ½ 1 ½
24	(i)A cyclist needs to bend inward while going on a circular track so that a component of his weight provides the necessary centripetal force to perform circular motion. (ii)I = Ft =m((v-u)/t)t = mv – mu (iii)Statement	1 ½ +1/2 1
25	Consideration/ diagram Hooke's law, Fα x F = -kx $W = \int F dx$ $W = \frac{1}{2} kx^2$ $U = \frac{1}{2} kx^2$	½ ½ ½ ½ ½ +1/2

26	final volume, $V_2 = \frac{1}{64}$ initial volume, V_1 i.e., $\frac{4}{3}\pi R_2^3 = \frac{1}{64} \times \frac{4}{3}\pi R_1^3$ $R_2^3\left(\frac{1}{4}R_1\right)^3$ or $R_2 = \frac{1}{4}R_1$ As no external torque is acting, $L = I\omega = I\left(\frac{2\pi}{T}\right) = cons\tan t$ i.e., $I_2/T_2 = I_1/T_1$ $\left(\frac{2}{5}MR_2^2\right)\frac{1}{T_2} = \left(\frac{2}{5}MR_1^2\right) \times \frac{1}{T_1}$ $T_2 = \frac{R_2^2}{R_1^2} \times T_1$ As $T_1 =$ time taken by earth to complate one revolution about its axis. i.e., normal lenght of the day $= 24$ hours $\therefore T_2 = \left(\frac{1}{4}\right)^2 \times 24 = 1.5h$ OR Here, $r = \frac{0.4}{2} = 0.2m, m = 10kg,$ $n = \frac{2100}{60}rps = 35rps$ $I = mr^2 = 10(0.2)^2 = 0.4kgm^2$ $L = I\omega = I(2\pi n) = 0.4(2 \times 3.14 \times 35)$ $= 88kgm^2s^{-1}$ Rotational $KE = \frac{1}{2}I\omega^2 = \frac{1}{2} \times 0.4(2\pi \times 35)^2$ $= 9680J$	½ ½ ½ ½ ½ ½ ½ +1/2 ½ +1/2 ½ +1/2
27	a) Definition b) $\therefore K = \frac{1}{2}I\omega^2 = \frac{1}{2}(I \times \omega) \times \omega$ $\Rightarrow K = \frac{1}{2}L\omega$ $\Rightarrow L = \frac{2K}{\omega}$ So, $\frac{L_2}{L_1} = \frac{K_2}{K_1} \times \frac{\omega_1}{\omega_2} = \frac{1}{2} \times \frac{1}{2}$ $\because 2\omega_1 = \omega_2$ and $2K_2 = K_1$ (Given) $\Rightarrow \frac{L_2}{L_1} = \frac{1}{4}$ $L_2 = \frac{L}{4}$	1 ½ ½ ½ ½

28	Consideration/ diagram $g=GM/R^2$ $g^1=GM/(R+h)^2$ Dividing the two equations $g^1/g=GM/(R+h)^2/ GM/R^2$ $=(1-2h/R)$	½ ½ ½ ½ ½

	$g^1=g\,(1-2h/R)$	½
29	i. b)ductile material ii. c)The Young's modulus of the material. iii. d)1 :1 iv. c)The material is stiff and resists deformation under stress. OR (a) Elastic region → Plastic region → Necking → Breaking point	1 1 1 1
30	i. c)the impulse imparted to each ball is 0.5 N. ii. a)Zero iii. c)10.0 kg iv. d)-80 N OR d)10 m	1 1 1 1
31	a) Graph Time of flight expression Maximum height expression b) $\frac{R}{2}=39.2,\ H=19.6$ ½ $-R=4H$ $\frac{U^2\times 2\sin\theta\cos\theta}{g}=\frac{4\times u^2\sin^2\theta}{2g}$ $\tan\theta=1$ $\theta=45°$ ½ $\frac{u^2\sin^2\theta}{2g}=19.6$ ½ $u^2\times\frac{1}{2}=2\times19.6\times9.8$ $u^2=2\times2\times9.8\times9.8\times2$ $u=19.6\times\sqrt{2}$ $=27.7$ m/s ½ **OR** a) Diagram 1 Steps ½ Resultant expression ½ Direction expression 1	1 1 1

	b) Let the force be A & B and A < B $A + B = 18 \Rightarrow B = 18 - A$ $\lvert\vec{A} + \vec{B}\rvert = 12$ $\sqrt{A^2 + B^2 + 2AB\cos\theta} = 12$ Also, $\tan 90^\circ = \frac{B\sin\theta}{A+B\cos\theta}$ $\Rightarrow A + B\cos\theta = 0 \Rightarrow \cos\theta = \frac{-A}{B}$ $\sqrt{A^2 + B^2 + 2AB\left(\frac{-A}{B}\right)} = 12$ $B^2 - A^2 = 144$ $(18 - A)^2 - A^2 = 144$ $324 - 144 = 36A$ $A = 5$ $B = 18 - A \Rightarrow B = 13$	½ ½ ½ ½
32	a) Definition Diagram/ Consideration $W = \int F\,dx$ $W = GMm/R$ $W = KE = 1/2mv^2$ $V = \sqrt{2GM/R}$ b) $v_0 = \sqrt{\frac{GM}{r}} = \sqrt{\frac{GM}{R+h}}$ ...(i) Given, $v_0 = \frac{v_e}{2} = \frac{\sqrt{2GM/R}}{2} = \sqrt{\frac{GM}{2R}}$ ...(ii) Froms Eqs. (i) and (ii), We get h=R=6400 km OR a) Statement. $W = \int F\,dx$ Substituting F and steps $W = -GMm/R = U$ b) $V = \frac{-GM}{R+h} = -5.4\times10^7$ ----------(1) and $g = \frac{GM}{(R+h)^2} = 6$ -----------(2) Dividing (1) by (2) $\frac{\frac{-GM}{R+h}}{\frac{GM}{(R+h)^2}} = \frac{-5.4\times10^7}{6} \Rightarrow \frac{5.4\times10^7}{(R+h)} = 6$ $\Rightarrow R + h = 9000$ km so, $h = 2600$ km	1 ½ ½ ½ ½ 1 ½ +1/2 1 ½ 1 ½ ½ ½ ½ +1/2
33	a) Diagram/ Consideration Momentum is conserved $m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$ Kinetic energy conserved $½\, m_1u_1^2 + ½\, m_2u_2^2 = ½\, m_1v_1^2 + 1/2\, m_2v_2^2$ Rearranging steps	½ ½ ½ 1

	Final answer of v_2, $v_2 = \frac{(M_2 - M_1)u_2 + 2M_1u_1}{M_1 + M_2}$	½
	Final answer of v_1, $v_1 = \frac{(M_1 - M_2)u_1 + 2M_2u_2}{M_1 + M_2}$	½
	$V_1 = \frac{m_1 - m_2}{m_1 + m_2}u_1 + \frac{2m_2}{m_1 + m_2}u_2$	½
	$\frac{-u_1}{3} = \frac{(m_1 - m_2)u_1 + 2m_2u_2}{m_1 + m_2}$	½
	$= \frac{(0.1 - m_2)u_1 + 2 \times m_2 \times 0}{0.1 + m_2}$	
	$\therefore \frac{-u_1}{3} = \frac{(0.1 - m_2)u_1}{0.1 + m_2}$	
	$\therefore -\frac{1}{3} = \frac{0.1 - m_2}{0.1 + m_2}$	
	$\therefore 0.1 + m_2 = -0.3 + 3m_2$	
	$\therefore 2m_2 = 0.4$	
	b) $\therefore m_2 = 0.2$ kg	½
	OR	
	a) Definition	1
	When bodies have the same mass i.e., $m_1 = m_2$	
	$v_1 = \left(\frac{m_1 - m_2}{m_1 + m_2}\right)u_1 + \left(\frac{2m_2}{m_1 + m_2}\right)u_2$	½
	$v_1 = (0)u_1 + \left(\frac{2m_2}{2m_2}\right)u_2$	½
	$v_1 = u_2$	
	$v_2 = \left(\frac{2m_1}{m_1 + m_2}\right)u_1 + \left(\frac{m_2 - m_1}{m_1 + m_2}\right)u_2$	½
	$v_2 = \left(\frac{2m_1}{2m_1}\right)u_1 + (0)u_2$	
	$v_2 = u_1$	½

	b) Initial momentum = 90000 kgm/s Final momentum = 18000 v kgm/s Initial momentum = final momentum V =5 m/s Initial KE =450000 J Final KE =225000 J Inelastic collision	 1 1