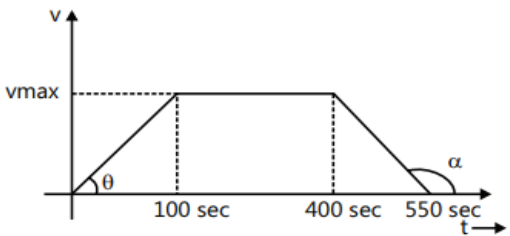




INDIAN SCHOOL AL WADI AL KABIR
CLASS XI
PHYSICS
ASSESSMENT 1 (2026 - 27)
SET 2-ANSWER KEY

Q.NO.	ANSWERS	MARKS
1	(A) kinetic energy	1
2	(D) $M^0 L^0 T^0$	1
3	(A) $(P-Q)/R$	1
4	(B) $M^0 L^0 T^0$	1
5	(B)	1
6	(D) zero	1
7	(C) $\frac{2v_1 v_2}{v_1 + v_2}$	1
8	(C) $\vec{A} \cdot \vec{B} = 0$	1
9	(A) $v\sqrt{2}$	1
10	(A) Static friction	1
11	(A) must be equal to the force applied by the monkey on the rope	1
12	(C) $10\sqrt{3}$ N	1
13	(A) Both A and R are true, and R is the correct explanation of A.	1
14	(B) Both A and R are true, but R is not the correct explanation of A.	1
15	(C) A is true, but R is false.	1
16	(C) A is true, but R is false.	1
17	Here, $m = 70$ kg, $g = 10$ m/s² In each instance, the weighing machine measures the reaction R, which represents the apparent weight. (a) When the lift moves downward with $a = 5$ ms⁻² $R = m(g - a) = 70(10 - 5) = 350$ N (b) When the lift moves upwards with uniform acceleration. $R = m(g + a) = 70 \times (10 + 5) = 1050$ N OR Initial momentum: $p_i = mu = (0.0005)(10) = 0.005$ kg m/s Final momentum: $p_f = mv = (0.0005)(-10) = -0.005$ kg m/s Change in momentum: $\Delta p = p_f - p_i$ $\Delta p = -0.005 - 0.005$ $\Delta p = -0.01$ kg m/s Therefore, the magnitude of the change in momentum is: $\Delta p = 0.01$ kg m/s	1 1 1 1
18	Diagram Statement	1 1

	 ii. (ii) Distance travelled = Area under $v - t$ graph $= \left[\frac{1}{2} (100) v_{\max} \right] + [(400 - 100) (v_{\max})] + \left[\frac{1}{2} (550 - 400) v_{\max} \right]$ $\Rightarrow 4250 = \frac{1}{2} \times 100 \times v_{\max} + 300 v_{\max} + \frac{1}{2} \times 150 v_{\max}$ $\Rightarrow 4250 = v_{\max} \Rightarrow v_{\max} = 10 \text{ m/s}$ (iii) $a = \frac{\Delta v}{\Delta t}$ For $t = 0$ to $100 \text{ sec} \Rightarrow a = \frac{10 - 0}{100 - 0} = 0.1 \text{ m/s}^2$ For $t = 100$ to $400 \text{ sec} \Rightarrow a = \frac{10 - 10}{400 - 100} = 0$ For $t = 400 \text{ sec}$ to 500 sec (retardation) $\Rightarrow a^- = \frac{0 - 10}{550 - 400} = -\frac{10}{150} \Rightarrow 0.06 \text{ m/s}^2$ OR i. (i) Distance from $t = 0 \text{ s}$ to $t = 18 \text{ s}$ (total area under the graph) O–A (0 to 8 s) Triangle $\frac{1}{2} \times 8 \times 20 = 80 \text{ m}$ A–B (8 to 10 s) Trapezoid $\frac{1}{2} \times (20 + 10) \times 2 = 30 \text{ m}$ B–C (10 to 14 s) Rectangle $4 \times 10 = 40 \text{ m}$ C–D (14 to 18 s) Triangle $\frac{1}{2} \times 4 \times 10 = 20 \text{ m}$ Total distance = $80 + 30 + 40 + 20 = 170 \text{ m}$ (ii) At $t = 2 \text{ s}$, still on O–A: $v = 2.5 \times 2 = 5 \text{ m/s}$ 2 s to 8 s (O–A segment): trapezoid with parallel sides 5 and 20, width 6 Area = $\frac{1}{2} \times (5 + 20) \times 6 = 75 \text{ m}$ 8 s to 10 s (A–B segment): trapezoid, area = 30 m (as above) 10 s to 12 s (part of B–C, constant $v = 10$): rectangle Area = $2 \times 10 = 20 \text{ m}$ Total distance = $75 + 30 + 20 = 125 \text{ m}$ Maximum acceleration during this interval ($t = 2 \text{ s}$ to 12 s) Comparing the magnitudes of slope in this window: 2.5 m/s^2 (O–A), -5 m/s^2 (A–B), 0 (B–C). Maximum acceleration = 5 m/s^2	1 1 1 1
23	The principle of homogeneity of dimensions states that in any valid physical equation, the dimensions of every term on both sides of the equation must be the same. In other words, only physical quantities having the same dimensional formula can be added, subtracted, or equated to one another.	1

	Let the frequency n depend on: - length of string l, raised to power a - tension T, raised to power b - mass per unit length m, raised to power c $n = k l^a T^b m^c$ <table><tr><td>Frequency, n</td><td>$[M^0 L^0 T^{-1}]$</td></tr><tr><td>Length, l</td><td>$[M^0 L^1 T^0]$</td></tr><tr><td>Tension, T (force)</td><td>$[M^1 L^1 T^{-2}]$</td></tr><tr><td>Mass per unit length, m</td><td>$[M^1 L^{-1} T^0]$</td></tr></table> $[M^0 L^0 T^{-1}] = [L]^a [MLT^{-2}]^b [ML^{-1}]^c$ $[M^0 L^0 T^{-1}] = M^{(b+c)} L^{(a+b-c)} T^{-2b}$ Power of M: $0 = b + c$ Power of L: $0 = a + b - c$ Power of T: $-1 = -2b$ From the T equation: $b = \frac{1}{2}$ From the M equation: $c = -b = -\frac{1}{2}$ From the L equation: $a = c - b = -\frac{1}{2} - \frac{1}{2} = -1$ $n = k l^{-1} T^{1/2} m^{-1/2}$ $n = \frac{k}{l} \sqrt{\frac{T}{m}}$	Frequency, n	$[M^0 L^0 T^{-1}]$	Length, l	$[M^0 L^1 T^0]$	Tension, T (force)	$[M^1 L^1 T^{-2}]$	Mass per unit length, m	$[M^1 L^{-1} T^0]$	1
Frequency, n	$[M^0 L^0 T^{-1}]$									
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Mass per unit length, m	$[M^1 L^{-1} T^0]$									
24	a. Yes, the scalar product of two non-zero vectors is zero when the vectors are perpendicular (mutually orthogonal) to each other. b. b. Angle between $A = \hat{i} + 2\hat{j} - \hat{k}$ and $B = -\hat{i} + \hat{j} - 2\hat{k}$ $A \cdot B = (1)(-1) + (2)(1) + (-1)(-2) = -1 + 2 + 2 = 3$ $ A = \sqrt{1^2 + 2^2 + (-1)^2} = \sqrt{1 + 4 + 1} = \sqrt{6}$ $ B = \sqrt{(-1)^2 + 1^2 + (-2)^2} = \sqrt{1 + 1 + 4} = \sqrt{6}$ $\cos \theta = \frac{A \cdot B}{ A B } = \frac{3}{\sqrt{6} \times \sqrt{6}} = \frac{3}{6} = \frac{1}{2}$ $\theta = \cos^{-1}\left(\frac{1}{2}\right) = 60^\circ$	1								

	perpendicular to the displacement.	
31	Banking of a road refers to raising the outer edge of a curved road above the level of the inner edge, so that the road surface makes a certain angle θ By banking the road, a component of the normal reaction force from the road also contributes toward the centripetal force, reducing the dependence on friction. This allows vehicles to negotiate curves safely at higher speeds and reduces wear and tear on tyres. Diagram Steps and Final answer OR Statement Diagram Steps with final answer $p_{\text{initial}} = 0$ After they push apart, the total momentum must still be zero (no external horizontal force acts on the system): $m_{\text{girl}} v_{\text{girl}} + m_{\text{boy}} v_{\text{boy}} = 0$ Taking the girl's direction as positive and the boy's direction as negative (since they move apart in opposite directions): $m_{\text{girl}} v_{\text{girl}} = m_{\text{boy}} v_{\text{boy}}$ $m_{\text{girl}} = 40 \text{ kg}, v_{\text{girl}} = 1.2 \text{ m/s}$ $m_{\text{boy}} = 60 \text{ kg}$ $40 \times 1.2 = 60 \times v_{\text{boy}}$ $48 = 60 v_{\text{boy}}$ $v_{\text{boy}} = 0.8 \text{ m/s}$	1 1 1 2 1 $\frac{1}{2}$ $1\frac{1}{2}$ 1 1
32	Diagram Deriving the time-of-flight expression Deriving the horizontal range expression Ratio of Horizontal Ranges $\frac{R_A}{R_B} = \frac{u^2 \sin(2 \times 30^\circ)}{u^2 \sin(2 \times 60^\circ)} = \frac{\sin 60^\circ}{\sin 120^\circ}$ Since $\sin 60^\circ = \sin 120^\circ = \frac{\sqrt{3}}{2}$: $\frac{R_A}{R_B} = 1 : 1$	1 1 1 1 1

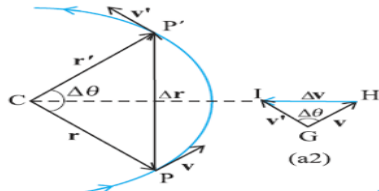
Ratio of Maximum Heights

$$\frac{H_A}{H_B} = \frac{\sin^2 30^\circ}{\sin^2 60^\circ} = \frac{(1/2)^2}{(\sqrt{3}/2)^2} = \frac{1/4}{3/4}$$

$$\boxed{\frac{H_A}{H_B} = 1 : 3}$$

OR

a)



Consider a body moving along a circular path of radius r and centre O , with uniform speed v . Suppose at time t the particle is at P and at time $t + \Delta t$, the particle is at P' . Let v and v' be the velocity vectors at P and P' , directed along the tangents at P and Q respectively.

Angle = Arc/radius

$$\Delta\theta = \Delta v/v$$

$$\Delta v = v \times \Delta\theta \text{ -----(1) but } \Delta\theta/\Delta t = \omega \text{ so, } \Delta\theta = \omega \times \Delta t \quad (a)$$

And $v = r \omega$ (b)

Substituting (a) and (b) in eq (1)

$$\Delta v = r \omega \times \omega \times \Delta t$$

$$= r \omega^2 \Delta t$$

$$\Delta v/\Delta t = r \omega^2$$

$$\text{But } \omega = v/r$$

$$a = r \omega^2$$

$$a = r \times (v/r)^2$$

$$a = v^2/r$$

(b) If the time taken to complete 1 revolution is T ,

$$\text{The angular speed} = \frac{2\pi}{T}$$

(c) angular velocity, $\omega = 2\pi f = 2 \times 22/7 \times 14/25 = 88/25 \text{ rad/s}$

$$\text{Centripetal acceleration, } a_c = r\omega^2 = 0.8 \text{ m} \times 88 \times 88 / 225 = 9.912 \text{ m/s}^2$$

Direction: Radially inwards, towards the centre of the circular path.

33	Statement Diagram Obtaining the expression with steps The total energy is the sum of kinetic and potential energy $E = KE + V(x)$ $E = \frac{1}{2}mv^2 + \frac{1}{2}kx^2$ At the turning point, the particle momentarily comes to rest before reversing direction, so its velocity — and hence its kinetic energy — is zero: $KE = 0$ At this point, all the energy is potential: $E = V(x) = \frac{1}{2}kx^2$ $1 = \frac{1}{2}(0.5)x^2$ $1 = 0.25x^2$ $x^2 = 4$ $x = \pm 2 \text{ m}$ OR i. Elastic collision: An elastic collision is a collision in which both the total kinetic energy and the total momentum of the system are conserved. Inelastic collision: An inelastic collision is a collision in which momentum is conserved, but the total kinetic energy is not conserved. ii. Diagram Steps and final answer iii. A body of mass m_1 moves with initial velocity u_1 and strikes a body of mass m_2, initially at rest ($u_2=0$). $v_1 = \left(\frac{m_1 - m_2}{m_1 + m_2} \right) u_1$ $v_2 = \left(\frac{2m_1}{m_1 + m_2} \right) u_1$ Divide numerator and denominator of each expression by m_2: $v_1 = u_1 \left(\frac{\frac{m_1}{m_2} - 1}{\frac{m_1}{m_2} + 1} \right), \quad v_2 = u_1 \left(\frac{2\frac{m_1}{m_2}}{\frac{m_1}{m_2} + 1} \right)$ Since $m_2 \gg m_1$, the ratio $\frac{m_1}{m_2} \rightarrow 0$. Substituting this: $v_1 \approx u_1 \left(\frac{0 - 1}{0 + 1} \right) = -u_1$ $v_2 \approx u_1 \left(\frac{2(0)}{0 + 1} \right) = 0$	1 $\frac{1}{2}$ $1\frac{1}{2}$ 1 1 1 1 $\frac{1}{2}$ $1\frac{1}{2}$
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