INDIAN SCHOOL AL WADI AL KABIR
CLASS XI
PHYSICS
ASSESSMENT 1 (2022 - 23)
ANSWER KEY

Q.NO.	ANSWERS	MARKS
1	b) Pressure if a = 1, b = -1, c = -2	1
2	d) 45°	1
3	c) Parabola or hyperbola	1
4	d) 0.4 m	1
5	a) $[MLT^{-1}]$ and $[MLT^{-4}]$	1
6	b) 1200 litre	1
7	d) 4 cm/s^2	1
8	d) zero	1
9	b) (2,2)	1
10	a) the light body	1
11	c) 45°	1
12	a) is zero	1
13	c) 40 N	1
14	b) lift is moving up with an acceleration g	1
15	b) Zero Torque	1
16	b) Both A and R are true and R is NOT the correct explanation of A	1
17	c) A is true but R is false	1
18	a) Both A and R are true and R is the correct explanation of A	1
19	Statement As moment of inertia decreases, angular velocity increases so that angular momentum to remain constant.	1 1
20	T= mg = 30 (10) = 300 N T-mg = ma (climbing up) a=T-mg/m a=300-25(10)/25 a=2 m/s^2 **OR** a = net force/total mass a=(m_A+m_B-m_C)g/ m_A+m_B+m_C a=(4+1-3)10/4+1+3 a=20/8=2.5 m/s^2 T_1=m_cg T_1=3(10) = 30 N	½ ½ ½ ½ ½ ½ ½ ½
21	$s = ut + \frac{1}{2}at^2$ $-x = \frac{1}{2}(-9.8)t^2$ $x = 4.9t^2$ --------------1 $100 - x = 50t + \frac{1}{2}(-9.8)t^2$ Sub 1 and simplifying t = 2 s x=19.6 m from the top or 80.4 m from the bottom	½ ½ ½ ½

22	Diagram or consideration $F \propto -x$ $F = -kx \quad \dots(1)$ $W_s = \int_0^{x_m} F\,dx \quad \dots(2)$ $W_s = -\int_0^{x_m} kx\,dx \quad \dots(3)$ $W_s = -k\left[\frac{x^2}{2}\right]_0^{x_m}$ $W_s = -\frac{1}{2}kx_m^2$ $W_E = \frac{1}{2}kx_m^2 \quad \dots(4)$ This work done is stored as the elastic potential energy 'U' of the spring. $U = \frac{1}{2}kx^2$ **OR** Statement Diagram or consideration $v^2 - u^2 = 2as$ Multiplying both the sides by 1/2m, we get $\frac{1}{2}mv^2 - \frac{1}{2}mu^2 = mas$ By Newton's second law, ma = F Therefore $\frac{1}{2}mv^2 - \frac{1}{2}mu^2 = \mathrm{F \times s} = \mathrm{W}$ Kf – Ki = W	½ ½ ½ ½ ½ ½ ½ ½
23	Consideration or diagram *As* $v^2-u^2 = 2as$ $v^2-0 = 2as$ $a= v^2/2s$ *According to Newton's second law of motion* *F = ma* *Work done , W = F x s = ma x s =* $W= mx \frac{v2}{2s} \times s = \frac{1}{2}mv^2$ *This work done appears as kinetic energy K of the body.* $K = \frac{1}{2}mv^2$	½ ½ ½ ½
24	V=s/t S=rΘ V= rΘ/t Θ/t = ω v=rω	½ ½ ½ ½
25	Net force(vector sum) acting on the system is zero And net torque (vector sum) acting on the system is zero The point of contact of the ladder with the ground is the point about which the ladder can rotate. When the labourer is at the top of the ladder, the lever arm of force is large, so theturning effect can be large.	½ ½ ½ ½
26	Diagram Writing the y components of 2nd equation of motion Mentioning the expression for time	½ ½ ½

	Substitution and Final expression for maximum height Writing the x components of 2^{nd} equation of motion Substitution for time Final expression for range	½ ½ ½
27	Graph Mentioning area under v-t graph gives displacement Writing the equation for area Substitution and rearranging Final expression	1 ½ ½ ½ ½

28	Statement Diagram or consideration Fα RATE OF CHANGE OF MOMENTUM F = K RATE OF CHANGE OF MOMENTUM F = K $\frac{dp}{dt}$ $F = K\,ma$, If K=1 F = ma **OR** a) To decrease the effect of impulse, spring increases the time for which a large force acts b) Due to inertia of motion c) Inertia of rest	1 ½ ½ ½ ½ 1 1 1
29	36 km/h =10 m/s $\frac{1}{2}kx^2 = \frac{1}{2}mv^2$ $x = \sqrt{\frac{mv^2}{k}}$ F=kx F = 60×10^3 N **OR** W=-FS=-(mgsinϴ) s W=$\frac{1}{2}mv^2 - \frac{1}{2}mu^2$ -(mgsinϴ) s = $-\frac{1}{2}mu^2$ S =22.95 m or 22.5 m	½ ½ ½ ½ ½ ½
30	$\vec{L} = (\vec{r} \times \vec{p})$ Differentiating both sides, $\frac{d\vec{L}}{dt} = \frac{d(\vec{r} \times \vec{p})}{dt}$ $= \vec{p}\frac{d\vec{r}}{dt} + \vec{r}\frac{d\vec{p}}{dt}$ $= \vec{v} \times m\vec{v} + \vec{r} \times \vec{f}$ $= \vec{r} \times \vec{f} = \vec{\tau}$ ($\therefore \vec{v} \times \vec{v} = 0$) $\frac{d\vec{L}}{dt} = \vec{\tau}$	½ ½ ½ ½ ½ ½

	Thus, rate of change of angular moment of a particle in rotational motion provides torque acting on it.	
31	a) Definition Diagram with vectors mentioned Mentioning the concept of similar triangles Equation for Δv Substitution and getting the expression for 'a'	1 ½ ½ ½ ½
	i) $V = s/t$ ii) $a = v^2/r$	
	b) **Calculation: From formula (I),**	½
	$50 = \frac{2\pi r}{40}$ $\therefore r = \frac{50\times 40}{2\pi}$ $\therefore r = \frac{1000}{\pi}$ cm	
	From formula (ii), $a = \frac{v^2}{r} = \frac{50^2}{1000/\pi}$ $\therefore a = \frac{5\pi}{2} = 7.85\ m/s^2$	½
	OR	
	Diagram or consideration X components equation and equation for time Y components equation and substitution $y=ax+bx^2$ equation and mention the terms a and b	1 ½ ½+½ ½
	As, $H = \frac{u^2 \sin^2\theta}{2g}$ $\therefore$ $20 = \frac{(20\sqrt{2})^2 \sin^2\theta}{2\times 10}$	½
	or $400 = 800 \sin^2\theta$ or $\sin^2\theta = \frac{400}{800} = \frac{1}{2}$	½
	or $\sin\theta = \frac{1}{\sqrt{2}} = \sin 45^\circ$ or $\theta = 45^\circ$	
	Horizontal range $= \frac{u^2 \sin 2\theta}{g}$	½
	$= \frac{(20\sqrt{2})^2 \sin 2\times 45^\circ}{10} = \frac{800\times 1}{10} = 80$ m	½
32	Diagram or consideration	½
	$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$ $m_1u_1 - m_1v_1 = m_2v_2 - m_2u_2$ $\Rightarrow m_1(u_1 - v_1) = m_2(v_2 - u_2) \ldots (1)$	½
	$\frac{1}{2}m_1u_1^2 + \frac{1}{2}m_2u_2^2 = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$ $m_1u_1^2 + m_2u_2^2 = m_1v_1^2 + m_2v_2^2$ $\Rightarrow m_1u_1^2 - m_1v_1^2 = m_2v_2^2 - m_2u_2^2$ $\Rightarrow m_1(u_1^2 - v_1^2) = m_2(v_2^2 - u_2^2)$ $\Rightarrow m_1(u_1 - v_1)(u_1 + v_1)$ $= m_2(v_2 - u_2)(u_2 + v_2) \ldots (2)$	½
	$(u_1 + v_1) = (v_2 + u_2)$---------------(3)	½

	$v_1 = \left(\frac{m_1 - m_2}{m_1 + m_2}\right) u_1 + \left(\frac{2m_2}{m_1 + m_2}\right) u_2 \quad \ldots(4)$ $v_2 = \left(\frac{m_2 - m_1}{m_2 + m_1}\right) u_2 + \left(\frac{2m_1}{m_2 + m_1}\right) u_1 \quad \ldots(6)$ $v_1 = \frac{(m_1 - m_2)u_1}{m_1 + m_2} + \frac{2m_2 u_2}{m_1 + m_2}$ $\frac{u_1}{3} = \frac{(2 - m_2)}{2 + m_2} u_1 + 0$ $2 + m_2 = 6 - 3m_2$ $4m_2 = 4, m_2 = 1kg$ **OR** Statement Consideration or diagram Proving for each case $P_{output} = \frac{W}{t} = \frac{mgh}{t} = \frac{(3 \times 10^4 kg)(10\ ms^{-2})(40\ m)}{900\ s}$ $= \frac{4}{3} \times 10^4 W$ $\text{Efficiency}, \eta = \frac{P_{output}}{P_{input}}$ $P_{input} = \frac{P_{output}}{\eta} = \frac{4 \times 10^4}{3 \times \frac{30}{100}} = \frac{4}{9} \times 10^5$ $= 44.4 \times 10^3 W = 44.4\ kW.$	1 1 1 ½ ½ +½+½
33	Meaning or definition Diagram $N \cos\theta - mg - f \sin\theta = 0$ $N \cos\theta = mg + f \sin\theta \quad \ldots(1)$ $f = \mu_s N \quad \ldots(2)$ $N \cos\theta = mg + \mu_s N \sin\theta \quad \ldots(3)$ $\Sigma F_x = f_c$ $N \sin\theta + f \cos\theta = f_c \quad \ldots(4)$ $N \sin\theta + \mu_s N \cos\theta = f_c \quad \ldots(5)$ $f_c = \frac{mv^2}{R}$ $N(\sin\theta + \mu_s \cos\theta) = \frac{mv^2}{R} \quad \ldots(6)$ $mg = N(\cos\theta - \mu_s \sin\theta)$ $N = \frac{mg}{(\cos\theta - \mu_s \sin\theta)} \quad \ldots(7)$ $\frac{\cancel{m}g(\sin\theta + \mu_s \cos\theta)}{(\cos\theta - \mu_s \sin\theta)} = \frac{\cancel{m}v_{max}^2}{R}$ $v_{max} = \sqrt{\left(\frac{Rg(\sin\theta + \mu_s \cos\theta)}{\cos\theta - \mu_s \sin\theta}\right)}$ $v_{max} = \sqrt{\mu r g} = \sqrt{0.8 \times 100 \times 9.8} = 28 m/s$ **OR**	1 ½ ½ ½ ½ ½ ½ 1

	a) Statement Consideration or diagram Proof (Any method) b) $v_2 = -\frac{m_1 v_1}{m_2} = -\frac{(10 \times 10^{-3} kg)(800 m/s)}{100 kg} = -0.08 m/s$ As mass of the bullet is negligible as compared to (rifle ++ man), ∴ Velocity acquired after 10 shots $=10v_2=0.8m/s$ b. The momentum is acquired by the rifleman is $P=m_2v_2$ $=100\times0.8 =80kgm/s$ This momentum is acquired in 10s, therefore the average force $=\triangle p/\triangle t$ $=80/5=16$ N	1 1
34	(i) Directly (ii) Definition (iii)Any two methods, advantages or disadvantages	1 mark each
35	(i) Work done, W =FScos60° =20 X 20 X cos60°=20X 20 X 1/2 = 200J. (ii) Conditions for negative work done (iii)Definition of one joule dimensional formula $[M^1 L^2 T^{-2}]$ OR According to the definition: Work is done whenever the given conditions are satisfied. (ii) there is a displacement of the body caused by the applied force along the direction of the applied force. No displacement takes place in this case. So, work done by a centripetal force is always zero	1 ½ ½ ½ ½