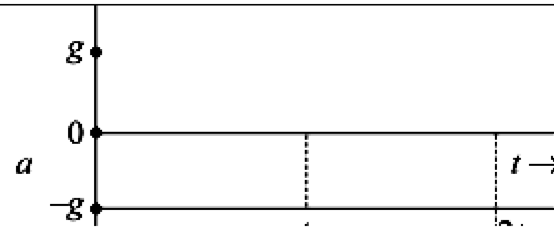
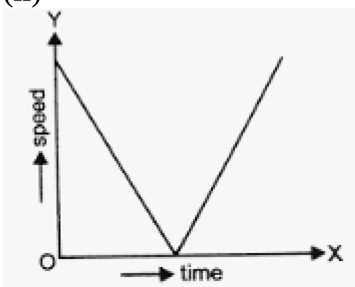
SET	A

INDIAN SCHOOL MUSCAT
HALF YEARLY EXAMINATION 2022
PHYSICS-042

CLASS: XI Max. Marks: 70

MARKING SCHEME			
SET	QN.NO	VALUE POINTS	MARKS
A	1	(iii) 1.7 g cm^{-3}	1
	2	(i) Tension and surface tension	1
	3	1 mark for any one option	1
	4	(ii) 48km/h	1
	5	(iii) R = 4H	1
	6	(ii) halved	1
	7	(i) or (ii)	1
	8	(i) mg (sinα + μcosα)	1
	9	(ii) Move in opposite directions with equal speeds	1
	10	(iii) Initial velocity of the object	1
	11	(ii) 13.5J	1
	12	(iii) 1:2	1
	13	(ii) or (iv)	1
	14	(ii) 2	1
	15	1 mark for any one option	1
	16	(iii) Assertion(A) is true but Reason(R) is false.	1
	17	(i) Both Assertion(A)and Reason(R) are true and Reason(R) is the correct explanation of A.	1
	18	1 mark for any one option	1
	19	any four limitations of the method of dimensional analysis.	½ + ½ +½ +½
	20	Showing dimensionally that $T^2 \alpha\ r^3$ OR Proving 1000J=25×10^7 new system of unit **(If dimensions are correct in both sides of equation give 2 marks)**	3 3
	21	(i)	

		 (ii)  	1 1
	22	(a)statement of parallelogram law of vector addition (b) the quantity should have magnitude as well as direction. The quantity should obey vector algebra for the operations like addition and multiplication or parallelogram law of vector addition	1 ½ ½
	23	Impulse- momentum theorem Statement- Proof-	 1 1
	24	Any two difference between conservative and non – conservative forces.	1+1
	25	(a) In a whirl wind, the air from nearby region gets concentrated in a small space thereby decreasing the value of moment of inertia considerably. Since, Iω= constant, due to decrease in moment of inertia, the angular speed becomes quite high. (b) Statement of law of conservation of angular momentum **OR** (a) Definition of radius of gyration (b) because of the centre of gravity of the bus shift to some more height. it reduces the stability **or** for stability of system, PE should be minimum, when height of CG rises then value of PE increases then reduces the stability	1 1 1 1
	26	Velocity-time graph for uniformly accelerated motion Derivation of $v^2=u^2+2as$	1 2
	27	Centripetal acceleration – Diagram (two diagrams- (i) position-vector diagram + velocity-vector diagram) **(If one diagram is missing deduct ½ mark)** Derivation direction of centripetal acceleration **OR** (a)Derivation of relation v = rω Diagram+ derivation (b) 90^0	 ½ + ½ 1½ ½ ½ +1½ 1
	28	Work energy theorem. Statement- (if constant force acting on the body is not given deduct ½ mark Proof – (if diagram given give ½ mark)	 1 2
	29	Definition of torque and angular momentum. Obtaining a relation between torque and angular momentum.	½ + ½ 2

	30	Definition- centre of mass of a system. Obtaining an expression for the centre of mass of a system of two particles. Diagram Derivation **OR** (a)Derivation of expression for rotational kinetic energy Diagram Derivation (b) zero	½ ½ 1+1 ½ 1½ 1
	31	(a) Proving the path of projectile is a parabola Diagram Mathematical expression Justification of parabolic path (b) Proof for two angles θ and (90-θ) of oblique projection the range remains the same. **OR** (a)Derivation i) maximum height (ii) time of flight and (iii) horizontal range. (b) $KE(initial) = \frac{1}{2}mu^2$ $KE(final) = \frac{1}{2}m(u\cos\theta)^2$ $\frac{1}{2}mu^2\cos^2\theta = \frac{3}{4} \times \frac{1}{2}mu^2$ $\cos\theta = \frac{\sqrt{3}}{2}$ $\theta = 30°$	 1 1½ ½ 2 1+1+1 ½ ½ ½ ½
	32	(a) Pulling is easier than Pushing (½ mark for statement only) Two free body diagrams Two equations Justification (b) a = g sinθ - μg cosθ Substitution and final answer 2.835m/s^2 **OR** Deriving an expression for the maximum safe velocity of a car moving in a banked circular road Free body diagram Derivation (b) $4g - T = 4a$ .. ..(1) and for 3kg block $T - 3g = 3a$ . . .(2) solving both equation we will get acceleration $= \frac{g}{7} = \frac{10}{7}$ m/s^2 and tension $= \frac{24g}{7} = \frac{240}{7}$ m/s^2 1.4m/s^2, 33.6N	 ½ +½ ½ +½ 1 ½ 1+1/2 1½ 1½ ½ ½ ½ ½

	33	(a) The relative velocity of approach before impact is equal to the relative velocity of separation after impact. – Proof Equation according to law of conservation of energy Equation according to law of conservation of momentum Remaining part of derivation (b) $\therefore$ Mass of water pumped = Volume × Density $= (30\ m^3)(10^3\ kg\ m^{-3}) = 3 \times 10^4 kg$ $P_{output} = \frac{W}{t} = \frac{mgh}{t} = \frac{(3 \times 10^4 kg)(10\ ms^{-2})(40\ m)}{900\ s}$ $= \frac{4}{3} \times 10^4 W$ Efficiency, $\eta = \frac{P_{output}}{P_{input}}$ $P_{input} = \frac{P_{output}}{\eta} = \frac{4 \times 10^4}{3 \times \frac{30}{100}} = \frac{4}{9} \times 10^5$ $= 44.4 \times 10^3 W = 44.4\ kW$. **OR** (a)Deriving an expression for the potential energy stored in a system of a block attached to a massless spring, when the block is pulled from its mean position. Diagram Derivation (any method graphical or calculus based) (b) $\frac{1}{2}mv^2 = \frac{1}{2}kx^2$ $v^2 = \frac{kx^2}{m} = \frac{24.5 \times (\frac{40}{100})^2}{2}$ (i) $v = 0.4\sqrt{12.25} = 0.4 \times 3.5 = 1.4$ m/s	 1 1 1 ½ ½ ½ ½ ½ 2½ ½ 1 ½
	34	(i) A cricketer lowers his hands while catching a ball because this increases the time of catch which in turn decreases the momentum since force = (change in momentum) / (time). Therefore, he needs to apply a small force to stop the ball and also the ball exerts a small force on his hands which prevents him from injury. (ii) Newton's first law from second law (iii) $a = F/m = -50/20 = -2.5\ m/s^2$ $v = u + at$ $0 = 15 - 2.5\ .t$ so $t = 6s$ **OR** $v = u + at$ $3.5 = 2 + a \times 25$ so $a = 0.06\ m/s^2$ $F = ma = 3 \times 0.06 = 0.18\ N$	1 1 1 1 1 1
	35	(i) Torque is vector and work is scalar (ii) $\zeta = r\ .F.\ \sin\theta$ If r is more and $\theta = 90^0$ then torque will be maximum (iii) $\zeta = 2 \times 0.04 = 0.08$ N-m **OR** mg x 5.0 = (2x5) x g x 33.0 m= 66.0 g	1 1 2