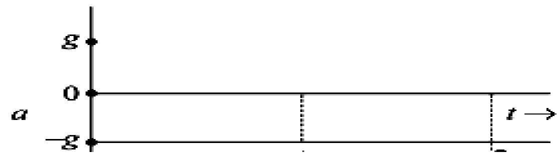
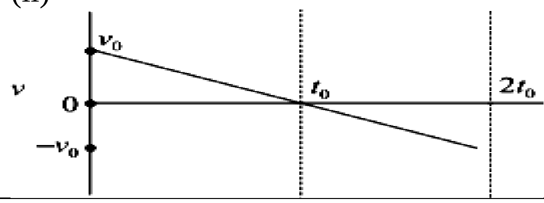
SET	B

INDIAN SCHOOL MUSCAT
HALF YEARLY EXAMINATION 2022
PHYSICS-042

CLASS:XI Max.Marks: 70

MARKING SCHEME			
SET	QN.NO	VALUE POINTS	MARKS
SET B	1	(ii) or (iv)	1
	2	(ii) 2	1
	3	1 mark for any one option	1
	4	(iii) Initial velocity of the object	1
	5	(ii) 13.5J	1
	6	(iii) 1:2	1
	7	(iii) 1.7 g cm^{-3}	1
	8	(i) Tension and surface tension	1
	9	1 mark for any one option	1
	10	(ii) 48km/h	1
	11	(ii) R = 4H	1
	12	(ii) halved	1
	13	(i) or (ii)	1
	14	(i) mg (sinα + μcosα)	1
	15	(ii) Move in opposite directions with equal speeds	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	By dimensional method, proving 1N=10^5dyne **OR** Show that M varies with the sixth power of the velocity of flow. **(If dimensions are correct in both sides of equation give 2 marks)**	3 3
	21		

		(i) Acceleration-time graph  (ii) 	1 1
	22	(a)Statement of triangle law of vector addition (b) equal vectors are vectors that have the same magnitude and the same direction. A unit vector is one whose magnitude is equal to one and used to describe a vector's direction.	1 ½ ½
	23	(a) When the speeding bus stops suddenly, the lower part of the passengers's body in contact with the seat mains at rest whereas the upper part of the body of the passengers continues to be in state of motion due to inertia. (b) Area of contact between the tyre and the ground is reduced. This reduces rolling friction.	1 1
	24	Any two difference between elastic and inelastic collision	1+1
	25	(a) Internal forces do not cause any change in th motion of CM so there will be no change in velocity of centre of mass of the compartment. (b) Moment of inertia-definition **(for formula give ½ mark)** **OR** (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. Because of the centre of gravity of the bus shift to some more height. it reduces the stability. (b) No, the CG of a solid body does not always lie within material of body. Eg: center of gravity of hollow sphere, ring lie at center but there is no material of body or any other relevant eg	1 1 1 ½ ½
	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 +1 ½ 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) 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) $\frac{1}{2}mv^2 = \frac{1}{2}kx^2$ $v^2 = \frac{kx^2}{m} = \frac{24.5 \times (\frac{40}{100})^2}{2}$ $v = 0.4\sqrt{12.25} = 0.4 \times 3.5 = 1.4$ m/s	 1 1 1 ½ ½ ½ ½ ½ 2½ ½ 1 ½
	32	(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.	 1 1½ ½ 2 1+1+1

		(b) $KE(initial) = \frac{1}{2}mu^2$ $KE(final) = \frac{1}{2}m(u\cos\theta)^2$ $\frac{1}{2}mu^2\cos^2\theta = \frac{3}{4} \times \frac{1}{2}mu^2$ $\cos\theta = \frac{\sqrt{3}}{2}$ $\theta = 30°$	½ ½ ½ ½
	33	(a) Pulling is easier than Pushing (½ mark for statement only) Two free body diagrams Two equations Justification (b) $a = g\sin\theta - \mu g\cos\theta$ Substitution and final answer $2.835 m/s^2$ **OR** (a) 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 $= \frac{24g}{7} = \frac{240}{7} m/s^2$ $1.4 m/s^2$, 33.6N	½ +½ ½ +½ 1 ½ 1+1/2 1½ 1½ ½ ½ ½ ½
	34	(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
	35	(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 X 25 so $a = 0.06 m/s^2$ F = ma = 3 x 0.06 = 0.18 N	1 1 1 1 1 1