INDIAN SCHOOL MUSCAT

FIRST TERM EXAMINATION

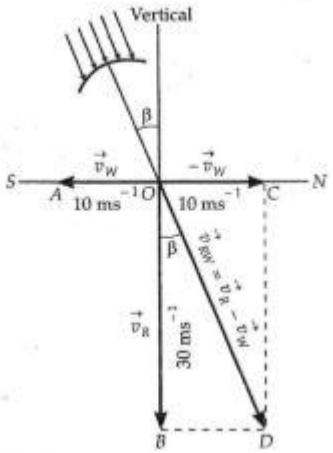
SEPTEMBER 2018

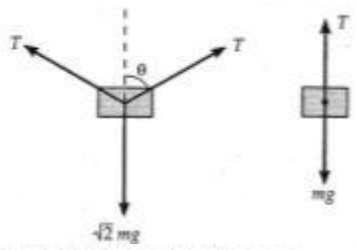
CLASS XI

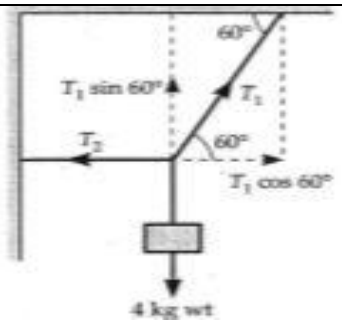
Marking Scheme – PHYSICS [THEORY]

SET - B

Q.NO.	Answers	Marks
	SECTION-A	
1.	$F_G : F_W : F_E : F_S = 1 : 10^{25} : 10^{36} : 10^{38}$	1
2.	Definition instantaneous velocity	1
3.	Definition of angle of friction	1
4.	$r = 1.496 \times 10^{11} / 3.08 \times 10^{16} = 4.86 \times 10^{-6}$ parsec	1
5.	No , two vectors can be combined to give zero resultant only if they have equal magnitude but in opposite directions	½ , ½
	SECTION-B	
6.	Four advantages of SI system over other systems	4 x ½
7.	Statement and verification of commutative law of vector addition Statement Vector diagram Verification	 ½ ½ 1
8.	Position –time graphs for relative velocity (i) zero (ii) positive	1,1
9.	(i) Definition of impulse (ii) Explanation- why a cricketer moves his hands backwards while holding a catch. **OR** (i) Definition of coefficient of kinetic friction. (ii) Explanation- proper inflation of tyres of vehicles	1 1 1 1
10.	Prove $R_{max} = 4 H_{max}$ For $\theta = 45^0$ Remaining proof	 ½ 1 ½
11.	(i) Velocity-time graph for an object thrown vertically upwards returning to the point of projection.	1

	(ii) No, as time increases distance also increases	½ ,½
12.	(i)Why a gun recoils back when it is being fired? Explanation on the basis of action and reaction or by law of conservation of linear momentum (ii) Why a passenger falls forward when a moving bus suddenly stops? Explanation on the basis of inertia of motion	
	SECTION-C	
13.	$T = K p^a d^b E^c$ $M^0 L^0 T = (M L^{-1} T^{-2})^a (ML^{-3})^b (ML^2 T^{-2})^c$ $M^0L^0T = M^{a+b+c} L^{-a-3b+2c} T^{-2a-2c}$ $a+b+c = 0$……..(1) $-a -3b +2c = 0$ ……(2) $-2a-2c = 1$…….(3) $a= 5/6$, $b = ½$, $c = 1/3$ **$T = d^{1/2}. E^{1/3}/ p^{5/6}$**	1 1½ ½
14.	Velocity – time graph Body is moving with uniform acceleration. Derivation of $s = ut + ½ at^2$ Derivation $v^2 = u^2 +2as$	½ ½ 1 1
15.	 $\vec{OD} = \vec{v}_R + (-\vec{v}_W) = \vec{v}_R - \vec{v}_W = \vec{v}_{RW}$ = Velocity of rain relative to woman cyclist $v_{RW} = OD = \sqrt{OC^2 + OB^2} = \sqrt{10^2 + 30^2}$ $= 10\sqrt{10} = 31.6 \text{ ms}^{-1}$ If OD makes angle β with the vertical, then $\tan\beta = \frac{BD}{OB} = \frac{OC}{OB} = \frac{10}{30} = 0.3333$ or $\beta = 18°26'$ The woman should hold her umbrella at 18°26′ with the vertical in the direction of her motion *i.e.*, towards south.	
16.	pulling is easier than pushing Free body diagram	

	Two equations Explanation with help of equations	½ ,½ ½ ,½ 1
17.	Newton's second law of motion is real law of motion. (i) Newton's first law of motion from Newton's second law of motion. (ii) Newton's third law of motion from Newton's second law of motion.	 1 2
18.	(i) Definition of principle of homogeneity. (ii) Definition dimensional constant and example. (iii) Distinguish between accuracy and precision.	1 1 1
19.	Derivation - distance travelled by a body in the **nth** second is $\mathbf{S_{nth} = u + \frac{a}{2}(2n-1)}$	3
20.	i) Not necessarily, if velocity increases , acceleration acts in direction of velocity and velocity decreases, then acceleration acts in opposite direction of velocity (ii) Yes, in uniform circular motion (iii) Yes, when two bodies move in opposite directions	½ ,½ ½ ,½ ½ ,½
21.	(i) Statement of parallelogram law of vector addition. (ii) $(\vec{A} + \vec{B}).(\vec{A} - \vec{B}) = 0$ $\vec{A}.\vec{A} - \vec{A}.\vec{B} + \vec{B}.\vec{A} - \vec{B}.\vec{B} = 0$ $A^2 - B^2 = 0$ $A = B$	1 ½ 1 ½
22.	 For the equilibrium of mass m, $mg = T$ For the equilibrium of mass $\sqrt{2}m$, $\sqrt{2}mg = 2T\cos\theta = 2mg\cos\theta$ $\therefore \cos\theta = \frac{1}{\sqrt{2}}$ or $\theta = 45°$ **OR**	1 1 1 1 1 1

	 $T_1 \sin 60° = 4 \text{ kg wt} = 4 \times 9.8 \text{ N}$ ...(i) $T_1 \cos 60° = T_2$ ...(ii) From (i), $T_1 = \frac{4 \times 9.8}{\sin 60°} = \frac{4 \times 9.8 \times 2}{\sqrt{3}} = 45.26 \text{ N}$ From (ii), $T_2 = T_1 \cos 60° = 45.26 \times 0.5 = 22.63 \text{ N}$	
23.	Definition of angle of repose. Relation with coefficient of static friction- FBD Relation	1 1 1
24.	(i) Definition of concurrent forces? (ii) Condition for translation equilibrium. (iii) Condition for the equilibrium of three concurrent forces.	1 1 1
	SECTION-D	
25.	(i) Statement of law of conservation of linear momentum Verification of law (ii) $\Delta p_x = -2p\cos 45^0$ $\Delta p_y = 0$ $\Delta p = -2 \cdot 5 \cdot 1/\sqrt{2} = 7.1$ kgm/s OR (i)) Definition of the coefficient of static friction. Expression for the acceleration of a body sliding down a rough inclined plane- Free body diagram Derivation of formula (ii) F = n x m(v-u)/t Substitution of all n = 3 bullets per second	1 2 1 ½ ½ 1 1 1 ½ 1½
26.	(i) Projectile path a parabolic path- Diagram with full representation of all velocity vectors Derivation (ii) $t = \sqrt{\frac{2h}{g}} = 10\ s$ $x = 98 \times 10 = 980m$ **OR**	1 2 1 1

	(i) Definition of centripetal acceleration Expression of centripetal acceleration: Two diagrams: (a) position –vector diagram (b) velocity – vector diagram Derivation of formula (ii) $\omega = 2\pi n = 2x\ 22/7\ x\ 7/100 = 0.44$ rad/s $V = r\omega = 12 \times 0.44 = 5.28$ cm/s	1 ½ ,½ 1 1 1
27.	(i) How is random error eliminated : Definition of (a) absolute error (b) mean absolute error (c) relative error and (d) percentage error (ii) $v = 4/3\ \pi\ r^3$ $= 4/3 \times 3.14 \times (1.41)^3\ cm^3 = 11.736\ cm^3$ $= 11.7\ cm^3$ (rounded off upto 3 SF) OR (i) Meaning of parallax and parallactic angle? Measurement the distance of moon by parallax method: Diagram Measurement (ii) Angular diameter $\theta = 1920'' = 1920 \times 4.85 \times 10^{-6}$ rad Linear diameter of the sun $D = S \times \theta = 1.5 \times 10^{11} \times 1920 \times 4.85 \times 10^{-6} = 1.4 \times 10^9$ m	1 ½ ,½ ½ ,½ 1 1 ½ ,½ 1 1 1 1