ANSWER KEY

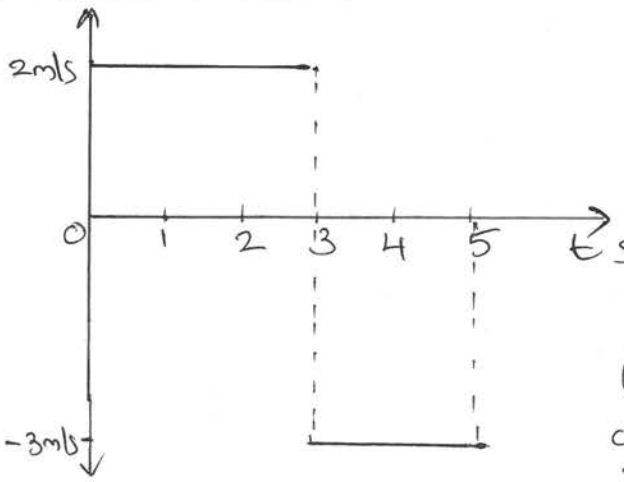
..FIRST YEAR HIGHER SECONDARY EXAMINATION ..JUNE 2022

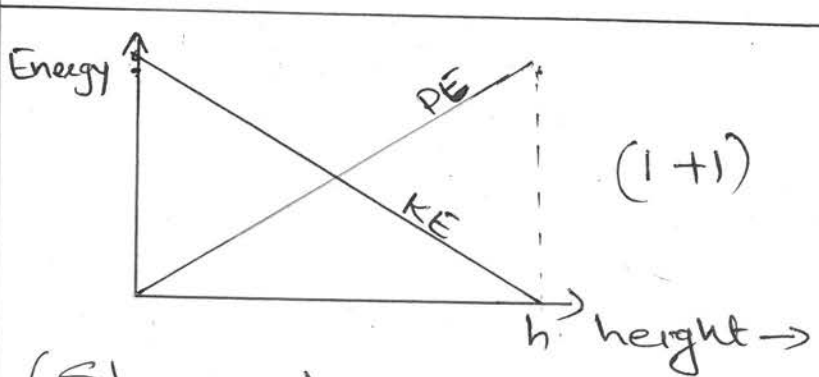
PART-I/II/III

SUBJECT: .....PHYSICS.....

CODE NO: .F.Y.... 24 **VERSION:** ....

.60. **SCORES** ....2.... **HOURS**

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
1.		Optics		1
2.		MT^{-2}		1
3.		$\theta = 90^\circ$ / $\pi/2$		1
4.		2.3 km/s		1
5.		Decreases		1
6.		Light body		1
7		Zero / minimum		1
8.		 upper half (½) lower half (½) Graph without values (½) Displacement = 6 - 6 = 0 / s = 0	1 1	2

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
9.		At highest point. $V = u\cos\theta = 5\cos 30 = 4.33$ m/s $= 5\frac{\sqrt{3}}{2}$ m/s or At highest point $V_y = 0$ (½) $V_x = u\cos\theta$ (½) Acceleration $a = -g$ or $= -9.8$ m/s^2 (Sign not necessary)	1 1	2
10.	(a)	Law of conservation of linear mtm or Third law of motion	½	
	(b)	$V = \frac{-mv}{M} = \frac{-15\times10^{-3}\times100}{2} = -075$ m/s [Equation only 1 mark]	1½	2
11.		 (1+1) (Shape only 1 mark)	2	2.
12.		A - Proportional limit B - Yield point / Elastic limit E - Fracture point / Break point OO - Permanent set / Residual strain	½ ½ ½ ½	2

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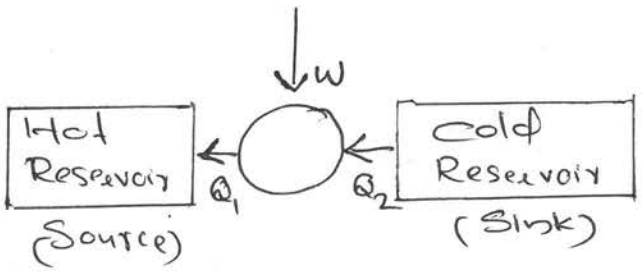
13.		 Coefficient of performance $\beta = \frac{Q_2}{W} / \frac{Q_2}{Q_1 - Q_2} / \frac{T_2}{T_1 - T_2}$	$1\frac{1}{2}$ $\frac{1}{2}$	2
14.		$I_1\omega_1 = I_2\omega_2$ $\frac{K_1}{K_2} = \sqrt{\frac{\omega_2}{\omega_1}}$	1 1	2
15.		$LHS = [V] = LT^{-1}$ $RHS = \left[\sqrt{\frac{GM}{R}}\right] = LT^{-1}$ LHS = RHS or Equation is correct OR or Statement of principle of homogeneity (1 mark)	1 1 1	3
16.		Derivation of $a_c = \frac{v^2}{R} / v\omega / R\omega^2$ fig only 1 mark final answer 1 mark.	3	3
17.		Proof of Total mechanical energy of a freely falling body = mgh with figure. fig only 1 mark Each part carries 1 mark	3	3

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
18	(a)	Derivation of $g' = g(1-\frac{d}{R})$	2	
		$g = \frac{Gm}{R^2}$ / $\frac{4}{3}\pi R \rho G$ 1 Score		
		$g' = g(1-\frac{d}{R})$ 1 score.		3
	(b)	$W = 0$	1	
19.	(a)	Statement of Pascal's law	1	
	(b)	$F_2 = \frac{F_1}{A_1} A_2$ / $\frac{F_1}{A_1} = \frac{F_2}{A_2}$	2	3
		OR		
		$P = F/A$ only ($\frac{1}{2}$ score)		
20.	(a)	Radiation	1	
	(b).	$\frac{\text{change in temp}}{\text{time}} = K\Delta T$		
		$\frac{8^\circ c}{2\,\text{minut}} = K\,70^\circ c$ — ① ($\frac{1}{2}$)	1	3
		$\frac{2^\circ c}{t} = K\,50^\circ c$ — ② ($\frac{1}{2}$)		
		①/② ⇒ $t = 0.7$ min. $= \underline{42}$ sec	1	
21.		$P = \frac{1}{3} n m \bar{v}^2$	$\frac{1}{2}$	
		$PV = \frac{1}{3} n V m \bar{v}^2$ $nV = N$		
		Derivation of $E_K = \frac{3}{2} RT$ (any correct method)	2	
		Average KE of a molecule		3
		$\bar{E} = \frac{3}{2}\frac{RT}{N}$		
		$= \frac{3}{2} K_B T$	$\frac{1}{2}$	
		OR		
		Final Answer only 1 mark		

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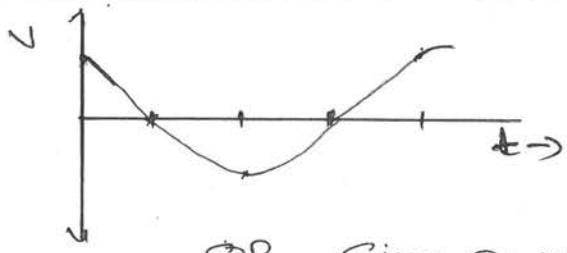
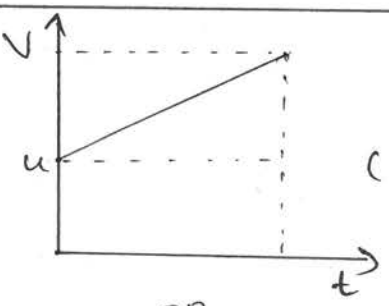
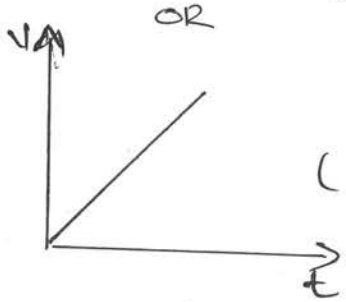
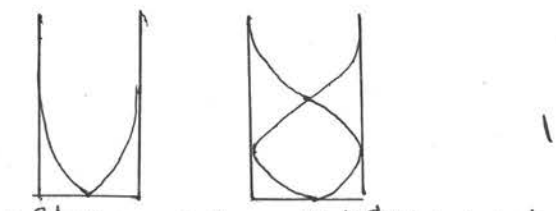
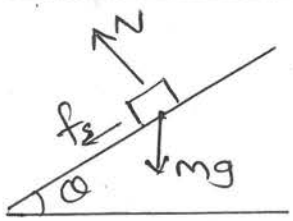
22.	(a)	 OR Sine curve	1	
	(b)	$A = 20cm \quad K = \frac{F}{D} = \frac{50}{20\times10^{-2}} = 2.5\times10^{2}\ N/m$	½	
		$\omega = \sqrt{\frac{K}{m}} = \sqrt{\frac{2.5\times10^{2}}{2}} = 11.2\ rad/s$	½	3
		$a = -\omega^2 x = -(11.2)^2 \times 10\times10^{-2} = 12.5\ m/s^2$	½	
		$KE = \frac{1}{2}m\omega^2(A^2-x^2) = \frac{1}{2}\times2\times(11.2)^2\left[\frac{400}{100}\right]\times10^{-4}$		
		$= 37,632\times10^{-4}\ J$	½	
		OR $= 3.76\ J$		
		$K = \frac{F}{x}$ / $\omega = \sqrt{\frac{K}{m}}$ / $a = -\omega^2 x$ / $KE = \frac{1}{2}m\omega^2(A^2-x^2)$ (1 Score)		
23.	(a)	 (1) S = Area under graph $= ut + \frac{1}{2}at^2$ (1)	2	
	(b)	OR  (1)		4
	(b)	$h = ut + \frac{1}{2}gt^2$ (1) $-25 = 20t + \frac{1}{2}(-10)t^2$	2	
		$t = 5\ sec$ (1) OR Any correct method		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
24.	(a)	Increases	1	
	(b)	$m(g+a)$ or $\frac{m(g+a)}{g}$	1	
	(c)	App. wt $= 30(10-5) = 150\,N$		4
		OR $\frac{30(10-5)}{10} = 15\,kg\,wt$	2	
25.	(a)	Derivation of $\tau = \frac{dL}{dt}$ (Any method)	2	
	(b)	$I_1\omega_1 = I_2\omega_2$ 1 score		
		$V_2 = \frac{1}{8}V_1$		
		$R_2 = \frac{R_1}{2}$		4
		$\therefore \frac{2}{5}mR_1^2\frac{1}{T_1} = \frac{2}{5}mR_2^2\frac{1}{T_2}$	2	
		$T_2 = \frac{24}{4} = 6$ hrs (1 score)		
26.	(a)	Viscous force, Gravitational force, Upthrust (buoyant force)	1½	
	(b)	Derivation of $V_t = \frac{2}{9}\frac{r^2(\rho-\sigma)g}{\eta}$	2½	4
		or final eqn - 1 mark		
27.	(a)	 1+1	2	
	(b)	$\nu_1 = \frac{V}{4L}$ (1)		4
		$\nu_2 = \frac{3V}{4L}$ (1) $\nu_1 : \nu_2 = 1:3$	2	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
28.	(a)		2	
	(b)	$N\cos\theta = mg + f_s \sin\theta$ 1 mark		5
		$N\sin\theta + f_s\cos\theta = \frac{mv^2}{r}$ 1 mark	3	
		$v = \sqrt{\frac{rg(\tan\theta+\mu)}{1-\mu\tan\theta}}$ 1 mark		
29.	(a)	$\frac{mv^2}{r} = \frac{GMm}{r^2}$ 1 score		
		$v = \sqrt{\frac{GM}{r}}$ 1 score.	3	
		Period $T = 2\pi\sqrt{\frac{r^3}{GM}}$ 1 score.		5
	(b)	One use of Geostationary satellite	1	
		One use of Polar satellite	1	
30.	(a)	Statement / Equation 2 score.	4	
		Derivation 2 score		5
	(b)	Non Viscous, incompressible Stream.	1	
		Line flow, steady flow (Any two)		
31.	(a)	PV = a constant	1	
	(b)	$W = \int_{V_1}^{V_2} P\,dv$ (1)		
		$= \int_{V_1}^{V_2} \frac{RT}{V}\,dv$ (1)	3	
		$= RT \ln \frac{V_2}{V_1}$ — (1)		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total Score
	(c)	$\eta = 1 - \frac{T_2}{T_1}$ (½) $1 - \frac{293}{398} = 0.264$ (½) 26.4%.	1	5
32.	(a)	fig 1 score.		
		$F = -mg\sin\theta$ (½)	2	
		$a = -\frac{g}{\ell}x$ (½)		
	(b)	$T = 2\pi\sqrt{\frac{\ell}{g}}$	1	5
	(c)	Pendulum whose time period T=2s	1	
		length = 1m	1	

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