

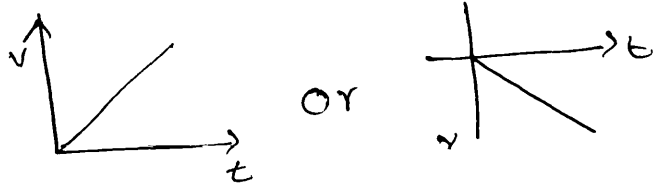
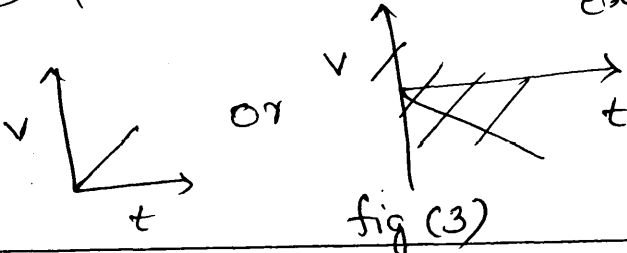
PHYSICS

FIRST YEAR HIGHER SECONDARY EXAMINATION MARCH 2018

SUBJECT: PHYSICS FIRST YEAR

CODE. NO: 115

Qn No	Sub Qns	Answer Key/Value Points	Score	Total
1.	b) Thermodynamics.		1	1
2	statement of 11 axes theorem / eqn.		1	1
3	b Intensity of gravitational field has same dimensions as that of acceleration.		1	1
4	Kinetic		1	1
5	2 s		1	1
6	Velocity - time graph		1	2
	Derivation of $x = v_0 t + \frac{1}{2} a t^2$		1	
7	a $E = \frac{1}{2} m (v \cos \theta)^2$ or $E = \frac{1}{2} m v^2 (\frac{1}{2})$ $v = u \cos \theta (\frac{1}{2})$		1	2
	b $E = \frac{1}{2} \times 0.2 \times (20 \times \cos 40) ^2$ $= 23.47 \text{ J}$ or (Answer only $\frac{1}{2}$)		1	
8	a 0		$4 \times \frac{1}{2}$	2
	b -ve / 0			
	c +ve			
	d +ve			

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
9	a	$-\frac{GMm}{R} + \frac{1}{2}mv^2 = 0$ $v = \sqrt{\frac{2GM}{R}}$ or any correct derivation (2) eqn only (1)	1	2
10	a	Yield point or elastic limit	1	2
	b	Far apart / close	1	
11		$v = \frac{2}{9\gamma} a^2 (p - \sigma) g$ substitution Ans only (1/2)	1	2
12	a		1	3
	b	Definition or correct explanation	1	
	c	 fig (3)	1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
13	a	ii) The momentum acquired by the gun and shot have the same magnitude	1	3
	b	$V = \frac{mv}{M}$ $V = \frac{mv}{M} = \frac{0.02 \times 80}{100} = 0.016 \text{ m/s}$ or eqn & sub answer only (4/2)	1	
14.	a	Derivation $g_d = g \left(1 - \frac{d}{R}\right)$	2	
		eqn (1)		3
	b	At surface $d=0$ $g_d = g$ or At Centre $d=R$ $g_d = 0$	1	3

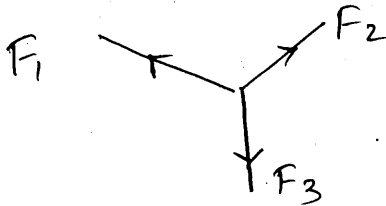
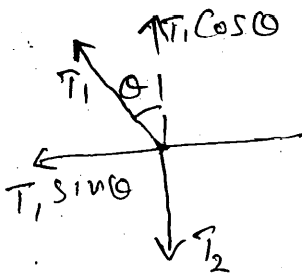
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
15	a	Hydraulic lift	1	
	b	$P = F/A = \frac{3000 \times 9.8}{425 \times 10^{-4}}$ $= 691 \times 10^5 \text{ N m}^{-2}$ OR eqn only (1) substitution (1) OR $F_1/A_1 = F_2/A_2 \quad (1)$	1	3
16	16	derivation $P = \frac{1}{3} n m \bar{v}^2$ eqn or fig only (1) OR change in momentum = $2mV_x$ Force — (1) L (1) Pressure — (1)	3	3
17	17	Heat lost by water $= 0.3 \times 4186 \times 43.3 = 54376 \text{ J}$ heat absorbed by ice to melt $= 0.15 L_f$	1	

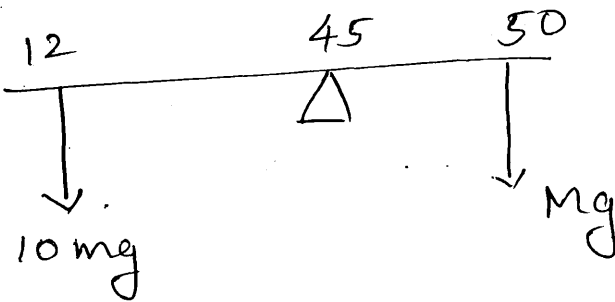
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
		Heat absorbed by water $Q_{\text{room ice}} = 0.15 \times 4186 \times 6.7$ $= 4207 \text{ J}$ $54376 = 4207 + 0.15 L_f$ $L_f = 3.34 \times 10^5 \text{ J/kg}$ OR heat lost = heat gained (1) heat lost = $m C \Delta T$ — (1) $\therefore H = m L$ — (1)	$\frac{1}{2}$ $\frac{1}{2}$	3
18	a	True / False.	1	
	b	$\frac{\Delta P}{P} \times 100\% = 3 \frac{\Delta a}{a} \times 100\% +$ $2 \frac{\Delta b}{b} \times 100\% +$ $\frac{1}{2} \frac{\Delta c}{c} \times 100\% +$ $\frac{\Delta d}{d} \times 100\%$	2	

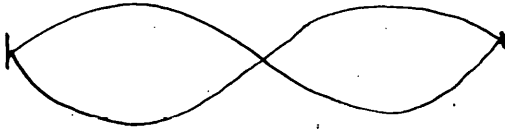
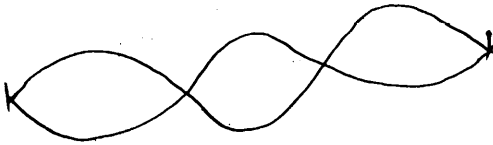
Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
19	a	$\frac{\Delta P}{P} \times 100\% = 13\%$	1	4
		OR		
		If $\sqrt{cd}$ is taken as $\sqrt{cd}$ Then $\frac{\Delta P}{P} \times 100 = 11.5\%$ Give 3 score		
		90°	1	
	b	$a = \frac{v^2}{r} = r\omega^2$	1	4
		$a = r(2\pi f)^2$	1	
		Substitution	1	
		OR		
20	a	$\omega = \frac{2\pi}{T} \quad - (1)$		4
		OR		
		$\omega = 2\pi f \quad - (1)$		
			1	
	b	0		4
		$ F = \sqrt{50} \text{ N}, d = \sqrt{50} \text{ m}$	1	
		$\vec{F} \cdot \vec{d} = 16 \text{ Nm}$	1	
		$\cos \theta = \frac{\vec{F} \cdot \vec{d}}{Fd} = 0.32$	1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
21		OR		
		$\vec{F} \cdot \vec{d} = Fd \cos \theta$	1	
		$ \vec{F} = \sqrt{50} \text{ N}$	1	
		$ \vec{d} = \sqrt{50} \text{ m}$	1	
	a	$\eta = 1 - \frac{T_2}{T_1}$ or $\eta = 1 - \frac{Q_2}{Q_1}$	1	
	b	All processes	1	
	c	$\frac{T_2}{T_1} = \frac{Q_2}{Q_1}$		4
		$\frac{273}{373} = \frac{Q_2}{4200}, Q_2 = 3075 \text{ J}$	2	
		OR		
	b	Four processes $(4 \times \frac{1}{2})$	2	
	c	$\frac{T_2}{T_1} = \frac{Q_2}{Q_1}$	$\frac{1}{2}$	
		Substitution or Answer	$\frac{1}{2}$	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
22	a	$a = -10x$	1	4
	b	$v = -A\omega \sin \omega t$	1	
		$a = -A\omega^2 \cos \omega t$	1	
		$a = -\omega^2 x$	1	
		OR		
	b	$v = \frac{dx}{dt} - (1/2)$		
		$a = \frac{dv}{dt} - (1/2)$		
		$a = -\omega^2 y (1/2)$		
		$v = \omega \sqrt{A^2 - x^2} (1)$		
		OR		
		Also derivation with		
		$x = A \sin \omega t$ - give full credit.		

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
23	a	Vector sum of all forces = 0	1	5
	b	$T \cos \theta = 60$	1	
		$T \sin \theta = 50$	1	
		$\theta = \tan^{-1}(5/6) = 40^\circ$	1	
	c	40° or no change	1	
	a	OR $\vec{F}_1 + \vec{F}_2 + \vec{F}_3 = 0$ or $\sum \vec{F} = 0$	2	2
		OR 	2	
	b		2	
	c	no change / 40° OR length is independent	1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
24	a	$\vec{\tau} = \vec{r} \times \vec{F}$	1	5
	b	 $2 \times mg \times 33 = mg \times 5$ $2 \times 5 \times g \times 33 = mg \times 5$ $m = 66g$	1	
	c	derivation of $\vec{\tau} = \frac{d\vec{L}}{dt}$	2	
	a	OR $\vec{\tau} = \vec{r} \times \vec{F}$	2	
	b	sig or Principle of moments or eqns like $m_1 r_1 = m_2 r_2$	1	
	c	eqn only	1	
		derivation	1	

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
25	a	Capillarity Or Capillary rise	1	5
	b	zig + deriv	3	
	c	small	1	
	b	OR Correct derivation	3	
		zig OR	1	
derivation OR eqn only		1 1		
26	a		1	
		OR		
				
				
				

Qn. No	Sub Qns	Answer Key/Value Points	Score	Total
	b	Correct proof	2	5
	c	$\lambda = \frac{1}{2l} \sqrt{\frac{T}{\mu}}$ $T = 248 \text{ N}$	1	
		OR	1	
	a	each fig (1 mark) Total (2 marks)	2	5
	b	Proof	2	
	c	$\lambda = \frac{1}{2l} \sqrt{\frac{T}{\mu}}$	1	
		OR		
	(b)	Fundamental frequency	1	
		$\lambda = \frac{v}{2L}$		