FIRST YEAR HIGHER SECONDARY IMPROVEMENT EXAMINATION JULY 2017

SUBJECT : PHYSICS

CODE. NO: 815

Qn No	Sub Qns	Answer Key/Value Points	Score	Total
1.		c.	1	1
2.	a.	Dimension of V	½	4
		" " V_0	½	
		" " at	½	
		Eqn. is dimensionally correct	½	
	b.	(ii)	1	
	c.	(iii)	1	
3.	a.	(iii)	1	4
	b.	Graph	1	
		Area under v-t graph represent displacement	½	
		Final result	½	
		(For other correct derivation give 1 mark)		
	c.	(i)	1	
4	a.	(ii)	1	(2)
	b.	Derivation for time to reach maximum height	(H)	
		OR		
		Time of flight (T)		
		OR		
		Derivation for maximum height		
		(Eqn only ½ mark each)		
	c.	$V_{ox} = V_0 \cos\theta_0 = 37 \cos 53.1 = 22.2$ m/s	½	

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		$x = V_{ox}t = (V_0\cos\theta_0)t = 22.2 \times 2 = 44.4\,m$	½	5
		$V_{oy} = V_0 \sin\theta_0 = 37 \sin 53.1 = 29.6\ m/s$	½	
		$y = V_{oy}t - \frac{1}{2}gt^2 = 29.6 \times 2 - \frac{1}{2} \times 9.8 \times 2^2 = 39.6\,m$	½	
		(for eqns. only 1 mark)		
5.	a.	(iii)	1	6
	b.	The different forces acting on the man are a) the upward normal force from the floor b) his wt. acting downward. c) the force exerted by the rope pulling to the left and d) the frictional force of the floor pushing the man to the right Cany two force 1 mark)	1	
	c.	Resultant force is zero.	1	
		Vectors diagram showing forces give 1 mark) Related explanation give full mark	3	
6.	a.	work - energy theorem - correct derivation $(v^2 - u^2 = 2as$ OR -1 mark)	2.	
	b	According to the law of conservation of momentum $P_3 = \sqrt{P_1^2 + P_2^2} = \sqrt{(mv)^2 + (mv)^2}$ $= \sqrt{2}\,mv$	1	
		Final K.E of the system $= \frac{P_1^2}{2m} + \frac{P_2^2}{2m} + \frac{P_3^2}{2(2m)}$ $= \frac{1}{2}mv^2 + \frac{1}{2}mv^2 + \frac{1}{2}mv^2 = \frac{3}{2}mv^2$	1	
		Before the explosion, the particle was at rest and initial K.E = 0	½	

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		According to the law of conservation of energy Total energy released $= \frac{3}{2}mv^2$ OR Momentum is conserved - ½ mark $K.E = \frac{1}{2}mv^2$ - ½ $p = mv$ - ½ $K.E = \frac{p^2}{2m}$ - ½	½	5
7.	a)	M.I of the ring about an axis passing through its centre and ⊥r to its plane $= MR^2$ By ⊥r axes theorem $I_z = I_x + I_y$ M.I of the ring about a diameter is given by, $I = I_d + I_d = 2I_d$ $I_d = I/2 = \frac{MR^2}{2}$	½ ½ ½ ½	
	b)	Translational $K.E = \frac{1}{2}mv^2$ where v is the linear velocity of the ring Rotational $K.E = \frac{1}{2}I\omega^2$, where ω is the ang. vel. of the ring. $\omega = V/R$ and $I = MR^2$ Rot $K.E = \frac{1}{2} \times MR^2 \times \frac{v^2}{R^2} = \frac{1}{2}mv^2 =$ Translational K.E	½ ½ ½ ½	5
	c)	(iii)	1	
8.		Derivation for g Variation of g with depth " " with height (OR any two derivations full mark)	1 1½ 1½	

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		(for final eqns. only ½ mark each) OR Definition Derivation of gravitational potential energy or gravitational potential	(2) (2)	4
9.		(b)	1	1
10.		A has greater Y. A is preferred or Fracture point of A is greater than that of B.	1 1	2
11		Statement of Bernoulli's principle. Diagram & Derivation (final eqn only 1 mark) OR Defn. of surface tension Diagram & derivation (for correct derivation only give 3 marks) (for final eqn only 1 mark) (diagram only 1 mark)	2 2 2 2	4
12.		Using Bernoulli's theorem, $\frac{P_1}{\rho} + \frac{V_1}{2} = \frac{P_2}{\rho} + \frac{V_2}{2}$ $P/2(v_2^2 - v_1^2) = P_1 - P_2$	½ ½	

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		But $P_1 - P_2 = \rho g h$	½	
		$h = \frac{V_2^2 - V_1^2}{2g} = \frac{7^2 - 3^2}{2 \times 10}$		2
		$= 2m$	½	
		OR		
		(Bernoulli's theorem is used give ½ mark		
		OR		
		Bernoulli's theorem eqn - 1 mark)		
13	a.	For each definition give ½ mark.	1½	
		water has the highest specific heat capacity.	½	3
		OR		
		Any three part give 2 marks)	1	
	b	(iii)		
14	a)	For correct derivation.	2	
		(for final eqn. 1 mark)		
	b.	In case of A, $P_2 = P_1 \frac{V_1}{V_2} = 2P_1$	½	
		In case of B, $P_2' = P_1 \left(\frac{V_1}{V_2}\right)^\gamma = 2^\gamma P_1$	½	4
		$\frac{P_2}{P_2'} = 2^\gamma = 2^{1.4}$	½	
		$= 2.64$	½	
		($PV = \text{const}$ (½) $PV^\gamma = \text{const}$ · (½)		
15.		Total internal energy $U = U_0 + U_{Ar}$		
		$= 2 \times 5/2 RT + 4 \times 3/2 RT$	1	

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		$= 11RT = 11 \times 8.3 \times (273+27)$	½	2
		$= 27390$ J	½	
		(OR $U = 11RT$ 1 mark		
		$U_0 = 3/2\,RT$ ½ mark		
		$U_{Ar} = 5/2\,RT$ ½ mark)		
16.		Correct Derivation OR (Eqn. for velocity – 1 mark	4	4
		$K.E = \frac{1}{2}mv^2$ ½ mark		
		$P.E = \frac{1}{2}kx^2$ ½ mark)		
		$F = -kx$ ½ mark		
		(Derivation for K.E & P.E in terms of time or displacement give full mark)		
		OR		
		Diagram and Explanation (Labelled diagrams)	1½	4
		$T = -L(mg\sin\theta)$	½	
		$\therefore I\alpha = -mgL\sin\theta$ and $\alpha = -mgL\sin\theta/I$	½	
		Since θ is small $\sin\theta = \theta$ and $\alpha = -mgL\theta/I$	½	
		But for SHM, acceleration $a = \omega^2 x = \alpha/\theta$	½	
		$\therefore \omega = \sqrt{\frac{mgL}{I}}$ and $T = 2\pi\sqrt{\frac{L}{g}}$	½	
		(for other correct derivation give full mark)		
17	(a)	(iv)	1	4
	(b)	$f = \frac{nV}{2L}$	½	
		$1100 = n \times 330/2 \times 0.30$	½	
		$n = \frac{1100}{550} = 2$	½	
		$n = 2$, means second harmonics	½	
	c)	(i)	1	6/6

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