





- Q.28. (a) Show that for two complementary angles of projection of a projectile thrown with the same velocity, the horizontal ranges are equal.
- (b) For what angles of projection of a projectile is the range maximum.
- (c) For what angle of projection of a projectile, are the horizontal range and maximum height attained by the projectile equal.

OR

Deduce expressions for (a) Time of flight (b) Horizontal range and (c) Maximum height reached by a projectile, in terms of its initial velocity and angle of projection.

- Q.29 State and prove Bernoulli's theorem. Give two applications of it?

(OR)

Describe stress strain relationship for a loaded steel wire and hence explain the terms elastic limit, yield point, tensile strength?

- Q.30 Derive expressions for the kinetic and potential energies of a harmonic oscillator. Hence show that total energy is conserved in SHM.

OR

What is SHM? Show that the acceleration of a particle in SHM is proportional to its displacement. Also derive expression for the time period.

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Marking Scheme

A-1) Coefficient of friction remains unchanged.	1
A-2) No quantity remains constant. The directions of all these vectors change from instant to instant.	$\frac{1}{2} + \frac{1}{2}$
A-3) Kilowatt hour. $(1 \text{ kwhr}) / (1 \text{ ev}) = (3.6 \times 10^6 \text{ J}) / (1.6 \times 10^{-19} \text{ J}) = 2.25 \times 10^{25}$	$\frac{1}{2} + \frac{1}{2}$
A-4) Statement	1
A-5) Capillary rise.	1
A-6) $Rc = \rho VD / \eta$	1
A-7) $\lambda / 2 = L \text{ cm}, \quad \lambda = 80 \text{ cm}$	$\frac{1}{2} + \frac{1}{2}$
A-8) The C G of loaded bus is raised.	1
A-9) The line making angle $60^\circ$ with time axis. $V_A / V_B = \tan 30 / \tan 60 = 1/3$	1
A-10) Explanation based on inertia.	2
OR	
The team gets greater friction force and this leads them to win.	2
A-11) $KE = \frac{1}{2} mv^2 = P^2 / m$ Lighter body have higher K.E.	1
A-12) Definition - 1 mark, Unit – $\frac{1}{2}$ mark, Dimension – $\frac{1}{2}$ mark	2
A-13) 04 conditions	$\frac{1}{2} \times 4 = 2$
A-14) Derivation. $W = R (T_2 - T_1) / 1 - \gamma$	2
A-15) Using the formula $V_{\text{rms}} = \sqrt{\frac{3RT}{M}}$ Substitution, Calculation and Result $T = 20 \text{ K}$	$\frac{1}{2}$
A-16) Using $y(x, t) = A \sin [(2 \pi t / T) + (2 \pi / \lambda)x + \Phi]$ (a) Yes, From right to left, $v = 20 \text{ m/s}$ (b) 3 cm, 5.73 /s	$\frac{1}{2} \times 3 = 1 \frac{1}{2}$
A-17) Newton's Formula, $v = \sqrt{\frac{P}{\rho}} = 280 \text{ m/s}$ Laplace's correction $v = \sqrt{\frac{\gamma P}{\rho}} = 332.5 \text{ m/s}$	1
A-18) 1 <sup>st</sup> law of thermo dynamics, $dQ = du + dw$ (i) Isochoric process, $dw = Pdv = 0, dQ = dU$ (ii) Isothermal process $du = 0, dQ = dW$	1
A-19) Prove, $M \propto v^6$ using dimensions.	1
A-20) Using $S = ut + \frac{1}{2} at^2$ $T = 1 \text{ sec}, \text{ height} = 15.1 \text{ m from ground}$	3
A-21) Newton's 1 <sup>st</sup> law from 2 <sup>nd</sup> law. Newton's 3 <sup>rd</sup> law from 2 <sup>nd</sup> law.	$\frac{1}{2}$
OR	
Statement	1
Explanation of Recoil of gun	2
A-22) Diagram	1
Derivation, $v = \sqrt{rg \tan \theta}$	2
A-23) Definition	1
Proof	2
A-24) Law of Perpendicular axes	1

	Law of parallel axes	1
	Using parallel axes theorem, $I_{cm} = (2/3) M R^2$	1
A-25	Definition	1
	Diagram	$\frac{1}{2}$
	Derivation	$1 \frac{1}{2}$
A-26	Using, work done = S. T. x increase in Surface Area	1
	Substitution – 1 mark, Calculation and Result $3168 \times 10^{-8} \text{ J}$	1
A-27	Derivation	3
A-28	a) Proof	2
	b) $\theta = 45^\circ$ (proof)	1
	c) Proof, $\theta = 75.58^\circ$	2
	OR	
	Diagram- 1 mark, Explanation – 1 mark,	
	Derivation of – a) time of flight – 1 mark	
	b) Horizontal range – 1 mark	
	c) Maximum height – 1 mark	
A-29	Statement	1
	Diagram	1
	Proof	2
	Application	1
	OR	
	Graph	1
	Explanation	1
	Def	$1 + 1 + 1$
A-30	Derivation K E	$1 \frac{1}{2}$
	Derivation P E	$1 \frac{1}{2}$
	Proof of conservation of energy in SHM	2
	OR	
	Definition	1
	Proof	2
	Derivation	2

## Model Question Paper 2008-09, Blue Print, Physics XI Class

Unit No.	Unit	Type of Question			
		VSA (1 marks)	SAI (2 marks)	SAII (3 marks)	(5 marks)
1	Physical World & Measurement	-	-	1	
2	Kinematics	-	1	1	
3	Law of Motion	2	1	2	
4	Work, Energy & Power	1	1	1	
5	Motion of system of particles & Rigid Bodies	1	1	1	
6	Gravitation	-	1	1	
7	Properties of Bulk Matter	2	-	1	
8	Thermodynamics	1	2	-	
9	Behaviour of Perfect gas & Kinetic Theory of gases	-	1	1	
10	Oscillation & Waves	1	2	-	
	<b>Total Marks</b>	<b>08</b>	<b>20</b>	<b>27</b>	

	Type of Question	Marks	No of Question	Total
1	VSA Carry one mark each	1	8	
2	SA I Carry two marks each	2	10	
3	SA II Carry three marks each	3	9	
4	LA Carry five marks each	5	3	
	<b>Total numbers of questions &amp; Marks</b>		<b>30</b>	

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