PHYSICS (Theory)
Class XI

Time Allowed : 3 Hrs Maximum Marks :70

General Instructions:

(i) All question are compulsory

(ii) There are 30 questions in total. Questions 1 to 8 carry one mark each , questions 9 to 18 carry 2 marks each , questions 19 to 27 carry 3 marks each & the questions 28 to 30 carry 5 marks each .

(iii) There is no overall choice, However, an internal choice has been provided in one question of two marks, one question of three marks and all three question of five marks each . You have to attempt only one of the given choices in such questions.

(iv) Use of calculators is not permitted.

Q.1 What happens to coefficient of friction when weight of body is doubled?

Q.2 A body is traveling with a constant speed in on the circumference of a circle, of the quantities –

a) Linear velocity b) Linear Acceleration

c) Acceleration toward the centre and d) Centripetal force,

which remains constant?

Q.3 Which of the two, Kilowatt hour or electron volt is a bigger unit of energy and by what factor?

Q.5 Why is the tip of the nib of a pen slit?

Q.4 State Newton's law of Cooling ?

Q.6 What is Reynolds's Number?

Q.7 The length of a string tied to two rigid supports is 40 cm . What is the maximum wave length of the stationary wave produced on it ?

Q.8 Standing is not allowed in a double Decker bus . Why ?

Q.9 Two straight lines drawn on the same displacement time graph make angles. 30 º & 60 º with time axis respectively which line represents greater velocity? What is the ratio of the two velocities?

Q.10. Why fruits fall down from a tree, when its branches are shaken?

(OR)

In a tug of war, the team that pushes harder against the ground wins why?

Q.11 A light body and a heavy body have the same momentum. Which one will have greater kinetic energy ?

Q.12 Define the Torque. Give its unit and dimension.

Q.13. State the conditions necessary for a satellite to appear stationary?

Q.14 Derive the expression for work done during an adiabatic process

Q. 15 At what temperature is the rms velocity of hydrogen molecule equal to that of an oxygen molecule at 47 º ?

Q.16 A transverse harmonic wave on a string is described by

$$Y(x, t) = 3 \sin(36t + 0.018x + \Pi/4)$$

Where x and y are in cm and t in sec.
The positive direction of x is from left to right.

a) Is this a travelling or a stationary wave? If it is travelling, what are the speed and direction of its propagation?

b) What are its amplitude and frequency?

Q.17 Write Newton's Formula for the speed of sound in air. What correction was made by Laplace in this formula?

Q.18 Apply first law of thermodynamics to
1) An Isochoric process 2) An Isothermal process

Q.19. Assuming that the mass M of the largest stone that can be moved by a flowing river depends upon 'v' the velocity, 'ρ' the density of water and on 'g' the acceleration due to gravity.
Using dimensions show that M varies with the sixth power of the velocity of flow.

Q.20. Two balls are thrown simultaneously, A vertically upwards with a speed of 20 m/s from the ground and B vertically downwards from a height of 40 m/s with the same speed and along the same line of action. At what points do the balls collide? ($g = 9.8\ m/s^2$)

Q.21. Show that Newton's second law of motion is the real law of motion.

(OR)

State the principle of conservation of linear momentum. Explain why the gun recoils when a bullet is fired from it .

Q.22 Derive a relation for the optimum velocity of negotiating a curve by a body in a banked curve.

Q.23 What is meant by elastic collision? Show that in case of one dimensional elastic collision of two bodies, the relative velocity of separation after the collision is equal to the relative velocity of approach before the collision.

Q.24 State the laws of moments of Inertia. The M. I. of a solid sphere about tangent is $(5/3)MR^2$
Where M is mass and R is radius of the sphere. Find the M.I. of the sphere about its diameter .

Q.25 Define acceleration due to gravity show that the value of 'g' decreases with altitude?

Q.26. A liquid drop of diameter 4mm breaks into 1000 droplets of equal size. Calculate the resultant change in energy.
(The surface tension of the liquid is 0.07 N/m)

Q.27. Show that the pressure exerted by a gas is two – third of the average kinetic energy per unit volume of the gas molecules.

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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Class – XI Physics (Theory)

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.	½ + ½
A-3) Kilowatt hour.	
(1 kwhr) / (1 ev) = $(3.6 \times 10^6$ J) / $(1.6 \times 10^{-19}$ J) = 2.25×10^{25}	½ + ½
A-4) Statement	1
A-5) Capillary rise.	1
A-6) $Rc = \rho VD / \eta$	1
A-7) $\lambda/2 = L$ cm, $\lambda = 80$ cm	½ + ½
A-8) The C G of loaded bus is raised.	1
A-9) The line making angle 60° with time axis.	1
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 = ½ $mv^2 = P^2 / m$	1
Lighter body have higher K.E.	1
A-12) Definition - 1 mark, Unit – ½ mark, Dimension – ½ mark	2
A-13) 04 conditions	½ x 4 = 2
A-14) Derivation. $W = R(T_2 - T_1) / 1 - \gamma$	2
A-15) Using the formula V rms = $\sqrt{\frac{3RT}{M}}$	½
Substitution, Calculation and Result T = 20 K	½ x 3 = 1 ½
A-16 Using $y(x, t) = A \sin[(2\Pi t / T) + (2\Pi / \lambda) + \Phi]$	
(a) Yes, From right to left , v = 20 m/s	1
(b) 3 cm, 5.73 /s	1
A-17 Newton's Formula, v = $\sqrt{\frac{P}{\rho}}$ = 280 m/s	1
Laplace's correction v = $\sqrt{\frac{\gamma P}{\rho}}$ = 332.5 m/s	1
A-18 I^{st} law of thermo dynamics, dQ = du + dw	
(i) Isochoric process, dw = Pdv = 0, dQ = dU	1
(ii) Isothermal process du = 0, dQ = dW	1
A-19 Prove, M α v^6 using dimensions.	3
A-20 Using $S = ut + ½ at^2$	½
T = 1 sec, height = 15.1 m from ground	1 ½ + 1
A-21 Newton's Ist law from 2^{nd} law.	1 ½
Newton's III^{rd} law from 2^{nd} law.	1 ½
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	½
	Derivation	1 ½
A-26	Using, work done = S. T. x increase in Surface Area	1
	Substitution – 1 mark, Calculation and Result 3168×10^{-8} 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 ½
	Derivation P E	1 ½
	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 m
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 pf 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	-	
	Total Marks	**08**	**20**	**27**	

	Type of Question	Marks	No of Question	T
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	
	Total numbers of questions & Marks		**30**	

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