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Practice Paper

2013-2014

STD:- XI

Sub:- Physics **Time:- 3 Hours**
Marks:- 70

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GENERAL INSTRUCTIONS:

1) All questions are compulsory.
2) There are 26 questions in total. Questions 1 to 5 questions short answer questions and carry 1 mark each, Questions 6 to 10 are short answer questions and carry two marks each, Questions 11 to 22 carry three marks each, question 23 carries 4 marks and questions 24to 26 are long answer questions and carry five marks each.
3) 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 questions of five marks each. You have to attempt only one of the given choices in such questions.
4) Use of calculators is not permitted. Log tables will be provided, if needed.
5) 15 minutes time has been allotted to read this question paper. During this time, the students will read the question paper only, she / he will not write any answer on the answer script during this period.

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1)	The density of oxygen is 16 times the density of hydrogen. What is the relation between the speeds of sound in two cases?	(1M)
2)	IF the momentum of a body is doubled, find % age increase in its kinetic energy ?	(1M
3)	If a vector $2\vec{i}+3\vec{j}+8\vec{k}$ is perpendicular to the vector $4\vec{j}+4\vec{i}+a\vec{k}$, find value of " a" ?	(1M)
4)	Three stars p, Q, R appear as green, red and blue respectively. Which star has minimum temperature?	(1M)
5)	If the polar ice caps melt and spread uniformly, how will the length of the day be affected?	(1M)
6)	Find the resultant of the following forces acting at a point $200\sqrt{2}$ N along NE, $500\sqrt{2}$ N along NW and 800 N along south.	(2M)
7)	Derive an equation for the distance covered by a uniformly accelerated body in nth second of its motion.	(2M)
8)	State the any four important postulates of the kinetic theory of gases.	(2M)

9)	It is impossible to construct to a heat engine of 100% efficiency? Why	(2M)
10)	Torque of equal magnitudes are applied to a hollow cylinder , and a solid sphere, both having the same mass and radius. The cylinder is free to rotate about its standard axis of symmetry and the sphere is free to rotate about an axis passing through its centre. Which of the two will acquire a greater angular speed after a given time?	(2M)
11)	The temperature of a black body is increased from 100 K to 200 K .How will the rate of emission of energy change?	(3M)
12)	Discus the variation of acceleration due to gravity with altitude. How does the expression modify when h<<R?	(3M)
13)	If x= a+bt+ct2, where x is in meters and t in seconds ,find the unit of b and c?	(3M)
14)	At what angle should the two forces(a-b) and (a+b) act so that magnitude of their resultant is $\sqrt{3a^2+b^2}$.	(3M)
15)	Show that the law of conservation of linear momentum and newton's third law are the same.	(3M)
16)	A liquid drop of diameter D breaks up into 27 tiny drops. Find the resulting change in energy. Take surface tension of the liquid as T.	(3M)
17)	Derive an expression for the ascent of a liquid in a capillary tube. Assume that the liquid wets the walls of the containing vessel.	(3M)
18)	Four spheres of diameter 2a and mass M each are placed with their center on the four corners of a square of side b. Calculate the moment of inertia of the system about one side of the square taken as its axis.	(3M)
19)	What is banking of tracks? Prove that velocity of vehicle on banked road is independent on mass of the vehicle.	(3M)
20)	Calculate the temperature at which rms velocity of gas molecules is double its value at 270C, pressure of the gas remaining the same.	(3M)
21)	Explain the construction and various operation for a Carnot's heat engine working between two temperatures. Hence, define the efficiency of the engine.	(3M)
22)	Derive Newton's law of gravitation from kepler's third law of planetary motion.	(3M)
23)	The physics teacher, while teaching the topic 'organ pipes', explained to her students the reason, for the change in the fundamental frequency (and the frequencies of harmonics), when one end of an open organ pipe is closed. She went on say that we can expect a similar 'change pattern' when we tend to give up an 'open approach' to our learning. She advised her students to 'keep open' all avenues of learning so that their learning can be built upon all aspects of their fundamental training. She also advised them to work	(4M)

	hard in a dedicated way so that their extra effort pushes up their 'learning Wavelengths' in much the same way. As an increase in the length of an organ pipe does to 1st fundamental wavelength. State what in your opinion, are the two values conveyed by the teacher, to her students through her lecture. Also state the value of the 'fundamental mode wavelength' associated with (i) an open organ pipe of length L, (ii) a closed organ pipe of length L. State how the wavelengths of the permitted normal modes, of the above two types of organ pipes, are related to their fundamental wavelengths	
24)	a) Show that in head on collision between two balls of equal masses moving along a straight line, the balls simply exchange their velocities. b) State and prove work –energy theorem. OR a) Find the expression for potential energy stored in a spring, when it is pulled from its mean position. Show graphically the variation of this elastic P.E of the spring with extension of the spring. b) A bullet of mass 0.01 kg and travelling at a speed of 500 m/s strikes a block of mass 2kg which is suspended by a string of length 5m. The centre of gravity of the block is found to rise a vertical distance of 0.1m. What is the speed of the bullet after it emerges from the block?	(3M) (2M) (3M) (2M)
25)	i) Derive Newton's formula for the velocity of sound in air. What corrections Laplace apply to it? ii) A particle executes SHM of amplitude A. a) At What distance from the mean position is its kinetic energy equal to its potential energy? b) At what points is its speed half the maximum speed? **OR** i) A particle is moving with SHM in a straight line. When the distance of the particle from the equilibrium position has values x_1 and x_2 the corresponding values of velocities are u_1 and u_2. Show that the time period of oscillation is given by $T = 2\pi \left[\frac{x_2^2 - x_1^2}{u_1^2 - u_2^2}\right]^{\frac{1}{2}}$ ii) A train, standing in the outer signal of a railway station blows a whistle of frequency 400Hz in still air. i) what is the frequency of the whistle for a platform observer when the train (a) approaches the platform	(3M) (2M) (3M)

	with a speed of 10 m/s. (b) recedes from the platform with a speed of 10 m/s.	(2M)
26)	Show that the trajectory of a projectile is parabolic and also obtain expression for a) the maximum height attained. b) the time of its flight c) the horizontal range. d) at what value of θ is the horizontal range maximum. **OR** i) A car accelerates from rest at a constant rate 'A' for some time, after which it retards at a constant rate 'B' to come to rest. If the total time lapsed is T seconds, evaluate the maximum velocity reached and the total distance travelled in terms of A, B and T. ii) Two trains are moving eastwards with velocities 10ms^{-1} and 15 ms^{-1} on parallel tracks. Calculate the relative velocity of slow train with respect to the fast train.	(5M) (3M) (2M)

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