Sample Paper – 2010
Class – XI
Subject – Physics (theory)

Time allowed: 3 hours Max Marks: 70

General Instruction
(i) All questions are compulsory.
(ii) Question numbers 1 to8 are very short answer type questions, carrying one mark each,
(iii) Question numbers 9-18 are short answer type question, carry two marks each.
(iv) Question numbers 19to27 are also short answer type question, carrying 3 mark each.
(v) Question number 28to30 are long answer type question carrying five marks each.
(vi) Use log tables for necessary calculations.

1.The position of a particle at time t is given by the relation $x(t)=(v_0/\alpha)(1- C^{-\alpha t})$,where v_0 is a constant and $\alpha > 0$.Write the dimensions of v_0 and α.

2.A ball is thrown vertically upward, draw a graph which represent velocity time graph of the ball during its flight.(air resistance is neglected)

3.Two weights W_1 and W_2 are suspended from the ends of a light string passing over a smooth fixed pulley. If the pulley is pulled up with an acceleration g then what will be the tension in the string?

4.Can a body have energy without having momentum?

5.You are given two spheres of the same mass, size and appearance, but one of them is solid while the other hollow. If they are allowed to roll down an incline which one will reach the bottom first.

6.In the language of physics which is more elastic(a)rubber or steel(b)air or water?

7.When you drink a liquid through a straw,you reduce the pressure in your mouth and let the atmosphere move the liquid.Could you use a straw to sip a drink on the moon?

8.On sounding tuning fork A with another tuning fork B of frequency 384 Hz, 6 beats are produced per second.After loading the prongs of A with wax and then

sounding it again with B, 4 Beats are produced per second, What is the frequency of the tuning fork A.

9.If two resistors of resistances $R_1=(4 \pm 0.5)\Omega$ and $R_2=(16 \pm 0.5)\Omega$ are connected in parallel, find the equivalent resistance with limits of percentage error.

10.(a) The angle between the vector $\vec{A}$ and $\vec{B}$ is θ.Calculate the value of the triple product

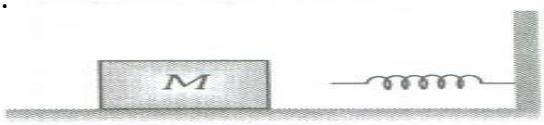
$$\vec{A} \cdot (\vec{B} \times \vec{A})$$

(b)If the sum of two unit vectors is a unit vector, then what is the magnitude of difference of two unit vector?

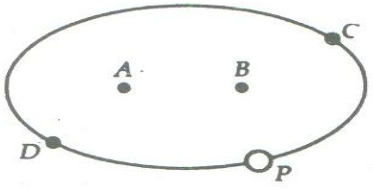
11.Derive the law of conservation of linear momentum from Newton's second law of motion.

12.The block of mass M moving on the frictionless horizontal surface collides with the spring of spring constant k and compress it by length L.Calculate the maximum momentum of the block after collision.

13.Show that the centre of mass of a uniform rod of mass M and length L lies at the middle point of the rod.



14.(a)Where will a body weigh more,1 km above the surface of earth or 1 km below the surface of earth?
(b)Identify the portion of sun in the following diagram if the linear speed of the planet is greater at C compared to that at D.



15.Explain how is Pascal's law applied in a hydraulic lift.

16.Derive an expression for the work done during the isothermal expansion of an ideal gas.

OR

Derive an expression for the work done during the adiabatic expansion of an ideal gas.

17.Two equal size rooms are connected through an open door –way. However, the average temperatures in the rooms are maintained at different values.in which room there is more air?

18.One end of a U- tube containing mercury is connected to a suction pump and the other end is connected to the atmosphere.A small pressure difference is maintained between the two columns.show that when the suction pump is removed, the liquid in the U- tube executes SHM.

19.Draw and discuss the position – time graph of two objects moving along a straight line,when their relative velocity is (i)zero(ii)positive and (iii)negative.

20.A body tied to one end of a string is made to revolve in a vertical circle.Derive the expression for the velocity of the body and tension in the string at any point.

OR

Determine the angle of banking so as to minimize the wear and tear of the tyres of a car negotiating a banked curve.

21. (a)If g is the acceleration due to gravity on the earth's surface, then calculate the gain in the potential energy of an object of mass m raised from the surface of the earth to a height equal to radius of the earth R.
(b)When a constant force is applied to a body moving with constant acceleration, is the power constant?

22. Derive an expression for the moment of inertia of a thin uniform circular ring about (a) an axis through its centre and perpendicular to its plane(b)its diameter.

23.Define escape velocity.Obtain an expression for the escape velocity of a body from the surface of the earth.

24.(a)Why a small iron needle sinks in water while a large iron ship floats?

(b)The radii of two soap bubbles are r1 and r2.In isothernal conditions,two meet together in vacuum.Then what is the radius of the resultant bubble?

25.Applying first law of thermodynamics, obtain an adiabatic relation between pressure and volume.

26.Show that the average kinetic energy of a gas molecule is directly proportional to the temperature of the gas,Hence give the kinetic interpretation of temperature.

27.Describe the various modes of vibrations of an open organ pipe.

28.(a)A block is kept on a frictionless inclined surface with angle of inclination α. The incline is given an acceleration a to keep the block stationary, what is the value of α? (b)Three bars of equal lengths and equal area of cross-section are connected in series. Their thermal conductivities are in the ratio of 2 : 4 : 3. If the open ends of the first and the last bars are at temperatures 200°C and 18°C respectively in the steady state, calculate the temperature of both the junctions.
(c) Is it unreasonable to take the coefficient of friction to be greater than unity?

OR

(a)A sphere is accelerated upwards with the help of a cord whose breaking strength is five times its weight, then what is the maximum acceleration with which the sphere can move up without cord breaking?
(b) A metal rod of length 20 cm and diameter 2 cm is covered with non-conducting substance. One of its ends is maintained at 100°C, while the other end is put in ice at 0°C. It is found that 25 g of ice melts in 5 minutes. Calculate the coefficient of thermal conductivity of the metal. Given latent heat of ice = 80 cal g^{-1}.
(c) Can the force of friction on a body be zero even if it on a rough surface?

29.(a) A body is revolving with a uniform speed v in a circle of radius r.What is the angular acceleration of the body?
(b)The position x of a particle varies with time t as $x=at^2-bt^3$.At what time the acceleration of the particle will be zero?
(c)Two balls of same mass are projected one vertically upwards and the other at angle 60^0 with the vertical. What is the ratio of their potential energy at the highest point?

OR

(a)If the speed of revolution of a particle on the circumference of a circle and the speed gained in falling through a distance equal to half the radius are equal, then what will be the centripetal acceleration?
(b)The displacement of the particle is given by $y=a+bt+ct^2-dt^4$.Calculate the initial velocity and acceleration.
(b)A ball is thrown at an angle θ with the horizontal.Its initial kinetic energy is 100J and it becomes 30 J at the highest point.What is the angle of projection?

30.(a)Radius of a soap bubble is increased from R to 2R, calculate the work done in this process in terms of surface tension.
(b)The speed of sound waves in air depends on temperature but that of light does not.Why?
(c) A railway engine and a car are moving on parallel tracks in opposite directions with speed of 144 kmh^{-1} and 72 kmh^{-1}, respectively. The engine is continuously sounding a whistle of frequency 500 Hz. The velocity of sound is 340 ms^{-1}. Calculate the frequency of sound heard in the car when
(i) the car and the engine are approaching each other
(ii) the two are moving away from each other.

OR

(a)If the work done in blowing a bubble of volume V isW,then what will be the work done in blowing the bubble of volume 2V from the same soap solution?
(b)In view of the characteristics of sound, distinguish between the roar of lion and humming of mosquito.
(c)Find the velocity of source of sound, when the frequency appears to be (i) double (ii) half the original frequency to a stationary observer. Velocity of sound = 330 ms^{-1}.