Sample Paper – 2010
Class – XI
Subject – Physics

Time-3 Hrs **M.M. 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-Define absolute zero according to kinetic interpretation of temperature.

2-What happens when a capillary tube of insufficient length is dipped in a liquid?

3-Write the full name of technique used in locating
(a) An underwater obstacle
(b) Position of an aero plane in space.

4-A satellite revolves close to the surface of a planet. How is its orbital velocity related with velocity of escape from that planet?

5-If the change in the value of g at a height h above the surface of earth is same as that at a depth x below it (both x and h being much smaller than radius of earth), then how are x and h related to each other?

6-What is the difference between velocity of wave and velocity of particle? Obtain the relation for the velocity of wave in wave motion.

7-Draw the graphical representation of simple harmonic motion, showing the
(a)Displacement-time curve
(b)Velocity-time curve and
(c)Acceleration-time curve

8-Calculate the number of molecules in $2x10^{-6}$ m^3 of a perfect gas at 27^0 C and at a pressure of 0.01 m of mercury. Mean kinetic-energy of a molecule at $27^0C=4x10^{-11}J$ and g =9.8 ms^{-2}

9-Drive the relation between specific heat of gas at constant pressure and at constant volume, when the amount of gas is one gram molecule.

10-Drive an expression for energy stored in a wire due to extension.

11-Two syringes of different cross section, filled with water are connected with a tightly fitted rubber tube with water. Diameters of the smaller and larger piston are 1.0 cm and 3.0 cm respectively.
(a) Find the force exerted on the larger piston when a force of 10 N is applied to the smaller piston.
(b)If the smaller piston is pushed in through 6.0 cm how does the larger piston move out?

12-How can you say that Newton's third law of motion follows from the Newton's second law of motion?

OR

Obtain an expression for the angle which a cyclist will have to make with the vertical, while taking a circular turn. [For successful negotiation]

13-A steel ball of radius r allowed to fall under gravity through a viscous liquid of coefficient of viscosity η. After some time, the velocity of the ball attains a constant value v_t. The terminal velocity depends upon
(a) Weight of the ball mg
(b) The coefficient of viscosity η
(c) The radius of the ball r
By method of dimensions determine the relation expressing terminal velocity.

14-The diagonals of a parallelogram are represented by R_1=3i +2j -7k and R_2= 5i+ 6j-3k. Find the area of parallelogram.

OR

Find the angular velocity of (a) hour hand of clock (b) second hand of clock and (c) of earth about its own axis.

15-A projectile is fired with velocity u making an angle θ with the horizontal form the surface of earth. Prove that the projectile will hit the surface of earth with same velocity and same angle.

16-Drive position time relation of a body moving with a constant acceleration and discuss it graphically.

17-A bullet of mass 0.012 kg and horizontal speed $70ms^{-1}$strikes the block of wood of mass 0.4 kg and instantly comes to rest with respect to the block. The block is suspended from the ceiling by means of thin wires. Calculate the height to which the block rises and the amount of heat produced in the block.

18-What is torque? Give its unit. Show that it is equal to the product of force and the perpendicular distance of its line of action from its axis of rotation.
19-Drive an expression for the kinetic energy of a body rotating about a given axis and find a definition for moment of inertia of the body in terms of kinetic energy of rotation.

20-Prove the law of conservation of mechanical energy for a body falling freely and discuss it graphically also.

21-Define limiting friction. Prove that it is always convenient to pull a heavier body than to push it on the surface.

22-Find the expression of total energy of a satellite revolving around the surface of earth. What is the significance of negative sign in the expression?

23-What is an ideal simple pendulum? Drive an expression for its time period.

24-A rocket is moving at a speed of 200 ms^{-1} towards a stationary target. While moving, it emits a wave of frequency 1000 Hz. On reaching the target, sound gets reflected back to the rocket as an echo. Calculate,
(a) The frequency of sound as detected by target and
(b) The frequency of echo as detected by rocket (taking speed of sound $330ms^{-1}$)

25-(a) Obtain an expression for the centripetal force required to make a body of mass m moving with a velocity v around a circular path of radius r.
(b) Find an expression for the velocity of recoil gun.

OR

What is the acceleration of the block and trolley system shown, if the coefficient of kinetic friction between the trolley and surface is 0.04? What is the tension in the string? (g =10 ms^{-2}). Neglect the mass of the string.

26-What is Carnot's engine? Drive an expression for its efficiency.

OR

State mathematically, first law of thermodynamics and use it to find the expression for work done during adiabatic expansion. Write two limitations of first law of thermodynamics.

27-State and prove Bernoulli's theorem. Name any two application of Bernoulli's principle.

OR

What is capillarity? Drive an expression for the capillary rise of a liquid in a tube.