SAMPLE PAPER-02 (unsolved)
PHYSICS (Theory)
Class - XI

Time allowed: 3 hours

Maximum Marks: 70

General Instructions:

a) All the questions are compulsory.
b) There are **26** questions in total.
c) Questions **1** to **5** are very short answer type questions and carry **one** mark each.
d) Questions **6** to **10** carry **two** marks each.
e) Questions **11** to **22** carry **three** marks each.
f) Questions **23** is value based questions carry **four** marks.
g) Questions **24** to **26** carry **five** marks each.
h) 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 in five marks each. You have to attempt only one of the choices in such questions.
i) Use of calculators is **not** permitted. However, you may use log tables if necessary.
j) You may use the following values of physical constants wherever necessary:

$$c = x10^8 \ m/s$$
$$h = 6.63x10^{-34} \ Js$$
$$e = 1.6x10^{-19} \ C$$
$$\mu_0 = 4\pi x10^{-7} \ TmA^{-1}$$
$$\frac{1}{4\pi\varepsilon_0} = 9x10^9 \ Nm^2 C^{-2}$$
$$m_e = 9.1x10^{-31} \ kg$$

1. At which place on the earth the centripetal is high?

2. What is the nature of force involved in the winding of a watch?

3. If a body falling from a height of 20 m rebounds from a hard floor, it loses 40% of its energy in impact. What is the height to which it would rise after the impact?

4. What provides the centripetal force in the following cases

   a) Electron revolving around the nucleus

   b) Earth revolving around the sun

5. If the absolute temperature of the gas is increased three times, then what will be the increase in r.m.s velocity of the gas molecules?

6. What will be its time of flight, if the object be projected at an angle $(90-\theta)_0$? Assume that the time of flight of an object projected at an angle θ is T.

7. In the physics lab, the teacher asked students to find the diameter of a wire using screw gauge. Mala took four readings and finished her practicals whereas Kala took more than four readings.

   a) What values do you associate with Mala and Kala?

   b) Whose method of readings is correct?

   c) Support your answer

8. A body of 2kg is initially at rest. Assuming that a constant force of 5 N acts on it for 10s, calculate the average power of the same.

9. If two soap bubbles in vacuum having radii 3 cm and 4 cm coalesce under isothermal conditions to form a single bubble, then what is the radius of the new bubble?

                                   Or

   If Young's modulus is E, find the force with which the steel ring is expanded. Assume that a steel ring of radius r and cross-section area A is fitted onto a wooden disc of radius R.

10. Prove: The third equation of rotational motion $\omega^2 - \omega_0^2 = 2\alpha\theta$

11. A body moving with uniform acceleration describes 12 m in 3rd second of its motion and 20 m in the 5th second. Find the velocity after 10 seconds?

12. Why does a person sitting in one train think that the other train is at rest, when both the trains are moving on parallel tracks with the same speed and in the same direction?

13. A group of friends went to circus where they saw a biker riding a motorcycle in a big ball of iron in all directions. After the show, they went to the biker and told that they were amazed of his performance and asked him how he did not fall down.

    a) What is the minimum speed at lowest and highest point if a motorcyclist loops in a vertical loop of diameter 50 m without dropping down even at the uppermost point?

    b) Find the net force on the body of mass 'm' tied to one end of string which is revolved in vertical circle of radius 'R' at the lowest F_{low} and highest F_{high} point of the circle directed vertically downward.

14. Given the example of the motion in the following cases:

    (i)   Where magnitude and direction of the acceleration of the particle changes

    (ii)   Where the magnitude ad direction of the acceleration of body remains constant

    (iii)   Where the magnitude of acceleration changes but its direction remains constants

    (iv)   Where the magnitudes of acceleration remain constant but its direction changes

                                   Or

Find at what temperature the velocity of sound is air will be $1\frac{1}{2}$ times the velocity at 11_0C.

15. If the volume of the air bubble increases 15 times when it rises from bottom to the top of the lake, then calculate the depth of the lake by assuming the density of lake water to be $1.02 \times 10_3$ kg/m_3 and atmospheric pressure to be 75 cm of mercury.

16. A particle of 10 kg mass is moving in a circle of 4m radius with constant speed of 5 m/sec. what is the angular momentum about the centre of circle and a point on the axis of the circle and 3 m distant from its centre?

17. A simple harmonic motion has an amplitude and time period T. what is the time taken to travel from x = A to $x = \frac{A}{2}$?

18. A. Explain Doppler Effect in sound.

B. Deduce an expression for apparent frequency of sound when source and listener are approaching each other.

19. Equal torque is applied on a cylinder and a sphere has same mass and radius. The cylinder rotates about its axis and the sphere rotates about one of its diameters. Which will acquire greater speed? Explain why?

20. A body is projected with a velocity of 30 m/s at an angle of 30_0 to the horizontal direction. Find:

      i. Maximum height

      ii. Time of flight

      iii. The horizontal range (Take g =10 m/s_2)

21. When two moles of an ideal monoatomic gas occupy a volume V at 37_0C, the gas expands adiabatically to a volume 2V. Calculate

a) Final temperature of gas

b) Change in its internal energy

c) Work done by the gas during the process.

    [Given: $\gamma = 5/3$]

22. If the volume of a metal sphere is 1000 cm_3 at 273 K and the coefficient of linear expansion of the metal is $18 \times 10_6$ K_{-1}, then what would be its volume at 373 K?

23. Sarah saw a baby of two years was trying to get into the dining table from the mother's hold where a jug of boiling water has been kept. The baby tried to jump and Sarah saw the baby jump removed the jar aside.

a) Give reason: "Steam causes more severe burn than boiling water".

b) What values of Sarah are appreciable?

c) If at atmospheric pressure, 4 g of water having volume of 4.00 cm3 becomes 6684 cm3 of steam when boiled, then find the amount of heat added to the system? [Latent heat of vapourisation of water is 539 cal/g at 1 atm]

24. A body covers 400 cm in the first 4 seconds and 440 cm in the next two seconds.

    a) What will be its velocity at the end of 14 seconds?

    b) Find the displacement in 14 seconds.

<div align="center">Or</div>

Show that for a projectile the angle between the velocity and the x-axis as a function of time is given by

$$\theta(t)= \tan^{-1}\left(\frac{v_{vy} - gt}{v_{vx}}\right)$$

25. Determine the force required to double the length of a steel wire of area of cross-section $5 \times 10^{-5} m^2$. Young modulus of steel $= 2 \times 10^{11} Nm^{-2}$

<div align="center">Or</div>

When a piece of brass weighing 12.9 g in air is completely immersed in water it weighs 11.3 g. What is the volume of copper contained in the brass?

26. Assuming that the earth to be a homogenous sphere, if a body is dropped in a hole drilled across a diameter of the earth. Show that it executes S.H.M.

<div align="center">Or</div>

a) What do you mean by interference of waves?

b) Distinguish between constructive and destructive interference with examples?