SAMPLE PAPER - 1

STD: XI PHYSICS TIME : 3 hours

Marks : 70

GENERAL INSTRUCTIONS:

1. *All questions are compulsory.*
2. *Internal choices have been provided in some questions. You have to attempt only one of the choices in such questions.*
3. *Question numbers 1 to 5 are very short answer questions, carrying one mark each. These questions are to be answered in one word or a sentence.*
4. *Question numbers 6 to10 are short answer questions, carrying two marks each. These questions are to be answered in one word or a sentence.*
5. *Question numbers 11 to 22 are also short answer questions, carrying three marks each. Their answers may not normally exceed 60 words each.*
6. *Question number 23is a value based question carrying 4marks.*
7. *Question numbers 24 to 26 are long answer questions, carrying five marks . Their answers may not normally exceed 100 words each.*
8. *Use of calculator is not permitted. However, you may use log tables, if necessary.*

1. A body of mass 2kg moving with a velocity 5m/s strikes a wall and rebounds with same velocity. Find the impulse. (1)
2. Name the phenomenon due to which oil rises in the wick of a lamp ? (1)
3. A body is projected with a velocity of 20m/s at an angle of 60° with the horizontal. Find the horizontal component of velocity after 1s (1)
4. Mercury does not stick to glass. Why? (1)
5. The Young's modulus of a wire of length l and radius R is Y. If the length is reduced to half and radius to R/4, what will be its Young's modulus? (1)
6. The moment of inertia of a thin disc about an axis passing through its centre and perpendicular to its plane is $MR^2/2$. Find the moment of inertia of the disc about an axis passing through its edge, perpendicular to its plane. (2)
7. The transverse displacement of a string clamped at its two ends is given by :
   $y = 0.03 \sin(\pi/3)x \cos(60\pi t)$, where x and y are in meter and t in seconds.
   a) Does the function represent a travelling or a stationary wave ? (2)
   b) Find the amplitude, frequency and wavelength of the wave.

   OR

   State the condition for resonance to take place. Give an example of resonance.
8. A book with many printing errors contains four different formulae for the displacement y of a particle undergoing a certain periodic motion. (2)
   a) $y = a \sin 2\pi t/T$
   b) $y = a \sin vt$
   c) $y = (a/T) \sin t/a$
   d) $y = a/2\,(\sin 2\pi t/T + \cos 2\pi t/T)$; where the letters have their usual meaning

   Rule out the wrong formulae on dimensional grounds
9. What are geostationary satellites? State two applications of geostationary satellites. (2)
10. An insect is trapped in a circular groove of radius 10cm moves along the grooves steadily and completes 5 revolutions in 50s. What is the angular speed and linear speed of the motion? Is the acceleration vector a constant vector? (2)
11. Draw the displacement – time, velocity – time and acceleration – time graphs for a particle performing SHM. (3)

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12. The time period of oscillation T of a small drop of liquid under surface tension depends upon the density ρ, surface tension S of the liquid and the radius R of the drop. Find the relation for the time period using dimensional analysis. (3)
13. Define the terms :
    i) free oscillations ii) damped oscillations iii) Forced oscillations

OR

    i) State the principle of superposition of waves. (3)
    ii) Give two differences between standing and travelling waves.
14. a) Is work done by a force a scalar or a vector quantity?
    b) Prove work energy theorem for a variable force (3)
15. i) A body is projected upwards with and initial velocity which returns back to its initial position. Draw the speed-time graph for the body.
    ii) The displacement of a particle at any instant is given by $x = 5t^3 - t^2$ m.
    Calculate the average velocity in the interval from t =0 to t =3s. (3)
16. Draw the stress-strain curve for a typical metal wire under increasing load.
    The length of a wire increases by10^{-4} times its original length when a stress of 10^7 Pa is applied on it. Calculate the Young's modulus of the material of the wire. (3)
17. Using the method of dimensional analysis, find the expression for speed of sound in a fluid. Discuss the correction applied by Laplace to this formula. (3)
18. Define Capillarity. Derive an expression for the height to which a liquid of surface tension S rises in capillary tube of radius r. (3)
19. What is a perfectly inelastic collision? Show that kinetic energy is lost in such a collision. (3)
20. A projectile is fired with a velocity 'u 'making an angle θ with the horizontal. Derive the expression for it range. Show that there are two angles of projection for the same range. (3)
21. Obtain the relation between torque and angular momentum. Hence, state the law of conservation of angular momentum. (3)
22. a) Define the term 'radius of gyration'.
    b) A child stands at the centre of a turntable with his two arms outstretched. The turntable is set to rotating with an angular speed of 40 rev/min. How much is the angular speed of the child if he folds his hands back and thereby reduces his moment of inertia 2/5 times the initial value ? Assume the rotation is frictionless. Also show that the new kinetic energy is more than the initial kinetic energy. (3)
23. Suresh noticed a big granite rock in his locality. He thought that if they worked upon it they could earn money. He took permission from the Government, completed all the formalities .He broke the rock using a bomb. The rock was made into slices .They established a granite industry. Many of the people in the surroundings started to earn and live comfortably. (4)
    a) What values of Suresh impress you?
    b) A bomb of mass 10kg, at rest, explodes into three fragments. Two fragments of masses 2kg and 3kg moves perpendicular to each other with velocities 30 m/s and 20 m/s respectively. Find the velocity of the third part.
24. i)State and prove Bernoulli's theorem for an ideal fluid? (5)
    ii) Water is flowing through two horizontal pipes of different diameters which are connected together. In the first pipe the speed of water is 4 m/s and the pressure is 2×10^4

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Pa. Calculate the speed and pressure of water in the second pipe. The diameters of the pipes are 3 cm and 6 cm respectively.

OR

a) Obtain an expression for the excess pressure inside a liquid drop of radius r and surface tension S.

b) Two soap bubbles have radii in a ratio 2 :3. Compare the excess pressure inside these bubbles. Also compare the work done in blowing these bubbles. (5)

25. a) Derive an expression for frequency of normal modes of vibration for a string fixed at both the ends..

b) Draw the first two harmonics.

c)What is the angle between the velocity of the particles of the medium and the velocity of the wave in i) transverse wave ii) longitudinal wave. (5)

OR

i) What are beats? How are they produced? Give an application of the phenomenon of beats. (5)

ii) Show the formation of beats with the help of a diagram.

ii) Two sitar stings A and B playing the note 'Dha' are slightly out of tune and produce beats of frequency 7 Hz. The tension of the string B is slightly increased and the beat frequency is found to decrease to 5 HZ. What is the original frequency of B if the frequency of A is 432 Hz

26. a) What do you understand by the term acceleration due to gravity? (5)

b) Derive an expression for acceleration due to gravity at a depth d from the surface of the earth. What happens to the weight of a body at the centre of the earth?

c) At what height above the earth's surface the value of g is the same as in a mine 80 km deep?

OR

a) What do you understand by the term gravitational potential energy of a body ? State its SI unit.

b) Derive an expression for the gravitational potential energy of a body of mass m located at a distance r from the centre of the earth. What does the negative sign indicate? (5)

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