
XI PHYSICS
SAMPLE QUESTION
PAPER 2020

Maximum Marks: 70

Time Allowed: 3 hours

General Instructions:

1. All questions are compulsory. There are 37 questions in all.
2. This question paper has four sections: Section A, Section B, Section C and Section D.
3. Section A contains twenty questions of one mark each, Section B contains seven questions of two marks each, Section C contains seven questions of three marks each, and Section D contains three questions of five marks each.
4. There is no overall choice. However, internal choices have been provided in two questions of one mark each, two questions of two marks, one question of three marks and three questions of five marks weightage. You have to attempt only one of the choices in such questions.

Section A

1. Significant figure of 0.0010 is
 - a. 1
 - b. 2
 - c. 4
 - d. 5

2. A projectile is fired a velocity of 150 meters per second at an angle of 30 degrees with the horizontal. What is the magnitude of the vertical component of the velocity in m/s at the time the projectile is fired?
 - a. 225
 - b. 75
 - c. 150
 - d. 130

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3. A bob of mass 0.1 kg hung from the ceiling of a room by a string 2 m long is set into oscillation. The speed of the bob at its mean position is 1 m s^{-1} . What is the trajectory of the bob if the string is cut when the bob is at its mean position?
- bob will fall vertically downwards
 - bob will fall vertically downwards
 - bob will go down in a parabolic path
 - bob will go upwards
4. The position of a particle is given by $r = 3.0t\hat{i} + 2.0t^2\hat{j} + 4.0\hat{k}$ Find the magnitude of velocity in m/s of the particle at $t = 2.0 \text{ s}$.
- 8.84
 - 6.54
 - 7.54
 - 8.54
5. The work done by a conservative force
- depends on both the end points as well as the path
 - depends on the path
 - depends only on the end points
 - depends only on the end point and the path
6. Material is said to be ductile if
- material cross section is not significantly reduced at failure
 - material breaks suddenly at little elongation
 - a large amount of plastic deformation takes place between the elastic limit and the fracture point
 - fracture occurs soon after the elastic limit is passed
7. What mass of steam initially at $130 \text{ }^\circ\text{C}$ is needed to warm 200 g of water in a 100-g glass container from 20.0°C to 50.0°C ? Specific heat of container is $837 \text{ J/Kg}^\circ\text{C}$ Specific heat of steam is $2110 \text{ J/Kg}^\circ\text{C}$ Specific heat of water is $4186 \text{ J/Kg}^\circ\text{C}$ Latent heat of vapourisation is $2.26 \times 10^6 \text{ J/Kg}$
- 16.9 g
 - 14.9 g
 - 10.9 g
 - 12.9 g

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8. Entropy of a given system is
- Extensive variable
 - Intensive variable
 - Neither a nor b
 - Cannot say
9. 1 mole of a monoatomic gas is mixed with 3 moles of a diatomic gas. What is the molecular specific heat of the mixture at constant volume?
- 18.7 J / mol K
 - 15.2 J / mol K
 - 12.5 J / mol K
 - 22.6 J / mol K
10. When a wave undergoes reflection at rarer medium then it undergoes a phase difference of
- $\pi/2$
 - $\pi/4$
 - No change in phase
 - π

11. Fill in the blanks:

_____ relates the motion of objects to the forces which cause them.

OR

Fill in the blanks: An object can be considered as a point object if the distance travelled by it is _____ than its size.

12. Fill in the blanks:

_____ is the mechanical energy required to disassemble a whole entity into separate parts.

13. Fill in the blanks:

The path of a projectile projected at some angle with the horizontal (i.e., ground) is a _____ path.

14. Fill in the blanks:

If a body is subjected to a uniform force from all sides, then the corresponding stress is called _____.

15. Fill in the blanks:

The temperature at which liquid starts to freeze is known at the _____ point of the liquid.

16. What is the angle made by vector $A = 2i + 2j$ with x-axis?

17. A trolley of mass 300 kg carrying a sandbag of 25 kg is moving uniformly with a speed of 27 km/h on a frictionless track. After a while, sand starts leaking out of a hole on the floor of the trolley at the rate of 0.05 kg s^{-1} . What is the speed of the trolley after the entire sand bag is empty?

18. Why are rain drops spherical?

19. Find the values of two molar specific heats of nitrogen. Given, $\gamma = 1.41$ and $R = 8.31 \text{ J mol}^{-1}\text{K}^{-1}$.

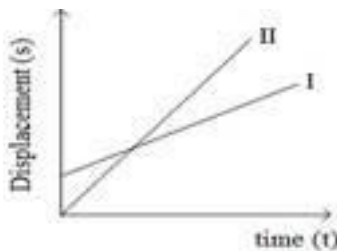
20. The displacement of an elastic wave is given by the function $y = 3 \sin \omega t + 4 \cos \omega t$ where, y is in cm and t is in second. Calculate the resultant amplitude.

OR

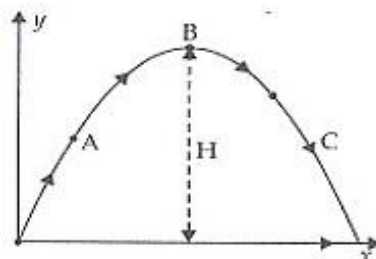
Sound waves from a point source are propagating in all directions. What will be the ratio of amplitudes at distances of x meter and y meter from the Source?

SECTION B

21. In Figure shows displacement - time curves I and II. What conclusions do you draw from these graphs?



22. A particle is projected in the air at some angle to the horizontal, moves along the parabola as shown in the figure, where x and y indicate horizontal and vertical directions respectively. Show in the diagram, direction of velocity and acceleration at points A, B and C.



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23. Although both torque and work are defined as force multiplied by distance, they differ in their physical meaning. Why?
24. Three particles A, B and C, each of mass m , are placed in a line with $AB = BC = d$. Find the gravitational force on a fourth particle P of same mass, placed at a distance d from the particle B on the perpendicular bisector of the line AC.
25. A spherical ball contracts in volume by 0.0098% when subjected a pressure of 100 atmospheres. Calculate its bulk modulus, Given that 1-atmosphere pressure, is 1.013×10^5 Pa.
26. What do you mean by the term 'latent heat'? What are three types of latent heat?

OR

On a hot day, a car is left in sunlight with all the windows closed. After some time, it is found that the inside of the car is considerably warmer than the air outside. Explain, why?

27. Calculate the total number of degrees of freedom possessed by the molecules in 1 cm^3 of H_2 gas at temperature 273 K and 1 atm pressure?

OR

A tank used for filling helium balloons has a volume of 0.6 m^3 and contains 2.0 mol of helium gas at 20.0°C . Assuming that the helium behaves like an ideal gas.

- What is the total translational kinetic energy of the molecules of the gas?
- What is the average kinetic energy per molecule?

SECTION C

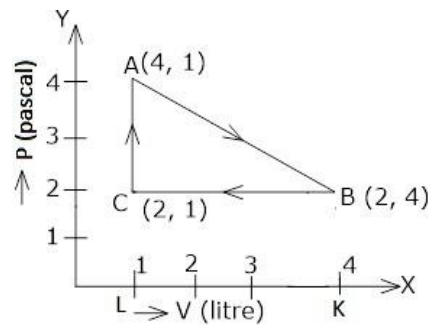
28. Derive the expression for maximum height and range of projectile.
29. Derive the third equation of motion using the method of integration.
30. Prove that in an elastic collision in one dimension the relative velocity of approach before impact is equal to the relative velocity of separation after impact.
31. Assuming the earth to be a sphere of uniform mass density, how much would body weigh halfway down to the centre of the earth if it weighted 250 N on the surface?
32. Water flows through a horizontal pipe of which the cross - section is not constant. The pressure is 1cm of mercury where the velocity is 0.35m/s. Find the pressure at a point

where the velocity is 0.65m/s.

OR

State the principle on which Hydraulic lift work and explain its working?

33. Deduce the work done in the following complete cycle.



34. The earth has a radius of 6400 km. The inner core of 1000 km radius is solid. Outside it, there is a region from 1000 km to a radius of 3500 km which is in molten state. Then again from 3500 km to 6400 km the earth is solid. Only longitudinal (P) waves can travel inside a liquid. Assume that the P wave has a speed of 8 km/second in solid parts and of 5 km/second in liquid parts of the earth. An earthquake occurs at some place close to the surface of the earth. Calculate the time after which it will be recorded in a seismometer at a diametrically opposite point on the earth if wave travels along diameter.

SECTION D

35. i. Obtain an expression for the centripetal force required to make a body of mass m moving with a speed v around a circular path of radius r .
- ii. A disc revolves with a speed of $33\frac{1}{3}$ rev/min, and has a radius of 15 cm. Two coins are placed at 4 cm and 14 cm away from the centre of the record. If the co-efficient of friction between the coins and the record is 0.15, which of the coins will revolve with the record? (Take $g = 10 \text{ m/s}^2$)

OR

- a. State three basic laws of motion. Show that the first law of motion gives the definition of force and the second law of motion gives the measure of force.
- b. A truck starts from rest and accelerates uniformly at 2.0 ms^{-2} . At $t = 10 \text{ s}$, a stone is dropped by a person standing on the top of the truck (the height of the top of the truck is 6 m from the ground). What are the magnitudes and directions of velocity, and acceleration of the stone at $t = 11 \text{ s}$? (Neglect air resistance.)
36. A solid cylinder rolls up an inclined plane of angle of inclination 30° . At the bottom of

the inclined plane the centre of mass of the cylinder has a speed of 5 m/s.

- a. How far will the cylinder go up the plane?
- b. How long will it take to return to the bottom?

OR

Find the centre of mass of a uniform

- i. half-disc,
- ii. quarter-disc.

37. Take the position of mass when the spring is unstretched as $x = 0$, and the direction from left to right as the positive direction of x -axis. Give x as a function of time t for the oscillating mass if at the moment we start the stopwatch ($t = 0$), the mass is

- a. at the mean position,
- b. at the maximum stretched position, and
- c. at the maximum compressed position.

In what way do these functions for SHM differ from each other, in frequency, in amplitude or the initial phase?

OR

A tunnel is dug through the centre of the Earth. Show that a body of mass ' m ' when dropped from rest from one end of the tunnel will execute simple harmonic motion.