Generated Question Paper

PHYSICS (Code No. 042) CLASS XI

Time Allowed: 3 hours Maximum Marks: 70

General Instructions:

All questions are compulsory. There are 34 questions in all.

This question paper has five sections: Section A, Section B, Section C, Section D and Section E.

Section A contains twelve Multiple Choice Questions (MCQs) of 1 mark each, four Assertion-Reasoning MCQs of 1 mark each and two questions of 1 mark each.

Section B contains five questions of 2 marks each. One question has an internal choice.

Section C contains seven questions of 3 marks each. One question has an internal choice.

Section D contains two case-study based questions of 4 marks each. Each case study has an internal choice.

Section E contains three questions of 5 marks each. Each question has an internal choice.

Use of calculators is not permitted.

List of Physical Constants:

$g = 9.8\ m/s^2$

Section A (16 Marks)

(i) Multiple Choice Questions (12 x 1 = 12 marks):

 The SI unit of angular velocity is:

(a) rad/s^2 (b) rad/s (c) s/rad (d) s^2/rad

 A body is projected vertically upwards. At its highest point, its:

(a) velocity is zero, acceleration is zero (b) velocity is zero, acceleration is g

(c) velocity is g, acceleration is zero (d) velocity is g, acceleration is g

 Which of the following is a vector quantity?

(a) Speed (b) Distance (c) Energy (d) Velocity

 Work done is zero when the angle between force and displacement is:

(a) 0° (b) 45° (c) 90° (d) 180°

 The moment of inertia of a solid sphere depends on:

(a) its mass only (b) its radius only (c) both its mass and radius (d) neither its mass nor its radius

 Kepler's second law is a consequence of the conservation of:

(a) linear momentum (b) angular momentum (c) energy (d) mass

 Which of the following is the most elastic?

(a) Rubber (b) Steel (c) Glass (d) Wood

 The SI unit of pressure is:

(a) dyne/cm² (b) N/m² (c) Pascal (d) both (b) and (c)

 The phenomenon of convection is related to:

(a) solids (b) liquids (c) gases (d) both liquids and gases

 The value of Cp/Cv for a monatomic gas is:

(a) 1 (b) 1.4 (c) 1.67 (d) 2

 The time period of a simple pendulum depends on:

(a) its mass (b) its length (c) the amplitude of oscillation (d) both (a) and (b)

 A transverse wave is characterized by:

(a) oscillations parallel to the direction of propagation

(b) oscillations perpendicular to the direction of propagation

(c) oscillations at 45° to the direction of propagation

(d) no oscillations

(ii) Assertion-Reasoning MCQs (4 x 1 = 4 marks):

For each of the following questions, two statements are given – one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is true.

<ol start="13">

 Assertion (A): The dimensional formula for energy and work is the same.

Reason (R): Work done is equal to the change in kinetic energy.

 Assertion (A): A body can have zero velocity and still have acceleration.

Reason (R): A body thrown vertically upward has zero velocity at the highest point but has acceleration due to gravity.

 Assertion (A): Friction is a self-adjusting force.

Reason (R): The force of friction always opposes relative motion between two surfaces.

 Assertion (A): The speed of sound is greater in solids than in gases.

Reason (R): Solids have higher density than gases.

(iii) Short Answer Questions (2 x 1 = 2 marks):

<ol start="17">

 Define scalar and vector quantities. Give one example of each.

 State Newton's second law of motion.

Section B (10 Marks)

<ol start="19">

 Derive the expression for the time period of a simple pendulum.

 State the principle of conservation of energy. Give an example to illustrate it.

 Define stress and strain. State Hooke's law.

 Explain the concept of surface tension.

 What is the difference between isothermal and adiabatic processes? OR Explain the concept of degrees of freedom of a gas molecule.

Section C (21 Marks)

<ol start="24">

 A body is moving along a straight line with uniform acceleration. Its velocity at time t=2s is 10m/s and at time t=5s is 25 m/s. Find its initial velocity and acceleration.

 Calculate the work done in stretching a spring with a force constant of 100 N/m by 5 cm.

 A car of mass 1000 kg is moving at a speed of 20 m/s. It is brought to rest by applying brakes in 10 seconds. Calculate the force required to stop the car.

 State Pascal's law. Explain how hydraulic brakes work based on this law.

 Explain the process of heat transfer by conduction, convection and radiation.

 Derive an expression for the excess pressure inside a liquid drop.

 A wave has a frequency of 500 Hz and a wavelength of 0.5 m. Calculate its speed. OR Explain the phenomenon of beats.

Section D (8 Marks)

<ol start="31">

 Case Study 1: A simple pendulum consists of a bob of mass 'm' suspended from a fixed point by a light inextensible string of length 'l'. The pendulum oscillates in a vertical plane.

(a) What is the restoring force acting on the bob when it is displaced from its mean position?

(b) Derive an expression for the time period of oscillation of the pendulum.

(c) How does the time period depend on the mass of the bob?

(d) How does the time period depend on the length of the string?

OR

(a) What is meant by simple harmonic motion?

(b) Give two examples of SHM.

(c) Define amplitude and frequency.

(d) Write the equation of motion for SHM.

 Case Study 2: A projectile is launched with an initial velocity 'u' at an angle ;, v—F, F†R †÷ izontal.

(a) What are the horizontal and vertical components of the initial velocity?

(b) Derive expressions for the time of flight, horizontal range, and maximum height of the projectile.

(c) At what angle of projection is the horizontal range maximum?

(d) What is the shape of the trajectory of the projectile?

OR

(a) Define projectile motion.

(b) State the assumptions made in the study of projectile motion.

(c) Derive an expression for the horizontal range of a projectile.

(d) What is the angle of projection for maximum range?

Section E (15 Marks)

<ol start="33">

 (a) State and explain Newton's laws of motion. (b) Discuss the limitations of Newton's laws of motion.

OR (a) State and explain the law of conservation of linear momentum. (b) Give two examples of its applications.

 (a) Explain Bernoulli's theorem. (b) Give two applications of Bernoulli's theorem.

OR (a) Explain the concept of viscosity. (b) State Stoke's law. (c) Derive an expression for the terminal velocity of a spherical body falling through a viscous medium.

 (a) State and explain the first law of thermodynamics. (b) Explain the concept of internal energy. (c) Give examples of isothermal and adiabatic processes.

OR (a) What is meant by a perfect gas? (b) State and explain the kinetic theory of gases. (c) Derive an expression for the pressure exerted by a gas based on kinetic theory.

This is a sample question paper and may not cover all aspects of the syllabus. Students should refer to the complete syllabus and textbook for a comprehensive preparation. The difficulty level of this question paper is basic, as requested.