Assignment UG-Sem-I (2024–2028)
Department of Physics
Model College Dumka

Section A: General Properties of Matter

- Short Answer Type Questions (Any Four):

1. Derive the relation between the three elastic constants: Young's modulus, Bulk modulus, and Rigidity modulus.

2. What is Poisson's ratio? Derive its expression in terms of elastic constants.

3. State Hooke's Law and explain the stress-strain diagram for a metallic wire.

4. What is surface tension? Derive the expression for excess pressure inside a soap bubble.

- Long Answer Type Questions (Any Four):

1. Describe the Searle's apparatus experiment for determining the modulus of rigidity of a wire.

2. Derive Poiseuille's equation for the flow of a viscous fluid through a capillary tube. Explain the necessary corrections.

3. Discuss the theory of a cantilever and derive an expression for Young's modulus using a cantilever loaded at one end.

4. What is viscosity? Describe Rankine's method for the determination of viscosity of a gas. Discuss the effect of temperature and pressure on viscosity.

Section B: Central Force Motion

- Short Answer Type Question:

1. State and explain Kepler's Laws of planetary motion.

- Long Answer Type Question:

1. Derive the trajectory of a particle moving under a central inverse square law force and discuss the concept of effective potential.

Section C: Oscillations

- Short Answer Type Question:

1. Derive the differential equation of SHM and solve it. What are the characteristics of SHM?

- Long Answer Type Questions (Any Two):

1. Discuss the motion of a compound pendulum and derive an expression for its time period.

2. Define resonance in forced oscillations. Derive the expression for amplitude and discuss the concept of Quality Factor.

Section D: Special Theory of Relativity

- Short Answer Type Questions:

1. What is the significance of the Michelson-Morley experiment? Discuss its outcome.

2. Derive the formula for time dilation using Lorentz transformations.

- Long Answer Type Questions:

1. State the postulates of Special Theory of Relativity. Derive the Lorentz transformation equations.

2. Derive the expression for relativistic Doppler effect and discuss its astronomical applications.