

Roll No.

(09/20-I)

5177

B. Sc. EXAMINATION

(Second Semester)

PHYSICS

(For Re-appear Candidates Only)

Paper-I (PH-201)

Properties of Matter and Kinetic Theory of
Gases

Time : Three Hours *Maximum Marks : 40*

Note : Attempt *Five* questions in all. Q. No. 1 is compulsory. Attempt *one* question from each Section. All questions carry equal marks.

1. (a) State theorem of perpendicular axis for moment of inertia.
- (b) Give physical significance of moment of inertia.

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- (b) Determine the degree of freedom for monoatomic and triatomic molecules. 3
7. What were the reasons for the modifications of gas equation ? Derive van der Waals' equation for real gas and hence define critical constants. 8

Section IV

8. What are transport phenomena ? Explain the phenomenon of viscosity of a gas and show that it is independent of the pressure at a given temperature. 8
9. (a) Define r.m.s. velocity, most probable velocity and average velocity. Find expression for r.m.s. velocity. 6
- (b) If the density of Nitrogen is 1.258 g/l at NTP, calculate the r.m.s. velocity of its molecules. 2

- (c) State Hooke's Law and define related terms.
- (d) State postulates of Kinetic theory of gases.
- (e) Differentiate between real gas and ideal gas.
- (f) Define Brownian motion.
- (g) Define modulus of rigidity. Give its units.
- (h) What is the value of moment of inertia for a circular ring ? $1 \times 8 = 8$

Section I

- 2. Derive expression for moment of inertia of a solid sphere about its any diameter and about its tangent. 8
- 3. (a) Derive expression for the acceleration of a rigid body rolling down an inclined plane without slipping. 6
- (b) A solid sphere rolls down an inclined plane of 30° . Calculate its acceleration. 2

Section II

- 4. Define Young's modulus, Bulk modulus and coefficient of rigidity. If Y, K, N represent these moduli respectively, prove that : 8

$$\frac{9}{Y} = \frac{3}{\eta} + \frac{1}{K}$$

- 5. (a) Prove that hollow shaft is much stronger than solid shaft of same length, mass and material. 6
- (b) Determine the force required to double the length of a steel wire of cross-section $5 \times 10^{-5} \text{ m}^2$, (Y for steel = $2 \times 10^{11} \text{ Nm}^2$). 2

Section III

- 6. (a) Explain the term degrees of freedom. Using Law of equipartition on energy, show that for perfect gas, $\frac{c_p}{c_v} = 1 + \frac{2}{n}$. 5