

Roll No.

Exam Code : D-24

Subject Code—62380

B.Sc. EXAMINATION

(Main/Re-appear)

(Batch 2020 Onwards)

(Third Semester)

PHYSICS

CPL-302 Course-V

Heat and Thermodynamics

Time : 3 Hours

Maximum Marks : 80

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

1. (a) Write two applications of First law of thermodynamics. 2
- (b) Differentiate between Reversible and Irreversible processes with example. 2

- (c) Write a short note on Virial Equation. 2
- (d) Differentiate between P-V and T-S diagram. 2
- (e) Define the law of Corresponding States. What is its significance ? 2
- (f) What are extensive and intensive properties ? 2
- (g) What is the physical significance of entropy ? 2
- (h) State Internal energy and enthalpy of a thermodynamic system. 2

Unit I

2. (a) Explain the construction, working and efficiency of Carnot Heat Engine. 12
- (b) A Carnot heat engine absorbs heat from a source at 500 K and rejects a part of it to the sink at a temperature of 300 K.

If the heat absorbed from the source be 1000 calorie, calculate the heat rejected to the sink. 4

3. (a) Explain work done during isothermal and adiabatic processes. 12

(b) Why C_p and C_v are called the principal specific heats of a gas ? 4

Unit II

4. (a) Derive an expression for the entropy of perfect gas in terms of volume and temperature. 10

(b) Prove that the change in entropy of reversible path is independent of the path. 6

5. (a) Show that the entropy of the universe is constant during reversible process and increases during irreversible process. 10

- (b) Explain additive nature and physical significance of entropy. 6

Unit III

6. (a) Using Maxwell's thermodynamic relations, prove that $C_p - C_v = R (1 + 2a/RTV)$ for a van der Waal gas. 8
- (b) Explain the four thermodynamic potentials : (i) Internal Energy (ii) Enthalpy (iii) Gibbs free energy and (iv) Helmholtz function. 8
7. (a) Establish the Clausius-Clapeyron's equation: $dP/dT = L/T(V_2 - V_1)$ from Maxwell's thermodynamical relations and explain the effect of pressure on boiling point of liquid and melting point of a solid. 12
- (b) Explain the variation of internal energy with volume during isobaric process. 4

Unit IV

8. (a) What is Joule-Thomson effect ?
Distinguish between adiabatic expansion and Joule-Thomson effect. 12
- (b) Derive the relation between Boyle's temperature and critical temperature. 4
9. (a) Show that for a gas obeying van der Waal's equation, $RT_c / P_c V_c = 8/3$ where T_c , P_c and V_c are the critical temperature, critical pressure and critical volume of the gas respectively. 12
- (b) What is inversion temperature and explain its physical significance ? 4