



Date: 27-10-2018
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART - A

ANSWER ALL QUESTIONS:

(10 × 2 = 20 MARKS)

1. Give Maxwell-Boltzmann energy distribution function for an ideal gas.
2. At what temperature will the mean speed of hydrogen molecules be the same as that of Nitrogen molecules at 35⁰C? Molecular weight of N₂ = 28 and that of H₂ = 2.
3. What do you mean by quasi-static process? Can it be achieved in practice?
4. Distinguish between open and closed systems.
5. Write down the limitations of the first law of thermodynamics.
6. State Kelvin-Planck statement of second law of thermodynamics.
7. Calculate the change in entropy when 10 gram of ice at 0⁰C is converted into water at the same temperature. (Given: Latent heat of ice = 3.34 × 10⁵ J·kg⁻¹)
8. Are we heading towards the Heat death of the universe? Justify your answer.
9. Define Helmholtz free energy.
10. What is meant by phase equilibrium?

PART - B

ANSWER ANY FOUR QUESTIONS:

(4 × 7.5 = 30 MARKS)

11. Give the interpretation of temperature on the basis of kinetic theory of gases and interpret absolute zero temperature.
12. State and explain zeroth law of thermodynamics. What is its importance? On the basis of this law, introduce the concept of temperature.
13. Explain different forms of internal energy and show that the internal energy of a system is a function of state of the system.

14. A certain mass of gas at NTP is expanded to three times its volume under adiabatic conditions. Calculate the resulting temperature and pressure. γ for the gas is 1.40.
15. Prove Clausius inequality.
16. Write short notes on thermodynamic mnemonic diagram with suitable illustration.

PART - C

ANSWER ANY **FOUR** QUESTIONS:

(4 × 12.5 = 50 MARKS)

17. State the basic postulates of kinetic theory of gases. Derive an expression for the pressure exerted by a gas enclosed in a vessel.
18. Derive and discuss the Van der Waals equation of state of a gas.
19. Describe Carnot's cycle and obtain an expression for the efficiency of an ideal heat engine working between two temperatures T_1 and T_2 .
20. Calculate the change in entropy of a system which undergoes (a) a reversible process (b) an irreversible process?
- (c) calculate the change in entropy when 10 gm of water is converted into steam at the same temperature. Given latent heat of steam $2.26 \times 10^6 \text{ J}\cdot\text{kg}^{-1}$
21. Deduce any four Maxwell's thermodynamical relations.
22. What do you mean by first order phase transition? Prove that $\left(\frac{dP}{dT}\right) = \frac{S_2 - S_1}{V_2 - V_1}$ where the terms have their usual meaning.
