

Heat and ThermodynamicsLong answer type questions :-

1. What is meant by Joule-Kelvin effect? Derive an expression for the Joule-Thomson cooling of a gas. What is inversion temperature?
or
Derive an expression for the change in the temperature of a gas undergoing Joule-Thomson expansion. Discuss the role of inversion temperature in it.
2. What is Joule-Thomson effect? Describe Joule-Thomson porous plug experiment. Deduce a theoretical expression for the Joule-Thomson cooling, why does hydrogen show a negative Joule-Thomson effect?
3. What is Joule-Thomson effect? Find the expressions for Joule-Thomson coefficient for ideal gases and Vander Waals' gases.
4. What are the two basic differences between a real gas and an ideal gas? Discuss the observed deviation of a real gas from an ideal gas. Explain this deviation by kinetic theory.
5. What are the critical constants of a gas? Calculate the values of these constants in terms of the constants of the Vander Waals' equation.
6. Explain the term mean free path and find its expression.
7. State and prove Carnot's theorem.
8. Discuss the concept of entropy. Find the change in reversible and irreversible processes.

9. Deduce general expression for Maxwell's thermodynamic relation and hence obtain Maxwell's four thermodynamic equations. (2)
10. Define the four fundamental thermodynamic potentials. Starting from the four thermodynamic potentials, derive Maxwell's thermodynamic relations.
11. Establish the Clausius-Clapeyron's equation $\frac{dp}{dT} = \frac{L}{T(v_2 - v_1)}$ from Maxwell's thermodynamic relations and explain the effect of pressure on:
- Bolling point of a liquid
 - Melting point of a solid.
12. State Stefan-Boltzmann law of radiation. Deduce this law on the basis of thermodynamic considerations.

Short answer type Questions

- Second law of thermodynamics
- Third law of thermodynamics
- Reversible and Irreversible processes with examples.
- Thermodynamic potentials, (four)
- Law of equipartition of energy and ratio of two specific heats of mono-atomic, diatomic and triatomic gases.
- Joule-Thomson expansion and adiabatic expansion
- Principle of increase of entropy.
- Different applications of Maxwell's thermodynamic relations.

- (9) ~~See~~ Black body radiation
- (10) Wien's displacement law, Raleigh-Jeans law
- (11) Planck's radiation formula
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