

3rd Semester Examination, 2021

Time : 3 hours

Full Marks : 60

Answer from all the Groups as per direction

*The figures in the right-hand margin indicate marks**Candidates are required to answer in their own words
as far as practicable*

(MODEL CBCS)

(THERMAL PHYSICS)

GROUP – A

1. Answer all questions : 1 × 8

- (a) Which Law of thermodynamics gives definition of temperature.
- (b) Entropy remains constant is _____ thermodynamic process.

(Turn Over)

- (c) Gibbs free energy (G) is a _____ (Thermodynamic potential/variable)
- (d) _____ remains unchanged in 1st order phase transition (temperature/volume).
- (e) Molecular velocity varies with absolute temperature (T) as _____.
- (f) Degrees of freedom of monoatomic gas molecule at normal temperature is _____.
- (g) Critical temperature in terms of van der Waals constant is $T_c =$ _____.
- (h) Boyle Temperature from van der Waals' equation is $T_B =$ _____ T_c .

GROUP – B

2. Answer any eight of the following questions : $1\frac{1}{2} \times 8$
- (a) State first law of Thermodynamics.
- (b) What is a reversible process ?
- (c) State third law of Thermodynamics.

(3)

- (d) Write examples of intensive and Extensive variables.
- (e) Explain cooling due to adiabatic demagnetisation.
- (f) Establish the relation $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$.
- (g) State principle of equipartition of energy.
- (h) Calculate rms speed of hydrogen gas at N.T.P.
- (i) Write two limitations of van der Waal's equation.
- (j) Define critical temperature.

GROUP – C

3. Answer any *eight* of the following : 2 × 8

- (a) State Kelvin Planck Statement of second law of thermodynamics.
- (b) Show that perfect gas scale is the thermodynamic scale of temperature.

(Turn Over)

(4)

- (c) Draw explain T-S diagram for Carnot Cycle.
- (d) Explain how surface tension varies with temperature.
- (e) Establish Clausius-Clapeyron equation.
- (f) Explain change of Temperature during adiabatic process from Maxwell's equation.
- (g) Find an expression for r.m.s speed of gas molecules.
- (h) At what temperature r.m.s speed of oxygen molecule will become half of hydrogen molecule at N.T.P.
- (i) Explain the causes of deviation of real gases from ideal behaviour.
- (j) Define Boyle temperature and explain its applications.

GROUP – D

4. Answer *all* questions : 6 × 4

(5)

(a) State and prove Carnot's theorem.

Or

Find an expression for entropy of a perfect gas.

(b) Explain first order and second order phase transition.

Or

Establish first and second Tds equations.

(c) Find an expression for molecular speed considering Maxwell-Boltzmann distribution.

Or

Find an expression for coefficient of viscosity using transport phenomenon.

(Turn Over)

(6)

(d) Establish van der Waal's equation of state. Find the critical constants.

Or

Discuss J-T effect for real and van der Waal's gases.

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