

22406

12223

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
- (2) Illustrate your answer with neat sketches wherever necessary.
- (3) Figures to the right indicate full marks.
- (4) Assume suitable data, if necessary.
- (5) Use of Non-programmable Electronic Pocket Calculator is permissible.
- (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

- 1. Answer any FIVE of the following: **10****
- a) Define state function and path function.
- b) State the necessity conditions for achieving mechanical and thermal equilibrium.
- c) Write the equation relating specific heat at constant pressure (C_p) and specific heat at constant volume (C_v).
- d) State the first law of thermodynamics.
- e) Write two examples indicating interconversion between work and heat.
- f) State the “Gibb’s phase rule”.
- g) Define entropy.

P.T.O.

- 2. Answer any THREE of the following:** **12**
- Explain the concept of adiabatic and isochoric process.
 - Show that for isothermal expansion of an ideal gas $\Delta u = 0$ and $\Delta H = w$.
 - One mole an ideal gas expands against constant external pressure of 1 atm from volume of 10L to volume to 30 L. Calculate the work done by gas in joule.
 - State and explain Third Law of thermodynamics. Also define standard entropy.
- 3. Answer any THREE of the following:** **12**
- State and explain Second Law of thermodynamics.
 - Explain Joule-Thomson expansion. State the importance of Joule-Thomson porous plug experiment.
 - Define extensive and intensive properties. Give one example of each.
 - Derive an expression for ideal gas process at constant volume and temperature.
- 4. Answer any THREE of the following:** **12**
- Explain the terms component, phase and degrees of freedom. Calculate the degrees of freedom for vapour in equilibrium with water.
 - Derive relation between first and second law of thermodynamics.
 - Derive mathematical expression for clausius inequaling.
 - State the applications of Le-chateliers principle.
 - Derive Van't Hoff's equation.
- 5. Answer any TWO of the following:** **12**
- State and explain Zeroth law of thermodynamics.
 - Draw and explain the phase diagram for water system.
 - Define chemical potential. Write its notation. State and explain Law of mass action.

6. Answer any TWO of the following:**12**

- a) Draw the phase diagram for sulfur system and explain in brief.
 - b) Write the mathematical expression of Van der Waals equation. Explain the meaning of terms involved in it.
 - c) 2 moles of PCl_5 are heated at 22°C till equilibrium is reached at a total pressure of 1 atm. Calculate the composition of equilibrium mixture and the percentage decomposition of PCl_5 . ($K_p = 0.46$ atm).
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