

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022**(Regular/Improvement/Supplementary)****CHEMISTRY****GCHE3B03T: PHYSICAL CHEMISTRY - I****Time: 2 Hours****Maximum Marks: 60****SECTION A: Answer the following questions. Each carries two marks.****(Ceiling 20 Marks)**

1. Write an expression for the average translational K.E. (i) per mole and (ii) per molecule of an ideal gas.
2. What is meant by Boyle temperature of a gas?
3. Define the term enthalpy of a reaction.
4. What is meant by a closed system?
5. Is vapour pressure an intensive property or an extensive property? Why?
6. Explain the term reversible process.
7. What is the relationship between q_p and q_v ?
8. Mention an important application of the Third Law of thermodynamics
9. In how many ways can four A molecules and six B molecules be arranged in a row so that no two A molecules are together?
10. Define the equilibrium constant in terms of partial pressures.
11. XeF_4 is a square planar molecule. How many proper rotation axes does the molecule have?
12. Define proper axis of rotation. Give an example.

SECTION B: Answer the following questions. Each carries five marks.**(Ceiling 30 Marks)**

13. Calculate the RMS, average and most probable velocities of SO_2 at 427°C .
14. Explain the term continuity of states.
15. The standard enthalpies of formation of $\text{CO}_2(\text{g})$ and $\text{H}_2\text{O}(\text{l})$ are respectively -393.5 and -285.8 kJ mol^{-1} . The standard enthalpy of combustion of ethane is -1560 kJ mol^{-1} . Calculate the enthalpy of formation of ethane.
16. Explain the term chemical potential.
17. What is Stirling's approximation? What is its importance in statistical thermodynamics?
18. Show that C_{2h} point group forms a mathematical group.
19. Explain elements of symmetry of molecules.

(PTO)

SECTION C: Answer any one question. Each carries ten marks.

20. (a) Define the term Gibbs free energy. What is its physical significance?
(b) Explain the Gibbs free energy criteria for (i) a spontaneous change, and (ii) an equilibrium state.
(c) Show that $-\Delta G_{T,P} = -w_{useful}$
21. State Le Chatelier principle and apply it to the equilibrium in the Haber process for the manufacture of NH_3 .

(1x 10 = 10 Marks)