D 111939 **(Pages : 2)** **Name.....**

Reg. No.....

THIRD SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2024

Chemistry, Industrial Chemistry, Polymer Chemistry

CHE 3B 03—PHYSICAL CHEMISTRY—I

(2021—2023 Admissions)

Time : Two Hours Maximum : 60 Marks

Section A (Short Answers)

Answer questions up to 20 *marks.*
Each question carries 2 *marks.*

1. Write the effect of temperature on most probable velocity.
2. What is meant by intensive properties ? Write any *two* examples.
3. Explain Nernst heat theorem.
4. Explain why heat capacity at constant pressure is greater than that at constant volume. Write the relation between the two.
5. Write the point group of water molecule and the symmetry elements present in it.
6. Write an expression for the relation between entropy and probability.
7. Derive Gibbs Duhem equation.
8. Calculate the RMS velocity of O_2 at 250°C.
9. Write the two important features of Maxwell Boltzmann distribution curve.
10. 10 moles of an ideal gas expands isothermally and reversibly from a volume of 10 atm to 20 atm at 25°C. What is the maximum work done ?
11. Write the significance of Gibb's free energy.
12. Show that Joule Thomson coefficient of an ideal gas is zero-.

(Ceiling of marks : 20)

Turn over

Section B (Paragraph)

Answer questions up to 30 *marks.*
Each question carries 5 *marks.*

13. Derive Maxwell relations.

14. Construct the group multiplication table of C_{2V} point group.

15. A certain gas has the critical constants : P_c = 45.6 atm, $V_{m,c}$ = 0.0987 $dm^3\ mol^{-1}$ and Tc = 190.6 K. Calculate the van der Waals constants of this gas. Also estimate the radius of the gas molecules assuming that they are spherical.

16. With the help of Le-Chatelier principle, write the condition which would favour the formation of ammonia in the reaction, $N_2+3H_2 \leftrightharpoons 2NH_3$

17. Explain the cause of deviation of real gases from ideal behavior. Write the Vander waals equation of state.

18. Derive the relation between temperature and volume for an adiabatic process.

19. Derive the equation showing temperature dependence of equilibrium constant

(Ceiling of marks : 30)

Section C (Essay)

Answer any **one** *question.*
The question carries 10 *marks.*

20. Explain Carnot cycle and write the expression for its efficiency.

21. Derive the expression for root mean square velocity, Average velocity and most probable velocity from Maxwell Boltzmann distribution.

(1 × 10 = 10 marks)