22U305 (Pages: 2) Name: .....

Reg.No: .....

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U CHE3 B03 - PHYSICAL CHEMISTRY - I

(Chemistry - Core Course)

(2019 Admission onwards)

Time : 2.00 Hours Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 2 marks.

1. Define the term root mean square velocity of a gas.
2. Give the van der Waals' equation for 'n' moles of a gas and explain the terms.
3. What is an intensive property? Give an example.
4. Give the relationship between the internal energy change and enthalpy change in process.
5. Define efficiency of a heat engine.
6. How is the entropy change related to heat exchanged reversibly in a process at constant temperature?
7. What does the Gibbs energy change (free energy change) in a process signify?
8. Define fugacity.
9. Distinguish between statistical probability and thermodynamic probability.
10. Derive an expression for Kp for the reaction: $NH_4Cl(s) \leftrightarrow NH_3(g) + HCl(g)$
11. Apply Le Chatelier principle the equilibrium: $2SO_2(g) + O_2(g) \leftrightarrow 2SO_3(g)$ + Heat.
12. Define a proper rotation axis.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer ***all*** questions. Each question carries 5 marks.

13. Calculate the mean free path of N_2 at 300 K and 1 atm pressure. Collision diameter=0.374 nm.
14. Discuss Andrews' experiments on the isotherms of a real gas.
15. Explain what is meant by Joule-Thomson effect and how the phenomenon originates.
16. Obtain the combined mathematical form of the First and Second Laws of thermodynamics.

17. Derive the Gibbs-Duhem equation.

18. Briefly explain the factors that influence the equilibrium.

19. Discuss the term multiplication as applied to symmetry operations.

(Ceiling: 30 Marks)

Part C (Essay questions)

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

20. Discuss the determination of the critical constants of a gas.

21. Discuss Linde's process and Claude's process for the liquefaction of gases.

(1 × 10 = 10 Marks)

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