

21U305

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Name:

Reg.No:

THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2022

(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. Calculate the RMS velocity of N₂ molecules at 27°C and 700 torr pressure.
2. Give an expression relating the Boyle temperature to the van der Waals constants.
3. What is the relationship between q_p and q_v ?
4. What is the Joule-Thomson coefficient for an ideal gas?
5. How is q related to w in a cyclic process?
6. What is entropy criterion for spontaneity?
7. State the Gibbs energy (free energy) criterion for spontaneous process.
8. Give the Gibbs-Helmholtz equation.
9. Explain unattainability of zero kelvin in context of third law of thermodynamics.
10. State and explain the law of mass action.
11. State and explain Le Chatelier principle.
12. Define a symmetry element.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

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

13. Calculate the collision frequency and the mean free path of CO gas at 27°C and 100 torr. Given: the molecular diameter of CO = 3.19 Å.
14. Derive the van der Waals' reduced equation of state and mention its importance.
15. Distinguish between isothermal, adiabatic, isobaric and isochoric processes.

16. Obtain the combined mathematical form of the First and Second Laws of thermodynamics.
17. How are entropy and probability are related?
18. Define chemical equilibria. What are its important characteristics?
19. Explain the term improper rotation with a suitable example.

(Ceiling: 30 Marks)

Part C (Essay questions)

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

20. Discuss Andrews experiments on the isotherms of CO₂, and bring out the idea of continuity of states.
21. Derive expressions connecting Joule-Thomson coefficient and inversion temperature with van der Waals constants.

(1 × 10 = 10 Marks)
