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Name: .....

Reg.No: .....

SECOND SEMESTER M.Sc. INTEGRATED GEOLOGY DEGREE EXAMINATION, APRIL 2025

(CBCSS)

(Regular/Supplementary/Improvement)

CC23 CHE2 IC02 - PHYSICAL CHEMISTRY

(Chemistry)

(2023 Admission onwards)

Time : 2.00 Hours

Maximum : 60 Marks

Credit : 2

**Part A** (Short answer questions)

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

1. How is the entropy of fusion of a substance related to its enthalpy of fusion?
2. What is Gibbs energy?
3. State and explain Avogadro's law.
4. List the elements of symmetry for a perfect cube.
5. Why does an increase in temperature decrease surface tension of a liquid?
6. State and explain Charles-van't Hoff law for solutions.
7. What are colligative properties? Give two examples.
8. What are strong electrolytes? Give two examples.
9. The cell constant of a cell is  $0.5\text{cm}^{-1}$ . The resistance of an electrolyte solution taken in the cell is 50 ohms. Calculate the conductivity of the solution.
10. What is calomel electrode? Give the electrode reaction.
11. The electrolytic conductivity of a  $0.20\text{ mol dm}^{-3}$  solution of KCl at 298 K is  $2.48 \times 10^{-2}\text{ ohm}^{-1}\text{ cm}^{-1}$ . Calculate its molar conductivity.
12. What is fuel cell? Give an example.

**(Ceiling: 20 Marks)**

**Part B** (Short essay questions - Paragraph)

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

13. Show that  $qv = \Delta U$  and  $qp = \Delta H$ .
14. Explain the significance of the van der Waals' constants  $a$  and  $b$ .
15. Sketch (100), (110) and (110) planes of a primitive cubic lattice and derive the interplanar distance ratio.
16. Explain Frenkel defect.

17. At what temperature will 3.6% solution of glucose (molar mass= $180\text{g mol}^{-1}$ ) develop an osmotic pressure of  $5.1 \times 10^5 \text{ Nm}^{-2}$ .
18. Explain the principle of conductometric titrations with a suitable examples. What are the advantages of the method?
19. Mention the applications of buffer solutions.

**(Ceiling: 30 Marks)**

**Part C (Essay questions)**

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

20. (a) Discuss the significance of internal energy change.  
(b) Calculate the change in internal energy produced when a gas expands isothermally against a constant external pressure 1 atm from  $10 \text{ dm}^3$  to  $20 \text{ dm}^3$  if it absorbs 650 J of thermal energy from its surrounding during the process.
21. Discuss the significance of Maxwell's equation for the distribution of molecular velocities and the effect of temperature on the distribution.

**(1 × 10 = 10 Marks)**

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