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M – 1483

Reg. No. :

Name :

Fifth Semester B.Sc. Degree Examination, December 2021

First Degree Programme Under CBCSS

Chemistry

Core Course

CH 1541 : PHYSICAL CHEMISTRY — I

(2014 & 2016 Admission)

Time : 3 Hours

Max. Marks : 80

PART – A

Answer **all** questions. **Each** carries **1** mark.

1. Write Virial equation of state?
2. Give an example for a crystal exhibiting both Schottky and Frenkel defect.
3. How abnormal molecular mass is related to van't Hoff factor i ?
4. What is the relation between ideal gas behaviour and compressibility factor?
5. Define point group.
6. What are the criteria of equilibrium and spontaneity in terms of Gibbs free energy?
7. Explain Kirchoff's law.
8. Define chemical potential.
9. Define space lattice.
10. What is the internal energy change and enthalpy change for adiabatic expansion of an ideal gas?

(10 × 1 = 10 Marks)

P.T.O.

PART – B

Answer **any eight** questions. **Each** carries **2** marks.

11. Explain the point group and symmetry elements of ammonia.
12. One mole of gas absorbs 400 J of heat at constant volume and its temperature is raised from 20° C to 25° C Calculate the values of W.
13. Write Gibbs-Duhem equation?
14. Give expressions for Inversion temperature and Boyle temperature.
15. Differentiate extensive and intensive properties with examples.
16. Give expression for osmotic pressure and explain the terms.
17. Explain the structure of TiO₂.
18. What are the factors affecting surface tension?
19. What is the physical significance of entropy?
20. Define fugacity.
21. Distinguish collision number and collision frequency.
22. Account on the relation between critical constants and van der Waals constants.
(8 × 2 = 16 Marks)

PART – C

Answer **any six** questions. **Each** carries **4** marks.

23. Define mean free path. Calculate the mean free path for N₂ at 27°C and at 1 atm pressure. The collision diameter for N₂ is 0.374 nm.
24. How Gibbs free energy change is related to temperature, pressure and volume?
25. What are Maxwell relations?

26. Briefly explain Carnot theorem.
27. Explain Beckman method to determine molecular mass.
28. Explain the group multiplication table for the point group of water.
29. Calculate the Miller indices of crystal planes which cut through the crystal axes at
 - (a) $(2a, 3b, c)$ and
 - (b) (a, b, c) .
30. Explain the terms molality, molarity, normality and mole fraction with equations.
31. Derive the expression for Joule-Thomson coefficient and relate Joule Thomson effect with inversion temperature.

(6 × 4 = 24 Marks)

PART – D

Answer **any two** questions. **Each** carries **15** marks.

32.
 - (a) Distinguish zinc blende and wurtzite structure with suitable examples.
 - (b) Briefly explain rotating crystal method and powder method
 - (c) Give an account on Bravais lattices of crystals.
33. What is meant by colligative properties? Derive the thermodynamic derivations for depression in freezing point, elevation in boiling point and osmotic pressure.
34. Explain Maxwell distribution of molecular velocities? Give derivations for most probable, average and root mean square velocities.
35.
 - (a) What are liquid crystals and give their applications?
 - (b) Briefly explain the characteristics of different types of liquid crystals.
 - (c) Explain Swarm theory of liquid crystals.

(2 × 15 = 30 Marks)