(Pages : 4) K – 3165

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Fifth Semester B.Sc. Degree Examination, February 2021

First Degree Programme Under CBCSS

Chemistry

Core Course

CH 1541 : PHYSICAL CHEMISTRY I

(2013, 2015-16 Admn)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions in **a word or** sentences. **Each** question carries **1** mark.

1. Write down the Van der Waals equation for *n* moles of a gas.
2. Define critical constants.
3. Schottky defects are due to ————————.
4. Total number of Bravais lattices is ————————.
5. Define fluidity.
6. Give any one example of a liquid crystalline substance.
7. Define Internal energy.
8. Explain Joule-Thomson expansion.

P.T.O

9. Write Boltzmann-Plank entropy equation.

10. What is the point group of BF_3 molecule?

(10 × 1 = 10 Marks)

SECTION – B

Each question carries **2** marks (Short answer type) Answer any **eight** questions.

11. Distinguish between *rms* velocity and *average* velocity.

12. Define mean free path.

13. Explain surface tension of liquids with any one example.

14. Explain why the Osmotic pressure of colloidal solutions are usually low.

15. Define enthalpy of formation.

16. Define bond energy and bond dissociation energy.

17. Discuss partition function.

18. State Carnot's theorem.

19. Explain plane of symmetry of a molecule with one example.

20. Define the operation improper rotation.

21. State and explain the first law of thermodynamics.

22. Define enthalpy of neutralization.

(8 × 2 = 16 Marks)

SECTION – C

Each question carries **4** marks (Short essay type) Answer any **six** questions.

23. Calculate the mean free path of O_2 gas at 300K and 1 atm. Take collision diameter $\sigma = 500A^{\circ}$

24. Derive thermodynamically the relation between osmotic pressure and lowering of vapour pressure.

25. Derive an expression for work done in the reversible isothermal expansion of an ideal gas.

26. Derive Gibbs Duhem equation.

27. Discuss the structure of NaCl and KCl.

28. Briefly describe the determination of fugacity of a gas.

29. Explain symmetry elements and symmetry operations with an example.

30. Discuss how critical temperature and critical pressure are determined experimentally.

31. Explain point defects.

(6 × 4 = 24 Marks)

SECTION – D

Each question carries **15** marks (Essay type) Answer any **two** questions.

32. Derive Gibbs-Helmholtz equation and discuss its application.

33. Derive Bragg's law and discuss about rotating crystal method of XRD.

34. (a) Derive an expression for the relationship between pressure and volume in a reversible adiabatic expansion of an ideal gas.

(b) 3 moles of an ideal gas expand isothermally and reversibly from a volume of 5 L to a volume of 15 L at 25° C. Calculate the maximum work done.

35. (a) Describe Berkley and Hartley's method for the determination of osmotic pressure.

(b) Describe the determination of depression in freezing point by Beckmann and Rast method.

(2 × 15 = 30 Marks)
