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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

(2018 Admission – Regular)

Time : 3 Hours Max. Marks :80

SECTION – A

Answer **all** questions. One word type. Each question carries **1** mark.

1. What will happen to the most probable velocity of a gas when the temperature is increased?
2. Which gas has the lowest critical temperature?
3. What is the SI unit of vander Waal's?
4. How many numbers of crystal systems exist in nature?
5. How many numbers of atoms in the unit cell of face centred cubic lattice?
6. What is the SI unit of coefficient of viscosity?
7. Liquids with high intermolecular forces have high viscosity. Explain.

P.T.O.

8. What will happen to vapour pressure of solution when a non-volatile solute is dissolved in a solvent?

9. When 5KJ of work is done on the system and 1KJ is given out by the system what will be ΔU?

10. What is the point group of boat form of cyclohexane?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Define root mean square velocity of a gas.

12. What is meant by the Boyle Temperature of a gas?

13. At what temperature will the RMS velocity of O_2 gas be equal to that of H_2 molecule at 27°C

14. Under what conditions does a real gas approach ideal behaviour?

15. What is the Joule-Thomson coefficient for an ideal gas?

16. What do you mean by smectic liquid crystal?

17. What do you mean by abnormal molecular mass?

18. Explain why the addition of a non-volatile solute increases the boiling point of a liquid?

19. Show that $Cp - Cv = R$ for one mole of an ideal gas.

20. Define efficiency of heat engine.

21. How is entropy of fusion of a substance related to enthalpy of fusion?

22. List out the symmetry elements of the C_{2v} point group.

23. Write down the expression for interplanar spacing (dhkl) of a cubic unit cell.

24. What is molal elevation constant?

25. Define entropy.

26. What are colligative properties?

(8 × 2 = 16 Marks)

SECTION – C

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

27. Explain the structure of NaCl.

28. Derive Bragg's equation.

29. Acetic acid associates to form double molecules. 1.65 g of acetic acid when dissolved in 100g of benzene raised the boiling point by 0.36°C. Calculate Van't Hoff's factor and degree of association of acetic acid in benzene.

30. Explain the molecular mass determination by Beckmann's method.

31. Explain the entropy criteria for reversible and irreversible process.

32. Derive the relation : $dG = VdP - SdT$.

33. Derive the Gibbs - Duhem equation.

34. Explain fugacity and its determination by graphical method.

35. Define the term Gibb's free energy? What is its physical significance?

36. Explain the Swam theory of liquid crystal.

37. Explain the non-stoichiometric defects in crystals.

38. What are critical constants of a gas? How would you determine them?

(6 × 4 = 24 Marks

SECTION – D

Answer **any two** questions. Long essay type, Each question carries **15** marks.

39. Derive the expression connecting the Joule-Thomson coefficient and inversion temperature with van der Walls constants.

40. (a) State and illustrate the Hess's law of constant heat summation.

    (b) Explain two applications of Hess's law.

    (c) The standard enthalpy of reaction for the hydrogenation of ethylene (C_2H_4) to ethane (C_2H_6) is -136.8 KJ/moles. The standard enthalpy of formation of ethane is -84.4 kJ/moles. Calculate the standard enthalpy of formation of ethylene?

41. (a) Explain the different types of point defects in crystals.

    (b) Explain the powder method for crystal structure determination?

42. (a) Discuss the different classes of liquid crystals with suitable examples.

    (b) Explain the different characterization techniques of liquid crystals.

43. (a) Derive the Gibbs Helmholtz relation and its significance.

    (b) Construct the group multiplication table for C_{2v} point group.

44. (a) Explain the different types of colligative properties exhibited by dilute solutions.

    (b) Discuss the method of determination of molecular mass by Rast's method.

(2 × 15 = 30 Marks)
