MAR IVANIOS COLLEGE (AUTONOMOUS) THIRUVANANTHAPURAM

Reg. No. :…………………   Name :……………….

Fifth Semester B.Sc. Degree Examination, November 2016
First Degree Programme under CBCSS
Core Course: Chemistry – V
AUCH542: Physical Chemistry – I

Time: **3** Hours   Max. Marks: **80**

SECTION – A

*Answer **ALL** questions in one or two sentences.*

1. The compressibility factor (z) is given by the equation Z = _____.
2. The rms velocity of N_2 is _____ than that of CO_2 at the same temperature.
3. $a = b = c$, $\alpha = \beta = \gamma \# 90^0$ represents _____ crystal system.
4. The number of Bravais lattices pertaining to the cubic system is _____.
5. As the temperature increases, viscosity of a liquid _____.
6. A mixture of 18g of urea (molar mass = 60) and 18g glucose (molar mass 180) is dissolved in 200 of water. The molality of solution is _____.
7. Among energy, enthalpy, viscosity, surface area, an intensive property of the system is _____.
8. Efficiency of Carnot engine working between temperatures T_1 and T_2 is _____.
9. The entropy of all perfectly crystalline solids at zero Kelvin is _____.
10. An example of a liquid crystalline substance is _____.

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions.*

11. Explain the causes for the deviation of real gases from ideal behavior.
12. Define mean free path and collision diameter.

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13. If a crystal plane makes intercepts ½ a, ½ b and 1c, what are the miller indices ?

14. What is Poiseuille's equation ?

15. Define Van't Hoff factor.

16. State and explain Hesse's law.

17. Give the statement of the first law of thermodynamics and it's mathematical formulation.

18. Explain virial equation of state.

19. Explain the concept of fugacity.

20. State the law of rationality of indices.

21. Give one example each for the following point groups.

　a) D_{6h}　　　b) C_{3v}　　　c) D_{2h}　　　d) C_{2v}

22. Give the group multiplication table of C_{2v} point group.

$(8 \times 2 = 16$ **Marks**$)$

SECTION – C

*Answer any **SIX** questions.*

23. Derive the expressions for critical constants Pc, Tc and Vc in terms of vander Waal's constant.

24. Derive Bragg equation.

25. Explain zinc blende structure.

26. How will you determine molecular mass of a solute by Beckmann's method ?

27. A solution containing 20 g of non – volatile organic solvent in 800 ml exerts an osmotic pressure of $8 \times 10^5 \, Nm^{-2}$ at 20^0 C. Calculate molar mass of the solute.

28. Derive an expression for work done for a reversible adiabatic expansion of an ideal gas.

29. Derive an expression for Joule Thomson coefficient.

30. Explain Gibbs – Helmholtz equation and its significance.

31. What is chemical potential ? Derive Gibbs – Duhem equation.

$(6 \times 4 = 24$ **Marks**$)$

SECTION – D

*Answer any **TWO** questions.*

32. a) Give Maxwell's law of distribution of molecular velocities and give the significance of Maxwell's equation.

 b) Show that the ratio, most probable velocity: average velocity: rms velocity is 1:1.128:1.224 **(7½ + 7 ½ = 15 Marks)**

33. a) Explain the different types of stoichiometric defects in crystals.

 b) Describe the powder method for X – ray diffraction studies of crystal.

 (7½ + 7 ½ = 15 Marks)

34. a) Give the criteria for a process to be spontaneous based on ΔH, ΔS and T.

 b) At what temperature does the reaction $C_{(s)} + H_2O_{(s)} \rightarrow CO_{(g)} + H_{2\,(g)}$ become spontaneous, If $\Delta H = +40.08\ KJ$ and $\Delta S = +133.6 JK^{-1}$ **(7½ + 7 ½ = 15 Marks)**

35. a) Explain the different types of symmetry operations with suitable examples.

 b) Compare the structural features of nematic and smectic liquid crystals.

 (7½ + 7 ½ = 15 Marks)

 (2 × 15 = 30 Marks)

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