U.G. 4th Semester Examination - 2021

CHEMISTRY

[HONOURS]

Course Code : CHEM-H-CC-T-8

Full Marks : 20   Time : 1 Hour

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

1. Answer any **five** questions: $1 \times 5 = 5$

   i)   Define colligative properties of solutions.

   ii) State Raoult's law for ideal systems.

   iii) Write down Debye-Huckel limiting equation mentioning the meaning of the symbols used.

   iv) Calculate the ionic strength of 0.01(M) HCl solution.

   v)   Write one difference between ψ and ψ^2.

   vi) State Konowaloft's rule.

   vii) What are azeotropic solutions?

   viii) State Henry's law.

2. Answer any **one** question: $5 \times 1 = 5$

   i)   State and explain the van't Hoff's factor "i". A sample of camphor ($K_f = 40$) melts at 176°C. A solution of 0.0205gm of a hydrocarbon in 0.261gm camphor melts at 156°C. The hydrocarbon contains 92.3% carbon. Determine the molecular formula of the hydrocarbon.
                                                      2+3

   ii) What is a Potentiometer? Construct the cell for potentiometric titration of Mohr's salt with $K_2Cr_2O_7$ solution. What will be the nature of graph if we plot E vs. V and $\Delta E / \Delta V$ vs. V (E=E.M.F, V= volume of $K_2Cr_2O_7$ added).
                                                      1+4

   iii) How structure of a co-valent molecule can be determined from dipole moment data? Explain with example.

        The dipole moment of chlorobenzene is 1.55D. The bond distance of $C_6H_6^+ - Cl^-$ is 2.8 Å. Estimate the percentage of ionic character of the bond. $2\frac{1}{2} + 2\frac{1}{2}$

3. Answer any **one** question: $10 \times 1 = 10$

   i)   Write down Debye equation and Clausius-Mossotti relation mentioning the meaning of the

symbols used. How polarisation and hence dipole moment of covalent molecules vary with temperature? Show graphically and explain. How dipole moment can be measured by temperature difference method?   (2+2)+3+3

ii) Write down 'phase Rule'. Define the terms i.e, phase, component, degrees of freedom used in this rule with example. Draw the phase diagram of water system with explanation.

$$(1+2+2+2)+3$$

iii) What do you mean liquid-Junction potention of a cell? How it can be eliminated? Briefly discuss about LCAOMO treatment with suitable example.   (2+2)+6

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