U.G. 4th Semester Examination - 2022

CHEMISTRY

[HONOURS]

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

(Physical)

Full Marks : 40   Time : $2\frac{1}{2}$ Hours

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** from the following questions:

    $2\times5=10$

    a) Give one example each of positive and negative deviations from Raoult's law.

    b) Give one specific example where transference number of an ion becomes negative.

    c) What do you mean by EMF of a cell? Name the method by which EMF of a cell is measured.

    d) What is the difference between wave function ψ and ψ^2?

    e) What is the substitution of hydrogen electrodes for determination of pH of a solution using calomel as a reference electrode?
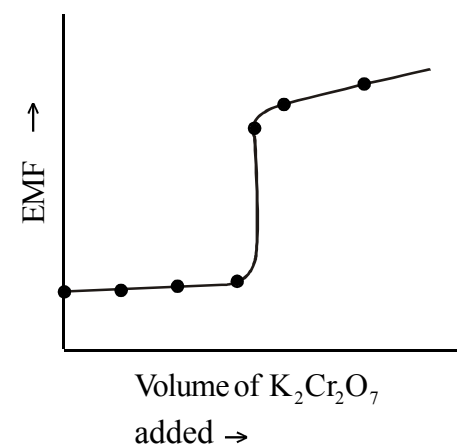
[Turn Over]

f) What is quinhydrone? How it is used as an electrode?

2. Answer any **two** from the following questions:

    $5\times2=10$

    a) What is Potentiometry? When Mohr salt solution in acid medium is titrated with $K_2Cr_2O_7$ solution potentiometrically the nature of graph is as follows :

Volume of $K_2Cr_2O_7$ added →

Justify briefly the nature of graph including sharp change which occurs. $1+4=5$

    b) What is salt-bridge? What is its importance and how it is prepared in the laboratory? How it is preserved in the laboratory?

    $1+\left(1\frac{1}{2}+1\frac{1}{2}\right)+1=5$

c) What do you mean by ebullioscopic constant? Calculate its value for pure water.

At 50°C, the vapour pressure of pure water and of alcohol are 92 and 220mm respectively. X gm of a solute were dissolved separately in 150gm of each solvents. What will be the ratio of lowering of vapour pressures in the two solvents? $(1+1)+3=5$

3. Answer any **two** from the following questions:

$$10 \times 2 = 20$$

a) i) What is a 'Glass Electrode'? How a glass electrode is preserved in the laboratory? If a glass electrode becomes dead, how you will re-activate it? What are the advantages and limitations of glass electrode?

$$1+1+1+(1+1)=5$$

ii) At 25°C and 1atm, for the cell $(Pt)H_2 | Hcl(0.1M) | AgCl - Ag$; the

$$EMF = 0.35 volt \quad and \quad \frac{dE}{dT} = -1.8 \times 10^{-4}$$

$Volt / °C$. Calculate ΔG, ΔH and ΔS for the cell reaction. 5

b) i) Briefly discuss the main features of LCAO–MO treatment of H_2+ species. 5

ii) Distinguish between VBT and MOT. 5

c) i) What are the main criteria to be fulfilled for an ideal solution? 3

ii) Derive Duhem–Margules equation and extact the conclusions from it. $4+3=7$

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