U.G. 4th Semester Examination - 2020

CHEMISTRY

[PROGRAMME]

Course Code : CHEM(G)-CC-T-4

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.

GROUP-A

(Marks : 21)

1. Answer any **three** questions: $2\times3=6$

   a) $\wedge^\circ$ of $Al_2(SO_4)_3$, NH_4OH and $(NH_4)_2SO_4$ are 858, 238.3 and 238.4 S Cm^2 eq^{-1} respectively at 25°C. Calculate $\wedge^\circ$ for $Al(OH)_3$.

   b) What is liquid junction potential and how is it eliminated?

   c) Write down Gibbs Phase rule for general system. Find the number of degrees of freedom at the triple point of water.

   d) What is meant by an ideal solution? Why does a solution deviate from ideality?

   e) Define ionic mobility and mention its unit.

[Turn Over]

2. Answer any **one** question: $5\times1=5$

   a) Explain the phase diagram of a two-component liquid-liquid system – Phenol water system. State the Kohlrausch's law of independent migration of ions. $3+2$

   b) Calculate the emf and ΔG° for the cell reaction at 25°C:

      $Zn_{(s)}$ | Zn^{2+} aq(0.01M) | Cd^{2+}aq(0.01M) |$Cd_{(s)}$

      Given $E^\circ_{Zn2+/Zn} = -0.763V$ and

      $E^\circ_{Cd2+/Cd} = -0.403V$. $2+3$

3. Answer any **one** question: $10\times1=10$

   a) Discuss the principle of moving boundary method for determining the transport number of an ion. Discuss the working principle of the quinhydrone electrode. Is it possible to obtain pure ethanol by distilling a mixture of ethanol water? Explain. $4+4+2$

   b) What do you understand by Eutectic mixture? Illustrate it with a simple labelled phase diagram. Draw a plot of the variation of equivalent conductance with concentration for a strong electrolyte. Discuss the plot in the light of the theory of interionic attraction. Write down Nernst distribution law. $2+2+2+2+2$

GROUP-B

(Marks : 19)

4. Answer any **two** questions: $2 \times 2 = 4$

   a) Give the electronic configuration of Sm^{2+}.

   b) What is meant by inner orbital complex?

   c) Calculate the CFSE of $[Ni(CN)_4]^{2-}$.

   d) Calculate the spin-only magnetic moment of $[Fe(H_2O)_6]^{2+}$.

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

   a) What is Lanthanide contraction? Give its causes and consequences. $1+2+2=5$

   b) A deep blue solution containing Co(II) in conc. HCl gradually turns pale pink on addition of excess water. Explain. What is jahn-Teller distortion? $3+2=5$

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

   a) i) Give the IUPAC nomenclature of the following: $Na_2[Fe(CN)_5NO]$ and $K[PtCl_3(C_2H_4)]$.

      ii) How do you separate lanthanides by ion exchange method?

   iii) 10 Dq increases in the order $[CrCl_6]^{3-} < [Cr(NH_3)_6]^{3+} < [Cr(CN)_6]^{3-}$

   iv) What is fac- and mer-stereoisomerism? $2+3+3+2=10$

   b) Write short notes on the following (any **two**): $5 \times 2 = 10$

      i) Spectrochemical series

      ii) Werner's coordination theory

      iii) Magnetic properties of lanthanides

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