

Total Pages – 6

B.Sc. RNLKWC-/CC-5T/22

2022

Chemistry

B.Sc. Third Semester End Examination - 2022

PAPER - CC-5T

Full Marks : 40

Time : 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.  
Illustrate the answers wherever necessary.*

**Group-A**

**Attempt any five from the following :**

**5×2=10**

1. a) Cite one example of non-gas non-metal electrode and write Nernst equation for this electrode reaction.
- b) 50 ml H<sub>2</sub>O + 50 ml HCl will be 100 ml HCl solution? –justify or criticise.

*(Turn Over)*

( 2 )

- c) Write down the physical significance of Gibbs-Dubem equation.
- d) The equivalent conductance of a 0.1(N)  $\text{CaCl}_2$  is given as  $120.36 \text{ Ohm}^{-1} \text{ cm}^2 \text{ equiv.}$  What will be molar conductance in S.I. system.
- e) Explain what is mean by  $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = 0.34 \text{ volt.}$
- f) Write S.I. unit of viscosity co-efficient.

**Group - B**

**Answer any four from the following.**

**5×4=20**

2. a) (i) Deduce the Van't Hoff reaction isotherm for general reaction  $aA+bB \rightarrow lL+mM$  using concept of chemical potential. 3
- (ii) How does the equilibrium constant for the reaction  $2A+3B \rightleftharpoons 4C+\Delta$ , change when (A) temperature decreased (B) a catalyst is added. 2

( 3 )

- b) (i) The standard reduction potential for the half cell :  $\text{NO}_3^-(\text{aq}) + 2\text{H}^+(\text{aq}) + \text{e}^- \rightarrow \text{NO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$  is 0.78v. What will be the reduction potential of the half cell in a neutral solution. (Assume all other species at unit conc) 3
- (ii) Galvanic Cell is a truly reversible cell– Justify. 2
- c) (i) A 4 molal  $\text{FeCl}_3$  solution electrolyzed between platinum electrodes. After the electrolysis in cathode solution weighing 30 gm is 3.15 molal in  $\text{FeCl}_3$  and 1 Molal in  $\text{FeCl}_2$ . What is transport number of  $\text{Fe}^{+3}$  and  $\text{Cl}^-$  ions.
- (ii) Mention two effects that lead to a decrease in conductance of a solution of strong electrolyte. How are they eliminated?
- d) (i) Write a short note on Quinhydrone electrode. 2
- (ii) Show that chemical potential of a pure substance is higher than in mixture. 3

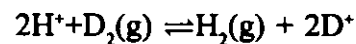
( 4 )

e) (i) Discuss the effect of temperature on viscosity coefficient. 2

(ii) Show that  $\left(\frac{\partial \mu}{\partial \zeta}\right)_{T,P} = \Delta G$

f) (i) In the reaction  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$  show that the maximum yield of  $NH_3$  will be obtained when  $N_2$  and  $H_2$  are in the molar ratio 1:3. 3

(ii) Calculate the equilibrium constant at  $25^\circ C$  for the reaction



$$E_{D^+ / D_2 / pt} \rightleftharpoons 3.4 \text{ mv at } 25^\circ C \quad 2$$

( 5 )

### Group -C

Answer any one from the following :  $1 \times 10 = 10$

3. (a) (i) Show that in a binary system, the decrease in Gibbs free energy of mixing is maximum if  $x_1 = x_2 = 0.5$  (where  $x_1$  and  $x_2$  are the mole fraction of 1st and 2nd component)

(ii) What is Reynold number. Write its significance. 3

(iii) For a certain reaction  $\Delta \mu^\circ = 4 \text{ kJ/mol}$  and  $\Delta H^\circ = 57 \text{ kJ/mol}$  at  $298 \text{ K}$ , calculate  $K_p$  for the reaction at  $500 \text{ K}$ , assuming  $\Delta H^\circ$  remains constant over the given temperature range.

(b) (i) Consider the Cell  $pt | H_2(\text{latm}) | HCl \equiv HCl / H_2(\text{lat}) pt$ . Write the net process that takes place due to passage of one Faraday of electricity. Hence write an expression for the emf of .... cell.

4

( 6 )

(ii) Draw and explain the conducto metric titration curve when KCl is titrated by AgNO<sub>3</sub>. Sketch the dirivative plot for such titration. 3

(iii) Find out the degree of dessociation and hydrogen ion concentration at 25°C for a 0.01 molar solution of propionic acid. ( $K_a=1.32 \times 10^{-5}$ ) 3