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_2O + 50 ml HCl will be 100 ml HCl solution? –justify or criticise.

c) Write down the physical significance of Gibbs-Dubem equation.

d) The equivalent conductance of a00.1(N) $CaCl_2$ is given as 120.36 Ohm^{-1} cm^2 euiv. What will be molar conductance in S.I. system.

e) Explain what is mean by $E°Cu^{2+}/Cu = 0.34$ volt.

f) Write S.I. unit of viscosity co-efficient.

Group - B

Answer any four from the follwing. **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

b) (i) The standard reduction potential for the half cell : $NO_3^-(aq) + 2H+(qr)+e \rightarrow NO_2(g)+H_2O(l)$ is 0.78v. What will be the reduction potential of the half cell in a neutral solution. (Assume all other species at unit cone) 3

(ii) Galvanic Cell is a truely reversible cell– Justify. 2

c) (i) A 4 molal $FeCl_3$ solution electrolyzed betwen platinum electrodes. After th electrolytes in cathode solution wighing 30 gm is 3.15 molal in $FeCl_3$ and 1 Molal in $FeCl_3$. What is transport number of Fe^{+3} and Cl^- ions.

(ii) Mention two effects that lead to a decrease in conductance of a solution of strong electrolyte. How are they eleminated?

d) (i) Write a short note on Quinhydrone electrode. 2

(ii) Show that chemical potential of a pure substance in higher than in mixture. 3

e) (i) Discuss the effect of temperature on viscosity co-efficient. 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 ration 1:3. 3

(ii) Calculate the equilibrium costant at 25°C for the reaction

$2H^+ + D_2(g) \rightleftharpoons H_2(g) + 2D^+$

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

Group -C

Answer any one from the following : 1×10=10

3. (a) (i) Show that in a binary system, the decrease in Gibbs free energy of mixing in 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 Raynold number. Write its significance. 3

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

(b) (i) Consider the Cell pt | H_2(latm) | HCl ≡ HCl/ H_2(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

(ii) Draw and explain the conducto metric titration curve when KCl is titrated by $AgNO_3$. 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. ($K_a=1.32\times10^{-5}$) 3