(d) Calculate the pH of 10^{-8} M HCl aqueous solution. (4,4,4,3)

5. (a) Explain buffer action if small amount of NaOH or HCl is added in basic buffer solution (NH_4OH/ NH_4Cl).

(b) Write any two applications of solubility product. 80 mL of 1.3×10^{-3} M $AgNO_3$ is mixed with 20 mL of 4.5×10^{-5} M Na_2S solution. Will precipitation occur (K_{sp} of Ag2S = 1.6×10^{-49})?

(c) (i) What are the factors affecting the degree of ionization?

(ii) Calculate the pH of 0.01 M NH_4OH. The dissociation constant of ammonium hydroxide is 1.8×10^{-5}. (5,5,5)

6. Write short notes on the following:

(a) Common Ion Effect and its Applications

(b) Enthalpy of Combustion and its applications

(d) Explain the Qualitative treatment of acid-base titration curves

(e) Two statements of second law of thermodynamics

(f) Kirchhoffs Equation (5×3)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7003 **K**

Unique Paper Code : 2172583501

Name of the Paper : DSC-A5: Physical Chemistry

Name of the Course : **B.Sc. (Prog) Applied Life Sciences Agrochemical and Pest Management**

Semester : V

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **four** questions in all.

1. Answer the following questions in brief:

(a) Distinguish between extensive and intensive properties. Give two examples for each

(b) Define specific heat capacity, why specific heat capacity is considered as intensive property

(c) One mole of an ideal gas undergoes isothermal and reversible expansion at a temperature of 300 K, increasing its volume from 10 dm^3 to a final volume of 20 dm^3. Determine the work done,

as well as the changes in internal energy (ΔE), enthalpy (ΔH), and heat transfer (δq).
($R = 8.314$ J $mol^{-1}K^{-1}$).

(d) Determine the concentration of H^+ ions in rainwater with a pH of 5.7. (4,4,4,3)

2. (a) State and explain Kohlrausch's Law of independent migration of ions. Illustrate how this law is used for the calculation of equivalent ionic conductance at infinite dilution of weak electrolytes.

(b) The heat of combustion of ethyl alcohol (C_2H_5OH) is 1380.7 KJ/mol. If the heat of formation of CO_2 and H_2O are 394.5 and 286.6 KJ/mol respectively. Calculate the heat of formation of Ethyl alcohol.

(c) State Third law of thermodynamics. Derive expression for the entropy calculation of any Substance.

(d) Define Integral and differential enthalpies of solution and dilution (4,4,4,3)

3. (a) State Le Chatelier's principle. For the equilibrium reactions given below. Discuss how the equilibrium will shift with the change in temperature and pressure :

(i) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

$\Delta H = -923.0$ KJ

(ii) $CaCo3(s) \rightleftharpoons CaO(s) + CO2(g)$

$\Delta H = +180.5$ KJ

(b) Deduce the relation between K_h, K_a, K_b and K_w for the solution of a salt of a weak acid and weak base. Also, find the pH of the hydrolyzed salt solution.

(c) Define acidic and basic buffers. Give one example for each.

Calculate the pH of a buffer solution containing 0.20 M CH_3COOH and 0.4M of CH_3COONa. (K_a for acetic acid is 1.8×10^{-5}). (5,5,5)

4. (a) What the relation between K_p and K_C. Give one example for which K_p is equal to K_C. For the reaction $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ $K_p = 0.1$ atm^{-1} at 300 K. Find K_C.

(b) Define Equivalent conductance and specific conductance. How are they related? Explain Why the specific conductance of a solution decreases with dilution, but molar conductance increases.

(c) The equilibrium constant (K_p) for the reaction

$CO(g) + 1/2O_2(g) \rightleftharpoons CO_2(g)$

is 5.04×10^{17}at 25°C. Calculate the standard free energy change for the reaction.

P.T.O.