AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)
Faculty of Science & Information Technology
Department of Chemistry

PROBLEMS: (Acid-base, pH and Solubility)

Problem 1. The solubility product of $CuCl_2$ is 3.2×10^{-7} at 25^0C. Calculate the solubility of $CuCl_2$ in mole litre^{-1}.

Problem 2. 100 ml of a saturated solution of $Mg(OH)_2$ contains 8.2×10^{-4} g solute. Mol. wt. of $Mg(OH)_2$ is 58.3 g mole^{-1}; calculate its K_{sp}.

Problem 3. K_{sp} of CaF_2 is 1.7×10^{-10} and its mol. wt. is 78 g mole^{-1}. What volume of the saturated solution will contain 0.078 g of CaF_2?

Problem 4. Will $PbCl_2$ precipitate on mixing 1 ml of 3×10^{-3} M NaCl solution with 2 ml of 1×10^{-3} M $Pb(NO_3)_2$ solution?

Problem 5. Calculate the solubility of AgCl ($K_{sp} = 1.7 \times 10^{-10}$) in 0.01 M NaCl solution.

Problem 6. K_{sp} of Ag_2S is 4×10^{-48} at 25^0C. Calculate its solubility in a pure water and 0.01 M aqueous solution of Ag_2S.

Problem 7. K_{sp} of $Mg(OH)_2$ is 1.8×10^{-11} at 25^0C. Calculate the solubility of $Mg(OH)_2$ in 0.1 M aqueous NaOH solution.

Problem 8. Accepting $K_w = 1 \times 10^{-14}$ at 25^0C, calculate concentrations of H_3O^+ and OH^- in mole/litre in 0.1M, 0.001M and 0.0002M HCl solutions; also calculate pH and pOH of the solutions.

Problem 9. Calculate pH and pOH of 0.02 M H_2SO_4 solution. $K_w = 1 \times 10^{-14}$ at 25^0C.

Problem 10. 1 litre solution at 25^0C contains (i) 4.0 g of NaOH, (ii) 0.4 g of NaOH, (iii) 0.02 g of NaOH. Calculate the concentration of H_3O^+ and OH^- in each solution, also calculate pH and pOH, $K_w = 1 \times 10^{-14}$. (Mol. wt. of NaOH is 40).

Problem 11. pH of an aqueous solution of HCl is 2.699 at 25^0C. Calculate the molarity of the solution.

Problem 12. Will $CaSO_4$ precipitate on mixing equal volumes of 0.02 M $CaCl_2$ and 0.04 M Na_2SO_4 solution? K_{sp} of $CaSO_4 = 2.4 \times 10^{-4}$.

Problem 13. Calculation of normality of strong acids, (a) 36% HCl, sp. gr. 1.18 and (b) 96% H_2SO_4, sp. gr. 1.84