

Atomic Energy Central School No.4, Rawatbhata

Chapter: 7 Equilibrium Module 6 (Worksheet 1

Subject: Chemistry

Class: XI

Solved Numerical:

Q. Calculate the pH of a buffer solution containing 0.25 moles / litre of formic acid (HCOOH) and 0.10 moles / litre of sodium formate (HCOONa). K_a for formic acid is 1.8×10^{-4} .

Solution:

Conc. Of acid = 0.25 M

Conc. Of salt = 0.10 M

and $K_a = 1.8 \times 10^{-4}$

So pka is:: $pka = -\log ka$

$= -\log 1.8 \times 10^{-4}$

$= -(\log 1.8 \times 10^{-4})$

$= -(\log 1.8 + \log 10^{-4})$

$= -[0.25 + (-4)]$

$= -(-3.75)$

$= 3.75$

Now,

$pH = pka + \log ([\text{salt}] / [\text{acid}])$

$= 3.75 + \log 0.10 / 0.25$

$= 3.75 - 0.397$

$= 3.34$

Answer: The pH of a buffer solution containing 0.25 M of formic acid and 0.10 M of sodium formate is 3.34.

Q.2 The solubility of $PbCl_2$ at 298 K is 2×10^{-2} . Calculate the solubility product of $PbCl_2$ at this temperature.

Solution: $K_{sp} = x^x y^y (S)^{x+y}$

$X = \text{No of cation} = 1, y = \text{No of Anion} = 2$

$K_{sp} = 1^1 2^2 (S)^{1+2}$

$= 4S^3$

$K_{sp} = 4 \times (2 \times 10^{-2})^3 = 3.2 \times 10^{-6}$

Unsolved Problems:

- Q.1. Define pH
- Q.2. Define Buffer solution and buffer capacity.
- Q.3. What is the pH Range of Human blood
- Q.4. A buffer solution is prepared by mixing 1.5 M NH_4Cl solution with 0.10 M NH_3 solution. [$K_b = 1.8 \times 10^{-5}$] Calculate the pH of buffer solution
- Q.5. What pH do you expect for 10^{-8} M solution of an acid?
- Q.6. What is the difference between ionic product and solubility product?
- Q.7. Through a solution containing Cu^{2+} and Ni^{2+} , H_2S gas is passed after adding dil. HCl, which will precipitate out and why?
- Q.8. In a NaOH solution, $[OH^-]$ is 2.0×10^{-4} M. Calculate the pH of the solution at 25°C.

- Q.9. The pH of rainwater in a region was 6. Calculate the H^+ ion concentration of the rainwater.
- Q.10. Calculate the pH of a 0.15 M acetic acid (CH_3COOH) solution, $K_a = 1.8 \times 10^{-5}$.
- Q.11. The pH of 0.06 M solution of formic acid ($HCOOH$) is 3.44. Calculate the K_a of the acid.
- Q.12. Calculate pH for the following solution.
- 0.55 M CH_3COOH ($K_a = 1.8 \times 10^{-5}$)
 - 0.23 M NH_3 ($K_b = 1.8 \times 10^{-5}$)
 - 0.1 M HCl
 - 0.001 M KOH
 - 0.45 M HCN ($K_a = 4.9 \times 10^{-10}$)
- Q.13. The K_a for benzoic acid, (C_6H_5COOH) is 6.5×10^{-5} . Calculate the pH of a 0.25 M benzoic acid solution.
- Q.14. The pH of an acid solution is 6.20. Calculate the K_a for the acid. The acid concentration is 0.01M.
- Q.15. Calculate the pH for 0.5M C_5H_5N . $K_b = 1.7 \times 10^{-9}$
- Q.16. Write the solubility product expression and state the units of K_{sp} for each of the following ionic compounds: a) $Ca_3(PO_4)_2$ b) Ag_2CO_3 c) $Zr_3(PO_4)_4$
- Q.17. The solubility product of silver chromate(VI), Ag_2CrO_4 is $2.4 \times 10^{-12} \text{ mol}^3 \text{ dm}^{-9}$. Calculate the concentration of $Ag^+(aq)$ and $CrO_4^{2-}(aq)$ in the saturated solution.
- Q.18. The solubility of silver sulphide, Ag_2S is 5.0×10^{-17} . Calculate the solubility product of Ag_2S .
- Q.19. Calculate the solubility of copper (II) hydroxide, $Cu(OH)_2$, in $g \text{ L}^{-1}$. ($K_{sp} \text{ Cu(OH)}_2 = 2 \times 10^{-20} \text{ M}^3$, Molar mass of $Cu(OH)_2 = 97.57 \text{ g mol}^{-1}$)

~~~~~**BEST OF LUCK**~~~~~