Chapter-03

Ionic Equilibria Marks 4 - with option 06

Multiple choice questions (1 Mark)

i) What is the percentage dissociation of 0.1 M Solution of acetic acid?

[$k_a(CH_3COOH) = 10^{-5}$]

a) 0.01% **b) 1%** C) 10% d) 100%

ii) For a reaction $HCl_{(aq)} + H_2O_{(1)} \rightleftharpoons H_3O^+_{(aq)} + C1^{(-)}_{(aq)}$

Which of the following is a conjugate acid-base pair?

a) H_2O and Cl^- b) $H_3O^{(+)}$ and Cl^-

c) $H_3O^{(+)}$ and H_2O d) HCl and $H_3O^{(+)}$

iii) In biochemical system, pH of blood in our body is maintained due to following buffer

a) $NH_4OH + NH_4Cl$ **b) $HCO_3^- + H_2CO_3$**

c) $CH_3COOH + CH_3COONa$ d) citric acid + $Mg(OH)_2$

iv) If 'IP' is the ionic product and 'k_{sp}' is the solubility product, precipitation of the compound will occur under the condition when.

a) IP = k_{sp} **b) IP > k_{sp}**

c) IP < k_{sp} d) IP << k_{sp}

v) NH_4F is a salt of weak acid HF ($k_a = 7.2 \times 10^{-4}$) and weak base NH_4OH ($K_b = 1.8 \times 10^{-5}$), the solution of NH_4F will be

a) slightly acidic b) slightly basic

c) strongly basic d) neutral

vi) The theory which explain amphoteric nature of water is

a) Arrhenius theory b) Lewis theory

c) Ostwald theory **d) Bronsted - Lowry theory**

vii) The pK_b of weak base BOH [K_b(BOH) = 1×10^{-5}] will be

a) -5 **b) 5** c) 1 d) 10^{-5}

Very short answer questions (1 Mark)

i) Write the name of buffer which is used to maintain pH of 8 to 10 for precipitation of cations of III A group in qualitative analysis

ii) Write the solubility product of sparingly soluble salt Bi_2S_3

iii) What is the p^{OH} if the hydrogen ion concentration in solution is $1x\ 10^{-3}$ mol dm^{-3} **(Ans:11)**

iv) Write the relationship between molar Solubility (S) and solubility product (k_{sp}) for PbI_2

v) Write any one example of salt derived from weak acid and weak base.

vi) Write the formula to calculate p^H of buffer solution.

vii) Indicate the one conjugate acid-base pair in the following reaction.

$$CO_3^{2+}{}_{(aq)} + H_2O_{(l)} \rightleftharpoons OH^{(-)} + HCO_3^{(-)}$$

viii) Calculate the P^{OH} of 10^{-8} M of HCl **(Ans:7.0414)**

Short answer questions (Type- I) (2 Marks)

1) Calculate the p^H and p^{OH} of 0.0001M HCl Solution **Ans: (p^H= 4 and p^{OH} = 10)**

2) The solubility product of $BaCl_2$ is $4.0\ x\ 10^{-8}$ what will be its molar solubility in mol dm^{-3} ? **Ans: (S = 1x 10^{-2} mol dm^{-3})**

3) Classify the following species into Lewis acids and Lewis bases

i) $CI^{(-)}$ ii) NH_4^{+} iii) BCl_3 iv) NH_3

4) Define the following terms i) pH ii) pOH

5) Define molar solubility. Write its unit.

6) Write a solubility product of the following sparingly soluble salts.

i) $BaSO_4$ ii) AgCl

7) Explain Ostwald's dilution law for weak acids.

8) Explain Ostwald's dilution law for weak bases.

9) Write any four applications of buffer solution

Short answer questions (Type- II) (3 Marks)

1) Define buffer solution. Explain its types.

2) Write one application for each of the following buffers.

i) citrate buffer ii) $HCO_3^- + H_2CO_3$ iii) $NH_4OH + NH_4Cl$

3) Derive the equation which implies that the degree of dissociation of weak acid is inversely proportional to the square root of its concentration.

4) A buffer solution contains 0.3 mol dm^{-3} NH_4OH ($K_b = 1.8 \times 10^{-5}$) and 0.4 mol dm^{-3} of NH_4Cl. Calculate pOH of the solution. **(Ans: 4.8696)**

6) The solubility of AgBr in water is 1.20×10^{-5} mol dm^{-3}. Calculate the solubility product of AgBr. **(Ans:$K_{sp} = 1.44 \times 10^{-10}$)**

Long answer questions (4 Marks)

1) Derive the equation $p^H + p^{OH} = 14$

Distinguish between strong electrolyte and weak electrolyte

2) If 'S' is solubility in mol dm and k_{sp} is the solubility product. Then write the relation between them for the CaF_2 and $BaSO_4$

Calculate the concentration of H_3O^+ ion in Soft drink whose P^H is 3.5 **(Ans:3.162×10^{-4} mol/dm^3)**

3) Explain the amphoteric nature of water.

Define a) Solubility product b) Hydrolysis of salt