DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : CHEMISTRY
DPP No. : 9

Topic :- Equilibrium

1 **(a)**

CH_4 has almost no acidic nature and thus, CH_3^- is the strongest base

3 **(c)**

$H_2SO_4 \rightleftharpoons H^+ + HSO_4^-$

4 **(a)**

$$h = \sqrt{\left[\frac{K_h}{c}\right]} = \sqrt{\left[\frac{K_w}{K_a \cdot c}\right]}$$

$$= \sqrt{\left[\frac{10^{-14}}{10^{-5} \times 0.001}\right]} = 10^{-3}$$

5 **(b)**

$$K_{c_1} = \frac{[NO]^2}{[N_2][O_2]} = 4 \times 10^{-4}$$

$$K_{c_2} = \frac{[N_2]^{1/2}[O_2]^{1/2}}{[NO]}$$

$$\therefore K_{C_2} = \sqrt{\frac{1}{K_{c_1}}} = \sqrt{\frac{1}{4 \times 10^{-4}}} = 50$$

6 **(d)**

$K_p = (P_{H_2O})^2$ and $K_c = [H_2O]^2$; the solid species are not used in writing K_c or K_p

7 **(c)**

H_2SO_4 is strong acid having pH < 7. $NaNO_2$ on hydrolysis gives alkaline solution of pH > 7. NaCl is neutral and H_2S is weak acid.

8 **(a)**

$A + B \rightleftharpoons C + D$;

$$Q = \frac{[C][D]}{[A][B]} = \frac{3 \times 4}{1 \times 2} = 6$$

But $K_c = 10$;

Thus, to increase the value of $Q$to K_c, forward reaction should occur.

9 **(d)**

$(A)CH_3COONH_4 + H_2O \longrightarrow CH_3COOH + NH_4OH$

Ammonium acetate

Although both (CH_3COOH and NH_4OH) of them are weak still CH_3COOH is slightly more acidic.

$\therefore$ Solution is acidic in nature.

(B) $NH_4Cl + H_2O \longrightarrow NH_4OH + HCl$

ammonium chloride — weak base — strong acid

$\therefore$ Solution is acidic in nature.

(C) $(NH_4)_2SO_4 + H_2O \longrightarrow 2NH_4OH + H_2SO_4$

ammonium sulphate — weak base — strong base

$\therefore$ Solution is acidic in nature.

(D) $CH_3COONa + H_2O \longrightarrow CH_3COOH + NaOH$

sodium acetate — weak acid — strong base

$\therefore$ Solution is basic in nature.

10 **(d)**

Isoelectric point is the condition when Zwitter ions or sol particles do not move under the influence of electric field, *i.e.*, they lose their charge.

11 **(a)**

The value of equilibrium constant is independent of volume of container.

$\therefore$ Value of equilibrium constant will remain same (300) if volume of reaction flask is tripled.

12 **(a)**

S has +4 ox.no. in H_2SO_3 and SO_2 both.

13 **(b)**

$CaF_2 \rightleftharpoons Ca^{2+} + 2F^-$

$s \qquad 2s$

$$K_{sp} = s(2s)^2 = 4s^3$$

$$K_{sp} = 4(2.3 \times 10^{-6})^3$$

$$= 48.668 \times 10^{-18}\ (\text{mol dm}^{-3})^3$$

14 **(c)**

Among the given, pH of 0.1M CH_3COOH is not equal to one as CH_3COOH is a weak acid, thus does not ionise completely.

15 **(a)**

Meq. of acetic acid $= 50 \times 2 = 100$

Meq. of $CH_3COONa = 10 \times 1 = 10$

$$\text{pH} = -\log K_a + \log\frac{[\text{Conjugate base}]}{[\text{Acid}]}$$

or $\text{pH} = -\log 10^{-5} + \log\frac{10}{100} = 4$

16 **(b)**

Let the solubility of AgCl is S

$$AgCl = Ag^+ + Cl^-$$

$$s \quad s$$

$[Cl^-]$ from NaCl=0.2

Concentration of $Cl^- = S + 0.2$

$$K_{sp} = S(S + 0.2)$$

$$1.8 \times 10^{-10} = S^2 + 0.2S$$

(S is very small as AgCl is sparingly soluble in water, thus $S^2 <<< 1$)

$$1.8 \times 10^{-10} = 0.2S$$

$$S = \frac{1.8 \times 10^{-10}}{0.2}$$

$$= 9.0 \times 10^{-10}\ \text{M}$$

17 **(d)**

$\alpha = 1.9 \times 10^{-9}; c = \frac{1000}{18}$

$$K = \frac{[H^+][OH^-]}{[H_2O]} = c\alpha^2$$

$$= 1.9 \times 10^{-9} \times 1.9 \times 10^{-9} \times \frac{1000}{18}$$

$$= 2.0 \times 10^{-16}$$

18 **(a)**

$N_2 + 3H_2 \rightleftharpoons 2NH_3 + \text{heat}$

It is an exothermic reaction, so high temperature favours backward reaction.
Hence, equilibrium is shifted towards the left.

19 **(b)**

$Ag_2CO_3(s) \rightleftharpoons 2Ag^+ + CO_3^{2-}$

$s \qquad 2s \qquad s$

$$K_{sp} = [Ag^+]^2[CO_3^{2-}] = (2s)^2.s$$

$\therefore \quad K_{sp} = 4s^3$

20 **(a)**

Given, concentration of NaCl = 0.2 M

$$K_{sp}(\text{AgCl}) = 1.20 \times 10^{-10}$$

Let the solubility of AgCl in NaCl = x

$$AgCl \rightarrow Ag^+ + Cl^-$$

$$\text{Solubility } \underset{x}{\text{NaCl}} \rightarrow \underset{x}{\text{Na}^+} + \underset{x}{\text{Cl}^-}$$

$$\underset{0.2}{[\text{Ag}^+]} = x \text{ and } \underset{0.2}{[\text{Cl}^-]} = (x + 0.2)$$

$\therefore \quad K_{sp}(\text{AgCl}) = [\text{Ag}^+][\text{Cl}^-]$

$= x(x + 0.2)$

$= x^2 + 0.2x$

$\therefore \quad K_{sp} = 0.2x (x^2 \ll 1)$

or $\quad 1.2 \times 10^{-10} = 0.2x$

$\therefore \quad x = 6 \times 10^{-10}$

ANSWER-KEY										
Q.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
A.	**A**	**C**	**C**	**A**	**B**	**D**	**C**	**A**	**D**	**D**
Q.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
A.	**A**	**A**	**B**	**C**	**A**	**B**	**D**	**A**	**B**	**A**