DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : CHEMISTRY
DPP No. : 1

Topic :- Equilibrium

1 **(b)**

$K_c = [Fe^{3+}][OH^-]^3$

If $[OH^-] = \frac{1}{4} \times [OH^-]_{initial}$, than $[Fe^{3+}] = 64\ [Fe^{3+}]_{initial}$ to have K_c constant

2 **(c)**

$A(g) \quad + 3B(g) \rightleftharpoons 4C(g)$

1	1	0	Initial concentration
$(1-x)$	$(1-3x)$	$4x$	Final concentration

(at equilibrium)

According to question, $1 - x = 4x$

$\therefore \quad x = \frac{1}{5}$

For above reaction,

$$K_c = \frac{[C]^4}{[A][B]^3} = \frac{(4x)^4}{(1-x)(1-3x)^3}$$

$$K_c = \frac{\left(4 \times \frac{1}{5}\right)^4}{\left(1-\frac{1}{5}\right)\left(1-3\times\frac{1}{5}\right)^3} = 8.0$$

3 **(a)**

m Mole of acid $= 6 \times 0.1 = 0.6$

m Mole of salt $= 12 \times 0.1 = 1.2$

$\therefore \text{pH} = 4.75 + \log\frac{1.2}{0.6} = 4.75 + 0.3010 = 5.05.$

4 **(c)**

50 mL of 0.1 M HCl $= \frac{0.1 \times 50}{1000} = 5 \times 10^{-3}$

50 mL of 0.2 M NaOH $= \frac{0.2 \times 50}{1000} = 10 \times 10^{-3}$

Hence, after neutralisation NaOH is left

$= 10 \times 10^{-3} - 5 \times 10^{-3}$

$= 5 \times 10^{-3}$

Total volume= 100 cc

The concentration of NaOH

$$= \frac{5 \times 10^{-3} \times 1000}{100} = 0.05 \text{ M}$$

$$[OH^-] = 0.05\ M = 5 \times 10^{-2} M$$

$$pOH = -\log\ [OH^-]$$

$$= -\log\ [5 \times 10^{-2}]$$

$$= 1.3010$$

$pH + pOH = 14$

$pH = 14 - 1.3010 = 12.699$

5 **(b)**

$$\underset{\substack{0.1 \\ (0.1-0.06)}}{2KCN} + \underset{\substack{0.03 \\ 0}}{AgNO_3} \rightarrow \underset{\substack{0 \\ 0.03}}{Ag(CN)_2^-} + \underset{\substack{0 \\ 0.03}}{KNO_3} + \underset{\substack{0 \\ 0.03}}{K^+}$$

$\therefore\ [Ag(CN)_2^-] = 0.03$

Now, $$\underset{\substack{0.03 \\ (0.03-a)}}{Ag(CN)_2^-} \rightleftharpoons \underset{\substack{0 \\ a}}{Ag^+} + \underset{\substack{0.04 \\ (0.04+a)}}{2CN^-} \text{ (left from KCN)}$$

K_c is small $\therefore 0.03 - a \approx 0.03$ and $0.04 + a \approx 0.04$

$\therefore K_c = 4 \times 10^{-19} = \frac{(0.04)^2 \times a}{0.03}$; $\therefore a = 7.5 \text{ x } 10^{-18}$

6 **(b)**

Higher $pK_a(-\log K_a)$ means lower K_a for acid.

7 **(a)**

$N_{NaOH} = 1 \times 1 = 1\ N$

$N_{H_2SO_4} = 2 \times 10 = 20\ N$

Millieq. of NaOH $= 1 \times 100 = 100$

Millieq. of $H_2SO_4 = 20 \times 10 = 200$

Thus, Millieq. of acid are left and therefore $pH < 7$. So, the resulting mixture will be acidic

8 **(a)**

$pH = 4.35$

$\therefore\ 4.35 = -\log[H^+]$

or $[H^+]$ = antilog of (-4.35)

$= 4.5 \times 10^{-5} M$

9 **(b)**

pH of salts of weak acid and weak base is derived by the relation : $[H^+] = \sqrt{K_H} = \sqrt{\frac{K_w}{K_a \cdot K_b}}$

10 **(a)**

$$\underset{\text{hydrogen molecule}}{H_2} \xrightarrow[2000°C]{\text{Electric arc}} \underset{\text{atomic hydrogen}}{2H} \quad -104.5 \text{ kcal}$$

The reaction is endothermic. For endothermic reaction increase in temperature shift the equilibrium in forward direction. To proceed forward the pressure must be low because for the above reaction, increase of pressure will favoured backward reaction. So, for maximum yield the conditions are high temperature and low pressure.

11 **(a)**

H_3PO_2 is monobasic acid and thus, it forms only one normal salt.

12 **(d)**

According to Lewis, "A base is a species which can donate an electron pair." In NH_3, $\ddot{N}$ has one lone pair. Thus, $\ddot{N}H_3$is a Lewis base.

13 **(d)**

$K < 1.0$

14 **(b)**

Higher is the value of K, more is the probability for a reaction to go for completion.

15 **(d)**

$H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$

The equilibrium constant (K_p) changes with the change in temperature.

Note : Variation of equilibrium constant with temperature can be express as:

$$\log\frac{K_2}{K_1} = \frac{\Delta H}{2.303R}\left[\frac{T_2 - T_1}{T_1.T_2}\right]$$

16 **(b)**

$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

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

$$NO \rightleftharpoons \frac{1}{2}N_2(g) + \frac{1}{2}O_2(g)$$

$$K_c' = \frac{[N_2]^{1/2}[O_2]^{1/2}}{[NO]}$$

$$= \sqrt{\frac{1}{K_c}} = \sqrt{\frac{1}{4 \times 10^{-4}}} = 50$$

17 **(b)**

$$2A_{(g)} + B_{(g)} \rightleftharpoons 3C_{(g)} + D_{(g)}$$

Initial	1.0	1.0	0	0
At.Eq.	0.5	0.75	0.75	0.25

$$K_c = \frac{(0.25) \times (0.75)^3}{(0.5)^2 \times 0.75}$$

18 **(c)**

RNH_2 is stronger base than NH_3. Also HI is strong acid and thus, I^- is weak base.

19 **(b)**

Due to ionisation in water.

20 **(a)**

$[H^+] = 10^{-1}$

$\therefore pH = 1$

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