DPP
DAILY PRACTICE PROBLEMS

Class : XIth
Date :

Solutions

Subject : CHEMISTRY
DPP No. : 3

Topic :- Equilibrium

2 **(d)**

It is $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 10H_2O$.

3 **(a)**

$[OH^-] = 2 \times 0.05 = 0.1$

$\therefore$ pOH = 1 and pH = 13.

4 **(b)**

For a reaction, $K_c = \frac{[\text{product}]}{[\text{reactant}]}$

Hence,

if $K_c > 1$, then [Product]>[Reactant]

5 **(c)**

For base BOH

$$BOH \rightleftharpoons B^+ + OH^-$$

Dissociation constant $K_b = \frac{[B^+][OH^-]}{[BOH]}$

$\therefore$ Higher the value of K_b, more will be dissociation of base and stronger will be base and *vice-versa.*

$\therefore$ Weakest base among given choices is having $K_b = 7.2 \times 10^{-11}$.

6 **(a)**

$2AB_2(g) \rightleftharpoons 2AB(g) + B_2(g)$

1 o o

$1-x$ x $x/2$

$$\therefore \quad K_p = \frac{x^2.x}{2(1-x)^2} \cdot \left[\frac{P}{1+\frac{x}{2}}\right]^1 = \frac{x^3.P}{2}$$

$$\left(1-x \approx 1 \text{ and } 1+\frac{x}{2} \approx 1, \text{since } x \ll 1\right)$$

Or $P = \frac{3\sqrt{2K_p}}{P}$

7 **(b)**

$K_p = K_c(RT)^{\Delta ng}$

$\Delta ng = -1$ (For the reaction, $2SO_2 + O_2 \rightleftharpoons 2SO_3$). Thus, for this reaction, K_p is less than K_c

8 **(a)**

$Cr(OH)_3 \rightleftharpoons Cr^{3+} + 3OH^-$

$$(s) \quad (3s)$$

$$K_{sp} = s \times (3s)^3$$

$$= 27s^4$$

$$2.7 \times 10^{-31} = 27s^4$$

$$\therefore \quad s = \sqrt[4]{\frac{K_{sp}}{27}} = \sqrt[4]{\frac{2.7 \times 10^{-31}}{27}}$$

$$= \sqrt[4]{10^{-32}}$$

$$= 10^{-8} \text{ mol/L}$$

9 **(d)**

$N_2O_4 \rightleftharpoons 2NO_2$

$1 \quad\quad 0$

$1-\alpha \quad\quad 2\alpha$

$$K_p = \frac{(n_{NO_2})^2}{n_{N_2O_4}} \times \left[\frac{P}{\Sigma n}\right]^1$$

For 33% dissociation: $K_p = \frac{(2 \times 0.33)^2}{0.67} \times \left[\frac{P}{1.33}\right]$

For 40% dissociation: $K_p = \frac{(2 \times 0.40)^2}{0.60} \times \left[\frac{P}{1.40}\right]$

$\therefore \frac{P_1}{P_2} = 1.56 \approx 1.60 = \frac{8}{5}$

10 **(a)**

$A + 2B \rightleftharpoons 2C$

$2 \quad 3 \quad\quad 2$ initial moles

$(2-0.5)(3-0.5)(2 \times 0.5)$ at equilibrium

Molar concentration of $A = \frac{1.5}{2}$

Molar concentration of $B = \frac{2.5}{2}$

Molar concentration of $C = \frac{1}{2}$

$$K = \frac{[C]^2}{[A][B]^2} = \frac{1 \times 1 \times 2 \times 2 \times 2 \times 2}{2 \times 2 \times 1.5 \times 2.5 \times 2.5}$$

$$= \frac{2}{1.5 \times 2.5 \times 2.5} = 0.21$$

11 **(d)**

In $\frac{N}{1000}$ KOH solution, $[OH^-] = 10^{-3}$ M

$$pOH = -\log[OH^-] = -\log[10^{-3}]$$

$$= +3\log 10 = 3$$

$$pH + pOH = 14$$

$$pH = 14 - pOH$$

$= 14 - 3$

$= 11$

12 **(a)**

Tears are alkaline in nature.

14 **(b)**

$MX_2 = M^{2+} + 2X^-$

$s \qquad 2s$

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

$\Rightarrow s = \sqrt[3]{\frac{K_{sp}}{4}} = \sqrt[3]{\frac{4 \times 10^{-12}}{4}} = 1.0 \times 10^{-4} \text{M}$

15 **(d)**

Let solubility of $BaSO_4$ = mol L^{-1}

$BaSO_4 \rightleftharpoons Ba^{2+} + SO_4^{2-}$

$x \qquad x \qquad x$

∴ Ions at equilibrium

$K_{sp} = [Ba^{2+}][SO_4^{2-}]$

$= x \times x$

x^2

Given, $K_{sp} = 1.5 \times 10^{-9}$

$(1.5 \times 10^{-9}) = x^2$

or $\sqrt{1.5 \times 10^{-9}} = x$

$x = 3.9 \times 10^{-5}$ mol/L

16 **(d)**

Strongest Bronsted base is that which has weakest conjugate acid.

Base	Conjugate acid (base + H^+)
ClO^-	$HClO$
ClO_2^-	$HClO_2$
ClO_3^-	$HClO_3$
ClO_4^-	$HClO_4$

∵ HClO is weak conjugate acid.

∵ ClO^- is strongest Bronsted base.

17 **(b)**

At equilibrium $Q = K_c$ (or $Q = K_p$)

18 **(a)**

Oxalic acid $= x$ mol/L

Oxalic acid $KMnO_4$

$$M_1V_1 = M_2V_2$$
$$40\text{ mL} \times x = 16\text{ mL} \times 0.05$$
$$x = \frac{16 \times 0.05}{40} = \frac{1}{50}$$
$$x = \frac{1}{50}\text{ M}$$

Now, convert molarity into normality

$N \times \text{eq.wt} = \text{M} \times \text{mol.wt.of oxalic acid}$

$$N \times 45 = \frac{1}{50} \times 90$$
$$N = \frac{1}{25}$$

This normality represents the hydrogen ion concentration.

So, $[\text{H}^+] = \frac{1}{25}$

$$\text{pH} = \log \frac{1}{[\text{H}^+]}$$
$$= \log 25 = 1.3$$

19 **(c)**

Simple cations such as Ag^+, Cu^{2+},Fe^{3+} etc. can accept pairs of electrons and hence are Lewis acids.

20 **(d)**

Aspirin is a weak acid. Due to common ion effect, it is unionised in acid medium but completely ionised in alkaline medium

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