

16 (c)

Let the solubility of BaCl_2 is x mol/L

$$\begin{aligned} \therefore K_{\text{sp}} &= [\text{Ba}^{2+}][\text{Cl}^-]^2 \\ &= (x) \times (2x)^2 \\ &= x \times 4x^2 = 4x^3 \end{aligned}$$

$$\begin{aligned} \text{or solubility of BaCl}_2 &= \frac{(\text{solubility product of BaCl}_2)^{1/3}}{4} \\ &= \frac{(4 \times 10^{-9})^{1/3}}{4} \\ &= 10^{-3} \text{ mol/L} \end{aligned}$$

17 (c)

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

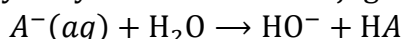
Here, $\Delta n_g = -1$ and $K_c = 26$

$$R = 0.0812, T = 250 + 273 = 523 \text{ K}$$

$$K_p = 26 \times (0.0812 \times 523)^{-1} = 0.605 = 0.61$$

18 (c)

The hydrolysis reaction of conjugate base of acid is



$$K_h = \frac{K_w}{K_a} = \frac{10^{-14}}{10^{-4}} = 10^{-10}$$

Since, degree of hydrolysis is negligible;

$$[\text{OH}^-] = \sqrt{K_h C} = 10^{-6}. p[\text{OH}] = 6$$

and $\text{pH} = 14 - 6 = 8$

19 (a)



$$\begin{array}{ccc} 1 & 0 & 0 \\ & p & p \end{array} \quad \text{At equilibrium}$$

Given,

$$p + p = 100 \text{ atm}$$

$$2p = 100 \text{ atm}$$

$$p = 50 \text{ atm}$$

$$\begin{aligned} K_p &= p_{\text{NH}_3} \cdot p_{\text{H}_2\text{S}} \\ &= 50 \times 50 = 2500 \text{ atm}^2 \end{aligned}$$

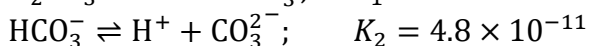
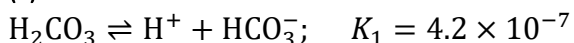
20 (c)

$$K_p = \frac{p_{\text{CO}}^2}{p_{\text{CO}_2}} = \frac{4 \times 4}{2} = 8$$

21 (c)

The equilibrium constant does not change when concentration of reactant is changed as the concentration of product also get changed accordingly.

22 (c)



$$K_1 \gg K_2$$

$$\therefore [\text{H}^+] = [\text{HCO}_3^-]$$

$$K_2 = \frac{[\text{H}^+][\text{CO}_3^{2-}]}{[\text{HCO}_3^-]}$$

So, $[\text{CO}_3^{2-}] = K_2 = 4.8 \times 10^{-1}$

23 (d)

Buffer capacity of an acidic buffer is maximum when the ratio of HA to A^- is unity.

Since, pH of acidic buffer = $\text{p}K_a + \log \frac{[A^-]}{[HA]}$

For maximum buffer capacity, $[A^-] = [HA]$

$\therefore \text{pH} = \text{p}K_a$

24 (a)

(i) BF_3 and BCl_3 are better Lewis acid than BMe_3 and B_2H_6 due to $-I$ -effect of Cl and F.

(ii) Between BCl_3 and BF_3 , BCl_3 is better Lewis acid due to lesser extent of $p\pi - p\pi$ back bonding in it.

25 (d)

Number of milliequivalents of

$$\text{NaOH} = 10 \times 0.1 = 1$$

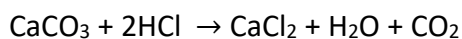
Number of milliequivalents of

$$\text{H}_2\text{SO}_4 = 10 \times 0.05 = 0.5$$

Milliequivalent of H_2SO_4 will neutralise NaOH so, that $(1-0.5)=0.5$ millieq. Of NaOH is left unneutralised.

Hence, pH of the resulting solution will be greater than seven ($\text{pH} > 7$).

26) a)



1 mol CaCO_3 (100g CaCO_3) = 2mol HCl(73g HCl)

\therefore for 40g $\text{CaCO}_3 = x$ g HCl

$$\Rightarrow x = \frac{40 \times 73}{100} = 29.2 \text{ g of HCl}$$

HCl is in excess.

$\therefore \text{CaCO}_3$ is limiting reagent

27) b)

28) c

CaCl_2 Solution = 25% $\frac{W}{W}$

Mass (CaCl_2) = $\frac{25 \times 10}{100} = 2.5 \text{ g}$

$n_{\text{CaCl}_2} = \frac{2.5}{111} = 0.0225$

$$n_{H_2O} = \frac{20}{18} = 1.111$$

$$x_{CaCl_2} = \frac{0.0225}{1.111+0.0225} = 0.0168$$

29) c

Molarity of acetic acid = 2.05 mol

∴ number of moles of acetic acid = 2.05 mol

Mass of acetic acid in 1 L solution = 2.05 x 60 = 123 g

$$\text{Density of solution} = \frac{\text{mass of solution}}{\text{volume}}$$

$$\Rightarrow \text{mass} = 1.02 \times 1000 = \underline{1020} \text{ g}$$

Mass of solvent = 1020 – 123 = 897 g = 0.897 kg

$$\Rightarrow \text{molality (m)} = \frac{n}{\text{mass of solvent (kg)}}$$

$$= \frac{2.05}{0.897} = 2.28 \text{ mol kg}^{-1}$$

30) a

concentration of BaCl₂ = 0.045 M

0.045 M = 0.045 mol

∴ mass of BaCl₂ = 0.045 x 208 g

∴ 15 g of BaCl₂ are present in

$$= \frac{1000 \times 15}{0.045 \times 208} \text{ ml}$$

$$= 1602.6 \text{ ml}$$