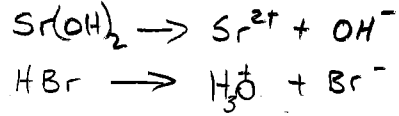


Chemistry 12 - Hebden Sections 12-15

More K_a and K_b work

1.) What is the pOH of the solution produced by mixing 250.0 mL of solution containing 10.5 g of $Sr(OH)_2$ with 150.0 mL of a solution containing 8.09 g of HBr? (4 marks)

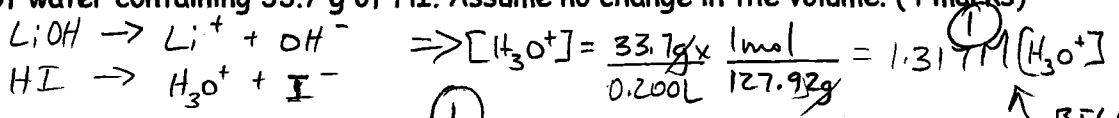


$$\Rightarrow [H_3O^+] \rightarrow 8.09g HBr \times \frac{1mol HBr}{80.91g HBr} \times \frac{3l}{0.400L} = 0.24996M H_3O^+ \textcircled{1}$$

$$\Rightarrow [OH^-] \rightarrow 10.5g Sr(OH)_2 \times \frac{1mol}{121.6g} \times \frac{1}{0.400L} = 0.21587M \times 2 = 0.4317M \textcircled{1} \leftarrow \text{BIGGER!} \text{ BASIC}$$

$$\Rightarrow 0.4317 - 0.24996 = 0.18178M OH^- / pOH = -\log(0.18178) / pOH = 0.740 \textcircled{1}$$

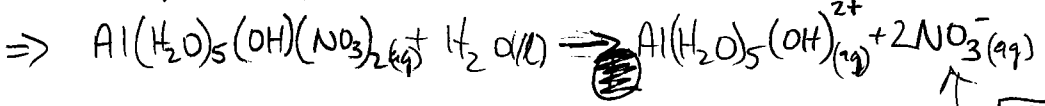
2.) Calculate the pH which results when 0.450 g of LiOH are added to 200.0 mL of water containing 33.7 g of HI. Assume no change in the volume. (4 marks)



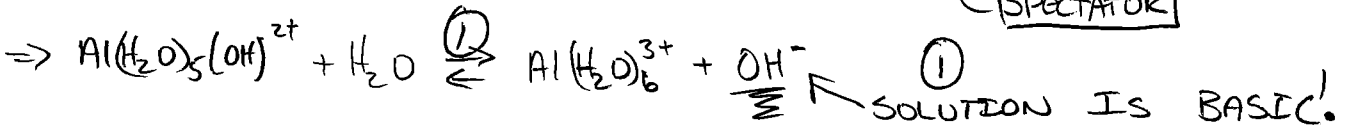
$$\Rightarrow [OH^-] = \frac{0.450g}{0.200L} \times \frac{1mol}{23.95g} = 0.093945M [OH^-] \textcircled{1}$$

$$\Rightarrow 1.317 - 0.093945 = 1.22305M \textcircled{1} pH = -\log(1.22305) / pH = -0.0874 \textcircled{1}$$

3.) If you mix $Al(H_2O)_5(OH)(NO_3)_2$ with water what is the resulting equilibrium expression and is the solution acidic or basic? (2 marks)



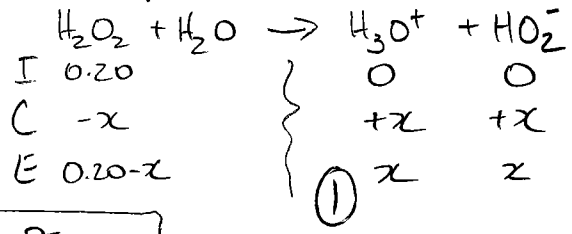
SPECTATOR



4.) What is the pH of a 0.20 M solution of H_2O_2 ? (4 marks)

$$K_a = 2.4 \times 10^{-12}$$

$$[HA] = 0.20M$$



$$K_a = \frac{[H_3O^+][HO_2^-]}{[H_2O_2]}$$

$$2.4 \times 10^{-12} = \frac{x^2}{0.20} / x = 6.928 \times 10^{-7} \textcircled{1}$$

Assume $0.20 - x \approx 0.20$ ①

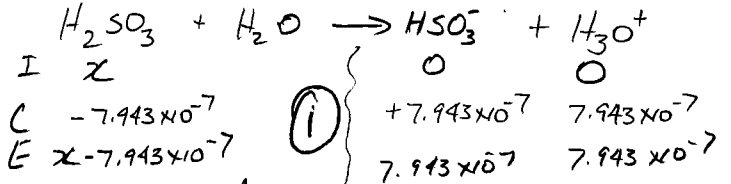
$$pH = -\log(6.928 \times 10^{-7}) / pH = 6.15 \textcircled{1}$$

5.) What is the concentration of $\text{SO}_3(\text{aq})$, that is " H_2SO_3 ", is required to

$$K_a = 1.5 \times 10^{-2}$$

produce a pH of 6.1? (4 marks)

$$\text{pH} = 6.1 \Rightarrow [\text{H}_3\text{O}^+] = 7.943 \times 10^{-7} \text{ M}$$



$$K_a = \frac{[\text{HSO}_3^-][\text{H}_3\text{O}^+]}{[\text{H}_2\text{SO}_3]} \Rightarrow 1.5 \times 10^{-2} = \frac{(7.943 \times 10^{-7})^2}{(x - 7.943 \times 10^{-7})} \quad \bigg/ \quad 1.5 \times 10^{-2} x - 1.1914 \times 10^{-8} = 6.309 \times 10^{-13}$$

$$x = 7.9431 \times 10^{-7} \quad \bigg/ \quad [\text{SO}_3] = [\text{H}_2\text{SO}_3] = 7.94 \times 10^{-7} \text{ M}$$

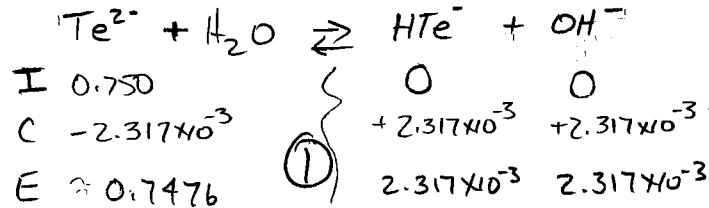
6.) A 0.750 M solution of Te^{2-} had a pH of 11.365. What is K_b for Te^{2-} ? (4

marks)

$$[\text{Te}^{2-}] = 0.750 \text{ M}$$

$$\text{pH} = 11.365 \Rightarrow [\text{OH}^-]$$

$$\text{pOH} = 2.635 \Rightarrow [\text{OH}^-] = 2.317 \times 10^{-3}$$



$$K_b = \frac{[\text{OH}^-][\text{HTe}^-]}{[\text{Te}^{2-}]} \quad \bigg/ \quad K_b = \frac{(2.317 \times 10^{-3})^2}{0.7476} = 7.180 \times 10^{-6} \quad \bigg/ \quad K_b = 7.18 \times 10^{-6}$$