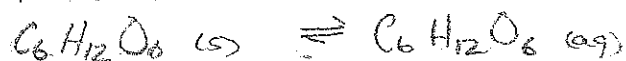
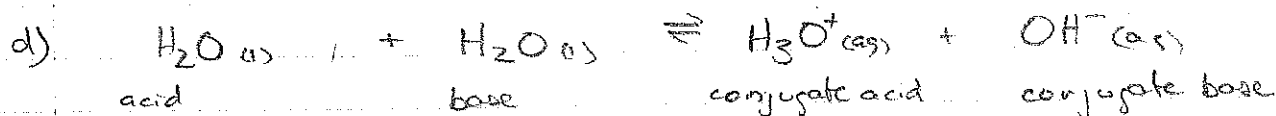
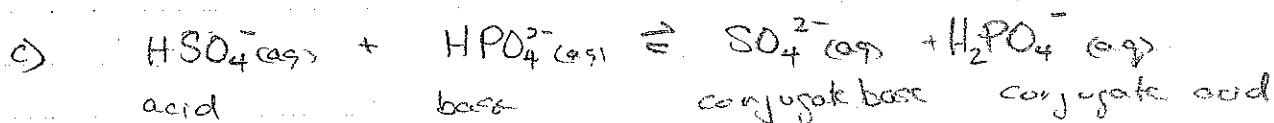
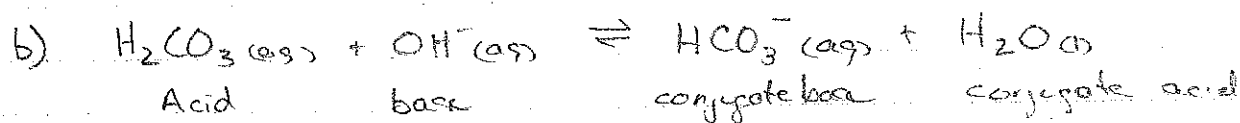
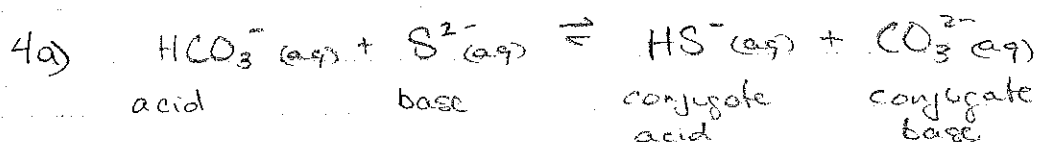


3. solubility: a measure of how much of a substance dissolves in water; in the process breaking intermolecular forces.



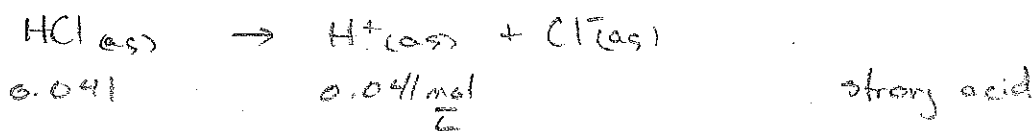
ionization: process where a dissolved particle will break an intramolecular bond to form two ions



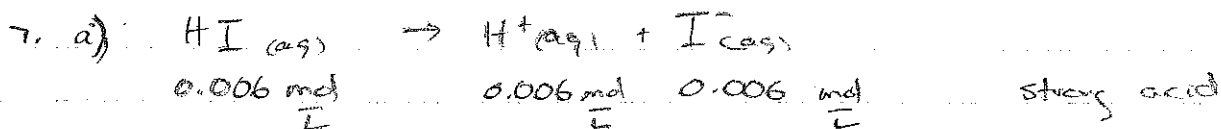
$$\begin{array}{l} \text{b) } K_w = [\text{H}^+][\text{OH}^-] \\ 1 \times 10^{-14} = (0.3)[\text{OH}^-] \\ [\text{OH}^-] = 3.3 \times 10^{-13} \end{array}$$

$$\begin{aligned}
 6. \quad [HCl] &= \frac{m}{MV} \\
 &= 0.37g \text{ HCl} \times \frac{(\text{mol HCl})}{36.46g \text{ HCl}} \times \frac{1}{0.2L} \\
 &= 0.041 \frac{\text{mol HCl}}{L}
 \end{aligned}$$

$$\begin{aligned}
 m &= 0.37g \text{ HCl} \\
 M &= 36.46g/\text{mol} \\
 V &= 0.25L
 \end{aligned}$$



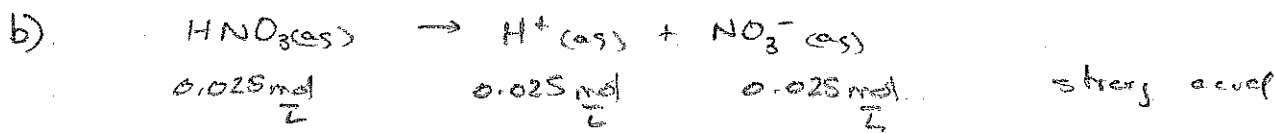
$$\begin{aligned}
 K_w &= [H^+][OH^-] \\
 1 \times 10^{-14} &= (0.041)[OH^-] \\
 [OH^-] &= 2.5 \times 10^{-13} \frac{\text{mol}}{L}
 \end{aligned}$$



$$\begin{aligned}
 \text{pH} &= -\log [H^+] \\
 &= -\log (0.006) \\
 \text{pH} &= 2.2
 \end{aligned}$$

$$\begin{aligned}
 \text{pOH} &= 14 - \text{pH} \\
 &= 14 - 2.2 \\
 \text{pOH} &= 11.8
 \end{aligned}$$

$$\begin{aligned}
 [OH^-] &= 10^{-\text{pOH}} \\
 &= 10^{-11.8} \\
 &= 1.7 \times 10^{-12} \frac{\text{mol}}{L}
 \end{aligned}$$



$$\begin{aligned}
 \text{pH} &= -\log [H^+] \\
 &= -\log (0.025) \\
 \text{pH} &= 1.60
 \end{aligned}$$

$$\begin{aligned}
 \text{pOH} &= 14 - \text{pH} \\
 &= 14 - 1.6 \\
 \text{pOH} &= 12.40
 \end{aligned}$$

$$\begin{aligned}
 [OH^-] &= K_w / [H^+] \\
 &= 1 \times 10^{-14} / 0.025 \\
 &= 4 \times 10^{-13} \frac{\text{mol}}{L}
 \end{aligned}$$

$$8. \quad [NaOH] = \frac{m}{MV}$$

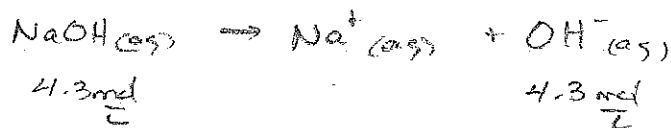
$$= 26g \times \frac{1 \text{ mol NaOH}}{40.01g \text{ NaOH}} \times \frac{1}{0.150L}$$

$$= 4.3 \frac{\text{mol}}{L}$$

$$m = 26g$$

$$M = 40.01g/mol$$

$$V = 0.150L$$



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

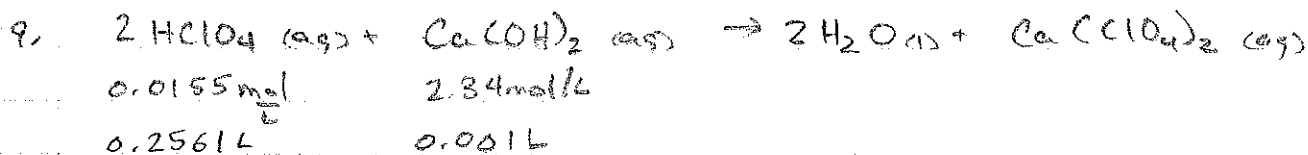
$$= -\log(4.3)$$

$$= -0.64$$

$$pH = 14 - pOH$$

$$= 14 - (-0.64)$$

$$pH = 14.64$$



$$n_{H^+} = [HClO_4] \times V \times \text{mol ratio}$$

$$= 0.2561L \times 0.0155 \frac{\text{mol HClO}_4}{L} \times \frac{1 \text{ mol H}^+}{1 \text{ mol HClO}_4} = 3.97 \times 10^{-3} \text{ mol H}^+$$

$$n_{OH^-} = [Ca(OH)_2] \times V \times \text{mol ratio}$$

$$= 2.34 \frac{\text{mol Ca(OH)}_2}{L} \times 0.001L \times \frac{2 \text{ mol OH}^-}{1 \text{ mol Ca(OH)}_2}$$

$$= 4.68 \times 10^{-3} \text{ mol OH}^-$$

$$pOH = -\log(OH^-)$$

$$= -\log(0.00276)$$

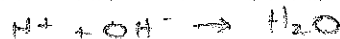
$$= 2.559$$

$$pH = 14 - pOH$$

$$= 14 - 2.559$$

$$pH = 11.441$$

$$n_{OH^-} > n_{H^+}$$

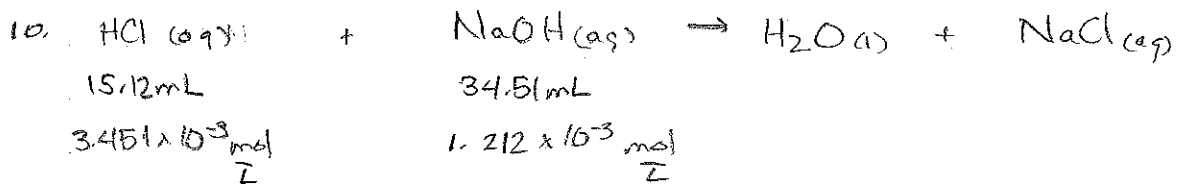


$$n_{OH^- \text{ remain}} = n_{OH^- \text{ have}} - n_{OH^- \text{ req}}$$

$$= 4.68 \times 10^{-3} \text{ mol OH}^- - \left( 3.97 \times 10^{-3} \text{ mol H}^+ \times \frac{1 \text{ mol OH}^-}{1 \text{ mol H}^+} \right)$$

$$= 7.1 \times 10^{-4} \text{ mol OH}^-$$

$$[OH^-] = \frac{n}{V} = \frac{7.1 \times 10^{-4} \text{ mol OH}^-}{(0.2572L)} = 0.00276 \text{ mol/L}$$



$$\begin{aligned}
 n_{\text{H}^+} &= [\text{HCl}] \times V \times \text{mol ratio} = 3.451 \times 10^{-3} \frac{\text{mol HCl}}{\text{L}} \times 0.01512 \text{ L} \times \frac{1 \text{ mol H}^+}{1 \text{ mol HCl}} \\
 &= 5.218 \times 10^{-5} \text{ mol H}^+
 \end{aligned}$$

$$\begin{aligned}
 n_{\text{OH}^-} &= [\text{NaOH}] \times V \times \text{mol ratio} = 1.212 \times 10^{-3} \frac{\text{mol NaOH}}{\text{L}} \times 0.03451 \text{ L} \times \frac{1 \text{ mol OH}^-}{1 \text{ mol NaOH}} \\
 &= 4.183 \times 10^{-5} \text{ mol OH}^-
 \end{aligned}$$

$n_{\text{H}^+} > n_{\text{OH}^-}$

$$\begin{aligned}
 n_{\text{H}^+ \text{ remain}} &= n_{\text{H}^+ \text{ have}} - n_{\text{H}^+ \text{ needed}} \\
 &= 5.218 \times 10^{-5} \text{ mol H}^+ - \left( 4.183 \times 10^{-5} \text{ mol OH}^- \times \frac{1 \text{ mol H}^+}{1 \text{ mol OH}^-} \right) \\
 &= 1.035 \times 10^{-5} \text{ mol H}^+
 \end{aligned}$$

$$\begin{aligned}
 [\text{H}^+] &= \frac{n_{\text{H}^+}}{V} \\
 &= \frac{(1.035 \times 10^{-5} \text{ mol H}^+)}{(0.01512 + 0.03451) \text{ L}}
 \end{aligned}$$

$$\begin{array}{r}
 1512 \\
 0.3451 \\
 \hline
 09.63
 \end{array}$$

$$[\text{H}^+] = 0.0002086 \frac{\text{mol H}^+}{\text{L}}$$

$$\begin{aligned}
 \text{pH} &= -\log [\text{H}^+] \\
 &= -\log (0.0002086) \\
 &= 3.6806
 \end{aligned}$$