2 (e) H^+ → 1.62×10^{-5} mg/L $\left(\frac{100/2}{1/1}\right)$ = 8.1×10^{-4} mg/L as $CaCO_3$

d) $pH = -\log[H^+] = -\log 1.62\times10^{-8} = 7.79$

3. Calculate the hydroxide ion concentration:

at 25°C, $K_w = 10^{-14}$

a) $10^{-14} = [H^+][OH^-]$ ← from 2(a)

$10^{-14} = [1.62\times10^{-8}][OH^-] \Rightarrow [OH^-] = 6.17\times10^{-7}$ mol/L

b) $OH^- = 6.17\times10^{-7}$ mol/L × $\frac{17\,g}{mol}$ × $1000\,\frac{mg}{g}$ = 0.0105 mg/L

c) $OH^- = 0.0105$ mg/L $\left(\frac{100/2}{17/1}\right)$ = 0.0309 mg/L as $CaCO_3$

d) $pOH = 14 - pH = 14 - 7.79 = 6.21$

4. Calculate the concentration of CO_2 as mg/L as $CaCO_3$.

$[CO_2] = [H_2CO_3]$

determine How many mol/L of H_2CO_3

$$K_a = \frac{[H^+][HCO_3^-]}{[H_2CO_3]}$$

$$10^{-6.35} = \frac{[1.62\times10^{-8}][6.92\times10^{-3}]}{[H_2CO_3]}$$

$[H_2CO_3] = 2.51\times10^{-4}$ mol/L = $[CO_2]$ ← in mol/L not in mg/L

∴ $[CO_2] = 2.51\times10^{-4}\,\frac{mol}{L} \times 44\,\frac{g}{mol} \times 1000\,\frac{mg}{g} = 11.04$ mg/L

CO_2 : 11.04 mg/L $\left(\frac{100/2}{44/2}\right)$ = 25.09 mg/L as $CaCO_3$

↓ n=2

see foot note [14] in textbook p. 184