Example: Consider a solution with a pH of 9.16, which has P_{alk} = 12 mg/L **$CaCO_3$** and a T_{alk} = 200 mg/L **$CaCO_3$**. Determine the concentration of [**HCO_3^-**], [**CO_3^{2-}**] and [**OH^-**].

$$[alk]_P = [OH^-] + [CO_3^{2-}]$$

$$10^{14-pH} = 10^{-4.84} = 1.45 \times 10^{-5}\ M$$

$$\frac{12\ mg\ CaCO_3}{L} \times \frac{1\ mol}{100{,}000\ mg} \times \frac{2\ mol\ H^+}{1\ mol\ CaCO_3} = 2.40 \times 10^{-4}\ M$$

$$\therefore [CO_3^{2-}] = [alk]_P - [OH^-]$$

$$= (2.40 \times 10^{-4}) - (1.45 \times 10^{-5})$$

$$= 2.26 \times 10^{-4}\ M$$

$$[alk]_T = [HCO_3^-] + 2[CO_3^{2-}] + [OH^-]$$

2.26×10^{-4} 1.45×10^{-5}

$$\frac{200\ mg\ CaCO_3}{L} \times \frac{1\ mol}{100{,}000\ mg} \times \frac{2\ mol\ H^+}{1\ mol\ CaCO_3} = 4.00 \times 10^{-3}\ M$$

$$\therefore [HCO_3^-] = [alk]_T - 2[CO_3^{2-}] - [OH^-]$$

$$= 4.00 \times 10^{-3} - 2(2.26 \times 10^{-4}) - (1.45 \times 10^{-5})$$

$$= 3.53 \times 10^{-3}\ M$$

So, 88% alk due to HCO_3^-