Converting Carbonate Alkalinity from mg/L as $CaCO_3$ to mg/L as CO_3^{2-}

$CaCO_3$ has a molecular weight of 100 g/mol

The CO_3^{2-} anion has a molecular weight of 60 g/mol

Therefore, each milligram of $CaCO_3$ contains 60/100 = 0.6 mg of CO_3^{2-}

The conversion is as follows:

Carbonate Alkalinity as CO_3^{2-} (mg/L) = 0.6 *Carbonate Alkalinity as $CaCO_3$ (mg/L)

Converting Bicarbonate Alkalinity from mg/L as $CaCO_3$ to mg/L as HCO_3^-

Consider the following reaction:

$CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$

$CaCO_3$ has a molecular weight of 100 g/mol

The HCO_3^- anion has a molecular weight of 61 g/mol

Therefore, each mol of $Ca(HCO_3)_2$ corresponds to one mol of $CaCO_3$ (100 g) and contains 2 x 61 g = 122 g of HCO_3^- and the conversion is as follows:

Bicarbonate Alkalinity as HCO_3^- (mg/L) = 1.22 *Bicarbonate Alkalinity as $CaCO_3$ (mg/L)

Converting Hydroxide Alkalinity from mg/L as $CaCO_3$ to mg/L as OH^-

Consider the following reactions of $CaCO_3$ and hydroxide ions with protons (acid):

$CaCO_3 + 2\ H^+ \rightarrow Ca^{2+} + H_2CO_3$

$2\ OH^- + 2\ H^+ \rightarrow 2\ H_2O$

In terms of consumption of protons, 2 moles of hydroxide ions (OH^-) are equivalent to one mol (100 g) of $CaCO_3$. Since the molecular weight of OH^- is 17 g/mol, the conversion is as follows:

Hydroxide Alkalinity as OH^- (mg/L) = 2*17/100 *Hydroxide Alkalinity as $CaCO_3$ (mg/L)

or:

Hydroxide Alkalinity as OH^- (mg/L) = 0.34 *Hydroxide Alkalinity as $CaCO_3$ (mg/L)