

# Hardness

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## **Slide#22 solution)**

*Don't have to consider  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{SO}_4^{2-}$  and  $\text{Cl}^-$*

<b>Ion</b>	<b>Conc. (mg/L)</b>	<b>Ion weight</b>	<b>Conc. (mM)</b>	<b>Conc. (meq/L)</b>
$\text{Ca}^{2+}$	40	40	1.0	2.0
$\text{Mg}^{2+}$	10	24.3	0.41	0.82
$\text{HCO}_3^-$	110	61	1.8	1.8

$$TH = (\text{Ca}^{2+}) + (\text{Mg}^{2+}) = 2.8 \text{ meq/L}$$

$$TH \text{ in mg/L as CaCO}_3 = 2.8 \text{ meq/L} \times 50 \text{ mg/meq} = 140 \text{ mg/L as CaCO}_3$$

*Since  $(\text{Ca}^{2+}) + (\text{Mg}^{2+}) > (\text{HCO}_3^-)$ ,*

$$CH = (\text{HCO}_3^-) = 1.8 \text{ meq/L} = 90 \text{ mg/L as CaCO}_3$$

$$NCH = TH - CH = 140 - 90 = 50 \text{ mg/L as CaCO}_3$$