

Group Quiz #1 chem 101 lecture **KEY**

1) What is the molarity (M) of a 250. mL solution containing 18.0 grams of sucrose (360 g/mol)?

#M sucrose = mol sucrose/L sucrose.

$$\#M \text{ sucrose} = (18.0 \text{ g})(1 \text{ mol sucrose}/360 \text{ g}) / (250 \text{ mL} (1 \text{ L}/1000 \text{ mL})) = \mathbf{0.200 \text{ M sucrose}}$$

2) How many grams of oxygen are contained in 25.0 mLs of .400 M CaCO₃ solution?
(in case you need the atomic weights: Ca = 40. g/mol, C=12.0 g/mol, O=16.0 g/mol)

$$\#g \text{ O} = (25.0 \text{ mL} (1 \text{ L}/1000 \text{ mL}))(.400 \text{ mol CaCO}_3/\text{L})(3 \text{ mol O/mol CaCO}_3)(16.0 \text{ g O/mol}) = \mathbf{0.48 \text{ g O}}$$

3) If the titration of 50.0 mLs of NaOH requires 22.5 mLs of 0.120M HCl to reach equivalence, what is the molarity of NaOH?

Titration equation: $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ (so at equivalence, #mol HCl = #mol NaOH)

$$\#M \text{ NaOH} = \text{mol NaOH}/\text{L NaOH} = \text{mol HCl}/\text{L NaOH} = M_{\text{HCl}}V_{\text{HCl}}/V_{\text{NaOH}} = (.120 \text{ M})(22.5 \text{ mL})/(50.0 \text{ mL})$$

$$\#M \text{ NaOH} = \mathbf{0.054 \text{ M NaOH}}$$

4) If instead of adding 50.0 mL in the above equation, you add only 25.0 mLs of 0.120 M HCl, (i.e. just halfway to equivalence point), what is the concentration of NaOH in that resulting solution?

Titration equation: $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$ (so at equivalence, #mol HCl = #mol NaOH)

$$\#M \text{ NaOH} = \text{mol NaOH unreacted} / \text{total volume} = (\text{total moles NaOH} - \text{mol NaOH reacted}) / \text{total vol.}$$

$$\begin{aligned} \#M \text{ NaOH} &= \{(.120 \text{ M})(22.5 \text{ mL}) - .120 \text{ M} (10.0 \text{ mL})\} / (50.0 \text{ mL} + 10.0 \text{ mL}) \\ &= \{2.70 \text{ mmol} - 1.20 \text{ mmol}\} / 60.0 \text{ mL} = \mathbf{0.025 \text{ M}} \end{aligned}$$