## Step-by-step Chemical Calculations

Given the quantity of a substance and a balanced equation
determine the quantity of another substance

1. Calculate moles of known
2. Calculate the number of moles for known

- Use $n=\frac{m}{M}$ if known is a mass
- Use $n=C \times V$ if known is a concentration and volume

4. Use the balanced chemical equation to determine the mole ratio $\frac{n_{\text {unknown }}}{n_{\text {known }}}$

- Use the coefficients (balancing numbers out the front of each species)

5. Calculate the moles of unknown by multiplying moles of known by the mole ratio
6. If unknown is a mass, calculate its molar mass $M$ (using the periodic table)
7. Calculate the quantity for unknown

- Use $m=n \times M$ if mass is required
- Use $C=\frac{n}{V}$ if concentration is required
- Use $V=\frac{n}{C}$ if volume is required


3. 

Calculate required quantity of unknown

## Step-by-step Chemical Calculations

Given the quantity of each reactant and the balanced equation
determine the excess and limiting reactant

1. For the purpose of following these instructions, label the reactants $A$ and $B$
2. Calculate the moles present of each

- Use $n=\frac{m}{M}$ if given mass
- Use $n=C V$ if given concentration and volume

3. Use the balanced chemical equation to determine the mole ratio $\frac{n_{A}}{n_{B}}$

- Use the coefficients (balancing numbers out the front of each species)

4. Calculate moles required of $A$ by multiplying the moles present of $B$ by the mole ratio
5. Compare moles present of $A$ with moles required of $A$

- If present is less than required, $A$ is the limiting reactant ( $B$ is in excess)
- If present is more than required, $B$ is the limiting reactant ( $A$ is in excess)

SUMMARY
1.

Calculate moles present of each
2.

Calculate moles of one required to exactly react with the other

## 3.

## Compare

moles required with moles present

