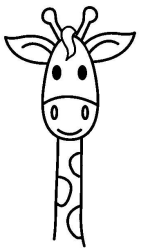
Step-by-step Chemical Calculations

Given the quantity of a substance and a balanced equation

determine the quantity of another substance

1. Determine which quantity is *known* and which is *unknown*
2. If *known* is a mass, calculate its molar mass M (using the periodic table)
3. 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 $\frac{n_{unknown}}{n_{known}}$
   - 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



SUMMARY

1. Calculate **moles** of ***known***

2. Use mole ratio to determine **moles** of ***unknown***

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 $n = CV$ 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)
   - If present is equal to required, neither reactant 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