Stoichiometry

Measuring the amounts of elements and compounds involved in a reaction.

Warm-Up. 3/3/15

* Write and balance the following reaction: Potassium reacts with sulfur in a synthesis reaction.

* What is the mass of potassium in 1 mol of the product?

* If you have 12 moles of potassium, how many moles of product will you form?

Representative particle review

* So far we've been looking at particles as ions.

* Particles can be atoms, molecules, compounds-- anything that we want to count at the atomic scale.

* For particles "things" at the atomic scale, always multiply number of moles of "things" by Avagadro's number.

Representative Particles

* How many molecules of CO_2 do we have in 3.5 mol of CO_2?

* How many moles of KNO_3 do we have if we have 3.4×10^{22} compounds?

Mole to Mole ratio

* Ratio of moles of reactants and products in **balanced** chemical equations.

moles B

↕ mole ratio

moles A

Practice

$$2C_6H_{14} + 19O_2 \longrightarrow 12CO_2 + 14H_2O$$

* For 8 moles of C_6H_{14}, how many moles of H_2O will there be?

   8 moles C_6H_{14} (14 moles H_2O/2 moles C_6H_{14}) = 56 moles H_2O

* For 3.6 moles of O_2, how many moles of CO_2 will there be?

   3.6 moles O_2 (12 moles CO_2/19 moles O_2) = 2.3 moles CO_2

Mass to mole relationship

* Mass is how we actually measure reactants and products.

* Use molar mass to convert moles to mass for a single element/compound/molecule.

molar
mass
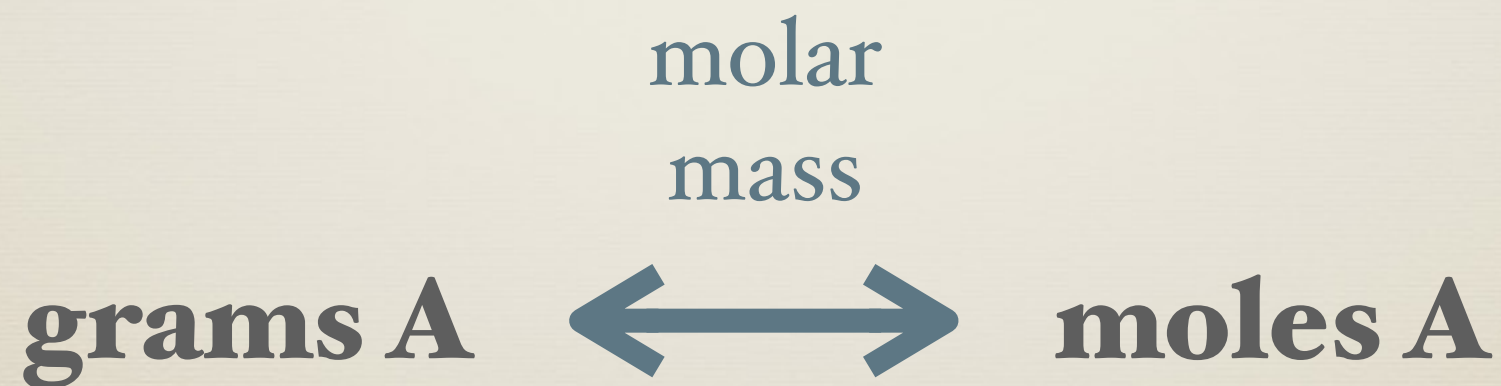
grams A $\longleftrightarrow$ **moles A**

Stoichiometry Roadmap

Problems
1. Identify where to start on map
2. Identify where to end
3. Use conversions to get between moles A - moles B or moles A - grams A

moles B

$\updownarrow$ mole ratio

grams A $\longleftrightarrow$ **moles A**

molar mass
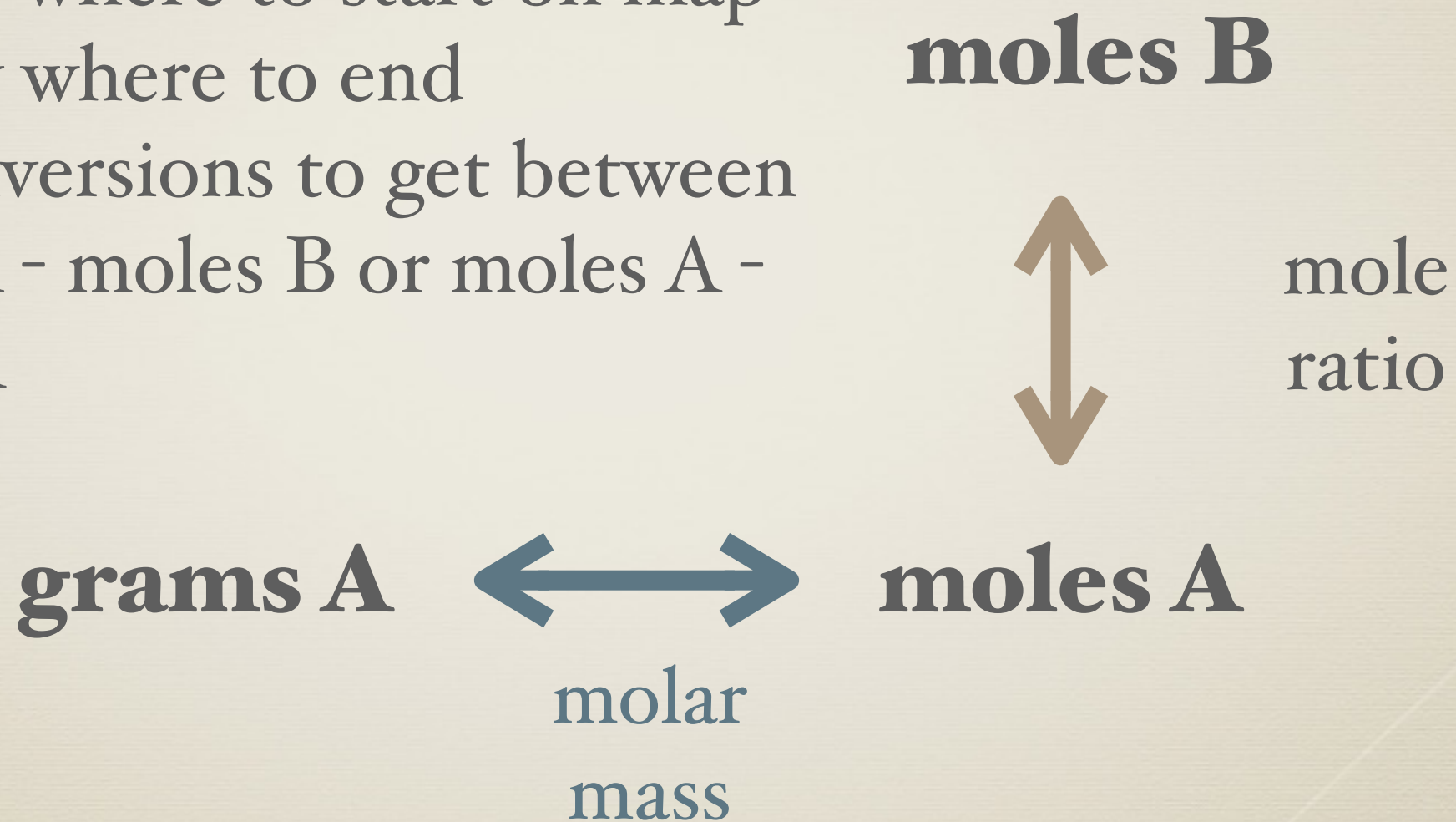
Putting it all together

$$2C_6H_{14} + 19O_2 \longrightarrow 12CO_2 + 14H_2O$$

* For 4.2 moles of C_6H_{14}, how many grams of H_2O will there be?

* For 36g of C_6H_{14}, how many moles of CO_2 would be produced?

Stoichiometry Conversions

Mole to Mole Ratio

Going between elements/compounds/molecules

$$\frac{\text{moles A}}{\text{moles B}}$$

Molar Mass

Going from moles to grams within an element/compound/molecule

$$\frac{\text{moles A}}{\text{grams A}}$$