

CONCEPT: LIMITING REAGENT

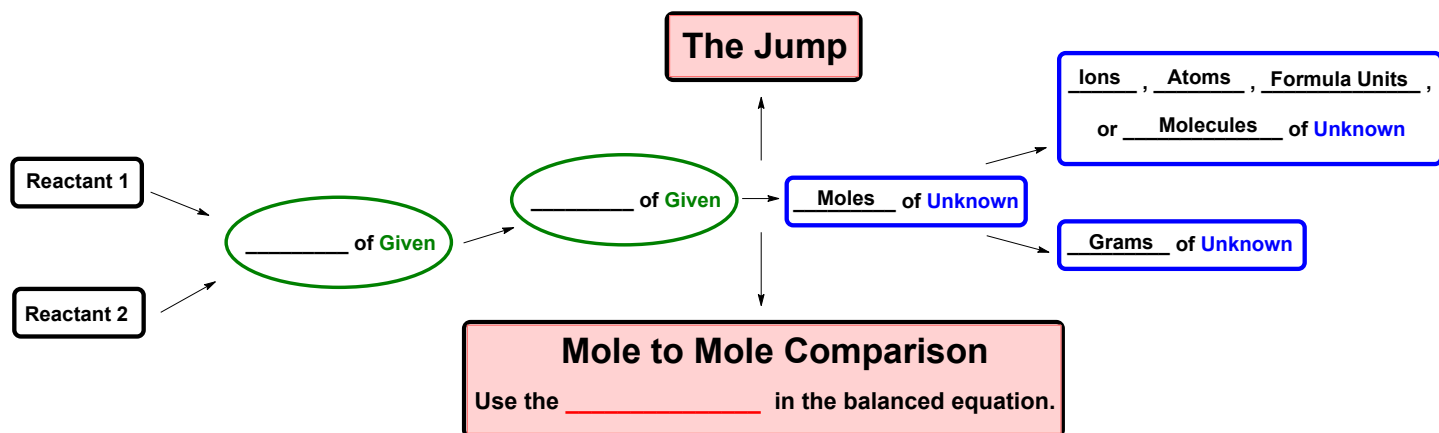
● **Limiting Reagent:** The reactant that is completely consumed in a reaction and determines the max amount of product.

□ _____ Yield: The maximum amount of product that can form from a chemical reaction.

- Also referred to as the _____ yield or _____ yield.

□ _____ Reagent: The reactant that remains after the completion of the chemical reaction.

- In order to determine which reactant is which we must work out the amounts of product each can make.



EXAMPLE: Zinc sulfide reacts with aqueous hydrochloric acid to form zinc chloride and hydrogen sulfide gas:



What is the mass of hydrogen sulfide formed when 12.11 g ZnS reacts with 15.92 g HCl?

STEP 1: Convert the **Given** quantities into moles of **Given**.

□ If any compound(s) is said to be in excess, then just _____.

STEP 2: Do a **Mole to Mole comparison** to convert moles of **Given** of each reactant into moles of **Unknown**.

STEP 3: If necessary, convert the moles of **Unknown** into the final desired units.

STEP 4: Compare the final amounts of the **Unknown** to determine the theoretical yield.

□ The _____ amount is for the limiting reagent, while the _____ amount is for the excess reagent.

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PRACTICE: The following reaction shows the mineral ilmenite, FeTiO_3 , being reacted with chlorine gas and sand in order to extract titanium (IV) chloride.



Assuming a 100% yield, how many grams of titanium (IV) chloride can be extracted when reacting 18.0 g ilmenite, 30.0 g Cl_2 and 40.0 g C?

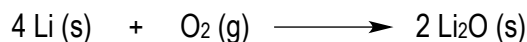
a) 211 g

b) 26.8 g

c) 22.5 g

d) 92.9 g

PRACTICE: Lithium solid reacts with oxygen gas to create lithium oxide solid.



If 131 g of Li are allowed to react with 215 g O_2 , how many kilograms of the excess reactant would remain?

a) 4.00 kg

b) 0.0640 kg

c) 9.44 kg

d) 0.0912 kg