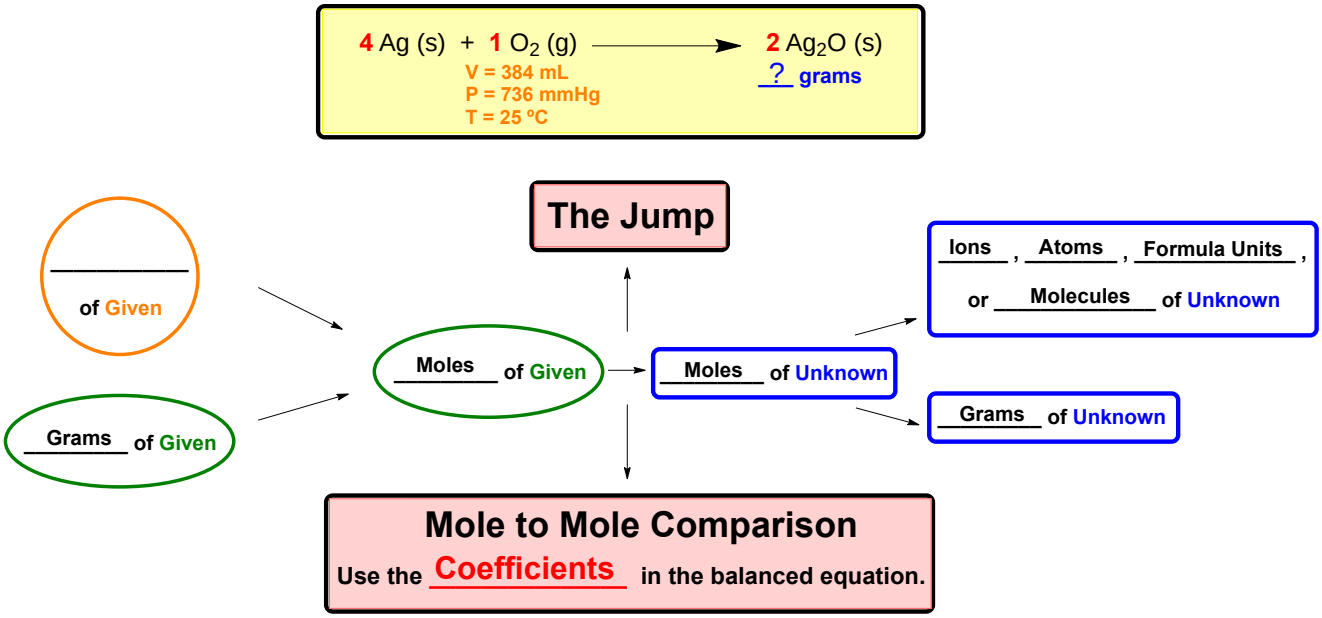
CONCEPT: GAS STOICHIOMETRY

- Recall, *stoichiometry* deals with the numerical relationship between compounds in a *balanced chemical equation*.
  - □ **Gas Stoichiometry** deals with stoichiometric calculations of chemical reactions that produce gases.

Gas Stoichiometric Chart

- The chart uses the **Given** quantity of a compound to determine the **Unknown** quantity of another compound.



EXAMPLE: What mass of Ag_2O is produced when 384 mL of oxygen gas at 736 mmHg and 25 °C is reacted with excess solid silver?

$$4\ Ag\ (s) + 1\ O_2\ (g) \longrightarrow 2\ Ag_2O\ (s)$$

STEP 1: Map out the portion of the stoichiometric chart you will use.

STEP 2: Convert the **given** quantity into moles of **given**.

STEP 3: Do a **mole to mole comparison** to convert moles of **given** into moles of **unknown**.

STEP 4: If necessary, convert the moles of **unknown** into the final desired units.

STEP 5: Recall, if you calculate more than one final amount then you must compare them to determine the theoretical yield.

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PRACTICE: The metabolic breakdown of glucose ($C_6H_{12}O_6$) (MW: 180.156 g/mol) is given by the following equation:

$$C_6H_{12}O_6\ (s) + 6\ O_2\ (g) \longrightarrow 6\ CO_2\ (g) + 6\ H_2O\ (l)$$

Calculate the volume (in mL) of CO_2 produced at 34°C and 1728.9 torr when 231.88 g glucose is used up in the reaction.

PRACTICE: The oxidation of phosphorus can be represented by the following equation:

$$P_4\ (s) + 5\ O_2\ (g) \longrightarrow 2\ P_2O_5\ (g)$$

If 1.85 L of diphosphorus pentoxide form at a temperature of 50.0 ºC and 1.12 atm, what is the mass (in g) of phosphorus that reacted?

PRACTICE: Determine the mass (in grams) of water formed when 15.3 L NH_3 (at 298 K and 1.50 atm) is reacted with 21.7 L of O_2 (at 323 K and 1.1 atm).

$$4\ NH_3\ (g) + 5\ O_2\ (g) \longrightarrow 4\ NO\ (g) + 6\ H_2O\ (g)$$