Burning Magnesium

- Mg reacts with O$_2$, N$_2$
- Equations?
  
  \[
  2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO} \\
  3 \text{Mg} + \text{N}_2 \rightarrow \text{Mg}_3\text{N}_2
  \]
“Stoichiometry”

- Quantitative relationships: “How much” or “How many” questions
- Applications of conservation laws
- “Composition stoichiometry” vs. “Reaction Stoichiometry”

Reaction Stoichiometry

- Balanced equation!
- Moles react with moles, so calculations centered on moles
- Use sample weight, molecular weight, volume, density, etc. to relate data to # of moles.
Example:

- Propane is burned in gas grills. The equation for burning propane is:

\[ C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O \]

- How many grams of \( O_2 \) are required to burn 400 g of propane?

“The average American car driven the average American distance in an average American year releases its own weight in carbon dioxide into the atmosphere.”

William McKibben
The New Yorker, 1989

We will spend some time in class evaluating the accuracy of this statement.
Car Exhaust Problem

• First, formulate a plan of attack.
  Theory: How to solve?
  Is it a chemistry problem?
  Can we make it into one?
• What data are needed?
• Assumptions to be made?
  We will spend a good deal of time working through this in class, so bring your ideas!

How much NaAlO$_2$ is required to produce 1.0 kg of Na$_3$AlF$_6$ by the following reaction?

$$6HF + 3\text{NaAlO}_2 \rightarrow \text{Na}_3\text{AlF}_6 + 3\text{H}_2\text{O} + \text{Al}_2\text{O}_3$$