What are Chemical Reactions?

Unit 4: Chemical Reactions

Chemical Reactions

- Process in which one or more substances are converted into new substances with different physical and chemical properties.

- This occurs by:
  - Break apart bonds
  - Forming new bonds

Chemical Reactions

- Compounds containing atoms break, causing atoms to rearrange and form new substances.

- Indications:
  - Formation of energy as heat or light.
  - Production of a gas
  - Production of a precipitate
  - Color change

Law of Conservation of Mass

- Principle of Matter: Matter cannot be created or destroyed.
- Matter is made of atoms.
- Compounds are made of atoms and used in reactions.
- In reactions atoms are not lost/gained but rearranged.

Reactants → Products

- A substance that is used in a chemical reaction.

Yields

Or

Produces

- A substance that forms during a chemical reaction.

- By the Law of Conservation of Matter:
  - The atoms going in must equal the atoms coming out.
  - (What goes in, must come out)

Practice Questions

___ What represents the term “produce” in a chemical reaction?

___ States that the amount of reactants must equal the products.

___ Substances that are present before the reaction occurs.

A. Products
B. Arrow
C. Reactants
D. Conservation of Mass
E. Reaction Rate
F. Chemical Reactions

Types of Reactions

- Synthesis
  - 2 substances produces 1 substance
  - General Equation: A + B → AB
- Decomposition
  - 1 substance produces 2 substances
  - General Equation: AB → A + B

Types of Reactions

- Single Displacement Reaction
  - 1 element or ion moves out of one compound and into another.
  - General Equation: A + BC → AC + B
- Double Displacement Reaction
  - Parts of each reactant is replaced by part of another reactant.
  - General Equation: AB + CD → AD + CB

Energy Usage in Reactions

Endothermic Reaction

- Requires more energy to break bonds than released forming new bonds.
- Absorb more energy than released.

Reactant
Energy
+
Energy (Absorbed)
=
Product
Energy

Energy Usage in Reactions

Reactant Energy

=

Energy (Released)

+

Product Energy

Exothermic Reaction

- Releases more energy forming new bonds than absorbed in breaking bonds.

- Releases more energy than absorbed.

Conservation of Energy

- Energy can neither be created nor destroyed, only transferred.

- The energy is not new, but energy that has been transferred (moved) in some form.

Writing Reactions

- Word Equation
  - Usage of name of compounds to describe the reaction.

Oxygen and Glucose will produce Water and Carbon Dioxide

Writing Reactions

- Chemical Equation
  - Usage of symbols that show relationship between reactants and products.

C6H12O6 + 6 O2 → 6 CO2 + 6 H2O

Balanced Equations

- Atoms (Mass) is conserved in chemical equations.
- # of atoms of each element as a reactant must equal the number of atoms as a product
- Use coefficient, a number, to show the amount of substance in a reaction.

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Steps for Balancing Equations

1. Write a word equation for the reaction.
2. Write the formula for each reactant and product.
3. Count the atoms of each element on both sides of the equation.
4. Add coefficients to balance the number of atoms.

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Steps for Balancing Equations

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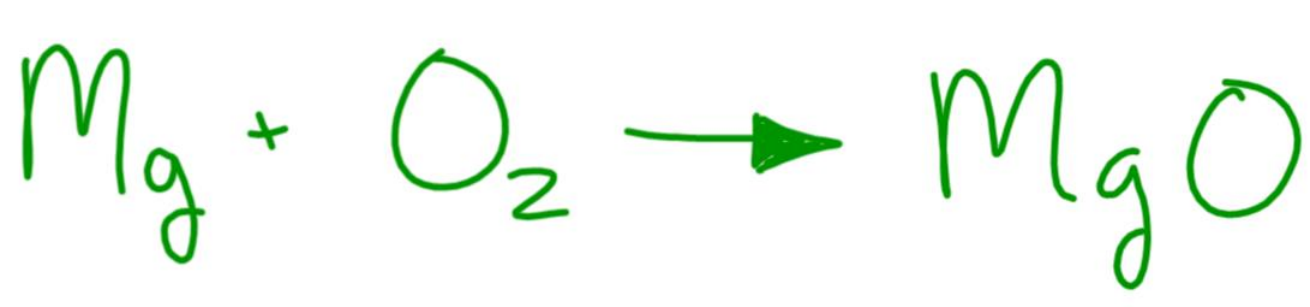
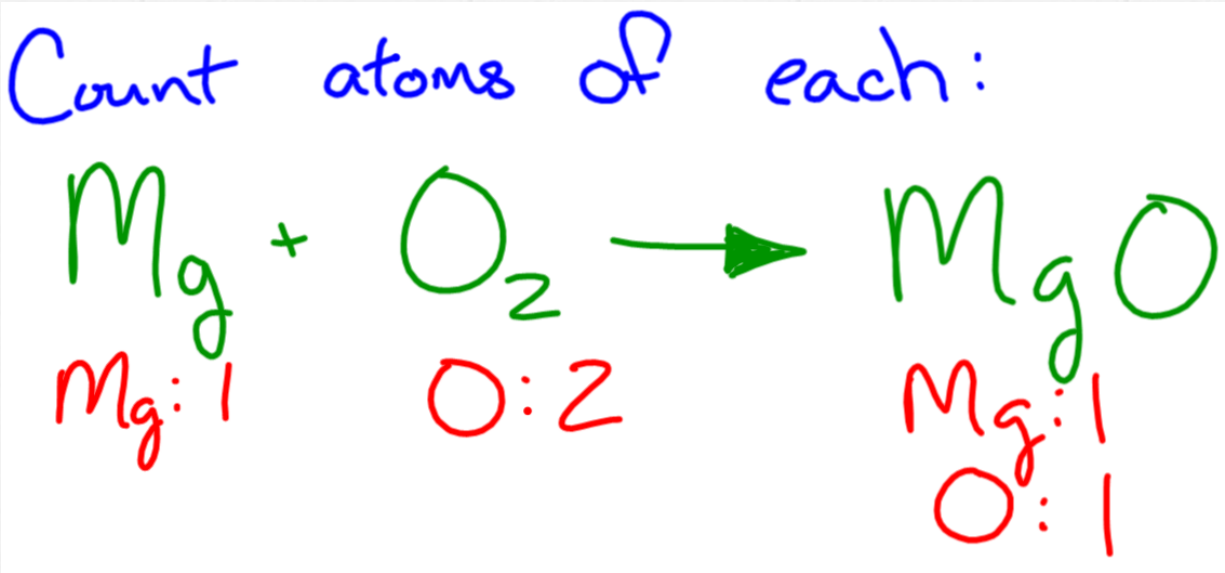


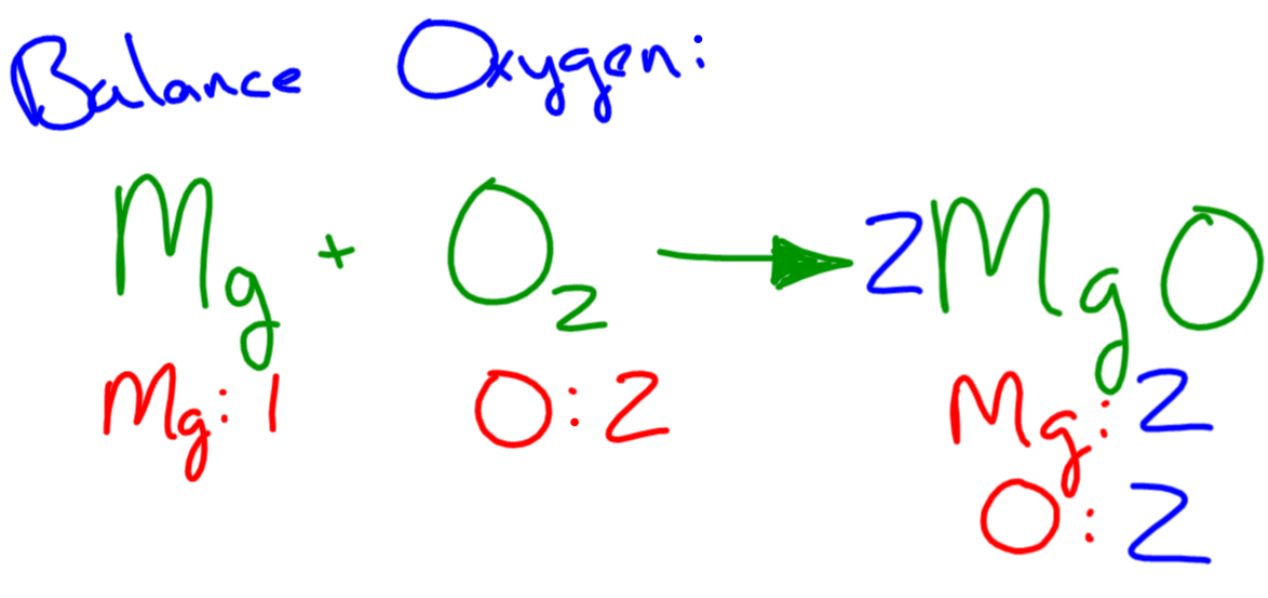
Steps for Balancing Equations

3. Count the atoms of each element on both sides of the equation.



Steps for Balancing Equations

4. Add coefficients to balance the number of atoms.



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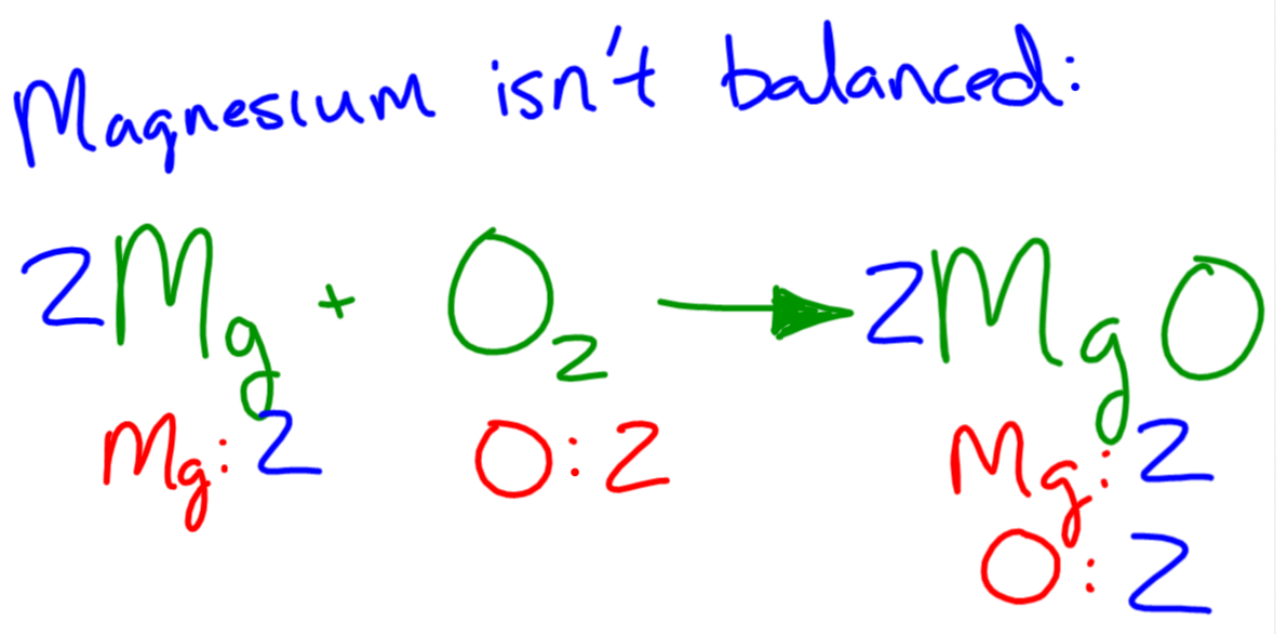
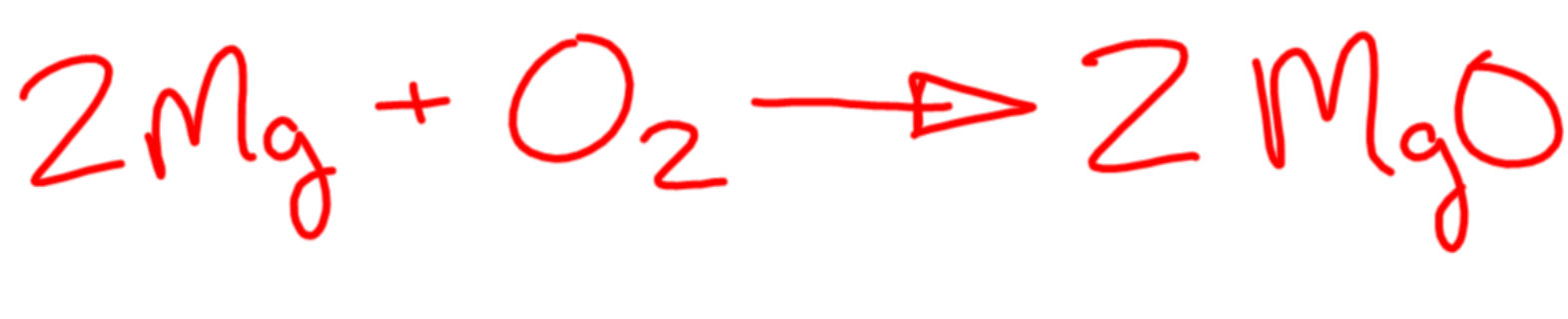


Balanced Equation



Hints for Balancing Equations

- Write each formula correctly
- Can not change SUBSCRIPTS within a formula
- Never write “1” as a coefficient
- Every time a coefficient is changed, make sure it doesn’t unbalance another element
- Always double check