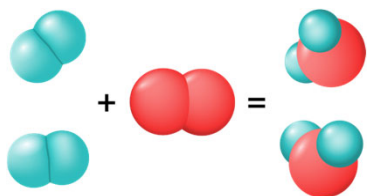


If I Mix These Chemicals,
Will They Explode?



Chemical Reactions

- When a chemical change (chemical reaction) occurs, the atoms rearrange to form new compounds.



- The idea that matter was conserved was a well accepted idea without strong evidence.
- Antoine Lavoisier (French) is credited with providing strong evidence and publishing an operational definition.



Portrait of Monsieur Lavoisier and His Wife

We may lay it down as an incontestible axiom, that, in all the operations of art and nature, nothing is created; an equal quantity of matter exists both before and after the experiment; the quality and quantity of the elements remain precisely the same; and nothing takes place beyond changes and modifications in the combination of these elements. Upon this principle the whole art of performing chemical experiments depends: We must always suppose an exact equality between the elements of the body examined and those of the products of its analysis.

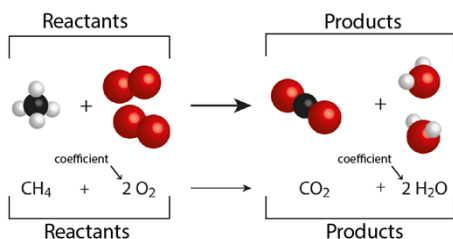
Elements of Chemistry, In a New Systematic Order, Containing All the Modern Discoveries

Law of Conservation of Matter

- Matter cannot be created or destroyed (in a closed system) it can only change forms.
- This means that the total amount of matter remains constant, even during physical or chemical changes.
- This also means that the elements present at the beginning of a chemical reaction can not change.

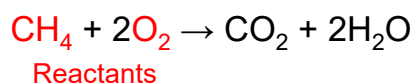
Chemical Equations

- A chemical reaction is represented by a balanced chemical equation.

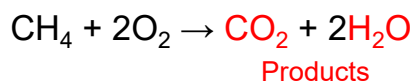


Parts of a Chemical Equation

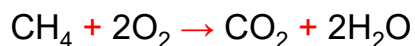
- The substances that are reacting are called reactants.
- Their formulas are placed on the left side of the equation.



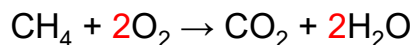
- The substances that are produced are called products.
- Their formulas are placed on the right side of the equation.



- Plus signs (+) separate the individual formulas, and an arrow (→) separates the reactant and product sides.



- Coefficients (numbers placed immediately to the left of each formula) are used to indicate the relative number of each compound.
- A coefficient of 1 is typically omitted.

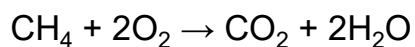


- A chemical equation is balanced when equal numbers of atoms for each element involved in the reaction are represented on the reactant and product sides.

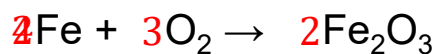
- This is a requirement the equation must satisfy to be consistent with the law of conservation of matter.



- We can confirm that an equation is balanced by counting the number of atoms of each element on both sides of the equation.



C	$1 \times 1 = 1$	$1 \times 1 = 1$ ✓
H	$4 \times 1 = 4$	$2 \times 2 = 4$ ✓
O	$2 \times 2 = 4$	$(2 \times 1) + (1 \times 2) = 4$ ✓



Fe: $\overset{\times 4 = 4}{\cancel{1 \times 2} = 2}$ Fe: $\cancel{2} \ 4$

O: $\underline{2 \times 3 = 6}$ O: $\underline{3 \times 2 = 6}$
