**Writing and Balancing Chemical Equations**

**Chemical Equations**

* Chemical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ result in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ Chemical changes occur when \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ The original substance(s), called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, change into new substance(s) called \_\_\_\_\_\_\_\_\_.
* Chemical reactions can be written in different ways.
	+ A \_\_\_\_\_\_\_\_\_\_\_\_ equation:
		- nitrogen monoxide + oxygen 🡪 nitrogen dioxide

State of matter

* Letters indicate the state of each compound.
* (aq) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* (s) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* ( ) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* (g) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ equation:
		- 2NO(g) + O2(g) 🡪 2NO2(g)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* Indicate the ratio of compounds in the reaction.
* Here, there is twice as much NO and NO2 than as is O2.

**Conservation of Mass in Chemical Change**

* Chemical change means new compounds are created.
	+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; atoms are just rearranged.
	+ \_\_\_\_\_\_\_\_\_\_\_ of the matter in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_ of the matter in the \_\_\_\_\_\_\_\_\_\_\_.
	+ Number of each atom in reactants = number of each atom in products.
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:
	+ In chemical reactions, atoms are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ Mass of reactants = mass of products

**Writing and Balancing Chemical Equations**

* The simplest form of chemical equation is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	+ potassium metal + oxygen gas 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ shows the formulas of the elements/compounds.
	+ A skeleton equation \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, but \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of atoms.

K + O2 🡪 K2O

* A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chemical equation **shows all atoms** **and their quantities**
	+ Balancing ensures that the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the reaction arrow.
	+ Always use the smallest whole-number ratio.

Balance: K + O2 🡪 K2O \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



🡪 Word equation

 🡪Skeleton equation



 # of atoms 🡨

Counting Atoms: 2 Methods, same meaning.



These two diagrams/equations look different, but both represent the same thing.

**Counting Atoms**

 **🡪**

**Counting Atoms to Balance an Equation**

* Using the law of conservation of mass, we can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to balance the number of atoms in chemical equations.
	+ Word equation: methane + oxygen 🡪 water + carbon dioxide
	+ Skeleton equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- To balance the compounds, look at how many atoms of each element occur on each side of the reaction arrow.
	+ Skeleton equation: CH4 + O2  🡪 H2O + CO2

 1 carbon, 4 hydrogen, 2 oxygen 🡪 1 carbon, 2 hydrogen, 3 oxygen

* + To balance, find \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that equate atoms on both sides
	+ Balanced equation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 carbon, 4 hydrogen, (2×2) oxygen 🡪 1 carbon, (2×2) hydrogen, (2×1)+2 oxygen

**Practice**: Balance H2 + O2 🡪 H2O

 



**Strategies for Balancing Equations**

* Balance chemical equations by following these steps:
	+ Trial and error will work but can be very inefficient.
	+ Balance compounds first and elements last.
	+ Balance one compound at a time.
	+ Only add coefficients; NEVER change subscripts.
	+ If H and O appear in more than one place, attempt to balance them LAST.
	+ Polyatomic ions (such as SO42–) can often be balanced as a whole group.
	+ Always \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ after you think you are finished.
* Balance the following:
	+ Fe + Br2 🡪 FeBr3
	+ Sn(NO2)4 + K3PO4 🡪 KNO2 + Sn3 (PO4)4
	+ C2H6 + O2 🡪 CO2 + H2O