




Introduction to Chemical Reactions

Making new substances

Main Ideas

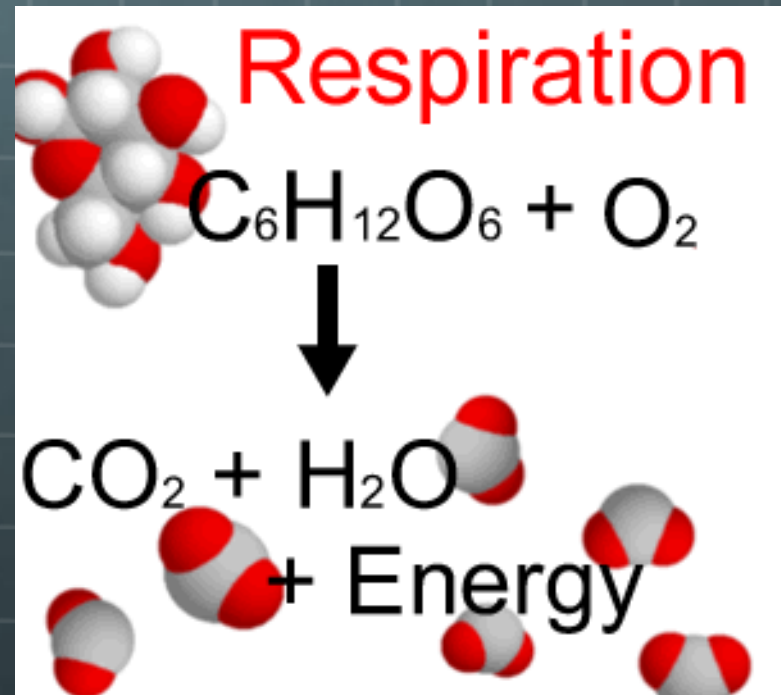
-  *Chemical Reactions are represented by Chemical Equations.*
-  *Chemical Equations are balanced to show the same number of atoms of each element on each side.*
-  *The Law of Conservation of Mass says that atoms won't be created or destroyed in a chemical reaction. That is why you have to balance chemical equations!*

Chemical Reactions are Everywhere

Cooking



Respiration



Chemical Reactions are Everywhere

Hair Dye



Auto Fuel



How do you know when a chemical reaction takes place?

Color Change

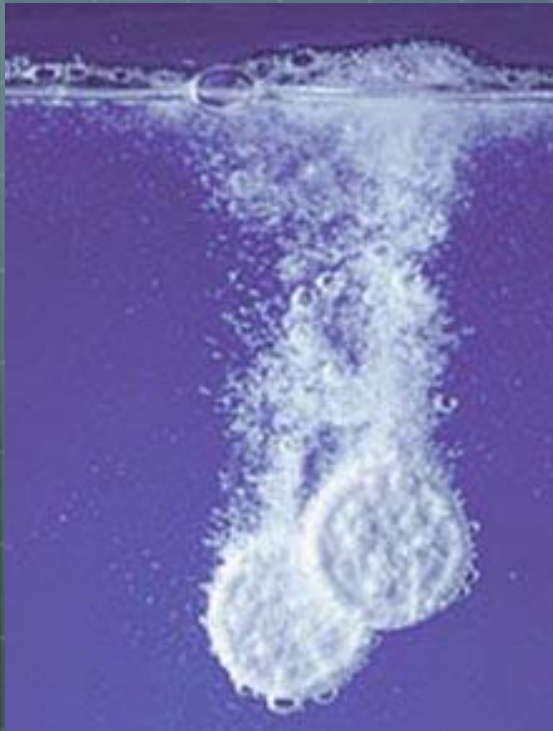


Precipitate Formation



How do you know when a chemical reaction takes place?

Gas Formation



Odor



How do you know when a chemical reaction takes place?

Temperature Change



Change in Acidity



Representing Chemical Reactions

- 🌐 Chemists observe chemical reactions and have come up with a way to represent or model what is happening.

Demo: Hydrolysis of Water







Chemical Equations are different from Numerical Equations

- 🌐 Numerical Equation: $3x + 2y = 47$
- 🌐 Chemical Equation $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$
- 🌐 ReactantA + Reactant B \rightarrow Product
- 🌐 The reactants are used up in forming the product
- 🌐 The arrow \rightarrow shows the direction of the reaction

Symbols used in Chemical Equations

Symbol	Purpose
+	Separates more than one reactant or product
→	Separates reactants from products. Indicates direction of reaction
(s)	Identifies a solid state
(aq)	Identifies that something is dissolved in water
(l)	Identifies liquid state
(g)	Identifies gaseous state

Law of Conservation of Mass

-  In a chemical reaction, matter is neither created nor destroyed.
-  Atoms won't change their identity (e.g. a Carbon atom can't become an Iron atom)
-  This means that you have to have the same number of each type of atom on each side of the chemical equation.
-  [Conservation of Mass Video](#)



Balancing Equations

After you write a chemical equation you have to balance it to make sure that the same number of atoms of each element are on each side.

How would you balance this equation?



Steps to Balancing a Chemical Equation

1. Write the Skeleton Equation



2. Count the atoms of the elements in the reactants

1 atom Li, 2 atoms H, 1 atom O

3. Count the atoms of the elements in the products

1 atom Li, 3 atoms H, 1 atom O

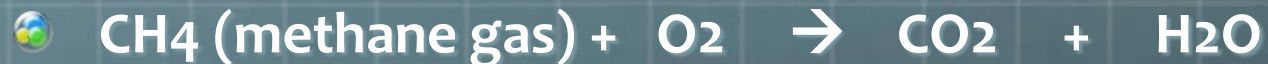
4. Change to Coefficients to make the number of atoms of each element equal on both sides of arrow



5. Write the Coefficients in their lowest possible ratio

6. Check your work

Another Example



Reactants	Products
# of Carbons = 1	# of Carbons = 1
# of Hydrogens = 4	# of Hydrogens = 2
# of Oxygens = 2	# of Oxygens = 3
Total atoms = 7	Total atoms = 6

7 ≠ 6!

Where did our atoms go?

Example Continued

🌐 Change the Coefficients to make the number of atoms of each element equal

🌐 Balance the Hydrogens:



🌐 Balance the Oxygens:



Example Continued

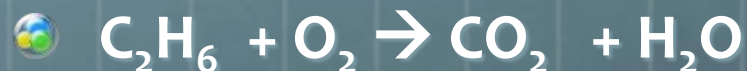


 Are your coefficients in their simplest ratio?

 Count your atoms again to check your work:

Reactants	Products
# of Carbons = 1	# of Carbons = 1
# of Hydrogens = 4	# of Hydrogens = 4
# of Oxygens = 4	# of Oxygens = 4
Total atoms = 9	Total atoms = 9

Try These!



 Hint : balance the polyatomic ion first!



Think – Pair - Share

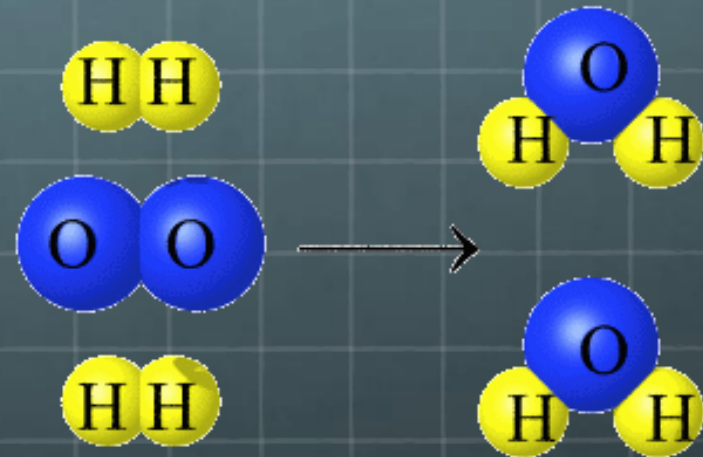
Review

Matter is not destroyed or created

Atoms are rearranged in chemical reactions

Chemical equations represent chemical reactions

You have to have the same number of each type of atom on the left and right hand side of a chemical equation



WARNING!

Don't mess with the insides of polyatomic ions – put a square around them, or label them as X – treat the **WHOLE** polyatomic ion as though it were an element!

Don't ever play around with subscripts (those little numbers that tell you how many atoms are in a molecule) e.g.

