

Before we begin, do you remember how to determine the number of atoms in a chemical formula? Count the number of atoms in each of the formulas below and record your answer in the blank.

- a. $6 \text{H}_2\text{SO}_4$ H: 12, S: 6, O: 24
- b. K_2SO_4 K: 2, S: 1, O: 4
- c. $(\text{NH}_4)_3\text{PO}_4$ N: 3, H: 12, P: 1, O: 4
- d. $\text{Ba}(\text{OH})_2$ Ba: 1, O: 2, H: 2

Chemical Equations and Conservation of Mass

What are they?

2

- **chemical reaction**- one or more substances are changed into new substances.



Reactants-the substances that react and are before the arrow

Products-the new substances formed and are after the arrow

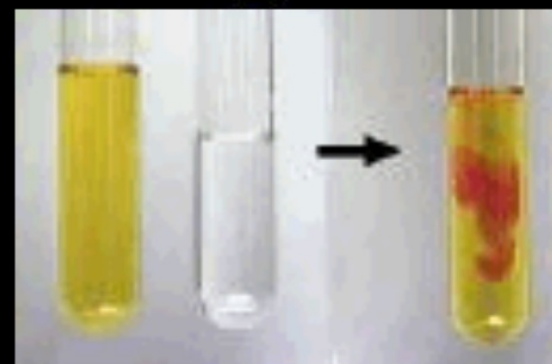
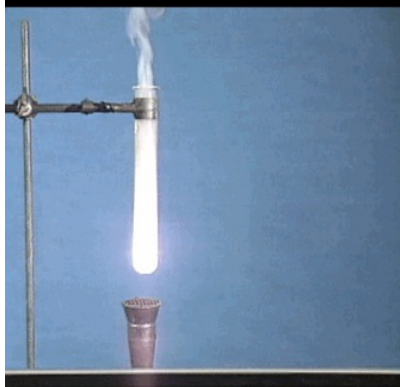
3

BRRR = Burning, Rusting, Rotting, & Reacting

Evidence of Reactions



- Bubbling
- Turns cloudy
- Temperature change
- Color change



Chemical Equation

- Expression that describes a chemical reaction using chemical formulas and other symbols

Symbol	Meaning
(cr)	Crystalline solid
(l)	Liquid
(g)	Gas
(aq)	Aqueous-solid dissolved in water

Symbols for Chemical Equations



" $\text{Pb}(\text{NO}_3)_4$ " is a formula.

\rightarrow Means produces (or yields)

$+$ Means added together

Subscripts - Number of a particular atom in a molecule

Coefficients - Number of molecules

6



Father of Modern Chemistry



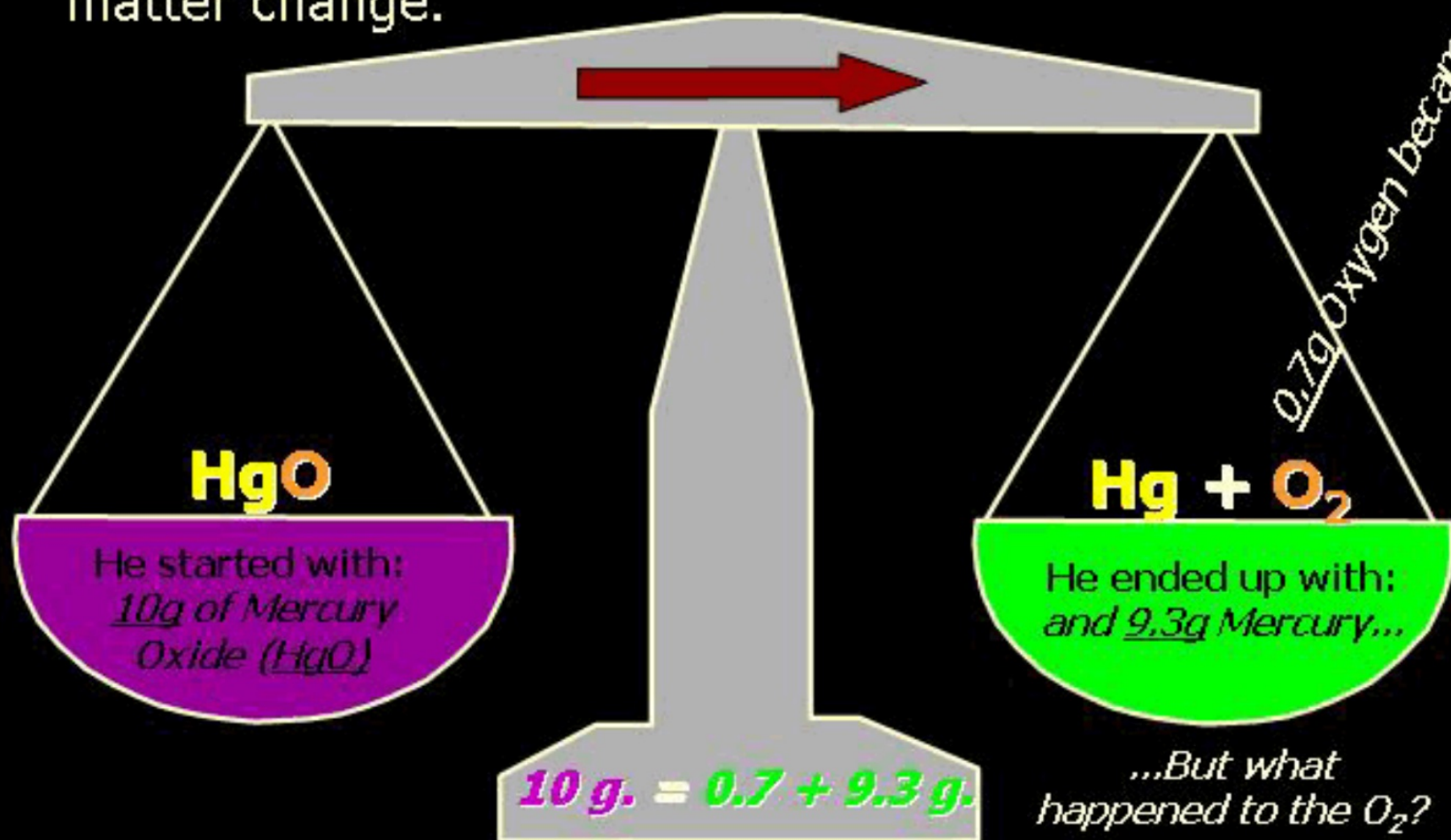
1743 - 1794

Antoine Lavoisier

First Described the "Law of Conservation of Mass"

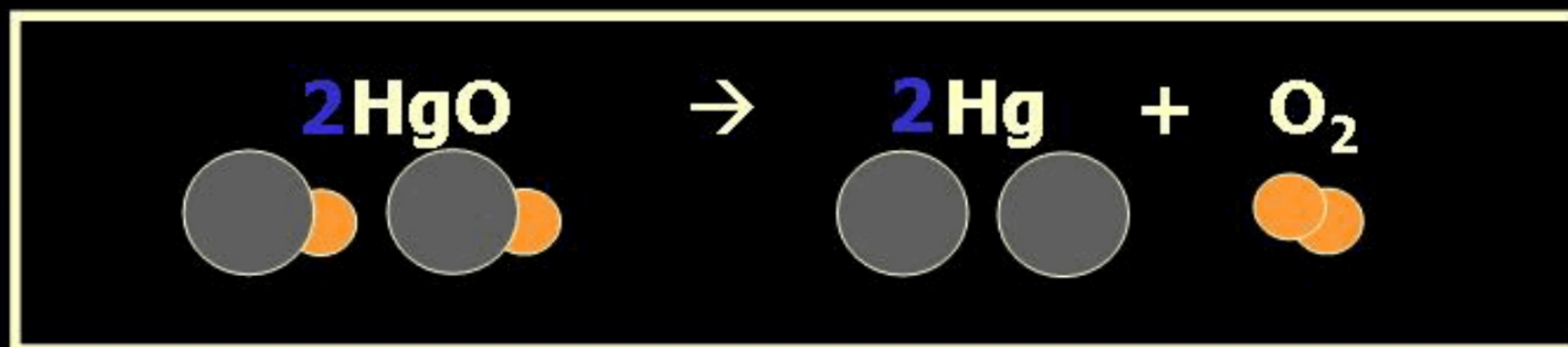
7 Conservation of Mass

Antoine Lavoisier found that the mass of the reactants and the products are equal, even when the states of matter change.



Matter is neither created nor destroyed.

Lavoisier's Chemical Equation:



Hg (mercury) can exist by itself...but, oxygen will need to bond with another oxygen to make O_2 (diatomic)

To balance the atoms we need to:

Put the coefficient of 2 in front of reactant HgO.

Put the coefficient of 2 in front the product Hg.

This balances the equation!

Is this balanced?



Why or Why Not?

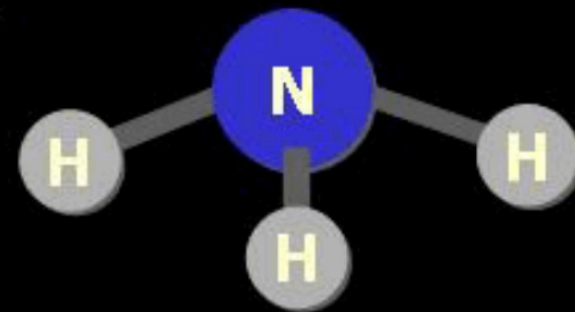
Let's Count the Atoms:



There are 2
nitrogen atoms

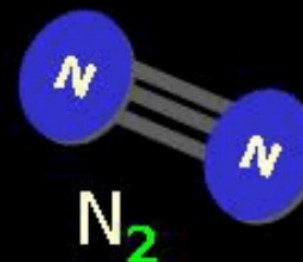
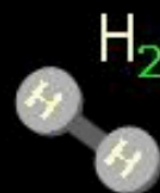
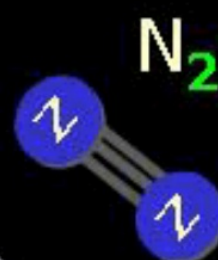
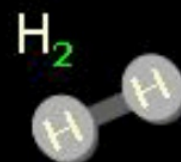
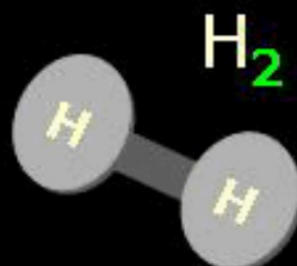
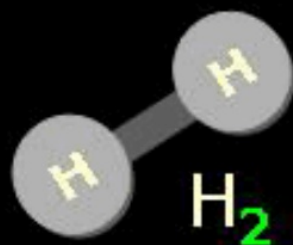
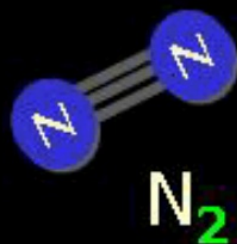
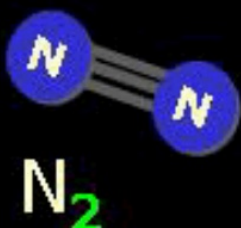
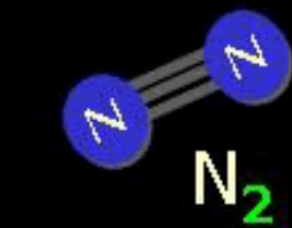


There are 2
hydrogen atoms

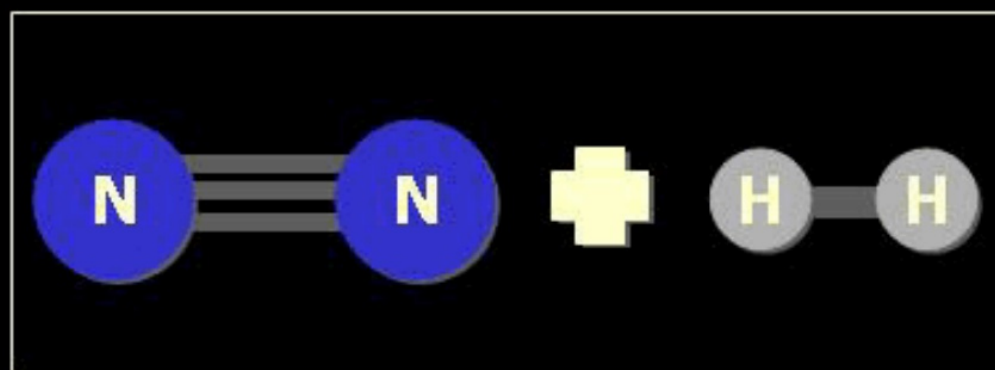


1 nitrogen and
3 hydrogen...

11 **Atoms can only bond in certain ways..**



That's why we can't
change the subscripts.



Here is what it means...

Subscripts - Small #'s below an element.

Coefficients - Large #'s in front of the formulas.

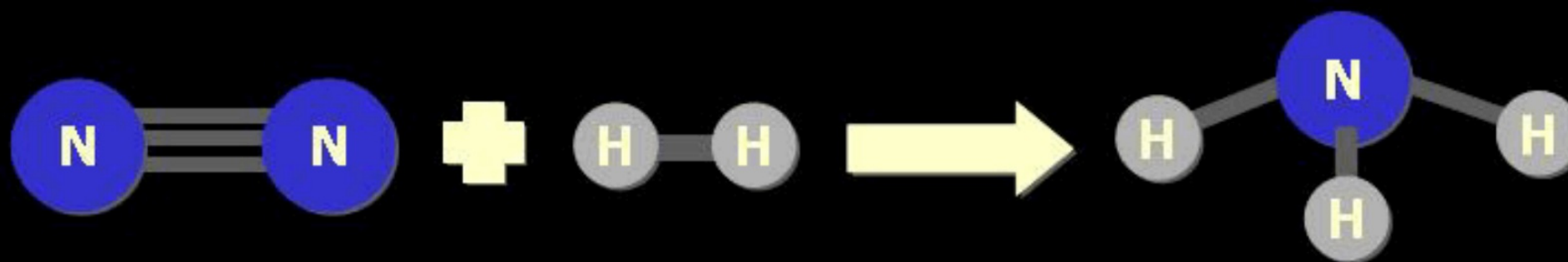


When balancing equations,
we can only change the *coefficients*!

Now, back to the
balancing...



We can only change coefficients
before the symbols.



1 molecule of
nitrogen

1 molecule of
hydrogen

1 molecule of
ammonia

14

Do both sides have the same amount of atoms?



2 N ~~1~~ 2

6 ~~2~~ H ~~3~~ 6

Four Steps to Balance Equations:

1. Set up your equation.

List the metals, nonmetals, oxygen, and hydrogen below equation.

2. Count the number of atoms you have on both sides.

3. Balance by changing the coefficients and recounting.

4. Start the process again if it still does not balance.

17

1. Set up your equation.

List the elements in this order below the equation:
Metals, Nonmetals, Oxygen, and Hydrogen



Metals

O

Nonmetals

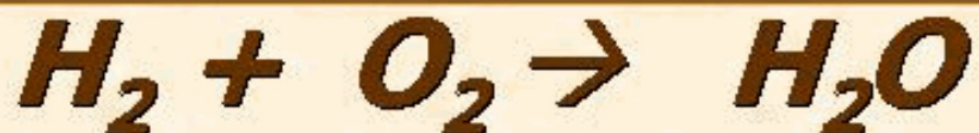
H

Oxygen

Hydrogen

18

2. *Count the number of atoms you have of each on both sides.*

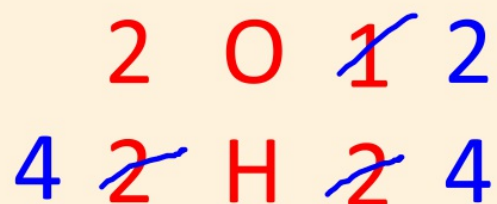


2 O 1

2 H 2

19

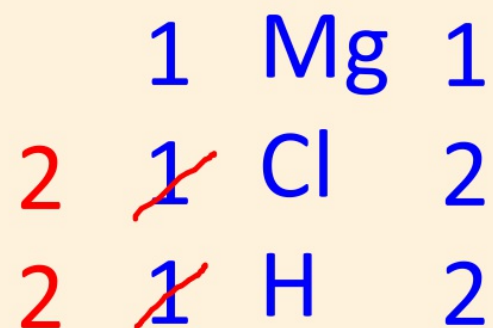
3. *Balance by changing the coefficients and recounting.*



Is this balanced?

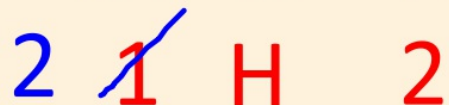
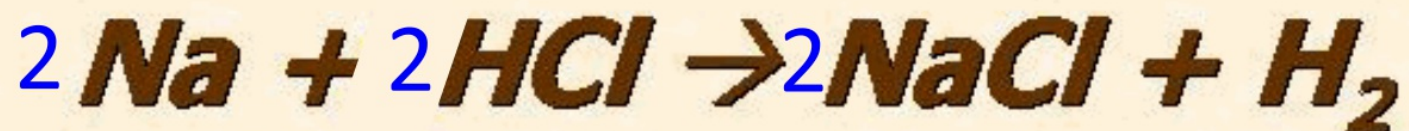
Yes!

Let's try another:



21

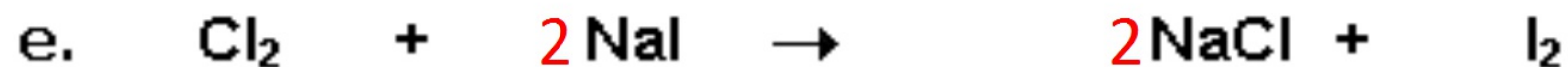
Let's try another:



Independent Practice

. Balance these equations below:

(These are the answers)



EXTRA PRACTICE-write this in your notes (These are the answers)

