Chemical Reactions - chemical changes

1. Evidence of a reaction

   A. forming a gas (bubbles)
   B. forming a precipitate (a solid)
   C. change in color
   D. change in odor
   E. change in energy (temperature increases or decreases)

2. Chemical Equations - short hand way of describing a chemical reactions

   A. reactants - starting substances
   B. products - new substances created in the reaction
   C. → - yields or produces, separates reacts (on the left) from products (on the right)
   D (s) - solid
   E (l) - liquid
   F (g) - gas
   G (aq) - aqueous, substance is dissolved in water (in solution)

Ex) $Na(s) + Cl_2(g) \rightarrow NaCl(s)$

Sodium solid & chlorine gas producing sodium chloride solid

$H_2SO_4(aq) + NaOH(s) \rightarrow H_2O(l) + Na_2SO_4(aq)$

aqueous sulfuric acid & solid sodium hydroxide producing liquid water & aqueous sodium sulfate

H. Diatomic Molecules - 7 elements always exist as 2 atoms bonded together unless they are in a compound

H_2 O_2 N_2 Cl_2

Br_2 I_2 F_2

I Balancing Chemical Equations

1) Law of Conservation of Mass - mass cannot be created or destroyed during a chemical reaction

↓ means

You must have the same amount of atoms/ions of each element on both sides of a chemical equation.

↓

Use coefficents to do this.

↓

#'s that go in front of a formula & multiply through every element in a formula.

Examples

1. $2\,Na(s) + Cl_2(g) \rightarrow 2\,NaCl(s)$

Na	2	Na	2
Cl	2	Cl	2

2. $3\,Mg(s) + Fe_2O_3(s) \rightarrow 2\,Fe(s) + 3\,MgO(s)$

Mg	3	Mg	3
Fe	2	Fe	2
O	3	O	3

3. $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$

K	~~1~~ 2		K	~~1~~ 2	
Cl	~~1~~ 2		Cl	~~1~~ 2	
O	~~3~~ 6		O	~~2~~ 6	

4. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

5. $2HNO_3(aq) + Ca(s) \rightarrow H_2(g) + Ca(NO_3)_2(aq)$

H	~~1~~ 2	Ca 1	H 2		Ca 1
(NO_3)	~~1~~ 2		(NO_3) 2		

6. $C_3H_8(l) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(g)$

6 + 4

C 3		C ~~1~~ 3	
H 8		H ~~2~~ 8	
O ~~2~~ 10		O ~~3~~ 10	

7. $Al_2(SO_4)_3(s) + 3Ba(ClO_3)_2(aq) \rightarrow 2Al(ClO_3)_3(aq) + 3BaSO_4(s)$

Al 2	Ba ~~1~~ 3		Al ~~1~~ 2	Ba ~~1~~ 3	
(SO_4) 3	(ClO_3) ~~2~~ 6		(SO_4) ~~1~~ 3	(ClO_3) ~~3~~ 6	

8. $2C_6H_{14}(g) + \cancel{8}\,19\,O_2(g) \rightarrow \cancel{6}\,12\,CO_2(g) + \cancel{7}\,14\,H_2O(g)$

12 + 7

C ~~6~~ 12		C ~~1~~ ~~6~~ 12	
H ~~14~~ 28		H ~~2~~ ~~14~~ 28	
O ~~2~~ 38		O ~~3~~ ~~19~~	$\times 24$, 14, 38