Science 1206

Chemical Equations

The Law of Conservaon of Mass

In any chemical reacon, mass is neither created nor destroyed.

Mass is conserved or transformed.

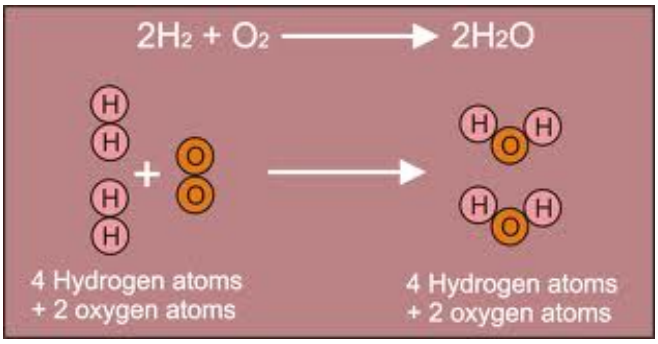
mass of reactants = mass of products

mass in = mass out

Experimental evidence from reacons also shows:

1. Energy is conserved in a reacon

2. Atoms are conserved (atoms in = atoms out)



Chemical Equations

- Show how chemicals react to form new compounds and molecules

$$2\,Mg(s) + O_2(g) \rightarrow 2MgO(s)$$

Reactants Products

The number of atoms must be conserved!!!

Chemical Equaons

A shorthand way of represenng a chemical reacon.

This is why you've needed the naming first.

All chemical equaons must:

1. Represent the correct chemical formula AND phase of each reactant and product.
   (solid, liquid or gas)

2. Show that atoms are conserved by balancing their numbers on both sides of the equaon.

note soluons and acids need the (aq).....

Before we start:

- Learn to count the atoms:
- $Ca(NO_3)_2$ $(NH_4)_2SO_4$

Ca =
N =
O =

N =
H =
S =
O =

Balancing Chemical Equations

Start by balancing the atom with the highest numbers:

$$Mg + O_2 \longrightarrow MgO$$

Note: Sometimes easier to balance the IONS instead of the atoms!!!

$$Cu + AgNO_3 \rightarrow Ag + Cu(NO_3)_2$$

$Pb(NO_3)_2 + KI \rightarrow PbI_2 + KNO_3$

NH3 ✹ N2 + H2

$CH_4 + O_2 \rightarrow CO_2 +$

Try These:

1. $Fe + O_2 \rightarrow Fe_2O_3$

2. $Na + Cl_2 \rightarrow NaCl$

3. $AsCl_3 + H_2S \rightarrow As_2S_3 + HCl$

4. $H_2SO_4 + NaHCO_3 \rightarrow Na_2SO_4 + CO_2 + H_2O$

5. $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$

1. ___$C_{10}H_{20(s)}$ + ___$O_{2(g)}$ → ___$CO_{2(g)}$ + ___$H_2O_{(g)}$

2. ___$Al(OH)_{3(s)}$ + ___$HCl_{(aq)}$ → ___$AlCl_{3(aq)}$ + ___$HOH_{(l)}$

3. ___$C_4H_{8(g)}$ + ___$O_{2(g)}$ → ___$CO_{2(g)}$ + ___$H_2O_{(g)}$

4. ___$C_{(s)}$ + ___$O_{2(g)}$ → ___$CO_{(g)}$

5. ___$C_5H_{12(l)}$ + ___$O_{2(g)}$ → ___$CO_{2(g)}$ + ___$H_2O_{(g)}$

6. ___$Li_{(s)}$ + ___$AlBr_{3(aq)}$ → ___$LiBr_{(aq)}$ + ___$Al_{(s)}$

7. ___$C_2H_{6(g)}$ + ___$O_{2(g)}$ → ___$CO_{2(g)}$ + ___$H_2O_{(g)}$

8. ___$NH_4OH_{(aq)}$ + ___$H_3PO_{4(aq)}$ → ___$(NH_4)_3PO_{4(aq)}$ + ___$HOH_{(l)}$

9. ___$Li_{(s)}$ + ___$P_{4(s)}$ → ___$Li_3P_{(s)}$

10. ___$CH_{4(g)}$ + ___$O_{2(g)}$ → ___$CO_{2(g)}$ + ___$H_2O_{(g)}$

11. ___$Al(OH)_{3(s)}$ + ___$H_2SO_{3(aq)}$ → ___$Al_2(SO_3)_{3(s)}$ + ___$HOH_{(l)}$

12. ___$Ca(NO_3)_{2(aq)}$ + ___$Na_3PO_{4(aq)}$ → ___$Ca_3(PO_4)_{2(s)}$ + ___$NaNO_{3(aq)}$

WRITING BALANCED CHEMICAL EQUATIONS

- To write a balanced chemical equation from a statement or word equation:

- Write the chemical formulas for all reactants and products involved
- Arrange as Reactants → Products
- Balance the atoms

Example

Hydrogen and chlorine react to produce hydrogen chloride gas.

Chemical Equation:

Example 2

Solid potassium and aqueous magnesium chloride react to produce solid magnesium and aqueous potassium chloride

Chemical Equation:

Practice...

1. nitrogen gas reacts with hydrogen gas to make gaseous ammonia

2. potassium nitride powder reacts with solids manganese II oxide to produce a soluon of potassium oxide and manganese II nitride pellets.

Balance the following:

_____ $NaF_{(s)}$ + _____ $Br_{2\,(l)}$ → _____ $NaBr_{(s)}$ + _____ $F_{2\,(g)}$

___ $CH_{4\,(g)}$ + _____ $O2_{\,(g)}$ → _____ $CO_{2\,(g)}$ + _____ $H_2O_{\,(g)}$

3. _____ $H_2O_{2\,(l)}$ → _____ $H_2O_{\,(l)}$ + _____ $O_{2\,(g)}$

4. _____ $CS_{2\,(l)}$ + _____ $Cl_{2\,(g)}$ → $CCl_{4\,(l)}$ + _____ $S_2Cl_{2\,(g)}$

5. _____ $NO_{\,(g)}$ + _____ $O_{2\,(g)}$ → _____ $NO_{2\,(g)}$

6. _____$MgO_{(s)}$ + _____ $LiCl_{\,(s)}$ → _____ $Li_2O_{(s)}$ +_____$MgCl_{2\,(aq)}$

7. _____ $Li_3P_{(s)}$ + _____ $HCl_{(aq)}$ → _____ $H_3P_{(aq)}$ + _____ $LiCl_{(s)}$