Chemical Reactions and Equations

Plan

- Continuing Reactions – predicting products
- Word problems to equations

Program of Studies

3 e) classify and identify categories of chemical reactions; i.e., formation (synthesis), decomposition, hydrocarbon combustion, single replacement, double replacement

3 f) translate word equations to balanced chemical equations and vice versa for chemical reactions that occur in living and nonliving systems

3 g) predict the products of formation (synthesis) and decomposition, single and double replacement, and hydrocarbon combustion chemical reactions, when given the reactants

5 Types of Reactions

- Recall we had 5 different types of reactions

1. Simple Composition (SC), also known as formation
2. Simple Decomposition (SD)
3. Single Replacement (SR)
4. Double Replacement (DR)
5. Hydrocarbon Combustion (HC)

Types of Reactions

In Science 10, we will learn 5 types of reactions:

1. **Simple Composition (SC) or Formation (F).** Two elements combine to form a compound

$$2Na_{(s)} + Cl_{2(aq)} \rightarrow 2NaCl_{(aq)}$$

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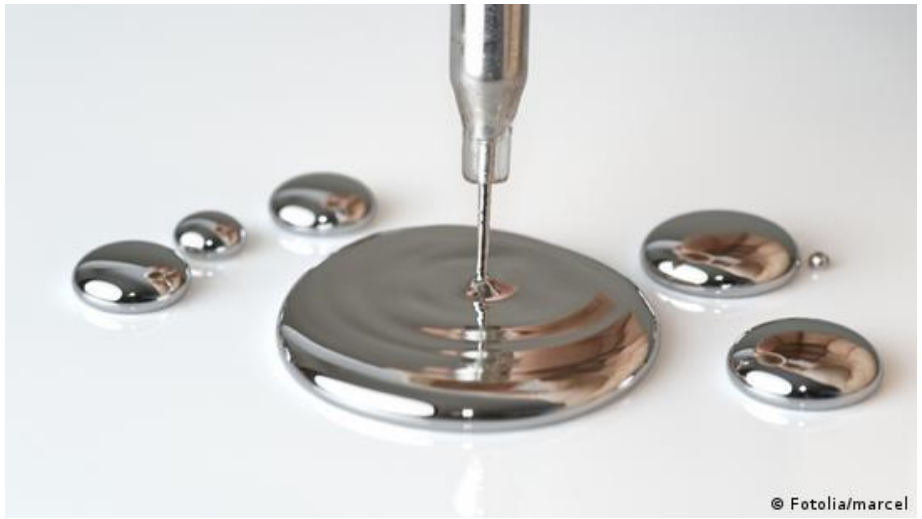
Types of Reactions

2. Simple Decomposition (SD): A compound decomposes into its two elements

$$2HgO_{(s)} \rightarrow 2Hg_{(l)} + O_{2(g)}$$



Replacement Reactions

3. Single Replacement (SR): An element and compound react to form a different element and compound

$$Zn_{(s)} + Cu(NO_3)_{2(aq)} \rightarrow Zn(NO_3)_{2(aq)} + Cu_{(s)}$$

Replacement Reactions

4. Double Replacement (DR): Two compounds form two new compounds

$$HCl_{(aq)} + NaOH_{(aq)} \rightarrow NaCl_{(aq)} + HOH_{(l)}$$

Combustion Reactions

5. Hydrocarbon Combustion (HC): A hydrocarbon reacts with oxygen gas to form carbon dioxide gas and water vapor

$$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)}$$

- Note: any other reaction can be classified with “O” for “other”

Predicting Products

Now that we know the types of reactions, we can use this information to predict the products of a reaction

Examples:

$S_{8(s)} + Cl_{2(g)} \rightarrow$

$FeO \rightarrow$

Predicting Products

$Al_{(s)} + NaCl_{(aq)} \rightarrow$

$KMnO_{4(aq)} + (NH_4)_2SO_{4\,(aq)} \rightarrow$

$C_3H_{8(g)} + O_{2(g)} \rightarrow$

Word problems

Because we know how to name compounds, we can use word problems to write equations and predict products:

Ex: Carbon solid added to oxygen gas reacts to form carbon dioxide gas

Word problems

Mercury(II) oxide solid decomposes into mercury liquid and oxygen gas

Calcium metal is put into a solution of lithium hydroxide solution

Word problems

Mercury(II) oxide solid decomposes into mercury liquid and oxygen gas

Calcium metal is put into a solution of lithium hydroxide solution, pure lithium metal and a solution of calcium hydroxide are produced

Word problems

A sodium chloride solution is mixed with a zinc nitrate solution.

Methanol undergoes combustion.