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## Science Shorts -8

### Chemical Equations and Reactions

If a chemical symbol can be thought of as a letter and a chemical formula as a word in the language of chemistry, then a chemical equation is a statement or sentence. **A chemical equation is a shorthand way of describing a chemical reaction between two or more substances.** A “+” sign means “combines with.” An arrow points away from the reactants and toward the products, and an arrow means “yields.”  $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$  means sodium combines with chlorine to yield sodium chloride (salt).

Look closely at the equation above. Notice the 2 in front of NaCl on the right and Na on the left. That 2, called a coefficient, is necessary to make the equation balance. Matter is neither created nor destroyed in a chemical reaction. Because chlorine only exists as a molecule made of two chlorine atoms, it requires two atoms of sodium to yield two molecules of salt (NaCl).

Chemical reactions fall into four categories: making something (**synthesis**) breaking something apart (**decomposition**), swapping one part for another (**single replacement**) or performing a double swap (**double replacement**). Using symbols, the reactions would like this:

Synthesis:  $\text{A} + \text{B} \rightarrow \text{C}$

- Many exothermic reactions, like making table salt from sodium and chlorine fall into this category

Decomposition  $\text{C} \rightarrow \text{A} + \text{B}$

- Limestone ( $\text{CaCO}_3$ ) breaks down into calcium oxide ( $\text{CaO}$ ) and carbon dioxide ( $\text{CO}_2$ )

Single Replacement  $\text{A} + \text{BX} \rightarrow \text{AX} + \text{B}$

- Sodium (Na) plus water ( $\text{H}_2\text{O}$ ) yields sodium hydroxide ( $\text{NaOH}$ ) plus hydrogen ( $\text{H}_2$ )

Double Replacement  $\text{AX} + \text{BY} \rightarrow \text{AY} + \text{BX}$

- Magnesium carbonate ( $\text{MgCO}_3$ ) plus hydrochloric acid ( $2\text{HCl}$ ) yields magnesium chloride ( $\text{MgCl}_2$ ) plus water ( $\text{H}_2\text{O}$ ) and carbon dioxide ( $\text{CO}_2$ )

1. What does the “+” sign mean in a chemical reaction? \_\_\_\_\_

2. What does the → sign mean in a chemical reaction? \_\_\_\_\_

3. For the equation  $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$  + energy:

A. List the reactants \_\_\_\_\_

B. List the products \_\_\_\_\_

C. What is the 2 in front of the Mg and MgO called? \_\_\_\_\_

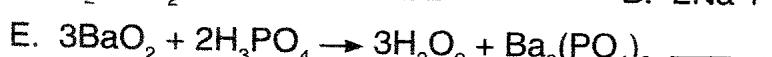
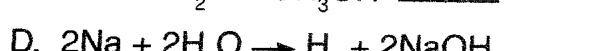
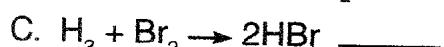
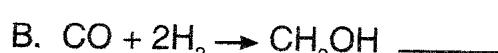
4. Look at the following reactions. Mark them as

Synthesis (S)

Decomposition (D)

Single replacement (SR)

Double Replacement (DR)



5. Which of the substances above have coefficients?

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