

# PS03A Chemical Reactions

Name: \_\_\_\_\_

Date: \_\_\_ / \_\_\_ / \_\_\_ Period \_\_\_ Room \_\_\_



## Did you know?

- 1 Chemical reactions happen when atoms break free of chemical bonds and form new substances with new chemical bonds.
- 2 Chemicals can be named either by their common name or an abbreviated shorthand symbol made up of a single letter, two letters, or sometimes three letters. The first letter of a chemical symbol is always capitalized (see Fig 1).
- 3 We can predict using mathematics what will happen in a chemical reaction by counting the atoms and balancing chemical

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<div style="display: flex; justify-content: space-between;"> <span style="font-size: 2em; font-weight: bold;">Ca</span> <span style="writing-mode: vertical-rl; transform: rotate(180deg);">2 8 8 2</span> </div> <p style="text-align: center;"><b>Calcium</b> 40.078</p>

Figure 1 - Calcium on the periodic table.

## So, why is it important to me?

equations.

- 4 Predicting what will happen when two or more chemicals are combined would be a good thing to know - especially if they could cause an explosion!
- 5 You can tell how much of each chemical is needed to produce a certain amount of the new chemical compound.

## What are the big ideas I need to know?

- 6 A chemical reaction occurs when some substances come into contact. The chemical bonds of the substances break, and the atoms that compose the compounds separate and re-arrange themselves into new compounds with new chemical bonds (see Fig 2).

Flour+Butter+Sugar+Vanilla+Baking Soda+Eggs+Chocolate Chips → Cookies

Figure 2 - Reactants on the left yield the products on the right.

- 7 The substances that were present at the beginning are called reactants and the substances present at the end are the products. Products are found after the arrow → and are usually on the right (see Fig 3)

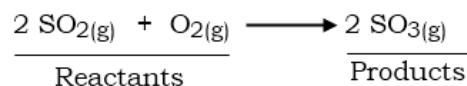


Figure 3 - Reactants on the left yield the products on the right.

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- 8 Chemists have a choice of methods for describing a chemical reaction. They could draw a picture of the chemical reaction (see Fig 4).
- 9 They could write a word equation for the chemical reaction. *Two molecules of hydrogen gas react with one molecule of oxygen gas to produce two molecules of water.*

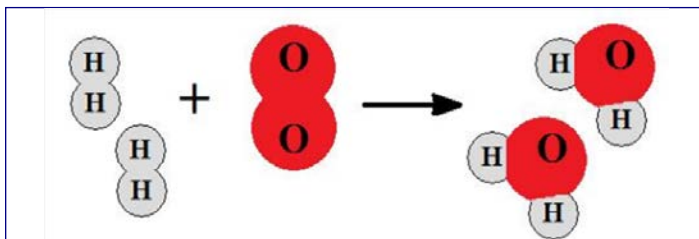


Figure 4 - Hydrogen and Oxygen combine to form water

- 10 The third way is to write the equation in chemical shorthand (see Fig 5).
- 11 In chemical reactions, atoms are never created or destroyed. This follows the law of conservation of mass. The same atoms that were present in the reactants are present in the products - they are merely re-organized into different arrangements.

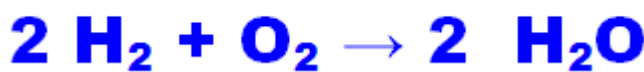


Figure 5 - Hydrogen and Oxygen combine to form water

- 12 In a complete chemical equation, the two sides of the equation must be balanced. That is, in a complete chemical equation, the same number of each atom must be present on the reactants and the products sides of the equation.
- 13 There are two types of numbers that appear in chemical equations. There are subscripts which are part of the chemical formulas of the reactants and products and there are coefficients that are placed in front of the formulas to indicate how many molecules of that substance is used or produced.
- 14 The subscripts are part of the formulas and once the formulas for the reactants and products are determined, the subscripts may not be changed. The coefficients indicate how many molecules of each substance is involved in the reaction and may be changed in order to balance the equation (see Fig 6).

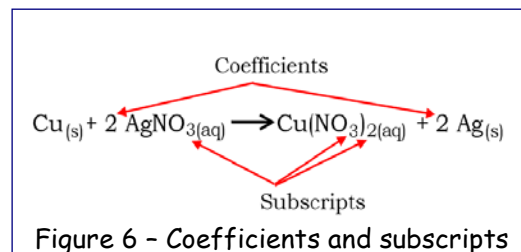


Figure 6 - Coefficients and subscripts

- 15 Chemical reactions are classified into groups to help us analyze them and also to help us predict what the products of the reaction will be. The four major types of chemical reactions are synthesis, decomposition, single replacement, and double replacement (see Fig 7).

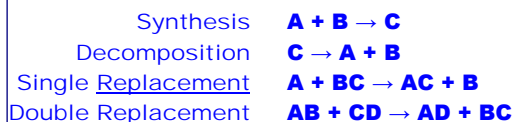


Figure 7 - Four possible chemical reactions.

## What about?

- 16 If a chemical reaction produces heat it is exothermic - "exo" meaning going out and "thermic" meaning heat. If the reaction absorbs heat - it is an endothermic reaction.