

How Chemical Reactions Happen

By Cindy Grigg

¹ Chemical reactions happen around us all the time. Some happen all by themselves like when plants use photosynthesis to chemically change energy from the sun into food. People also cause chemical reactions to happen. Cooking food and burning fuel cause chemical reactions. A chemical reaction is a process when one or more substances are changed into other substances. How do they happen? It all can be explained by atoms.

² Electrons surround the nucleus of an atom in layers called shells. The first shell, closest to the nucleus, is full with only two electrons. The second shell is full with eight electrons, and the third shell will also hold eight electrons. For the most stable atom, the outer shell needs to be full of electrons. To get a full shell, atoms will take or give up electrons to other atoms or share electrons with another atom. When this happens, a chemical reaction has taken place and a chemical bond has formed.

³ To better understand this, let's look at the sodium atom. Sodium has eleven electrons. Its first shell is full with two electrons, and its second shell is full with eight more electrons, making ten electrons. But since sodium has eleven electrons, it has one all alone in the third shell. To become more stable, sodium will easily give up that one electron so it will have a full shell. The extra electron will go to another atom that needs one electron to have a full shell. Chlorine is a good example. Chlorine has seventeen electrons: two in the first shell, eight in the second shell, and seven in the third shell. To be stable, chlorine needs to pick up another electron. It can take one electron from sodium. This forms a bond between the atoms of sodium and chlorine. A new compound, sodium chloride, or table salt, has been made.

⁴ This is one reason why atoms are arranged in the Periodic Table the way they are. Elements in the column on the far right side of the Periodic Table have full electron shells; they do not react easily with other atoms. This group of elements, "Group 0," is stable because of their full shells. They are called inert gases because they do not react with other atoms. The elements in the column on the far left side of the Periodic Table are very reactive; they only have one electron in their outer shell. This column is called "Group 1" because that tells you that those elements only have one electron in their outer shells. These elements are easily reactive; to become stable, they need to give up one electron. As you go from left to right across the Periodic Table, each column or group has an increasing number of electrons in their outer shells.

⁵ Some atoms share electrons with each other rather than give them up or take them. The most common is carbon, which has four electrons in its outer shell. Carbon bonds easily with other carbon atoms because four electrons plus four electrons makes a full shell. All living things have thousands of carbon compounds in them.

⁶ Chemical reactions happen when atoms gain, lose, or share electrons. When atoms react, energy is released. A battery produces electricity through a chemical reaction. Plants get food from a series of chemical reactions called photosynthesis. The word photosynthesis comes from two words: photo, meaning "light," and synthesis, meaning "to make something." In photosynthesis, plants use energy from the sun, water, and carbon dioxide to form chemical reactions that make sugar molecules. Water and carbon dioxide are called the reactants, the chemicals that react, and oxygen and sugar are called the products of the reaction. The plant uses the sugar to grow, and the oxygen is released back into the air to be breathed by animals and people. Breathing, or respiration, is also a chemical reaction. People and animals cannot live without it. Chemical reactions are happening around you all the time!



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<p>1. What are the layers of electrons surrounding the nucleus of an atom called?</p> <p><input type="radio"/> A Paths</p> <p><input type="radio"/> B Shells</p> <p><input type="radio"/> C Layers</p> <p><input type="radio"/> D Orbits</p>	<p>2. How many electrons will the first shell hold?</p> <p><input type="radio"/> A One</p> <p><input type="radio"/> B Two</p> <p><input type="radio"/> C Eighteen</p> <p><input type="radio"/> D Eight</p>
<p>3. How many electrons will the second shell hold?</p> <p><input type="radio"/> A One</p> <p><input type="radio"/> B Eight</p> <p><input type="radio"/> C Two</p> <p><input type="radio"/> D Eighteen</p>	<p>4. What makes the most stable atom?</p> <p><input type="radio"/> A To have a partner</p> <p><input type="radio"/> B To have a group of the same kinds of atoms near</p> <p><input type="radio"/> C To have a full shell</p> <p><input type="radio"/> D To have a group of different kinds of atoms near</p>
<p>5. Group 0 on the Periodic Table is _____.</p> <p><input type="radio"/> A Unstable, because they have no electrons</p> <p><input type="radio"/> B Neither stable nor unstable</p> <p><input type="radio"/> C Unstable, because their shells are empty</p> <p><input type="radio"/> D Stable, because their shells are full</p>	<p>6. Group 1 on the Periodic Table is _____.</p> <p><input type="radio"/> A Unstable, because their shells are empty</p> <p><input type="radio"/> B Unstable, because they have only one electron in their outer shell</p> <p><input type="radio"/> C Neither stable nor unstable</p> <p><input type="radio"/> D Stable, because their shells are full</p>
<p>7. What causes chemical reactions to happen?</p> <p><input type="radio"/> A People cause chemical reactions to happen.</p> <p><input type="radio"/> B They happen by accident.</p> <p><input type="radio"/> C They happen when atoms gain, lose, or share electrons.</p>	<p>8. What is released when chemical reactions happen?</p> <p><input type="radio"/> A Sunlight</p> <p><input type="radio"/> B Oxygen</p> <p><input type="radio"/> C Food</p> <p><input type="radio"/> D Energy</p>

