# **Chemical Compounds and Reactions Comprehension Check**

1. How are chemical compounds, elements, molecules, and atoms related?
2. What is a chemical formula? What does the chemical formula CO2 represent?
3. What is a chemical equation and how does it show reactants and products?
4. According to the text, “atoms are not created or destroyed in chemical reactions.” How does the following chemical equation show this? CH4 + 2O2 🡪 CO2 + 2H2O
5. Many chemical reactions release energy. What is an exothermic reaction? Provide an example to strengthen your response.
6. What are endothermic reactions? Provide an example to strengthen your response.
7. Why are atoms likely to form compounds in the first place?
8. Explain the roles of elections and electron shells in covalent bonds.
9. Explain the roles of elections and electron shells in ionic bonds.
10. Compare activation energy to catalysts.

# **Chemical Compounds and Reactions Comprehension Check Answer Key**

1. How are chemical compounds, elements, molecules, and atoms related?
   1. Atoms are tiny particles that make up all matter. When two or more atoms join and bond, they create a molecule. There are two types of molecules: compounds and elements. Chemical elements are unique. A chemical element is a substance made of only one kind of atom. Chemical compounds, on the other hand, are substances that contain more than one kind of atom.
2. What is a chemical formula? What does the chemical formula CO2 represent?
   1. A chemical formula is a notation that shows the number and kind of atoms that make up a particular substance. We use chemical formulas as shorthand when writing chemical equations and when talking about molecules. CO2 represents the chemical compound carbon dioxide.
3. What is a chemical equation and how does it show reactants and products?
   1. Chemical reactions occur when atoms split from or join with other atoms to create countless substances. Reactants are the substances that begin chemical reactions, and products are the substances that are left after the reactions take place. Chemical equations use chemical formulas to show reactants on the left side of an arrow and products on the right.
4. According to the text, “atoms are not created or destroyed in chemical reactions.” How does the following chemical equation show this? CH4 + 2O2 🡪 CO2 + 2H2O
   1. According to the text, chemical reactions do not create or destroy atoms, rather they cause atoms to rearrange. The example above shows CH4 reacting with two O2 molecules to produce one molecule of CO2 and two molecules of H2O. If we break apart the products into their individual chemical components, we can see that we still have a total of one C atom, four O atoms, and two H atoms.
5. Many chemical reactions release energy. What is an exothermic reaction? Provide an example to strengthen your response.
   1. Exothermic reactions are those that release energy in the form of heat. For example, traditional car engines use exothermic energy to burn fuel. Although other byproducts are created during this chemical reaction, those are released as waste. People use the energy created by the chemical reaction to do the work needed to move the vehicle.
6. What are endothermic reactions? Provide an example to strengthen your response.
   1. Endothermic reactions are those that absorb heat from the environment, rather than produce it. For example, cooking food creates an endothermic reaction. The heat from the oven or pan changes the food chemically through an endothermic reaction.
7. Why are atoms likely to form compounds in the first place?
   1. Atoms form compounds because of their structural needs. Atoms contain a nucleus with protons and neutrons. Electrons travel freely around the nucleus in organized rings called electron shells. Although atoms have different numbers of electrons, they tend to want their outer shells to be full of electrons, so they begin to bond and form compounds to fill in the “missing” electrons.
8. Explain the roles of elections and electron shells in covalent bonds.
   1. In a covalent bond, atoms share their electrons to get the number they want. By sharing electrons, both atoms have access to the electrons they need to have a full electron shell.
9. Explain the roles of elections and electron shells in ionic bonds.
   1. Ionic bonds, on the other hand, involve giving electrons to, or taking electrons from, other atoms. When this type of bond occurs, one atom “donates” an electron to another atom, helping to fill that atom’s electron shell.
10. Compare activation energy and catalysts.
    1. Some reactions occur automatically, but other require a little energy. Activation energy is the energy required to start a chemical reaction. For example, gasoline and oxygen do not automatically react when exposed to one another. However, adding activation energy in the form or a spark or flame can cause a chemical reaction to occur.
    2. Just like some reactions require activation energy to take place, some chemical reactions require catalysts to get started. A catalyst is a substance that causes a chemical reaction while itself remaining practically unchanged. Because catalysts are not used up or bound into the reactants, they remain ready to jump start other reactions!