# **Chemical Compounds and Reactions Discussion Guide (for use during or after reading)**

1. Define the vocabulary terms reactants and products. How are these shown in chemical equations? (Chemical Reactions, Chemical Equations, p. 12-18)
   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.
2. According to the text, what is an example of a substance that does not react easily? What is an example of a substance that does react easily? (Chemical Reactions, p. 12-16)
   1. According to the text, nitrogen gas, which makes up about 70 percent of Earth’s atmosphere, does not react easily because its atoms have some of the strongest known bonds. Substances that form or break bonds easily are reactive. Hydrogen and oxygen easily bond to form water and can be split back apart by electricity.

1. Page 13 of the text states, “atoms are not created or destroyed in chemical reactions.” How does the following chemical equation show this? CH4 + 2O2 🡪 CO2 + 2H2O (Chemical Reactions, Chemical Equations, p. 12-18)
   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.
2. Many chemical reactions release energy. What is an exothermic reaction? Provide an example to strengthen your response. (Reactions and Energy, p. 19-25)
   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.
3. What is activation energy and how does it work? (Reactions and Energy, p. 19-25)
   1. Some reactions occur automatically, but others 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: an explosion!
4. What are endothermic reactions? Provide an example to strengthen your response. (Reactions and Energy, p. 19-25)
   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.
5. What are catalysts and how do they work? (Reactions and Energy, p. 19-25)
   1. 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.
6. According to the text, why do atoms form compounds in the first place? (Compounds and Electrons, p. 26-27)
   1. According to the text, 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.
7. Explain the roles of elections and electron shells in both covalent and ionic bonds. (Types of Chemical Bonds, p. 28-32)
   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. 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.
8. What fun fact stood out to you and why? (Can You Believe It?!, p. 38-39)
   1. Students’ answers will vary.