

## Chapter 14 CHANGES IN MATTER

### Chapter 14 Assessment

#### Vocabulary

Select the correct term to complete the sentences.

reactant	product	catalyst
precipitate	radioactive	chemical reaction
nuclear fission	synthesis reaction	exothermic
stable	chemical equilibrium	nuclear fusion
activation energy	polymerization	chemical equation
coefficient	law of conservation of mass	decomposition
combustion reaction		nuclear reaction
endothermic	dissolution reaction	reaction rate
half-life		

#### Section 14.1

1. A(n) \_\_\_\_\_ is a process that involves reactants and products.
2. A starting ingredient in a chemical reaction is called a(n) \_\_\_\_\_.
3. A substance that is the result of the forming of new bonds in a chemical reaction is called a(n) \_\_\_\_\_.
4. An insoluble product in a double-displacement reaction is called a(n) \_\_\_\_\_.
5. A(n) \_\_\_\_\_ is the written form of a chemical reaction.
6. The \_\_\_\_\_ states that the mass of reactants always equals the mass of the products.
7. You can change the number of atoms in a chemical equation by placing a(n) \_\_\_\_\_ in front of a chemical formula.

#### Section 14.2

8. A(n) \_\_\_\_\_ is a chemical reaction in which two or more substances combine to form a new compound.

9. \_\_\_\_\_ is the formation of large, repeating molecules by a series of synthesis reactions.
10. When a compound is broken down into two or more smaller substances, it is called a(n) \_\_\_\_\_ reaction.
11. A(n) \_\_\_\_\_ results in a large amount of energy being produced when a carbon compound combines with oxygen.

#### Section 14.3

12. A reaction that releases more energy than it uses is called \_\_\_\_\_.
13. A reaction that uses more energy than it releases is called \_\_\_\_\_.
14. The energy required to start a reaction is called \_\_\_\_\_.
15. The change in concentration of reactants or products in a chemical reaction over time is called \_\_\_\_\_.
16. For a given chemical reaction, \_\_\_\_\_ is the state at which the forward reaction equals the reverse reaction.

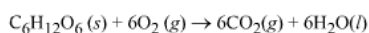
#### Section 14.4

17. A(n) \_\_\_\_\_ occurs when the number of protons and/or neutrons is altered in one or more atoms.
18. When an atomic nucleus stays together it is called \_\_\_\_\_.
19. A nucleus that spontaneously falls apart is called \_\_\_\_\_.
20. When the nuclei of lighter atoms combine to make heavier atoms, a(n) \_\_\_\_\_ has occurred.
21. When the nuclei of heavier atoms are split to make lighter atoms, a(n) \_\_\_\_\_ has occurred.
22. The time it takes for half the amount of a radioactive element to undergo radioactive decay is called \_\_\_\_\_.

## Concepts

### Section 14.1

- Your body produces heat and maintains a stable, warm body temperature of about 98°F (37°C). Is this evidence that your body is undergoing chemical changes or physical changes?
- In your chemistry lab, you mix baking soda and vinegar in a beaker. You carefully find the mass of the baking soda and vinegar you use in the reaction. However, after you are done with the reaction, you find that the product of the reaction has much less mass than the combined mass of the reactants. Evaluate your results. Are they correct? How might you perform this reaction again to make sure?
- Answer the following for the reaction below. You should be able to recognize three of the compounds. The compound  $C_6H_{12}O_6$  is a molecule of glucose, a sugar.



- What are the reactants and products in this reaction? Give the state of matter for each.
- What does the arrow in a chemical equation mean?
- Is this equation balanced? Justify your answer.

### Section 14.2

- Write the general equations for each type of reaction.
- You perform a reaction with two substances. One of the reactants is an oxygen-containing compound. The products are oxygen gas and another binary compound. What kind of reaction is this? Justify your answer. Illustrate this reaction with symbols and a diagram.

### Section 14.3

- Write a general equation that illustrates the difference between an exothermic reaction and an endothermic reaction. You only need to use the following items in your general equation: reactants, products, and energy. Be sure to include an arrow in your equation.
- Your teacher asks you to mix two compounds to find out if the reaction is endothermic or exothermic. What will you do to determine which type of reaction is occurring?

### Section 14.4

- Describe two ways that nuclear reactions are different from chemical reactions.
- Say you know a certain fossil is more than a million years old. Can you use carbon dating to date it? Why or why not?


## Problems

### Section 14.1

- Which of the following equations is balanced?
  - $Al + Br_2 \rightarrow 2AlBr_3$
  - $2Al + 2Br_2 \rightarrow 3AlBr_3$
  - $2Al + 3Br_2 \rightarrow 2AlBr_3$
  - $Al + Br_2 \rightarrow AlBr_3$
- Balance the following equations. If an equation is already balanced, say so in your answer.
  - $Cl_2 + Br \rightarrow Cl + Br_2$
  - $CaO + H_2O \rightarrow Ca(OH)_2$
  - $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + NaCl$
  - $ZnS + O_2 \rightarrow ZnO + SO_2$
  - $Cl_2 + KBr \rightarrow KCl + Br_2$
  - $H_2SO_4 + NaOH \rightarrow Na_2SO_4 + H_2O$

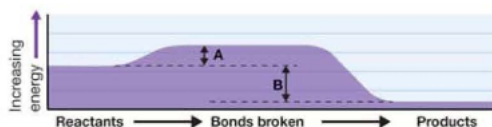
## Chapter 14 CHANGES IN MATTER

### Section 14.2

3. When your body burns food for energy, carbon dioxide and water are released. This process is called *respiration* and it is exactly like the respiration process performed by yeast in making pizza dough. Oxygen is needed for respiration to occur. Answer these questions:
- 
 $+ O_2 \rightarrow CO_2 + H_2O$
- Where do the carbon dioxide and water come from in this reaction?
  - Classify this reaction. Justify your answer.

### Section 14.3

4. The graph below illustrates the change in energy for an exothermic reaction.
- Label A and B on the graph.
  - Make a sketch that would show the change of energy that occurs for an endothermic reaction.



### Section 14.4

5. The half-life of cesium-137 is 30 years. Make a graph that shows its radioactive decay over a period of 300 years. Show time on the  $x$ -axis of the graph and number of atoms on the  $y$ -axis. The starting amount of cesium-137 is 100 atoms. Be sure to give the graph a title and label the axes.

## Applying Your Knowledge

### Section 14.1

1. Look for situations that demonstrate chemical change. List each situation and describe the evidence of chemical change that you observe. Try to identify the reactants and products.

### Section 14.2

2. Balance this equation and then answer the questions.
- $$SiI_4(g) + \text{heat} \rightarrow Si(s) + I_2(g)$$
- What kind of reaction is this?
  - Pure silicon is very useful in the electronics industry. How is it used?
  - Oxygen is the most abundant element in Earth's crust. How does silicon compare in abundance?

### Section 14.3

3. The US Army developed a Meal, Ready to Eat (or MRE) for the 1991 Gulf War. These meals have a special sleeve placed around the food, which is wrapped in aluminum foil. When water is added to the sleeve, the resulting chemical reaction produces enough heat to cook the food inside the foil. The sleeve contains a pad with suspended particles of magnesium metal. When the magnesium reacts with the water to produce magnesium hydroxide, heat is released. Write the balanced chemical equation for this reaction. What kind of reaction is this? How do you know?

### Section 14.4

4. For every atom heavier than helium, there needs to be at least as many neutrons as protons to hold the nucleus together. For example, calcium-40 has 20 protons and 20 neutrons. For heavier atoms, more neutrons are needed than protons. For atoms with more than 83 protons, even the added strong nuclear force from neutrons is not enough to hold the nucleus together. How would you describe the elements that have more than 83 protons?