Vocabulary Anchor Activity

Unit: Chemical Reactions and the Law of Conservation of Mass

Due Date 1/27/2017

Vocabulary Words

1	**Catalyst**	A substance that speeds up the rate of a chemical reaction.
2	**Chemical bond**	An attractive force that holds together the atoms, ions, or groups of atoms in a molecule or compound.
3	**Chemical Equation**	A way to describe a chemical reaction using chemical formulas and other symbols
4	**Chemical Reaction**	A process in which one or more substances are changed into others.
5	**Coefficient**	A number in front of a chemical formula in an equation that indicates how many molecules or atoms of each reactant and product are involved in a reaction
6	**Concentration**	Concentration is the measure of how much of a given substance there is mixed with another substance
7	**Endothermic Reaction**	A reaction that absorbs energy in the form of heat.
8	**Exothermic Reaction**	A reaction that releases energy in the form of heat.
9	**Law of Conservation of Mass**	Mass cannot be created or destroyed in a chemical reaction; therefore, the mass of the reactants must equal the mass of the products.
10	**Products**	The elements or compounds produced by a chemical reaction
11	**Reactants**	Molecules entering or starting a reaction
12	**Reactivity**	How readily a substance combines chemically with other substances.
13	**Subscript**	A number used to indicate the ratio of atoms in the formula for a compound.

Choose 1 of the 4 Activities:

 **Create a set of flashcards using ALL the words.** ***You will need to write the word and an illustration on one side and a definition and sentence on the other side.***	 **Create a crossword puzzle (NO Internet) using all the words and using a definition as a clue.**	 **Complete a Frayer Model for 8 of the terms.**	 **Complete a 3-way tie for at least 12 words. Write in complete sentences how each word relates to eachother then write a summary on how each of the three words are related.**

Name _____ Date _____ Class _____

Observing Chemical Change

Key Concepts

- How can matter and changes in matter be described?
- How can you tell when a chemical reaction occurs?

Matter is anything that has mass and takes up space. The study of matter and how matter changes is called **chemistry**. **Matter can be described in terms of two kinds of properties—physical properties and chemical properties. Changes in matter can be described in terms of physical changes and chemical changes.**

A **physical property** is a characteristic of a substance that can be observed without changing the substance into another substance. The temperature at which a solid melts is a phyical property. Color, hardness, and texture are other physical properties.

A **chemical property** property is a characteristic of a substance that describes its ability to change into other substances. To observe the chemical properties of a substance, you must change it into another substance. For example, to observe the chemical reactivity of magnesium, you can let magnesium combine with oxygen to form a new substance called magnesium oxide.

A **physical change** is any change that alters the form or appearance of a substance but that does not make the substance into another substance. Examples of physical changes are bending and cutting.

A change in matter that produces one or more new substances is a chemical change, or **chemical reaction**. The burning of gasoline in a car's engine is a chemical change. **Chemical changes occur when bonds form between atoms, or when bonds break and new bonds form.** As a result, new substances are produced.

One way to detect chemical reactions is to observe changes in the properties of the materials involved. **Chemical reactions involve two main kinds of changes you can observe—formation of new substances and changes in energy.** Changes in properties result when new substances form. A change in color may signal that a new substance has formed. Another indicator might be the formation of a solid when two solutions are mixed. A solid that forms from solution during a chemical reaction is called a **precipitate**. A third indicator is the formation of a gas when solids or liquids react. These and other kinds of observable changes in properties may indicate that a chemical reaction has occurred.

As matter changes in a chemical reaction, it can either absorb or release energy. One indication that energy has been absorbed or released is a change in temperature. An **endothermic reaction** is a reaction in which energy is absorbed. A reaction that releases energy in the form of heat is called an **exothermic reaction**.

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Observing Chemical Change

Understanding Main Ideas

Complete the following table. Describe changes in properties that you might notice during each process and state whether the changes are chemical or physical.

Changes in Matter		
Event	**Observable Changes**	**Type of Change**
Baking a cake	**1.**	**2.**
Burning a log	**3.**	**4.**
Freezing water	**5.**	**6.**

Building Vocabulary

From the list below, choose the term that best completes each sentence.

matter
chemical reaction
chemistry
precipitate
physical change
endothermic reaction
exothermic reaction

7. Any change that alters a substance without changing it into another substance is a(n) _____.
8. _____ is anything that has mass and takes up space.
9. A reaction that releases energy in the form of heat is called a(n) _____.
10. A(n) _____ is a reaction in which energy is absorbed.
11. A chemical change is also referred to as a(n) _____.
12. A(n) _____ is a solid formed from a solution during a chemical reaction.
13. _____ is the study of the properties of matter and how matter changes.

Name _____ Date _____ Class _____

Describing Chemical Reactions

Key Concepts

- What information does a chemical equation contain?
- What does the principle of conservation of mass state?
- What must a balanced chemical equation show?
- What are three categories of chemical reactions?

A **chemical equation** is a short, easy way to show a chemical reaction. **Chemical equations use chemical formulas and other symbols instead of words to summarize a reaction.** All chemical equations have a common structure. A chemical equation tells you the substances you start with in a reaction and the substances you get at the end. The substances you have at the beginning are called the **reactants**. When the reaction is complete, you have new substances called the **products**. The formulas for the reactants are written on the left side of the equation, followed by an arrow (→). You read the arrow as "yields." The formulas for the products are written on the right side of the equation. When there are two or more reactants or products, they are separated by plus signs.

The principle called **conservation of mass** was first demonstrated in the late 1700s. **The principle of conservation of mass states that in a chemical reaction, the total mass of the reactants must equal the total mass of the products.** In an **open system**, matter can enter from or escape to the surroundings. A match burning in the air is an example of an open system. You cannot measure the mass of all the reactants and products in an open system. A **closed system** is a system in which matter cannot enter from or escape to the surroundings. A sealed plastic bag is an example of a closed system. A closed system allows you to measure the mass of all reactants and products in a reaction.

To describe a reaction accurately, a chemical equation must show the same number of each type of atom on both sides of the equation. An equation is balanced when it accurately represents conservation of mass. To balance a chemical equation, you may have to use coefficients. A **coefficient** is a number placed in front of a chemical formula in an equation. It tells you how many atoms or molecules of a reactant or a product take part in the reaction.

Many chemical reactions can be classified in one of three categories: synthesis, decomposition, or replacement. When two or more elements or compounds combine to make a more complex substance, the reaction is called a **synthesis** reaction. The reaction of hydrogen and oxygen to make water is a synthesis reaction. A reaction called a **decomposition** reaction breaks down compounds into simpler products. For example, hydrogen peroxide decomposes into water and oxygen gas. When one element replaces another in a compound, or when two elements in different compounds trade places, the reaction is called a **replacement** reaction.

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Describing Chemical Reactions

Understanding Main Ideas

Balance the equations on the lines below. State whether the reaction is a synthesis, decomposition, or replacement reaction.

Given Equation	Balanced or Not Balanced?	Type of Reaction
1. $FeS_2 + HCl_2 \rightarrow FeCl_2 + H_2S$	a.	b.
2. $2Na + F_2 \rightarrow 2NaF$	a.	b.
3. $2HgO \rightarrow 3Hg + O_2$	a.	b.

Answer questions 4 and 5 on a separate sheet of paper.

4. Describe in words the chemical composition of the molecules involved and the reaction represented by the equation: $2H_2 + O_2 \rightarrow 2\ H_2O$
5. Use the principle of conservation of mass to explain why the equation in question 4 is balanced.

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

____ 6. chemical equation

____ 7. decomposition reaction

____ 8. coefficient

____ 9. product

____ 10. reactant

____ 11. conservation of mass

____ 12. synthesis reaction

____ 13. replacement reaction

a. substance present after a reaction

b. reaction in which substances combine to form a more complex compound

c. uses symbols and formulas to show chemical reactions

d. reaction in which one element replaces another in a compound

e. substance present before a reaction

f. number telling how many molecules of a substance are involved in a chemical reaction

g. reaction in which compounds are broken down into simpler products

h. principle that states that matter is not created or destroyed during a chemical reaction

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Section 6.2 Summary

Factors Affecting the Rate of Chemical Reactions

Textbook pages 272–281

Before You Read

What do you already know about the speed of chemical reactions? Outline your ideas in the lines below.

What is rate of reaction and how does it apply to chemical reactions?

In a chemical reaction, how quickly or slowly reactants turn into products is called the **rate of reaction**. A reaction that takes a long time has a low reaction rate. A reaction that occurs quickly has a high reaction rate. A *rate* describes how quickly or slowly a change occurs. Every chemical reaction proceeds at a definite rate. However, you can speed up or slow down the rate of a chemical reaction.

What factors affect the rate of a chemical reaction?

The four main factors that affect the rate of chemical reactions are temperature, concentration, surface area, and the presence of a catalyst.

1. Increasing the **temperature** causes the particles (atoms or molecules) of the reactants to move more quickly so that they collide with each other more frequently and with more energy. Thus, the higher the temperature, the greater the rate of reaction. If you decrease the temperature, the opposite effect occurs. The particles move more slowly, colliding less frequently and with less energy. In this case, the rate of reaction decreases.

2. Concentration refers to how much solute is dissolved in a solution.

If a greater concentration of reactant atoms and molecules is present, there is a greater chance that collisions will occur among them. More collisions mean a higher reaction rate. Thus, increasing the concentration of the reactants usually results in a higher reaction rate. At lower concentrations, there is less chance for collisions between particles. This

Mark the Text

Reinforce Your Understanding

As you read the section, highlight the main point of each paragraph. Then write out an example that helps you explain this main point.

Reading Check

How does temperature affect the rate of a chemical reaction?

means that decreasing the concentrations of the reactants results in a lower reaction rate.

3. Surface area is the measure of how much area of an object is exposed.

For the same mass, many small particles have a greater total surface area than one large particle. For example, steel wool has a larger surface area than a block of steel of the same mass. This allows oxygen molecules to collide with many more iron atoms per unit of time. The more surface contact between reactants, the higher the rate of reaction. The less surface contact, the lower the reaction rate.

Surface area can also be important if a reaction occurs between two liquids that do not mix. In this case, the reaction occurs only at the boundary where the two liquids meet. It is also important to note that not all reactions depend on surface area. If both reactants are gases or liquids that mix together, then there is no surface, and surface area is not a factor.

4. A **catalyst** is a substance that speeds up the rate of a chemical reaction without being used up in the reaction itself. Catalysts reduce the amount of energy required to break and form bonds during a chemical reaction. When catalysts are used, a reaction can proceed although less energy is added during the reaction. For example, enzymes are catalysts that allow chemical reactions to occur at relatively low temperatures within the body.

Reading Check

Is a catalyst used up in a chemical reaction?

Name _____ Date _____

Cloze Activity
Section 6.2

Use with textbook pages 272–277.

Rate of chemical reactions

Vocabulary	
catalyst	energy
catalytic converter	heat
collisions	rate of reaction
concentration	surface area
dilute	temperature

Use the terms in the vocabulary box to fill in the blanks. You may use each term only once.

1. A freshly exposed surface of metallic sodium tarnishes almost instantly if exposed to air and moisture, while iron will slowly turn to rust under the same conditions. In these two situations, the _____ refers to how quickly or slowly reactants turn into products.
2. Adding _____ will increase the rate of reaction because this causes the particles of the reactants to move more quickly, resulting in more collisions and more _____ .
3. Removing heat will lower the _____, causing the particles of the reactants to slow down, resulting in less frequent collisions.
4. _____ refers to how much solute is dissolved in a solution. If there is a greater concentration of reactant particles present, there is a greater chance that _____ among them will occur. More collisions mean a higher rate of reaction.
5. A concentrated acid solution will react more quickly than a _____ acid solution because there are more molecules present, increasing the chance of collisions.
6. Grains of sugar have a greater _____ than a solid cube of sugar of the same mass, and therefore will dissolve quicker in water.
7. A _____ , for example an enzyme, is used to speed up a chemical reaction but is not used up in the reaction itself.
8. A _____ in a car has metallic catalysts where several reactions occur. Carbon monoxide, which was produced in the combustion of gasoline, is changed into carbon dioxide and water in the presence of these metallic catalysts.

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Comprehension
Section 6.2

Use with textbook pages 272–277.

Different rates of reactions

1. Indicate whether each of the following would increase or decrease the rate of reaction.
   (a) adding heat _____
   (b) removing heat _____
   (c) adding a catalyst _____
   (d) diluting a solution _____
   (e) removing an enzyme _____
   (f) lowering the temperature _____
   (g) increasing the temperature _____
   (h) decreasing the surface area _____
   (i) increasing the concentration of a solution _____
   (j) breaking a reactant down into smaller pieces _____
2. Identify which situation would have a higher reaction rate. Then state the factor that affected the rate of reaction in each situation.

	Situation X	Situation Y	Situation with a higher reaction rate (X or Y)	Factor affecting the rate of reaction
(a)	1 g of sugar (cubes) 	1 g of sugar (grains)