

Prepare Your Own Summary

In this chapter, you learned about the properties of acids, bases, and salts, and also how to distinguish between organic and inorganic compounds. Create your own summary of the key ideas from this chapter. You may include graphic organizers or illustrations with your notes. (See Science Skill 11 for help with using graphic organizers.) Use the following headings to organize your notes:

1. Using pH and Acid-Base Indicators to Measure Acidity Levels
2. Names, Formulas, and Properties of Common Acids and Bases
3. Common Reactions Involving Acids
4. Distinguishing between Organic Compounds and Inorganic Compounds
5. Hydrocarbons and Alcohols

Checking Concepts

1. State the pH value or pH range of the following.
(a) a neutral solution (c) an acidic solution
(b) a basic solution
2. Copy and complete the following chart in your notebook.

Term	Definition	Used to Describe Acids, Bases, or Both?
Alkaline		
Corrosive		
Caustic		
Low pH		

3. What is a pH typical of each of the following?
(a) pure water (d) human blood
(b) normal rainwater (e) human saliva
(c) acid precipitation
4. What is the increase in acidity associated with a decrease of one unit on the pH scale?
5. Describe how you would use litmus paper to determine whether a solution is acidic, basic, or neutral.

6. (a) How can you identify an acid by looking at its chemical formula?
(b) How can you identify a base by looking at its chemical formula?
7. State the formula of each of the following.
(a) an acid used to make fertilizers
(b) a base that has the common name of caustic soda
(c) a household base used as a kitchen cleaner
(d) the active ingredient in milk of magnesia
(e) an acid in your stomach that helps digest food
(f) the battery acid used in automobiles
(g) hydrated lime, used in soil and water treatment
(h) the acid present in vinegar
8. Give the chemical name for each compound in question 7.
9. State whether each of the following describes acids, bases, or both.
(a) taste sour
(b) taste bitter
(c) feel slippery
(d) conduct electricity
(e) have a pH greater than 7
(f) produce hydrogen (H^+) ions in solution
(g) react with metals, causing them to corrode
10. What is meant by the term acid-base neutralization?
11. (a) When metal oxides are dissolved in water, are the resulting solutions acidic or basic?
(b) When non-metal oxides are dissolved in water, are the resulting solutions acidic or basic?
12. How does adding lime (calcium carbonate) help reduce the effects of acid precipitation in lake water?
13. Define:
(a) organic compound
(b) inorganic compound
14. (a) What two elements are present in all hydrocarbon compounds?
(b) What are three uses for hydrocarbons?

15. (a) What three elements are present in all alcohols?
(b) What are three uses for alcohols?

Understanding Key Ideas

16. How many times more basic is a solution of pH 11 compared to a solution of pH 9?
17. What is the colour of the indicator after it is added to each of the following solutions? (Assume the colour of the solution being tested does not mask the colour of the indicator.) Refer to the indicator chart in Figure 5.6 on page 224.
- lemon juice in the presence of indigo carmine indicator
 - milk in methyl red indicator
 - bleach in phenolphthalein
 - tap water in phenolphthalein
 - egg white in litmus
18. Change the following names to the names used when the acid is aqueous.
- hydrogen fluoride
 - hydrogen perchlorate
 - hydrogen sulphate
 - hydrogen chloride
19. Complete and balance the following neutralization reactions. Then, write the names of all the reactants and all the products in each chemical reaction.
- $\text{HNO}_3 + \text{Al}(\text{OH})_3 \rightarrow$
 - $\text{HF} + \text{KOH} \rightarrow$
 - $\text{H}_3\text{PO}_3 + \text{Ca}(\text{OH})_2 \rightarrow$
 - $\text{CH}_3\text{COOH} + \text{NaOH} \rightarrow$
 - $\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow$
20. Complete and balance the following chemical reactions between an acid and a metal.
- $\text{HBr} + \text{Mg} \rightarrow$
 - $\text{H}_2\text{SO}_3 + \text{Al} \rightarrow$
 - $\text{HI} + \text{Ca} \rightarrow$
 - $\text{HClO} + \text{Zn} \rightarrow$
 - $\text{H}_3\text{PO}_3 + \text{Na} \rightarrow$
21. State whether each of the following is an acid, a base, a salt, or none of these.
- $\text{HCl}(\text{aq})$
 - KOH
 - $\text{Sr}(\text{OH})_2$
 - MgCl_2
 - K_3PO_4
 - $\text{H}_2\text{SO}_4(\text{aq})$

22. Classify each of the following compounds as organic or inorganic by examining their formulas.

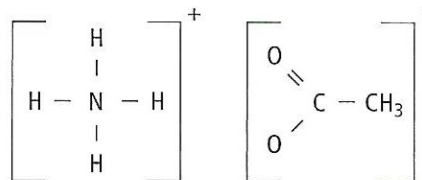
- | | |
|--|---------------------|
| (a) CH_3OH | (e) FeBr_3 |
| (b) $\text{Mg}(\text{HC}_2\text{O}_4)_2$ | (f) CH_4 |
| (c) SiC | (g) NH_3 |
| (d) Na_2CO_3 | (h) CO |

23. Draw structural diagrams for these organic compounds.

- (a) CH_4 (b) $\text{CH}_3\text{CH}_2\text{CH}_3$

Applying Your Understanding

24. Some compounds, such as ammonium acetate, can fall into more than one category at a time.



Ammonium acetate is made of positive ammonium ions and negative acetate ions, consistent with the formula of a salt. The acetate ion contains carbon atoms, making it organic. The ammonium ion can react with water to release hydrogen ions, so it is an acid. The acetate ion can react with water to make hydroxide ions, so it is a base.

- Do you think it is possible for this salt to make a solution both acidic and basic at the same time?
- How would you test your prediction?

Pause and Reflect

In this chapter, you used your knowledge of chemical formulas to classify compounds. How might you use this knowledge in your daily life? Why might it be important for you to recognize the type of compound by reading its chemical formula?

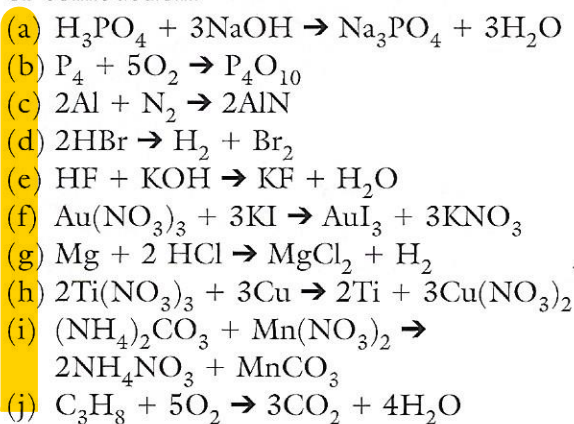
Prepare Your Own Summary

In this chapter, you learned to classify reactions as one of six different types as well as predict the identity of the products of the reaction. You investigated the factors that affect the rate of chemical reaction and examined the role of catalysts in reaction rate. Create your own summary of the key ideas from this chapter. You may include graphic organizers or illustrations with your notes. (See Science Skill 11 for help with graphic organizers.) Use the following headings to organize your notes:

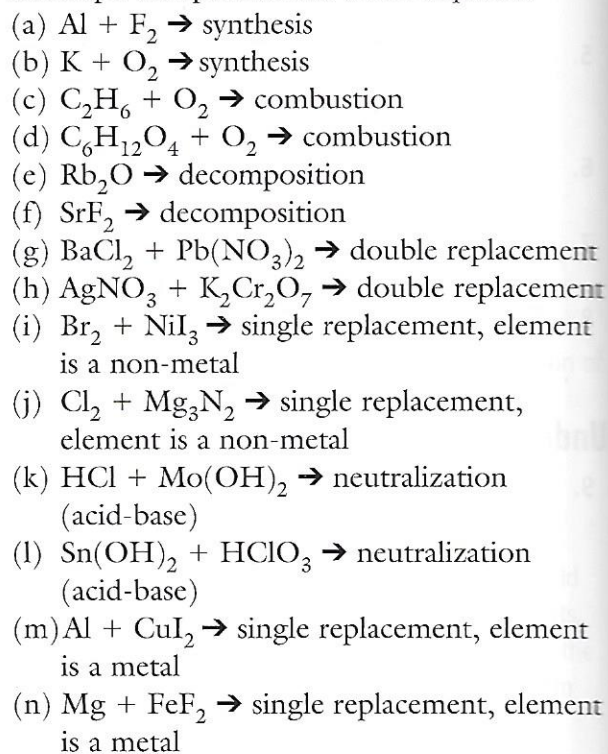
1. Six Types of Chemical Reactions
2. Classifying and Predicting Products of Reactions Based on the Reactants Only
3. Examples of Reactions Occurring at Different Rates
4. Four Factors Affecting the Rates of Reactions.

Checking Concepts

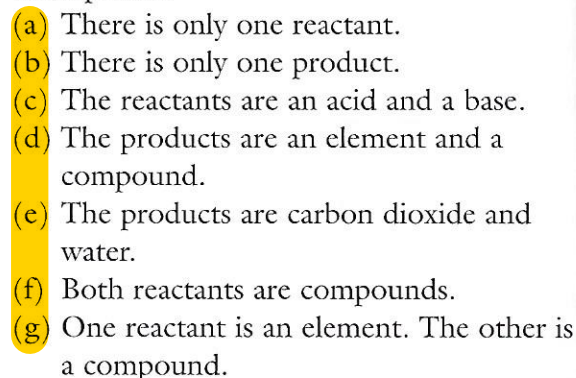
1. Identify each of the following reactions as synthesis, decomposition, single replacement, double replacement, neutralization (acid-base), or combustion.



2. Each reaction below has been identified by type. Use this information to help predict products. Copy and then complete each equation by writing the products of the reactions. **Hint:** Use the charges shown on the periodic table in Figure 4.3 on page 172. Remember to include subscripts and parentheses when required.



3. Which type(s) of reactions match the following descriptions?



4. Which of the four factors affecting reaction rate is most important in each example below? Choose from among concentration, temperature, surface area, and catalyst.

- (a) Extra dish soap is added to help cut the grease when washing a frying pan.
- (b) Firewood is chopped up into kindling (small pieces) to help start a fire.
- (c) A lighted match is brought near a candlewick in order to light the candle.
- (d) Lemon juice is rubbed on an iron sink to help remove rust.
- (e) The accelerator pedal in a car is pressed, resulting in a faster consumption of fuel in the engine.
- (f) The reaction of oxygen with sucrose in human cells takes place in the presence of an enzyme.
- (g) In order to release the fragrance of garlic when frying it in oil, the garlic is crushed and ground.
- (h) A mild skin disinfectant containing hydrogen peroxide is prepared in a 1 percent solution, while a stronger formulation is prepared in a 3 percent solution.

Understanding Key Ideas

5. Classify each of the following reactions, and write a balanced formula equation for each.
- (a) lithium + oxygen $\rightarrow$ lithium oxide
 - (b) magnesium + aluminum chloride $\rightarrow$ magnesium chloride + aluminum
 - (c) butane (C_4H_{10}) + oxygen $\rightarrow$ carbon dioxide + water
 - (d) hydrochloric acid + lithium hydroxide $\rightarrow$ lithium chloride + water
 - (e) aluminum oxide $\rightarrow$ aluminum + oxygen
 - (f) tin + gold(III) nitrate $\rightarrow$ tin(IV) nitrate + gold

- (g) barium hydroxide + lead(IV) bromide $\rightarrow$ barium bromide + lead(IV) hydroxide
- (h) glycerine ($C_3H_8O_3$) + oxygen $\rightarrow$ carbon dioxide + water
- (i) nitrogen + oxygen $\rightarrow$ nitrogen dioxide

6. Some chemical reactions are affected by surface area, whereas others are not. Explain why this is so.

Applying Your Understanding

7. Suppose a chemist performed an experiment dissolving equal masses of marble in hydrochloric acid. The results of the three trials are shown in the table below.

Trial	Hydrochloric Acid	Marble	Temperature
1.	Dilute	Finely ground	20°C
2.	Concentrated	Lump	20°C
3.	Dilute	Lump	40°C

The marble dissolved fastest in Trial 1. and slowest in Trial 2. List concentration, surface area, and temperature in decreasing order of their importance in increasing the rate of this reaction.

Pause and Reflect

Many chemical reactions happen in your daily life. When might it be important for you to use your knowledge of speeding up or slowing down chemical reactions? How could you use your knowledge?