Chapter 3 Review

READING TOOLBOX

1. **Comparison Table** Make a comparison table to compare proteins and nucleic acids.
2. **Concept Map** Make a concept map that illustrates the structure of matter. Include the following terms in your map: *atom, element, compound, molecule,* and *ion.*

Using Key Terms

3. Explain the relationship between *reactant, product,* and *substrate.*

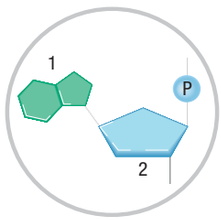
For each pair of terms, explain how the meanings of the terms differ.

4. *cohesion* and *adhesion*
5. *nucleic acid* and *nucleotide*

Understanding Key Ideas

6. What are the three components of atoms?
   - **a.** matter, electrons, and ions
   - **b.** matter, compounds, and ions
   - **c.** nucleus, electrons, and isotopes
   - **d.** protons, electrons, and neutrons
7. Water dissolves ionic compounds because water molecules
   - **a.** are nonpolar.
   - **b.** do not contain atoms.
   - **c.** have a pH of 14 or greater.
   - **d.** have partially charged ends.
8. An aqueous solution that contains extra hydroxide ions is a(n)
   - **a.** gas
   - **b.** base
   - **c.** acid
   - **d.** solid
9. How many electrons are in the valence shell of a carbon atom?
   - **a.** 1
   - **b.** 2
   - **c.** 4
   - **d.** 6
10. The order of amino acids is a protein's
    - **a.** primary structure.
    - **b.** secondary structure.
    - **c.** tertiary structure.
    - **d.** quaternary structure.
11. A new substance that forms as the result of a chemical reaction is a(n)
    - **a.** gas.
    - **b.** product.
    - **c.** reactant.
    - **d.** element.
12. Why do living things depend on enzymes?
    - **a.** Enzymes produce energy.
    - **b.** Enzymes change the temperature.
    - **c.** Enzymes speed up chemical reactions.
    - **d.** Enzymes prevent the formation of wastes.

This diagram is a model of a nucleotide. Use the diagram to answer the following question(s).



13. What does Structure 1 represent?
    - **a.** a base
    - **b.** a sugar
    - **c.** a steroid
    - **d.** a phosphate
14. What does Structure 2 represent?
    - **a.** a base
    - **b.** a sugar
    - **c.** a steroid
    - **d.** a phosphate

Explaining Key Ideas

15. **Describe** how forming compounds affects the stability of atoms.
16. **Identify** an example of adhesion and an example of cohesion.
17. **Compare** the structure of a simple carbohydrate with that of a complex carbohydrate.
18. **Identify** an important characteristic of waxes in living things.
19. **Differentiate** between a physical change and a chemical change.
20. **Explain** why a product might not form even if the activation energy is available.

Assignment Guide

Section	Questions
1	2, 6, 7, 15, 23, 24, 25, 26
2	4, 8, 16, 21, 22, 26, 31, 32, 34
3	1, 5, 9, 10, 13, 14, 17, 18, 27, 28, 29, 33
4	3, 11, 12, 19, 20, 21, 22, 30, 31, 35

Review

Reading Toolbox

1. Students' comparison tables should include similarities and differences between proteins and nucleic acids in terms of structure and function.
2. See previous page for answer to concept map.

Using Key Terms

3. A *reactant* is a substance that changes in a chemical reaction to form a *product.* A *substrate* is a reactant that binds to an enzyme in an enzyme-catalyzed chemical reaction.
4. *Cohesion* is the attraction among particles of the same substance. *Adhesion* is attraction between particles of different substances.
5. A *nucleic acid* is a molecule made up of one or two chains of nucleotides. A *nucleotide* is a subunit of a nucleic acid chain that consists of a sugar, a phosphate, and a nitrogenous base.

Understanding Key Ideas

6. d 7. d 8. b 9. c
10. a 11. b 12. c 13. a
14. b

Explaining Key Ideas

15. Most atoms are not naturally stable because their outermost energy levels are not filled. Atoms react by gaining, losing, or sharing electrons to fill their outer levels and become more stable.
16. The formation of dew shows cohesion. Water can move up a stem due to its adhesion to the cells of the plant and cohesion with its neighboring water molecules.
17. A simple carbohydrate may be made up of one sugar unit (monosaccharide) or two sugar units linked together (disaccharide). A complex carbohydrate is made up of several sugar units linked as chains or branches. The basic unit of both simple and complex carbohydrates is made up of carbon, hydrogen, and oxygen in a 1:2:1 ratio.
18. Waxes are waterproof and form protective coatings.

19. In a physical change, the identity of the substance does not change shape. In a chemical change, the substance becomes a different substance.

20. Reacting atoms of the reactants must also align properly so that the new chemical bonds can form.

Using Science Graphics

21. pH 3.0

22. The stomach is more acidic than the small intestine.

Critical Thinking

23. All atoms in an element are of the same type.

24. H_2 and O_2 are more stable than H and O because atoms within H_2 and O_2 share electrons in covalent bonds and have full energy levels. H_2 and O_2 are not compounds; but they are molecules.

25. The covalent bond occurs when atoms share electrons to complete their outer energy levels. An ionic bond is the force of attraction between ions of opposite charge that occurs when atoms lose or gain electrons.

26. When salt is added to water, it dissolves. The dissolved ions disrupt the hydrogen bonds that form among water molecules as water solidifies. Thus, it is more difficult for ice to form after salt has been added to the water. Lowering the temperature below the freezing point of the solution will eventually cause it to freeze.

27. If you eat an unbalanced diet, you may lack one or more of these three nutrients, and your cells will lack the components to store energy and make proteins.

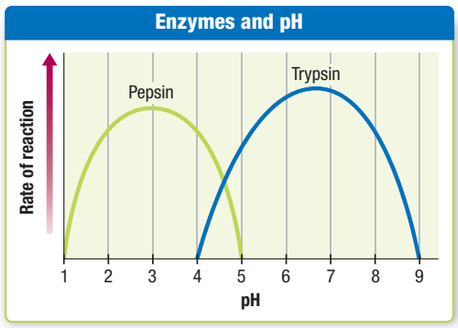
28. Oils have lower freezing points, so they are less likely to freeze in cold temperatures.

29. Hair is made up of proteins. Heat from the curling iron weakens the bonds between the amino acid chains. New bonds form to curl the hair around the barrel of the curling iron, changing the proteins' shape.

30. Maintaining the organization within a living system requires energy. Metabolism requires energy. Activation energy is needed for metabolic reactions to occur.

Using Science Graphics

This graph shows the relationship between pH and the activity of two digestive enzymes, pepsin and trypsin. Use the graph to answer the following question(s).



21. At what pH does pepsin work best?

22. Pepsin works in the stomach, while trypsin works in the small intestine. What does the graph indicate about the relative acidity of the stomach and small intestine?

Critical Thinking

23. Applying Information Given that elements are pure substances, how many types of atoms make up the structure of a single element? Explain your answer.

24. Analyzing Concepts In nature, the elements oxygen and hydrogen are usually found as gases with the formulas O_2 and H_2. Why? Are they compounds? Are they molecules?

25. Recognizing Differences What are two differences between ionic bonds and covalent bonds?

26. Inferring Relationships When salt is added to water, the freezing point of the water decreases. Explain why.

27. Applying Concepts Based on what you know about carbohydrates, lipids, and proteins, why is a balanced diet important?

28. Making Inferences Animals that live in freezing climates often store body fat as oil. What would be the adaptive advantage of storing body fat as oil instead of as a solid?

29. Recognizing Relationships High temperatures can weaken bonds within a protein molecule. How might this fact explain the effects of using a hot curling iron or rollers in one's hair?

30. Analyzing Concepts Living things need a constant supply of energy. Explain why.

31. Inferring Conclusions Outline a reason why a slight change in the pH of solutions in living things could result in the death of the organism.

Why It Matters

32. Surface Tension Using what you have learned about the properties of water, explain how some insects, such as water striders, can stand on the surface of water.

Alternative Assessment

33. Evaluating Promotional Claims Analyze the ingredients of various packaged foods. For each food, record the percentage of the food that carbohydrates, fats, and proteins make up. List any additives that the products contain. Research whether the additives are natural or artificial, and find out why they are added to particular foods. Compare these data to advertising claims about the products that you analyzed.

Writing for Science

34. Extended Response Pure water contains equal numbers of hydronium ions and hydroxide ions and is therefore neutral. What is the initial cause of the dissociation of water molecules into hydrogen and hydroxide ions? Explain the process. After water dissociates, hydronium ions form. Explain this process.

35. Short Response In an experiment that a student conducted, the rate of an enzyme-catalyzed reaction did not increase, even though the student increased the substrate concentration. Deduce why the reaction rate does not change even though more of the reactant is available.

31. Enzymes that catalyze chemical reactions function within a narrow pH range.

Why It Matters

32. The attraction between individual water molecules at the surface forms a kind of "film" over the surface. The weight of the water strider is well-distributed over water-resistant legs. Thus, it can stand on the water's surface.

Alternative Assessment

33. Some examples of natural additives are carrageen and agar, derived from algae and used as thickening agents. Salt, sugar, and vinegar are some natural preservatives. Recent concerns over advertising claims have caused the FDA to create guidelines for determining whether a food can be labeled as all natural or not.

Writing Skills

34. Polar attractions coupled with the proper orientation between colliding water molecules split a molecule to form a hydrogen ion and a hydroxide ion. The hydrogen ion reacts with water to form a hydronium ion.

35. When the amount of substrate exceeds the amount of enzyme, there are no additional enzyme molecules to bind the substrate. The enzyme becomes available when the other reactions have been completed.