

Reviewing Vocabulary

Vocabulary Connections

The vocabulary terms in this chapter are related to each other in various ways. For each group of words below, write a sentence or two to clearly explain how the terms are connected.

For example: for the terms *covalent bond* and *molecule*, you could write "A *molecule* is made of atoms connected by *covalent bonds*."

- Atom, ion
Atoms are the basic unit of matter.
An atom that gains or loses electrons and has a charge is an ion.
- Hydrogen bond, cohesion
Cohesion in water is the result of hydrogen bonds that form from one polar water molecule being attracted to another.
- Solution, solvent
A solvent dissolves other substances to form a solution.
- Acid, base, pH
Acids have a high concentration of H^+ ions and low pH. Bases have a low concentration of H^+ ions and a high pH.
- Exothermic, endothermic
Exothermic reactions release more energy than they absorb. Endothermic reactions absorb more energy than they release.
- Catalyst, enzyme
A catalyst is a substance that increases the rate of a chemical reaction. Enzymes are biological catalysts.

Reviewing MAIN IDEAS

- Explain how the combination of electrons, protons, and neutrons results in the neutral charge of an atom.
Neutrons have no charge \emptyset , Each proton has $+1$ charge, Each electron has -1 charge.
Atoms are neutral when $\#$ protons = $\#$ electrons

- Potassium ions (K^+) have a positive charge, What happens to a potassium atom's electrons when it becomes an ion?



loses one electron

$$\begin{array}{r} 19 \text{ protons + electrons} \\ -1 \text{ electron} \\ \hline 18 \text{ electrons} = +1 \text{ charge} \end{array}$$

- Some types of atoms form more than one covalent bond with another atom. What determines how many covalent bonds two atoms can make? Explain.

p. 39
drawing If atoms need more than one electron to fill their outermost energy levels, they can share more than one electron pair

13. How is hydrogen bonding among water molecules related to the structure of the water molecule?

p.41 The larger oxygen atom pulls electrons away from H atoms, producing charged regions that result in H bonding

14. Explain the difference between solvents and solutes.

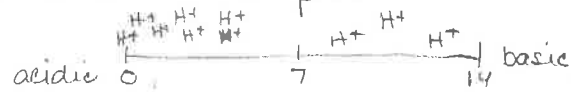
Solvents a substance that is present in a greater amount and dissolves another substance

Solutes a substance that dissolves in a solvent

15. Describe the relationship between hydrogen ions (H^+) and pH. How is pH related to a solution's acidity?

the greater the H^+ concentration, the lower the pH

- the more acidic the solution



16. Carbon forms a very large number of compounds. What characteristic of carbon atoms allows the formation of all of these compounds? Explain.

Carbon atoms have 4 unpaired electrons in their outermost energy level, so they can form four covalent bonds

17. Identify and explain examples of monomers and polymers in carbohydrates, proteins, and nucleic acids.

C, H, O Carbohydrates - simple sugars are monomers that bond \rightarrow polysaccharides

$2, H, O, N$ Proteins - amino acids are monomers bonded to form proteins

DNA/RNA Nucleic acids - nucleotides are monomers bonded to form nucleic acids

18. Explain the relationship between a protein's structure and its ability to function.

specific function of a protein is dependent on its precise structure

A change in protein structure changes its function

19. What are the components of a chemical reaction?

reactants \rightarrow products

20. Explain the difference between exothermic and endothermic reactions.

endothermic - absorbs more energy than it releases

exothermic - releases more energy than it absorbs

21. Describe the effect of a catalyst on activation energy and reaction rate.

- decreases activation energy

- increases reaction rate

22. What is the role of enzymes in organisms?

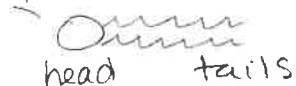
In living organisms enzymes make chemical reactions go faster


23. Compare and Contrast

How are phospholipids similar to lipids such as triglycerides? How are they different?

p. 47 Similar... have fatty acid chains bonded to glycerol

Different... a third fatty acid is replaced by a phosphate group

phospholipid

head tails

triglyceride


24. Compare and Contrast

Briefly describe the similarities and differences between hydrogen bonds and ionic bonds.

Similarities... • attraction between positive and negative charges

Differences... • ionic bonds have strong attractions - result in a compound
• Hydrogen bonds have weak attractions - do not form a compound

Which type of bond do you think is stronger? Why?

ionic bonds

25. Infer... Suppose that you have a cold. What characteristics must cold medicine have that allow it to be transported throughout your body? Explain. for medication to travel in body - must dissolve in blood and molecules of medication must be polar

26. Predict ... Homeostasis involves the maintenance of constant conditions in an organism. What might happen to a protein if homeostasis is disrupted? Why?

H⁺ bonds break and protein's structure changes due to changes in pH or temperature

27. Compare and Contrast

Describe the structures and functions of starch and cellulose. How are the molecules similar? How are they different?

28. Apply ... Suppose you had a friend who wanted to entirely avoid eating fats. What functions of lipids could you describe to convince that person of the importance of fats to his or her health?

29. Infer... The human body can reuse some of the enzymes found in raw fruits and vegetables. Why is this not the case for cooked fruits and vegetables?

Interpreting Visuals

The diagram below shows the lock-and-key model of enzyme function. Use it to answer the next three questions.



30. Summarize...briefly explain what is happening at each step of the process. Be sure to identify each of the substances (A-D) shown in each step of the process.

- Step 1: A substrate binds to the active site of the enzyme (A)
- Step 2: A chemical reaction occurs due to the reactants' weakened bonds
- Step 3: Products (C and D) are released from the enzyme

Identify... (A) enzyme (B) substrate (C & D) products

31. Apply....How does Substance A affect the amount of activation energy needed by the process? Explain.

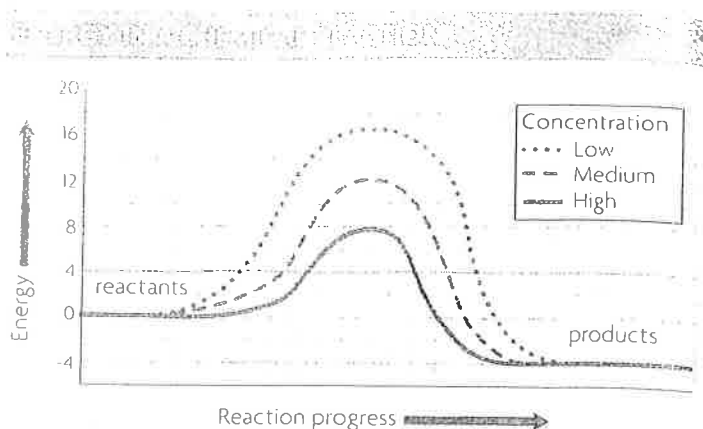
decreases the amount of activation energy needed because the weakened bonds of substrate are easier to break

32. Synthesize....Describe the importance of buffers in solutions in allowing the process shown above to take place.

Buffers keep pH stable

Analyzing Data

Use the graph below to answer the next three questions.



33. **Apply**.... Suppose the graph was constructed from data collected during an experiment. What were the independent and dependent variables in the experiment? Explain.

Independent: enzyme (catalyst)

Dependent: energy required

34. **Analyze**... How much activation energy is needed to start the chemical reaction represented by each line on the graph? How much energy is released from each reaction?

Low Concentration: 17 units needed / 21 units released

Medium Concentration: 12 units needed / 16 units released

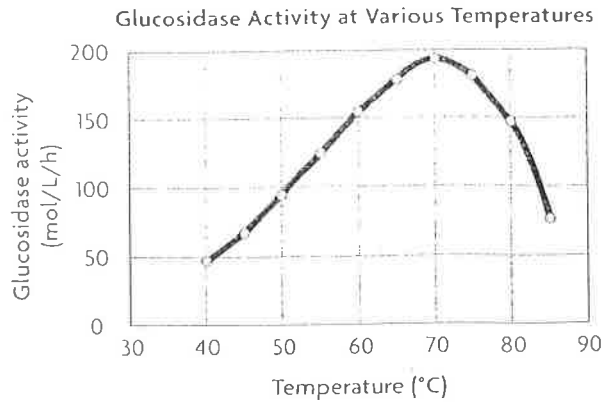
High Concentration: 8 units needed / 12 units released

35. **Apply**... Explain whether each of the chemical reactions shown on the graph is *endothermic* or *exothermic*.

exothermic

release more energy than they absorb

1.



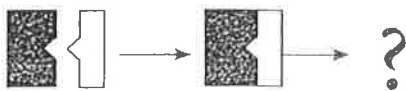
This graph shows the activity of an enzyme called glucosidase. What can you conclude from these data?

- a. Glucosidase breaks down glucose substrates.
- b. Glucosidase functions best around 70 degrees celsius
- c. Glucosidase does not function below 70 degrees celsius
- d. Glucosidase is not affected by temperature

2. Proteins are long molecules that are built from various combinations of

- a. carbohydrates.
- b. nucleic acids
- c. lipids.
- d. amino acids.

3.



The diagram shows how an enzyme (black) binds to a substrate (white) during a chemical reaction. When this reaction is complete, the

- a. enzyme's shape will be different.
- b. surrounding temperature will have increased.
- c. hydrogen ion concentration will have decreased.
- d. substrate will be a different molecule

4. An animal's stomach contains enzymes that break down food into smaller molecules that the animal's cells can use. Enzymes perform this function by

- a. participating in chemical reactions.
- b. increasing the temperature.
- c. changing the ionic concentration.
- d. lowering the pH.

5. A macromolecule such as a lipid is characterized by having

- a. ionic bonds.
- b. polar bonds.
- c. low-energy bonds.
- d. high-energy bonds.

6. A spider is able to walk on water without sinking due to water's

- a. cohesion.
- b. high specific heat.
- c. adhesion.
- d. solvency.

