

SECTION SUMMARY

Reviewing the Concepts

♦ **Vitamins, organic molecules necessary for basic life functions, are classified as fat-soluble or water-soluble.**

1. Vitamins are not considered to be foods, yet they are a vitally important part of healthy diets. Explain.
2. What are some typical symptoms of vitamin deficiency?
3. What chemical characteristics determine whether a vitamin is fat-soluble or water-soluble?
4. Why must water-soluble vitamins be consumed more regularly than fat-soluble vitamins?
5. Why do RDAs for vitamins and minerals vary for individuals based on age and gender?

♦ **A titration can be used to determine the amount or concentration of solute in a particular solution.**

6. Describe the key steps in a titration, and explain how the process may be used to analyze a solution.
7. a. Can titration be used to determine both the amount and the identity of an unknown solute?
b. Explain.
8. a. What is meant by the "endpoint" of a titration?
b. What does the endpoint indicate about the progress of a reaction?
9. Vitamin C is colorless in solution, yet you were able to measure its concentration in Laboratory Activity D.2. What chemical reactions allowed you to detect its presence in solution?

♦ **Minerals are elements that are essential to life.**

10. Name three minerals that are essential for human life.
11. What is the difference between a macromineral and a micromineral?
12. What are some important roles of minerals in the body?
13. Although high temperatures can destroy vitamins in foods, they rarely affect the quality of minerals in the foods. Explain.
14. Regarding minerals in the diet, some people believe that "if a little is good, more must be better." Evaluate that idea in terms of the quantity of minerals needed in a healthy diet.

♦ **Food additives are used to increase the nutritive value, storage life, visual appeal, or ease of production of foods.**

15. What determines whether a substance is considered an additive or a basic component of a food?
16. List two typical food additives and their functions in the product.
17. Suppose that a ban were placed on all food additives. Overall, would the ban, in your opinion, produce positive or a negative results? Explain.

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♦ **Fat and carbohydrate molecules are composed of carbon, hydrogen, and oxygen. Differences in structure between fat and carbohydrate molecules account for their different properties and energy content.**

1. Where did the name "carbohydrate" come from?
2. Compare the structure of a molecule of fat to that of a molecule of carbohydrate.
3. What is the chemical explanation for why fats contain more food energy per gram than carbohydrates?
4. Why is the term "burning fat" sometimes used, even though no actual burning is involved?
5. List two chemical characteristics shared
 - a. by all fats.
 - b. by all carbohydrates.

♦ **Carbohydrates include simple sugars such as glucose and also substances involving chemical combinations of two or more simple-sugar units.**

6. Name two common monosaccharides and two common disaccharides.

monosaccharide, a disaccharide, and a polysaccharide.
7. Using a shaded oval to represent one molecule of a monosaccharide, sketch a model of a
 - a. monosaccharide, a disaccharide, and a polysaccharide.
8. What kind of chemical reaction links monosaccharides together to make more complex carbohydrates?

♦ **A triglyceride (a typical fat molecule) is formed by a condensation reaction between three fatty acid molecules and a glycerol molecule.**

9. What are fatty acids? In what ways are these substances similar to or different from inorganic acids?
10. Describe the reaction that chemically combines three fatty acid molecules to a molecule of glycerol.
11. Fats are examples of "triglycerides." Why does that name provide an appropriate description of all fats?

♦ **Fats may be saturated (all C—C bonds) or unsaturated (some C=C bonds). Unsaturated fats can become more saturated through hydrogenation.**

12. With what is a "saturated fat" actually saturated?
13. How does the degree of unsaturation affect the properties of a fat?
 - a. What property does the product gain as a result of partial hydrogenation?
 - b. Why do you think a manufacturer might decide against completely hydrogenating the margarine?
14. Some margarines are advertised as "partially hydrogenated."
 - a. What property does the product gain as a result of partial hydrogenation?
 - b. Why do you think a manufacturer might decide against completely hydrogenating the margarine?
15. What are some natural sources of
 - a. saturated fats?
 - b. unsaturated fats?

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◆ **Proteins, the major structural components of living tissue, perform many cellular functions.**

1. Name three tissues in your body for which protein is the main structural component.
2. The name “protein” comes from a Greek word meaning “of prime importance.” Why is this name appropriate for proteins?
3. What are some cellular functions for which proteins are particularly important?
4. Name five food items that are made primarily of protein.

◆ **Amino acids, small molecules that contain at least one amino group and at least one carboxylic acid group, are chemically combined to form protein polymers. The human body is unable to synthesize all the types of amino acids it needs; essential amino acids must be obtained directly from foods.**

5. How does the relatively small number of different amino acids account for the vast variety of proteins found in nature?
6. What is the range for the total number of amino acids in various protein molecules?
7. From where does the name “amino acid” come?
8. Explain the meaning of each of these terms:
 - a. complete proteins
 - b. essential amino acids
 - c. complementary proteins

◆ **Some protein molecules function as enzymes—biological catalysts that speed up cellular reactions.**

9. a. How are enzymes like other catalysts?
b. How are enzymes different from other catalysts?
10. What would be the effect of halting all enzyme activity in the body?
11. Explain the effect of excessively high temperatures on the function of an enzyme.
12. Describe how enzymes work to speed up chemical reactions.
13. a. Explain the interaction of an active site and a substrate in terms of the analogy of a lock and key.
b. Identify at least one limitation in the lock-and-key analogy for enzyme activity.