

Concept Review

Chapter 13

Summary of Terms

Amino acid The monomers of polypeptides, each monomer consisting of an amine group and a carboxylic acid group bonded to the same carbon atom.

Anabolism A general term for all the energy-requiring chemical reactions that produce large biomolecules from smaller molecules.

Carbohydrate Organic molecules produced by photosynthetic plants containing only carbon, hydrogen and oxygen.

Catabolism Chemical reactions that break down biomolecules in the body.

Chromosomes An elongated bundle of DNA and protein that appears in a cell's nucleus just prior to cell division.

Deoxyribonucleic acid (DNA) A nucleic acid containing a the sugar deoxyribose and having a double helical structure, as well as carrying genetic code in the nucleotide sequence.

Enzymes A protein that catalyzes (speeds up) biochemical reactions.

Fat A biomolecule that packs a lot of energy per gram and consists of a glycerol unit attached to three fatty acid molecules.

Gene A particular sequence of DNA nucleotides along the DNA strand that leads a cell to manufacture a particular polypeptide.

Glycogen A polymer made of hundreds of glucose monomers and sometimes referred to as animal starch.

Lipid A broad class of biomolecules not soluble in water because their structures are largely of a hydrocarbon nature.

Metabolism The general term describing the sum of all the chemical reactions in the body.

Mineral Inorganic chemicals that play a wide variety of roles in the body and are obtained from our diet.

Nucleic acid A long polymeric chain of nucleotide monomers holding the information for how amino acids need to be linked together to form the organism.

Nucleotide A nucleic acid monomer consisting of three parts: a nitrogenous base, ribose (in RNA) or deoxyribose (in DNA), and a phosphate group.

Protein A polymer of amino acids having some biological function.

Replication The process by which DNA strands are duplicated.

Ribonucleic acid (RNA) A nucleic acid containing a fully oxygenated ribose and which executes protein synthesis based on code read from DNA.

Saccharide Another term for carbohydrate. The prefixes *mono-*, *di-*, and *poly-* are used with this term to indicate the size of the carbohydrate.

Vitamins Organic chemicals that assist in various biochemical reactions in the body and are obtained from our diet.

Review Questions

13.1 Biomolecules

1. Is the cell nucleus within the cytoplasm of a cell or is the cytoplasm within the cell nucleus?
2. What are the four major categories of biomolecules discussed in this chapter?

13.2 Carbohydrates

3. Are all carbohydrates digestible by humans?
4. Why do plants produce starch?

5. Which monosaccharide do starches and cellulose have in common?
6. What is the most abundant organic compound on the Earth?

13.3 Lipids

7. What are the structural components of a triglyceride?
8. What makes a saturated fat saturated?

9. What do all steroids have in common?

13.4 Proteins

10. How do various amino acids differ from one another?

11. What do a peptide, polypeptide, and protein all have in common?

12. What is the role of enzymes in the body?

13. What holds a substrate to its receptor site?

13.5 Nucleic Acids

14. What is the difference between a nucleic acid and a nucleotide?

15. Where in a cell are deoxyribonucleic acids found?

16. Which four nitrogenous bases are found in DNA? In RNA?

17. What happens to the DNA double helix during replication?

13.6 Vitamins and Minerals

18. What are two classes of vitamins?

19. Why is it often more healthful to eat vegetables that have been steamed rather than boiled?

13.7 Metabolism

20. What is the general outcome of catabolism?

21. What is the general outcome of anabolism?

13.8 A Healthy Diet

22. According to the food pyramid, which type of biomolecule should be the primary component of our diets?

23. Are all dietary fibers made of cellulose?

24. Which type of lipoproteins has a greater association with the formation of plaque on artery wall: LDLs or HDLs?

25. Why doesn't the human body synthesize the essential amino acids?

Quantitative Questions

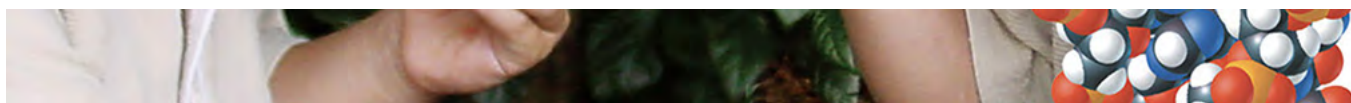
26. Rank the following molecules in order of increasing sweetness: glucose, cellulose, starch.

27. Rank the following amino acids in order of most acidic to least acidic: phenylalanine, tyrosine, histidine.

28. Rank the following molecules in order of increasing molecular mass: cholesterol, glycine, deoxyribonucleic acid.

29. Rank the following in order of increasing size: gene, nucleic acid, nucleotide.

30. Rank the following minerals in order of how much we need each day: calcium, sodium, potassium, chromium.



Solutions (Odd-Numbered)

1. The cell nucleus is within the cytoplasm.

3. Not all carbohydrates can be digested by humans. Cellulose, for example, is a carbohydrate that is not digestible. Many adults also lack the ability to digest the carbohydrate lactose.

5. Starches and cellulose have glucose in common.

7. A triglyceride consists of a glycerol molecule attached to three fatty acid molecules.

9. Steroids all have a system of four linked carbon rings.

11. They are all made of amino acids.

13. Molecular attractions, including hydrogen bonding and induced dipole-induced dipole attractions, hold a substrate to the receptor site.

15. DNA is found mainly in the cell nucleus.

17. The DNA double helix unwinds and each strand becomes a template for the formation new complementary strands. The end result is that one DNA double helix is replicated into two

19. Vegetables boiled in water lose their water-soluble vitamins.

21. Anabolism results in the synthesis of large biomolecules.

23. No. Cellulose is an insoluble fiber. Dietary fibers may also be made of soluble fibers, which are found in oats, barley, and legumes and which slow digestion thus stabilizing blood glucose levels.

25. It is more energy efficient for the body to obtain these amino acids from other living organisms. The reason for this is because the essential amino acids have side groups that are biochemically difficult to synthesize.

27. Looking at the side chains of these amino acids from Figure 13.16 and reviewing the discussion of functional groups in Chapter 12: (most acidic) tyrosine > phenylalanine > histidine (least acidic, which is the same as most basic)

29. Nucleotides come together to make a nucleic acid. A gene is a small portion of the sequence of nucleotides. In order of increasing size: nucleotide < gene < nucleic acid.