

Chemistry 2, Lesson 8

Proteins

1. Proteins are organic polymers made of _____ linked together in a specific way.
 - a. **Amino acids**
 - b. Nucleic acids
2. A _____ is a reactant in an enzyme-catalyzed reaction.
 - a. Catalyst
 - b. **Substrate**
3. A _____ is a chain of two or more amino acids linked together.
 - a. **Peptide**
 - b. Simple sugar
4. _____ is the process in which a protein's natural three-dimensional structure is disrupted.

Denaturation
5. Explain how the active site of an enzyme functions.

Once a substrate is bound to such an active site, "the site changes shape slightly to fit more tightly around the substrates. This recognition process is called induced fit. The shapes of the substrates must fit the shape of the active site, in the same way that puzzle pieces or a lock and key fit together."

6. Describe the functions of proteins in living cells.

Proteins within a living cell act as enzymes, allowing the speeding up of chemical reactions. In addition, they act as structural support, giving the living cell rigidity. Some of the hormones that allow for communication between cells are protein molecules.

Lipids

1. What is the process in which triglycerides react with a strong, inorganic base such as sodium hydroxide to produce carboxylate salts and glycerol?

a. Polymerization

b. **Saponification**

c. Peptide linkage

d. Lipogenesis

2. Select the correct answers.

(Waxes | **Steroids**) are lipids that have multiple cyclic rings. The building block of many lipids is the (amino acid | **fatty acid**). A typical cell membrane has two layers of (polypeptides | **phospholipids**). A(n) (**triglyceride** | phospholipid) is formed when three fatty acids are bonded to glycerol.

3. How are phospholipid molecules arranged in cellular membranes?

Phospholipid molecules are arranged in cellular membranes in two distinct layers, “which are arranged with their nonpolar tails pointing inward and their polar heads pointing outward. This arrangement is called a lipid bilayer. Because the lipid bilayer structure acts as a barrier, the cell is able to regulate the materials that enter and leave through the membrane.”

4. Describe the functions of lipids in living cells.

“In living organisms, lipids store energy efficiently, and make up most of the structure of cell membranes.”

Nucleic Acids

1. Nucleic acids are made of nucleotides. There are three components to a nucleotide. Which of the following correctly identifies those three parts?

a. Nitrogen base, a protein, and a five-carbon sugar

b. Nitrogen base, phosphate, and a six-carbon sugar

c. **Nitrogen base, phosphate, and a five-carbon sugar**

d. Hydroxyl base, phosphate, and a five-carbon sugar

2. The monomer that makes up a nucleic acid is called a(n) _____.

nucleotide

3. Cells use _____ to extract energy from glucose in the absence of oxygen.
fermentation
4. In a DNA molecule, adenine forms hydrogen bonds with _____.
thymine
5. RNA contains the nitrogen base _____.
uracil, that which is not found in DNA
6. Describe the functions of nucleic acids in living cells.
Nucleic acids function as “storage and transmission of genetic information.”

Metabolism

1. Most cellular reactions are only around 40% efficient; what happens to the waste energy?
- a. It is expelled as body waste.
 - b. It is released as sound.
 - c. **It is released as heat.**
 - d. It is stored for later use.
2. What is the source of waste oxygen in photosynthesis?
 $6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$
- a. Glucose
 - b. **Carbon dioxide**
 - c. Sunlight
 - d. water
3. In cellular respiration, carbon atoms in glucose are _____ and oxygen atoms in oxygen gas are _____.
- a. **Oxidized; reduced**
 - b. Reduced; oxidized
 - c. Reduced; reduced
 - d. Oxidized; oxidized

4. Compared to cellular respiration, fermentation is less efficient because there is no _____ to react with glucose. $C_6H_{12}O_6 \rightarrow 2CH_3CH_2OH + 2CO_2 + \text{energy}$

a. Oxygen

b. Ethanol

c. Hydrogen

d. Carbon dioxide

5. Explain the role of ATP in the metabolism of living organisms.

ATP "functions as the universal energy-storage molecule in living cells."

6. Determine whether each process is anabolic or catabolic.

Photosynthesis

anabolic

Cellular respiration

catabolic

Fermentation

catabolic

7. Compare and contrast the processes of photosynthesis, cellular respiration, and fermentation.

Photosynthesis uses light energy, water, and carbon dioxide to produce glucose. In contrast, Cellular respiration revolves around the break-down of glucose to produce energy. Fermentation is a less energy efficient method of conversion of glucose to energy than cellular respiration, with the trade-off of greatest note being the lack of oxygen spent. "Cells can extract energy from glucose in the absence of oxygen, but not nearly as efficiently."