

## Topic 2: Biochem

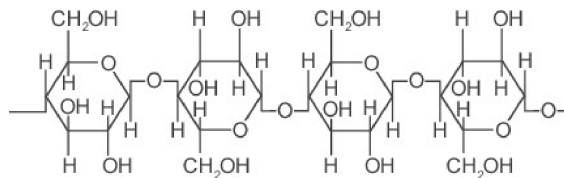
Name: \_\_\_\_\_

Date: \_\_\_\_\_

- All living things contain which element?
  - helium
  - sodium
  - copper
  - carbon
- Plants and animals are composed of organic compounds. Which of the following are the common elements found in organic compounds?
  - iron, oxygen, nickel, copper
  - sodium, potassium, gold, hydrogen
  - helium, neon, argon, krypton
  - carbon, hydrogen, oxygen, nitrogen
- What characteristic of carbon (C) makes it essential to living organisms?
  - Carbon forms crystal structures under certain conditions.
  - Carbon can exist as a solid, liquid, or gas.
  - Carbon bonds in many ways with itself to form chains.
  - Carbon exists in radioactive forms.
- Which of the following elements is *best* able to combine with itself and hydrogen (H) to form large molecules?
  - sodium (Na)
  - lithium (Li)
  - sulfur (S)
  - carbon (C)
- Which of the following compounds is *most* likely to be part of living organisms?
  - $C_6H_{12}O_6$
  - $BF_3$
  - $MoCl_2$
  - $CsI$
- Which of the following is the fundamental element found in all living organisms?
  - iron
  - carbon
  - calcium
  - magnesium
- There are many different enzymes located in the cytoplasm of a single cell. How is a specific enzyme able to catalyze a specific reaction?
  - Different enzymes are synthesized in specific areas of the cytoplasm.
  - Most enzymes can catalyze many different reactions.
  - An enzyme binds to a specific substrate (reactant) for the reaction catalyzed.
  - Enzymes are transported to specific substrates (reactants) by ribosomes.
- Some snake venoms are harmful because they contain enzymes that destroy blood cells or tissues. The damage caused by such a snakebite could *best* be slowed by
  - applying ice to the bite area.
  - drinking large amounts of water.
  - inducing vomiting.
  - increasing blood flow to the area.
- Maltose can be broken down into glucose molecules by the enzyme maltase. Which of the following would slow the reaction rate?
  - adding maltase
  - adding maltose
  - removing glucose
  - diluting with water

10. Although there are a limited number of amino acids, many different types of proteins exist because the
- size of a given amino acid can vary.
  - chemical composition of a given amino acid can vary.
  - sequence and number of amino acids is different.
  - same amino acid can have many different properties.
11. The clear protein of an egg white becomes opaque and firm when cooked because the heat
- mutates the DNA.
  - turns the protein into carbohydrates.
  - stops protein formation.
  - changes the protein structure.
12. Proteins are large macromolecules composed of thousands of subunits. The structure of the protein depends on the sequence of
- lipids.
  - monosaccharides.
  - amino acids.
  - nucleosides.
13. What types of monomers form proteins?
- Glucose
  - Nucleotides
  - Amino acids
  - Polyatomic ions

14. The structural formula of cellulose is shown.



Which phrase correctly describes cellulose?

- A polymer made of glucose
  - A branched form of sucrose
  - A disaccharide
  - A simple sugar
15. Carbohydrates are macromolecules used for energy in living organisms. Large carbohydrate molecules are made of smaller building blocks called monosaccharides.
- The arrangement of which three components is used to distinguish one monosaccharide from another?
- Carbon, hydrogen, and oxygen
  - Glucose, fructose, and ribose
  - Peptide, fatty acid, and purine
  - Water, carbon dioxide, and nitrogen
16. Use the pictures below to answer the question.



cell



organ



tissue

Which shows the correct order from simplest to most complex?

- Cell → Tissue → Organ
- Organ → Tissue → Cell
- Cell → Organ → Tissue
- Tissue → Organ → Cell



24. If scientists search other planets for possible life, they are likely to focus on the presence of molecules containing which of the following elements?

- A. carbon                      B. iron  
C. potassium                  D. sodium

25. In red blood cells, the compound carbonic anhydrase increases the rate at which carbon dioxide is converted to bicarbonate ions for transport in the blood. In red blood cells, carbonic anhydrase acts as which of the following?

- A. an enzyme                  B. a hormone  
C. a lipid                        D. a sugar

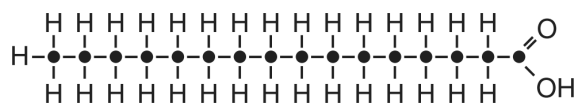
26. Many plants have waxy coatings on some surfaces. This coating reduces water loss because it is not water-permeable. This waxy coating is which of the following types of organic molecule?

- A. carbohydrate              B. lipid  
C. nucleic acid                D. protein

27. Ovalbumin is a protein found in eggs. Which of the following *best* describes the molecular structure of ovalbumin?

- A. a group of six carbon atoms joined in a ring  
B. a chain of amino acids folded and twisted into a molecule  
C. a set of three fatty acids attached to a molecule of glycerol  
D. a sequence of nitrogenous bases attached to a sugar-phosphate backbone

28. A diagram of an organic molecule is below.



Which element is found at the positions marked by the dots (●) in the molecule?

- A. carbon                      B. nitrogen  
C. phosphorus                D. sulfur

29. Which of the following lists of elements contains the *most common* elements in organic compounds?

- A. calcium, iron, and potassium  
B. carbon, hydrogen, and oxygen  
C. chlorine, phosphorus, and sodium  
D. copper, magnesium, and sulfur

30. One category of organic compounds contains molecules composed of long hydrocarbon chains. The hydrocarbon chains may be saturated or unsaturated.

Which of the following categories of organic compounds contains these molecules?

- A. carbohydrates              B. lipids  
C. nucleic acids                D. proteins

31. Some bacteria contain a substance called nitrogenase. Nitrogenase catalyzes the chemical reaction that converts atmospheric nitrogen ( $N_2$ ) into ammonia ( $NH_3$ ). Nitrogenase is an example of which of the following?

- A. a sugar                      B. an enzyme  
C. a nucleotide                D. an amino acid

32. Which of the following categories of organic molecules is correctly paired with one of its functions?
- A. nucleic acids—digest dead cells
  - B. lipids—give quick energy to cells
  - C. carbohydrates—store genetic information
  - D. proteins—provide structure in skin, hair, and nails

33. Which of the following *best* describes the composition of a nucleotide?
- A. a pair of six-carbon rings attached to each other
  - B. a carbon atom joined to hydrogen and three functional groups
  - C. a chain of carbon atoms with a carboxyl group bonded to one end
  - D. a five-carbon sugar attached to a phosphate group and a nitrogenous base

The following section focuses on different lemur species of Madagascar.

Madagascar is an island located off the east coast of Africa, as shown on the map below.



Madagascar has a unique animal community. Lemurs are one of the animal groups that have diversified extensively on Madagascar. Lemurs are primates, which is an order of mammals that also includes monkeys and apes. Lemur species vary widely in habitat, diet, size, and color. Lemurs only live on the island of Madagascar. However, fossil evidence shows that lemur ancestors existed on Africa's mainland. Scientists hypothesize that lemur ancestors reached Madagascar by floating across the Mozambique Channel on matted clumps of vegetation.

Four different lemur species are shown in figures 1–4 below.

**Figure 1. Mouse lemur**

Length: 12.5 cm

Habitat: Rain forest and deciduous forest



**Figure 2. Verreaux's sifaka**

Length: 45 cm–55 cm

Habitat: Spiny deciduous forest and evergreen forest



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**Figure 3. Ring-tailed lemur**

Length: 38 cm–46 cm

Habitat: Deciduous forest and scrub forest



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**Figure 4. Red-bellied lemur**

Length: 36 cm–54 cm

Habitat: Rain forest



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34. Lemurs' bodies are adapted to efficiently store energy for times when food is scarce. This adaptation may help to explain how lemur ancestors survived the trip across the Mozambique Channel from mainland Africa to Madagascar.

Which of the following types of molecules are primarily used for long-term energy storage in the lemur?

- A. lipids                      B. monosaccharides  
C. nucleic acids              D. proteins

35. In the human body, fibrinogen is necessary for sealing cuts and stopping the loss of blood. Since fibrinogen is made of chains of amino acids, it is an example of which type of organic molecule?

- A. carbohydrate              B. protein  
C. fatty acid                    D. nucleic acid

36. Baby food manufacturers sometimes use proteases in their products. Proteases catalyze the breakdown of the proteins in these foods, making digestion easier for infants.

Proteases are which of the following types of molecules?

- A. enzymes                      B. fatty acids  
C. hormones                    D. monosaccharides

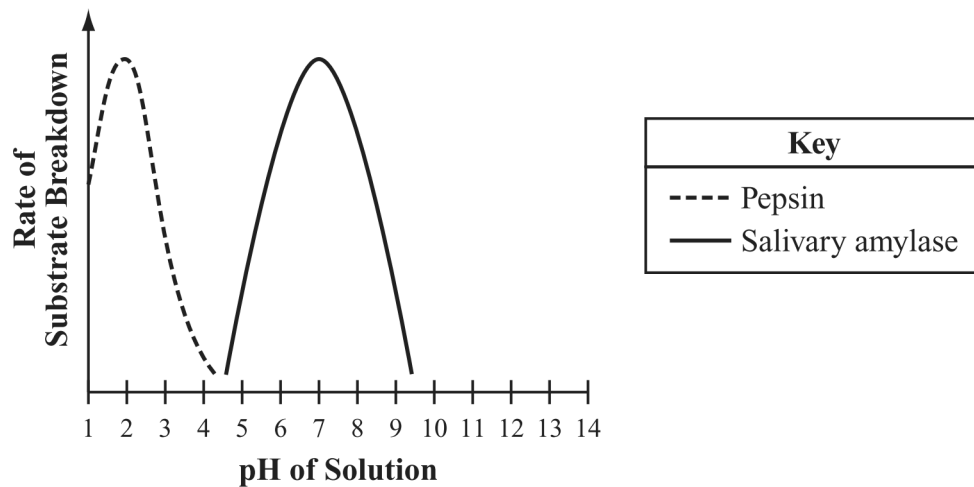


Biology students investigated various human digestive enzymes. The table below summarizes the functions of several different digestive enzymes.

Enzyme	Function
salivary amylase	begins to break down starch into smaller polysaccharides or the disaccharide maltose
pepsin	begins to break down proteins into small polypeptides
pancreatic amylase	continues to break down starch and smaller polysaccharides into disaccharides
lipase	breaks down fats into glycerol, fatty acids, or glycerides
aminopeptidase	breaks down small polypeptides into amino acids

The students conducted experiments to study digestive enzyme activity. In the first experiment, the students observed the rate at which salivary amylase breaks down starch (the substrate) in solutions with different pH values. The students then performed the same type of experiment with pepsin. The graph below shows the students' results for the two experiments.

### Pepsin and Salivary Amylase Activity at Different pH Values



37. Salivary amylase breaks down which class of organic molecules?

- A. carbohydrates
- B. lipids
- C. nucleic acids
- D. proteins

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- |         |   |            |       |
|---------|---|------------|-------|
| 1.      |   | 21.        |       |
| Answer: | D | Answer:    | B     |
| 2.      |   | 22.        |       |
| Answer: | D | Answer:    | D     |
| 3.      |   | 23.        |       |
| Answer: | C | Answer:    | B     |
| 4.      |   | 24.        |       |
| Answer: | D | Answer:    | A     |
| 5.      |   | 25.        |       |
| Answer: | A | Answer:    | A     |
| 6.      |   | 26.        |       |
| Answer: | B | Answer:    | B     |
| 7.      |   | 27.        |       |
| Answer: | C | Answer:    | B     |
| 8.      |   | 28.        |       |
| Answer: | A | Answer:    | A     |
| 9.      |   | 29.        |       |
| Answer: | D | Answer:    | B     |
| 10.     |   | 30.        |       |
| Answer: | C | Answer:    | B     |
| 11.     |   | 31.        |       |
| Answer: | D | Answer:    | B     |
| 12.     |   | 32.        |       |
| Answer: | C | Answer:    | D     |
| 13.     |   | 33.        |       |
| Answer: | C | Answer:    | D     |
| 14.     |   | Objective: | B.06A |
| Answer: | A | 34.        |       |
| 15.     |   | Answer:    | A     |
| Answer: | A | 35.        |       |
| 16.     |   | Answer:    | B     |
| Answer: | A | 36.        |       |
| 17.     |   | Answer:    | A     |
| Answer: | A | 37.        |       |
| 18.     |   | Answer:    | A     |
| Answer: | A |            |       |
| 19.     |   |            |       |
| Answer: | C |            |       |
| 20.     |   |            |       |
| Answer: | C |            |       |