

# National End-of-Course Practice

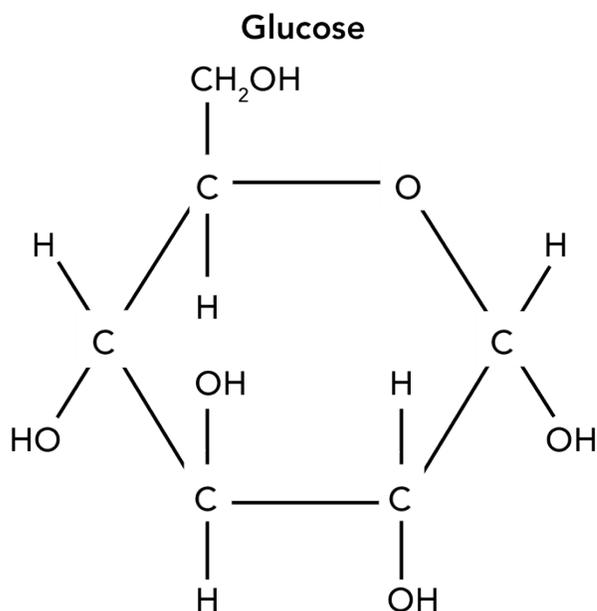
## Chapter 2

### Directions

For multiple choice questions, write the letter that best answers the question or completes the statement on the line provided. For other question types, follow the directions provided.

Refer to the diagram to answer questions 1 and 2.

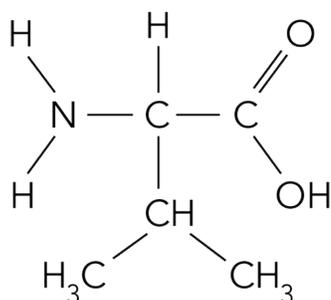
The diagram shows the structure of glucose, a molecule that organisms make and use.



1. Which of these statements describes how organisms could use molecules of glucose?
- I. Several glucose molecules could be assembled into a larger molecule.
  - II. Glucose molecules could be broken apart to form smaller molecules.
  - III. The atoms of glucose molecules could be combined with other elements to form a different molecule.
- (A) I only  
(B) III only  
(C) I and II only  
(D) I and III only  
(E) I, II, and III

2. What structural feature does glucose share with larger organic molecules, including DNA and proteins?
- (A) A basic structure, or backbone, formed by chains of carbon atoms
  - (B) A ratio of 1 carbon atom to 2 hydrogen atoms to 1 oxygen atom
  - (C) The presence of double covalent bonds between carbon atoms
  - (D) Strong bonds between carbon atoms that cannot be broken
  - (E) Ionic bonds between carbon atoms and oxygen atoms
3. Roger is comparing a model of a sugar molecule to a model of an amino acid. Which of the following evidence statements would be supported by the two models?
- (A) Sugars and amino acids are made of exactly the same elements.
  - (B) Sugars and amino acids have the same structure.
  - (C) Sugars and amino acids are made of the same elements except amino acids also contain nitrogen.
  - (D) Sugars and amino acids are made of the same elements except sugars also contain phosphorus.
  - (E) Sugars and amino acids are both polymers.
4. Lisa is investigating a chemical reaction involving carbon compounds. Which of these results could NOT occur, according to scientific laws about chemical reactions, matter, and energy?
- (A) The reaction releases energy to the environment.
  - (B) The reaction absorbs energy from the environment.
  - (C) The mass of carbon in the products is greater than the mass of carbon in the reactants.
  - (D) The mass of carbon in the products is equal to the mass of carbon in the reactants.
  - (E) The reaction occurs faster in the presence of a certain protein.
5. Two students are developing a computer simulation of a chemical reaction that forms amino acids. Their simulation uses colored spheres to represent atoms of different elements. It uses lines connecting the spheres to represent chemical bonds. For the simulation to be accurate, which of these features should be included?
- (A) lines that break and reform between the spheres
  - (B) spheres that break apart into small pieces
  - (C) spheres that disappear during the simulated course of the reaction
  - (D) spheres that appear during the simulated course of the reaction
  - (E) lines that never break once they are placed

6. The diagram shows the structure of valine, an amino acid.



Jan is researching a procedure to synthesize valine from glucose and other compounds. The procedure involves several chemical reactions. Most likely, one of the reactions will accomplish which of these tasks?

- (A) removing sulfur atoms from a 6-carbon sugar
  - (B) adding oxygen atoms to a 6-carbon sugar
  - (C) adding an amino group (-NH<sub>2</sub>) to a carbon compound
  - (D) removing a carboxyl group (-COOH) from a carbon compound
  - (E) adding double bonds between two carbon atoms
7. Atoms of carbon, oxygen, and hydrogen are found in all biological macromolecules. Which macromolecules are made ONLY of these three elements?
- (A) carbohydrates only
  - (B) carbohydrates and lipids
  - (C) carbohydrates, lipids, and nucleic acids
  - (D) lipids, proteins, and nucleic acids
  - (E) carbohydrates, proteins, and nucleic acids
8. A cell gains energy by combining glucose with oxygen in a series of chemical reactions. The products are carbon dioxide and water. What is the source of this energy?
- (A) the forces that attract protons and neutrons within carbon nuclei
  - (B) the breaking of chemical bonds within the molecules of the reactants
  - (C) the breaking of chemical bonds within the molecules of the products
  - (D) the kinetic energy of oxygen molecules
  - (E) strong forces within the atomic nuclei of the reactants

9. Circle each word or phrase that completes the sentence accurately.

Glucose is an example of a (**monosaccharide / polysaccharide / disaccharide**). Many glucose molecules may join together to form a complex (**lipid / carbohydrate / protein**), such as (**carbonic anhydrase / cellulose / RNA**).

10. A carbon atom has four valence electrons. How do all living things depend on this property and other special chemical properties of the carbon atom?

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