

## Macromolecule Practice Test

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

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

- Which of the following compounds is *most* likely to be part of living organisms?
  - $C_6H_{12}O_6$
  - $BF_3$
  - $MoCl_2$
  - $CsI$
- 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?

  - carbohydrates
  - lipids
  - nucleic acids
  - proteins
- Most carbohydrates in the human body are
  - used as building blocks for proteins
  - used as catalysts for reactions in cells
  - consumed as a source of energy
  - not easily absorbed into the bloodstream
- 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
- 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.

Use the information to answer the the following question(s).

### DNA

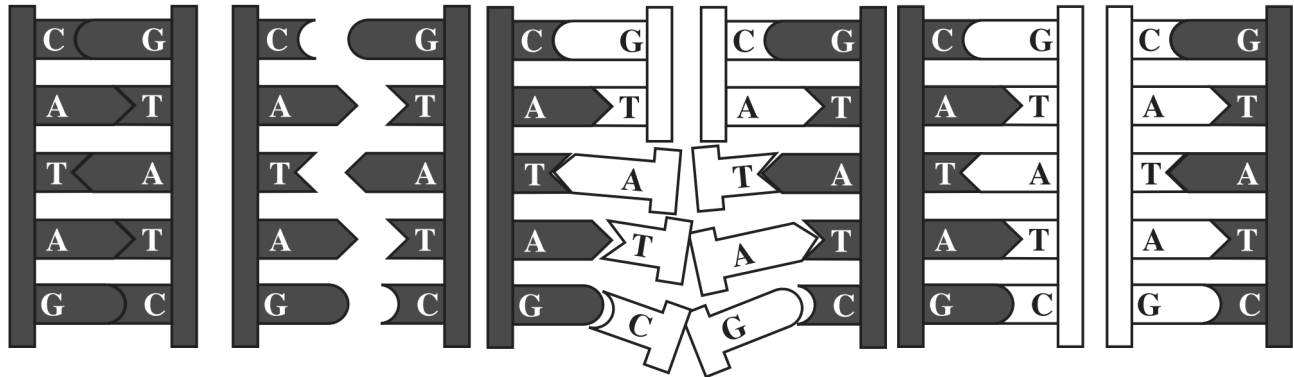
Scientists study DNA to understand heredity, disease, and the evolutionary history of organisms. During these studies, DNA must first be separated into two complementary strands. Next, the appropriate nucleotides are attached to the nucleotides in each original strand to produce two new complete DNA strands. The diagram below shows a simple model of this process. The letters A, T, C, and G represent the four nucleotides.

**Original DNA Molecule**

**Stage 1**  
Original molecule is separated into two complementary strands.

**Stage 2**  
Nucleotides are attached to original strands.

**Stage 3**  
The result is two complete DNA molecules.



6. Which table correctly compares the DNA, cell shape, and proteins produced by a liver cell and a nerve cell from the same organism?

- A. 

	DNA	Cell Shape	Proteins Produced
Liver and nerve cells	same	different	different
- B. 

	DNA	Cell Shape	Proteins Produced
Liver and nerve cells	same	same	different
- C. 

	DNA	Cell Shape	Proteins Produced
Liver and nerve cells	different	different	different
- D. 

	DNA	Cell Shape	Proteins Produced
Liver and nerve cells	different	different	same

7. Many aquatic birds secrete waxy organic substances that repel water. The birds use these substances to coat their feathers. An analysis of these substances would reveal that they are composed mostly of

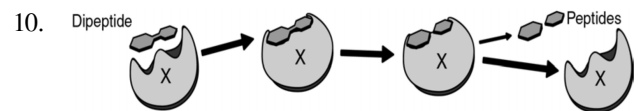
- A. lipids.                      B. proteins.  
C. carbohydrates.            D. nucleic acids.

8. Which of the following is the main reason that humans need to include carbohydrates in their diet?

- A. Carbohydrates are broken down in cells for energy.  
B. Carbohydrates combine to form many different proteins.  
C. Carbohydrates act as catalysts to speed up chemical reactions.  
D. Carbohydrates are the building blocks for cell growth and repair.

9. 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



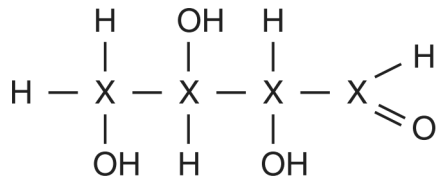
In the diagram above, the substance labeled X is *most likely*—

- A. an enzyme.                      B. water.  
C. ATP.                                D. oxygen.

11. An amoeba in a pond engulfs and consumes a paramecium. The amoeba uses which of the following to quickly break down the organic molecules in the paramecium?

- A. enzymes                          B. glucose  
C. polysaccharides                D. water

12. The structure of an organic molecule is represented below.



In this organic molecule, which element is identified by each X?

- A. iron                                  B. carbon  
C. sodium                                D. phosphorus
13. Which of the following *best* explains why enzymes are necessary for many cellular reactions?
- A. Enzymes supply the oxygen necessary for the reactions.  
B. Enzymes change reactants from solid to liquid during the reactions.  
C. The reactions take up too much space in the cell if enzymes are missing.  
D. The reactions are too slow to meet the needs of the cell if enzymes are missing.
14. All living things contain which element?
- A. helium                                B. sodium  
C. copper                                 D. carbon

15. What characteristic of carbon (C) makes it essential to living organisms?
- A. Carbon forms crystal structures under certain conditions.  
B. Carbon can exist as a solid, liquid, or gas.  
C. Carbon bonds in many ways with itself to form chains.  
D. Carbon exists in radioactive forms.

16. Muscle cells need to quickly convert energy from food molecules into a usable form. For this reason, which of the following do muscle cells have in *greater* numbers than most other types of cells?
- A. chromosomes                        B. mitochondria  
C. nuclei                                 D. vacuoles
17. All of the following are organic molecules *except*—
- A. protein.                                B. lipid.  
C. carbohydrate.                        D. salt.

18. Which of the following is a central role of carbon in the chemistry of living organisms?

- A. Carbon can only bond with other carbon atoms.
- B. Carbon is a solvent that breaks chemical bonds.
- C. Carbon readily forms ionic bonds that separate easily.
- D. Carbon can form many types of molecules with covalent bonds.

19. Acetylcholine is an important chemical signal in the nervous system. Once acetylcholine is released, it is quickly broken down into other chemicals because of the activity of cholinesterase.

Cholinesterase is which of the following?

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

20. The molecules made by living cells are *mainly* assembled around which element?

- A. Calcium
- B. Carbon
- C. Hydrogen
- D. Oxygen

21. Which of the following is a lipid?

- A. Cholesterol
- B. Cellulose
- C. Glucose
- D. Protein

22. A student is preparing to run in a school track competition. For the quickest source of energy, the student should eat a food that contains a high percentage of

- A. carbohydrates.
- B. fat.
- C. proteins.
- D. sodium.

23. The role of an enzyme in a chemical reaction is to change which of the following?

- A. the type of reaction
- B. the activation energy of the reaction
- C. the pH at which the reaction occurs
- D. the temperature at which the reaction occurs

24. 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

25. Which of the following statements describes the role of ATP in animal cells?
- A. ATP stores and releases energy.
  - B. ATP forms the channels in the plasma membrane.
  - C. ATP serves as the hereditary material in the nucleus.
  - D. ATP attaches to and digests unneeded organic molecules.

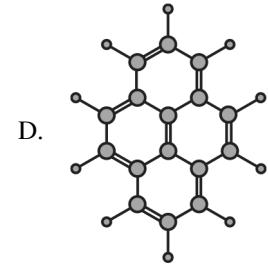
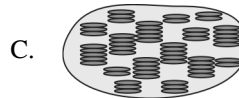
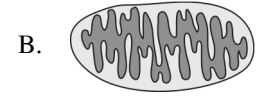
26. The diagram below shows a pair of DNA nucleotides. The nitrogenous base guanine (G) is labeled.



Which nitrogenous base pairs with guanine?

- A. adenine (A)
- B. cytosine (C)
- C. thymine (T)
- D. uracil (U)

27. Which of the following shows a DNA molecule?



28. The table below shows the elemental composition of three different types of organisms.

**Elemental Composition of Selected Organisms (percent by weight)**

Element	Human	Alfalfa	<i>E.coli</i> Bacterium
<b>O</b>	65.0	77.9	73.7
<b>C</b>	18.5	11.3	12.1
<b>H</b>	9.5	8.7	9.9
<b>X</b>	3.3	0.8	3.0
<b>P</b>	1.0	0.7	0.6
<b>S</b>	0.3	0.1	0.3
<b>Total</b>	97.6%	99.5%	99.6%

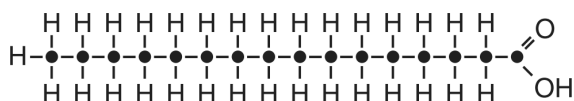
The X in the table represents which of the following elements?

- A. calcium (Ca)
- B. iron (Fe)
- C. nitrogen (N)
- D. sodium (Na)

29. Proteins are made of long chains of—
- A. lipids.                      B. monosaccharides.  
C. amino acids.                D. enzymes.

30. Which of the following is the fundamental element found in all living organisms?
- A. iron                          B. carbon  
C. calcium                      D. magnesium

31. 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
32. Which element is the main component of all organic molecules?
- A. carbon                      B. nitrogen  
C. potassium                    D. sodium

33. In the first step of glycolysis, glucose is converted to glucose-6-phosphate. Which of the following supplies the energy for the reaction?

- A. ATP                          B. RNA  
C. oxygen                      D. hydrogen

34. 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

35. The glucose produced during photosynthesis is an example of a—

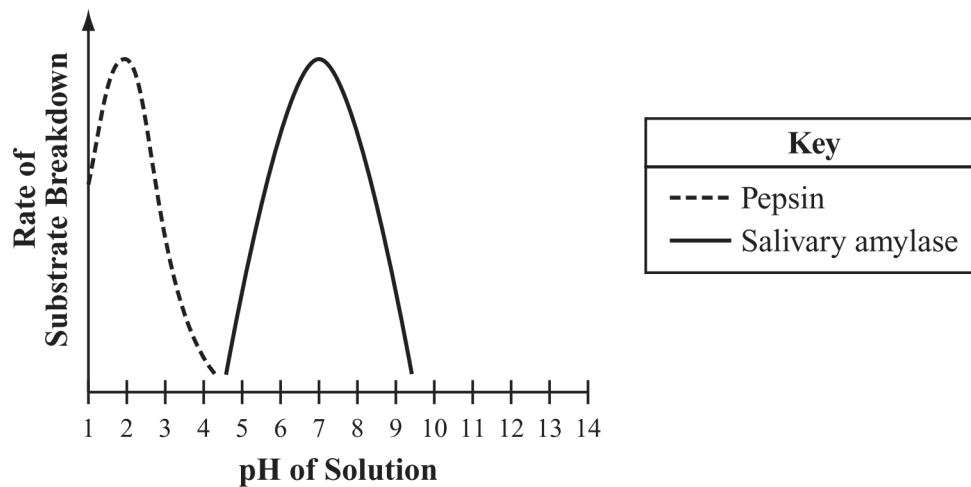
- A. lipid.                        B. monosaccharide.  
C. protein.                      D. nucleic acid.

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





36. Fatty acids are one of the products that result from the action of lipase in the digestive system. What is one way that fatty acids are used in the body?

- A. for storing energy
- B. for encoding genetic information
- C. as the building blocks of antibodies
- D. as the building blocks of hemoglobin

37. A DNA molecule is shaped like a double helix, which looks like a twisted ladder.



DNA Model

Which of the following *best* describes the section of the ladder that contains a hereditary gene?

- A. The top of the ladder
- B. The bottom of the ladder
- C. The vertical sides of the ladder
- D. The horizontal sections of the ladder

38. 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

39. Vitamin D is an organic molecule that regulates the absorption of calcium by the body. Which of the following elements is most common in a molecule of vitamin D?

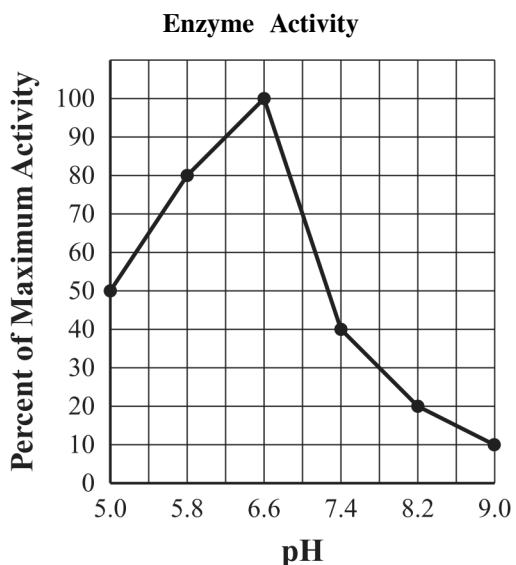
- A. aluminum
- B. carbon
- C. magnesium
- D. sodium

40. ATPases are enzymes that help convert ATP into ADP in cells. When a person exercises, ATPases *directly* increase which of the following?

- A. the amount of energy stored in muscle cells
- B. the number of mitochondria in muscle cells
- C. the number of muscle cells in muscle tissue
- D. the amount of energy released in muscle cells

41. A cell requires a constant energy supply to perform basic life functions. Which two organelles are primarily responsible for energy transformations in the cell?
- nucleus and ribosome
  - lysosome and vacuole
  - mitochondrion and chloroplast
  - endoplasmic reticulum and Golgi apparatus

42. The graph below shows how the activity of an enzyme changes over a range of pH values.



Which of the following conclusions is supported by the data?

- The optimum pH of the enzyme is 6.6.
- The optimum pH of the enzyme is 5.8.
- The enzyme's activity is greater around pH 8.0 than around pH 5.0.
- The enzyme's activity continually increases as pH increases from 5.0 to 9.0.

43. 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)

44. The molecule ATP is composed of elements commonly found in organic molecules. Which of the following is one of these elements?

- aluminum
- calcium
- phosphorus
- tin

45. 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?

- an enzyme
- a hormone
- a lipid
- a sugar

46. 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

47. Which of the following is a primary function of carbohydrates?
- A. storage of energy
  - B. transmission of genetic material
  - C. acceleration of chemical reactions
  - D. transport of molecules across membranes

48. What types of monomers form proteins?
- A. Glucose
  - B. Nucleotides
  - C. Amino acids
  - D. Polyatomic ions

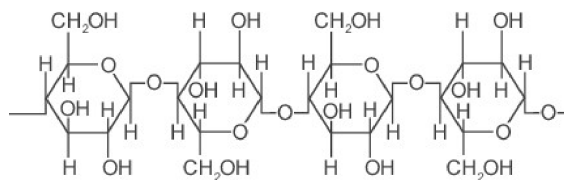
49. Which type of molecule in the yolk of a chicken egg provides the *most* energy for a developing chick?

- A. lipid
- B. nucleic acid
- C. salt
- D. water

50. 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

51. The structural formula of cellulose is shown.



Which phrase correctly describes cellulose?

- A. A polymer made of glucose
- B. A branched form of sucrose
- C. A disaccharide
- D. A simple sugar

52. Which of the following is needed to transfer and release energy?

- A. Calcium
- B. Phosphate
- C. Nitrate
- D. Potassium

53. Scientists have found geysers on one of Saturn's moons. The geysers release water vapor containing complex organic compounds, which may indicate the presence of life.

Which of the following elements is most likely abundant in the organic compounds in the water vapor?

- A. carbon
- B. chlorine
- C. iron
- D. zinc

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



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**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



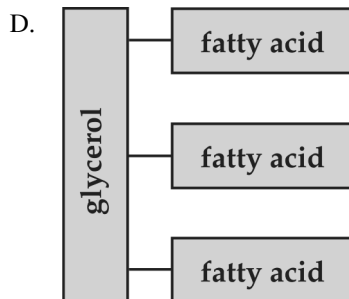
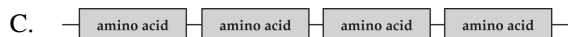
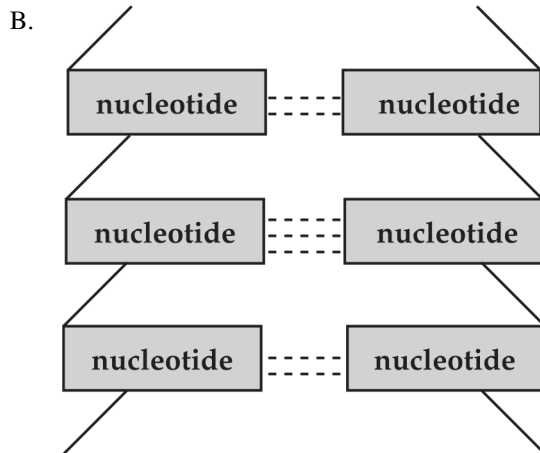
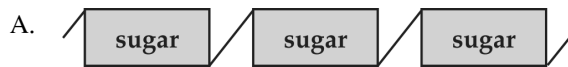
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54. Lemurs' bodies are adapted to efficiently store energy for times when food is scarce. This adaptation may help to explain how lemur ancestors survived the trip across the Mozambique Channel from mainland Africa to Madagascar.

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

55. Amylase is an enzyme that allows the human body to digest starch. Which of these diagrams *best* represents part of the structure of amylase?



56. 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

57. Energy for most chemical reactions in cells is supplied by which of the following molecules?

- A. ATP
- B. DNA
- C. adrenaline
- D. hemoglobin

58. All organisms have ways to produce ATP. Which of the following statements describes why ATP is a critical compound for all cells?

- A. It causes mitosis to begin.
- B. It is an energy-transfer molecule.
- C. It is a major component of cell membranes.
- D. It carries information from DNA to the ribosomes.

59. The clear protein of an egg white becomes opaque and firm when cooked because the heat
- A. mutates the DNA.
  - B. turns the protein into carbohydrates.
  - C. stops protein formation.
  - D. changes the protein structure.

60. 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
- A. applying ice to the bite area.
  - B. drinking large amounts of water.
  - C. inducing vomiting.
  - D. increasing blood flow to the area.

61. Although there are a limited number of amino acids, many different types of proteins exist because the
- A. size of a given amino acid can vary.
  - B. chemical composition of a given amino acid can vary.
  - C. sequence and number of amino acids is different.
  - D. same amino acid can have many different properties.

62. Proteins are large macromolecules composed of thousands of subunits. The structure of the protein depends on the sequence of

- A. lipids.
- B. monosaccharides.
- C. amino acids.
- D. nucleosides.

63. Maltose can be broken down into glucose molecules by the enzyme maltase. Which of the following would slow the reaction rate?

- A. adding maltase
- B. adding maltose
- C. removing glucose
- D. diluting with water

64. 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?

- A. Carbon, hydrogen, and oxygen
- B. Glucose, fructose, and ribose
- C. Peptide, fatty acid, and purine
- D. Water, carbon dioxide, and nitrogen



65. Which group of organic compounds contains fatty acids?

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

66. Cellular respiration involves a series of chemical reactions. Which of the following is a *primary* way that enzymes affect these reactions?

- A. They decrease the pH of the products.
- B. They increase the rate of the reactions.
- C. They take the place of oxygen as a reactant.
- D. They change the location of the reactions in the cell.

67. Carbon atoms in organic molecules *most commonly* bond to atoms of hydrogen, oxygen, and

- A. calcium.
- B. magnesium.
- C. nitrogen.
- D. sodium.

68. In the 1940s and 1950s, scientists did experiments to determine the molecule responsible for heredity.

Their experiments demonstrated that the molecule that encodes and transmits information in organisms is

- A. DNA.
- B. glucosamine.
- C. insulin.
- D. vitamin D.

Macromolecule Practice Test      8/23/2019

1.		15.	
Answer:	A	Answer:	C
Points:	1	Points:	1
2.		16.	
Answer:	B	Answer:	B
Points:	1	Points:	1
3.		17.	
Answer:	C	Answer:	D
Points:	1	Points:	1
4.		18.	
Answer:	D	Answer:	D
Points:	1	Points:	1
5.		19.	
Answer:	C	Answer:	C
Points:	1	Points:	1
6.		20.	
Answer:	A	Answer:	B
Points:	1	Points:	1
7.		21.	
Answer:	A	Answer:	A
Points:	1	Points:	1
8.		22.	
Answer:	A	Answer:	A
Points:	1	Points:	1
9.		23.	
Answer:	B	Answer:	B
Points:	1	Points:	1
10.		24.	
Answer:	A	Answer:	D
Points:	1	Points:	1
11.		25.	
Answer:	A	Answer:	A
Points:	1	Points:	1
12.		26.	
Answer:	B	Answer:	B
Points:	1	Points:	1
13.		27.	
Answer:	D	Answer:	A
Points:	1	Points:	1
14.		28.	
Answer:	D	Answer:	C
Points:	1	Points:	1
		29.	
		Answer:	C
		Points:	1

30.  
Answer: B  
Points: 1

31.  
Answer: A  
Points: 1

32.  
Answer: A  
Points: 1

33.  
Answer: A  
Points: 1

34.  
Answer: A  
Points: 1

35.  
Answer: B  
Points: 1

36.  
Answer: A  
Points: 1

37.  
Answer: D  
Points: 1

38.  
Answer: D  
Objective: B.06A  
Points: 1

39.  
Answer: B  
Points: 1

40.  
Answer: D  
Points: 1

41.  
Answer: C  
Points: 1

42.  
Answer: A  
Points: 1

43.  
Answer: D  
Points: 1

44.  
Answer: C  
Points: 1

45.  
Answer: A  
Points: 1

46.  
Answer: B  
Points: 1

47.  
Answer: A  
Points: 1

48.  
Answer: C  
Points: 1

49.  
Answer: A  
Points: 1

50.  
Answer: B  
Points: 1

51.  
Answer: A  
Points: 1

52.  
Answer: B  
Points: 1

53.  
Answer: A  
Points: 1

54.  
Answer: A  
Points: 1

55.  
Answer: C  
Points: 1

56.  
Answer: B  
Points: 1

57.  
Answer: A  
Points: 1

58.  
Answer: B  
Points: 1

59.  
Answer: D  
Points: 1

60.  
Answer: A  
Points: 1

61.  
Answer: C  
Points: 1

62.  
Answer: C  
Points: 1

63.  
Answer: D  
Points: 1

64.  
Answer: A  
Points: 1

65.  
Answer: B  
Points: 1

66.  
Answer: B  
Points: 1

67.  
Answer: C  
Points: 1

68.  
Answer: A  
Points: 1