

## Chapter 02 Chemistry of Life

### Multiple Choice Questions

1. The smallest unit of an element that still retains the chemical and physical properties of that element is called

- A. an isotope.
- B. a nucleus.
- C. an atom.**
- D. a molecular bond.
- E. a neutrino.

An atom is the smallest unit of an element that still retains the chemical and physical properties of that element.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.01 Distinguish between atoms and elements.*

*Section: 02.01*

*Topic: Chemistry*

2. In an atom, the number of protons always equals the number

- A. of electrons.**
- B. of neutrons.
- C. of neutrons and protons.
- D. of quarks.
- E. of neutrinos.

In an atom, the number of protons always equals the number of electrons.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.02 Describe the structure of an atom.*

*Section: 02.01*

*Topic: Chemistry*

3. How many elements occur naturally?

- A. 112
- B. 92**
- C. 64
- D. 32
- E. 6

There are 92 naturally occurring elements.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.01 Distinguish between atoms and elements.*

*Section: 02.01*

*Topic: Chemistry*

4. The atomic number of an atom is determined by the number of

- A. protons.**
- B. neutrons.
- C. electrons.
- D. protons and neutrons.
- E. protons and electrons.

The atomic number of an atom is determined by the number of protons.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.02 Describe the structure of an atom.*

*Section: 02.01*

*Topic: Chemistry*

### **True / False Questions**

5. An element cannot be broken down by chemical means.

**TRUE**

An element is one of the basic building blocks of matter and cannot be broken down by chemical means.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.01 Distinguish between atoms and elements.*

*Section: 02.01*

*Topic: Chemistry*

### **Multiple Choice Questions**

6. Why is He positioned above Ne in the periodic table?

A. They both have the same atomic mass.

B. They both have the same number of electrons in their outermost orbital.

**C.** They both have a full outermost orbital.

D. They both have the same atomic number.

E. They both have the same number of protons in their nuclei.

He has a full outermost orbital with 2 electrons. Ne has a full outermost orbital with 8 electrons.

*Bloom's Level: 5. Evaluate*

*Learning Outcome: 02.01.02 Describe the structure of an atom.*

*Section: 02.01*

*Topic: Chemistry*

7. Be has an atomic number of 4 and an atomic mass of 9. How many protons does it have?

- A. 4
- B. 5
- C. 9
- D. 13
- E. 7

The atomic number gives the number of protons, so Be has 4 protons.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.01.02 Describe the structure of an atom.*

*Section: 02.01*

*Topic: Chemistry*

8. What is the symbol for sodium?

- A. Na
- B. S
- C. So
- D. N
- E. Dm

Na (short for natrium) is the symbol for sodium.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.01 Distinguish between atoms and elements.*

*Section: 02.01*

*Topic: Chemistry*

9. Which of the following elements will have more than 2 electrons and have a full outer orbital?

- A. He
- B. Ne**
- C. C
- D. N
- E. O

He contains 2 electrons and Ne contains 10 electrons. Both have their outermost orbital filled.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.01.02 Describe the structure of an atom.*

*Section: 02.01*

*Topic: Chemistry*

10. Isotopes of an element differ due to the number of

- A. protons.
- B. neutrons.**
- C. electrons.
- D. both protons and electrons.
- E. neutrinos.

Isotopes of an element differ due to the number of neutrons.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.01.03 Define an isotope and summarize its application in both medicine and biology.*

*Section: 02.01*

*Topic: Chemistry*

11. Carbon dating is a common method employed in dating certain kinds of fossils. It is based upon the radioactive decay of an isotope of carbon ( $C^{14}$ ). Referring to the atomic number of carbon attained from the periodic table, how many neutrons does  $C^{14}$  have?

- A. 2
- B. 4
- C. 8**
- D. 12
- E. 14

Carbon fourteen possesses two more neutrons than carbon twelve, for a total of 8 neutrons.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.01.03 Define an isotope and summarize its application in both medicine and biology.*

*Section: 02.01*

*Topic: Chemistry*

12. What substance is used in medicine to produce various images of organs and tissues?

- A. A mixture
- B. A tracer**
- C. An emulsion
- D. A colloid
- E. A sensor

Tracers, such as iodine 131, can be used in medicine to produce various images of organs and tissues.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.03 Define an isotope and summarize its application in both medicine and biology.*

*Section: 02.01*

*Topic: Chemistry*

## **True / False Questions**

13. Radiation can produce both positive and negative effects for humans.

**TRUE**

Radiation can be used beneficially but can also harm.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.01.03 Define an isotope and summarize its application in both medicine and biology.*

*Section: 02.01*

*Topic: Chemistry*

### **Multiple Choice Questions**

14. A combination of two or more atoms of the same type is called

A. an atomic unit.

**B.** a molecule.

C. a compound.

D. an isotope.

E. an ion.

Two or more atoms of the same type that combine are defined as a molecule.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.04 Distinguish between ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemistry*

15.  $\text{Ca}_3(\text{PO}_4)_2$  represents a/an

- A. element.
- B. mixture.
- C.** compound.
- D. isotope.
- E. atom.

$\text{Ca}_3(\text{PO}_4)_2$  represents a compound because it is a combination of different atoms.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.01.04 Distinguish between ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemistry*

16. Atoms that share electrons have what type of bonds?

- A.** covalent
- B. neutral
- C. hydrogen
- D. colloidal
- E. ionic

Atoms that share electrons have covalent bonds.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01.04 Distinguish between ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemistry*



17.  $\text{CaCl}_2$  is a salt that forms as the result of what type of bond?

- A. covalent
- B. hydrogen
- C. polar
- D. non-polar
- E.** ionic

$\text{CaCl}_2$  is a salt that forms as the result of an ionic bond.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.01.04 Distinguish between ionic and covalent bonds.*

*Section: 02.01*

*Topic: Chemistry*

### **True / False Questions**

18. Water makes up 60-70% of total body weight.

**TRUE**

Water is the most abundant molecule in living organisms.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.02.01 List the properties of water.*

*Section: 02.02*

*Topic: Chemistry*

### **Multiple Choice Questions**

19. Which type of bond is responsible for holding two water molecules together creating the properties of water?

- A. hydrogen
- B. covalent
- C. ionic
- D. polar
- E. double covalent

Hydrogen bonds are the attraction of the hydrogen of one water molecule to the oxygen of a second water molecule. Due to this type of bond, the properties of water are established.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.02.02 Explain the role of hydrogen bonds in the properties of water.*

*Section: 02.02*

*Topic: Chemistry*

20. Hydrogen bonds

- A. result from the loss of neutrons by an atom.
- B. result in the formation of salts.
- C. involve the loss and gain of electrons.
- D. involve the sharing of electrons.
- E. are relatively weak and can be broken rather easily.

Hydrogen bonds are relatively weak and can be broken rather easily, but are very strong because there are so many of them.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.02.02 Explain the role of hydrogen bonds in the properties of water.*

*Section: 02.02*

*Topic: Chemistry*

21. The reason water is polar is because
- A. in polar molecules atoms share electrons evenly.
  - B.** the oxygen atom is larger than the hydrogen atom.
  - C. hydrophilic molecules interact with water.
  - D. hydrophobic molecules do not interact with water.
  - E. there is a transfer of electrons from the hydrogen to the oxygen.

Because the oxygen is larger than the hydrogen, the electron spends more time circling the oxygen, and therefore, water is polar.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.02.02 Explain the role of hydrogen bonds in the properties of water.*

*Section: 02.02*

*Topic: Chemistry*

22. Which of the following characteristics of water is most responsible for the sinking of the Titanic?
- A. Water is liquid at room temperature.
  - B. Water has a high heat of vaporization.
  - C. The temperature of liquid water rises and falls slowly.
  - D.** Frozen water is less dense than liquid water.
  - E. Water molecules are cohesive.

Since frozen water is less dense than liquid water, ice, including icebergs, will float in liquid water.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.02.01 List the properties of water.*

*Section: 02.02*

*Topic: Chemistry*

23. On a warm day in April, Tina jumped into the swimming pool. To her surprise the water was really cold. Which property of water did she discover?

- A. Water molecules are cohesive.
- B.** The temperature of liquid water rises and falls slowly.
- C. Water possesses hydrogen bonds.
- D. Water is a polar molecule.
- E. Frozen water is less dense than liquid water.

Water is a good temperature buffer because a great deal of energy is required to raise the temperature of water.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.02.01 List the properties of water.*

*Section: 02.02*

*Topic: Chemistry*

24. William noticed water mysteriously climbing up a capillary tube. This is an example of which property of water?

- A. Frozen water is less dense than liquid water.
- B. The temperature of liquid water rises and falls slowly.
- C.** Water molecules are cohesive.
- D. Water has a high heat of vaporization.
- E. Water is a solvent.

Water climbing up a capillary tube is an example of the cohesive nature of water.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.02.01 List the properties of water.*

*Section: 02.02*

*Topic: Chemistry*

25. In an acidic solution

- A. the number of  $H^+$  is less than the number of  $OH^-$ .
- B.** the number of  $H^+$  is greater than the number of  $OH^-$ .
- C. the number of  $H^+$  is equal to the number of  $OH^-$ .
- D. the number of  $H^+$  is 3 times less than the number of  $OH^-$ .
- E. the number of  $H^+$  is 10 times less than the number of  $OH^-$ .

In an acidic solution the number of  $H^+$  is greater than the number of  $OH^-$ .

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.02.03 Summarize the structure of the pH scale and the importance of buffers to biological systems.*

*Section: 02.02*

*Topic: Chemistry*

### **True / False Questions**

26. A solution with a pH of 7 has 10 times as many  $H^+$  as a pH of 6.

**FALSE**

A pH of 7 actually has 10 times fewer  $H^+$  as a pH of 6.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.02.03 Summarize the structure of the pH scale and the importance of buffers to biological systems.*

*Section: 02.02*

*Topic: Chemistry*

### **Multiple Choice Questions**

27. A solution containing 0.00001 moles of  $H^+$  has a pH of

- A. 3
- B. 5**
- C. 7
- D. 9
- E. 11

This (0.00001 moles) is the same as  $1 \times 10^{-5}$  moles, so the pH would be 5.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.02.03 Summarize the structure of the pH scale and the importance of buffers to biological systems.*

*Section: 02.02*

*Topic: Chemistry*

### **True / False Questions**

28. The presence of a buffer in our blood is an example of homeostasis.

**TRUE**

A buffer maintains the pH within a normal range which is required for homeostasis.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.02.03 Summarize the structure of the pH scale and the importance of buffers to biological systems.*

*Section: 02.02*

*Topic: Chemistry*

### **Multiple Choice Questions**

29. Joining small molecules (monomers) together to form longer chains (polymers) requires a process called

- A. a hydrolysis reaction.
- B.** a dehydration reaction.
- C. monomerization.
- D. emulsification.
- E. disassembly.

Polymerization of monomers into polymers requires a process called a dehydration reaction.

This (0.00001 moles) is the same as  $1 \times 10^{-5}$  moles, so the pH would be 5.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03.02 Describe the processes by which the organic molecules are assembled and disassembled.*

*Section: 02.03*

*Topic: Chemistry*

30. Which of the following is not one of the four classes of organic molecules found in cells?

- A.** vitamins
- B. lipids
- C. proteins
- D. carbohydrates
- E. nucleic acids

Vitamins are not one of the four categories of organic molecules unique to cells.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.03.01 List the four classes of organic molecules that are found in cells.*

*Section: 02.03*

*Topic: Chemistry*

### **True / False Questions**

31. In biology, calling something organic means that it was grown without the use of any type of herbicide.

**FALSE**

False. In Biology organic refers to molecules that have carbon and hydrogen in them. This is usually associated with living organisms.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03.01 List the four classes of organic molecules that are found in cells.*

*Section: 02.03*

*Topic: Chemistry*

32. NaCl is not an organic molecule.

**TRUE**

Organic molecules contain carbon and hydrogen and NaCl does not.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.03.01 List the four classes of organic molecules that are found in cells.*

*Section: 02.03*

*Topic: Chemistry*

33. After lunch our digestive system will use the process of hydrolysis to break the food down into smaller subunits.

**TRUE**

True. Hydrolysis is the process of breaking down food into smaller subunits.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03.02 Describe the processes by which the organic molecules are assembled and disassembled.*

*Section: 02.03*

*Topic: Chemistry*



34. A hydrolysis reaction involves the loss of water.

**FALSE**

A hydrolysis reaction involves the addition of water.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.03.02 Describe the processes by which the organic molecules are assembled and disassembled.*

*Section: 02.03*

*Topic: Chemistry*

### **Multiple Choice Questions**

35. Which grouping of elements is found in carbohydrates?

**A.** C - H - O

B. C - H - P

C. H - O - Cl

D. N - S - O

E. Ca - H - O

Carbon (C), Hydrogen (H), and Oxygen (O) are the primary elements that make up the basic structure of carbohydrates.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Summarize the basic chemical properties of a carbohydrate.*

*Section: 02.04*

*Topic: Chemistry*

36. Sugars with three to seven carbon atoms are called

- A. monosaccharides.
- B. disaccharides.
- C. trisaccharides.
- D. polysaccharides.
- E. steroids.

Sugars with only three to seven carbon atoms are called simple sugars or monosaccharides.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Summarize the basic chemical properties of a carbohydrate.*

*Section: 02.04*

*Topic: Chemistry*

37. If a person is looking to eat a breakfast that will help supply them with energy for the entire course of the day, which of the following foods would they want to include?

- A. pancakes with maple syrup
- B. bacon, eggs, and toast
- C. cup of coffee and a donut
- D. bowl of grapes and a glass of milk
- E. All of these choices would provide the same potential for all day energy.

Pancakes with maple syrup would provide the person with the best form of complex carbohydrates (polysaccharides). These would be broken down slowly over the course of the day providing a long term source of energy. Bacon, eggs, and toast would have a limited amount of carbohydrates available for energy. This meal would primarily provide protein and fats to the person. A cup of coffee and a donut would provide almost no polysaccharides. The donut is primarily composed of glucose. A bowl of grapes and a glass of milk would provide the person with a large amount of disaccharides.

*Bloom's Level: 5. Evaluate*

*Learning Outcome: 02.04.02 State the roles of carbohydrates in human physiology.*

*Section: 02.04*

*Topic: Chemistry*

38. Which of the following is not a monosaccharide?

- A. glucose
- B. fructose
- C. galactose
- D.** maltose
- E. None of these are monosaccharides.

All of these are single sugars except maltose which is a disaccharide composed of two glucose molecules.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.01 Summarize the basic chemical properties of a carbohydrate.*

*Section: 02.04*

*Topic: Chemistry*

39. Which polysaccharide is stored as an energy source in the body of animals?

- A.** glycogen
- B. glucose
- C. cellulose
- D. starch
- E. chitin

Glycogen is a polysaccharide that is stored in the muscle tissue and blood of animals.

Glucose is a monosaccharide that can be found in both plant and animals. Cellulose and starch are both polysaccharides that are found in members of Kingdom Plantae. Chitin is a polysaccharide found in the fungi and the exoskeleton of insects and crustaceans. It is not stored as an energy source.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.04.03 Compare the structure of simple and complex carbohydrates.*

*Section: 02.04*

*Topic: Chemistry*

40. What passes through the digestive tract as fiber or roughage?

- A. Maltose
- B. Glucose
- C. Glycogen
- D. Starch
- E.** Cellulose

Cellulose passes through the digestive tract as fiber or roughage because we are unable to break it down.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04.04 Explain the importance of fiber in the diet.*

*Section: 02.04*

*Topic: Chemistry*

41. Which of the following foods would be a good source of fiber?

- A.** All of these are good sources of fiber.
- B. peaches
- C. whole wheat bread
- D. peanuts
- E. bran cereal

All of these are a good source of fiber. Fruits are a type of soluble fiber. Bran, nuts, seeds, and whole wheat foods are forms of insoluble fiber.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.04.04 Explain the importance of fiber in the diet.*

*Section: 02.04*

*Topic: Chemistry*

42. Which polysaccharide is branched the most?

- A. cellulose
- B. starch
- C. glycogen**
- D. glucose
- E. fructose

Glycogen has more side chains than the others. Glucose and fructose are monosaccharides with relatively few side branches.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.04.03 Compare the structure of simple and complex carbohydrates.*

*Section: 02.04*

*Topic: Chemistry*

43. Which polysaccharide is consumed as a source of fiber?

- A. cellulose**
- B. glycogen
- C. glucose
- D. chitin
- E. starch

Cellulose is the main polysaccharide that functions as a source of fiber in our diets. Glycogen is a polysaccharide but it acts as a backup source of energy for our body. Glucose is a monosaccharide that acts as a quick source of energy for our body. Chitin is a polysaccharide but it is not a source of fiber for our body. Starch is a polysaccharide but it is digested into glucose and used as a source of energy.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.04.04 Explain the importance of fiber in the diet.*

*Section: 02.04*

*Topic: Chemistry*

## **True / False Questions**

44. The main function of carbohydrates is for long-term energy storage.

**FALSE**

The main function of carbohydrates is for quick and short-term energy storage.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.04.02 State the roles of carbohydrates in human physiology.*

*Section: 02.04*

*Topic: Chemistry*

45. Our body is capable of converting starch into glycogen.

**TRUE**

We eat starchy foods, and the glucose enters the bloodstream. The liver then can store this glucose as glycogen.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.04.02 State the roles of carbohydrates in human physiology.*

*Section: 02.04*

*Topic: Chemistry*

### **Multiple Choice Questions**

46. Starch, cellulose, and glycogen are alike in that

- A.** they are all made of glucose.
- B. they contain the same number of side chains.
- C. they have the same types of bonds between the monomer units.
- D. they are all found in animals.
- E. they can all be digested by our bodies.

Starch, glycogen, and cellulose are all made of glucose molecules.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.04.03 Compare the structure of simple and complex carbohydrates.*

*Section: 02.04*

*Topic: Chemistry*

47. A fat contains how many fatty acids?

- A. 1
- B. 2
- C. 3**
- D. 4
- E. 5

A fat, or triglyceride, contains three fatty acids.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.05.01 Compare the structure of fats, phospholipids, and steroids.*

*Section: 02.05*

*Topic: Chemistry*

48. How are fats, phospholipids, and steroids alike?

- A. They are all solid at room temperature.
- B. They each contain a polar phosphate group.
- C. They each contain only 1 fatty acid.
- D. They do not dissolve in water.**
- E. They all contain at least one carbon ring.

All lipids are insoluble in water.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.05.01 Compare the structure of fats, phospholipids, and steroids.*

*Section: 02.05*

*Topic: Chemistry*

49. A fatty acid that contains only single bonds between the carbon atoms is considered  
**A.** saturated.  
B. unsaturated.  
C. trans unsaturated.  
D. a cholesterol.  
E. a steroid.

If all the carbon atoms are connected by single bonds, the fatty acid is considered saturated.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.05.01 Compare the structure of fats, phospholipids, and steroids.*

*Section: 02.05*

*Topic: Chemistry*

### **True / False Questions**

50. Fats are usually of animal origin while oils are usually of plant origin.

**TRUE**

Fats, such as lard and butter, are of animal origin, while oils, such as corn oil and soybean oil, are of plant origin.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.05.01 Compare the structure of fats, phospholipids, and steroids.*

*Section: 02.05*

*Topic: Chemistry*

### **Multiple Choice Questions**



51. The sex hormones belong to which category of lipids?

- A. steroids
- B. fats
- C. oils
- D. triglycerides
- E. phospholipids

The sex hormones are steroids.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.05.02 State the function of each class of lipids.*

*Section: 02.05*

*Topic: Chemistry*

52. The membranes of cells are composed of

- A. phospholipids.
- B. fats.
- C. oils.
- D. steroids.
- E. triglycerides.

Membranes are bilayers of phospholipids.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.05.02 State the function of each class of lipids.*

*Section: 02.05*

*Topic: Chemistry*

### **True / False Questions**

53. Fats and oils function better than other biological molecules as energy-storage molecules because of the carbon they contain.

**FALSE**

Fats and oils function well as energy-storage molecules because they contain more energy per gram than other biological molecules. All organic molecules contain carbon.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.05.02 State the function of each class of lipids.*

*Section: 02.05*

*Topic: Chemistry*

### **Multiple Choice Questions**

54. The monomer unit of a protein is

A. fatty acids.

**B.** amino acids.

C. monosaccharides.

D. polysaccharides.

E. nucleic acids.

Proteins are composed of amino acids.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.06.02 Explain how amino acids are combined to form proteins.*

*Section: 02.06*

*Topic: Chemistry*

55. What makes each amino acid unique?

- A. the central carbon
- B. the R group**
- C. the amino group
- D. the carboxyl group
- E. the carbon ring

The R group for each amino acid is unique.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.06.01 Describe the structure of an amino acid.*

*Section: 02.06*

*Topic: Chemistry*

56. Which of the following is not a function of proteins?

- A. quick energy**
- B. support
- C. transport
- D. enzymes
- E. motion

Carbohydrates, not proteins, serve as a source of quick energy.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.06.01 Describe the structure of an amino acid.*

*Section: 02.06*

*Topic: Chemistry*

57. Why does a protein not function after it has been denatured?

- A.** The normal bonding between the R groups has been disturbed and the protein loses its normal shape.
- B. The normal bonding between the beta sheets has been disturbed and the protein loses its normal shape.
- C. The normal bonding between the hydrogens in the alpha helix has been disturbed and the protein loses its normal shape.
- D. The R groups form additional bonds causing the structure to become more compact.
- E. The normal peptide bonds are ruptured and the individual amino acids are not held together any more.

During denaturation the normal bonding between the R groups has been disturbed and the protein loses its normal shape. This is due to changes in temperature and / or pH.

*Bloom's Level: 5. Evaluate*

*Learning Outcome: 02.06.02 Explain how amino acids are combined to form proteins.*

*Section: 02.06*

*Topic: Chemistry*

58. An alpha helix or a beta sheet are examples of what level of protein structure?

- A.** secondary
- B. primary
- C. tertiary
- D. quaternary
- E. octagon

The secondary structure of a protein can be an alpha helix or a beta sheet.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.06.03 Summarize the four levels of protein structure.*

*Section: 02.06*

*Topic: Chemistry*

59. Which level of protein structure is characterized by alpha and beta sheets in which hydrogen bonding holds the shape in place?

- A. secondary structure
- B. primary structure
- C. tertiary structure
- D. quaternary structure
- E. pentagonal structure

The secondary structure is characterized by alpha and beta sheets in which hydrogen bonding holds the shape in place. The primary structure is characterized by a straight chain sequence of amino acids. The tertiary structure is characterized by the combination secondary structures in a three dimensional shape. Shape is maintained by the bonding between the R groups. Quaternary structures are composed of multiple polypeptides that are bonded to each other. There is no such protein level as a pentagonal structure.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.06.03 Summarize the four levels of protein structure.*

*Section: 02.06*

*Topic: Chemistry*

60. When two amino acids combine via a dehydration reaction,

- A. a peptide bond is formed.
- B. the R groups are lost.
- C. water is added to begin the reaction.
- D. the carboxyl group of each join together.
- E. the amino group of each join together.

XWhen two amino acids form a dipeptide, a peptide bond is formed between the carboxyl group of one and the amino group of the other.

*Bloom's Level: 3. Apply*

*Learning Outcome: 02.06.02 Explain how amino acids are combined to form proteins.*

*Section: 02.06*

*Topic: Chemistry*

### **True / False Questions**

61. The primary level of protein structure is composed of amino acids in a linear sequence joined by peptide bonds.

**TRUE**

True. The primary level of protein structure is composed of amino acids in a linear sequence joined by peptide bonds.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.06.03 Summarize the four levels of protein structure.*

*Section: 02.06*

*Topic: Chemistry*

62. All amino acids are alike in that their R groups are polar.

**FALSE**

The R groups of an amino acid can be polar or nonpolar.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.06.01 Describe the structure of an amino acid.*

*Section: 02.06*

*Topic: Chemistry*

## **Multiple Choice Questions**

63. The sides of the DNA ladder (backbone) are

- A. alternating carbons and nitrogens.
- B. the *R* groups.
- C. the nitrogenous bases.
- D. alternating nitrogens and phosphates.
- E.** sugars and phosphates.

Sugars and phosphates make up the sides of the DNA ladder.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.07.01 Explain the differences between RNA and DNA.*

*Section: 02.07*

*Topic: Chemistry*

64. When an ATP molecule is used to supply energy, which of the following occurs?

- A. a phosphate bond is added
- B.** a phosphate bond is broken
- C. oxygen is removed
- D. oxygen is added
- E. an adenine is added

A phosphate bond is broken when ATP is converted to ADP + phosphate + energy.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.07.02 Summarize the role of ATP in cellular reactions.*

*Section: 02.07*

*Topic: Chemistry*

65. Which of the following nitrogenous bases is NOT found in DNA?

- A. cytosine
- B. thymine
- C. uracil**
- D. guanine
- E. adenine

Uracil is found in RNA, not DNA.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.07.01 Explain the differences between RNA and DNA.*

*Section: 02.07*

*Topic: Chemistry*

66. Which of the following is not present in a nucleotide?

- A. phosphate
- B. nitrogenous base
- C. 5 ring sugar
- D. an R group**
- E. a pentose

R groups are found in amino acids, not nucleotides.

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.07.01 Explain the differences between RNA and DNA.*

*Section: 02.07*

*Topic: Chemistry*



67. A species has 29% of its DNA composed of the nucleotide containing guanine (G). What percent does the nitrogen base thymine (T) equal?

- A. 58%
- B. 42%
- C. 21%**
- D. 67%
- E. 29%

In DNA G pairs with C and A pairs with T. If G is 29% then C would be 29%. The combination of G (guanine) and C (cytosine) would equal 58%. This would leave 42% for the combination of A (adenine) and T (thymine). Since A and T are equal then both A and T would comprise 21%.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.07.01 Explain the differences between RNA and DNA.*

*Section: 02.07*

*Topic: Chemistry*

68. ATP carries energy in the form of high-energy

- A. carbohydrate bonds.
- B. peptide bonds.
- C. lipid bonds.
- D. phosphate bonds.**
- E. hydrogen bonds

ATP carries energy in the form of high-energy phosphate bonds.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.07.02 Summarize the role of ATP in cellular reactions.*

*Section: 02.07*

*Topic: Chemistry*

## **True / False Questions**

69. The function of RNA in the body is to store the genetic information in the nucleus.

**FALSE**

The function of DNA is to store genetic information in the nucleus.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.07.01 Explain the differences between RNA and DNA.*

*Section: 02.07*

*Topic: Chemistry*

70. ATP is called the energy currency of the body because it is a type of electricity.

**FALSE**

ATP is called the energy currency of the body because it can be spent (like money or currency) to facilitate reactions.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.07.02 Summarize the role of ATP in cellular reactions.*

*Section: 02.07*

*Topic: Chemistry*

### **Short Answer Questions**

71. List the function of proteins that are formed from a combination of amino acids.

Functions of proteins include:

1. support
2. enzymes that bring reactants together in chemical reactions
3. transport of substance through the cell membrane and within the cell
4. defense of the body from foreign substances
5. hormones that serve as intercellular messengers
6. motion of the body

*Bloom's Level: 6. Create*

*Learning Outcome: 02.06.02 Explain how amino acids are combined to form proteins.*

*Section: 02.06*

*Topic: Chemistry*

72. List the properties of water.

1. Water has a high heat capacity.
2. Water has a high heat of evaporation.
3. Water is a solvent.
4. Water molecules are cohesive and adhesive.
5. Frozen water is less dense than liquid water.

*Bloom's Level: 6. Create*

*Learning Outcome: 02.02.01 List the properties of water.*

*Section: 02.02*

*Topic: Chemistry*

73. Describe the structure and function of the DNA molecule.

DNA is composed of a phosphate group, nitrogen-containing base, and a 5 carbon (pentose) sugar. The nitrogen-containing base can have one of four bases associated with it (adenine, thymine, cytosine, and guanine).

Functions of DNA include: stores information about how to copy or replicate itself and specifies the order in which amino acids are joined to make a protein.

*Bloom's Level: 6. Create*

*Learning Outcome: 02.07.01 Explain the differences between RNA and DNA.*

*Section: 02.07*

*Topic: Chemistry*