

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Hydrogen bonds are found in all of the following EXCEPT 1) _____
- A) between water molecules.
 - B) in α -helices.
 - C) between the R groups of amino acids in proteins.
 - D) between phosphates in ATP.
 - E) in the DNA double helix between nucleotides.

Answer: D

- Explanation: A)
B)
C)
D)
E)

- 2) Which of the following is a property of water? 2) _____
- A) It is not a common reactant in metabolic reactions.
 - B) It is liquid in a very narrow temperature range.
 - C) It is a nonpolar molecule.
 - D) It has a high capacity for heat.
 - E) It is not a good solvent.

Answer: D

- Explanation: A)
B)
C)
D)
E)

- 3) Amylose is a(n) _____ carbohydrate. 3) _____
- A) nucleotide B) polymer C) monomer D) simple E) ionic

Answer: B

- Explanation: A)
B)
C)
D)
E)

4) A protein is a _____ of amino acids.

4) _____

- A) decomposition product
- B) solution
- C) bilayer
- D) monomer
- E) polymer

Answer: E

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

5) An acid dissociates in water to release

5) _____

- A) anion(s).
- B) hydrogen ion(s).
- C) hydroxyl group(s).
- D) cation(s).
- E) both anions and hydrogen ions.

Answer: E

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

6) A(n) _____ is a compound that dissolves into anions and cations in water.

6) _____

- A) buffer
- B) acid
- C) base
- D) salt
- E) catalyst.

Answer: D

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

7) Nucleic acids, proteins, and complex carbohydrates are all produced by

7) _____

- A) catabolic reactions.
- B) dehydration synthesis.
- C) hydrolytic reactions.
- D) exchange reactions.
- E) hydrogen bonding.

Answer: B

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

8) Which of the following statements concerning nucleic acids is FALSE? 8) _____
A) Not all DNA is double stranded.
B) Nucleic acid strands are held together by hydrogen bonds between complementary bases.
C) Cytosine is found in all nucleic acid molecules.
D) The nucleic acid polymer is composed of peptide bonds.
E) Some viruses have DNA as their genomes.

Answer: D

Explanation: A)
B)
C)
D)
E)

9) Which parts of the atoms interact in a chemical reaction? 9) _____
A) protons B) ions C) neutrons D) electrons E) isotopes

Answer: D

Explanation: A)
B)
C)
D)
E)

10) Which of the following is NOT a characteristic of saturated fats? 10) _____
A) They contain at least one double bond.
B) They are found in animals.
C) They are a form of stored energy.
D) They are usually solid at room temperature.
E) Their fatty acids pack tightly together.

Answer: A

Explanation: A)
B)
C)
D)
E)

11) Unstable isotopes can be useful 11) _____
A) in medical diagnosis.
B) catalysts.
C) in vitamins.
D) as buffers.
E) in the formation of hydrogen bonds.

Answer: A

Explanation: A)
B)
C)
D)
E)

12) All of the following are associated with ATP molecules EXCEPT

12) _____

- A) high-energy bonds.
- B) a recyclable energy supply.
- C) a long-term energy supply.
- D) formation of coenzymes.
- E) three phosphate groups.

Answer: C

Explanation: A)
B)
C)
D)
E)

13) All of the following are components of an amino acid EXCEPT a(n)

13) _____

- A) R group.
- B) α -carbon.
- C) pentose group.
- D) carboxyl group.
- E) amino group.

Answer: C

Explanation: A)
B)
C)
D)
E)

14) Which of the following are examples of pyrimidines?

14) _____

- A) thymine and adenine
- B) uracil and adenine
- C) cytosine and thymine
- D) cytosine and guanine
- E) thymine and guanine

Answer: C

Explanation: A)
B)
C)
D)
E)

15) Which of the following is an INCORRECT pairing?

15) _____

- A) hydrolysis; hydrogen bonds
- B) electrolytes; anions
- C) dehydration; anabolism
- D) synthesis; endothermic
- E) catabolism; exothermic

Answer: A

Explanation: A)
B)
C)
D)
E)

16) The type(s) of bond produced when atoms share electrons equally is/are

16) _____

- A) a polar covalent bond.
- B) an ionic bond.
- C) a nonpolar covalent bond.
- D) a hydrogen bond.
- E) both polar covalent and ionic bonds.

Answer: C

Explanation: A)
B)
C)
D)
E)

17) Proteins contain both acidic and basic R groups, and can therefore function as

17) _____

- A) energy storage macromolecules.
- B) catalysts.
- C) structural macromolecules.
- D) genetic material.
- E) buffers.

Answer: E

Explanation: A)
B)
C)
D)
E)

18) Which of the following is an example of a polysaccharide?

18) _____

- A) glycogen
- B) sucrose
- C) glucose
- D) fructose
- E) deoxyribose

Answer: A

Explanation: A)
B)
C)
D)
E)

19) Which of the following is found in nucleic acids?

19) _____

- A) carboxylic acid
- B) glycerol
- C) amines
- D) R group
- E) purines

Answer: E

Explanation: A)
B)
C)
D)
E)

20) All of the following bases are found in RNA molecules EXCEPT 20) _____
A) guanine. B) adenine. C) cytosine. D) uracil. E) thymine.

Answer: E

Explanation: A)
B)
C)
D)
E)

21) Lipids found in the membranes of all eukaryotic cells are 21) _____

- A) waxes.
- B) polyunsaturated fats.
- C) phospholipids.
- D) triglycerides.
- E) steroids.

Answer: C

Explanation: A)
B)
C)
D)
E)

22) Tertiary and quaternary structure of proteins involves _____ bonds. 22) _____

- A) hydrogen
- B) polar covalent
- C) nonpolar covalent
- D) ionic
- E) ionic, hydrogen, polar, and nonpolar covalent

Answer: E

Explanation: A)
B)
C)
D)
E)

23) Decomposition reactions are commonly _____ reactions. 23) _____

- A) exothermic
- B) dehydration
- C) exchange
- D) anabolic
- E) endothermic

Answer: A

Explanation: A)
B)
C)
D)
E)

24) Plant cell walls are composed of _____ held together by _____. 24) _____
A) fatty acids; polar covalent bonds
B) peptidoglycan; ionic bonds
C) polysaccharides; hydrogen bonds
D) disaccharides; hydrophobic interactions
E) amino acids; peptide bonds

Answer: C

Explanation: A)
B)
C)
D)
E)

25) A hydroxyl _____ acts as a base. 25) _____
A) anion B) atom C) cation D) salt E) group

Answer: A

Explanation: A)
B)
C)
D)
E)

26) An amine group is removed from an amino acid and bonded to a second compound to form a different amino acid. No other molecules are used or produced. What type of reaction is likely to be involved? 26) _____
A) a hydrolysis reaction
B) a synthesis reaction
C) a decomposition reaction
D) an exchange reaction
E) The answer cannot be determined for the available information.

Answer: E

Explanation: A)
B)
C)
D)
E)

27) The valence of an atom represents its 27) _____
A) electronegativity.
B) ability to interact with water.
C) radioactivity.
D) ability to interact with other atoms.
E) ability to attract electrons.

Answer: D

Explanation: A)
B)
C)
D)
E)

- 28) Anna is conducting an experiment using a pH indicator that is red at low pH, green at neutral pH and purple at high pH. She starts with a green solution. When she adds compound X to her solution it turns purple. Then she adds compound Z to the solution and it turns green. She adds more Z, the solution remains green. These observations suggest X is _____ and Z is _____.
- A) a base; a buffer
 - B) a buffer; a base
 - C) an acid; a base
 - D) a base; a strong acid
 - E) an acid; a buffer

28) _____

Answer: A

Explanation: A)
B)
C)
D)
E)

- 29) Which of the following is NOT a characteristic of phospholipids?

29) _____

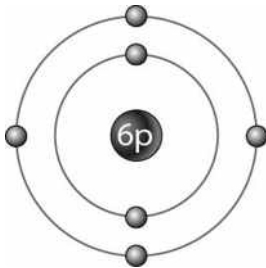
- A) They are found in cellular membranes.
- B) They contain fatty acids that associate with water.
- C) They can form micelles and bilayers.
- D) They contain two fatty acids and a phosphate functional group.
- E) They contain a hydrophilic phosphate "head."

Answer: B

Explanation: A)
B)
C)
D)
E)

30)

30) _____



The outer ring in Figure 2-1 represents

- A) an electron shell.
- B) the nucleus.
- C) a neutron.
- D) an isotope.
- E) an electron.

Answer: A

Explanation: A)
B)
C)
D)
E)

31) Adenosine triphosphate (ATP) is a

31) _____

- A) polymer.
- B) simple carbohydrate.
- C) monomer.
- D) lipid.
- E) bilayer.

Answer: C

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

32) A polymer composed of simple sugars is a(n)

32) _____

- A) glycoprotein.
- B) protein.
- C) amino acid.
- D) triglyceride.
- E) starch.

Answer: E

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

33) Organisms use carbohydrates in all of the following ways EXCEPT

33) _____

- A) as a long-term energy source.
- B) as a short-term energy source.
- C) as a building block of DNA and RNA molecules.
- D) as a component of cell walls.
- E) to keep membranes flexible at low temperatures.

Answer: E

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

34) The reverse of a dehydration synthesis reaction is a(n) _____ reaction.

34) _____

- A) anabolic
- B) hydrolytic
- C) endothermic
- D) exchange
- E) metabolic

Answer: B

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

35) The type(s) of bond produced when atoms with somewhat different electronegativities share electrons is/are 35) _____
A) a nonpolar covalent bond.
B) a hydrogen bond.
C) a polar covalent bond.
D) an ionic bond.
E) both nonpolar covalent and ionic bonds.

Answer: C

Explanation: A)
B)
C)
D)
E)

36) Which of the following is a particle found in the nucleus of an atom and that has no electrical charge? 36) _____
A) neutron B) electron C) element D) isotope E) proton

Answer: A

Explanation: A)
B)
C)
D)
E)

37) Which of the following is an INCORRECT pairing? 37) _____
A) tertiary structure; covalent bonds
B) primary structure; amino acid sequence
C) quaternary structure; two or more polypeptides
D) secondary structure; β -pleated sheets
E) secondary structure; disulfide bridges

Answer: E

Explanation: A)
B)
C)
D)
E)

38) Which of the following would NOT normally be found as a component of a cell's nucleic acids? 38) _____
A) thymine deoxyribonucleotides
B) adenine deoxyribonucleotides
C) adenine ribonucleotides
D) cytosine ribonucleotides
E) uracil deoxyribonucleotides

Answer: E

Explanation: A)
B)
C)
D)
E)

39) DNA is composed of repeating units of sugars, phosphates, and nucleic acids. This is an example of a _____ 39) _____

- A) salt.
- B) polymer.
- C) lipid.
- D) micelle.
- E) monomer.

Answer: B

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

40) Matter composed of a single type of atom is known as a(n) _____ 40) _____

- A) electron.
- B) element.
- C) compound.
- D) molecule.
- E) mineral.

Answer: B

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

41) A stable atom has _____ in its valence shell. 41) _____

- A) 8 electrons
- B) 4 electrons
- C) 10 electrons
- D) 2 neutrons
- E) 8 protons

Answer: A

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

42) The "backbone" of the DNA molecule is composed of _____ 42) _____

- A) phosphates.
- B) alternating phosphates and pentoses.
- C) amino acids.
- D) nitrogenous bases.
- E) pentoses.

Answer: B

- Explanation:
- A)
 - B)
 - C)
 - D)
 - E)

43) Compounds that readily dissociate in water are 43) _____
A) ionic.
B) nonpolar.
C) polar.
D) either polar or ionic.
E) never polar or ionic.

Answer: D

Explanation: A)
B)
C)
D)
E)

44) Which of the following statements about proteins is FALSE? 44) _____
A) Their primary function is energy storage.
B) They are formed by dehydration synthesis reactions.
C) They can be hydrophobic, hydrophilic, or both.
D) They have multiple levels of structural organization.
E) They are composed of amino acids.

Answer: A

Explanation: A)
B)
C)
D)
E)

45) A(n) _____ is an arrangement of atoms found in a variety of macromolecules. 45) _____
A) isotope
B) functional group
C) salt
D) buffer
E) stereoisomer

Answer: B

Explanation: A)
B)
C)
D)
E)

46) Which of the following types of chemical bonds do carbon atoms generally NOT form? 46) _____
A) nonpolar covalent bonds
B) ionic bonds
C) hydrogen bonds
D) polar covalent bonds
E) neither ionic nor hydrogen bonds

Answer: E

Explanation: A)
B)
C)
D)
E)

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

47) The (atoms/isotopes/stereoisomers) of an element vary in the number of neutrons in the nucleus. 47) _____

Answer: isotopes

Explanation:

48) A chemical reaction that traps energy within newly formed chemical bonds is an (exothermic/endothermic) reaction. 48) _____

Answer: endothermic

Explanation:

49) A(n) (base/acid) is a molecule that binds with hydrogen ions when it is dissolved in water. 49) _____

Answer: base

Explanation:

50) An atom or molecule becomes a(n) (anion/ion/cation) when it loses an electron to a more electronegative molecule. 50) _____

Answer: cation

Explanation:

51) A(n) (indicator/base/buffer) is a substance that maintains the pH even when the amounts of acid and / or base are changing. 51) _____

Answer: buffer

Explanation:

52) The folding of a polypeptide into a three-dimensional shape is its (secondary/tertiary/quaternary) structure. 52) _____

Answer: tertiary

Explanation:

53) Radioactive iodine is sometimes used to treat thyroid cancer. This is an example of the use of (isotopes/elements/radiation) in medical treatment. 53) _____

Answer: isotopes

Explanation:

54) A(n) (catalyst/enzyme) is any molecule that speeds up a chemical reaction. 54) _____

Answer: catalyst

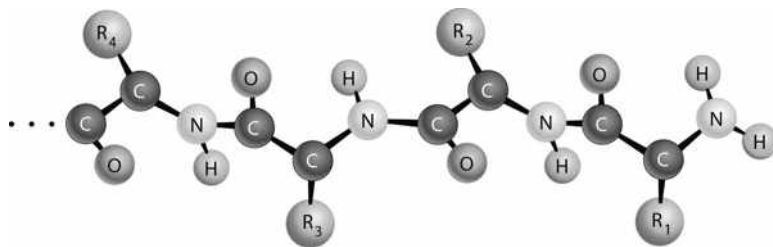
Explanation:

55) The sum of all the chemical reactions within an organism is referred to as its (metabolism/physiology). 55) _____

Answer: metabolism

Explanation:

56)



56) _____

Figure 2.2 depicts the (primary/secondary/tertiary) structure of a protein.

Answer: primary

Explanation:

57) A chemical reaction in which a water molecule is a reactant is known as a(n) (dehydration/hydrolysis) reaction.

57) _____

Answer: hydrolysis

Explanation:

58) The monomer of a nucleic acid is called a (nucleoside/nucleotide/base).

58) _____

Answer: nucleotide

Explanation:

59) Cell surface markers composed of both carbohydrate and lipid molecules are known as (glycoproteins/glycolipids/LPS).

59) _____

Answer: glycolipids

Explanation:

60) The phosphorylation of a protein by ATP is a(n) (exchange/transfer) reaction

60) _____

Answer: exchange

Explanation:

61) The DNA double helix is held together by (covalent/ionic/hydrogen) bonds.

61) _____

Answer: hydrogen

Explanation:

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

62) Salts are produced from exchange reactions in which acids and bases neutralize each other.

62) _____

Answer: True False

Explanation:

63) A molecule composed of carbon and hydrogen is a compound.

63) _____

Answer: True False

Explanation:

64) The side groups of amino acids can interact with each other and with other molecules.

64) _____

Answer: True False

Explanation:

- 65) Denaturation of a protein is always permanent. 65) _____
Answer: True False
Explanation:
- 66) The electron shells of atoms hold eight electrons each. 66) _____
Answer: True False
Explanation:
- 67) The smallest chemical units of matter are elements. 67) _____
Answer: True False
Explanation:
- 68) An organic molecule with the chemical formula $C_4H_5O_1N_3$ is probably a pyrimidine. 68) _____
Answer: True False
Explanation:
- 69) The long-term chemical energy storage molecules in plants are triglycerides. 69) _____
Answer: True False
Explanation:
- 70) One of the products of dehydration synthesis reactions is water. 70) _____
Answer: True False
Explanation:
- 71) Hydrogen bonds are stronger than covalent bonds. 71) _____
Answer: True False
Explanation:

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

- 72) Compare and contrast synthesis reactions with decomposition reactions.
Answer: Synthesis and decomposition reactions are often the reverse of each other. Synthesis reactions consume energy (are endothermic), whereas decomposition reactions release energy (are exothermic). Synthesis reactions often release water molecules in a process called dehydration synthesis, whereas decomposition reactions often consume water molecules in a process called hydrolysis. Finally, decomposition reactions break large macromolecules into their component monomers, which can then be used in synthesis reactions to build new macromolecules for use by the cell, whereas synthesis reactions utilize component monomers to build larger molecules.
- 73) Nitrogen is an essential element for living things, as demonstrated by the fact that nearly all fertilizers contain nitrogenous compounds. Discuss why nitrogen is essential.
Answer: Nitrogen is a component in the structure of two of the four types of organic macromolecules. The amino group of an amino acid is a key reactant in the formation of peptide bonds, or primary structure, of proteins. Nitrogen also participates in hydrogen bonding and thereby contributes to the secondary, tertiary, and quaternary structure of proteins. Nitrogen is a key structural component of the bases in nucleic acids, and its participation in hydrogen bonding results in the formation of the base pairs and therefore the double helix of DNA.

Answer Key

Testname: C2

- 1) D
- 2) D
- 3) B
- 4) E
- 5) E
- 6) D
- 7) B
- 8) D
- 9) D
- 10) A
- 11) A
- 12) C
- 13) C
- 14) C
- 15) A
- 16) C
- 17) E
- 18) A
- 19) E
- 20) E
- 21) C
- 22) E
- 23) A
- 24) C
- 25) A
- 26) E
- 27) D
- 28) A
- 29) B
- 30) A
- 31) C
- 32) E
- 33) E
- 34) B
- 35) C
- 36) A
- 37) E
- 38) E
- 39) B
- 40) B
- 41) A
- 42) B
- 43) D
- 44) A
- 45) B
- 46) E
- 47) isotopes
- 48) endothermic
- 49) base
- 50) cation

Answer Key
Testname: C2

- 51) buffer
- 52) tertiary
- 53) isotopes
- 54) catalyst
- 55) metabolism
- 56) primary
- 57) hydrolysis
- 58) nucleotide
- 59) glycolipids
- 60) exchange
- 61) hydrogen
- 62) TRUE
- 63) TRUE
- 64) TRUE
- 65) FALSE
- 66) FALSE
- 67) FALSE
- 68) TRUE
- 69) FALSE
- 70) TRUE
- 71) FALSE
- 72) Synthesis and decomposition reactions are often the reverse of each other. Synthesis reactions consume energy (are endothermic), whereas decomposition reactions release energy (are exothermic). Synthesis reactions often release water molecules in a process called dehydration synthesis, whereas decomposition reactions often consume water molecules in a process called hydrolysis. Finally, decomposition reactions break large macromolecules into their component monomers, which can then be used in synthesis reactions to build new macromolecules for use by the cell, whereas synthesis reactions utilize component monomers to build larger molecules.
- 73) Nitrogen is a component in the structure of two of the four types of organic macromolecules. The amino group of an amino acid is a key reactant in the formation of peptide bonds, or primary structure, of proteins. Nitrogen also participates in hydrogen bonding and thereby contributes to the secondary, tertiary, and quaternary structure of proteins. Nitrogen is a key structural component of the bases in nucleic acids, and its participation in hydrogen bonding results in the formation of the base pairs and therefore the double helix of DNA.
- 74) The chemistry of the cell would basically be impossible without hydrogen bonds. Water, which is required by all cellular reactions, would not have its unique properties of cohesiveness and polarity without hydrogen bonds. Hydrogen bonds hold the double helix of DNA together and contribute to the overall shape of protein molecules. However, unlike covalent bonds, hydrogen bonds are not permanent bonds, so they can easily and temporarily be broken, a characteristic that is important at certain points in the cell's life cycle (such as during DNA replication).
- 75) Phospholipids have polar phosphate "heads" and nonpolar fatty acid "tails," which interact in different ways with water molecules. The phospholipid heads are attracted to polar water molecules, but the nonpolar tails of the phospholipid are repelled by water. As the tails are driven away from the water molecules, they congregate together, either in the interior of a ball of lipid (called a micelle) or within the interior of a double layer of phospholipids (called a bilayer). This leaves the phosphate heads "outside," where they can easily interact with the water molecules.
- 76) Max's results are consistent with L being an acid and M being a weak base. Compound N appears to be a buffer. The green color of the indicator is seen when the concentrations of hydroxyl and hydrogen ions are equal. The red color of the solution indicates the concentration of hydrogen ions is greater than the hydroxyl ion concentration. The data does not provide information for calculating the concentrations. Blue and purple indicator colors show the hydroxyl ion concentrations exceed the hydrogen ion concentrations. The results with the mixes of L and M suggest that L dissolves to release 5 times more hydrogen ions than the concentration of hydroxyl ions produced by the ionization of M. Compound N accepts or releases ions with changing hydrogen ion concentrations to maintain equal concentrations of cations and anions.