**Microbiology with Diseases Taxonomy**

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

1)

Which of the following is a particle found in the nucleus of an atom and that has no electrical charge?

1)

\_\_\_\_\_\_\_

A)

element

B)

electron

C)

neutron

D)

proton

E)

isotope

2)

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

2)

\_\_\_\_\_\_\_

A)

molecule.

B)

electron.

C)

mineral.

D)

compound.

E)

element.

3)

A stable atom has \_\_\_\_\_\_\_\_ in its valence shell.

3)

\_\_\_\_\_\_\_

A)

2 neutrons

B)

4 electrons

C)

8 electrons

D)

8 protons

E)

10 electrons

4)

Which parts of the atoms interact in a chemical reaction?

4)

\_\_\_\_\_\_\_

A)

neutrons

B)

protons

C)

isotopes

D)

electrons

E)

ions

5)



The outer ring in Figure 2-1 represents

5)

\_\_\_\_\_\_\_

A)

an electron.

B)

an isotope.

C)

the nucleus.

D)

a neutron.

E)

an electron shell.

6)

The valence of an atom represents its

6)

\_\_\_\_\_\_\_

A)

ability to interact with other atoms.

B)

ability to attract electrons.

C)

electronegativity.

D)

ability to interact with water.

E)

radioactivity.

7)

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

7)

\_\_\_\_\_\_\_

A)

an ionic bond.

B)

a polar covalent bond.

C)

a nonpolar covalent bond.

D)

a hydrogen bond.

E)

both polar covalent and ionic bonds.

8)

The type(s) of bond produced when atoms with somewhat different electronegativities share electrons is/are

8)

\_\_\_\_\_\_\_

A)

a nonpolar covalent bond.

B)

an ionic bond.

C)

a hydrogen bond.

D)

a polar covalent bond.

E)

both nonpolar covalent and ionic bonds.

9)

Which of the following types of chemical bonds do carbon atoms generally NOT form?

9)

\_\_\_\_\_\_\_

A)

polar covalent bonds

B)

nonpolar covalent bonds

C)

ionic bonds

D)

hydrogen bonds

E)

neither ionic nor hydrogen bonds

10)

Unstable isotopes can be useful

10)

\_\_\_\_\_\_

A)

in the formation of hydrogen bonds.

B)

catalysts.

C)

as buffers.

D)

in medical diagnosis.

E)

in vitamins.

11)

Which of the following is an incorrect pairing?

11)

\_\_\_\_\_\_

A)

catabolism; exothermic

B)

dehydration; anabolism

C)

synthesis; endothermic

D)

electrolytes; anions

E)

hydrolysis; hydrogen bonds

12)

Compounds that readily dissociate in water are

12)

\_\_\_\_\_\_

A)

ionic.

B)

polar.

C)

nonpolar.

D)

either polar or ionic.

E)

never polar or ionic.

13)

Which of the following is a property of water?

13)

\_\_\_\_\_\_

A)

it is not a common reactant in metabolic reactions.

B)

It is not a good solvent.

C)

it is a nonpolar molecule.

D)

it has a high capacity for heat.

E)

it is liquid in a very narrow temperature range.

14)

An acid dissociates in water to release

14)

\_\_\_\_\_\_

A)

anion(s).

B)

hydrogen ion(s).

C)

cation(s).

D)

hydroxyl group(s).

E)

both anions and hydrogen ions.

15)

The reverse of a dehydration synthesis reaction is a(n) \_\_\_\_\_\_\_\_ reaction.

15)

\_\_\_\_\_\_

A)

exchange

B)

metabolic

C)

endothermic

D)

anabolic

E)

hydrolytic

16)

A hydroxyl \_\_\_\_\_\_\_\_ acts as a base.

16)

\_\_\_\_\_\_

A)

group

B)

anion

C)

salt

D)

cation

E)

atom

17)

Which of the following is NOT a characteristic of saturated fats?

17)

\_\_\_\_\_\_

A)

they are a form of stored energy.

B)

they are usually solid at room temperature.

C)

they are found in animals.

D)

they contain at least one double bond.

E)

their fatty acids pack tightly together.

18)

Which of the following is NOT a characteristic of phospholipids?

18)

\_\_\_\_\_\_

A)

they contain fatty acids that associate with water.

B)

they are found in cellular membranes.

C)

they contain a hydrophilic phosphate "head."

D)

they contain two fatty acids and a phosphate functional group.

E)

they can form micelles and bilayers.

19)

Organisms use carbohydrates in all of the following ways EXCEPT

19)

\_\_\_\_\_\_

A)

as a building block of DNA and RNA molecules.

B)

to keep membranes flexible at low temperatures.

C)

as a long-term energy source.

D)

as a short-term energy source.

E)

as a component of cell walls.

20)

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

20)

\_\_\_\_\_\_

A)

hydrogen bonding.

B)

hydrolytic reactions.

C)

dehydration synthesis.

D)

exchange reactions.

E)

catabolic reactions.

21)

Which of the following is an example of a polysaccharide?

21)

\_\_\_\_\_\_

A)

sucrose

B)

glucose

C)

glycogen

D)

deoxyribose

E)

fructose

22)

Which of the following statements about proteins is FALSE?

22)

\_\_\_\_\_\_

A)

They have multiple levels of structural organization.

B)

They are formed by dehydration synthesis reactions.

C)

They can be hydrophobic, hydrophilic, or both.

D)

Their primary function is energy storage.

E)

They are composed of amino acids.

23)

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

23)

\_\_\_\_\_\_

A)

carboxyl group.

B)

pentose group.

C)

R group.

D)

amino group.

E)

α-carbon.

24)

Which of the following is found in nucleic acids?

24)

\_\_\_\_\_\_

A)

purines

B)

amines

C)

R group

D)

glycerol

E)

carboxylic acid

25)

Hydrogen bonds are found in all of the following EXCEPT

25)

\_\_\_\_\_\_

A)

between phosphates in ATP.

B)

between the R groups of amino acids in proteins.

C)

between water molecules.

D)

in the DNA double helix between nucleotides.

E)

in α-helices.

26)

Tertiary and quaternary structure of proteins involves \_\_\_\_\_\_\_\_ bonds.

26)

\_\_\_\_\_\_

A)

polar covalent

B)

nonpolar covalent

C)

ionic

D)

hydrogen

E)

ionic, hydrogen, polar, and nonpolar covalent

27)

Which of the following are examples of pyrimidines?

27)

\_\_\_\_\_\_

A)

thymine and guanine

B)

cytosine and guanine

C)

uracil and adenine

D)

cytosine and thymine

E)

thymine and adenine

28)

All of the following bases are found in RNA molecules EXCEPT

28)

\_\_\_\_\_\_

A)

thymine.

B)

cytosine.

C)

uracil.

D)

adenine.

E)

guanine.

29)

The "backbone" of the DNA molecule is composed of

29)

\_\_\_\_\_\_

A)

phosphates.

B)

nitrogenous bases.

C)

pentoses.

D)

alternating phosphates and pentoses.

E)

amino acids.

30)

Which of the following would NOT normally be found as a component of a cell's nucleic acids?

30)

\_\_\_\_\_\_

A)

cytosine ribonucleotides

B)

adenine deoxyribonucleotides

C)

uracil deoxyribonucleotides

D)

adenine ribonucleotides

E)

thymine deoxyribonucleotides

31)

All of the following are associated with ATP molecules EXCEPT

31)

\_\_\_\_\_\_

A)

formation of coenzymes.

B)

a recyclable energy supply.

C)

high-energy bonds.

D)

a long-term energy supply.

E)

three phosphate groups.

32)

Which of the following statements concerning nucleic acids is FALSE?

32)

\_\_\_\_\_\_

A)

Not all DNA is double stranded.

B)

Cytosine is found in all nucleic acid molecules.

C)

The nucleic acid polymer is composed of peptide bonds.

D)

Nucleic acid strands are held together by hydrogen bonds between complementary bases.

E)

Some viruses have DNA as their genomes.

33)

Which of the following is an incorrect pairing?

33)

\_\_\_\_\_\_

A)

secondary structure; β-pleated sheets

B)

primary structure; amino acid sequence

C)

secondary structure; disulfide bridges

D)

quaternary structure; two or more polypeptides

E)

tertiary structure; covalent bonds

34)

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

34)

\_\_\_\_\_\_

A)

catalysts.

B)

structural macromolecules.

C)

genetic material.

D)

energy storage macromolecules.

E)

buffers.

35)

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

35)

\_\_\_\_\_\_

A)

buffer

B)

catalyst.

C)

base

D)

salt

E)

acid

36)

Plant cell walls are composed of \_\_\_\_\_\_\_\_ held together by \_\_\_\_\_\_\_\_.

36)

\_\_\_\_\_\_

A)

amino acids; peptide bonds

B)

disaccharides; hydrophobic interactions

C)

polysaccharides; hydrogen bonds

D)

peptidoglycan; ionic bonds

E)

fatty acids; polar covalent bonds

37)

A(n) \_\_\_\_\_\_\_\_ is an arrangement of atoms found in a variety of macromolecules.

37)

\_\_\_\_\_\_

A)

isotope

B)

functional group

C)

salt

D)

buffer

E)

stereoisomer

38)

Decomposition reactions are commonly \_\_\_\_\_\_\_\_ reactions.

38)

\_\_\_\_\_\_

A)

endothermic

B)

exchange

C)

dehydration

D)

anabolic

E)

exothermic

39)

Lipids found in the membranes of all eukaryotic cells are

39)

\_\_\_\_\_\_

A)

steroids.

B)

waxes.

C)

phospholipids.

D)

triglycerides.

E)

polyunsaturated fats.

40)

A protein is a \_\_\_\_\_\_\_\_ of amino acids.

40)

\_\_\_\_\_\_

A)

decomposition product

B)

polymer

C)

monomer

D)

bilayer

E)

solution

41)

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

41)

\_\_\_\_\_\_

A)

monomer.

B)

polymer.

C)

salt.

D)

lipid.

E)

micelle.

42)

A polymer composed of simple sugars is a(n)

42)

\_\_\_\_\_\_

A)

triglyceride.

B)

protein.

C)

starch.

D)

amino acid.

E)

glycoprotein.

43)

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 \_\_\_\_\_\_\_\_.

43)

\_\_\_\_\_\_

A)

a base; a strong acid

B)

a base; a buffer

C)

a buffer; a base

D)

an acid; a base

E)

an acid; a buffer

44)

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?

44)

\_\_\_\_\_\_

A)

a hydrolysis reaction

B)

an exchange reaction

C)

a decomposition reaction

D)

a synthesis reaction

E)

The answer cannot be determined for the available information.

45)

Adenosine triphosphate (ATP) is a

45)

\_\_\_\_\_\_

A)

polymer.

B)

simple carbohydrate.

C)

lipid.

D)

monomer.

E)

bilayer.

46)

Amylose is a(n) \_\_\_\_\_\_\_\_ carbohydrate.

46)

\_\_\_\_\_\_

A)

polymer

B)

ionic

C)

nucleotide

D)

monomer

E)

simple

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

47)

The smallest chemical units of matter are elements.

47)

\_\_\_\_\_\_

48)

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

48)

\_\_\_\_\_\_

49)

A molecule composed of carbon and hydrogen is a compound.

49)

\_\_\_\_\_\_

50)

The electron shells of atoms hold eight electrons each.

50)

\_\_\_\_\_\_

51)

Hydrogen bonds are stronger then covalent bonds.

51)

\_\_\_\_\_\_

52)

An organic molecule with the chemical formula C4H5O1N3 is probably a pyrimidine.

52)

\_\_\_\_\_\_

53)

Denaturation of a protein is always permanent.

53)

\_\_\_\_\_\_

54)

The long-term chemical energy storage molecules in plants are triglycerides.

54)

\_\_\_\_\_\_

55)

One of the products of dehydration synthesis reactions is water.

55)

\_\_\_\_\_\_

56)

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

56)

\_\_\_\_\_\_

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

57)

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

57)

\_\_\_\_\_\_\_\_\_\_\_\_\_

58)

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

58)

\_\_\_\_\_\_\_\_\_\_\_\_\_

59)

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

59)

\_\_\_\_\_\_\_\_\_\_\_\_\_

60)

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

60)

\_\_\_\_\_\_\_\_\_\_\_\_\_

61)

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

61)

\_\_\_\_\_\_\_\_\_\_\_\_\_

62)

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

62)

\_\_\_\_\_\_\_\_\_\_\_\_\_

63)

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

63)

\_\_\_\_\_\_\_\_\_\_\_\_\_

64)

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

64)

\_\_\_\_\_\_\_\_\_\_\_\_\_

65)



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

65)

\_\_\_\_\_\_\_\_\_\_\_\_\_

66)

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

66)

\_\_\_\_\_\_\_\_\_\_\_\_\_

67)

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

67)

\_\_\_\_\_\_\_\_\_\_\_\_\_

68)

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

68)

\_\_\_\_\_\_\_\_\_\_\_\_\_

69)

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

69)

\_\_\_\_\_\_\_\_\_\_\_\_\_

70)

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

70)

\_\_\_\_\_\_\_\_\_\_\_\_\_

71)

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

71)

\_\_\_\_\_\_\_\_\_\_\_\_\_

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

72)

Compare and contrast synthesis reactions with decomposition reactions.

73)

Discuss the importance of hydrogen bonds in the chemistry of the cell.

74)

Max is exploring the properties of various compounds. Some of his explorations involve the use of a pH indicator that is red at low pH, yellow-green at neutral pH and blue to purple at high pH. He sets up several tubes containing water and the pH indicator and then begins to add some of the compounds he is characterizing in various combinations. His results are shown on the Figure 2.3.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Compound** | None | 1 × L | 1 × M | 2 × M | 5 × M | 1 × N | 1 × L + 1 × M | 1 × L + 5 × M | 1 × L + 1 × M + 1 × N |
| Color | Green | Red | Green | Blue | Purple | Green | Red | Green | Green |

What can Max conclude about his compounds based on these results? Describe the likely events in terms of hydrogen and hydroxyl ions.

75)

Describe the chemical properties of phospholipids that account for their behavior in water.

76)

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.

1)

C

2)

E

3)

C

4)

D

5)

E

6)

A

7)

C

8)

D

9)

E

10)

D

11)

E

12)

D

13)

D

14)

E

15)

E

16)

B

17)

D

18)

A

19)

B

20)

C

21)

C

22)

D

23)

B

24)

A

25)

A

26)

E

27)

D

28)

A

29)

D

30)

C

31)

D

32)

C

33)

C

34)

E

35)

D

36)

C

37)

B

38)

E

39)

C

40)

B

41)

B

42)

C

43)

B

44)

E

45)

D

46)

A

47)

FALSE

48)

TRUE

49)

TRUE

50)

FALSE

51)

FALSE

52)

TRUE

53)

FALSE

54)

FALSE

55)

TRUE

56)

TRUE

57)

isotopes

58)

exchange

59)

glycolipids

60)

cation

61)

hydrolysis

62)

base

63)

tertiary

64)

hydrogen

65)

primary

66)

catalyst

67)

nucleotide

68)

endothermic

69)

buffer

70)

metabolism

71)

isotopes

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)

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).

74)

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.

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)

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.