Student name:_____

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

1) If you placed a DNA molecule in a vertical orientation, then from top to bottom, the two parallel strands are both orientedin the same, 5′ to 3′, direction.

- ◎ true
- ◎ false

2) RNA is a long double-stranded helix containing ribose and uracil.

- ◎ true
- ◎ false

3) Lipids, like nucleic acids and proteins, are made of chains of similar subunits.

- ◎ true
- ◎ false

4) Steroids are simple lipids.

- ◎ true
- ◎ false

5) Water-soluble substances easily pass through the phospholipid bilayer of a cell membrane.

- ◎ true
- ◎ false

6) DNA is always double-stranded, but RNA is always single-stranded.

- ◎ true
- ◎ false

7) Lipids are polar, hydrophilic molecules.

◎ true
◎ false

8) Simple lipids contain carbon, hydrogen, and oxygen in a 1:2:1 ratio.

◎ true
◎ false

9) Phospholipids are polar molecules.

◎ true
◎ false

10) Unsaturated fats have lower melting points than saturated fats.

◎ true
◎ false

CHECK ALL THE APPLY. Choose all options that best completes the statement or answers the question.

11) The atomic number for an atom of a specific element is equal to
2-12-2013

A) the number of protons plus electrons in a single atom of that element.
B) the number of electrons plus neutrons in a single atom of that element.
C) the number of protons plus neutrons in a single atom of that element.
D) the position of an atom in the atomic table.
E) the position of an ion on the periodic table.

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

12) In addition to investigations with bacteria that led to Pasteur being considered the Father of Microbiology, he also

A) found that some molecules can exist as stereoisomersANDcreated aspartame.
B) created aspartame ANDseparated organic acids using a microscope.
C) found that some molecules can exist as stereoisomers AND separated organic acids using a microscope.
D) separated organic acids using a microscope ANDdiscovered polarized light.
E) discovered polarized light AND found that some molecules can exist as stereoisomers.

13) The negatively charged component of the atom is the

A) proton.
B) electron.
C) neutron.
D) nucleus.
E) valence.

14) The part of the atom that is most involved in chemical reactivity is the

A) proton.
B) neutron.
C) electron.
D) nucleus.
E) ion.

15) Which of the following is TRUE regarding electrons?

A) They are found in the area outside the nucleus known as the cloud.
B) They may gain energy but do notlose energy.
C) They cannot move from one shell to another within the cloud.
D) They are located farthest from the nucleus and have the leastenergy.
E) They are positively charged particles in an atom.

16) Sharing of electrons between two atoms forms a(n)

A) hydrogen bond.
B) ionic bond.
C) covalence bond.
D) atomic bond.
E) covalent bond.

17) If electrons are gained or lost when a bond is formed, that bond is a(n) _____ bond.

A) ionic
B) covalent
C) hydrogen
D) nonpolar
E) intermediate

18) Charged atoms are called

A) ions.
B) neutrons.
C) molecules.
D) polymers.
E) atoms.

19) Which statement regarding water is TRUE?

A) Water is a polar molecule.
B) Water is referred to as a universal solvent.
C) Water makes up over 70% of an organism.
D) Water is often a product or reactant in chemical reactions.
E) All of the answer choices are correct.

20) Which statement regarding pH is CORRECT?

A) pH is a measure of the hydrogen ion concentration in a solution.
B) pH is measured using a scale from 5 to 8.
C) pH is measured using a linear (not logarithmic)scale.
D) pH is an abbreviation for "power of helium."
E) pH reflects the tendency of a solution to donate or accept electrons.

21) The subunits (building blocks) of proteins are

A) nucleotides.
B) phospholipids.
C) amino acids.
D) carbohydrates.
E) monosaccharides.

22) If the side chains of amino acids contain carboxyl (-COOH) groups, they

A) contribute a positive charge to the amino acid at pH 10 AND are considered acidic amino acids.
B) contribute a negative charge to the amino acid at pH 10 AND are considered nucleic acids.
C) contribute a positive charge tothe amino acid at pH 10 AND are considered nucleic acids.
D) contribute a negative charge to the amino acid at pH 10 AND are considered acidic amino acids.
E) contribute a negative charge to the amino acid at pH 10 AND are considered acidic monosaccharides.

23) Amino acids that contain many methyl (-CH_3) groups

A) are considered hydrophilic.
B) are nonpolar.
C) carry a positive charge.
D) carry a negative charge.
E) are considered hydrophilic AND carry a positive charge.

24) D-amino acids are associated with

A) radioactive isotopes.
B) bacterial cell walls.
C) plant proteins.
D) human proteins.
E) all proteins.

25) The most important feature of a protein is its

A) secondary structure.
B) side group.
C) shape.
D) electric charge.
E) size.

26) Alpha helices and beta pleated sheets form a protein's

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

27) Select the CORRECT statement regarding acidic or basic amino acids.

A) They are insoluble in water.
B) They are readily soluble in water.
C) They areunable to form ions.
D) They are considered hydrophobic.
E) They are unable to form peptide bonds.

28) The N terminal in a protein is

A) the end characterized by a free carboxyl group.
B) the end characterized by a free amino group.
C) typically found in the middle of a protein.
D) the part of a protein that is bound to another protein.
E) indicatedwith an "R".

29) Select the FALSE statement regarding protein denaturation.

A) Denaturation can occur due to certain chemicals.
B) Denaturation can occur due to pH changes.
C) Denaturation can occur due to high temperature.
D) Denaturation may cause the protein to no longer function.
E) Denaturationcannot be reversed.

30) Select the FALSE statement regarding carbohydrates.

A) They may be part of the structure of bacteria.
B) They may serve as a source of food.
C) They contain carbon, hydrogen, and oxygen in a 1:2:1 ratio.
D) They may be bonded to proteins to form glycoproteins.
E) Cholesterol and ergosterol are examples of carbohydrates.

31) Select the CORRECT statement regarding carbohydrates.

A) They form only ring structures.
B) They form only linear structures.
C) They may interconvert between ring and linear structures.
D) They contain both ring and linear portions within the same molecule.
E) They are all structural isomers of each other.

32) Structural isomers

A) contain the same number of atoms/elements, butin different arrangements AND may be referred to as the -D and -P forms.
B) are exemplified by glucose and galactose AND are formed by different arrangements of the -COOH groups
C) contain the samenumber of atoms/elements, butin different arrangements AND areexemplified by glucose and galactose.
D) are formed by different arrangements of the -COOH groups AND may be referred to as the -D and -L forms.
E) may be referred to as the -D and -Pforms AND are exemplified by glucose and fructose.

33) What type of bond holds one strand of DNA to the complementary strand of DNA?

A) Covalent
B) Hydrogen
C) Disulfide
D) Ionic
E) Peptide

34) How many carbon atoms do the sugars found in nucleic acids contain?

A) 3 carbon atoms.
B) 5 carbon atoms.
C) 7 carbon atoms.
D) 9 carbon atoms.
E) either 5 or 7 carbon atoms.

35) Which of the following are found in RNA but not in DNA?

A) Adenine AND ribose
B) Ribose AND thymine
C) Ribose AND uracil
D) Thymine AND uracil
E) UracilAND deoxyribose

36) Which base pairing example is INCORRECT?

A) A:T
B) G:C
C) G:T
D) A:U
E) A:T, G:C, AND A:U

37) The components of fats are fatty acids and

A) amino acids.
B) nucleotides.
C) phosphate.
D) glycerol.
E) cholesterol.

38) Select the CORRECT statement regardingsaturated fats and unsaturated fats.

A) They have approximately the same melting temperature as each other.
B) Saturated fats have a lower melting temperature than unsaturated fats.
C) Unsaturated fats have a lower melting temperature than saturated fats.
D) Unsaturated fats have a higher melting temperature than saturated fats.
E) Saturated fats are more liquid at room temperature than unsaturated fats.

39) Which is the positively charged component of the atom?

A) Electron
B) Neutron
C) Proton
D) Cation
E) Anion

40) Which is the uncharged component of the atom?

A) Electron
B) Proton
C) Neutron
D) Proline
E) Neulon

41) What determines the chemical and physical properties of an atom of an element?

A) Atomic number
B) Neutrons
C) Atomic weight
D) Electrons
E) Atomic size

42) Why does the atom have no charge overall?

A) The number of protons in the atom equals the number of neutrons.
B) The number of electrons in the atom equals the number of neutrons.
C) Neutrons in the atom neutralize all the other charges.
D) The number of protons in the atom equals the number of electrons.
E) The number of protons in the atom exceeds the number of electrons.

43) The mass number of an atom is equal to

A) the number of electrons.
B) the number of electrons and neutrons.
C) the number of neutrons and protons.
D) the number of protons.
E) the number of electron shells.

44) If electrons are shared unequally, a(n) _____ bond is formed.

A) weak
B) polar
C) nonpolar
D) ionic
E) hydrogen

45) Atoms that gain electrons become

A) positively charged.
B) negatively charged.
C) neutral.
D) lighter.
E) elements.

46) Which of these bonds are weak individually but are much stronger as a group?

A) Covalent AND hydrogen
B) Ionic AND covalent
C) Neutron AND ionic
D) Hydrogen AND neutron
E) Ionic AND hydrogen

47) The most important molecule(s) in the world is (are) _____.

A) water
B) proteins
C) carbohydrates
D) nucleic acids
E) nitrogen

48) The components of adenosine triphosphate are

A) adenosine, deoxyribose, and three phosphates.
B) adenosine, ribose, and three phosphates.
C) a pyrimidine base, ribose, and three phosphates.
D) a purine base, deoxyribose, and two phosphates.
E) a pyrimidine base, deoxyribose, and three phosphates.

49) How many different amino acids are there to choose from when assembling a protein?

A) 5
B) 10
C) 20
D) 25
E) 64

50) L-amino acids occur in proteins and are designated

A) unnatural.
B) left-handed.
C) rare.
D) right-handed.
E) non-biological.

51) Amino acids in proteins are linked to one another by peptide bonds between the

A) methyl group of one amino acid and a side group of another amino acid.
B) carbon atoms of two adjacent amino acids.
C) carboxyl group of one amino acid and the amino group of another.
D) nitrogen atom and carboxyl ion.
E) phosphate group and nitrogenous base.

52) The primary structure of a protein refers to

A) the helical folding of a protein.
B) the sequence of amino acids.
C) two or more polypeptides linked to one another.
D) the initial folding of a protein.
E) the beta-pleated sheets in a protein.

53) Side chains are important to proteins because they

A) help determine protein shape AND are a source of energy for hydration reactions in the cell.
B) help determine the degree of solubility of the protein in water.
C) are a source of energy for hydration reactions in the cell.
D) form the peptide bonds that link amino acids to one another.
E) help determine protein shape AND help determine the solubility of the protein in water.

54) Which statement(s) regarding a protein is/are CORRECT?

A) A protein can form any number of equally functional shapes.
B) A protein may need help from chaperonesto assume the correct shape.
C) A protein consists of a chain of hydroxyl acids AND is always polar.
D) A protein is always polar AND may need help from chaperones to assume the correct shape.
E) A protein assumes any number of equally functional shapes AND is always polar.

55) Weak bonds are important for the _____ structure of proteins.

A) primary AND secondary
B) primary, secondary, AND tertiary
C) secondary, tertiary, AND quaternary
D) primary, tertiary, ANDquaternary
E) quarternary

56) Which statements about proteins are TRUE?

A) They are involved in almost every important function performed by a cell AND are characterized by a 1:3:1ratio of carbon to hydrogen to oxygen.
B) They make upmore than 50% of the dry weight of a cell AND are composed of a chain of nucleotides.
C) They are involved in almost every important function performed by a cell AND make up more than 50% of the dry weight of a cell.
D) They are composed of a chain of amino acids AND are characterized by a 1:3:1 ratio of carbon to hydrogen and oxygen.
E) They are characterized by a 1:2:1 ratio of carbon to hydrogen to oxygen AND are composed of a chain of nucleotides.

57) The carbohydrate(s) found in nucleic acids is (are)

A) ribose OR deoxyribose.
B) ribose OR glucose.
C) glucose OR galactose.
D) galactose OR deoxyribose.
E) deoxyriboseonly.

58) The -OH group in a carbohydrate

A) may be found above or below the plane of the ring.
B) is involved in the formation of stereoisomers.
C) is involved when linking monosaccharides together.
D) is involved in the formation of stereoisomers ANDmay be found above or below the plane of the ring.
E) All of the answer choices are correct.

59) Dehydration reactions are involved in

A) the formation of polypeptides AND the formation of monosaccharides.
B) the formation of polysaccharides AND the formation of nucleotides.
C) the formation of polypeptides AND the formation of polysaccharides.
D) the formation of monosaccharides AND the formation of amino acids.
E) the formation of polypeptides AND the formation of nucleotides.

60) Which statement is true of nucleotides?

A) They are the basic subunits of DNA.
B) There are 20 naturally occurring nucleotides.
C) They are joined together by peptide bonds.
D) They are double-stranded.
E) All of the answer choices are correct.

61) The purines of DNA are

A) adenine and guanine.
B) thymine and adenine.
C) serine and threonine.
D) thymine and uracil.
E) thymine, adenine AND uracil.

62) To which end of the nucleic acid chain are more nucleotides added during DNA synthesis?

A) 5 prime (5') end.
B) C terminal.
C) 3 prime (3') end.
D) N terminal.
E) -COOHterminal.

63) The characteristic common to all lipids is their

A) solubility in organic solvents AND hydrophilic nature.
B) solubility in organic solvents AND hydrophobic nature.
C) hydrophilic nature AND large size.
D) large size AND solubility in water.
E) hydrophobic nature AND solubility in water.

64) Which is NOT true of lipids?

A) They are a major structural element of all cell membranes.
B) They control the movement of molecules into and out of a cell.
C) They separate a cell from its environment.
D) Examples include steroids and phospholipids.
E) They are a homogeneous group of molecules.

65) Microorganisms use hydrogen bonds to attach themselves to the surfaces that they live on. Many of them lose hold of the surface because of the weak nature of these bonds and end up dying or being washed away. Why don't microbes just use covalent bonds instead?

A) Covalent bonds depend on completely giving up or completely accepting an electron to form the bond. This isn't possible for many microbes without dramatically altering their basic molecular composition.

B) Covalent bonds typically require enzymes to form/break, whereas hydrogen bonds don't. If covalent bonds were used, it would require much more energy and molecules to be contributed from the cell. Hydrogen bonds don't have these requirements.

C) Bacteria grow in very moist environments, where water is freely available. Water is a supply of hydrogen atoms, so it makes sense for the bacteria to simply use hydrogen bonds for attachment.

D) Hydrogen bonds typically require enzymes to form/break, whereas covalent bonds don't. Microorganisms have more enzymes than any other type of cell, so it makes sense that they use hydrogen bonds rather than covalent bonds.

E) None of the answer choices is correct.

66) A biologist determined the amounts of several amino acids in two separate samples of pure protein. His data showed that Protein A contained 7% leucine, 12% alanine, 4% histidine, 2% cysteine, and 5% glycine. Interestingly, Protein B had the same percentagesof the same amino acids. He concluded from this datathat Proteins A and B are the same protein. Based on this information and his conclusion, determine which of the following is the correct statement regarding his findings:

A) He is correct; the proteinshave the same percentages of each amino acid, so they are identical protein molecules.

B) He is incorrect; there is no informationaboutthe amino acids sequence (which dictates the overall structure of a protein), so the two proteins could be very different in shape.

C) He is correct; although there is no information on the amino acid sequence in each protein, the order of the amino acids is irrelevant. It's only the total number of each molecule that is important to structure.

D) He is incorrect; he hasn't accounted at all for the effects of pH on the composition of the protein and its effects on the individual amino acids.

E) He is partly correct; the percentage of the listed amino acids is the same in each protein, but Protein A is hydrophobic and Protein B is hydrophilic.

67) You are a biochemist working on a molecule found in a recently discovered bacteria. You determine that the molecule is composed of a chain of similar subunits and can thus conclude that the molecule is unlikely to be a

A) lipid.
B) nucleic acid.
C) protein.
D) carbohydrate.
E) lipid or protein.

68) Which of the following pairs is mismatched?

A) RNA - ribose sugar.
B) Dehydration synthesis - water removal.
C) Sharing electrons - covalent bond.
D) Carboxyl - CH_3
E) Lipids - hydrophobic.

69) Please identify the CORRECT definition.

A) Molecules that contain carbon and hydrogen are called inorganic compounds. <!--Markup Copied from Habitat-->
B) Electrolytes are salts that conduct electricity when they are dissolved in water.
C) A compound is a molecule composed of two or more identical elements.
D) Electrons in a polar covalent bond are shared equally.
E) The starting components of a chemical reaction are called products.

70) Which of the following is the correct order from most acidic to least acidic?

A) Stomach acid, vinegar, unpolluted rainwater, blood, drain cleaner
B) Drain cleaner, blood, unpolluted rainwater, vinegar, stomach acid
C) Unpolluted rainwater, blood, vinegar, drain cleaner, stomach acid
D) Stomach acid, drain cleaner, unpolluted rainwater, blood, vinegar
E) Vinegar, blood, unpolluted rainwater, drain cleaner, stomach acid

71) You are working in a laboratory, making media for growing bacteria. The recipe you are following calls for the addition of TRIS buffer. You can't find any TRISin the lab, so you decide to leave it out of the medium. Select the FALSE statement regarding your decision.

A) The medium will likely not be useable, because bacteria live within a narrow pH range, near pH 14. <!--Markup Copied from Habitat-->
B) Maintaining the correct pH is essential for cells, because crucial molecules such as enzymes may lose function in the incorrect pH.
C) Buffers are added to solutions to stabilize the hydrogen ion concentration of that solution.
D) The acidity of the medium without buffer may change dramatically as the bacteria grow.
E) The medium will likely not be useable, because bacteria live within a narrow pH range, near neutral.

72) Which of the following statements about enzymes is FALSE?

A) Enzymes are composed of amino acids.
B) Enzymes help break covalent bonds.
C) Enzymes position reactants so covalent bonds form more easily.
D) Enzymes are essential for maintaining life.
E) Enzymes increase the temperature of a reaction.

73) Enzymes are required to break which of the following bonds?

A) Covalent
B) Ionic
C) Peptide
D) Hydrostatic
E) Polar

74) Which of the following statements about nucleic acids is FALSE?

A) They are the subunits of nucleotides.
B) They may be single stranded or double stranded.
C) Eukaryotic cells have both DNA and RNA.
D) All living cells have nucleic acids.
E) They are composed of nucleotides.

75) Please select the FALSE statement regarding butyrate.

A) Butyrate is consumed in plant material.
B) Butyrate is a short-chain fatty acid.
C) Butyrate is produced by gut bacteria.
D) Butyrate is a degradation product of plant material.
E) Butyrate may protect against colon cancer.

76) Please select the FALSE statement regarding lipids.

A) Short-chain fatty acids contain five or fewer carbon atoms and may reduce the risk of colon cancer.

B) Butyrate is a long-chain fatty acid that is produced by gut bacteria when they degrade undigested plant material.

C) Phospholipids resemble triglycerides but one fatty acid is replaced with a phosphate group.

D) A wax is a long-chain fatty acid covalently bonded to a long-chain alcohol and is insoluble in water.

E) Steroids differ in structure from lipids but are classified as such because they are insoluble in water.

77) Which of the following best describes the structure of DNA?

A) A double helix consisting of antiparallel two sugar-phosphate backbones with nucleobases oriented towards the interior.

B) A double helix consisting of two chains of nucleobases held together by bonds between with sugar-phosphate groups.

C) A triple helix consisting of three chains of nucleobases held together by bonds between with sugar-phosphate groups.

D) A double helix consisting of two parallel sugar-phosphate backbones with nucleobases oriented towards the interior.

E) A double helix consisting of two sugar-phosphate backbones with nucleobases oriented towards the exterior.

78) Which of the following correctly describes the pairing and hydrogen bonding of nucleobases in DNA?

A) Adenine pairs with thymine via two hydrogen bonds; cytosine pairs with guanine via three hydrogen bonds.

B) Adenine pairs with thymine via three hydrogen bonds; cytosine pairs with guanine via two hydrogen bonds.

C) Adenine pairs with thymine via three hydrogen bonds; cytosine pairs with guanine via three hydrogen bonds.

D) Adenine pairs with thymine via two hydrogen bonds; cytosine pairs with guanine via two hydrogen bonds.

E) Cytosine pairs with thymine via two hydrogen bonds; adenine pairs with guanine via three hydrogen bonds.

79) What functional group is at the 5' end of a DNA strand, and which is at the 3' end of a DNA strand?

A) Phosphate group at the 5' end; hydroxyl group at the 3' end

B) Phosphate group at the 3' end; hydroxyl group at the 5' end

C) Phosphate group at the 5' end and the 3' end on one strand; hydroxyl group at the 5' end and the 3' end on the other strand

D) Phosphate group at the 5' end; deoxyribose at the 3' end

E) Adenine or thymine at the 5' end; cytosine or guanine at the 3' end

80) Why are electrons not considered when determining the mass of an atom? <!--Markup Copied from Habitat-->

A) Electrons are too light too contribute to the mass of an atom.

B) Every atom has random numbers of electrons, so they must be ignored.

C) Electrons are too far away from the atom nucleus to contribute to its weight.

D) Neutrons cancel out the mass of the electrons, so they are discounted.

E) Protons cancel out the mass of electrons, so they are discounted.

81) Which of the statements about ions is TRUE?

A) Anions are negatively charged atoms while cations are positively charged atoms.
B) Anions are positively charged atoms while cations are negatively charged atoms.
C) An anion is an atom that has gained an electron and a proton.
D) Cations and anions both have an overall positive charge.
E) The ion Mg^{2+} has gained two electrons while the ion Na^{+} has gained one electron.

82) In a redox reaction,

A) the reactant that loses an electron is oxidised and the reactant that gains an electron is reduced.
B) the reactant that loses an electron is reduced and the reactant that gains an electron is oxidised.
C) the reactant that loses an electron is a oxidising-oxidising agent.
D) the reactant that gains an electron is reduced and is an oxidising reagent.
E) both the reducing agent and the oxidising agent gain electrons.

83) Which list goes from heaviest to lightest?

A) Compound, atom, proton, electron
B) Electron, proton, atom, compound
C) Electron, proton, atom, molecule
D) Proton, molecule, atom, electron
E) Atom, molecule, proton, neutron

84) Please select the CORRECT choice regarding pH and hydrogen ion concentration.

A) A pH of 4 is more acidic than a pH of 5 AND the pH 4 solution has an H^+ concentration of 1×10^{-4}

B) A pH of 4 is less acidic than a pH of 5 AND the pH 4 solution has an H^+ concentration of 1×10^{-4}

C) A pH of 4 is more basic than a pH of 5 AND the pH 4 solution has an H^+ concentration of 1×10^{-4}

D) A pH of 4 is more acidic than a pH of 5 AND the pH 5 solution has an H^+ concentration of 1×10^{5}

E) A pH of 4 is more acidic than a pH of 5 AND the pH 4 solution has an OH^- concentration of 1×10^{-4}

85) Dehydration synthesis is involved in the synthesis of all of the following EXCEPT

A) glucose.
B) DNA and RNA.
C) peptidoglycan.
D) enzymes.
E) triglycerides.

86) When the pH of a solution changes from 9 to 2, the H^+ concentration

A) increases as the solution becomes more acidic.
B) decreases as the solution becomes more acidic.
C) increases as the solution becomes more basic.
D) decreases as the solution becomes more basic.
E) remains unchanged as the solution becomes more basic.

SECTION BREAK. Answer all the part questions.

87) Dan is a body builder. He decides that he is going to change his diet in an effort to increase his muscle mass. Dan tells you that he plans to eat vegetables and proteins but nofats or carbohydrates, because cells do not naturally contain these molecules and do not need them. You advise Dan that his new diet is not a good choice, and that he would do better to follow a well balanced diet that incorporates healthy amounts of proteins, fats AND carbohydrates.

87.1) You tell Dan that while many of his cell components do indeed contain amino acids, carbohydrates and lipids are also essential for cells. Which of the following components contain both amino acids AND lipids?

A) Cytoplasmic membrane
B) Nucleic acids
C) Enzymes
D) Peptidoglycan
E) Ribosomes

87.2) Dan tells you that he knows proteins are needed to build muscle mass but that he doesn't quite understand the role of proteins in a cell. He tells you five things he believes proteins are needed for in cell function, but he is mistaken on one of these. Which of the following statements regardingthe role of proteins in cells is INCORRECT?

A) Proteins are involved in transporting molecules into or out of cells.
B) Proteins are involved in movement of certain cells.
C) Proteins provide structural support in cells (cytoskeleton).
D) Proteins are a major component of starch.
E) Proteins catalyze chemical reactions within cells.

87.3) Dan tells you that he believes that proteins are the primary source of energy for his cells because proteins are easily digested. You tell him that this is.

◎ true
◎ false

87.4) Dan asks you how his cells are able to use complex molecules such as proteins. You explain to him that proteins are macromolecules composed of _____ and that proteins can be broken down by _____, a type of reaction in which the addition of _____ breaks covalent bonds between subunits.

A) water; hydrolysis; amino acids
B) amino acid; hydrolysis; water
C) monosaccharides; hydrolysis; water
D) amino acids; dehydration synthesis; water
E) monosaccharides; dehydration synthesis; water

87.5) Dan is confused about the reason you advise him that in fact a healthy diet includes fats. He tells you that all fats are bad fats. You correct him, telling him that lipids are essential for cells. Which of the following is NOT true of lipids?

A) Lipids are an essential component of the cytoplasmic membrane.
B) Cholesterol provides rigidity to eukaryote cell membranes.
C) Lipids are composed of identical subunits.
D) The most common simple lipids in nature are the triglycerides.
E) Oils contain unsaturated fatty acids.

88) With so much research being carried out onthe gut microbiome, interesting discoveries are frequently made. Now scientists at MIT and Harvard University have investigateda novel bacterial enzyme that may have therapeutic potential for treating a disease called CDI, caused by the bacterium *Clostridioides difficile*. *C. difficile* is found at part of the gastrointestinal microbiotaof many healthy people. However, if the bacterial populations in those people are disturbed (a situation called dysbiota), for example by taking antibiotics, the organism can causeCDI.

The research team discovered that *C. difficile* and a number of other gut bacteria produces an enzyme called hydroxyl-L-proline dehydratase (HypD). The scientists had previously shown that this enzyme carries out an unusual reaction, breaking down hydroxyl-L-proline into a precursor of proline, one of the 20 naturally occurring amino acids. In bacteria like *C. difficile*, proline can then be used to generate ATP through a process called amino acid fermentation. In other words, the microbes use HypD to help them grow. Now, using a method called X-ray crytallography, the team has been able to identify the active site on HypD where the chemical reaction takes place. Their aim is to now develop drugs that target and block that site, preventing the enzyme from functioning properly. In this way, they will potentially be able to slow the growth of *C. difficile* without necessarily killing it. The attempt to inhibit the growth of the bacteria rather than eliminating them entirely reflects the fact thatunder normal circumstances, the organism plays a rolein maintaining gastrointestinal health.

Source: Massachusetts Institute of Technology. "Bacterial enzyme could become a new target for antibiotics." ScienceDaily. ScienceDaily, 17 March 2020. www.sciencedaily.com/releases/2020/03/200317130718.htm

88.1) The subunits of proteins are _____, joined together by _____ bonds called _____ bonds.

A) amino acids; covalent; peptide
B) nucleic acids; covalent; peptide
C) amino acids; ionic; peptide
D) monsaccharides; covalent; glycosidic
E) amino acids; covalent; glycosidic

88.2) Which statement regarding HypD is FALSE?

A) It generates a precursor for the amino acid proline.
B) It is uniquely synthesized by *Clostridium difficile*.
C) It is involved in a dehydration chemical reaction.
D) It may potentially be targeted for treating CDI.
E) It is produced by a number of different gut bacteria.

88.3) HypD is used by certain bacteria to generate ATP from amino acids.

◎ true
◎ false

88.4) What is the significance of this research?

A) The researchers discovered a potential target for inhibiting growth of *C. difficile*.
B) The authors discovered a new gut bacterium called *Clostridium difficile*.
C) The research team discovered that *Clostridium difficile* can cause CDI.
D) The researchers were able to reduce the growth of *C. difficile* in the gut.
E) The teams proved that dysbiosis may lead to the development of CDI.

Answer Key

Test name: Nester 2

1) FALSE
2) FALSE
3) FALSE
4) TRUE
5) FALSE
6) FALSE
7) FALSE
8) FALSE
9) TRUE
10) TRUE
11) [A]
12) C
13) B
14) C
15) A
16) E
17) A
18) A
19) E
20) A
21) C
22) D
23) B
24) B
25) C
26) B

27) B
28) B
29) E
30) E
31) C
32) C
33) B
34) B
35) C
36) C
37) D
38) C
39) C
40) C
41) A
42) D
43) C
44) B
45) B
46) E
47) A
48) B
49) C
50) B
51) C
52) B
53) E
54) B
55) C
56) C

57) A
58) E
59) C
60) A
61) A
62) C
63) B
64) E
65) B
66) B
67) A
68) D
69) B
70) A
71) A
72) E
73) A
74) A
75) A
76) B
77) A
78) A
79) A
80) A
81) A
82) A
83) A
84) A
85) A
86) A

87) Section Break

87.1) A

87.2) D

87.3) FALSE

87.4) B

87.5) C

88) Section Break

88.1) A

88.2) B

88.3) FALSE

88.4) A