Dr. Dryer
Introduction to Biological Science I
BIOL-1431

THIS IS A PRACTICE EXAM DESIGNED TO HELP YOU STUDY THE MATERIAL IN THE FIRST UNIT. IT COVERS CHAPTERS 2, 3 AND 4, AND INCLUDES FILL IN THE BLANK AND MULTIPLE CHOICE QUESTIONS. YOUR ACTUAL MIDTERM EXAM WILL ONLY INCLUDE MULTIPLE CHOICE. ANSWERS ARE PROVIDED ON THE LAST PAGE.

1. The sum of the atomic weights in any given molecule is called its _____.

2. The attraction between a partial positive charge on a hydrogen atom and the partial negative charge of a nearby atom is a _____.

3. The chemical properties of an element are determined by the arrangement of _____ in its atoms.

4. Every atom except _____ has one or more neutrons in its nucleus.

5. A _____ is two or more atoms linked by chemical bonds.

6. _____ occurs when one atom, such as ^{14}C, is transformed into another atom, such as ^{14}N, with an accompanying emission of energy.

7. A _____ is the amount of heat needed to raise the temperature of 1 g of pure water from 14.5°C to 15.5°C.

8. A chemical reaction that can proceed in either direction is called a _____.

9. The water strider skates along the surface of water due to a property of liquids called _____.

10. The nutritionist's Calorie, which biologists and chamists call a kilocalorie, is the equivalent of _____ heat-energy calories.

11. The element with which of the following atomic number would be most stable?
    A) 1
    B) 3
    C) 12
    D) 18

12. The part of the atom of greatest importance for biochemical reactions is:
    A) proton.
    B) outermost shell.
    C) neutron.
    D) innermost shell.
    E) None of the above

13. Which of the following lists of characteristics is true for helium?
    A) Mass number = 4; atomic number = 2; net charge = 0
    B) Mass number = 4; atomic number = 4; net charge = 0
    C) Mass number = 4; atomic number = 2; net charge = +2
    D) Mass number = 4; atomic number = 2; net charge = +1

14. The strongest chemical bonds occur when
    A) two atoms share electrons in a covalent bond.
    B) two atoms share electrons in an ionic bond.
    C) hydrogen bonds are formed.
    D) van der Waals forces are in effect.

15. The atomic number of an element is the same as the number of
    A) neutrons in each atom.
    B) protons plus electrons in each atom.
    C) protons in each atom.
    D) neutrons plus protons in each atom.
    E) a and c

16. The mass of an atom is primarily determined by the
    A) number of electrons it contains.
    B) number of protons it contains.
    C) sum of the number of protons and electrons it contains.
    D) sum of the number of protons and neutrons it contains.
    E) number of charges it contains.

17. ^{14}C is an example of
    A) an atom with a stable nucleus.
    B) a radioisotope.
    C) the most abundant form of carbon.
    D) a carbon atom that cannot form organic molecules.
    E) all of the above.

18. Ionic bonds are
    A) attractions between oppositely charged ions.
    B) the result of electron sharing.
    C) the strongest of the chemical bonds.
    D) caused by partial electrical charges.
    E) All of the above

19. Polar molecules
    A) have an overall negative charge.
    B) have an equal distribution of electric charge.
    C) have an overall positive electric charge.
    D) have an unequal distribution of electric charge

20. Butane and isobutane have the same chemical formula but different arrangements of atoms. These two compounds are called
    A) ionic.
    B) alcohols.
    C) functional groups.
    D) amines.
    E) isomers.

21. The pH 6.0 contains
    A) 10^6 hydrogen ions.
    B) 6^{10} hydrogen ions.
    C) 6^{10} moles of hydrogen ions.
    D) more OH^- than H^+.
    E) 10^{-6} moles of hydrogen ions.

22. Of the following types of molecules, the one always containing nitrogen is
    A) thiol.
    B) sugar.
    C) hydrocarbon.
    D) amino acid.

23. The four elements most common in organisms are
    A) calcium, iron, hydrogen, and oxygen.
    B) water, carbon, hydrogen, and oxygen.
    C) carbon, oxygen, hydrogen, and nitrogen.
    D) nitrogen, carbon, iron, and hydrogen.
    E) phosphorus, water, carbon, and oxygen.

24. Which of the following is *not* caused by the hydrogen bonding between two water molecules?
    A) High surface tension of water
    B) Great cohesive strength water
    C) Polar nature of water
    D) The ability of water to dissolve lipids
    E) High heat of evaporation for water

25. If you place a paper towel in a dish of water, the water will move up the towel by capillary action. What property of water gives rise to capillary action?
    A) Water molecules ionize.
    B) Water is a good solvent.
    C) Water molecules have hydrophobic interactions.
    D) Water can form hydrogen bonds.
    E) Water takes up large amounts of heat when it vaporizes.

26. Which of the following is/are properties of water?
    A) Three different physical phases
    B) A solid state that is less dense than its liquid state
    C) Heat loss when changing from a liquid to a gas
    D) Limited ionization
    E) All of the above

27. The functional group with the structure =O is a(n)
    A) carbonyl.
    B) carboxyl.
    C) aldehyde.
    D) amino.
    E) hydroxyl.

28. Solutions that contain buffers tend to resist pH changes because buffers
    A) are bases.
    B) change from ionic to non-ionic in solution.
    C) change from non-ionic to ionic in response to changes in pH and release or absorb H^+.
    D) are weak acids or bases.

29. Select the statement that describes a difference between ionic bonds and covalent bonds.
    A) An ionic bond is stronger.
    B) Electron sharing is more equal in the covalant bond.
    C) An ionic bond occurs more often in aqueous solutions.
    D) An ionic bond occurs only in acids.
    E) A covalent bond occurs only in nonpolar molecules.

30. Oil remains as a droplet in water because of
    A) the van der Waals interactions of the nonpolar oil molecules.
    B) the hydrophobic interactions of the nonpolar oil molecules.
    C) the hydrogen bonds formed between the nonpolar molecules of the oil and the water molecules.
    D) the covalent bonds formed between the nonpolar molecules of the oil.
    E) the covalent bonds formed between the nonpolar molecules of the oil and the water molecules.

31. In proteins, amino acids are linked together by _____ bonds.

32. Disulfide bonds can form between _____ residues in proteins.

33. Cholesterol is classified as a(n) _____.

34. Cholesterol, vitamin D, and testosterone all have a multiple-ring structure and are members of a family of lipids known as _____.

35. The bonds between the units in a carbohydrate polymer are called _____ bonds.

36. Fatty acids with more than one carbon-carbon double bond are called _____.

37. The _____ molecules found in cell nuclei contain ribose or deoxyribose.

38. All amino acids have a hydrogen atom, a carboxyl group, and an amino group attached to a carbon atom. The variability in the 20 different amino acids lies in the structure of their _____.

39. Fluidity and melting point of fatty acids are determined in part by the number of _____ bonds.

40. _____ link nucleic acid monomers together in DNA.

41. Sucrose is
    A) a hexose.
    B) a lipid.
    C) a disaccharide.
    D) a glucose.
    E) a simple sugar.

42. The side chain of leucine is a hydrocarbon. In a folded protein, where would you expect to find leucine?
    A) In the interior of a cytoplasmic enzyme
    B) On the exterior of a protein embedded in a membrane
    C) On the exterior of a cytoplasmic enzyme
    D) a and b
    E) a and c

43. Lipids, as a complex class of macromolecules, are similar in that they are synthesized from
    A) glycerol.
    B) fatty acids.
    C) steriod precursors.
    D) cholesterol.

44. Polysaccharides, polypeptides, and polynucleotides all
    A) are formed from condensation reactions.
    B) are found in cell membranes.
    C) contain simple sugars.
    D) contain nitrogen.
    E) are not soluble in water.

45. The pairing of purines with pyrimidines to create a double-stranded DNA molecule is called
    A) complementary base pairing.
    B) phosphodiester bonding.
    C) antiparallel synthesis.
    D) dehydration.

46. A peptide linkage (peptide bond) holds together two
    A) protein molecules.
    B) amino acid molecules.
    C) sugar molecules.
    D) fatty acid molecules.
    E) phospholipid molecules.

47. DNA and RNA contain
    A) pentoses.
    B) hexoses.
    C) fructoses.
    D) maltoses.
    E) amyloses.

48. Which of the following statements concerning polymers is *not* true?
    A) Polymers are synthesized from monomers by condensation reactions.
    B) Polymers are synthesized from monomers by hydrolysis reactions.
    C) Polymers consist of at least two *different* types of monomers.
    D) Both a and c

49. The amino acids of the protein keratin are arranged in an alpha helix. This secondary structure is stabilized by
    A) covalent bonds.
    B) peptide bonds.
    C) glycosidic linkages.
    D) polar bonds.
    E) hydrogen bonds.

50. Which of the following is *not* a characteristic of lipids?
    A) They are readily soluble in water.
    B) They are soluble in organic solvents.
    C) They release large amounts of energy when broken down.
    D) They form two layers when mixed with water.

51. The bonds that form between the building blocks of polymeric macromolecules are
    A) hydrogen.
    B) peptide.
    C) disulfide.
    D) covalent.
    E) ionic.

52. What is the nucleotide sequence of the complementary strand of this DNA molecule:
    A A T G C G A?

    A) T T A C G C T
    B) A A T G C G A
    C) G G C A T A G
    D) C C G T T A T
    E) T C G C A T T

53. Beta sheat is an example of which level of protein structure?
    A) Primary
    B) Secondary
    C) Tertiary
    D) Quaternary

54. The primary structure of a protein is determined by its
    A) disulfide bridges.
    B) α-helix structures.
    C) order of amino acids
    D) degree of branching.
    E) three-dimensional nature.

55. Cellulose is the most abundant organic compound on Earth. Its main function is
    A) to store genetic information.
    B) as a storage compound for energy in plant cells.
    C) as a storage compound for energy in animal cells.
    D) as a component of biological membranes.
    E) to provide mechanical strength to plant cell walls.

56. The portion of a phospholipid that contains the phosphorous group has one or more electric charges. That makes this region of the molecule
    A) hydrophobic.
    B) hydrophilic.
    C) nonpolar.
    D) unsaturated.
    E) saturated.

57. Which of the following components of nucleic acids is analogous to the side chains of amino acids?
    A) Sugar
    B) Sugar-phosphate
    C) Purine/pyrimidine
    D) Nucleoside
    E) Nucleotide

58. All nucleic acids
    A) are polymers of nucleotides.
    B) are polymers of amino acids.
    C) are double-stranded.
    D) are double-helical.
    E) contain deoxyribose.

59. Two important polysaccharides made up of glucose monomers are
    A) guanine and cytosine.
    B) RNA and DNA.
    C) sucrose and lactose.
    D) cellulose and starch.
    E) testosterone and cortisone.

60. The _____ structure of a protein relates to how separate polypeptides assemble together.
    A) primary
    B) secondary
    C) tertiary
    D) quaternary
    E) helical

61. Microfillaments are made of _____.

62. RNA carries information for protein synthesis from the DNA in the nucleus to the ribosomes in the cytoplasm. To get from the nucleoplasm to the cytoplasm, RNA must pass through _____.

63. In biology, we call the basic unit of life the _____.

64. The light microscope has glass lenses for focusing light (photons) for imaging, whereas the electron microscope has _____ for focusing electrons for imaging.

65. All organisms are composed of cells; all cells come from preexisting cells. These statements comprise the _____.

66. The _____of some bacteria help them avoid being detected by the human immune system.

67. The meshwork of intermediate filaments found on the interior surface of the nuclear membrane is called the _____.

68. The substances that enter the Golgi apparatus come from the _____.

69. Highly organized internal membrane systems are components of certain organisms termed _____.

70. _____ is the process whereby light energy is converted into chemical bonds.

71. Which of the following is an argument for the endosymbiotic theory?
    A) Mitochondria forms of some enzymes are more similar to bacterial forms than cytosolic forms.
    B) Mitochondria and chloroplasts have DNA and ribosomes.
    C) Mitochondrial ribosomes are similar to bacterial ribosomes.
    D) All of the above

72. The carotenoid pigments that give ripe tomatoes their red color are contained in organelles called
    A) chloroplasts.
    B) proplastids.
    C) protoplasts.
    D) leucoplasts.
    E) chromoplasts.

73. Which of the following is a general function of all cellular membranes?
    A) They form compartments and regulate which materials can cross the membrane.
    B) They support the cell and determine its shape.
    C) They produce energy for the cell.
    D) They produce proteins for the cell.
    E) They move the cell.

74. Components of chloroplasts include
    A) grana.
    B) thylakoids.
    C) cristae.
    D) a and b
    E) a, b, and c

75. Which of the following statements about cells is *true*?
    A) Animal cells do not produce chloroplasts.
    B) Animal cells do not have mitochondria.
    C) All plant cells contain chloroplasts.
    D) Plant cells do not have plastids.
    E) None of the above

76. If you removed the pili from a bacterial cell, which of the following would you expect to happen?
    A) The bacterium could no longer swim.
    B) The bacterium would not adhere to other cells as well.
    C) The bacterium could no longer regulate the movement of molecules into and out of the cell.
    D) The bacterium would dry out.
    E) The shape of the bacterium would change.

77. An organelle consisting of a series of flattened sacks stacked somewhat like pancakes is the
    A) mitochondrion.
    B) gap junction.
    C) Golgi apparatus.
    D) rough endoplasmic reticulum.
    E) flagellum.

78. The pores found in the nuclear membrane are composed of
    A) one large protein.
    B) eight large protein granules.
    C) keratin.
    D) intermediate filaments.
    E) lipids.

79. One type of cell always lacking a cell wall is the
    A) bacterial cell.
    B) plant cell.
    C) animal cell.
    D) fungal cell.
    E) none of the above.

80. Chloroplasts are a kind of
    A) leucoplast.
    B) endoplasmic reticulum.
    C) chromoplast.
    D) Golgi apparatus.
    E) plastid.

81. Microscopes are used to resolve images that cannot be seen with the unaided eye. Electron microscopes use _____ to resolve images, whereas light microscopes use _____ to resolve images .
    A) light and lenses, diffraction of electron beams
    B) diffraction of electron beams, light and lenses
    C) lasers, light and lenses
    D) None of the above

82. This cellular component can be found at the base of each cilium.
    A) Centriole
    B) Basal body
    C) Nucleolus
    D) Flagellum
    E) Microvillus

83. Hair and intermediate filaments are composed of
    A) microtubules.
    B) microfilaments.
    C) collagen.
    D) hydroxyapatite.
    E) keratin.

84. Nuclear DNA exists as a complex of proteins called _____ that condenses into _____ during cellular division.
    A) chromosomes, chromatin
    B) chromatids, chromosomes
    C) chromophors, chromatin
    D) chromatin, chromosomes

85. Starch molecules are examples of
    A) plant polysaccharides.
    B) animal polysaccharides.
    C) components of cell walls.
    D) simple carbohydrates.
    E) none of the above.

86. Light energy for conversion to chemical energy is trapped in the
    A) mitochondrion.
    B) chromoplast.
    C) thylakoid.
    D) endoplasmic reticulum.
    E) Golgi apparatus.

87. Which of the following best describes ribosomes?
    A) Ribosomes are required for cellular protein synthesis.
    B) Ribosomes are found only in the nucleus or on the RER.
    C) There are no ribosomes in the mitochondria.
    D) All of the above

88. Ribosomes are not visible under a light microscope, but can be seen with an electron microscope. This is because
    A) electron beams have more energy than light beams.
    B) electron microscopes focus light with magnets.
    C) electron microscopes have more resolving power than light microscopes.
    D) electrons have such high energy that they pass through biological samples.
    E) living cells can be observed under the electron microscope.

89. Of the following, the structure involved with the movement of organelles within a cell is/are the
    A) Golgi apparatus.
    B) endoplasmic reticulum.
    C) mitochondrion.
    D) microfilaments.

90. Some organelles in eukaryotic cells are thought to have
    A) originated from extracellular symbiotic relationships.
    B) their own endoplasmic reticulum.
    C) their own mitochondria.
    D) originated from endosymbiotic relationships.
    E) the ability to live free from the host cell.

Answer Key

1. molecular weight
2. hydrogen bond
3. electrons
4. hydrogen
5. molecule
6. Radioactive decay
7. calorie
8. reversible reaction
9. surface tensions
10. 1,000
11. D
12. B
13. A
14. A
15. C
16. D
17. B
18. A
19. D
20. E
21. E
22. E
23. C
24. C
25. D
26. D
27. A
28. C
29. B
30. B
31. peptide
32. cysteine
33. lipid
34. steroids
35. glycosidic
36. polyunsaturated
37. nucleic acid
38. R group
39. unsaturated (or carbon double)
40. phosphates
41. C
42. D
43. B
44. A
45. A
46. B
47. A
48. D
49. E
50. A
51. D
52. A
53. B
54. C
55. E
56. B
57. C
58. A
59. D
60. D
61. actin
62. nuclear pores
63. cell
64. magnets
65. the cell theory
66. capsules
67. nuclear lamina
68. ER
69. eukaryotes
70. Photosynthesis
71. D
72. E
73. A
74. D
75. A
76. B
77. C
78. B
79. C
80. E
81. B
82. B
83. E
84. D
85. A
86. C
87. A
88. C
89. D
90. D