

1. Which of the following is mismatched pair?
 - A. Cellulose / structural polysaccharide in plant cells
 - B. Glycogen / Storage polysaccharide in animal cells
 - C. Amylose / Branched form of starch**
 - D. Chitin / Structural polysaccharide contains nitrogen

2. In a polysaccharide (Glycosidic bond) is analog to (-----) in a polypeptide.
 - A. Hydrogen bond
 - B. Peptide bond**
 - C. Phosphodiester
 - D. Ester bond

3. Each fat molecule:
 - A. Contains one glycerol and 3 fatty acids
 - B. Formed by dehydration reaction with removal of 3 water molecules.
 - C. Contains one glycerol and 2 fatty acids
 - D. Both A and B**
 - E. Both A and C

4. Which levels of protein structure that least affected with disruption of hydrogen bonds?
 - A. Primary level**
 - B. Secondary level
 - C. Tertiary level
 - D. Quaternary level

5. Which of the following statements is correct?
 - A. Collagen is a globular protein made of 3 polypeptides
 - B. Hemoglobin is a globular protein made of 3 polypeptides
 - C. Collagen is a fibrous protein made of 4 polypeptides
 - D. Hemoglobin is globular protein made of 4 polypeptides**

6. Describe the specific heat of water:

- A. High
- B. Low
- C. Moderate
- D. Equals 1 Cal (g.C)
- E. Both A and D correct

7. How many water molecules needed to completely hydrolyze a polymer that is 11 monomers long?

- A. 11
- B. 10
- C. 12
- D. 9
- E. Can't be determined

8. In a polypeptide, the peptide bond formed between:

- A. Carboxyl and amino group
- B. Carboxyl and Carbonyl group
- C. Carbonyl and amino group
- D. Any of the above
- E. None of the above

9. What type of covalent bond between amino acid side chains (R groups) functions in maintaining a polypeptide's specific three-dimensional shape?

- A. ionic bond
- B. hydrophobic interaction
- C. van der Waals interaction
- D. disulfide bond
- E. hydrogen bond

10. If ^{14}C -labeled uridine triphosphate is added to the growth medium of cells, what macromolecules will be labeled?

- A. phospholipids
- B. DNA
- C. RNA
- D. both DNA and RNA
- E. proteins

11. Which of the following types of microscopes used to study internal ultrastructure of a cell?

- A. SEM
- B. TEM**
- C. Light microscopy
- D. Phase-contrast microscopy
- E. Super-resolution microscope

12. Which type of organelle or structure is primarily involved in the synthesis of oils, phospholipids, and steroids?

- A. ribosome
- B. lysosome
- C. smooth endoplasmic reticulum**
- D. mitochondrion
- E. contractile vacuole

13. Which cell would be best for studying lysosomes?

- A. muscle cell
- B. leaf cell of a plant
- C. nerve cell
- D. phagocytic white blood cell**
- E. bacterial cell

14. Which of the following factors would tend to increase membrane fluidity?

- A. a greater proportion of unsaturated phospholipids**
- B. a lower temperature
- C. a relatively high protein content in the membrane
- D. a greater proportion of saturated phospholipids
- E. a greater proportion of relatively large glycolipids compared with lipids having smaller molecular masses

15. The major interaction responsible for stabilizing plasma membrane:

- A. Hydrophilic interaction
- B. Hydrophobic interaction**
- C. Ionic bonds
- D. Hydrogen bonds

16. An animal cell lacking oligosaccharides on the external surface of its plasma membrane would likely be impaired in which function?

- A. Transporting ions against an electrochemical gradient
- B. **Cell-cell recognition**
- C. Maintaining fluidity of the phospholipid bilayer
- D. Attaching to the cytoskeleton
- E. Establishing the diffusion barrier to charged molecules

17. What are the membrane structures that function in active transport?

- A. Peripheral proteins
- B. Carbohydrates
- C. Cholesterol
- D. Cytoskeleton filaments
- E. **Integral proteins**

18. What mechanisms do plants use to load sucrose produced by photosynthesis into specialized cells in the veins of leaves?

- A. an electrogenic pump
- B. a proton pump
- C. cotransport protein
- D. A and C only
- E. **A, B, and C**

19. Choose the correct word in each statement:

(DNA, RNA, Nucleotide, Nucleoside, Hydrogen bonds, Phosphodiester bonds)

- A. This bond stabilizes the double helix of DNA **Hydrogen bonds**
- B. This type of nucleic acid contains deoxyribose sugar and able to replicate itself – **DNA**
- C. This bond found between the adjacent nucleotides within nucleic acid **Phosphodiester**
- D. Contains pentose sugar and nitrogenous base only **Nucleoside**
- E. This type of nucleic acid found as a single stranded molecule **RNA**

20. About these types of carbohydrates, choose the correct one in each statement:

(Chitin, Maltose, Glucose, Amylose, Glycogen, Cellulose, Lactose, Fructose)

- A. Structural polysaccharide contains B-glucose and cannot be digested by human **Cellulose**
- B. Disaccharide consists of 2 glucose monomers connected by 1,4 glycosidic linkage **Maltose**
- C. Monosaccharide represents the major fuel of cells **Glucose**
- D. Structural polysaccharide contains nitrogen **Chitin**
- E. Stored in liver and muscles **Glycogen**
- F. Ketose monosaccharide with formula (C₆H₁₂O₆) **Fructose**
- G. Milk sugar, that consists of glucose and galactose **Lactose**

21. The tendency of water molecules to stay close to each other as a result of hydrogen bonding _____.

- A. Provides the surface tension that allows leaves to float on water
- B. Is called cohesion
- C. Acts to moderate temperature
- D. Keeps water moving through the vessels in a tree trunk
- E. **All of the listed responses are correct.**

22. The amount of heat required to convert 1 g of any substance from the liquid to the gaseous state is defined as _____.

- A. Molecular cohesion
- B. 1 calorie
- C. The specific heat of that substance
- D. **The heat of vaporization of that substance**
- E. The heat of fusion of that substance

23. Nonpolar molecules that cluster away from water molecules are called _____ molecules

- A. Ionic
- B. Saponified
- C. Hydrophilic
- D. **Hydrophobic**
- E. None of the listed responses is correct.

24. Which of the following statements concerning unsaturated fats is true?
- A. They are more common in animals than in plants.
 - B. They have double bonds in the carbon chains of their fatty acids.**
 - C. They generally solidify at room temperature.
 - D. They contain more hydrogen than do saturated fats having the same number of carbon atoms.
 - E. They have fewer fatty acid molecules per fat molecule.
25. Which class of biological polymer has the greatest functional variety?
- A. Polysaccharides
 - B. Proteins**
 - C. DNA
 - D. RNA
26. Among these biological polymers, which has the least structural variety?
- A. Polysaccharides
 - B. Proteins
 - C. DNA**
 - D. RNA
27. How will brief heating (to 95°C) affect macromolecular structures in aqueous solution?
- A. DNA duplexes will unwind and separate.
 - B. Proteins will unfold (denature).
 - C. Starch will hydrolyze into monomeric sugars.
 - D. Proteins will hydrolyze into amino acids.
 - E. DNA duplexes will unwind and separate, and proteins will unfold (denature).**
28. If cells are grown in a medium containing radioactive ^{15}N , which of these molecules will be labeled?
- A. Fatty acids only
 - B. Nucleic acids only
 - C. Proteins only
 - D. Amylase only
 - E. Both proteins and nucleic acids**

29. If cells are grown in a medium containing radioactive ^{32}P -labeled phosphate, which of these molecules will be labeled?
- A. Phospholipids
 - B. Nucleic acids
 - C. Proteins
 - D. Amylose
 - E. Both phospholipids and nucleic acids
30. If a DNA sample were composed of 10% thymine, what would be the percentage of guanine?
- A. 10
 - B. 20
 - C. 40
 - D. 80
 - E. impossible to tell from the information given
31. Which of the following are nitrogenous bases of the pyrimidine type?
- A. guanine and adenine
 - B. cytosine and uracil
 - C. thymine and guanine
 - D. ribose and deoxyribose
 - E. adenine and thymine
32. Which of the following are nitrogenous bases of the purine type?
- A. cytosine and guanine
 - B. guanine and adenine
 - C. adenine and thymine
 - D. thymine and uracil
 - E. uracil and cytosine
33. Which of the following statements about the 5' end of a polynucleotide strand of DNA is correct?
- A. The 5' end has a hydroxyl group attached to the number 5 carbon of ribose.
 - B. The 5' end has a phosphate group attached to the number 5 carbon of ribose.
 - C. The 5' end has phosphate attached to the number 5 carbon of the nitrogenous base.
 - D. The 5' end has a carboxyl group attached to the number 5 carbon of ribose.
 - E. The 5' end is the fifth position on one of the nitrogenous bases.

34. What is the term used for a protein molecule that assists in the proper folding of other proteins?

- A. Tertiary protein
- B. Chaperonin**
- C. Enzyme protein
- D. Renaturing protein
- E. Denaturing protein

35. Misfolding of polypeptides is a serious problem in cells. Which of the following diseases are associated with an accumulation of misfolded polypeptides?

- A. Alzheimer's only
- B. Parkinson's only
- C. Diabetes mellitus only
- D. Alzheimer's and Parkinson's only**
- E. Alzheimer's, Parkinson's, and diabetes mellitus

36. At which level of protein structure are interactions between the side chains (R groups) most important?

- A. Primary
- B. Secondary
- C. Tertiary**
- D. Quaternary
- E. All of the above

37. The tertiary structure of a protein is the

- A. Bonding together of several polypeptide chains by weak bonds.
- B. Order in which amino acids are joined in a polypeptide chain.
- C. Unique three-dimensional shape of the fully folded polypeptide.**
- D. Organization of a polypeptide chain into an α helix or β pleated sheet.
- E. Overall protein structure resulting from the aggregation of two or more polypeptide subunits.

38. Which of the following components that make a triglycerol molecule?

- A. Alpha helix and beta pleated sheets
- B. Glycogen and acetylglucose amine
- C. Glycerol and fatty acids**
- D. Purine and ribose
- E. Glucose and amino acids

39. Which is false for glucose and fructose

- A. Both are ketoses**
- B. Both are monomers for sucrose
- C. Both are structural isomers
- D. Both are hexose
- E. Both are monosaccharides

40. Smooth endoplasmic reticulum is responsible for:

- A. Detoxifying drugs and poisons
- B. Storage of calcium ions
- C. Synthesizing sex hormones and lipids
- D. None of the choices is correct
- E. All choices are correct**

41. Phosphodiester bonds are found in:

- A. Nucleoside
- B. Purine
- C. DNA strand**
- D. Pyrimidine
- E. Fats

42. Water has maximum density at ----- C

- A. 4**
- B. 0
- C. 37
- D. -4
- E. 100

43. The structural polysaccharide found in many insects and fungi is

- A. Cellulose
- B. Amylopectin
- C. Chitin
- D. Glycogen
- E. Amylose

44. What maintains the secondary structure of a protein?

- A. Peptide bonds
- B. Hydrogen bonds between the amino group of one peptide bond and the carboxyl group of another peptide bond
- C. Disulfide bonds
- D. Hydrophobic interactions
- E. Hydrogen bonds between the R groups

45. The reaction that break larger molecules into their smaller subunits is known as

- A. Polymerization reaction
- B. Dehydration reaction
- C. Condensation reaction
- D. Hydrolysis reaction
- E. None of the above

46. How many different kinds of polypeptides, each composed of 12 amino acids, could be synthesized using the 20 common amino acids?

- A. 4^{12}
- B. 12^{20}
- C. 240
- D. 20
- E. 20^{12}

47. What type of carbohydrates does plant cells secret to hold (cement) the primary cell walls of adjacent cells together?

- A. Glycogen
- B. Pectin
- C. Amylose
- D. Amylopectin
- E. None of the above

48. Dehydration reactions are used in forming which of the following compounds?

- A. Triacylglycerides
- B. Polysaccharides
- C. Proteins
- D. Triacylglycerides and proteins only
- E. Triacylglycerides, polysaccharides, and proteins

49. Which of the following can pass through the pore complexes in the nuclear envelope?

- A. Transport vesicles
- B. Ribosomal proteins
- C. RNA molecules
- D. Ribosomal subunits
- E. All choices are correct except transport vesicles

50. The function of nucleolus is

- A. Intracellular digestion
- B. To manufacture polypeptides
- C. To produce hydrogen peroxide
- D. Store chromatin
- E. To manufacture ribosomes

51. Which structure is the site of the synthesis of proteins that may be exported from the cell?

- A. Rough ER
- B. Plasmodesmata
- C. Golgi vesicles
- D. Lysosomes
- E. Free cytoplasmic ribosomes

52. Which plant cell organelle contain its own DNA and ribosomes?

- A. Glyoxysomes
- B. Peroxisomes
- C. vacuoles
- D. Chloroplasts

53. There are 20 different amino acids. What makes one amino acid different from another?

- A. Different side chains (R groups) attached to a carboxyl carbon
- B. Different side chains (R groups) attached to the amino groups
- C. Different side chains (R groups) attached to an α carbon
- D. Different structural and optical isomers
- E. Different asymmetric carbons

54. What kind of chemical bond is found between paired bases of the DNA double helix?

- A. Hydrogen
- B. Ionic
- C. Phosphodiester
- D. Double or triple covalent bond
- E. None of the above

55. Pinocytosis is one type of:

- A. Exocytosis
- B. Endocytosis
- C. Diffusion
- D. Facilitated transport
- E. Active transport

56. Which organelle or structure is absent in plant cell:

- A. Mitochondria
- B. Golgi vesicles
- C. Peroxisomes
- D. Microtubules
- E. Centrosomes

57. Water molecules are able to form hydrogen bonds with

- A. Oils
- B. Any compound that is not soluble in water
- C. Oxygen gas
- D. Chloride ions
- E. Compounds that have polar covalent bonds

58. Water's high specific heat is mainly a consequence of the
- A. Absorption and release of heat when hydrogen bonds break and form
 - B. Small size of the water molecules
 - C. Fact that water is poor heat conductor
 - D. Inability of water to dissipate heat into dry air
 - E. High specific heat of oxygen and hydrogen atoms
59. Thylakoids, DNA and ribosomes are all components found in:
- A. Mitochondria
 - B. vacuoles
 - C. None of the options
 - D. Chloroplasts
 - E. Lysosomes
60. A cell with predominance of free ribosomes is most likely
- A. Producing primarily proteins for secretion
 - B. Producing primarily cytoplasmic proteins
 - C. Enlarging its vacuoles
 - D. Digesting large food particles
 - E. Constructing an extensive cell wall or ECM
61. The secretion of glycoproteins out of the cell is considered as an example of:
- A. Exocytosis
 - B. Pinocytosis
 - C. Phagocytosis
 - D. Endocytosis
 - E. Receptor mediated endocytosis
62. The molecules responsible for membrane transport are:
- A. Proteins
 - B. Glycolipids
 - C. Phospholipids
 - D. Cholesterol
 - E. Carbohydrate

63. Which of the following is a branched polysaccharide?

- A. Glycogen
- B. Amylose
- C. Cellulose
- D. Chitin
- E. None of the options

64. The concentration of calcium in a cell is 0.3%. The concentration of calcium in the surrounding fluid is 0.1%. How could the cell obtain more calcium?

- A. Active transport
- B. Pinocytosis
- C. Osmosis
- D. Simple diffusion
- E. Facilitated diffusion

65. Monomers made of pentose sugar, nitrogenous base and phosphate group are:

- A. Fatty acids
- B. Phospholipids
- C. Amino acids
- D. Nucleotides
- E. Amylose

66. The substitution of glutamic acid with valine at 6th position of B-subunit of hemoglobin results in all of the following except:

- A. Change in primary structure
- B. Change in protein folding
- C. Hemoglobin crystallization into a fiber
- D. Increased efficiency of O₂ transport by hemoglobin
- E. Sickle – cell disease in human

67. All of the following nitrogenous bases found in DNA except:

- A. Adenine
- B. Uracil
- C. Thymine
- D. Cytosine

68. Which molecules form a bilayer in aqueous environment?

- A. Cholesterol
- B. Glucose
- C. Phospholipids**
- D. Triacylglycerol
- E. Amylose

69. All of the following are a part of prokaryotic cell except:

- A. Ribosomes
- B. Nucleoid
- C. Cytoplasm
- D. Endoplasmic reticulum**

70. Animal muscle cells adhere together strongly through ----- which are supported by intermediate filaments:

- A. Desmosomes**
- B. Plasmodesmata
- C. Tight junctions
- D. Gap junctions
- E. Cellulose fibers

71. The monomers that make up amylopectin is:

- A. Amino acid
- B. Alpha glucose**
- C. Beta glucose
- D. Fatty acid
- E. Cellulose

72. What kind of bonds hold water molecules together?

- A. Hydrogen bonds**
- B. Ionic bonds
- C. Hydrophilic bonds
- D. Polar covalent bonds
- E. None of the above

73. Which of the following organelles contains hydrolytic enzymes in animal cells?

- A. Glyoxysomes
- B. Central vacuole
- C. Peroxisomes
- D. Chloroplasts
- E. Lysosomes

74. Ions diffuse across membranes down their:

- A. Chemical gradients.
- B. Concentration gradients.
- C. Electrical gradients.
- D. Electrochemical gradients.
- E. A and B are correct

75. What mechanisms do plants use to load sucrose produced by photosynthesis into specialized cells in the veins of leaves?

- A. n electrogenic pump
- B. A proton pump
- C. A cotransport protein
- D. A and C only E
- E. A, B, and C

76. Cell membranes are asymmetrical. Which of the following is a most likely explanation?

- A. The cell membrane forms a border between one cell and another in tightly packed tissues such as epithelium.
- B. Cell membranes communicate signals from one organism to another.
- C. Cell membrane proteins are determined as the membrane is being packaged in the ER and Golgi.
- D. The "innerness" and "outerness" of membrane surfaces are predetermined by genes.
- E. Proteins can only span cell membranes if they are hydrophobic

77. Water passes quickly through cell membranes because

- A. The bilayer is hydrophilic.
- B. It moves through hydrophobic channels.
- C. Water movement is tied to ATP hydrolysis.
- D. it is a small, polar, charged molecule.
- E. it moves through aquaporins in the membrane

78. A cell whose cytoplasm has a concentration of 0.02 molar glucose is placed in a test tube of water containing 0.02 molar glucose. Assuming that glucose is not actively transported into the cell, which of the following terms describes the tonicity of the external solution relative to the cytoplasm of the cell?

- A. Turgid
- B. Hypertonic
- C. Hypotonic
- D. Flaccid
- E. Isotonic

79. Which of the following statements correctly describes the normal tonicity conditions for typical plant and animal cells?

- A. The animal cell is in a hypotonic solution, and the plant cell is in an isotonic solution.
- B. The animal cell is in an isotonic solution, and the plant cell is in a hypertonic solution.
- C. The animal cell is in a hypertonic solution, and the plant cell is in an isotonic solution.
- D. The animal cell is in an isotonic solution, and the plant cell is in a hypotonic solution.
- E. The animal cell is in a hypertonic solution, and the plant cell is in a hypotonic solution

80. Which of the following membrane activities require energy from ATP hydrolysis?

- A. Facilitated diffusion.
- B. Movement of water into a cell
- C. Na^+ ions moving out of the cell
- D. Movement of glucose molecules
- E. Movement of water into a paramecium

81. Which structure is not part of the endomembrane system?

- A. Nuclear envelope
- B. Chloroplast
- C. Golgi apparatus
- D. Plasma membrane
- E. ER

82. Which structure is common to plant and animal cells?

- A. Chloroplast
- B. Wall made of cellulose
- C. Central vacuole
- D. Mitochondrion
- E. Centriole

83. Cyanide binds with at least one molecule involved in producing ATP. If a cell is exposed to cyanide, most of the cyanide would be found within the

- A. Mitochondria.
- B. Ribosomes.
- C. Peroxisomes.
- D. Lysosomes.
- E. Endoplasmic reticulum

84. Plasmodesmata in plant cells are most similar in function to which of the following structures in animal cells?

- A. Peroxisomes
- B. Desmosomes
- C. Gap junctions
- D. Extracellular matrix
- E. Tight junctions

85. Ions can travel directly from the cytoplasm of one animal cell to the cytoplasm of an adjacent cell through

- A. Plasmodesmata
- B. intermediate filaments.
- C. Tight junctions.
- D. Desmosomes.
- E. Gap junctions

86. Which of the following are capable of converting light energy to chemical energy?

- A. Chloroplasts
- B. Mitochondria
- C. Leucoplasts
- D. Peroxisomes
- E. Golgi bodies

87. Organelles other than the nucleus that contain DNA include

- A. Ribosomes.
- B. Mitochondria.
- C. Chloroplasts.
- D. B and C only
- E. A, B, and C

88. Which of the following contains enzymes that transfer hydrogen from various substrates to oxygen?

- A. lysosome
- B. vacuole
- C. mitochondrion
- D. Golgi apparatus
- E. peroxisome

89. Grana, thylakoids, and stroma are all components found in

- A. Vacuoles.
- B. Chloroplasts.
- C. Mitochondria.
- D. lysosomes.

90. Which of the following contains hydrolytic enzymes?

- A. lysosome
- B. vacuole
- C. mitochondrion
- D. Golgi apparatus
- E. peroxisome

91. Which of the following is a compartment that often takes up much of the volume of a plant cell?

- A. lysosome
- B. vacuole
- C. mitochondrion
- D. Golgi apparatus
- E. peroxisome

92. The liver is involved in detoxification of many poisons and drugs. Which of the following structures is primarily involved in this process and therefore abundant in liver cells?

- A. rough ER
- B. smooth ER
- C. Golgi apparatus
- D. Nuclear envelope
- E. Transport vesicles

93. Which of the following produces and modifies polysaccharides that will be secreted?

- A. Lysosome
- B. Vacuole
- C. Mitochondrion
- D. Golgi apparatus
- E. Peroxisome

94. Tay-Sachs disease is a human genetic abnormality that results in cells accumulating and becoming clogged with very large and complex lipids. Which cellular organelle must be involved in this condition?

- A. The endoplasmic reticulum
- B. The Golgi apparatus
- C. The lysosome**
- D. Mitochondria
- E. Membrane-bound ribosomes

95. Which of the following correctly lists the order in which cellular components will be found in the pellet when homogenized cells are treated with increasingly rapid spins in a centrifuge?

- A. ribosomes, nucleus, mitochondria
- B. chloroplasts, ribosomes, vacuoles
- C. nucleus, ribosomes, chloroplasts
- D. vacuoles, ribosomes, nucleus
- E. nucleus, mitochondria, ribosomes**

96. A primary objective of cell fractionation is to

- A. View the structure of cell membranes.
- B. identify the enzymes outside the organelles.
- C. determine the size of various organelles.
- D. separate the major organelles so that their particular functions can be determined.**
- E. crack the cell wall so the cytoplasmic contents can be released.

97. Temperature is a measure of

- A. Specific heat.
- B. Average kinetic energy of molecules.**
- C. Total kinetic energy of molecules.
- D. Celsius degrees.
- E. Joules.

98. Hydrophobic substances such as vegetable oil are

- A. nonpolar substances that repel water molecules.
- B. nonpolar substances that have an attraction for water molecules.
- C. polar substances that repel water molecules.
- D. polar substances that have an affinity for water.
- E. charged molecules that hydrogen-bond with water molecules

99. Which type of bond must be broken for water to vaporize?

- A. ionic bonds
- B. nonpolar covalent bonds
- C. polar covalent bonds
- D. hydrogen bonds
- E. covalent bonds

100. Each water molecule is capable of forming

- A. one hydrogen bond.
- B. three hydrogen bonds.
- C. four hydrogen bonds.
- D. two covalent bonds and two hydrogen bonds.
- E. two ionic bonds and two hydrogen bonds.