***Fundamentals of Anatomy and Physiology*, 9e (Martini)**
Chapter 3 The Cellular Level of Organization

Multiple-Choice Questions

1) The smallest living unit within the human body is
A) a protein.
B) the cell.
C) a tissue.
D) an organ.
E) an organ system.
Answer: B
Learning Outcome: 3-1
Bloom's Taxonomy: Knowledge

2) Which of the following terms is **not** used to define the structure that separates the contents of a human cell from its surrounding medium?
A) cell wall
B) cell membrane
C) plasma membrane
D) plasmalemma
E) both a cell wall and a plasmalemma
Answer: A
Learning Outcome: 3-1
Bloom's Taxonomy: Knowledge

3) Functions of the plasmalemma include all of the following, **except**
A) separation of the cytoplasm from the extracellular fluid.
B) regulation of exchange of materials with the extracellular environment.
C) sensitivity to chemical changes in the extracellular fluid.
D) thermal insulation.
E) structural support.
Answer: D
Learning Outcome: 3-1
Bloom's Taxonomy: Knowledge

4) The plasma membrane is composed of
A) a bilayer of proteins.
B) a bilayer of phospholipids.
C) carbohydrate molecules.
D) carbohydrates and proteins.
E) carbohydrates and lipids.
Answer: B
Learning Outcome: 3-1
Bloom's Taxonomy: Knowledge

5) Which of the following is **not** a function of membrane proteins?
A) bind to ligands
B) regulate the passage of ions
C) act as carrier molecules for various solutes
D) act as anchors or stabilizers for the cell membrane
E) storage of cellular nutrients
Answer: E
Learning Outcome: 3-1
Bloom's Taxonomy: Knowledge

6) The tails of a phospholipid molecule are
A) hydrophilic.
B) composed of amino acids.
C) hydrophobic.
D) facing the cytosol.
E) interlocked to provide membrane strength.
Answer: C
Learning Outcome: 3-1
Bloom's Taxonomy: Knowledge

7) The plasmalemma includes
A) integral proteins.
B) glycolipids.
C) phospholipids.
D) cholesterol.
E) All of the answers are correct.
Answer: E
Learning Outcome: 3-1
Bloom's Taxonomy: Knowledge

8) What is the first part of the cell that is affected when the pH of extracellular fluid changes?
A) nucleus
B) nucleolus
C) the cytosol
D) plasmalemma
E) cytoskeleton
Answer: D
Learning Outcome: 3-1
Bloom's Taxonomy: Comprehension

9) Membrane proteins perform which of the following functions?
A) anchoring
B) receptors
C) recognition
D) enzymes
E) All of the answers are correct.
Answer: E
Learning Outcome: 3-1
Bloom's Taxonomy: Comprehension

10) The organelles and the watery component of the cell together is called
A) cytosol.
B) protoplasm.
C) extracellular fluid.
D) interstitial fluid.
E) cytoplasm.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

11) The watery component of the cytoplasm is called
A) cytosol.
B) protoplasm.
C) extracellular fluid.
D) interstitial fluid.
E) a colloidal gel.
Answer: A
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

12) Each of the following is an example of a nonmembranous organelle, **except**
A) lysosomes.
B) cilia.
C) centrioles.
D) ribosomes.
E) cytoskeleton.
Answer: A
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

13) Components of the cytoskeleton may include all of the following, **except**
A) microfilaments.
B) intermediate filaments.
C) microsomes.
D) microtubules.
E) thick filaments.
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

14) Which of the following about cytoplasm is **false**?
A) extracellular fluid contains more protein
B) the material that fills a cell
C) semi-rigid texture
D) includes cytoskeleton
E) includes cytosol
Answer: A
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

15) Many proteins in the cytosol are _____ that accelerate metabolic reactions.
A) carbohydrates
B) enzymes
C) lipids
D) messengers
E) ions
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

16) Microfilaments
A) anchor the cytoskeleton to membrane proteins.
B) control the consistency of cytoplasm.
C) with myosin, produce cell movement.
D) consist of the protein called actin.
E) All of the answers are correct.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

17) Microfilaments
A) are usually composed of myosin.
B) are hollow, filamentous structures.
C) anchor the cytoskeleton to integral proteins of the cell membrane.
D) interact with filaments composed of tubulin to produce muscle contractions.
E) are found in the cytoplasm radiating away from the centrosome.
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

18) Tubulin is a
A) carbohydrate that assembles into filamentous tubes (microtubules).
B) lipid that assembles into filamentous tubes (microtubules).
C) protein that assembles into filamentous tubes (microtubules).
D) protein that forms the tubular portion of the cytosol.
E) lipid that forms the ER.
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

19) Compared to the extracellular fluid, cytosol contains
A) a higher concentration of potassium ions.
B) a lower concentration of dissolved proteins.
C) almost no glycogen.
D) a higher concentration of amino acids.
E) almost no lipids.
Answer: A
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

20) Which of the following cytoskeleton components moves the chromosomes during cell division?
A) microfilaments
B) intermediate filaments
C) thick filaments
D) microtubules
E) basal bodies
Answer: D
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

21) Most of the ATP required to power cellular operations is produced in the
A) cytoplasm.
B) endoplasmic reticulum.
C) nucleus.
D) mitochondria.
E) cilia.
Answer: D
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

22) In the mitochondrion, folds are to cristae as the contained fluid is to
A) actin.
B) microvilli.
C) cytosol.
D) basal body.
E) matrix.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

23) Synthesis of lipids and glycogen takes place at the
A) ribosomes.
B) rough ER.
C) smooth ER.
D) Golgi apparatus.
E) mitochondria.
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

24) Which of the following consists of a network of intracellular membranes with attached ribosomes?
A) rough endoplasmic reticulum
B) smooth endoplasmic reticulum
C) mitochondria
D) nucleoli
E) Golgi apparatus
Answer: A
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

25) Renewal or modification of the cell membrane is a function of the
A) microtubules.
B) mitochondria.
C) rough endoplasmic reticulum.
D) ribosomes.
E) Golgi apparatus.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

26) Organelles that break down fatty acids and hydrogen peroxide are
A) lysosomes.
B) peroxisomes.
C) endocytic vesicles.
D) nuclei.
E) toxisomes.
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

27) When activated, lysosomes function in
A) formation of new cell membranes.
B) synthesis of proteins.
C) digestion of foreign material.
D) synthesis of lipids.
E) cell division.
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

28) Which form of endoplasmic reticulum modifies and packages newly synthesized proteins?
A) ribosomal endoplasmic reticulum
B) proteosomes reticulum
C) raised endoplasmic reticulum
D) smooth endoplasmic reticulum
E) rough endoplasmic reticulum
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

29) Microtubules have which of the following functions?
A) They form structural components of organelles.
B) They move chromosomes during cell division.
C) They provide a mechanism for changing the cell shape.
D) Molecular motors move along them.
E) All of the answers are correct.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

30) Which of following properties of microtubules is **true**?
A) made of myosin
B) made of actin
C) found only in the terminal web
D) another term for microfilaments
E) interact with dynein and kinesin
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

31) The endoplasmic reticulum is responsible for
A) drug and toxin neutralization.
B) lipid synthesis.
C) modification of new proteins.
D) shipping molecules to the Golgi apparatus.
E) All of the answers are correct.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

32) Match the organelle (1-4) with the correct description (5-8):

1. mitochondrion
2. centriole
3. endoplasmic reticulum
4. cytosol

5. intracellular transport
6. liquid in cell
7. manufactures cell energy
8. separates chromosomes during mitosis

A) 1 & 7, 2 & 6, 3 & 8, 4 & 5
B) 1 & 8, 2 & 5, 3 & 6, 4 & 7
C) 1 & 7, 2 & 8, 3 & 5, 4 & 6
D) 1 & 5, 2 & 6, 3 & 7, 4 & 8
E) 1 & 6, 2 & 8, 3 & 5, 4 & 7
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

33) Tubulin is to microtubules as actin is to
A) ribosomes.
B) microfilaments.
C) intermediate filaments.
D) flagella.
E) microvilli.
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

34) Molecular motors that carry materials in opposite directions along microtubules are called
A) kinesin and myosin.
B) actin and myosin.
C) dynein and myosin.
D) dynein and actin.
E) dynein and kinesin.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

35) Peroxisomes
A) contain enzymes that break down hydrogen peroxide.
B) absorb and break down fatty acids, generating hydrogen peroxide in the process.
C) are produced from other peroxisomes.
D) are more abundant in cells with higher metabolic rates.
E) All of the answers are correct.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

36) Which of the following statements about the Golgi apparatus is **false**?
A) receives transport vesicles from the RER
B) sends transport vesicles to the RER
C) produces lysosomes
D) supplies new membrane components
E) produces secretory vesicles
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

37) Which of following properties of the cytoskeleton is **false**?
A) supports organelles
B) controls cell shape
C) provides cell strength
D) made of cytobones
E) moves organelles
Answer: D
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

38) Which organelle is most prominent in cells that make large amounts of protein?
A) nucleus
B) nucleolus
C) chromosome
D) proteasome
E) mitochondria
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

39) If an animal cell lacked centrioles, it would not be able to
A) move.
B) synthesize proteins.
C) produce DNA.
D) metabolize sugars.
E) form the mitotic spindle.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

40) Each of the following statements concerning mitochondria is true, **except** one. Identify the exception.
A) The cristae increase the inner surface area of the organelle.
B) The matrix contains metabolic enzymes involved in energy production.
C) Respiratory enzymes are attached to the surface of the cristae.
D) The mitochondria require carbon dioxide and produce oxygen in the process of energy production.
E) The mitochondria produce most of a cell's ATP.
Answer: D
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

41) Each of the following is a function of smooth endoplasmic reticulum, **except**
A) storage and release of calcium ions.
B) modification of protein.
C) synthesis of steroid hormones.
D) synthesis of triglycerides.
E) detoxification of drugs.
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

42) The following is a list of the steps involved in the process of secretion by the Golgi apparatus.
1. Material moves from cisterna to cisterna by means of transfer vesicles.
2. Exocytosis.
3. Products from RER are packaged into transport vesicles.
4. Secretory vesicles are formed at the maturing face.
5. Vesicles arrive at the forming face.
6. Enzymes modify arriving proteins and glycoproteins.

The proper order for these is
A) 5, 6, 1, 4, 2, 3.
B) 2, 3, 5, 6, 1, 4.
C) 4, 3, 1, 6, 5, 2.
D) 3, 5, 6, 1, 4, 2.
E) 1, 3, 6, 4, 2, 5.
Answer: D
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

43) Examination of a sample of glandular cells reveals an extensive network of smooth endoplasmic reticulum. Which of the following is the likeliest product of these cells?
A) digestive enzymes
B) steroid hormones
C) protein hormones
D) transport proteins
E) antibodies
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Application

44) Some cells contain large numbers of mitochondria while others have relatively few or none. This suggests that
A) cells with large numbers of mitochondria are short-lived.
B) cells with large numbers of mitochondria have a high energy demand.
C) cells with small numbers of mitochondria have a large ATP supply.
D) cells with large numbers of mitochondria have a low energy demand.
E) some cells are older than others.
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Application

45) Microscopic analysis of a tissue sample indicates that it contains abundant myosin filaments. This tissue is probably contains
A) nerve cells.
B) reproductive cells.
C) bone cells.
D) muscle cells.
E) liver cells.
Answer: D
Learning Outcome: 3-2
Bloom's Taxonomy: Application

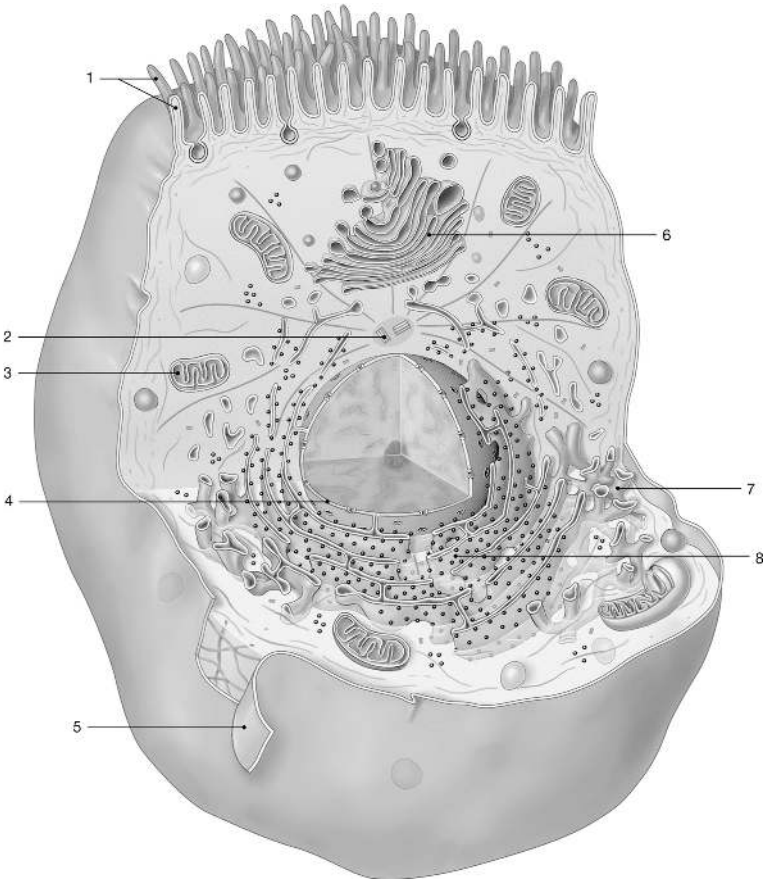

Figure 3-1 The Anatomy of a Representative Cell
Use Figure 3-1 to answer the following questions:

46) Which structure organizes the mitotic spindle during cell division?
A) 1
B) 2
C) 3
D) 5
E) 6
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

47) Synthesis of carbohydrates and lipids occurs in the structure labeled
A) 4.
B) 5.
C) 6.
D) 7.
E) 8.
Answer: D
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

48) Which structure produces ATP for the cell?
A) 1
B) 2
C) 3
D) 5
E) 6
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

49) Which organelle renews the cell membrane and modifies and packages proteins for secretion?
A) 4
B) 5
C) 6
D) 7
E) 8
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

50) The structure labeled "1" permits the cell to
A) attach to neighboring cells.
B) produce more cells.
C) increase surface area for increased membrane transport.
D) swim in extracellular fluid.
E) trap bacteria.
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

51) The components of ribosomes are formed within
A) the endoplasmic reticulum.
B) Golgi complexes.
C) lysosomes.
D) mitochondria.
E) nucleoli.
Answer: E
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

52) Histones are found in
A) nucleosomes.
B) proteasomes.
C) lysosomes.
D) vesicles.
E) endosomes.
Answer: A
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

53) Chromosomes consist of _____ and _____.
A) RNA; carbohydrates
B) DNA; lipids
C) DNA; proteins
D) water; RNA
E) RNA; proteins
Answer: C
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

54) Most of a cell's DNA is located in its
A) ribosomes.
B) lysosomes.
C) Golgi apparatus.
D) nucleus.
E) nucleolus.
Answer: D
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

55) The control center for cellular operations is the
A) nucleus.
B) mitochondria.
C) Golgi apparatus.
D) endoplasmic reticulum.
E) ribosome.
Answer: A
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

56) The complex structures of DNA and protein found in the cell nucleus are
A) nucleoplasm.
B) chromosomes.
C) histones.
D) nucleases.
E) mitochondria.
Answer: B
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

57) The triplet codes needed to specify a specific polypeptide chain are found in the
A) cytoplasm.
B) gene.
C) codon.
D) anticodon.
E) polypeptide itself.
Answer: B
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

58) The functional units of DNA that contain the instructions for making one or more proteins are
A) chromosomes.
B) genes.
C) ribosomes.
D) codons.
E) RNA.
Answer: B
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

59) A mature red blood cell lacks a nucleus; therefore, it
A) can repair itself readily.
B) is malformed.
C) can only divide once more.
D) will be a long-lived cell.
E) cannot make new proteins and will be worn out within a few months.
Answer: E
Learning Outcome: 3-4
Bloom's Taxonomy: Application

60) mRNA is needed to synthesize _____ in the cytoplasm.
A) carbohydrates
B) lipids
C) proteins
D) phospholipids
E) salts
Answer: C
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

61) As each codon arrives at the active site of a ribosome, it attracts another molecule containing the anticodon. This molecule is called
A) DNA.
B) mRNA.
C) rRNA.
D) tRNA.
E) RER.
Answer: D
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

62) The process of protein formation directed by mRNA is called
A) replication.
B) transcription.
C) translation.
D) mitosis.
E) auscultation.
Answer: C
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

63) The process of forming mRNA is called
A) replication.
B) transcription.
C) translation.
D) ribolation.
E) auscultation.
Answer: B
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

64) Specific proteins are manufactured through the interaction of _____ and _____.
A) multiple enzymes; three types of RNA
B) multiple enzymes; two types of RNA
C) multiple carbohydrates; three types of DNA
D) multiple proteins; three types of DNA
E) multiple enzymes; three types of DNA
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

65) The mRNA sequence that is complementary to the sequence ATC on DNA is
A) ATC.
B) TAG.
C) UAG.
D) AUG.
E) AUC.
Answer: C
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

66) The anticodon for the triplet UCA is
A) AGU.
B) AGC.
C) TCA.
D) TGT.
E) AGT.
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

67) Before the mRNA transcribed from a gene can be used to translate into a protein, it must be
A) edited to remove introns.
B) edited to remove exons.
C) transported into the cytoplasm.
D) edited to remove introns and transported into the cytoplasm.
E) coated with phospholipids for transport out of the nucleus.
Answer: D
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

68) Thymine is replaced by which nitrogen base in RNA?
A) ribose
B) uracil
C) guanine
D) thymine is not replaced in RNA
E) cytosine
Answer: B
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

69) The molecule that brings the proper amino acid into place at the ribosome for the elongation of a new protein is called
A) mRNA.
B) tRNA.
C) ATP.
D) Na-K.
E) rRNA.
Answer: B
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

70) Put the following steps of protein synthesis in correct order of occurrence:
1. mRNA is produced in nucleus
2. ribosome moves along mRNA
3. DNA uncoils for transcription
4. polypeptide is produced
5. tRNA brings amino acids to ribosome
6. mRNA moves to ribosome

A) 3, 1, 6, 2, 5, 4
B) 2, 4, 6, 1, 3, 5
C) 2, 1, 5, 4, 3, 6
D) 3, 5, 1, 6, 2, 4
E) 1, 5, 3, 4, 2, 6
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

71) The unit of DNA that specifies a certain amino acid is called a _____, the same unit of mRNA is called a _____ which, during protein synthesis, is matched by the _____ of tRNA.
A) triplet, codon, anticodon
B) nitrogen base, sugar, phosphate
C) codon, anticodon, ribosome
D) gene, gene, triplet, amino acid
E) triplet, co-triplet, gene
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

72) The duplication of DNA is called _____, the copying of DNA to mRNA is called _____, and the reading of the mRNA by the cell to make a protein is called _____ .
A) replication, transcription, translation
B) interphase, replication, active transport
C) replication, translation, transcription
D) mitosis, duplication, protein synthesis
E) reproduction, duplication, initiation
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

73) What would the complimentary DNA template strand be to produce the mRNA sequence of UGU - CAA?
A) ACA - GTT
B) UCU - GUU
C) CGC - ATT
D) ACA - GUU
E) TCT - GTT
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

74) A gene is a set of specific instructions that
A) produces amino acids for proteins.
B) copies DNA strands for mitosis.
C) controls the process of mitosis.
D) indicates the sequence of amino acids in a protein molecule.
E) directs carbohydrate synthesis.
Answer: D
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

75) The DNA molecule is like a twisted ladder. What molecules form the "sides" of the DNA ladder?
A) alternating molecules of sugar and phosphate groups
B) carbohydrates and lipids
C) repeating molecules of acids and bases
D) amino acids and protein
E) nitrogen bases and sugar molecules
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

76) A DNA nucleotide is composed of
A) three amino acids.
B) a codon and an anticodon.
C) one nitrogen base, deoxyribose sugar, and a phosphate group.
D) four nitrogen bases.
E) protein, lipid, and ribose sugar.
Answer: C
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

77) What would the complimentary (matching) mRNA and tRNA molecules be from a DNA molecule that has the following triplets?

coding strand:	ATG-CAA
template strand:	TAC-GTT

A) mRNA: AUG-CAA, tRNA: TAC-GTT
B) mRNA: ATG-CAA, tRNA: TAC-GTT
C) mRNA: UAC-GUU, tRNA: AUG-CAA
D) mRNA: TAC-GTT, tRNA: AUG-CAA
E) mRNA: AUG-CAA, tRNA: UAC-GUU
Answer: E
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

78) The movement of oxygen from an area of high concentration to an area of low concentration is an example of
A) osmosis.
B) active transport.
C) diffusion.
D) facilitated transport.
E) filtration.
Answer: C
Learning Outcome: 3-5
Bloom's Taxonomy: Knowledge

79) Diffusion of a substance across the cell membrane is influenced by all of the following, **except**
A) hydrolysis of ATP.
B) the presence of the membrane channels.
C) the charge on the ion.
D) concentration gradient.
E) lipid solubility.
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Knowledge

80) Water molecules and small ions enter a cell through
A) channels formed by integral proteins.
B) peripheral proteins.
C) lipid channels.
D) peripheral carbohydrates.
E) defects in the lipid layer of the membrane.
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Knowledge

81) A solution that contains a lower osmotic pressure than the cytoplasm of a cell is called
A) merotonic.
B) hypertonic.
C) isotonic.
D) hypotonic.
E) homotonic.
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Knowledge

82) If a red blood cell (RBC) is placed in a 0.5% salt solution, which of the following would occur?
1. water will move out of the RBC
2. RBC will hemolyze
3. RBC will crenate
4. water will enter the RBC

A) 1 and 3 only
B) 2 and 3 only
C) 1 and 2 only
D) 3 and 4 only
E) 2 and 4 only
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

83) Which statement best describes osmosis?
A) active transport of water across the cell membrane
B) diffusion of water from a greater to a lesser water concentration
C) movement of water into a solute
D) diffusion of water from a greater to a lesser water concentration across a selectively permeable membrane
E) random movement of water due to kinetic energy
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

84) Osmotic pressure
A) forces water to move toward the higher solute concentration.
B) forces water to move across a semipermeable membrane.
C) can be opposed by hydrostatic pressure.
D) increases as solute concentration increases.
E) All the answers are correct.
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

85) "Spikes" form on a blood cell when it is placed in a(n) _____ solution.
A) isotonic
B) hypertonic
C) hypotonic
D) merotonic
E) homotonic
Answer: B
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

86) Hemolysis may occur when a blood cell is placed into
A) isotonic solution.
B) hypertonic solution.
C) hypotonic solution.
D) merotonic solution.
E) homotonic solution.
Answer: C
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

87) The skin swells and puckers during a long bath. This suggests that bath water is a(n) _____ fluid.
A) isotonic
B) hypotonic
C) hypertonic
D) diffusion
E) toxic
Answer: B
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

88) Red blood cell shrinkage is to _____ as cell bursting is to _____.
A) crenation; hemolysis
B) lysis; crenation
C) hypotonic; isotonic
D) isotonic; hypotonic
E) isotonic; hypertonic
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

89) If the amount of chloride ion in blood plasma increases, which of the following would **initially** occur?
A) The blood osmotic pressure will increase.
B) The blood osmotic pressure will decrease.
C) The blood osmotic pressure will stay the same.
D) The blood hydrostatic pressure will increase.
E) The blood hydrostatic pressure will decrease.
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

90) If the concentration of sodium chloride in the interstitial fluid surrounding cells decreases and the concentration of other solutes remains constant,
A) the cells will shrink.
B) the cells will swell.
C) the fluid outside of the cells will become isotonic.
D) the fluid outside of the cells will become hypertonic.
E) the cells will not change.
Answer: B
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

91) There is a direct correlation between the potency of a general anesthetic such as ether and its ability to
A) dissolve in water.
B) dissolve in lipids.
C) bind to proteins.
D) interact with carbohydrates.
E) bind to DNA.
Answer: B
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

92) An impermeable carbohydrate that is often administered to patients suffering blood loss is
A) saline solution.
B) salt solution.
C) glucose.
D) isotonic saline.
E) dextran.
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

93) A patient suffers blood loss and is given IV fluids that contain an impermeable carbohydrate called dextran which serves to
A) provide nutrition.
B) increase the osmolarity of the blood.
C) make the blood hypertonic.
D) decrease the osmolarity of the blood.
E) reduce blood clotting.
Answer: B
Learning Outcome: 3-5
Bloom's Taxonomy: Application

94) Imagine two rigid chambers separated by a rigid membrane that is freely permeable to water but impermeable to glucose. Side 1 contains a 10 percent glucose solution and side 2 contains pure water. At equilibrium, what will be the situation?
A) Water will continue to move from side 1 to side 2.
B) Water will continue to move from side 2 to side 1.
C) The hydrostatic pressure will be higher in side 1.
D) The hydrostatic pressure will be higher in side 2.
E) no way to tell what the situation will be
Answer: C
Learning Outcome: 3-5
Bloom's Taxonomy: Application

95) Breathing faster and deeper eliminates more carbon dioxide from the body than normal breathing. Under these circumstances
A) more carbon dioxide will diffuse out of the blood.
B) more carbon dioxide will diffuse into the blood.
C) less carbon dioxide will diffuse out of the blood.
D) less carbon dioxide will diffuse into the blood.
E) the amount of carbon dioxide diffusion will remain unchanged.
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Application

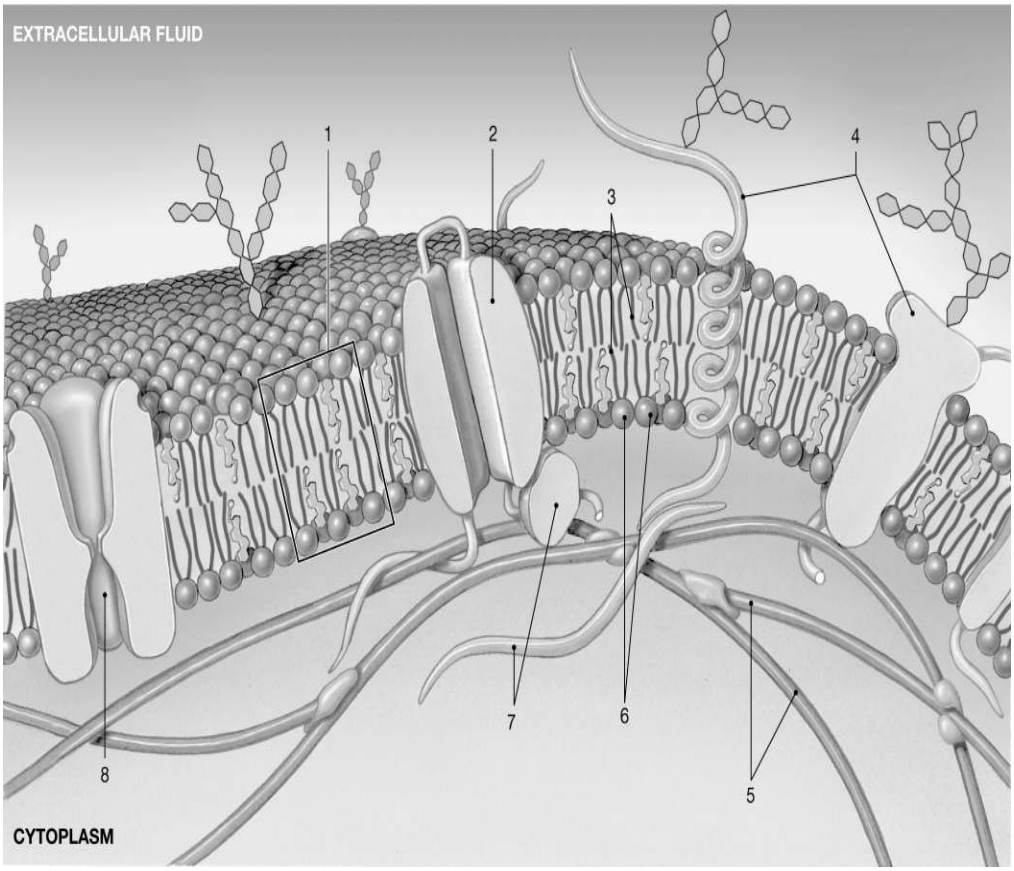

Figure 3-2 The Plasmalemma
Use Figure 3-2 to answer the following questions:

96) Which structure is water most likely to pass through?
A) 1
B) 2
C) 3
D) 4
E) 8
Answer: B
Learning Outcome: 3-1
Bloom's Taxonomy: Comprehension

97) Which structure has a "gate" to control transport?
A) 1
B) 2
C) 4
D) 7
E) 8
Answer: E
Learning Outcome: 3-1
Bloom's Taxonomy: Comprehension

98) What part of the plasmalemma is hydrophobic?
A) 1
B) 2
C) 3
D) 4
E) 6
Answer: C
Learning Outcome: 3-1
Bloom's Taxonomy: Comprehension

99) Microfilaments are labeled
A) 1.
B) 2.
C) 3.
D) 5.
E) 6.
Answer: D
Learning Outcome: 3-2
Bloom's Taxonomy: Comprehension

100) Lipid molecules pass into the cell through the structure labeled
A) 1.
B) 2.
C) 3.
D) 5.
E) 6.
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

101) The process by which molecules such as glucose are moved into cells along their concentration gradient with the help of membrane-bound carrier proteins is called
A) osmosis.
B) facilitated diffusion.
C) active transport.
D) endocytosis.
E) exocytosis.
Answer: B
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

102) Facilitated diffusion differs from ordinary diffusion in that
A) facilitated diffusion consumes no ATP.
B) facilitated diffusion moves molecules from an area of higher concentration to lower concentration.
C) the rate of molecular movement is limited by the number of available carrier molecules.
D) facilitated diffusion never eliminates the concentration gradient.
E) the rate of molecular movement is not limited by the number of available carrier molecules.
Answer: C
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

103) All of the following membrane transport mechanisms are passive processes, **except**
A) diffusion.
B) facilitated diffusion.
C) vesicular transport.
D) osmosis.
E) movement of water.
Answer: C
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

104) A process that requires cellular energy to move a substance against its concentration gradient is called
A) active transport.
B) passive transport.
C) facilitated transport.
D) osmosis.
E) diffusion.
Answer: A
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

105) The intake of small membrane vesicles from the extracellular fluid is called
A) osmosis.
B) active transport.
C) facilitated transport.
D) endocytosis.
E) an ion exchange pump.
Answer: D
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

106) Two types of vesicular transport include
A) endocytosis and retrocytosis.
B) endocytosis and exocytosis.
C) exocytosis and retrocytosis.
D) pinocytosis and active transport.
E) passive diffusion and active diffusion.
Answer: B
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

107) The principal cations in our body fluids are _____ and _____.
A) sodium; potassium
B) calcium; magnesium
C) sodium; calcium
D) chloride; bicarbonate
E) sodium; chloride
Answer: A
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

108) In order to maintain cellular homeostasis, an exchange pump ejects _____ ions from the cell and imports _____ ions.
A) potassium; calcium
B) sodium; calcium
C) potassium; sodium
D) sodium; potassium
E) calcium; sodium
Answer: D
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

109) Endocytosis is
A) a method for transporting substances into the cell.
B) a method for metabolizing within the cytosol.
C) a form of anabolism.
D) a viral infection.
E) a method for packaging secretions.
Answer: A
Learning Outcome: 3-6
Bloom's Taxonomy: Comprehension

110) A defense cell engulfing a bacterium illustrates
A) pinocytosis.
B) endocytosis.
C) exocytosis.
D) phagocytosis.
E) receptor-mediated endocytosis.
Answer: D
Learning Outcome: 3-6
Bloom's Taxonomy: Comprehension

111) Which of these transport processes always requires metabolic energy?
A) diffusion
B) carrier-mediated transport
C) vesicular transport
D) freely permeable
E) impermeable
Answer: C
Learning Outcome: 3-6
Bloom's Taxonomy: Comprehension

112) A membrane transport process is found experimentally to have a saturation limit. Which of the following is a possible property of the process?
A) energy-dependent
B) carrier-mediated
C) cotransport
D) active transport
E) All of the answers are correct.
Answer: E
Learning Outcome: 3-6
Bloom's Taxonomy: Application

113) Assume that the transport of a particular amino acid across the plasmalemma is observed (1) to occur only down its concentration gradient and (2) to slow when a similar amino acid is added to the extracellular fluid. The movement of the amino acid through the membrane is most likely by
A) osmosis.
B) diffusion.
C) facilitated diffusion.
D) active transport.
E) pinocytosis.
Answer: C
Learning Outcome: 3-6
Bloom's Taxonomy: Application

114) Which of the following about a cell's resting transmembrane potential is **false**?
A) inside slightly more positive than outside
B) inside slightly more negative than outside
C) depends on separation of + and – charges
D) represents potential energy
E) controls muscular contraction and nervous signaling
Answer: A
Learning Outcome: 3-7
Bloom's Taxonomy: Knowledge

115) The potential difference across the cell membrane is due to the separation of
A) carbohydrate molecules.
B) water molecules.
C) cations and anions.
D) acids and bases.
E) phospholipids and proteins.
Answer: C
Learning Outcome: 3-7
Bloom's Taxonomy: Knowledge

116) Changes in the transmembrane potential of a cell are involved in
A) movement.
B) thought.
C) glandular secretion.
D) nerve cell communication.
E) All of the answers are correct.
Answer: D
Learning Outcome: 3-7
Bloom's Taxonomy: Knowledge

117) In a series of measurements of resting transmembrane potentials, the following values were recorded. Which one is likeliest to be an error?
A) -10 mV
B) -20 mV
C) -40 mV
D) -70 mV
E) +100 mV
Answer: E
Learning Outcome: 3-7
Bloom's Taxonomy: Comprehension

118) If a cell lacked the enzyme DNA polymerase, it could not
A) form protein.
B) form complementary sequences of DNA.
C) link segments of DNA together.
D) form spindle fibers.
E) form a new nuclear membrane during telophase.
Answer: B
Learning Outcome: 3-8
Bloom's Taxonomy: Comprehension

119) When is DNA replicated?
A) interphase
B) anaphase
C) metaphase
D) telophase
E) interkinesis
Answer: A
Learning Outcome: 3-8
Bloom's Taxonomy: Comprehension

120) The stage in a cell's life cycle in which the cell performs its normal functions and prepares for division is called
A) prophase.
B) metaphase.
C) interphase.
D) telophase.
E) anaphase.
Answer: C
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

121) A cell duplicates its chromosomes during the _____ phase.
A) G_o
B) G_1
C) G_2
D) G_m
E) S
Answer: E
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

122) During mitosis, chromatids separate into daughter chromosomes during
A) prophase.
B) metaphase.
C) interphase.
D) telophase.
E) anaphase.
Answer: E
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

123) Mitosis is to somatic cells as meiosis is to
A) visceral cells.
B) reproductive cells.
C) plant cells.
D) sensory cells.
E) stem cells.
Answer: B
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

124) During this phase of cell division, the chromosomes uncoil, the nuclear membrane forms, and cytokinesis occurs.
A) anaphase
B) prophase
C) interphase
D) telophase
E) metaphase
Answer: D
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

125) Before a cell divides, its DNA must be replicated to
A) provide a backup copy of DNA in case the original DNA is damaged during mitosis.
B) replace the DNA lost during transcription.
C) supply each new cell with a full set of the genetic material.
D) replace genetic instructions used by the original cell.
E) use as an energy source during cytokinesis.
Answer: C
Learning Outcome: 3-8
Bloom's Taxonomy: Comprehension

126) Which phase of the cell cycle has the most variable duration?
A) S phase
B) G_0 phase
C) G_1 phase
D) G_2 phase
E) V phase
Answer: B
Learning Outcome: 3-8
Bloom's Taxonomy: Comprehension

127) Generally, cells with a very brief interphase and lacking a G_0 phase
A) are stem cells.
B) do not exhibit cytokinesis.
C) have brief life spans.
D) are reproductive cells.
E) lack the enzyme DNA polymerase.
Answer: A
Learning Outcome: 3-8
Bloom's Taxonomy: Comprehension

128) During mitosis, two daughter cells form, each of which has
A) a different number of chromosomes than the original cell.
B) twice as many chromosomes as the original cell.
C) the same number of chromosomes as the original cell.
D) a lesser number of chromosomes than the original cell.
E) half as many chromosomes as the original cell.
Answer: C
Learning Outcome: 3-8
Bloom's Taxonomy: Comprehension

129) The correct order of phases in cell division is:
A) prophase, interphase, anaphase, metaphase, telophase
B) telophase, anaphase, metaphase, interphase, prophase
C) interphase, prophase, anaphase, metaphase, telophase
D) interphase, prophase, metaphase, anaphase, telophase
E) metaphase, anaphase, interphase, prophase, telophase
Answer: D
Learning Outcome: 3-8
Bloom's Taxonomy: Comprehension

130) If a cell has 18 chromosomes and undergoes mitosis how many chromosomes would each daughter cell have?
A) cannot be determined
B) 9
C) 36
D) 23
E) 18
Answer: E
Learning Outcome: 3-8
Bloom's Taxonomy: Comprehension

131) The genetically programmed death of cells is called
A) differentiation.
B) replication.
C) apoptosis.
D) metastasis.
E) mitosis.
Answer: C
Learning Outcome: 3-9
Bloom's Taxonomy: Knowledge

132) An alternate term for *tumor* is
A) neoplasm.
B) cytoplasm.
C) benign malignancy.
D) primary metastasis.
E) nucleoplasm.
Answer: A
Learning Outcome: 3-10
Bloom's Taxonomy: Knowledge

133) Cancer cells
A) are indistinguishable from normal body cells.
B) have a slow mitotic rate.
C) may exhibit metastasis.
D) do not form neoplasms.
E) generally form benign tumors.
Answer: C
Learning Outcome: 3-10
Bloom's Taxonomy: Comprehension

134) As genes are functionally eliminated, the cell becomes limited in the range of proteins it can make. This specialization process is termed
A) adaptation.
B) differentiation.
C) structural integration.
D) cellular activation.
E) apoptosis.
Answer: B
Learning Outcome: 3-11
Bloom's Taxonomy: Knowledge

Short Answer Questions

135) Recognition keeps the immune response from attacking _____, while still enabling it to recognize and destroy invading pathogens.
Answer: self
Learning Outcome: 3-1
Bloom's Taxonomy: Knowledge

136) Receptor molecules on the surface of cells bind specific molecules called, in general, _____.
Answer: ligands
Learning Outcome: 3-1
Bloom's Taxonomy: Knowledge

137) The cytoplasm contains the fluid cytosol and the suspended _____.
Answer: organelles
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

138) Masses of insoluble material that are sometimes found in cytosol are known as _____.
Answer: inclusions
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

139) _____ cells are all of the cells of the body except the reproductive cells (sperm and oocytes). (Note: Be sure to capitalize the first letter of your answer).
Answer: Somatic
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

140) The endoplasmic reticulum is an example of a(n) _____ organelle.
Answer: membranous
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

141) The extracellular fluid in most tissues is called the _____ fluid.
Answer: interstitial
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

142) Cilia and flagella contain 9 pairs of _____ surrounding a central pair.
Answer: microtubules
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

143) _____ are responsible for identifying and digesting damaged or denatured proteins. (Note: Be sure to capitalize the first letter of your answer).
Answer: Proteasomes
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

144) The _____ typically consists of five or six flattened membranous discs called cisternae.
Answer: Golgi apparatus
Learning Outcome: 3-2
Bloom's Taxonomy: Knowledge

145) The nucleus is surrounded by the _____.
Answer: nuclear envelope
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

146) In cells that are not dividing, chromosomes uncoil to form a tangle of fine fibers known as _____.
Answer: chromatin
Learning Outcome: 3-3
Bloom's Taxonomy: Knowledge

147) _____ refers to identifying an individual on the basis of repetitive nucleotide sequences in his or her DNA. (Note: Be sure to capitalize the first letter of your answer).
Answer: DNA fingerprinting
Learning Outcome: 3-3
Bloom's Taxonomy: Comprehension

148) Ribosomes are composed of protein and _____.
Answer: rRNA
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

149) Transfer of mRNA from the nucleus to the cytosol occurs through _____.
Answer: nuclear pores
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

150) A molecule of _____ contains all the codons needed to produce a particular polypeptide.
Answer: mRNA
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

151) The enzyme _____ is required for the synthesis of mRNA.
Answer: RNA polymerase
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

152) Amino acids are transferred to the ribosome to be incorporated into a growing polypeptide chain by _____.
Answer: tRNA
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

153) During the synthesis of proteins, amino acids are assembled in the proper sequence because each tRNA molecule that brings them to the ribosome has a(n) _____ that binds to a complementary codon in the mRNA.
Answer: anticodon
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

154) The start of each gene begins with a _____ segment.
Answer: promoter
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

155) A(n) _____ is a series of ribosomes attached to the same mRNA.
Answer: polyribosome or polysome
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

156) Permanent alterations in a cell's DNA that affect the nucleotide sequence of one or more genes are called _____.
Answer: mutations
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

157) A point mutation involves a change in _____.
Answer: a single nucleotide
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

158) Write out the term for tRNA.
Answer: transfer ribonucleic acid or transfer RNA
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

159) Write out the term for mRNA.
Answer: messenger ribonucleic acid or messenger RNA
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

160) Write out the term for rRNA.
Answer: ribosomal ribonucleic acid or ribosomal RNA
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

161) A change in a nucleotide sequence of a gene is termed a(n) _____.
Answer: mutation
Learning Outcome: 3-4
Bloom's Taxonomy: Knowledge

162) The _____ of a membrane indicates how easy it is for substances to cross.
Answer: permeability
Learning Outcome: 3-5
Bloom's Taxonomy: Knowledge

163) Cell membranes are said to be _____ because they allow some substances to pass but not others.
Answer: selectively permeable
Learning Outcome: 3-5
Bloom's Taxonomy: Knowledge

164) _____ channels can open or close to regulate the passage of materials through the cell membrane. (Note: Be sure to capitalize the first letter of your answer).
Answer: Gated
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

165) Membrane-bound proteins that use metabolic energy to move ions across the plasmalemma are called _____.
Answer: ion pumps
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

166) In _____ one substance is transported into the cell, and another is transported out.
Answer: countertransport or antiport
Learning Outcome: 3-6
Bloom's Taxonomy: Knowledge

167) Whenever positive and negative ions have been separated, a(n) _____ will be produced.
Answer: potential difference
Learning Outcome: 3-7
Bloom's Taxonomy: Knowledge

168) The potential difference across the cell membrane is known as the _____.
Answer: transmembrane potential
Learning Outcome: 3-7
Bloom's Taxonomy: Knowledge

169) The transmembrane potential in an undisturbed cell is called its _____.
Answer: resting membrane potential
Learning Outcome: 3-7
Bloom's Taxonomy: Knowledge

170) Nuclear division of somatic cells is known as _____.
Answer: mitosis
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

171) The process of duplicating chromosomes prior to cell division is called _____.
Answer: replication
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

172) Special cells called _____ maintain tissues by unending cycles of cell division.
Answer: stem cells
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

173) The proper distribution of a cell's genetic material to two daughter cells is accomplished by the process of _____.
Answer: mitosis
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

174) The physical process by which a single animal cell separates into two cells is called _____.
Answer: cytokinesis
Learning Outcome: 3-8
Bloom's Taxonomy: Knowledge

175) A(n) _____ is a mutant of a regulatory gene that causes cancer.
Answer: oncogene
Learning Outcome: 3-10
Bloom's Taxonomy: Comprehension

176) A malignant neoplasm is often called a(n) _____.
Answer: cancer
Learning Outcome: 3-10
Bloom's Taxonomy: Comprehension

177) The process by which cells become specialized is called _____.
Answer: differentiation
Learning Outcome: 3-11
Bloom's Taxonomy: Knowledge

Essay Questions

178) Which organelles are involved in membrane flow? Trace the route of a single integral membrane protein from formation to incorporation into the plasma membrane.
Answer: All membranous organelles are involved in membrane flow. Those most directly associated are the ER, Golgi apparatus, secretory vesicles, and plasma membrane. A membrane protein would be synthesized in the RER, then flow through the cisternae to a transport vesicle. There the protein will be moved to the forming face of the Golgi apparatus, where it will slowly travel upward toward the maturing face, usually becoming modified along the way. Once reaching the maturing face of the Golgi apparatus, the protein would be embedded in the membrane of a secretory vesicle and transported to the plasma membrane. There the vesicle will fuse with the membrane, inserting the protein in the cell membrane.
Learning Outcome: 3-2
Bloom's Taxonomy: Application

179) Differentiate between transcription and translation.
Answer: In transcription, RNA polymerase uses the nucleotide sequence on DNA to construct a complementary strand of mRNA. In translation, ribosomes use information carried by the mRNA strand and tRNA to synthesize the corresponding polypeptide.
Learning Outcome: 3-4
Bloom's Taxonomy: Comprehension

180) When a person receives intravenous fluids to help build up blood volume, why is it important for the fluid to be isotonic?
Answer: Intravenous fluids must be isotonic to prevent the cells from losing or gaining water. If the solution were hypertonic, the cells of the body would lose water, shrink, and possibly be harmed. On the other hand, the introduction of hypotonic fluid would cause the cells to swell and tissues to rupture.
Learning Outcome: 3-5
Bloom's Taxonomy: Application

181) Define osmosis.
Answer: Osmosis is the transfer of water across a semipermeable membrane due to a difference in concentration of impermeable solute.
Learning Outcome: 3-5
Bloom's Taxonomy: Comprehension

182) During kidney dialysis, a person's blood is passed through a bath that contains several ions and molecules. The blood is separated from the dialysis fluid by a membrane that allows water, small ions, and small molecules to pass, but does not allow large proteins or blood cells to pass. What should the composition of dialysis fluid be for it to remove urea (a small molecule) without changing the blood volume (removing water from the blood)?
Answer: For the dialysis fluid to remove urea without removing water, it should not contain urea. Because urea is a small molecule, it will diffuse through the dialysis membrane from an area of high concentration (the blood) to an area of low concentration (the dialysis fluid). To prevent an associated osmotic water movement, the dialysis fluid should have an osmotic concentration similar to that of blood plasma, but with higher concentrations of solutes such as bicarbonate ions or glucose. As urea diffuses into the dialysis fluid, glucose and bicarbonate diffuse into the blood; as a result, the solute concentrations remain in balance and no osmotic water movement occurs.
Learning Outcome: 3-5
Bloom's Taxonomy: Application

183) A) What are the similarities between facilitated diffusion and active transport? B) What are the differences?
Answer: A) Both processes use carrier proteins and exhibit saturation. B) Facilitated diffusion is driven by a concentration gradient, does not consume ATP, and so is "passive," whereas active transport is active, consumes ATP, and moves a substance up its concentration gradient.
Learning Outcome: 3-6
Bloom's Taxonomy: Comprehension

184) What role does the sodium-potassium exchange pump play in stabilizing the resting membrane potential?
Answer: By ejecting sodium ions from the cytosol and absorbing potassium ions from the extracellular fluid, the sodium-potassium pump maintains the K concentration gradient that leads to a negative resting membrane potential.
Learning Outcome: 3-6
Bloom's Taxonomy: Comprehension

185) How would an inhibitor of the sodium-potassium exchange pump affect the resting potential?
Answer: The maintenance of a proper resting potential requires the sodium-potassium exchange pump, an active transport process. Without the pump, the cell would not be able to pump the sodium ion (+ charge) out and so the membrane potential would become more positive.
Learning Outcome: 3-6
Bloom's Taxonomy: Application

186) Intravenous injection of KCl could be fatal. Why?
Answer: Increasing the amount of potassium ion in the extracellular fluid would result in more potassium (+ charges) entering the cell, leading to a resting potential that was more positive. This would disturb the resting transmembrane potential, upsetting muscle contraction (heart and skeletal muscles).
Learning Outcome: 3-7
Bloom's Taxonomy: Application