

***Human Anatomy, 9e (Martini)***

**Chapter 2 Foundations: The Cell**

**2.1 Multiple Choice Questions**

1) Cells float in a watery medium called \_\_\_\_\_.

- A) cytoplasm
- B) extracellular fluid
- C) cytosol
- D) cellular fluid
- E) None of the answers are correct.

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

2) Which of the following describes phospholipids in the plasma membrane?

- A) The phospholipid tails are hydrophobic.
- B) The phospholipid tails are hydrophilic.
- C) The phospholipid heads are hydrophobic.
- D) The phospholipid tails are at the surface.
- E) The phospholipid heads are on the inside.

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

3) The viscous, superficial coating on the outer surface of the plasma membrane is called the \_\_\_\_\_.

- A) glycocalyx
- B) pseudopodia
- C) inclusions
- D) tubulin
- E) cytosol

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

4) How do peripheral proteins contribute to the structure of the plasma membrane?

- A) They form a structural element by being embedded in the plasma membrane.
- B) Some form channels to permit passage of water molecules, ions, and small water-soluble compounds into and out of the cell.
- C) Some may function as catalysts.
- D) They are attached to either the inner or outer surface of the membrane.
- E) None of the answers are correct.

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

5) Substances that enter the cell usually do so through the \_\_\_\_\_.

- A) cholesterol
- B) glycocalyx
- C) glycolipids
- D) integral proteins
- E) peripheral proteins

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

6) The general functions of the plasma membrane include \_\_\_\_\_.

- A) physical isolation of the cell contents from the surrounding extracellular fluid
- B) regulation of exchange of materials with the environment
- C) sensitivity to changes in the extracellular fluid
- D) structural support of the cell
- E) All of the answers are correct.

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

7) Which statement describes how the plasma membrane is used in communication and sensitivity?

- A) It serves as a storage site for large amounts of proteins for future use by the cell.
- B) It effectively isolates the cytoplasm from the surrounding fluid environment.
- C) It serves as an impermeable membrane.
- D) It acts as a site for the attachment of glycoproteins and glycolipids, which act as receptors for molecules present in the extracellular fluid.
- E) It provides for specialized connections between neighboring cells, giving tissues a stable structure.

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

8) Because the plasma membrane restricts some substances and permits others through, it is referred to as being \_\_\_\_\_.

- A) structurally rigid
- B) impermeable
- C) selectively permeable
- D) freely permeable
- E) both structurally rigid and selectively permeable

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

9) Which of the following is a passive process for material movement across a plasma membrane?

- A) receptor-mediated endocytosis
- B) phagocytosis
- C) exocytosis
- D) active transport
- E) facilitated diffusion

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

10) An active process for transporting extracellular fluid, such as water and small molecules, across a plasma membrane is \_\_\_\_\_.

- A) phagocytosis
- B) pinocytosis
- C) osmosis
- D) diffusion
- E) None of the answers are correct.

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

11) Iron ions and cholesterol are brought into the cell by the process of \_\_\_\_\_.

- A) pinocytosis
- B) phagocytosis
- C) receptor-mediated pinocytosis
- D) active transport
- E) None of the answers are correct.

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

12) Carbon dioxide moves through the plasma membrane through the process of \_\_\_\_\_.

- A) diffusion
- B) osmosis
- C) facilitated diffusion
- D) active transport
- E) both diffusion and osmosis

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

13) Processes involved in the movement of substances across a membrane at the expense of ATP, via exchange pumps, are classified as \_\_\_\_\_.

- A) osmosis
- B) diffusion
- C) filtration
- D) facilitated diffusion
- E) active transport

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

14) What is the term for the movement of water across a selectively permeable membrane from a low solute concentration to a high solute concentration?

- A) facilitated diffusion
- B) osmosis
- C) filtration
- D) active transport
- E) None of the answers are correct.

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

15) The extracellular fluid contains high concentration of \_\_\_\_\_.

- A) potassium ions
- B) dissolved and suspended proteins
- C) amino acids
- D) sodium ions
- E) lipids

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

16) Which of the following statements accurately describes cytosol?

- A) The term encompasses all material inside the cell.
- B) It is the fluid content inside the cell.
- C) It contains much less protein than the extracellular fluid.
- D) It contains large amounts of carbohydrates.
- E) It is composed of the intracellular structures known as organelles.

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

17) \_\_\_\_\_ are common inclusions in the cytosol of fat cells.

- A) Glycogen granules
- B) Suspended proteins
- C) Lipid droplets
- D) Dissolved proteins
- E) Metabolic enzymes

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

18) Which of the following is another name for cytosol?

- A) intracellular fluid
- B) gelatin
- C) interstitial fluid
- D) extracellular fluid
- E) integral proteins

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

19) The protein-synthesizing organelles are the \_\_\_\_\_.

- A) nucleus
- B) Golgi apparatus
- C) mitochondria
- D) lysosomes
- E) ribosomes

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

20) Which of the following is a non-membranous organelle?

- A) Golgi apparatus
- B) mitochondria
- C) nucleus
- D) centriole
- E) All of the answers are correct.

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

21) Which of the following is a function of microtubules?

- A) being part of the spindle apparatus
- B) control of metabolism
- C) storage of secretory products and lysosomal enzymes
- D) intracellular removal of damaged organelles or of pathogens
- E) assist in DNA replication

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

22) Which of the following is a cylindrical structure composed of short microtubules?

- A) DNA
- B) chromatin
- C) envelope
- D) nucleolus
- E) centriole

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

23) Why are microtubules considered among the non-membranous organelles?

- A) They do not have their own enclosed membrane.
- B) They are associated with the plasma membrane.
- C) They are aggregated into bundles.
- D) They are composed primarily of the protein actin.
- E) They are comprised chiefly of the protein tubulin.

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

24) Thick filaments \_\_\_\_\_.

- A) form intermediate filaments to stabilize organelle position
- B) are stable structures that do not change once formed
- C) are called neurofilaments in neurons
- D) interact with actin to produce contractions
- E) form the spindle apparatus during cell division

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

25) If a cell lacked centrioles, it would be unable to \_\_\_\_\_.

- A) direct the movement of chromosomes during cell division
- B) move through the surrounding fluid
- C) replicate its own DNA
- D) manufacture proteins
- E) move fluids or solutes across the plasma membrane

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

26) In the nucleus, what is the special protein to which DNA strands are bound?

- A) tubulin
- B) histone
- C) cytokeratin
- D) actin
- E) myosin

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

27) Which cellular operation occurs in the smooth endoplasmic reticulum?

- A) regulation of protein synthesis
- B) synthesis of RNA
- C) DNA replication leading to cell division
- D) synthesis of carbohydrates and lipids
- E) synthesis of ribosomes via nucleoli

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

28) The nucleus of a cell \_\_\_\_\_.

- A) is completely enclosed with no way in or out
- B) contains only the DNA
- C) is surrounded by a double layered membrane
- D) it contains large proteins that form the chromosomes and are the genetic material for the cell
- E) has all of these attributes

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

29) Which of the following is a vesicle that contains enzymes?

- A) ribosome
- B) lysosome
- C) nucleosome
- D) chromosome
- E) hyaluronan

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

30) Manufactured proteins from the rough endoplasmic reticulum are delivered to the Golgi apparatus by \_\_\_\_\_.

- A) cisternae
- B) bulk transport
- C) transport vesicles
- D) ribosomal RNA
- E) None of the answers are correct.

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

31) Renewal or modification of the plasma membrane is the major function of which organelle?

- A) lysosomes
- B) Golgi apparatus
- C) peroxisomes
- D) mitochondria
- E) cytoskeleton

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

32) Which organelle determines the structural and functional characteristics of the cell by controlling protein synthesis, determining what proteins are synthesized, and in what amounts?

- A) endoplasmic reticulum
- B) Golgi apparatus
- C) ribosomes
- D) mitochondria
- E) nucleus

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

33) Which of the following synthesizes the components of ribosomes?

- A) nuclear envelope
- B) nuclear pore
- C) nucleoplasm
- D) nucleosome
- E) nucleolus

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

34) The cell theory states that \_\_\_\_\_.

- A) cells are produced by the division of newly synthesized cells
- B) cells are the largest structural units of life
- C) cells are structural "building blocks"
- D) cells perform limited, nonessential functions
- E) All of the statements are correct

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

35) \_\_\_\_\_ increase surface area to facilitate absorption of extracellular materials.

- A) Cilia
- B) Microvilli
- C) Flagella
- D) Centrioles
- E) Mitochondria

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

36) Peripheral proteins are attached to the surface of the plasma membrane, while \_\_\_\_\_ are embedded within the membrane.

- A) histone proteins
- B) lysosomal proteins
- C) transport vesicles
- D) integral proteins
- E) peroxisomal proteins

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

37) The membrane of a cell is composed of a(n) \_\_\_\_\_ bilayer.

- A) endoplasmic
- B) cytoskeleton
- C) phospholipid
- D) steroid
- E) glycolipid

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

38) In osmosis, the substance(s) moved across a selectively permeable membrane is/are \_\_\_\_\_.

- A) water
- B) extracellular fluid and its associated solutes
- C) gases, small inorganic ions and molecules
- D) glucose and amino acids
- E) fluid and cellular wastes

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

39) "Little organs" inside a cell that have specialized functions are called \_\_\_\_\_.

- A) glycocalyx
- B) organelles
- C) microvillus
- D) intracellular fluids
- E) microfilaments

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

40) Dissolved ions and water-soluble compounds cannot cross the \_\_\_\_\_ portion of a plasma membrane.

- A) integral protein
- B) carbohydrate
- C) peripheral protein
- D) glycocalyx
- E) lipid

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

41) Channels in the plasma membrane that can open or close to regulate the passage of water, small ions, and water-soluble molecules are called \_\_\_\_\_ channels.

- A) hydrophobic
- B) solute
- C) diffusion
- D) gated
- E) osmotic

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

42) \_\_\_\_\_ help stabilize the plasma membrane structure and maintain its fluidity.

- A) Sterols
- B) Carbohydrates
- C) Phospholipids
- D) Glycolipids
- E) Peripheral proteins

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

43) Small, finger-shaped projections of the plasma membrane are termed \_\_\_\_\_.

- A) flagella
- B) centrioles
- C) thick filaments
- D) microvilli
- E) cilia

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

44) \_\_\_\_\_ is/are the substance(s) involved in facilitated diffusion.

- A) Only water
- B) Glucose and amino acids
- C) Lipid-soluble materials
- D) Small organic ions and molecules
- E) Extracellular fluid

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

45) A passive process that involves movement of substances from an area of higher concentration to an area of lower concentration is called \_\_\_\_\_.

- A) osmosis
- B) pinocytosis
- C) exocytosis
- D) diffusion
- E) phagocytosis

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

46) A transport process that produces cytoplasmic vesicles filled with extracellular fluid is called \_\_\_\_\_.

- A) exocytosis
- B) active transport
- C) osmosis
- D) receptor-mediated endocytosis
- E) pinocytosis

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

47) Factors affecting the rate of phagocytosis include the presence and abundance of \_\_\_\_\_.

- A) extracellular pathogens or debris
- B) receptors on the plasma membrane
- C) calcium ions and ATP
- D) target molecules
- E) carrier proteins, solutes, and ATP

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

48) Compared with extracellular fluid, a sample of cytosol has \_\_\_\_\_.

- A) high quantities of carbohydrate
- B) a high concentration of sodium ions
- C) a relatively high concentration of dissolved or suspended proteins
- D) low reserves of amino acids and lipids
- E) a relatively low concentration of potassium ions

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

49) The cytosol contains a high concentration of \_\_\_\_\_ ions, while the extracellular fluid usually contains a high concentration of \_\_\_\_\_ ions.

- A) calcium; magnesium
- B) potassium; sodium
- C) magnesium; calcium
- D) sodium; potassium
- E) hydrogen; chloride

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

50) \_\_\_\_\_ are slender strands, usually composed of the protein actin.

- A) Microtubules
- B) Thick filaments
- C) Microfilaments
- D) Myosin filaments
- E) Neurofilaments

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

51) Microtubules, thick filaments, intermediate filaments, and microfilaments are all part of the cell's \_\_\_\_\_.

- A) endoplasmic reticulum
- B) plasma membrane
- C) cytoskeleton
- D) Golgi apparatus
- E) centrosome

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

52) \_\_\_\_\_ provide strength, stabilize organelles, and transport materials within the cytoplasm; they are defined by their size rather than composition, which varies from cell to cell.

- A) Cilia
- B) Thick filaments
- C) Microfilaments
- D) Tubulin filaments
- E) Intermediate filaments

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

53) A \_\_\_\_\_ moves a cell through the surrounding fluid, rather than moving the fluid past a stationary cell.

- A) flagellum
- B) centriole
- C) neurofilament
- D) cilium
- E) thick filament

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

54) \_\_\_\_\_ are organelles that contain an unusual double-layered membrane, and functions in producing most of the ATP in the body.

- A) Ribosomes
- B) Microvilli
- C) Lysosomes
- D) Mitochondria
- E) Endoplasmic reticulum

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

55) Chemical communication between the nucleus and the cytosol occurs through (the) \_\_\_\_\_.

- A) perinuclear space
- B) nuclear pores
- C) histones
- D) nuclear matrix
- E) nucleosomes

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

56) At intervals, the DNA wind around special proteins, forming a complex called \_\_\_\_\_; this complex may also coil around other special proteins.

- A) chromosome
- B) histone
- C) nuclear matrix
- D) chromatin
- E) nucleosome

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

57) A major function of the Golgi apparatus is \_\_\_\_\_.

- A) the synthesis and packaging of secretions
- B) the renewal or modification of the nuclear envelope
- C) packaging of lipids for use in lysosomes
- D) detoxification and neutralization of cellular toxins
- E) degradation of bacteria and organic debris

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

58) The \_\_\_\_\_ is the organelle that synthesizes the components of ribosomes.

- A) nucleolus
- B) centrosome
- C) Golgi apparatus
- D) nucleosome
- E) endoplasmic reticulum

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

59) The continual movement and exchange of vesicles to and from the plasma membrane is called \_\_\_\_\_.

- A) osmosis
- B) active transport
- C) membrane flow
- D) facilitated diffusion
- E) exocytosis

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

60) \_\_\_\_\_ are organelles filled with digestive enzymes, which function in the intracellular removal of pathogens and damaged organelles.

- A) Peroxisomes
- B) Rough endoplasmic reticulum
- C) Centrosomes
- D) Lysosomes
- E) Mitochondria

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

- 61) Peroxisomes function in the \_\_\_\_\_.  
A) production of ATP required by the cell  
B) absorption and breakdown (catabolism) of fatty acids  
C) movement of materials over the cell surface  
D) control of metabolism  
E) synthesis of secretory products

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

- 62) Which type of cell junction attach an epithelial cell to extracellular structures.  
A) Hemidesmosomes  
B) Spot desmosomes  
C) Gap junction  
D) Tight junction  
E) All of these choices are correct

Answer: A

Learning Outcome: 2.2

Bloom's Taxonomy: 1-2: Remembering/Understanding

- 63) At structures called \_\_\_\_\_, two cells are held together by membrane proteins that function as a narrow passageway, allowing ions, small metabolites, and regulatory molecules to pass from cell to cell.  
A) anchoring junctions  
B) CAMs  
C) focal adhesions  
D) zonula adherens  
E) cell junctions

Answer: E

Learning Outcome: 2.2

Bloom's Taxonomy: 1-2: Remembering/Understanding

- 64) A/an \_\_\_\_\_ is a form of an anchoring junction that encircles a cell.  
A) cytokeratin  
B) macula adherens  
C) CAM  
D) adhesion belt  
E) connexons

Answer: D

Learning Outcome: 2.2

Bloom's Taxonomy: 1-2: Remembering/Understanding

65) Large areas of opposing plasma membrane may be interconnected by transmembrane proteins called \_\_\_\_\_, which bind to each other and to other extracellular materials.

- A) cytokeratins
- B) hemidesmosomes
- C) connexons
- D) cell adhesion molecules (CAMs)
- E) nexuses

Answer: D

Learning Outcome: 2.2

Bloom's Taxonomy: 1-2: Remembering/Understanding

66) Hemidesmosomes are found \_\_\_\_\_.

- A) in connective tissue that is undergoing deep wound repair
- B) in epithelial tissues subjected to a significant amount of abrasion and shearing forces
- C) among epithelial cells where they help coordinate functions such as the beating of cilia
- D) in abundance in cardiac muscle and smooth muscle
- E) in epithelial tissues where they are essential to the coordination of muscle cell contractions

Answer: B

Learning Outcome: 2.2

Bloom's Taxonomy: 1-2: Remembering/Understanding

67) In correct order from beginning to end, cells undergoing mitosis pass through \_\_\_\_\_.

- A) anaphase, prophase, interphase, and telophase
- B) metaphase, prophase, telophase, and anaphase
- C) interphase, telophase, metaphase, and prophase
- D) prophase, metaphase, anaphase, and telophase
- E) telophase, anaphase, metaphase, and prophase

Answer: D

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

68) Cytokinesis \_\_\_\_\_.

- A) usually begins after metaphase
- B) separates the daughter cells after mitosis
- C) is the last phase of mitosis
- D) initiates the process of mitosis
- E) All of the answers are correct.

Answer: B

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

69) Which of the following events occur during metaphase?

- A) Centromeres move along the chromosomal microtubules to a narrow central zone.
- B) Microtubules form the spindle apparatus.
- C) Daughter chromosomes move toward the opposite ends of the cell.
- D) Centrioles move apart.
- E) All of the answers are correct.

Answer: A

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

70) Which of the following processes occurs during interphase?

- A) Chromatid pairs separate.
- B) Chromatin condenses into chromosomes.
- C) DNA replicates.
- D) A cleavage furrow forms.
- E) The mitotic spindle forms.

Answer: C

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

71) Which of the following is true of cell division?

- A) Its importance diminishes after an individual grows to maturity.
- B) It requires accurate duplication (replication) of the genetic material.
- C) Each dividing somatic cell produces four daughter cells at the end of cell division.
- D) Mitosis is the distinct process for producing gametes.
- E) Protein synthesis in preparation for division occurs during the S phase of interphase.

Answer: B

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

72) Which sequence correctly traces the steps of DNA replication during the S phase?

- (1) Weak bonds between nitrogenous bases of the DNA are broken.
- (2) DNA strands unwind.
- (3) DNA polymerase binds to exposed nitrogenous bases.
- (4) Ligases link together short complementary chains of nucleotides.
- (5) Nitrogenous bases of the DNA strand attach to complementary nucleotides.

A) 1, 2, 3, 4, 5

B) 1, 2, 3, 5, 4

C) 5, 4, 3, 2, 1

D) 1, 3, 5, 2, 4

E) 4, 2, 3, 1, 5

Answer: B

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

73) The process that involves the phases prophase, metaphase, anaphase, and telophase is called \_\_\_\_\_.

- A) DNA replication
- B) cytokinesis
- C) mitosis
- D) reproduction
- E) interphase

Answer: C

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

74) During \_\_\_\_\_, the centromere of each chromatid pair separates and the daughter chromosomes are pulled toward opposite ends of the cell, along the chromosomal microtubules.

- A) anaphase
- B) telophase
- C) interphase
- D) prophase
- E) metaphase

Answer: A

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

75) Somatic cells spend the majority of their functional lives in \_\_\_\_\_.

- A) prophase
- B) metastasis
- C) interphase
- D) DNA replication
- E) anaphase

Answer: C

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

76) In cells preparing for division, the phase of the life cycle that is most variable in length is the \_\_\_\_\_ of interphase.

- A) S phase
- B) G1 phase
- C) G0 phase
- D) G2 phase
- E) All of the answers are correct.

Answer: B

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

## 2.2 True/False Questions

1) A passive process that allows passage of small inorganic ions and molecules, gases, and lipid-soluble materials in all cell types is called diffusion.

Answer: TRUE

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

2) A passive process that involves the movement of water (solvent) molecules toward solute concentrations across a membrane is called facilitated diffusion.

Answer: FALSE

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

3) A passive process wherein carrier molecules transport materials down concentration gradients across a membrane is called osmosis.

Answer: FALSE

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

4) Endocytosis is an energy-requiring process where vesicles are packaged with extracellular material for importation into the cell.

Answer: TRUE

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

5) Active transport is an energy-requiring process whereby ions and possibly other materials are moved across a membrane by carrier proteins, which work despite an opposing concentration gradient.

Answer: TRUE

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

6) Vesicles that contain oxidases and catalase are called peroxisomes.

Answer: TRUE

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

7) The endoplasmic reticulum is the organelle responsible for the synthesis of secretory products and provides for intracellular storage and transport.

Answer: TRUE

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

8) As the Golgi apparatus loses membrane through generation of vesicles at the cis face, it gains membrane by the fusion of transport vesicles at the trans face.

Answer: FALSE

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

9) The mitochondrion is enclosed by a double membrane with numerous folds, or cristae, in the inner membrane; the fluid matrix of these organelles contains important metabolic enzymes.

Answer: TRUE

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

### 2.3 Essay Questions

1) Why is it potentially harmful to give a patient intravenous fluid that is pure water?

Answer: Body fluids (extracellular – ECF and intracellular fluids – ICF) are not comprised of pure water, they are a mixture of water and solutes. The addition of water without solutes causes an imbalance in the body between the amount of water compared to solute, which dilutes the body fluids. More specifically, the plasma membrane plays a major role in sensitivity in that it is the first part of the cell to be affected by changes in ECF. It contains a variety of receptors that allow the cell to recognize and respond to specific molecules in its environment and to communicate with other cells. Any alteration in the plasma membrane, such as exposing it to only pure water, may affect all cellular activities. Its functional role in physical isolation of the cell from the surrounding ECF is important because the composition of the cytoplasm is very different from that of the ECF, and that difference must be maintained for survival. The ultimate outcome will result in the lysing (bursting) of red blood cells. As a result, the kidneys may become overwhelmed while attempting to rid the bloodstream of the products of this destruction.

Learning Outcome: 2.1

Bloom's Taxonomy: 5-6: Evaluating/Creating

2) Solutions A and B are separated by a selectively permeable barrier. Over time, the level of fluid on side A increases. Which solution initially had the higher concentration of solute?

Answer: Side A had the higher solute concentration, as osmosis is drawing water to it and out of solution B.

Learning Outcome: 2.1

Bloom's Taxonomy: 5-6: Evaluating/Creating

3) Explain why an animal cell without centrioles cannot divide.

Answer: Centrioles are a structure used during mitosis of cell division. During metaphase and anaphase, the centrioles direct the organization of the microtubules of the cytoskeleton, hence the movement of daughter chromosomes to opposite ends of the cell so that cytokinesis will result in two daughter cells, each containing its own set of chromosomes.

Learning Outcome: 2.1

Bloom's Taxonomy: 3-4: Applying/Analyzing

4) Predict the consequences of non-functional cilia in the respiratory airways.

Answer: Cilia lining the respiratory tract beat in a synchronized manner to move sticky mucus and trapped dust particles toward the throat and away from delicate respiratory surfaces. This cleansing action is lost if the cilia are damaged or immobilized by heavy smoking or some metabolic problem, and the irritants will no longer be removed. As a result, chronic respiratory infections develop.

Learning Outcome: 2.1

Bloom's Taxonomy: 5-6: Evaluating/Creating

5) What is the role of the Golgi apparatus in cellular metabolism?

Answer: The Golgi apparatus synthesizes and packages secretions, such as enzymes that store, modify, and package the proteins and glycoproteins arriving from the RER via transport vesicles. Among the vesicles that are packaged by the Golgi and remain in the cytoplasm are lysosomes, which are filled with enzymes that digest damaged membranous organelles.

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

6) How does the plasma membrane change either over time or in response to modifications in the extracellular fluid?

Answer: Membrane turnover (renewal or modification of the plasma membrane) is performed by the Golgi apparatus, which continually adds new membrane to the cell surface and can alter the membrane properties as required. In an actively secreting cell, the entire surface area of the plasma membrane may be replaced in as little as an hour.

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

7) Distinguish between primary and secondary lysosomes; how do they function?

Answer: Primary lysosomes contain inactive enzymes; activation of these enzymes occurs when the lysosome fuses with the membrane of damaged organelles. This forms a secondary lysosome, which contains activated enzymes that act to break down the engulfed contents. These contents then either reenter the cytosol (if nutrients) or are eliminated by exocytosis (if toxins or wastes).

Learning Outcome: 2.1

Bloom's Taxonomy: 3-4: Applying/Analyzing

8) How do peroxisomes differ from lysosomes?

Answer: Peroxisomes are smaller than lysosomes, and they carry different groups of enzymes. Peroxisomal enzymes are formed by free ribosomes within the cytoplasm and then inserted into the membranes of preexisting peroxisomes, whereas the Golgi apparatus packages digestive enzymes, formed by the rough endoplasmic reticulum (RER), into lysosomes. Peroxisomes absorb and break down fatty acids and other organic compounds; lysosomes perform essential intracellular cleanup, recycling, and defense, all by activating and/or releasing their digestive enzymes under appropriate circumstances.

Learning Outcome: 2.1

Bloom's Taxonomy: 3-4: Applying/Analyzing

9) How does the structure of a tight junction differ from that of an anchoring junction?

Answer: At a tight junction, the lipid portions of the opposing plasma membrane are tightly bound together by interlocking membrane proteins, providing the strongest of intercellular connections. At an anchoring junction, the two plasma membrane remain distinct but are powerfully attached by CAMs (cell adhesion molecules) and a layer of proteoglycans (intercellular cement), with a dense area of layered proteins inside each plasma membrane, reinforcing the junction and binding it to the cell's cytoskeleton.

Learning Outcome: 2.2

Bloom's Taxonomy: 3-4: Applying/Analyzing

10) What is cytokinesis? What is its role in the cell cycle?

Answer: Cytokinesis is the process by which daughter chromosomes approach the ends of the spindle apparatus. The cytoplasm then constricts along the plane of the metaphase plate, forming a cleavage furrow that deepens until the two daughter cells are separated; thus, completing their physical separation at the end of mitosis. The completion of cytokinesis marks the end of cell division and the beginning of the next interphase period (a new cell cycle).

Learning Outcome: 2.3

Bloom's Taxonomy: 1-2: Remembering/Understanding

11) Explain why adult animals and plants replace many of their cells throughout their lifetimes.

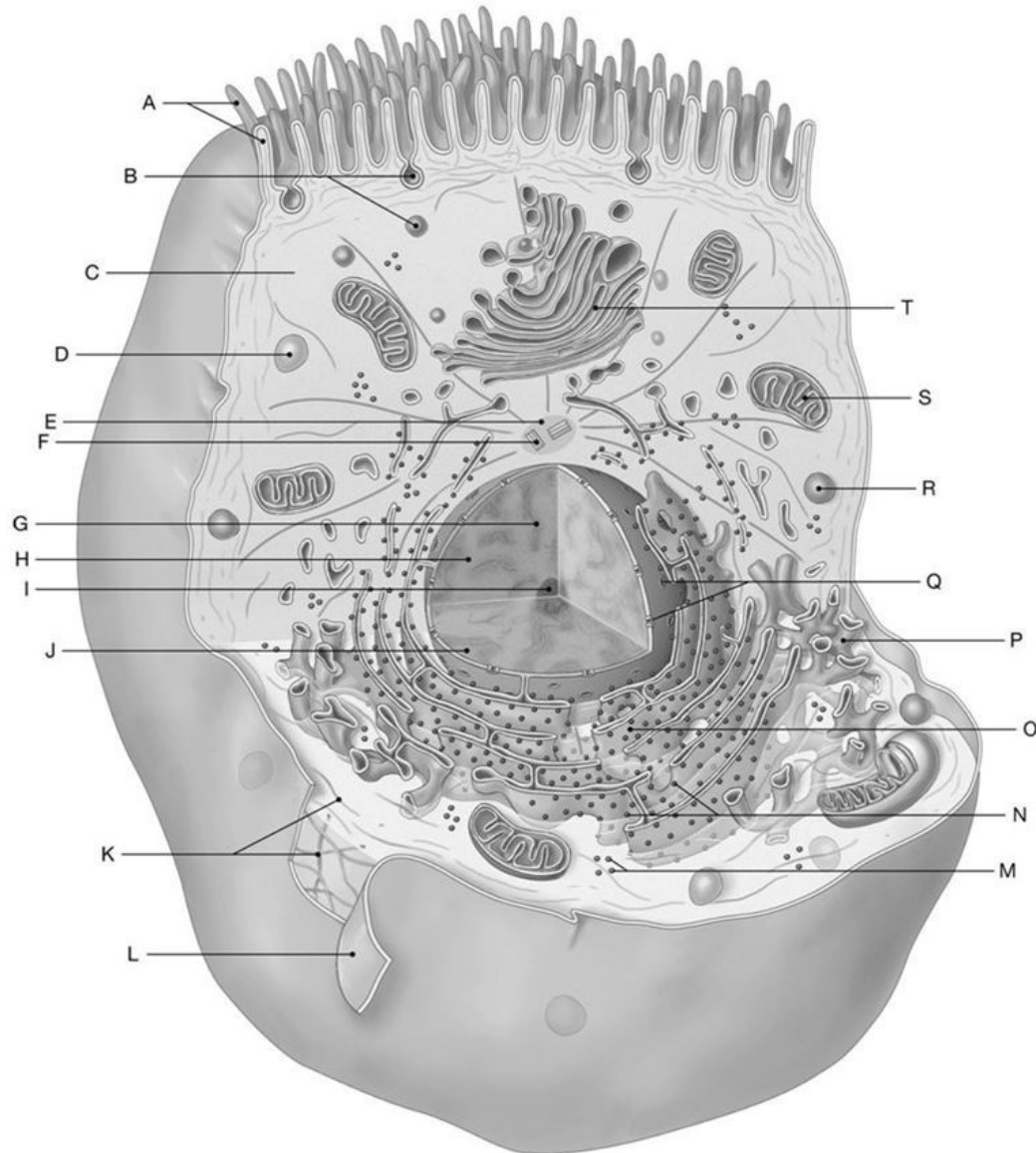
Answer: Cells can be damaged by physical wear and tear (abrasion), toxic chemicals, pathogens, temperature changes, or other environmental hazards. Since cells have variable life expectancies, they are also lost due to aging and must therefore be replaced.

Learning Outcome: 2.3

Bloom's Taxonomy: 3-4: Applying/Analyzing

## 2.4 Labeling Questions

**Figure 2.1**



*Using the figure above, answer the following questions.*

1) What is the anatomical term for Label A?

- A) Centrosome
- B) Mitochondria
- C) Cytoskeleton
- D) Microvilli
- E) Secretory vesicles

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

2) What is the anatomical term for Label C?

- A) Nucleoplasm
- B) Cytosol
- C) Centriole
- D) Free ribosomes
- E) Cytoskeleton

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

3) What is the anatomical term for Label D?

- A) Nucleosome
- B) Fixed ribosome
- C) Peroxisome
- D) Centrosome
- E) Lysosome

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

4) What is the anatomical term for Label F?

- A) Centriole
- B) Chromatin
- C) Secretory vesicle
- D) Mitochondria
- E) Nucleolus

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

5) What is the anatomical term for Label G?

- A) Nucleoplasm
- B) Centrosome
- C) Cytoskeleton
- D) Chromatin
- E) Centriole

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

6) What is the anatomical term for Label I?

- A) Nuclear pore
- B) Nuclear envelope
- C) Nucleolus
- D) Plasma membrane
- E) Chromatin

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

7) What is the anatomical term for Label K?

- A) Cytoskeleton
- B) Nucleoplasm
- C) Cytoplasm
- D) Centrosome
- E) Cytosol

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

8) What is the anatomical term for Label L?

- A) Microvilli
- B) Plasma membrane
- C) Cytoplasm
- D) Cytosol
- E) Nuclear envelope

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

9) What is the anatomical term for Label M?

- A) Cytoplasm
- B) Rough ER
- C) Fixed ribosomes
- D) Peroxisomes
- E) Free ribosomes

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

10) What is the anatomical term for Label O?

- A) Rough endoplasmic reticulum
- B) Golgi apparatus
- C) Nucleus
- D) Mitochondrion
- E) Cristae

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

11) What is the anatomical term for Label Q?

- A) Rough endoplasmic reticulum
- B) Nuclear envelope
- C) Nucleoplasm
- D) Nuclear matrix
- E) Nuclear pores

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

12) What is the anatomical term for Label S?

- A) Lysosome
- B) Smooth endoplasmic reticulum
- C) Mitochondrion
- D) Peroxisome
- E) Cisternae

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

13) What is the anatomical term for Label T?

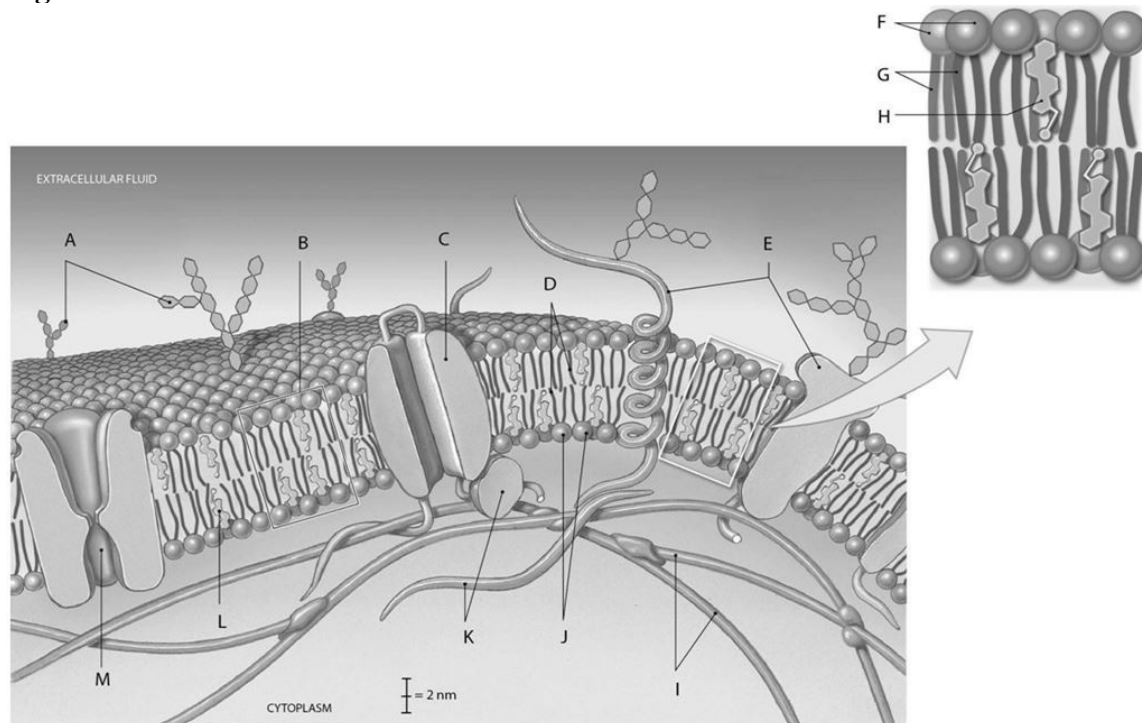
- A) Cytoskeleton
- B) Rough ER
- C) Golgi apparatus
- D) Cristae
- E) Smooth ER

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

**Figure 2.2**



*Using the figure above, identify the labeled parts.*

14) What is the anatomical term for Label A?

- A) Phospholipids
- B) Glycolipids
- C) Hydrophobic tail
- D) Integral protein
- E) Glycoprotein

Answer: B

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

15) What is the anatomical term for Label B?

- A) Hydrophobic heads
- B) Cholesterol
- C) Peripheral proteins
- D) Phospholipid bilayer
- E) Integral proteins

Answer: D

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

16) What is the anatomical term for Label C?

- A) Peripheral protein
- B) Hydrophilic tail
- C) Integral protein
- D) Cholesterol
- E) Integral glycoproteins

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

17) What is the anatomical term for Label E?

- A) Integral phospholipid
- B) Peripheral cholesterol
- C) Integral glycolipids of glycocalyx
- D) Peripheral gated channels
- E) Integral glycoproteins

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

18) What is the anatomical term for Label H?

- A) Hydrophilic tail
- B) Glycocalyx
- C) Hydrophobic head
- D) Phospholipid bilayer
- E) Cholesterol

Answer: E

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

19) What is the anatomical term for Label I?

- A) Cytoskeleton
- B) Cytoplasm
- C) Peripheral proteins
- D) Integral glycoproteins
- E) Integral glycolipids

Answer: A

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

20) What is the anatomical term for Label K?

- A) Peripheral glycocalyx
- B) Gated channel
- C) Peripheral proteins
- D) Hydrophilic tails
- E) Peripheral cholesterol

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding

21) What is the anatomical term for Label M?

- A) Integral glycocalyx
- B) Peripheral glycoprotein
- C) Gated channel
- D) Cholesterol
- E) Phospholipid bilayer

Answer: C

Learning Outcome: 2.1

Bloom's Taxonomy: 1-2: Remembering/Understanding