

Human Physiology: An Integrated Approach, 7e, (Silverthorn)
Chapter 3 Compartmentation: Cells and Tissues

1) When cancer develops in one tissue and spreads to another via the blood or the lymph, the cancer is said to have undergone what process?

- A) differentiation
- B) metastasis
- C) cytokinesis
- D) mutation

Answer: B

Section: Functional Compartments of the Body

Learning Outcome: 3.1

Bloom's Taxonomy: Comprehension

2) The space that is surrounded by the tissue wall of hollow organs is known as the

- A) peritoneal cavity.
- B) lumen.
- C) extracellular space.
- D) epidural space.
- E) tract.

Answer: B

Section: Functional Compartments of the Body

Learning Outcome: 3.1

Bloom's Taxonomy: Comprehension

3) The lumen of a hollow organ such as the stomach is considered to be part of the _____ environment.

- A) internal
- B) external

Answer: B

Section: Functional Compartments of the Body

Learning Outcome: 3.1

Bloom's Taxonomy: Comprehension

4) The watery medium that surrounds a cell is known as

- A) cytosol.
- B) protoplasm.
- C) extracellular fluid.
- D) cytoplasm.
- E) plasma.

Answer: C

Section: Functional Compartments of the Body

Learning Outcome: 3.1

Bloom's Taxonomy: Comprehension

5) 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) a cell wall
- B) a cell membrane
- C) plasma membrane
- D) plasmalemma
- E) All of the answers are correct.

Answer: A

Section: Biological Membranes

Learning Outcome: 3.2

Bloom's Taxonomy: Knowledge

6) Which of the following is NOT a function of membrane proteins?

- A) respond to extracellular molecules
- B) creating junctions between cells
- C) act as transport molecules for various solutes
- D) anchor or stabilize the cell membrane
- E) produce energy

Answer: E

Section: Biological Membranes

Learning Outcome: 3.3

Bloom's Taxonomy: Knowledge

7) Cell membranes are said to be

- A) impermeable barrier.
- B) freely permeable barrier.
- C) selectively permeable barrier.
- D) only permeable to water soluble molecules.
- E) None of the answers are correct.

Answer: C

Section: Biological Membranes

Learning Outcome: 3.2

Bloom's Taxonomy: Knowledge

8) What is/are the major role(s) of the phospholipid bilayer in the cellular membrane?

- A) the absorption of fats only
- B) the formation of a barrier that is selectively permeable to lipid-soluble molecules only
- C) to provide a framework for membrane proteins only
- D) to carry water-soluble molecules through a hydrophobic environment only
- E) the formation of a barrier that is a selective for lipid-soluble molecules and to provide a framework for membrane proteins

Answer: E

Section: Biological Membranes

Learning Outcome: 3.2

Bloom's Taxonomy: Comprehension

9) Which of the following is NOT a membrane lipid?

- A) sphingolipids
- B) cholesterol
- C) phospholipids
- D) All are membrane lipids.

Answer: D

Section: Biological Membranes

Learning Outcome: 3.3

Bloom's Taxonomy: Knowledge

10) Which structure is a lipid bilayer that controls which objects can leave or enter the cell?

- A) endoplasmic reticulum
- B) Golgi apparatus
- C) nucleus
- D) plasma membrane
- E) ribosome

Answer: D

Section: Biological Membranes

Learning Outcome: 3.2

Bloom's Taxonomy: Knowledge

11) A liposome is

- A) only an additive to creams and lotions.
- B) only a drug-delivery vehicle.
- C) only a type of lipid.
- D) only a structural component of cell membranes.
- E) an additive to creams and lotions and a drug-delivery vehicle.

Answer: E

Section: Intracellular Compartments

Learning Outcome: 3.4

Bloom's Taxonomy: Comprehension

12) An immunoliposome is a liposome that

- A) suppresses the immune system.
- B) stimulates the immune system.
- C) can recognize cancer cells.
- D) None of the answers are correct.

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.4

Bloom's Taxonomy: Knowledge

13) Intermediate filaments

- A) provide the cell with strength.
- B) stabilize the position of organelles.
- C) transport materials within the cytoplasm.
- D) form the neurofilaments in nerve cells.
- E) All of the answers are correct.

Answer: E

Section: Intracellular Compartments

Learning Outcome: 3.7

Bloom's Taxonomy: Comprehension

14) Which proteins assist in the movement of vesicles along microtubules?

- A) kinesins
- B) mitochondria
- C) rough endoplasmic reticulum
- D) ribosomes
- E) Golgi complex

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.10

Bloom's Taxonomy: Knowledge

15) Which of the following is an example of a membranous organelle?

- A) lysosome
- B) cilia
- C) centriole
- D) ribosome
- E) cytoskeleton

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

16) The thickest protein fibers from the following group are

- A) microtubules.
- B) neurofilaments.
- C) microfilaments.
- D) myosin molecules.
- E) keratin filaments.

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.7

Bloom's Taxonomy: Knowledge

17) Ribosomal RNA is formed by

- A) the endoplasmic reticulum.
- B) Golgi complexes.
- C) lysosomes.
- D) mitochondria.
- E) nucleoli.

Answer: E

Section: Intracellular Compartments

Learning Outcome: 3.5

Bloom's Taxonomy: Comprehension

18) Each of the following statements concerning mitochondria is true EXCEPT one. Identify the exception.

- A) The mitochondrial cristae form the inner membrane forming separate compartments.
- B) The matrix of the mitochondria contains metabolic enzymes involved in energy production.
- C) The intermembrane space plays an important role in mitochondrial ATP production.
- D) The mitochondria contain no DNA or RNA.
- E) The mitochondria produce most of a cell's ATP.

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

19) In humans, only _____ cells have flagella.

- A) respiratory tract lining
- B) intestine lining
- C) stomach lining
- D) sperm
- E) uterine tube lining

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.8

Bloom's Taxonomy: Knowledge

20) Tay-Sachs is a disease caused by having ineffective

- A) mitochondria.
- B) Golgi bodies.
- C) lysosomes.
- D) rough endoplasmic reticulum.
- E) smooth endoplasmic reticulum.

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

- 21) Microvilli are found
- A) mostly in muscle cells.
 - B) on the inside of cell membranes.
 - C) in large numbers on cells that secrete hormones.
 - D) in cells that are actively engaged in absorption.
 - E) only on cells lining the reproductive tract.

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.9

Bloom's Taxonomy: Comprehension

- 22) Microtubules
- A) are composed of tubulin.
 - B) are hollow, filamentous structures.
 - C) form cilia that aid in cell movement.
 - D) are the largest cytoplasmic fibers.
 - E) All of the answers are correct.

Answer: E

Section: Intracellular Compartments

Learning Outcome: 3.7

Bloom's Taxonomy: Knowledge

- 23) Centrioles
- A) function as pipelines to move fluid through the cell.
 - B) direct the movement of DNA during cell division.
 - C) hold the cell's ribosomes in place.
 - D) are white blood cells out of vessels.
 - E) provide shape and stability to a cell.

Answer: B

Section: Intracellular Compartments

Learning Outcome: 3.7

Bloom's Taxonomy: Knowledge

- 24) Most of the ATP required to power cellular operations is produced in the
- A) ribosomes.
 - B) endoplasmic reticulum.
 - C) nucleus.
 - D) mitochondria.
 - E) Golgi apparatus.

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

25) Which does NOT accurately complete the sentence? One of the major functions of BOTH types of endoplasmic reticulum (ER) is the

- A) synthesis of biomolecules.
- B) storage of genetic material for the cell.
- C) transport of biomolecules.
- D) storage of biomolecules.

Answer: B

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

26) All of the following are synthesized along various sites of the endoplasmic reticulum EXCEPT one. Identify the exception.

- A) proteins
- B) fatty acids
- C) steroids
- D) RNA
- E) phospholipids

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

27) Which of the following is NOT a molecule synthesized in the smooth endoplasmic reticulum (SER)?

- A) fatty acids
- B) steroids
- C) proteins
- D) lipids
- E) All are synthesized in the SER.

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

28) 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

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Comprehension

29) All of the structures listed below are involved in storage, EXCEPT

- A) lysosomes.
- B) peroxisomes.
- C) mitochondrial cristae.
- D) storage vesicles.
- E) All are involved in cellular storage.

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

30) The proteins synthesized in the rough endoplasmic reticulum are then sent to the

- A) smooth endoplasmic reticulum for storage.
- B) Golgi complex for packaging.
- C) lysosome for modification.
- D) cell membrane for secretion.
- E) nucleus for cellular use.

Answer: B

Section: Intracellular Compartments

Learning Outcome: 3.12

Bloom's Taxonomy: Comprehension

31) If a cell lacked lysosomes, it would not be able to

- A) synthesize lipids.
- B) produce enzymes.
- C) digest cellular wastes and bacteria.
- D) destroy H₂O₂.
- E) transport water-soluble molecules.

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Comprehension

32) Which substance is responsible for activating the digestive enzymes inside lysosomes?

- A) air
- B) water
- C) acid
- D) enzymes
- E) base

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

33) Peroxisomes

- A) use an enzyme to destroy H₂O₂ that is toxic to the cell.
- B) are a type of lysosome.
- C) are responsible for the atrophy of unused muscles.
- D) are sites for synthesis of fatty acids, steroids, and phospholipids.
- E) All of the answers accurately describe peroxisomes.

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.12

Bloom's Taxonomy: Comprehension

34) The number of mitochondria in skeletal muscle cells is _____ adipose (fat) cells.

- A) greater than
- B) less than
- C) equal to

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Comprehension

35) The control center for cellular operations is the

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

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.11

Bloom's Taxonomy: Knowledge

36) The beta cells of the pancreas produce insulin, a protein-based hormone. Which of the following organelles would be found in higher levels in the beta cells?

- A) mitochondria
- B) ribosomes
- C) microvilli
- D) lysosomes

Answer: B

Section: Intracellular Compartments

Learning Outcome: 3.12

Bloom's Taxonomy: Application

37) If the adrenal cortex produces lipid-based hormones such as aldosterone, which organelle would be higher in cells of the adrenal cortex than in the adrenal medulla?

- A) Golgi apparatus
- B) mitochondria
- C) ribosome
- D) rough endoplasmic reticulum
- E) smooth endoplasmic reticulum

Answer: E

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Application

38) The nucleus stores all the information needed to synthesize which of the following molecules?

- A) carbohydrates
- B) lipids
- C) proteins
- D) phospholipids
- E) All of the answers are correct.

Answer: E

Section: Intracellular Compartments

Learning Outcome: 3.11

Bloom's Taxonomy: Comprehension

39) The term *secretion* refers to

- A) the process by which a cell releases a substance into the extracellular space.
- B) synthesis of a protein for export from the cell.
- C) the manufacture and assembly of a material.
- D) storage of a material, until it is time for it to leave the cell.
- E) None of the answers describe secretion.

Answer: A

Section: Biological Membranes

Learning Outcome: 3.2

Bloom's Taxonomy: Knowledge

40) Which cellular organelle is considered the powerhouse of the cell because it produces most of the ATP?

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

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Comprehension

41) Arrange the following events in protein secretion in the proper sequence.

1. The polypeptide chain enters the lumen of the endoplasmic reticulum.
2. A secretory vesicle is formed.
3. A transport vesicle is formed.
4. The polypeptide chain enters the lumen of the Golgi complex.

A) 1, 2, 3, 4

B) 1, 3, 2, 4

C) 1, 3, 4, 2

D) 4, 3, 1, 2

E) 3, 1, 4, 2

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.12

Bloom's Taxonomy: Comprehension

42) Movement of material between cells is known as the _____ pathway.

A) transcellular

B) paracellular

C) metacellular

D) transendothelial

E) cisendothelial

Answer: B

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Knowledge

43) All but one of the structures listed below are a type of cell junction. Identify the exception.

A) desmosomes

B) tight junctions

C) gap junctions

D) loose junctions

E) adherens junctions

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Comprehension

44) The esophagus is a tube that carries food from the mouth to the stomach. It does not secrete any enzymes or absorb any nutrients, but it does need to stand up to significant friction and stress. The type of epithelium most likely lining the esophagus would be

- A) cuboidal epithelium.
- B) simple squamous epithelium.
- C) simple columnar epithelium.
- D) stratified squamous epithelium.
- E) transitional epithelium.

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Application

45) The type of protein found in gap junctions is the

- A) claudin.
- B) occludin.
- C) cadherin.
- D) connexin.
- E) integrin.

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Knowledge

46) Disappearance of which type of junction most likely contributes to the metastasis of cancer cells throughout the body?

- A) gap
- B) tight
- C) anchoring

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Knowledge

47) The types of junction proteins important in nerve growth and development are

- A) claudins.
- B) occludins.
- C) CAMs.
- D) connexins.
- E) integrins.

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Knowledge

48) Each of the following is a primary tissue type EXCEPT one. Identify the exception.

- A) muscle tissue
- B) neural tissue
- C) osseous tissue
- D) connective tissue
- E) epithelial tissue

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.15

Bloom's Taxonomy: Knowledge

49) Functions of epithelia include all of the following EXCEPT

- A) providing physical protection.
- B) controlling permeability.
- C) producing specialized secretions.
- D) storing energy reserves.
- E) movement.

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

50) Epithelial cells that are adapted for membrane transport of materials, such as ions and nutrients, usually have _____ on their apical surface.

- A) mitochondria
- B) cilia or flagella
- C) microvilli
- D) junctional complexes
- E) vesicles

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

51) Epithelia are connected to underlying connective tissues by

- A) a basement membrane only.
- B) protein filaments embedded in glycoprotein only.
- C) a basal lamina only.
- D) an apical membrane and protein filaments embedded in proteoglycans only.
- E) a basement membrane, protein filaments embedded in proteoglycans, and a basal lamina.

Answer: E

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

52) Glands that secrete hormones into the blood via tissue fluids are

- A) endocrine glands.
- B) mixed glands.
- C) exocrine glands.
- D) unicellular glands.
- E) None of the answers are correct.

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

53) Exocrine glands

- A) may make either mucous or serous secretions.
- B) release their secretions into the external environment.
- C) release their secretions through open tubes, called ducts.
- D) may work as single cells or as a multicellular organ.
- E) All of the statements are true.

Answer: E

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

54) Every substance that enters or leaves the internal environment of the body must cross an epithelium.

- A) True
- B) False

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

55) Due to the fact that they divide frequently, epithelia are prone to the genetic mutations associated with cancer.

- A) True
- B) False

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

56) The function of microvilli, often seen on the apical membrane of transporting epithelia, is to

- A) increase the movement of extracellular fluid.
- B) increase the resistance of the cell to viruses.
- C) increase the cell's surface area.
- D) increase the toughness of the cell.
- E) allow the cell to move through a fluid medium.

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

57) The simple squamous epithelial lining of blood vessels is called

- A) basolateral epithelium.
- B) endothelium.
- C) luteal cells.
- D) the vasa recta.
- E) None of the answers are correct.

Answer: B

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

58) Which type of tissue below has minimal extracellular matrix?

- A) epithelial only
- B) connective only
- C) neural only
- D) muscle only
- E) epithelial, neural, and muscle

Answer: E

Section: Tissues of the Body

Learning Outcome: 3.13

Bloom's Taxonomy: Comprehension

59) Functions of connective tissue include

- A) establishing a structural framework for the body.
- B) transporting fluids and dissolved materials.
- C) providing protection for delicate organs.
- D) storing energy reserves.
- E) All of the answers are correct.

Answer: E

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Comprehension

60) Cells that store fat are called

- A) fibroblasts.
- B) liposomes.
- C) adipocytes.
- D) mast cells.
- E) melanocytes.

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Comprehension

61) Loose connective tissue functions in

- A) supporting small glands.
- B) supporting epithelia.
- C) anchoring blood vessels and nerves.
- D) All of the answers are correct.

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Comprehension

62) Plasma is not

- A) a dilute solution of ions and dissolved organic molecules.
- B) the fluid portion of blood.
- C) a subdivision of the ECF.
- D) considered an extracellular matrix.
- E) a sticky solution containing glycoproteins and proteoglycans.

Answer: E

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Comprehension

63) The term meaning "programmed cell death" is

- A) necrosis.
- B) apoptosis.
- C) oncogenesis.
- D) diuresis.
- E) cytocide.

Answer: B

Section: Tissue Remodeling

Learning Outcome: 3.20

Bloom's Taxonomy: Knowledge

64) The term meaning "a mitotic population of cells that persists into adulthood" applies to

- A) stem cells.
- B) totipotent cells.
- C) apoptosis.
- D) nurse cells.
- E) gametocytes.

Answer: A

Section: Tissue Remodeling

Learning Outcome: 3.21

Bloom's Taxonomy: Comprehension

65) Groups of tissues that carry out related functions may form structures known as

- A) cells.
- B) organs.
- C) organelles.
- D) organisms.
- E) Impossible to tell from the information given.

Answer: B

Section: Organs

Learning Outcome: 3.22

Bloom's Taxonomy: Knowledge

66) The heaviest organ in the body is the

- A) liver.
- B) brain.
- C) skin.
- D) stomach.
- E) urinary bladder.

Answer: C

Section: Organs

Learning Outcome: 3.22

Bloom's Taxonomy: Knowledge

67) This organelle is the site of most ATP synthesis in the cell.

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

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

68) These degrade long chain fatty acids and toxic foreign molecules.

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

Answer: E

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

69) This is the digestive system of a cell, degrading and/or recycling bacterial or organic components.

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

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

70) This modifies proteins and packages them into secretory vesicles for export from the cell.

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

Answer: B

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

71) The simplest cell-cell junction is called a(n)

- A) gap junction.
- B) tight junction.
- C) anchoring junction.
- D) desmosome.
- E) neuromuscular junction.

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Knowledge

72) This junction contributes to the blood-brain barrier.

- A) gap junction
- B) tight junction
- C) anchoring junction
- D) desmosome
- E) neuromuscular junction

Answer: B

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Knowledge

73) These junctions can be cell-matrix junctions.

- A) gap junction
- B) tight junction
- C) anchoring junction
- D) connexin
- E) neuromuscular junction

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Knowledge

74) The loss of these junctions are a characteristic of cancer.

- A) gap junction
- B) tight junction
- C) anchoring junction
- D) claudin constructed junction
- E) neuromuscular junction

Answer: C

Section: Tissue Remodeling

Learning Outcome: 3.14

Bloom's Taxonomy: Comprehension

75) This tissue is made up of adipocytes.

- A) cartilage
- B) bone
- C) dense, irregular connective tissue
- D) fat
- E) dense, regular connective tissue

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Knowledge

76) Fibroblasts that secrete collagen-rich matrix dominates this tissue.

- A) cartilage
- B) bone
- C) loose connective tissue
- D) fat
- E) blood

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Knowledge

77) Chondrocytes secrete a firm but flexible matrix to form what tissue?

- A) cartilage
- B) bone
- C) loose connective tissue
- D) fat
- E) blood

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Knowledge

78) An osteocyte is the main cell type in which of the following?

- A) cartilage
- B) adipose
- C) loose connective tissue
- D) blood
- E) bone

Answer: E

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Knowledge

79) Which of the following plays a role in temperature regulation in infants?

- A) cartilage
- B) brown fat
- C) collagen
- D) bone
- E) white fat

Answer: B

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Knowledge

80) Nucleoli function in the production of

- A) peroxisomes.
- B) secretory vesicles.
- C) RNA for ribosomes.
- D) DNA that controls all cell functions.
- E) proteins.

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.11

Bloom's Taxonomy: Knowledge

81) Cell membranes are said to be _____ because they allow some substances to pass but not others.

- A) hydrophilic
- B) a physical barrier
- C) structural
- D) selectively permeable
- E) metabolically active

Answer: D

Section: Biological Membranes

Learning Outcome: 3.2

Bloom's Taxonomy: Comprehension

82) The nucleus is surrounded by a(n)

- A) plasmalemma.
- B) nuclear envelope.
- C) cell wall.
- D) protein coat.
- E) adhesion molecule.

Answer: B

Section: Intracellular Compartments

Learning Outcome: 3.11

Bloom's Taxonomy: Knowledge

83) Communication between the nucleus and cytosol occurs through

- A) plasmalemma.
- B) desmosomes.
- C) sodium channels.
- D) nuclear pores.
- E) nucleoli.

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.11

Bloom's Taxonomy: Knowledge

84) Cells are transformed into specialized units during

- A) differentiation.
- B) mitosis.
- C) apoptosis.
- D) transcription.
- E) programmed cell death.

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.21

Bloom's Taxonomy: Knowledge

85) The lining of the heart is called

- A) transporting epithelium.
- B) ciliated epithelium.
- C) protective epithelium.
- D) endothelium.
- E) secretory epithelium.

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

86) _____ is the extracellular component of connective tissues.

- A) Cytoplasm
- B) Blood
- C) Mucous
- D) Cartilage
- E) Ground substance

Answer: E

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Knowledge

87) The combination of fibers and ground substance in supporting connective tissues is known as

- A) cytoplasm.
- B) extracellular matrix.
- C) blood.
- D) mucous.
- E) micelles.

Answer: B

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Knowledge

88) The fluid substance of blood is called

- A) interstitial fluid.
- B) cytoplasm.
- C) peroxide.
- D) endothelium.
- E) plasma.

Answer: E

Section: Functional Compartments of the Body

Learning Outcome: 3.1

Bloom's Taxonomy: Knowledge

89) The study of tissue structure and function is called

- A) histology.
- B) plasticity.
- C) differentiation.
- D) physiology.
- E) remodeling.

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.15

Bloom's Taxonomy: Knowledge

90) Structures composed of epithelial cells that produce secretions are called

- A) nuclear pores.
- B) cell junctions.
- C) glands.
- D) ducts.
- E) micelles.

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

91) _____ is a tissue that is modified to transmit chemical and electrical signals from one cell to another.

- A) Endothelium
- B) Neural tissue
- C) Connective tissue
- D) Exocrine tissue
- E) Epithelia tissue

Answer: B

Section: Tissues of the Body

Learning Outcome: 3.19

Bloom's Taxonomy: Comprehension

92) _____ secretions are released onto an epithelial surface.

- A) Nuclear
- B) Hormonal
- C) Microtubular
- D) Exocrine
- E) Endocrine

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

93) _____ secretions are released into interstitial space to diffuse into the blood.

- A) Endocrine
- B) Exocrine
- C) Mucous
- D) Serous
- E) Ribosomal

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

94) _____ proteins extend all the way across the cell membrane.

- A) Nuclear
- B) Transmembrane
- C) Cytoskeletal
- D) Peripheral
- E) Glycolipid

Answer: B

Section: Biological Membranes

Learning Outcome: 3.3

Bloom's Taxonomy: Knowledge

95) _____ proteins attach loosely to other membrane proteins or polar regions of phospholipids.

- A) Nuclear
- B) Transmembrane
- C) Cytoskeletal
- D) Peripheral
- E) Glycolipid

Answer: D

Section: Biological Membranes

Learning Outcome: 3.3

Bloom's Taxonomy: Comprehension

96) _____ is a protective layer made up of mostly membrane carbohydrates.

- A) Epidermis
- B) Glycocalyx
- C) Connective tissue
- D) Focal Adhesion
- E) Cadherin

Answer: B

Section: Biological Membranes

Learning Outcome: 3.3

Bloom's Taxonomy: Comprehension

97) Explain the relationship between microtubules, cilia, flagella, centrioles, spindle fibers, and the centrosome.

Answer: Microtubules are a cytoskeletal protein made of tubulin. Microtubules form a major component of the internal scaffolding of the cell. Microtubules can also be assembled into cilia and flagella, which are organelles that produce cell-generated movements, and into centrioles and spindle fibers. Centrioles produce the spindle fibers, which are responsible for changing the position of chromosomes during nuclear division. Centrioles are part of a larger structure known as the centrosome, which also includes a darkly staining material and acts as the cell's microtubule organizing center.

Section: Intracellular Compartments

Learning Outcome: 3.8

Bloom's Taxonomy: Comprehension

98) List the four major tissue types. Give an example and location of each.

Answer: See Table 3.4 and the "Tissues of the Body" section in the chapter.

Section: Tissues of the Body

Learning Outcome: 3.15

Bloom's Taxonomy: Knowledge

99) Describe the structure of the cytoskeleton, and list its functions.

Answer: The cytoskeleton consists of actin microfilaments, intermediate filaments, and microtubules and forms a scaffold throughout the cytoplasm. An interesting feature is that some of the proteins are relatively fixed in position, whereas others can be rapidly assembled or disassembled as necessary. The functions include providing mechanical strength and shape, stabilizing position of organelles, intracellular transport system, functional linkage to other cells and to extracellular space, and cell-generated movements.

Section: Intracellular Compartments

Learning Outcome: 3.9

Bloom's Taxonomy: Comprehension

100) Define, compare, and contrast each term listed and explain how the terms are related to each other: *rough endoplasmic reticulum*, *smooth endoplasmic reticulum*, *ribosomes*, and *Golgi Apparatus*.

Answer: All are structures involved in synthesis of biomolecules. All but ribosomes are membranous structures. Ribosomes may be free or attached to ER, making it rough. See Figure 3.4 in the chapter.

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Analysis

101) Sketch a cell membrane. Label at least three components and briefly explain what each one does.

Answer: See Figure 3.2

Section: Biological Membranes

Learning Outcome: 3.3

Bloom's Taxonomy: Knowledge

102) Describe the composition and function of the extracellular matrix.

Answer: In any tissue, the extracellular matrix consists of two basic components: proteoglycans and insoluble proteins. The matrix plays an important role in processes ranging from growth and development to cell death. The matrix aids in cell communication with its environment by attaching to the cell membrane or cytoskeleton.

Section: Tissues of the Body

Learning Outcome: 3.13

Bloom's Taxonomy: Comprehension

103) Define, compare, and contrast each term listed, and explain how the terms are related to each other: *tendons*, *ligaments*, *cartilage*, *bone*.

Answer: Each term is a type or subtype of connective tissue. Tendons attach skeletal muscle to bone, whereas ligaments connect bone to bone. Cartilage and bone together are structurally supportive tissues. See Figure 3.12 and 3.13 in the chapter.

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Analysis

104) If an animal cell lacked centrioles, it would not be able to

A) maintain its balance.

B) synthesize proteins.

C) produce DNA.

D) metabolize sugars.

E) undergo nuclear division.

Answer: E

Section: Intracellular Compartments

Learning Outcome: 3.7

Bloom's Taxonomy: Application

105) Which of the following cytoskeleton components are responsible for the movement of chromosomes during cell division?

- A) microfilaments
- B) intermediate filaments
- C) thick filaments
- D) microtubules
- E) All of the answers are correct.

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.9

Bloom's Taxonomy: Comprehension

106) A flagellum moves a cell through a fluid medium. What moves the fluid medium across the surface of cells that are not free to move?

- A) centrioles
- B) thick filaments
- C) cilia
- D) ribosomes
- E) endoplasmic reticulum

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.8

Bloom's Taxonomy: Comprehension

107) Which of the following statements is NOT true regarding mitochondria?

- A) The outer mitochondrial membrane is responsible for its shape.
- B) The intermembrane space is used in the production of ATP.
- C) Mitochondria contain their own DNA and RNA.
- D) Mitochondria can replicate themselves only when directed by the cell's nuclear DNA.
- E) Mitochondria are responsible for providing energy to the cell.

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Comprehension

108) Plasma is to blood as _____ is to cytoplasm.

- A) inclusion
- B) organelle
- C) protein
- D) cytosol
- E) serum

Answer: D

Section: Intracellular Compartments

Learning Outcome: 3.5

Bloom's Taxonomy: Analysis

109) Examination of a sample of glandular cells reveals an extensive network of smooth endoplasmic reticulum. Which of the following would be a likely product of these cells?

- A) digestive enzymes
- B) steroid hormones
- C) protein (peptide) hormones
- D) transport proteins
- E) antibodies

Answer: B

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Application

110) In a pancreatic cell producing digestive enzyme, you would expect to find an elaborate

- A) rough endoplasmic reticulum.
- B) smooth endoplasmic reticulum.

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Application

111) Chondrocytes are to cartilage as osteocytes are to

- A) blood.
- B) epithelium.
- C) fat.
- D) bone.
- E) neural tissue.

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Analysis

112) The tissue(s) that is/are considered excitable because of the ability to generate electrical signals is/are called _____ tissue.

- A) muscle
- B) neural
- C) epithelial
- D) muscle tissue and neural
- E) muscle tissue, neural tissue, and epithelial

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.15

Bloom's Taxonomy: Knowledge

113) You are looking at a slide of an unknown organ that has an empty lumen with stratified squamous epithelium contacting the lumen. Deep to the epithelium is a basement membrane and then two layers of smooth muscle. Which of the following organs would this most likely belong to and why?

- A) The intestines because they need to move food along and absorb digested products.
- B) The liver because it secretes enzymes and bile and needs to move them to the gallbladder.
- C) The esophagus because it is a passageway that needs to move but not absorb food products.
- D) The urinary bladder because it needs to stretch and constrict to store and eliminate urine.

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Application

114) A layer of glycoproteins and a network of fine protein filaments that prevents the movement of proteins and other large molecules from the connective tissue to epithelium describes

- A) interfacial canals.
- B) the basal lamina.
- C) the reticular lamina.
- D) areolar tissue.
- E) endothelium.

Answer: B

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Application

115) The distinguishing characteristic of connective tissue is

- A) that it is arranged in sheets of tissue that lie on body surfaces.
- B) that it is always dividing, constantly being replaced throughout the body.
- C) the presence of extensive extracellular matrix containing widely scattered cells.
- D) the collagen fibers that offer support.
- E) All of these characteristics help make connective tissue unique.

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Knowledge

116) Which type of connective tissue does NOT fit with the typical characteristic of a dense ground substance?

- A) cartilage
- B) bone
- C) blood
- D) adipose
- E) tendons

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Analysis

117) Close examination of an organ reveals a lining of several layers of cells. The layers do not contain any blood vessels, and one surface of the cells faces the internal cavity of the organ. This tissue is probably

- A) epithelium.
- B) muscle tissue.
- C) connective tissue.
- D) neural tissue.
- E) fat tissue.

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.15

Bloom's Taxonomy: Analysis

118) Increasing muscle mass and decreasing fat content in your body can increase ones use of energy. Why is this?

- A) Fat is a connective tissue and not an excitable one.
- B) Muscle cells have more mitochondria than fat cells.
- C) Adipocytes contain more cytoplasmic inclusions.
- D) Fat cells have no blood supply.

Answer: B

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Comprehension

119) Microscopic examination of a tissue reveals an open framework of fibers with a large volume of fluid ground substance and elastic fibers. This tissue would most likely have come from the

- A) inner wall of a blood vessel.
- B) muscle
- C) larynx.
- D) tissue that separates skin from underlying muscle.
- E) bony socket of the eye.

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Analysis

120) Mature nerve and muscle cells are expected to lack which organelle(s)?

- A) nucleus
- B) endoplasmic reticulum
- C) centrioles
- D) ribosomes
- E) Golgi bodies

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.6

Bloom's Taxonomy: Comprehension

121) Neurons in the CNS of the adult don't contain centrioles. What does that tell you about CNS neurons?

- A) They don't produce any products.
- B) It doesn't tell you much of anything.
- C) They don't replicate themselves.
- D) They don't carry nerve impulses.

Answer: C

Section: Tissue Remodeling

Learning Outcome: 3.6

Bloom's Taxonomy: Comprehension

122) Only totipotent stem cells are capable of producing new cells in an adult.

- A) True
- B) False

Answer: B

Section: Tissue Remodeling

Learning Outcome: 3.21

Bloom's Taxonomy: Comprehension

123) A lysosome is considered which of the following?

- A) membranous organelle
- B) transmembrane protein
- C) inclusion
- D) cytoskeletal protein
- E) glycolipid

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

124) Mitochondria are considered which of the following?

- A) membranous organelle
- B) transmembrane protein
- C) inclusion
- D) cytoskeletal protein
- E) glycolipid

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Knowledge

125) A ribosome is considered which of the following?

- A) membranous organelle
- B) transmembrane protein
- C) inclusion
- D) cytoskeletal protein
- E) glycolipid

Answer: C

Section: Intracellular Compartments

Learning Outcome: 3.5

Bloom's Taxonomy: Knowledge

126) Cilia are considered which of the following?

- A) membranous organelle
- B) adheren
- C) inclusion
- D) mitochondrial protein
- E) protein fiber

Answer: E

Section: Intracellular Compartments

Learning Outcome: 3.5

Bloom's Taxonomy: Comprehension

127) The endoplasmic reticulum is considered which of the following?

- A) membranous organelle
- B) adheren
- C) inclusion
- D) mitochondrial protein
- E) glycocalyx

Answer: A

Section: Intracellular Compartments

Learning Outcome: 3.5

Bloom's Taxonomy: Comprehension

128) This type of epithelia is found in the epidermis, esophagus, and mouth, and these stacked layers of cells prevent exchange, while they resist chemicals, bacteria, and other destructive forces.

- A) exchange
- B) transport
- C) ciliated
- D) protective
- E) secretory

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

129) This type of epithelia actively and selectively regulates the exchange of nongaseous material, such as ions and nutrients, and can be regulated in response to various stimuli.

- A) exchange
- B) transport
- C) ciliated
- D) protective
- E) secretory

Answer: B

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

130) This type of epithelia is composed of thin, flattened cells that allow the rapid passage of O₂ and CO₂ in and out of the lungs and of certain blood vessels.

- A) exchange
- B) transport
- C) ciliated
- D) protective
- E) secretory

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

131) This type of epithelia has cells that produce a substance and release it, either onto a surface or into the blood.

- A) exchange
- B) transport
- C) ciliated
- D) protective
- E) secretory

Answer: E

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

132) This type of epithelia is composed of cells with membrane extensions that beat in a coordinated fashion to move fluid and particles across the tissue.

- A) exchange
- B) transport
- C) ciliated
- D) protective
- E) secretory

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

On the row of cells indicated below, match A-E to the terms in the following question(s).

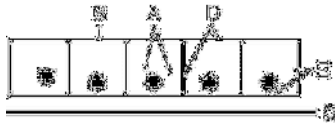


Figure 3.1

133) Referring to Figure 3.1, which letter represents the apical membrane?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: B

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

134) Referring to Figure 3.1, which letter represents the basolateral membrane?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: E

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Knowledge

135) Referring to Figure 3.1, which letter represents the basal lamina?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: C

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

136) Referring to Figure 3.1, which letter represents the plasma membrane?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: D

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

137) Referring to Figure 3.1, which letter represents the cytosol?

- A) A
- B) B
- C) C
- D) D
- E) E

Answer: A

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

138) Design a concept map for the types of cell junctions and the proteins that compose them.
Answer: This is discussed in the "Tissues of the Body" section of the chapter and shown in Figure 3.8a.

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Knowledge

139) Cancer is abnormal, uncontrolled cell division. Which property of epithelial tissues makes them more prone to develop this condition?

Answer: Epithelial tissues contain a population of dividing cells, which divide at a moderate rate.

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Application

140) Describe the progression of a fertilized egg, from totipotent cell through pluripotent and multipotent stem cells. How might stem cells be of therapeutic value? What is plasticity?

Answer: This is discussed in the "Tissue Remodeling" section of the chapter.

Section: Tissue Remodeling

Learning Outcome: 3.21

Bloom's Taxonomy: Comprehension

141) Describe the anatomical and fluid compartments of the body. How do the lumens of hollow organs fit into these classifications? Which fluid-containing cavities are considered to be internal and which are external? Of those that are external, why are they external (give examples)? You may wish to design a flow chart to help answer this.

Answer: The anatomical compartments are the cranial cavity, containing the brain; the thoracic cavity, containing the heart and lungs; and the abdominopelvic cavity, containing organs of the digestive, urinary, and reproductive systems. The fluid compartments are the intracellular fluid (inside the cells) and the extracellular fluid (outside the cells). The extracellular fluids are found in the interstitial fluid between cells and the plasma of the blood, which is in the lumen of the circulatory system. Lumens of hollow organs such as the digestive and urinary tracts are part of the external environment, whereas the intracellular and interstitial fluids are internal. The lumen of the circulatory system is also internal. External lumens are those that open to the outside environment. These openings include the mouth, nostrils, anus, urethral, and vaginal orifices.

Section: Functional Compartments of the Body

Learning Outcome: 3.1

Bloom's Taxonomy: Comprehension

142) Describe the two general meanings of the term *membrane*, as used in biology. Which usage indicates layers of cells and which indicates layers of molecules?

Answer: Prior to the use of microscopes, membranes were simply thin, flexible layers of cells that separated large compartments or lined large cavities. When microscopic study of cells allowed visualization of the cell envelope and organelles, the term *membrane* was additionally applied to thin layers of molecules.

Section: Biological Membranes

Learning Outcome: 3.2

Bloom's Taxonomy: Comprehension

143) Give three examples of structures whose formation involves molecular interactions that either increase or decrease contact with water molecules, explaining how they are similar and how they differ from each other. (Hint: They all involve molecules that have both polar and nonpolar portions.)

Answer: Phospholipids have a polar portion that is attracted to water and a nonpolar portion that repels water. The molecules orient in water such that water is excluded from contacting the nonpolar portions. This is seen in: the bilayer arrangement of phospholipids in cell membranes, in which hydrophobic tails are in the middle of the layer; micelles, in which a single layer of phospholipids forms a sphere with the hydrophobic tails in the middle; and liposomes, which are hollow spheres made from phospholipid bilayers that can be filled with water-soluble molecules.

Section: Biological Membranes

Learning Outcome: 3.4

Bloom's Taxonomy: Comprehension

144) Your study partner is having difficulty understanding dense fibrous connective tissue, tendons, and ligaments. Explain to her how they are related to each other and how they are different from other categories of connective tissue.

Answer: Dense fibrous connective tissue is a category of connective tissue, distinct from loose, adipose, blood, bone, and cartilage. It is not as dense as cartilage and bone but is denser than the other types listed. Like loose connective tissues, fibroblasts are the primary cell type, but unlike loose, the matrix consists of relatively more protein fibers and less ground substance. Like bone and cartilage, the fibers are primarily collagen. The fibers can be arranged randomly (irregular) or parallel to each other (regular). Tendons and ligaments are both composed of dense fibrous connective tissue. Tendons attach muscles to bones, whereas ligaments attach bones to bones; tendons lack elastic fibers, but they are present in ligaments; therefore ligaments are slightly stretchy.

Section: Tissues of the Body

Learning Outcome: 3.17

Bloom's Taxonomy: Analysis

145) Define and distinguish between *necrosis* and *apoptosis*, and give specific examples of each.
Answer: *Necrosis* is cell death as a result of damage from toxins, physical trauma, or lack of oxygen; damaged cells release chemicals that may damage neighboring cells. An example is death of skin cells as a result of sunburn. *Apoptosis* is programmed cell death, which is an internally regulated process and does not involve neighboring cells unless they too are so programmed. An example is the loss of skin webbing between fingers and toes in a fetus.

Section: Tissue Remodeling

Learning Outcome: 3.20

Bloom's Taxonomy: Analysis

146) What is the difference between cell movements in response to outside forces and cell-generated movements (in response to specific cell activity)? (Hint: Do red blood cells move because of RBC activity? What causes cell movements associated with cytokinesis?) Using the index of your text to guide you to relevant sections in other chapters (look up entries for the various cytoskeletal proteins), explain the different types of movements that cells generate.

Answer: Red blood cells and other cells in circulation move because they are suspended in a flowing fluid (blood or lymph); the axon of a nerve cell in the arm will move when the arm moves. Cell-generated movements involve the activity of actin microfilaments, intermediate filaments, microtubules, and myosin thick filaments (in muscle). The processes of chromosome alignment during mitosis/meiosis, cytoplasmic pinching during cytokinesis, beating of cilia and flagella, endocytosis and exocytosis, and muscle contraction are all examples of cell-generated movements.

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Analysis

147) If a person who has not exercised regularly begins a consistent exercise routine, she will notice that her metabolism will seem to increase as her endurance improves. Why is this?

Answer: Metabolism will increase with endurance because the number of mitochondria will increase with consistent exercise. The increase in mitochondria will improve endurance and increase metabolism of glucose because they will be metabolizing more glucose into ATP.

Section: Biological Membranes

Learning Outcome: 3.4

Bloom's Taxonomy: Comprehension

148) What is the benefit of having some of the cellular organelles enclosed by a membrane similar to the cell (plasma) membrane?

Answer: The isolation of the internal contents of membrane-bound organelles allows them to manufacture or store secretions, enzymes, or toxins that could adversely affect the cytoplasm in general. Another benefit is the increased efficiency of having specialized enzyme systems concentrated in one place, for example, those necessary for energy production in the mitochondrion. In addition, the membranes themselves serve as "workspace," allowing the anchoring of enzymes or other proteins into a stabilized location.

Section: Intracellular Compartments

Learning Outcome: 3.6

Bloom's Taxonomy: Comprehension

149) Sketch a short series of simple columnar epithelial cells. Label each of the three different borders. Briefly explain the different kinds of activities that may go on at each border, and tell how their structures and junctions support these functions.

Answer: This is discussed in the "Tissues of the Body" section of the chapter.

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Comprehension

150) Which type of epithelium would one expect to compose the alveoli (air sacs) in the lungs? Defend your answer.

Answer: Since gases must diffuse across the alveoli and associated capillaries you would expect to find exchange epithelia, composed of very thin cells (simple squamous epithelium). Thicker types of epithelial cells would slow the process of gas diffusion to and from the blood.

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Application

151) During a lab practical, Laurant examines a tissue that is composed of densely packed protein fibers that are running parallel and form a cord. There are few nuclei and no striations, and there is no evidence of other cellular structures. Laurant identifies the tissue as skeletal muscle. Why is Laurant's choice wrong, and which tissue is he probably observing?

Answer: Skeletal muscle tissue is made up of densely packed fibers running in the same direction, but since muscle fibers are composed of cells, they would have many nuclei and mitochondria. Skeletal muscle also has an obvious banding pattern or striations due to the arrangement of the actin and myosin filaments within the cell. Laurant is probably looking at a slide of tendon (dense connective tissue).

Section: Tissues of the Body

Learning Outcome: 3.17, 3.18

Bloom's Taxonomy: Analysis

152) Cancer is not one disease but a group of related diseases, caused by abnormal genes, environmental factors, and/or viral infections. Describe the basic common characteristics of cancers, including the role of anchoring junctions and proteases. What is a tumor? What is metastasis? Is cancer usually considered to be contagious? Explain.

Answer: Cancer results when cells begin to divide and grow and do not respond to normal controls that would limit their growth. Anchoring junctions eventually fail to keep the cancer cells together, allowing them to spread to other organs where they continue to grow uncontrolled. Some cancer cells secrete proteases that improve their ability to spread or metastasize. A tumor is a lump of cancerous cells. Cancer is usually not contagious, being caused instead by genetic mutations in an individual or exposure to environmental factors by that individual; exceptions are cancers caused by viruses, which are believed to be the minority.

Section: Tissues of the Body

Learning Outcome: 3.14

Bloom's Taxonomy: Comprehension

153) In typical women of reproductive age, the epithelial cells lining the uterus (the endometrium) die and are shed from the body roughly once every month, in the process of menstruation. The triggers in this process include chemical (hormonal) changes and contraction of the blood vessels in the lining. Cell death may be a result of either apoptosis or necrosis. Give the characteristics of each process. Devise an argument for classifying the process of menstruation as an example of apoptosis, and then argue for classifying it as necrosis. Which is correct?

Answer: (Note to instructor: If students have not yet studied the reproductive system, they may not be able to answer the final question, therefore it could be omitted.) Necrosis is cell death as a result of damage from toxins, physical trauma, or lack of oxygen; damaged cells release chemicals that may damage neighboring cells. Apoptosis is programmed cell death, which is an internally regulated process and affects only the cell it occurs within. Menstruation may result from necrosis if the causative factor is changes in blood flow to the endometrium such that the oxygen supply is inadequate. Menstruation may result from apoptosis if it results from hormonal changes that directly kill the cells. While menstruation is a normal event and removes unneeded cells (characteristics of apoptosis), it results directly from the decrease in circulation, causing the cells to die from lack of oxygen; thus it is an example of necrosis.

Section: Tissue Remodeling

Learning Outcome: 3.20

Bloom's Taxonomy: Synthesis

154) The most common types of cancer in America include colon cancer, skin cancer, breast cancer, cervical cancer, and prostate cancer. What do all of these cancers have in common and why are they so prevalent in our society?

Answer: All of these structures have epithelial tissue that is reproducing at a rapid rate. Because they undergo mitosis so often if a failure of apoptosis occurs or if a mutation alters the DNA of one of the cells, the new copies of the existing cells will cause an increase in the cancerous cells at a much faster rate than in other tissues that divide at a much slower rate.

Section: Tissues of the Body

Learning Outcome: 3.16

Bloom's Taxonomy: Analysis

155) Apoptosis and necrosis are described as the two ways cells die. Which one is "messy"? Which is "tidy"? Explain. Why do these forms of cell death exist? What are some advantages and/or disadvantages of each? Use the lining cells of the digestive tract in an example of an advantageous process.

Answer: Necrosis is a result of damage to cells. The cells swell and rupture, and the enzymes that are released cause damage to other cells in the area; hence the descriptor "messy." Necrosis has the disadvantage of damaging cells that might otherwise have survived unscathed. Necrosis is not an advantageous process, but it is unavoidable because trauma to cells is unavoidable; we all get hurt sometimes. Apoptosis is "tidy" in that the cells do not rupture and release damaging enzymes; instead the cell breaks up into membrane-surrounded pieces that are consumed by immune cells. Apoptosis is advantageous in that it can shape a structure such as fingers and toes during development. In the case of the digestive tract, the harsh chemical environment would lead to frequent necrosis if it weren't for the programmed apoptosis occurring every day or so.

Section: Tissue Remodeling

Learning Outcome: 3.20

Bloom's Taxonomy: Analysis

156) A. Define *stem cells* and *differentiation*, and describe the different types and the extent to which they are present during the life of an individual (include the fertilized egg as well as the adult that eventually results).

B. Which of the four tissue types contain populations of stem cells of known function, and what is that function? Which types of tissue have stem cells of unknown function? Do any types of tissue lack stem cells?

C. How do fully differentiated cells differ from stem cells? How can stem cells be used in medical treatment? Give examples.

Answer:

A. Stem cells are cells that are mitotic and not fully differentiated. Differentiation is the process cells undergo as they become more and more specialized in structure and function as is typical of the specific tissues they compose. The fertilized egg and the cells resulting from the first few cleavage divisions after fertilization are totipotent, which means they can ultimately produce all the types of cells in an adult. Within the first week after conception, the cells begin differentiation and become capable of producing many types of cells but not all. These cells are pluripotent. By adulthood, stem cells can be described as multipotent, which are stem cells that can produce many of the cell types in a specific tissue, and committed stem cells, which can only become one specific cell type within that tissue.

B. Epithelial and connective tissues have active populations of multipotent stem cells, which replace cells lost to damage or normal turnover. Muscle and nervous tissues contain stem cells but appear to be unable to replace lost cells. They were once thought to lack stem cells altogether.

C. Once cells are fully differentiated, they can no longer divide to produce more cells. Disease conditions or injuries that result in cell loss may be remedied by treatment with appropriate stem cells. Examples are neurological injuries and diseases marked by irreversible damage to cells that cannot (yet) be replaced by new cells.

Section: Tissue Remodeling

Learning Outcome: 3.21

Bloom's Taxonomy: Analysis

157) Stem cell research has become a political topic in the last few decades. Explain why the research is being done, why some cells are favored for this research over others, and what the factors are that cause some people not to support this type of research. Are any alternatives available that are less opposed?

Answer: Stem cell therapy may remedy previously untreatable diseases and conditions such as those involving brain and spinal injury. It has become political because one source of stem cells that are highly desirable for research is those removed from human embryos and fetuses. These cells are less differentiated and therefore more likely to be able to yield the specific types of mature cells desired. Many people opposed to abortions of human pregnancies are opposed to the use of human embryos and fetuses as a source of stem cells because these embryos and fetuses are destroyed in the process. Use of umbilical cord blood from live births is less opposed, though these cells are somewhat limited in the types of cells they can produce and therefore may not be valuable for treating as large a variety of diseases and injuries.

Section: Tissue Remodeling

Learning Outcome: 3.21

Bloom's Taxonomy: Comprehension

158) Nervous tissue consists of two general types of cells: nerve cells and glial cells. Glial cells are mitotic, whereas neural cells are not (excluding the small population of stem cells). Which type of cell is most likely to be involved in brain cancer, and why?

Answer: Cancer results from uncontrolled cell division in mitotic cells. Therefore, glial cell cancers (gliomas) are the most common type of nervous system cancers, as they have the most mitotic activity.

Section: Tissues of the Body

Learning Outcome: 3.19

Bloom's Taxonomy: Analysis

159) Cell membranes consist of lipid, protein, and carbohydrate in relative amounts that vary according to cell type. Describe the relative proportions of these substances in three structures, and relate these differences to cell function where possible.

Answer: (Note to instructor: This may be a good question to use on a comprehensive final exam, as it ties together basic membrane composition with cell functions revealed in later chapters.)

See Table 3.1 in the chapter. Red blood cells have nearly equal amounts of protein and lipid, with a small amount of carbohydrate, in this ratio of protein:lipid:carbohydrate: 49:43:8. Myelin is almost all lipid, followed by protein and carbohydrate in this ratio of lipid:protein:carbohydrate: 79:18:3. In later chapters on the nervous system, it will be seen that this preponderance of lipid results in electrical insulation, which is one of the main functions of myelin. The inner mitochondrial membrane is mostly protein, in this ratio of protein:lipid:carbohydrate: 76:24:0. This reflects the function of this membrane in chemical synthesis that relies on a variety of protein enzymes.

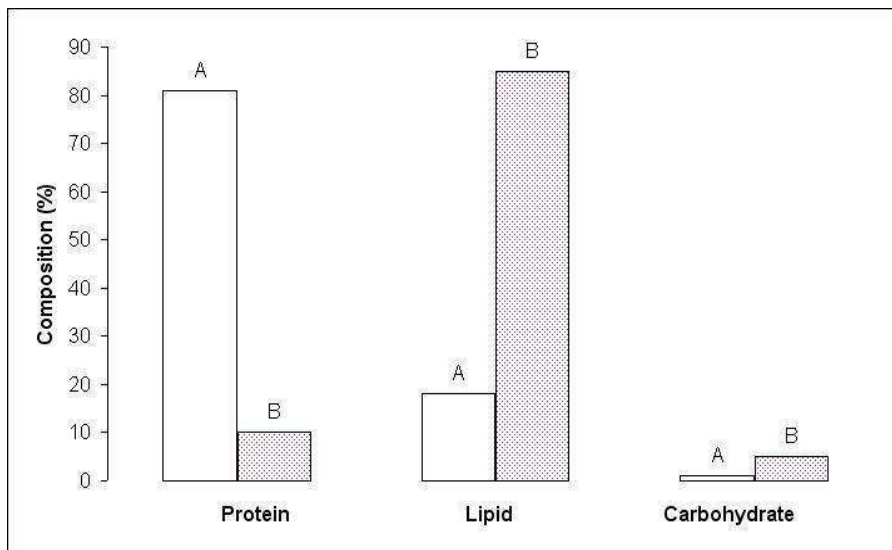
Section: Biological Membranes

Learning Outcome: 3.2

Bloom's Taxonomy: Application

160) Nutrients undergo the last stages of digestion by enzymes located on the cells of the small intestine; then the nutrients are absorbed by these same cells by way of various membrane transport processes. Adipose cells absorb and store excess food energy in the form of fat. You and the other students in the physiology lab you are taking are doing an analysis of cell membrane composition, on unknown animal tissue samples labeled A and B. All lab groups determined that sample A contained, on average, 81% protein, 18% lipid, and 1% carbohydrate. Sample B contained 85% lipid, 10% protein, and 5% carbohydrate. Sketch a graph of the class data. You now have to make a logical conclusion as to which sample is more likely to be intestine and which is adipose tissue. What do you conclude, and why?

Answer: A bar graph would be appropriate, as in the figure below. The presence of digestive enzymes and membrane transporters in small intestine cells indicate there should be a significant amount of protein present. Adipose cells, on the other hand, are relatively inactive and can passively absorb lipids by way of simple diffusion through the membrane phospholipids. Adipose tissue is expected, therefore, to consist primarily of lipids. Sample A is most likely small intestine, and sample B adipose.



Section: Biological Membranes

Learning Outcome: 3.3

Bloom's Taxonomy: Analysis