***Human Anatomy & Physiology, 10e,* (Marieb)**
Chapter 3 Cells: The Living Units

3.1 Matching Questions

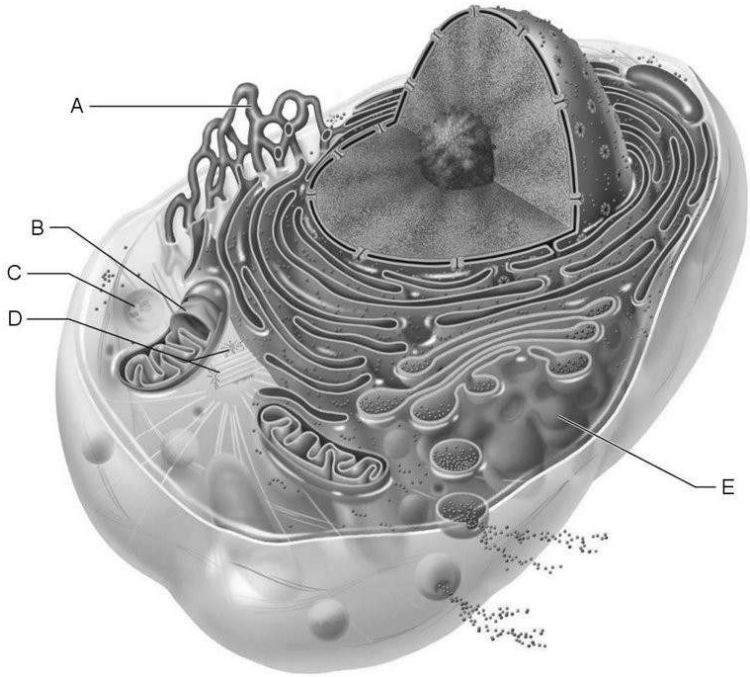

Figure 3.1

Using Figure 3.1, match the following:
A) C
B) E
C) D
D) A
E) B

1) Produces ATP aerobically.
Section: 3.1
Learning Outcome: 3.1, 3.3
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

2) Site of enzymatic breakdown of phagocytized material.
Section: 3.1
Learning Outcome: 3.1, 3.3
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

3) Packages proteins for insertion in the cell membrane or for exocytosis.
Section: 3.1
Learning Outcome: 3.1, 3.3
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

4) Site of synthesis of lipid and steroid molecules.
Section: 3.1
Learning Outcome: 3.1, 3.3
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

5) Forms the mitotic spindle.
Section: 3.1
Learning Outcome: 3.1, 3.3
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

6) Replicate for cell division.
Section: 3.1
Learning Outcome: 3.1, 3.3
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

7) When ruptured it releases the enzymes responsible for autolysis.
Section: 3.1
Learning Outcome: 3.1, 3.3
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

Answers: 1) E 2) A 3) B 4) D 5) C 6) C 7) A

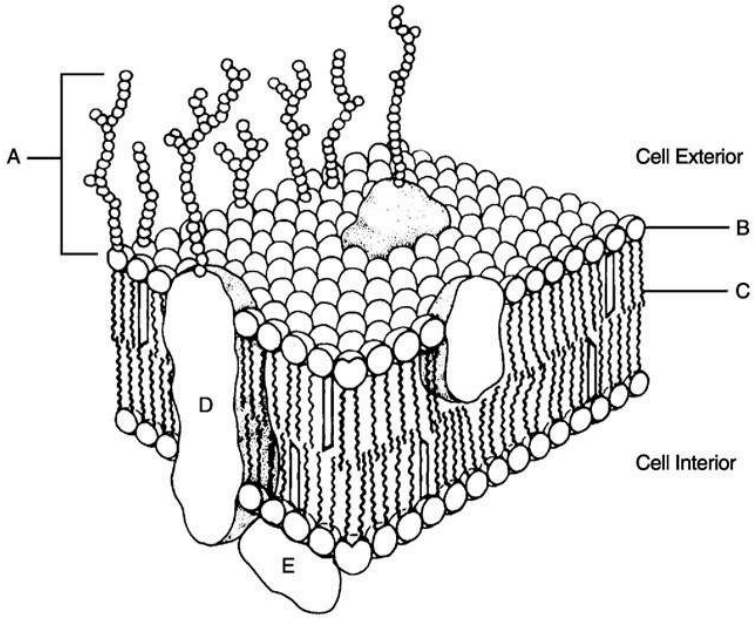

Figure 3.2

Using Figure 3.2, match the following:
A) A
B) E
C) C
D) D
E) B

8) Nonpolar region of phospholipid.
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

9) Glycocalyx.
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

10) Polar region of phospholipid.
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

11) Peripheral protein.
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

12) Integral protein.
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

13) Unique glycoproteins and glycolipids involved in cell recognition.
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

14) Hydrophilic portion of phospholipid.
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

Answers: 8) C 9) A 10) E 11) B 12) D 13) A 14) E

Match the following:
A) Transfer RNA
B) Messenger RNA
C) Ribosomal RNA
D) ATP
E) Synthetase enzymes

15) Forms part of the subunits for the protein synthesizing organelle.
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

16) A molecule that binds to a specific codon and specific amino acid simultaneously.
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

17) Attaches the correct amino acid to its transfer RNA.
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

18) Provides the energy needed for synthesis reactions.
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

19) Produced in the nucleus, this molecule specifies the exact sequence of amino acids of the protein to be made.
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

20) May be attached to the ER or scattered in the cytoplasm.
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

Answers: 15) C 16) A 17) E 18) D 19) B 20) C

Match the following:
A) Anaphase
B) Late prophase
C) Telophase
D) Early prophase
E) Metaphase

21) Chromosomes uncoil to form chromatin.
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

22) Chromosomal centromeres split and chromosomes migrate to opposite ends of the cell.
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

23) Nuclear membrane and nucleolus disintegrate.
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

24) Chromosomes align on the spindle equator.
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

25) Centrioles move to opposite ends of the cell.
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

Answers: 21) C 22) A 23) B 24) E 25) D

Match the following:
A) Microtubules
B) Nucleoli
C) Ribosomes
D) Endoplasmic reticulum
E) Nucleus

26) Plays a role in the synthesis of steroid-based hormones and proteins.
Section: 3.7
Learning Outcome: 3.16
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

27) The organelle that facilitates peptic bond formation between amino acids.
Section: 3.7
Learning Outcome: 3.16
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

28) Play a critical role in forming spindle fibers for cell division, organize and move organelles as well as giving shape to the cell.
Section: 3.7
Learning Outcome: 3.18
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 3 Application

29) Dense spherical bodies in the nucleus that are the synthesis site for ribosomal RNA.
Section: 3.9
Learning Outcome: 3.21
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

30) The vast majority of the cell's genetic material is housed here.
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

Answers: 26) D 27) C 28) A 29) B 30) E

Match the following:
A) Tight junctions
B) Gap junctions
C) Desmosomes

31) Help prevent molecules from passing through the extracellular space between adjacent cells.
Section: 3.2
Learning Outcome: 3.5
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

32) Type of anchoring junction.
Section: 3.2
Learning Outcome: 3.5
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

33) Allows ions and small molecules to pass through from one cell to another.
Section: 3.2
Learning Outcome: 3.5
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

34) Present in electrically excitable tissues.
Section: 3.2
Learning Outcome: 3.5
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

35) Abundant in tissues subjected to great mechanical stress.
Section: 3.2
Learning Outcome: 3.5
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

Answers: 31) A 32) C 33) B 34) B 35) C

3.2 True/False Questions

1) Each daughter cell resulting from mitotic cell division has the exactly same genetic composition.
Answer: TRUE
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

2) Apoptosis is programmed cell suicide; cancer cells do not undergo this process.
Answer: TRUE
Section: 3.12
Learning Outcome: 3.29
Global LO: G7
HAPS LO: HAPS1, HAPS6
Bloom's Level: 2 Comprehension

3) Introns represent a genome scrap yard that provides DNA segments for genome evolution and a variety of small RNA molecules.
Answer: TRUE
Section: 3.11
Learning Outcome: 3.25
Global LO: G2, G7
HAPS LO: HAPS1
Bloom's Level: 4 Analysis

4) Enzymes and proteins needed for cell division are synthesizes and put into place during G_2 phase.
Answer: TRUE
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

5) Lipid rafts, found in the cell outer membrane surface, are concentrating platforms for certain receptor molecules or for protein molecules needed for cell signaling.
Answer: TRUE
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 2 Comprehension

6) Osmosis is the passive movement of water but it follows almost completely opposite laws of physics when compared to the diffusion of ions or other small particles.
Answer: FALSE
Section: 3.3
Learning Outcome: 3.7
Global LO: G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 4 Analysis

7) The genetic information encoded in DNA by the regular alternation of sugar and phosphate molecules.
Answer: FALSE
Section: 3.11
Learning Outcome: 3.24
Global LO: G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 2 Comprehension

8) Dividing cells must pass through the phases of mitosis the following order: Prophase, Metaphase, Anaphase, and Telophase.
Answer: TRUE
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 3 Application

9) DNA transcription is another word for DNA replication.
Answer: FALSE
Section: 3.11
Learning Outcome: 3.25
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 3 Application

10) The glycocalyx is composed of glycolipids, glycoproteins and cholesterol molecules that are displayed on the outside surface of the plasma membrane.
Answer: FALSE
Section: 3.6
Learning Outcome: 3.12
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 2 Comprehension

11) Microfilaments are thin strands of the contractile protein composed of myosin.
Answer: FALSE
Section: 3.7
Learning Outcome: 3.18
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 2 Comprehension

12) Interstitial fluid represents one type of extracellular material.
Answer: TRUE
Section: 3.1
Learning Outcome: 3.2
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

13) Aquaporins are believed to be present in red blood cells and kidney tubules, but not in any other cells in the body.
Answer: FALSE
Section: 3.2
Learning Outcome: 3.4
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 2 Comprehension

14) Microtubules are hollow tubes made of subunits of the protein tubulin.
Answer: TRUE
Section: 3.7
Learning Outcome: 3.18
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

15) Telomeres are the regions of chromosomes that code for the protein ubiquitin.
Answer: FALSE
Section: 3.11
Learning Outcome: 3.24
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

16) The speed of individual particle diffusion is influenced by temperature and particle size, not by concentration.
Answer: TRUE
Section: 3.3
Learning Outcome: 3.6
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 3 Application

17) Concentration differences cause ionic imbalances that polarize the cell membrane, and active transport processes.
Answer: TRUE
Section: 3.4, 3.5
Learning Outcome: 3.8, 3.11
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 3 Application

1.3 Multiple Choice Questions

1) Which of the following is FALSE regarding the membrane potential?
A) The resting membrane potential is determined mainly by the concentration gradients and differential permeability of the plasma membrane to K+ and Na+ions.
B) The resting membrane potential is maintained solely by passive transport processes.
C) The resting membrane potential occurs due to active transport of ions across the membrane due to the sodium-potassium pump.
D) In their resting state, all body cells exhibit a resting membrane potential.
Answer: B
Section: 3.5
Learning Outcome: 3.11
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 3 Application

2) In certain kinds of muscle cells, calcium ions are stored in _____.
A) the cytoplasm
B) both smooth and rough ER
C) the smooth ER
D) the rough ER
Answer: C
Section: 3.7
Learning Outcome: 3.16
Global LO: G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 2 Comprehension

3) The RNA responsible for bringing the amino acids to the ribosome for protein formation is _____.
A) mRNA
B) rRNA
C) tRNA
D) ssRNA
Answer: C
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

4) A red blood cell placed in pure water would _____.
A) neither shrink nor swell
B) swell and burst
C) swell initially, then shrink as equilibrium is reached
D) shrink
Answer: B
Section: 3.3
Learning Outcome: 3.7
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 3 Application

5) Which of the following describes the plasma membrane?
A) a phospholipid bilayer surrounding the cell
B) a membrane composed of tiny shelves or cristae
C) a double layer of protein enclosing the plasma
D) a single-layered membrane that surrounds the nucleus of the cell
Answer: A
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

6) Which of the following structures would aid a cell in allowing more nutrients to be absorbed by the cell?
A) stereocilia
B) flagella
C) primary cilia
D) microvilli
Answer: D
Section: 3.8
Learning Outcome: 3.20a
Global LO: G7

HAPS LO: HAPS1
Bloom's Level: 3 Application

7) Which of the following statements is correct regarding net diffusion?
A) The greater the concentration gradient, the faster the rate.
B) The lower the temperature, the faster the rate.
C) The rate is independent of temperature.
D) Molecular weight of a substance does not affect the rate.
Answer: A
Section: 3.3
Learning Outcome: 3.6
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 3 Application

8) If cells are placed in a hypertonic solution containing a solute to which the membrane is impermeable, what could happen?
A) The cells will lose water and shrink.
B) The cells will show no change due to diffusion of both solute and solvent.
C) The cells will swell and ultimately burst.
D) The cells will shrink at first, but will later reach equilibrium with the surrounding solution and return to their original condition.
Answer: A
Section: 3.3
Learning Outcome: 3.7
Global LO: G2, G3
HAPS LO: HAPS1, HAPS2, HAPS4
Bloom's Level: 3 Application

9) Riboswitches are folded RNAs that act as switches to turn protein synthesis on or off in response to _____.
A) specific codes from the DNA
B) changes in the environment
C) the presence or absence of ubiquitins
D) specific tRNAs
Answer: B
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

10) Which of the following is a function of a plasma membrane protein?
A) molecular transport through the membrane
B) forms a lipid bilayer
C) circulating antibody
D) oxygen transport

Answer: A
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

11) Which of the following statements is correct regarding RNA?
A) rRNA is always attached to the rough ER.
B) If the base sequence of DNA is ATTGCA, the messenger RNA template will be UCCAGU.
C) There is exactly one specific type of mRNA for each amino acid.
D) Messenger RNA, transfer RNA, and ribosomal RNA play a role in protein synthesis.
Answer: D
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

12) Which of the following would not be a constituent of a plasma membrane?
A) glycoproteins
B) glycolipids
C) messenger RNA
D) phospholipids
Answer: C
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

13) Mitosis _____.
A) creates diversity in genetic potential
B) is division of the genetic material within the nucleus
C) is always a part of the cell cycle
D) is the formation of sex cells
Answer: B
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

14) The electron microscope has revealed that one of the components within the cell consists of pinwheel array of 9 triplets of microtubules arranged to form a hollow tube. This structure is a _____.
A) centrosome

B) ribosome
C) centriole
D) chromosome
Answer: C
Section: 3.8
Learning Outcome: 3.19
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

15) Which of these is an inclusion, not an organelle?
A) lysosome
B) microtubule
C) cilia
D) melanin
Answer: D
Section: Part 2 page 83
Learning Outcome: 3.14
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

16) Which of the following is not a factor that binds cells together?
A) special membrane junctions
B) glycoproteins in the glycocalyx
C) glycolipids in the glycocalyx
D) wavy contours of the membranes of adjacent cells
Answer: C
Section: 3.6
Learning Outcome: 3.12
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

17) If the nucleotide or base sequence of the DNA strand used as a template for messenger RNA synthesis is ACGTT, then what would be the sequence of bases in the corresponding mRNA?
A) ACGTT
B) GUACC
C) UGCAA
D) TGCAA
Answer: C
Section: 3.11
Learning Outcome: 3.26
Global LO: G2, G3
HAPS LO: HAPS1, HAPS2
Bloom's Level: 2 Comprehension

18) Which transport process is the main mechanism for the movement of most macromolecules by body cells?
A) secondary active transport
B) receptor-mediated endocytosis
C) pinocytosis
D) phagocytosis
Answer: B
Section: 3.4
Learning Outcome: 3.10a
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

19) Passive membrane transport processes include _____.
A) the use of transport proteins when moving substances from areas of low to high concentration
B) movement of a substance down its concentration gradient
C) consumption of ATP
D) movement of water from an area of high solute concentration to an area of low concentration
Answer: B
Section: 3.3
Learning Outcome: 3.6
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

20) Which of the following is NOT a function of the smooth endoplasmic reticulum?
A) breakdown of stored glycogen to form free glucose
B) steroid-based hormone synthesis
C) protein synthesis in conjunction with ribosomes
D) lipid metabolism and cholesterol synthesis
Answer: C
Section: 3.7
Learning Outcome: 3.16
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

21) Mitochondria _____.
A) are single-membrane structures involved in the breakdown of ATP
B) synthesize proteins for use outside the cell
C) contain digestive enzymes called acid hydrolyses
D) contain some of the DNA and RNA code necessary for their own function
Answer: D
Section: 3.7
Learning Outcome: 3.15
Global LO: G7
HAPS LO: HAPS2

Bloom's Level: 1 Knowledge

22) Peroxisomes _____.
A) sometimes function as secretory vesicles
B) are functionally the same as lysosomes
C) function to digest particles ingested by endocytosis
D) are able to detoxify substances by enzymatic action
Answer: D
Section: 3.7
Learning Outcome: 3.17
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 1 Knowledge

23) Which of the following is NOT a function of lysosomes?
A) degrading worn-out or nonfunctional organelles
B) help in the formation of cell membranes
C) digesting particles taken in by endocytosis
D) breaking down bone to release calcium ions into the blood
Answer: B
Section: 3.7
Learning Outcome: 3.17
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

24) Which of the following is a principle of the fluid mosaic model of cell membrane structure?
A) Phospholipids form a bilayer that is largely impermeable to water-soluble molecules.
B) Phospholipids consist of a polar head and a nonpolar tail made of three fatty acid chains.
C) All proteins associated with the cell membrane are contained in a fluid layer on the outside of the cell.
D) The lipid bilayer is a solid at body temperature, thus protecting the cell.
Answer: A
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

25) Which of the following statements is most correct regarding the intracellular chemical signals known as "second messengers"?
A) Second messengers usually inactivate protein kinase enzymes.
B) Second messengers usually act to remove nitric oxide (NO) from the cell.
C) Cyclic AMP and calcium may be second messengers.
D) Second messengers act through receptors called K-proteins.
Answer: C
Section: 3.6

Learning Outcome: 3.13
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

26) The main component of the cytosol is _____.
A) sugars
B) water
C) proteins
D) salts
Answer: B
Section: Part 2 page 83
Learning Outcome: 3.14
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 1 Knowledge

27) The functions of centrioles include _____.
A) producing ATP
B) serving as the site for ribosomal RNA synthesis
C) providing a whiplike beating motion to move substances along cell surfaces
D) organizing the mitotic spindle in cell division
Answer: D
Section: 3.8
Learning Outcome: 3.19
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

28) A gene can best be defined as _____.
A) a segment of DNA that carries the instructions for one polypeptide chain
B) a three-base triplet that specifies a particular amino acid
C) noncoding segments of DNA up to 100,000 nucleotides long
D) an RNA messenger that codes for a particular polypeptide
Answer: A
Section: 3.11
Learning Outcome: 3.24
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

29) Some hormones enter cells via _____.
A) exocytosis
B) receptor-mediated endocytosis
C) primary active transport
D) pinocytosis
Answer: B

Section: 3.4
Learning Outcome: 3.10a
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

30) If a tRNA had an AGC anticodon, it could attach to a(n) _____ mRNA codon.
A) UCG
B) TCG
C) UGA
D) AUG
Answer: A
Section: 3.11
Learning Outcome: 3.26
Global LO: G2, G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

31) Bone is a connective tissue that provides support for the body with its strength and rigidity. Which of the following provides the best explanation for how this is so?
A) Bone cells are very dense and therefore resist physical stress.
B) Bones cells secrete an extracellular matrix that when combined with minerals becomes rock hard.
C) Bone cells have extensive cytoskeleton that makes them ridged.
D) The bone cell's plasma membrane contains a high degree of cholesterol that stabilizes the cell membrane, giving it strength.
Answer: B
Section: 3.1
Learning Outcome: 3.2
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

32) If a human cell were to increase the amount of cholesterol embedded within its plasma membrane which of the following would most likely happen?
A) The plasma membrane would become more permeable to ions and less permeable to lipids.
B) The cell would form a plaque that could potential block a blood vessel.
C) The plasma membrane would become more fluid and the phospholipids less stable.
D) The plasma membrane would become more stable, less fluid and less permeable.
Answer: D
Section: 3.2
Learning Outcome: 3.4
Global LO: G2, G7
HAPS LO: HAPS4
Bloom's Level: 4 Analysis

33) Cancerous cells can divide so rapidly that they will often produce a glycocalyx that is

different than the other cells in the body. This may result in _____.
A) allowing the cancer cells to bind to their healthy, neighboring cells
B) a decrease in the permeability of the tumor cell's plasma membrane preventing the uptake of chemotherapy drugs
C) the cancer cells conserving energy for more growth
D) cells of the immune system recognizing the tumorous cells as foreign and destroying them
Answer: D
Section: 3.2
Learning Outcome: 3.4, 3.12
Global LO: G2, G7
HAPS LO: HAPS4
Bloom's Level: 3 Application

34) The myocardium (cardiac muscle tissue) undergoes a significant amount of physical stress due to its contractions. You would expect to see relatively large numbers of which of the following embedded within their plasma membrane?
A) tight junctions
B) desmosomes
C) glycolipids
D) transport proteins
Answer: B
Section: 3.2
Learning Outcome: 3.5
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 3 Application

35) Which of the following will NOT speed up the net rate of diffusion for glucose into a cell?
A) Decreasing the number of phospholipids in the plasma membrane
B) Increasing the concentration of glucose outside of the cell.
C) Increasing the number of glucose transport proteins within the plasma membrane.
D) Decreasing the concentration of glucose within the cell.
Answer: A
Section: 3.3
Learning Outcome: 3.6
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

36) The lungs deliver a regular supply of oxygen to the blood, which is in turn circulated to most all the cells of the body. At the same time oxygen is consumed during aerobic cellular respiration within these cells. This implies that _____.
A) oxygen will passively diffuse into the cells
B) oxygen requires active transport to enter most cells
C) the concentration gradient for oxygen is steepness inside of the cell
D) the rate of oxygen diffusion is independent of concentration
Answer: A

Section: 3.3
Learning Outcome: 3.7
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

37) The movement of water across the plasma membrane can be described by all of the following EXCEPT _____.
A) carrier-mediated facilitated diffusion.
B) passive membrane transport.
C) simple diffusion.
D) facilitated diffusion through aquaporins.
Answer: A
Section: 3.3
Learning Outcome: 3.7
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

38) If active transport establishes a concentration gradient with the use of ATP, then the concentration gradient can be looked at as _____.
A) potential energy that can be harnessed when molecules passively diffuse down the concentration gradient
B) a byproduct of active transport that will be alleviated by pinocytosis
C) an unusable byproduct of active transport that will simply diffuse away
D) unwanted pressure that will be alleviated by channel mediated facilitated diffusion
Answer: A
Section: 3.4
Learning Outcome: 3.8
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

39) Which of the following would not be restricted (limited) by low levels of ATP?
A) exocytosis
B) pinocytosis
C) phagocytosis
D) osmosis
Answer: D
Section: 3.4
Learning Outcome: 3.9
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2, HAPS4
Bloom's Level: 4 Analysis

40) A cell engulfing a relatively large particle will likely utilize _____.
A) phagocytosis

B) pinocytosis
C) receptor-mediated endocytosis
D) exocytosis
Answer: A
Section: 3.4
Learning Outcome: 3.10a
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 3 Application

41) If a cell is non-selectively engulfing samples of extracellular fluid, for example to absorb nutrients, it will likely utilize _____.
A) phagocytosis
B) pinocytosis
C) receptor-mediated endocytosis
D) exocytosis
Answer: B
Section: 3.4
Learning Outcome: 3.10a
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 3 Application

42) If a cell is selectively reducing the concentration of a particular enzyme in the extracellular fluid it will likely utilize _____.
A) phagocytosis
B) pinocytosis
C) receptor-mediated endocytosis
D) exocytosis
Answer: C
Section: 3.4
Learning Outcome: 3.10a
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

43) A type of transport protein found in the plasma membrane of cells lining the inside of the intestine allows sodium ions to diffuse down their concentration gradient. The ions move through the transport protein, and into the cell. These transport proteins will use the kinetic energy of the diffusing sodium ions to bring glucose into the cells as well. This transport protein would best be described as _____.
A) a carrier protein
B) a symporter
C) a pump
D) a channel
Answer: B
Section: 3.4

Learning Outcome: 3.7, 3.8
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2
Bloom's Level: 3 Application

44) A type of transport protein found in the plasma membrane of cells lining the inside of the intestine allows sodium ions to diffuse down their concentration gradient. The ions move through the transport protein, and into the cell. These transport proteins will use the kinetic energy of the diffusing sodium ions to bring glucose into the cells as well. Which of the following would stop transport of glucose through this transport protein?
A) Increasing the number of digestive enzymes in the digestive tract.
B) Stopping the activity of the sodium potassium pump.
C) Increasing the concentration of glucose outside of the cell.
D) Lowering the energy of activation.
Answer: B
Section: 3.4
Learning Outcome: 3.7, 3.8
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 5 Synthesis

45) Which of the following would NOT assist in establishing a resting membrane potential?
A) Having greater concentration of glycolipids on the outside surface of the membrane.
B) Selective diffusion allowing more uncharged particles into the cell.
C) Selective diffusion allowing more positively charged ions to diffuse out of the cell.
D) Selective diffusion allowing fewer positively charged ions to diffuse into the cell.
Answer: B
Section: 3.5
Learning Outcome: 3.11
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 5 Synthesis

46) When tissues are injured or infected, chemical signals can be releases that affect the plasma membrane of cells that line the nearby blood vessels. These blood vessels cells (endothelial cells) respond to the chemical signals by displaying a type of glycoproteins on their surface. These proteins will attach to circulating white blood cells bringing them to the site of injury or infection. These glycoproteins would best be described as _____.
A) desmosomes
B) G-proteins
C) transport proteins
D) Cell Adhesion Molecules (CAMs)
Answer: D
Section: 3.6
Learning Outcome: 3.12
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4

Bloom's Level: 3 Application

47) Myocardium (cardiac muscle tissue) must rhythmically contract for a lifetime. This requires a considerable amount of energy production by the cells. You would expect to see a relatively high amount of which organelle in these cells?
A) cytoskeleton
B) smooth endoplasmic reticulum
C) mitochondria
D) lysosomes
Answer: C
Section: 3.7
Learning Outcome: 3.15
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

48) Beta cells in the pancreas produce and secrete the protein hormone insulin. You would expect to see a relatively large amount of which organelles in these cells?
A) cytoskeleton, and peroxisomes
B) mitochondria, and cilia
C) Golgi apparatus, rough endoplasmic reticulum
D) smooth endoplasmic reticulum, and lysosomes
Answer: C
Section: 3.7
Learning Outcome: 3.16
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

49) Colchicine is a drug that can prevent the formation of microtubules. Which is the most likely affect colchicine would have on cell division?
A) It will enhance mitosis by moving chromosome toward the spindle equator.
B) It would have little no effect on mitosis.
C) It would delay mitosis by preventing S phase.
D) It will arrest mitosis by preventing the formation of spindle microtubules.
Answer: D
Section: 3.10
Learning Outcome: 3.19
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

1.4 Short Answer Questions

1) The RNA that has an anticodon and attaches to a specific amino acid is _____ RNA.
Answer: transfer
Section: 3.11
Learning Outcome: 3.25
Global LO: G2, G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

2) Water may move through membrane pores constructed by transmembrane proteins called _____.
Answer: aquaporins
Section: 3.3
Learning Outcome: 3.6
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

3) _____ is the division of the cytoplasmic mass into two parts.
Answer: Cytokinesis
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

4) The metabolic or growth phase of a cell life cycle is called _____.
Answer: interphase
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

5) Aerobic cellular respiration occurs in the _____.
Answer: mitochondria
Section: 3.7
Learning Outcome: 3.15
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

6) The most common extracellular ion is _____.
Answer: sodium
Section: 3.5
Learning Outcome: 3.11

Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 1 Knowledge

7) The process of discharging particles from inside a cell to the outside is called _____.
Answer: exocytosis
Section: 3.4
Learning Outcome: 3.10a
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

8) A red blood cell would swell if its surrounding solution were _____.
Answer: hypotonic
Section: 3.3
Learning Outcome: 3.7
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 2 Comprehension

9) Describe two important functions of the Golgi apparatus.
Answer: To modify, sort, and package proteins.
Section: 3.7
Learning Outcome: 3.16
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 2 Comprehension

10) Why can we say that a cell without a nucleus will ultimately die?
Answer: Without a nucleus, a cell cannot make proteins, nor can it replace any enzymes or other cell structures (which are continuously recycled). Additionally, such a cell could not replicate.
Section: 3.9
Learning Outcome: 3.21
Global LO: G2, G7
HAPS LO: HAPS1, HAPS2, HAPS4
Bloom's Level: 4 Analysis

11) What processes maintain a steady state "resting" membrane potential?
Answer: Both diffusion and active transport mechanisms operate within the cell membrane to maintain a resting membrane potential.
Section: 3.5
Learning Outcome: 3.11
Global LO: G2, G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

12) Briefly describe the glycocalyx and its functions.

Answer: The glycocalyx is the sticky, carbohydrate-rich area on the cell surface. It helps bind cells together and provides a highly specific biological marker by which cells can recognize each other.
Section: 3.6
Learning Outcome: 3.12
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

13) In all living cells hydrostatic and osmotic pressures exist. Define these pressures and explain how they are used in the concept of tonicity of the cell.
Answer: Hydrostatic pressure is the pressure of water exerted on the cell membrane. Osmotic pressure is created by different concentrations of molecules in a solution separated by the cell membrane. Because these pressures are exerted on the membrane they can be used by the cell to change the shape of the cell, regulate substances entering and exiting the cell, and change the osmolarity of the cell.
Section: 3.3
Learning Outcome: 3.6
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

14) Other than the nucleus, which organelle has its own DNA?
Answer: Mitochondria.
Section: 3.7
Learning Outcome: 3.15
Global LO: G7
HAPS LO: HAPS1
Bloom's Level: 1 Knowledge

15) How are the products of free ribosomes different from membrane-bound ribosomes?
Answer: Free ribosomes make soluble proteins that function in the cytosol. Membrane-bound ribosomes produce proteins that are to be used on the cell membrane or exported from the cell.
Section: 3.7
Learning Outcome: 3.16
Global LO: G2, G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

16) How are peroxisomes different from lysosomes?
Answer: Peroxisomes contain oxidases that use oxygen to detoxify harmful substances. They are very good at neutralizing free radicals. Peroxisomes directly bud from the ER. Lysosomes contain powerful hydrolytic enzymes that will pretty much destroy anything they come in contact with. They are manufactured by the Golgi apparatus.
Section: 3.7
Learning Outcome: 3.17
Global LO: G2, G7

HAPS LO: HAPS2
Bloom's Level: 3 Application

17) Briefly name the subphases of interphase and tell what they do.
Answer: G1 - growth phase. The cell is metabolically active and the centriole begins to divide at the end of this phase.
S - DNA replicates itself. New histones are made and assembled into chromatin.
G2 - Enzymes and proteins are synthesized and centriole replication is completed. This is the final phase of interphase.
Section: 3.10
Learning Outcome: 3.22
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

18) What are nucleolar organizer regions?
Answer: nuclear regions containing the DNA that issues genetic instructions for synthesizing ribosomal RNA
Section: 3.9
Learning Outcome: 3.21
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

19) List possible causes of aging.
Answer: 1. chemical insults and free radical formation (wear and tear theory)
2. diminished energy production by free radical-damaged mitochondria
3. progressive disorders in the immune system
4. genetic programming
Section: 3.12
Learning Outcome: 3.29
Global LO: G2, G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

20) What factors contribute to the fragility of the lysosome and subsequent cell autolysis?
Answer: cell injury, cell oxygen deprivation, presence of excessive amounts of vitamin A in the cell
Section: 3.12
Learning Outcome: 3.27
Global LO: G2, G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

21) Why can we say that cells are protein factories?
Answer: Most of the metabolic machinery of the cell is involved in protein synthesis since structural proteins constitute most of the dry cell material and functional proteins direct all

cellular activities.
Section: 3.11
Learning Outcome: 3.25
Global LO: G2, G7
HAPS LO: HAPS2
Bloom's Level: 4 Analysis

22) What are cell exons and introns?
Answer: Exons are amino acid-specifying informational sequences in genes. Introns are noncoding gene segments that provide a reservoir of ready-to-use DNA segments for genome evolution and a source of a large variety of RNA molecules.
Section: 3.11
Learning Outcome: 3.25
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

23) What are lipid rafts? What are their functions?
Answer: They are assemblies of saturated phospholipids associated with sphingolipids and cholesterol. They are concentrating platforms for molecules needed for cell signaling.
Section: 3.2
Learning Outcome: 3.4
Global LO: G7
HAPS LO: HAPS2
Bloom's Level: 3 Application

24) Follow the pathway that a typical protein, destined for exocytosis will make as it passes from the ribosome, into the rough endoplasmic reticulum. In your answer be sure to describe role that ribosomes play, and the events that take place in the Rough Endoplasmic reticulum.
Answer: A new polypeptide is translated at the ribosome and is threaded into the rough endoplasmic reticulum (RER). Within the RER the protein is aided in folding by chaperone proteins and modifications, like the addition of carbohydrates can be made to the protein here. The protein will be placed into a vesicle that will migrate from the RER to the cis-face of the Golgi apparatus.
Section: 3.7
Learning Outcome: 3.16
Global LO: G2, G7, G8
HAPS LO: HAPS2, HAPS4
Bloom's Level: 5 Synthesis

25) Describe the events that take place within the Golgi apparatus to a protein that is destined for secretion by the cell into the extracellular fluid.
Answer: Within the Golgi apparatus, further modifications of the protein can take place, like the addition of phosphate groups. The folded and processes protein will then be "tagged" and sent by vesicle from the trans-face of the Golgi apparatus to the plasma membrane for exocytosis.
Section: 3.7
Learning Outcome: 3.16

Global LO: G2, G7, G8
HAPS LO: HAPS2, HAPS4
Bloom's Level: 5 Synthesis

26) Compare a gap junction to a channel protein, how are they alike and how are the different?
Answer: Both allow ions and small molecules to pass through by diffusion. However, gap junctions are embedded within in the plasma membranes of two neighboring cells. The alignment and connection of the gap junctions between the neighboring cells allows the passage of ions and small molecules directly from one cell into another.
Section: 3.7
Learning Outcome: 3.16
Global LO: G2, G7, G8
HAPS LO: HAPS2, HAPS4
Bloom's Level: 5 Synthesis

1.5 Clinical Questions

1) A patient was admitted to the hospital for severe dehydration. Explain what changes occur in extracellular and intracellular fluid compartments during dehydration.
Answer: Fluid volume deficit occurs when the body loses both water and electrolytes from the extracellular fluid compartment. Fluid is initially lost from the intravascular compartment (blood). Then fluid is drawn from the interstitial compartment into the intravascular compartment, depleting the interstitial compartment. To compensate for the decreased volume, the body then draws intracellular fluid out of the cells. This could lead to collapse and death.
Section: 3.3
Learning Outcome: 3.7
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

2) At of age of 6 months, Caleb was diagnosed with Tay-Sachs disease. As his primary care physician, what would you tell his parents about this disease?
Answer: It is an inherited condition where various chemicals are broken down in the brain by a cell organelle called the lysosome. Unfortunately, because of the buildup of undigested nerve cell lipids, the symptoms of listlessness and motor weakness will progress to mental retardation, seizures, blindness, and ultimately death.
Section: 3.7
Learning Outcome: 3.17
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

3) Your patient has a respiratory disease that has literally paralyzed the cilia. Explain why this patient would be at an increased risk for a respiratory infection.
Answer: Ciliated cells that live in the respiratory tract propel mucus, laden with dust particles and bacteria, upward and away from the lungs. If the cilia are paralyzed, bacteria remain in the

lungs and may cause infection.
Section: 3.8
Learning Outcome: 3.20a
Global LO: G2, G7
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis

4) Describe the difference in cell division between normal cells and cancer cells.
Answer: Normal cells divide in two distinct events□mitosis and cytokinesis which are well-controlled. Cancer cells divide wildly, with uncontrollable mechanisms and defective mitosis, sometimes ending in unequal chromosome sets, which makes them dangerous to their host.
Section: 3.10
Learning Outcome: 3.22
Global LO: G2, G4
HAPS LO: HAPS2, HAPS4
Bloom's Level: 4 Analysis