Essentials of Anatomy & Physiology, 7e, Global Edition **(Martini/Bartholomew)**
Chapter 3 Cell Structure and Function

3.1 Multiple-Choice Questions

1) The smallest living things are
A) proteins.
B) organ systems.
C) tissues.
D) organs.
E) cells.
Answer: E
Learning Outcome: 3-1
Bloom's Taxonomy: Remembering

2) You are a researcher specializing in cytology, specifically the cell structures of the skeletal muscle that moves the body. The instrument that you would use to see the fine detail within cells would be the
A) MRI scan.
B) light microscope.
C) scanning electron microscope.
D) transmission electron microscope.
E) CT scan.
Answer: D
Learning Outcome: 3-1
Bloom's Taxonomy: Understanding

3) The concept that each cell of an organism maintains homeostasis is part of our understanding of
A) cell theory.
B) Darwinian theory.
C) the cell cycle.
D) mitotic theory.
E) the theory of differentiation.
Answer: A
Learning Outcome: 3-1
Bloom's Taxonomy: Remembering

4) Which of the following is a concept of the cell theory?
A) Cells are the basic structural unit of life.
B) Tissues are the site of control.
C) Organelles are the basic functional unit of life.
D) Cells are produced by meiosis.
E) Cells are immortal.
Answer: A
Learning Outcome: 3-1
Bloom's Taxonomy: Understanding

5) Looking at a tissue through a microscope, you notice that all of the cells along the free surface of the tissue have microvilli along the free edges of the cells. This would tell you that this tissue has what function?
A) the need to detoxify many chemicals
B) a high metabolic rate
C) phagocytosis
D) motility
E) absorption
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Understanding

6) Which of the following terms is used to define the structure that separates the contents of a human cell from its surrounding medium?
A) cell wall
B) cell layer
C) plasma membrane
D) cell boundary
E) nuclear envelope
Answer: C
Learning Outcome: 3-2
Bloom's Taxonomy: Remembering

7) The plasma membrane
A) is a watery gel in which structures are suspended.
B) contains the powerhouse of the cell.
C) is the central government of the cell.
D) regulates the exchange of substances with the environment.
E) carries the cell's hereditary information.
Answer: D
Learning Outcome: 3-2
Bloom's Taxonomy: Remembering

8) Membrane-bound proteins that allow identification of a cell as "self" or "nonself" are called _____ proteins.
A) integral
B) recognition
C) carrier
D) peripheral
E) channel
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Remembering

9) The membrane proteins that are sensitive to extracellular materials are called
A) receptor proteins.
B) channel proteins.
C) carrier proteins.
D) anchor proteins.
E) identifier proteins.
Answer: A
Learning Outcome: 3-2
Bloom's Taxonomy: Remembering

10) The phosphate "head" of a phospholipid is
A) hydrophobic.
B) hydrophilic.
C) polar.
D) nonpolar.
E) both hydrophilic and polar.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Remembering

11) Structurally, the plasma membrane
A) contains no imbedded proteins.
B) separates the chromatin from the cytoplasm in eukaryotes.
C) contains carbohydrate molecules only.
D) is nonporous.
E) is composed of a bilayer of lipids.
Answer: E
Learning Outcome: 3-2
Bloom's Taxonomy: Understanding

12) Flu viruses enter into a prospective host cell (along the respiratory tract) and direct it to produce many copies of the viruses. As those viruses bud off of the infected cell, they take the cell membrane of the host cell with them. How might this kill the host cell?
A) The infected host cell loses the ability to transport materials in and out.
B) The infected cell cannot metabolize.
C) The infected cell cannot make RNA.
D) The infected cell loses the ability to move towards nutrient sources.
E) None of these is correct.
Answer: A
Learning Outcome: 3-2
Bloom's Taxonomy: Analyzing

13) Which of the following is a function of the membrane proteins called channel proteins?
A) They bind to specific extracellular molecules to trigger a cellular change.
B) They permit the passage of ions, bypassing the lipid portion of the cell membrane.
C) They are enzymes.
D) They serve as anchors or stabilizers for the cell membrane.
E) They are used as a source of energy.
Answer: B
Learning Outcome: 3-2
Bloom's Taxonomy: Understanding

14) Plasma membranes allow certain molecules to pass, while blocking others. Membranes with this property are called
A) impermeable.
B) freely permeable.
C) selectively permeable.
D) actively permeable.
E) nonpermeable.
Answer: C
Learning Outcome: 3-3
Bloom's Taxonomy: Remembering

15) The movement of water across a membrane from an area of higher water (lower solute) concentration to an area of lower water (higher solute) concentration is known as
A) filtration.
B) active transport.
C) diffusion.
D) facilitated diffusion.
E) osmosis.
Answer: E
Learning Outcome: 3-3
Bloom's Taxonomy: Remembering

16) Which of these transport mechanisms do **not** fit into the rest of the group listed?
A) osmosis
B) diffusion
C) ion pumps
D) passive transport
E) facilitated diffusion
Answer: C
Learning Outcome: 3-3
Bloom's Taxonomy: Understanding

17) Opening a bottle of perfume releases perfume molecules from the container, and within a few minutes the perfume can be smelled by a person many feet away from the bottle. This illustrates
A) diffusion.
B) facilitated diffusion.
C) osmosis.
D) filtration.
E) active transport.
Answer: A
Learning Outcome: 3-3
Bloom's Taxonomy: Understanding

18) Immersion of red blood cells into a(n) _____ solution results in lysis of the cell.
A) isotonic
B) hypertonic
C) hypotonic
D) monotonic
E) equilibrated
Answer: C
Learning Outcome: 3-3
Bloom's Taxonomy: Remembering

19) Crenation occurs when a blood cell is placed in a(n)
A) isotonic solution.
B) pinocytotic solution.
C) hypotonic solution.
D) monotonic solution.
E) hypertonic solution.
Answer: E
Learning Outcome: 3-3
Bloom's Taxonomy: Remembering

20) Which substances can pass directly through the plasma membrane?
A) carbohydrate-bound
B) water soluble
C) lipid insoluble
D) iron soluble
E) lipid soluble
Answer: E
Learning Outcome: 3-3
Bloom's Taxonomy: Remembering

21) Which property of a membrane determines which molecules may enter or leave?
A) differentiation
B) growth
C) structural integration
D) permeability
E) cellular activation
Answer: D
Learning Outcome: 3-3
Bloom's Taxonomy: Understanding

22) Alcohol and fatty acids enter cells via
A) anchor proteins.
B) receptor proteins.
C) lipid channels.
D) diffusion.
E) endocytosis.
Answer: D
Learning Outcome: 3-3
Bloom's Taxonomy: Understanding

23) A solution that contains a higher solute concentration than the cytoplasm of a cell is called
A) monotonic.
B) hypertonic.
C) isotonic.
D) hypotonic.
E) semitonic.
Answer: B
Learning Outcome: 3-3
Bloom's Taxonomy: Understanding

24) You mix a drop of blood with a drop of an unknown solution and look at the solution under the microscope. The cells look normal to you, so the solution you mixed with the blood would likely be
A) isotonic.
B) hypoosmotic.
C) hypotonic.
D) hypertonic.
E) hyperosmotic.
Answer: A
Learning Outcome: 3-3
Bloom's Taxonomy: Applying

25) The concentration of _____ determines the osmotic pressure of a solution.
A) solvent molecules
B) water molecules
C) solute molecules
D) channel proteins
E) lipid molecules
Answer: C
Learning Outcome: 3-3
Bloom's Taxonomy: Understanding

26) In which type of solution would equilibrium exist?
A) isotonic
B) hypertonic
C) hypotonic
D) osmotic
E) ionic
Answer: A
Learning Outcome: 3-3
Bloom's Taxonomy: Understanding

27) Two solutions are separated by a semipermeable membrane with the same properties as a cell membrane. Solution A is 5 percent glucose and solution B is 10 percent glucose. Under these circumstances,
A) water will move from solution A to solution B.
B) water will move from solution B to solution A.
C) glucose will move from solution A to solution B.
D) glucose will move from solution B to solution A.
E) at equilibrium the concentration of glucose will be higher in solution B.
Answer: A
Learning Outcome: 3-3
Bloom's Taxonomy: Applying

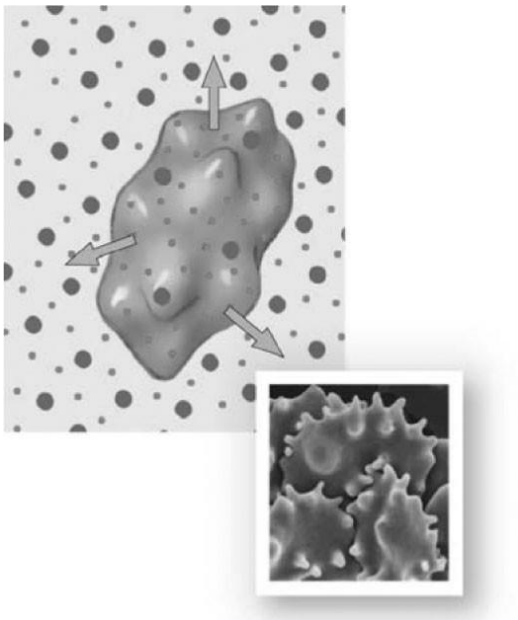

Photo Credit: Steve Gschmeissner / Photo Researchers, Inc.

Figure 3-1 A Red Blood Cell

Use Figure 3-1 to answer the following question:

28) Choose the correct description for the preceding image.
A) The cell is in a hypotonic saline solution.
B) Osmotic flow does not occur across the plasma membrane of the cell.
C) As the current condition of the cell continues, its plasma membrane may rupture or lyse.
D) The cell is in equilibrium with the solution in that as one water molecule moves out of the cell, another moves in to replace it.
E) As water moves out of the cell, crenation occurs.
Answer: E
Learning Outcome: 3-3
Bloom's Taxonomy: Understanding

29) The release of intracellular materials by a vesicle at the cell surface is called
A) osmosis.
B) active transport.
C) exocytosis.
D) endocytosis.
E) an ion exchange pump.
Answer: C
Learning Outcome: 3-4
Bloom's Taxonomy: Remembering

30) Place these steps in phagocytosis in the correct order.
1. Residue is ejected from the cell.
2. Lysome fuses with vesicle.
3. Cytoplasmic extensions of the cell surround the object being destroyed.
4. A vesicle is formed in the cytoplasm.
5. Digestive enzymes are activated.
A) 3, 4, 5, 2, 1
B) 2, 4, 3, 5, 1
C) 3, 4, 2, 5, 1
D) 1, 4, 5, 2, 3
E) 5, 3, 4, 2, 1
Answer: C
Learning Outcome: 3-4
Bloom's Taxonomy: Analyzing

31) A mechanism in which two substances move in opposite directions across the cell membrane is called
A) facilitated diffusion.
B) vesicular transport.
C) endocytosis.
D) countertransport.
E) osmosis.
Answer: D
Learning Outcome: 3-4
Bloom's Taxonomy: Remembering

32) The movement of a molecule from an area of high concentration to an area of low concentration by interacting with a carrier protein is an example of
A) osmosis.
B) active transport.
C) diffusion.
D) facilitated diffusion.
E) filtration.
Answer: D
Learning Outcome: 3-4
Bloom's Taxonomy: Remembering

33) A process that requires ATP energy to move a substance independently of its concentration gradient is called
A) active transport.
B) passive transport.
C) facilitated transport.
D) osmosis.
E) diffusion.
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding

34) Which of the following is **true** of the sodium-potassium exchange pump?
A) It maintains sodium at equal intracellular and extracellular levels.
B) It is a passive transport process.
C) It moves sodium into the cell and potassium out of the cell.
D) There is one type of carrier protein for sodium and a different type of carrier protein for potassium.
E) It is an example of active transport.
Answer: E
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding

35) The process of binding a specific molecule and then bringing it into the cell in a vesicle is called
A) exocytosis.
B) transcytosis.
C) phagocytosis.
D) receptor-mediated endocytosis.
E) pinocytosis.
Answer: D
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding

36) Carrier molecules are located within the
A) cytoplasm.
B) plasma membrane.
C) transport vesicles.
D) lipid droplets.
E) chromosomes.
Answer: B
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding

37) Which of these is an example of carrier-mediated transport that does not require energy input?
A) an ion exchange pump
B) facilitated diffusion
C) endocytosis
D) exocytosis
E) pinocytosis
Answer: B
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding

38) How does facilitated diffusion differ from simple diffusion?
A) Facilitated diffusion expends no ATP.
B) Facilitated diffusion moves molecules from an area of higher concentration to lower concentration.
C) The rate of solute transport cannot increase indefinitely in facilitated diffusion.
D) The concentration gradient is never eliminated in facilitated diffusion.
E) Facilitated diffusion is independent of carrier molecules.
Answer: C
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding

39) Palytoxin is a very potent toxin from a particular seaweed in Hawaii that locks the carrier proteins of the ion pump system of the cell in an open position. What result would this have on cell function?
A) Sodium cannot enter the cells, and cell metabolism is damaged.
B) The cells cannot utilize glucose.
C) Phagocytosis is inhibited.
D) Diffusion cannot occur.
E) The cell cannot concentrate ions to achieve concentrations necessary for cell function.
Answer: E
Learning Outcome: 3-4
Bloom's Taxonomy: Analyzing

40) A cell must expend energy to accomplish substance movement during
A) diffusion.
B) active transport.
C) passive transport.
D) osmosis.
E) filtration.
Answer: B
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding

41) _____ processes move substances across a membrane regardless of concentration gradients.
A) Active transport
B) Filtration
C) Passive transport
D) Diffusion
E) Osmotic
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding

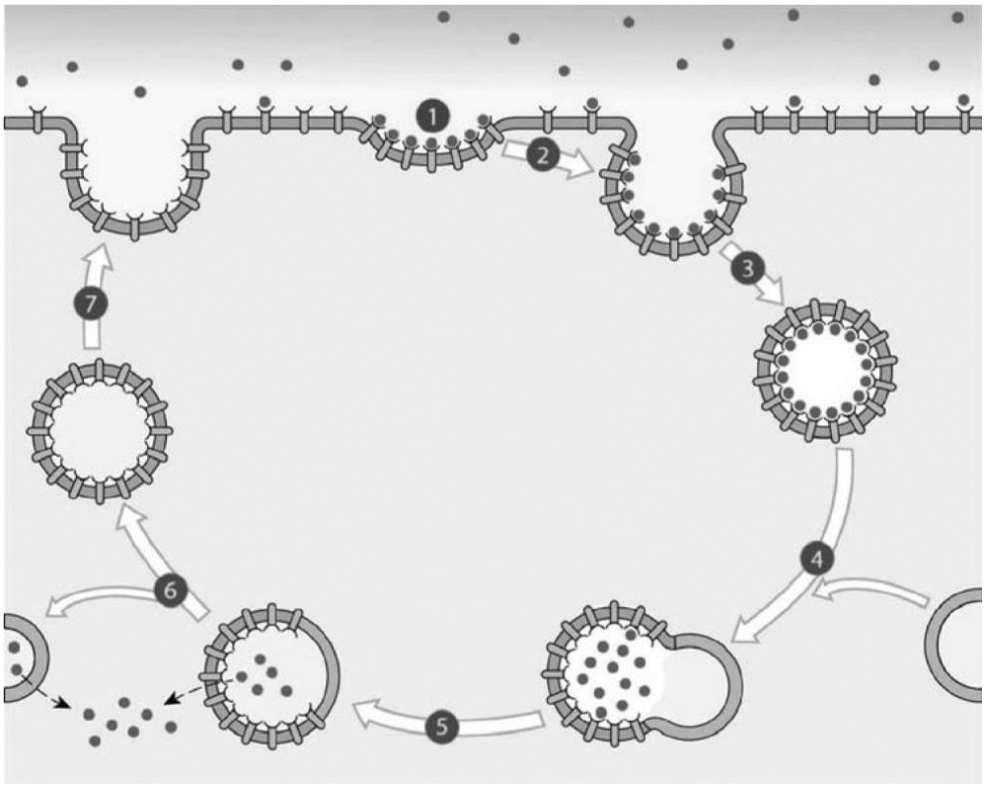

Figure 3-2 A Process

Use Figure 3-2 to answer the following questions:

42) Identify the **primary** process that is featured in the preceding image.
A) receptor-mediated endocytosis
B) pinocytosis
C) sodium-potassium exchange
D) phagocytosis
E) facilitated diffusion
Answer: A
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding

43) Using the preceding image, determine the **correct** sequence of events in the **primary** process, which begins when target molecules (ligands) bind to receptors in the plasma membrane.
1. Target molecules are removed and absorbed into the cytoplasm.
2. The membrane containing the receptor molecules detaches from the lysosome.
3. Pockets pinch off, forming coated vesicles.
4. Areas coated with ligands form deep pockets in the membrane surface.
5. The vesicle fuses with the plasma membrane.
6. Coated vesicles fuse with lysosomes.
A) 4, 6, 1, 2, 3, 5
B) 4, 1, 3, 6, 5, 2
C) 4, 3, 6, 1, 2, 5
D) 1, 2, 4, 3, 6, 5
E) 1, 4, 3, 2, 5, 6
Answer: C
Learning Outcome: 3-4
Bloom's Taxonomy: Analyzing

44) Modification and packaging of proteins with other molecules is done by the
A) ribosome.
B) nucleolus.
C) smooth endoplasmic reticulum.
D) Golgi apparatus.
E) nucleus.
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

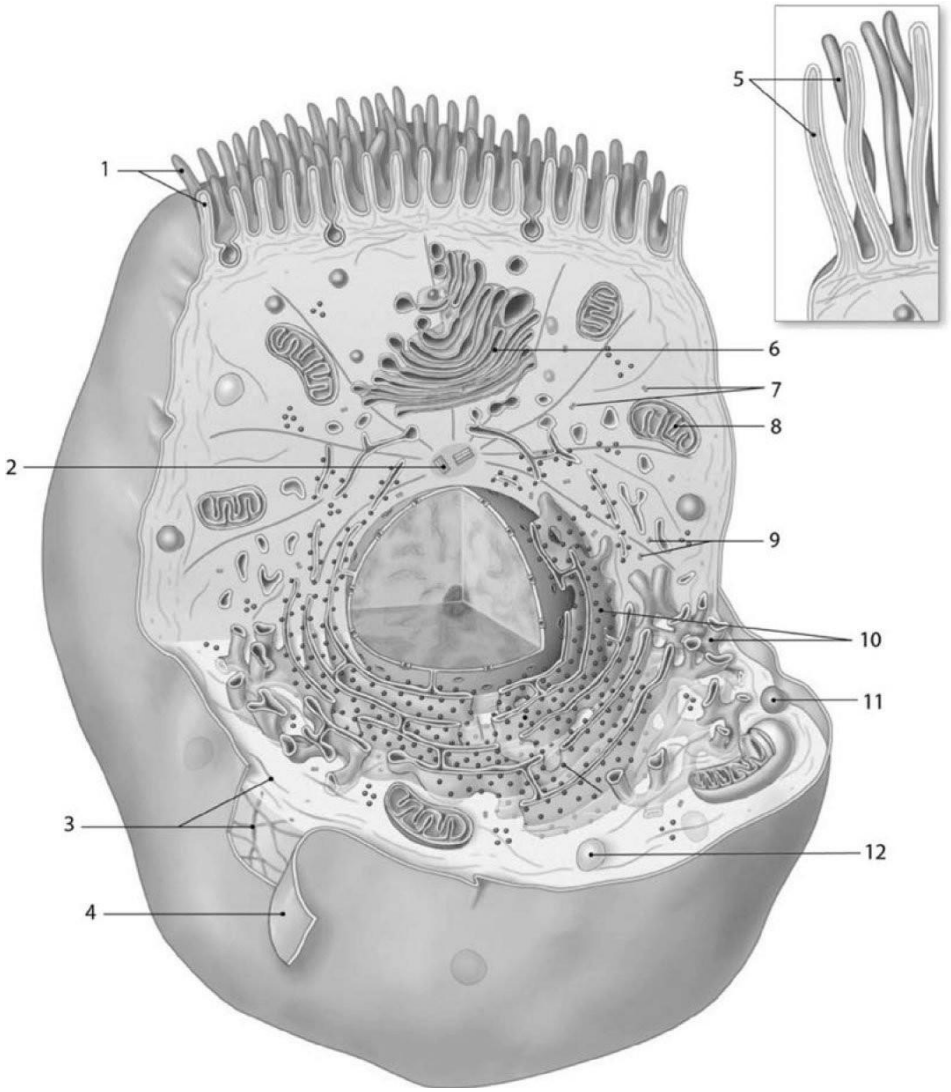

Figure 3-3 Anatomy of a Model Cell

Use Figure 3-3 to answer the following questions:

45) Which of the following labeled structures is essential for movement of the chromosomes during cell division?
A) 5
B) 3
C) 2
D) 6
E) 1
Answer: C
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

46) Structure #1 represents the
A) ribosomes.
B) microvilli.
C) cilia.
D) Golgi apparatus.
E) cytoskeleton.
Answer: C
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

47) Which of the labeled cellular structures are involved in metabolic activity that produces energy for the cell?
A) 10
B) 6
C) 5
D) 11
E) 8
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

48) Which of the following functions in the synthesis of secretory products, as well as intracellular storage and transport?
A) 9
B) 10
C) 4
D) 11
E) 6
Answer: B
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

49) What is the function of the structure labeled #12?
A) intracellular removal of damaged organelles or pathogens
B) breakdown and recycling of damaged or abnormal intracellular proteins
C) protein synthesis
D) movement of material over cell surface
E) catabolism of fats and other organic compounds
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

50) Which of the following is an example of membranous organelles?
A) lysosomes
B) cilia
C) centrioles
D) ribosomes
E) cytoskeleton
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

51) The primary components of the cytoskeleton are
A) microfilaments.
B) microtubules.
C) intermediate filaments.
D) phospholipids.
E) actin molecules.
Answer: B
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

52) There are chemicals that bind to microfilaments and block the elongation of actin in a cell. This would damage
A) cell metabolism.
B) protein synthesis.
C) DNA replication.
D) muscle contraction.
E) ATP production.
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

53) The folds of the internal membrane within mitochondria are called
A) cristae.
B) cytosol.
C) cisternae.
D) matrix.
E) histones.
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

54) Protein production is a function of the
A) microtubules.
B) mitochondria.
C) rough ER.
D) ribosomes.
E) Golgi apparatus.
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

55) Which of the following consists of a set of flattened membranous disks?
A) rough ER
B) smooth ER
C) mitochondria
D) nucleoli
E) Golgi apparatus
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

56) The peroxisome
A) produces proteins.
B) is responsible for the formation of microtubules.
C) functions in macromolecular biosynthesis.
D) breaks down fatty acids and other organic compounds.
E) is responsible for cellular transport through the Golgi apparatus.
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

57) Paired structures made of microtubules that are perpendicular to each other are called the
A) chromosomes.
B) ligand receptors.
C) centromeres.
D) nucleoli.
E) centrioles.
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

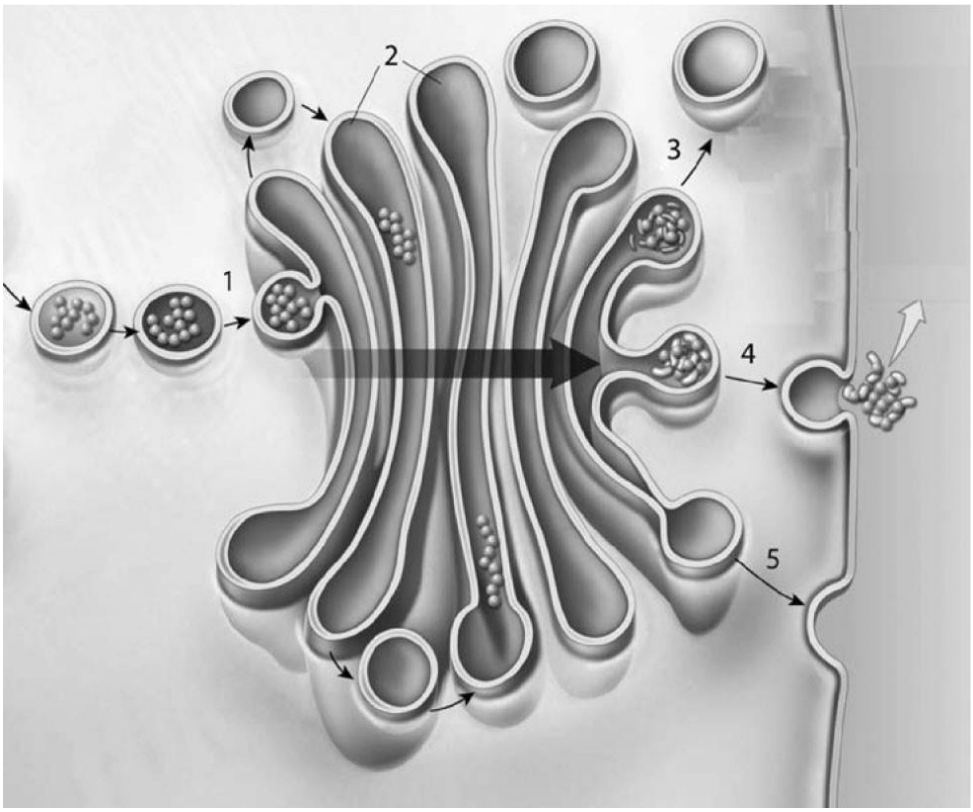

Figure 3-4 Protein Synthesis

Use Figure 3-4 to answer the following questions:

58) Identify the organelle shown in the figure, which is described as stacks of flattened membranes containing chambers.
A) flagellum
B) RER
C) mitochondrion
D) Golgi apparatus
E) SER
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

59) The cell seen in the preceding diagram could be
A) undergoing cell respiration.
B) replicating its DNA.
C) phagocytosing cell debris.
D) modifying and releasing a cellular protein.
E) performing active transport.
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Analyzing

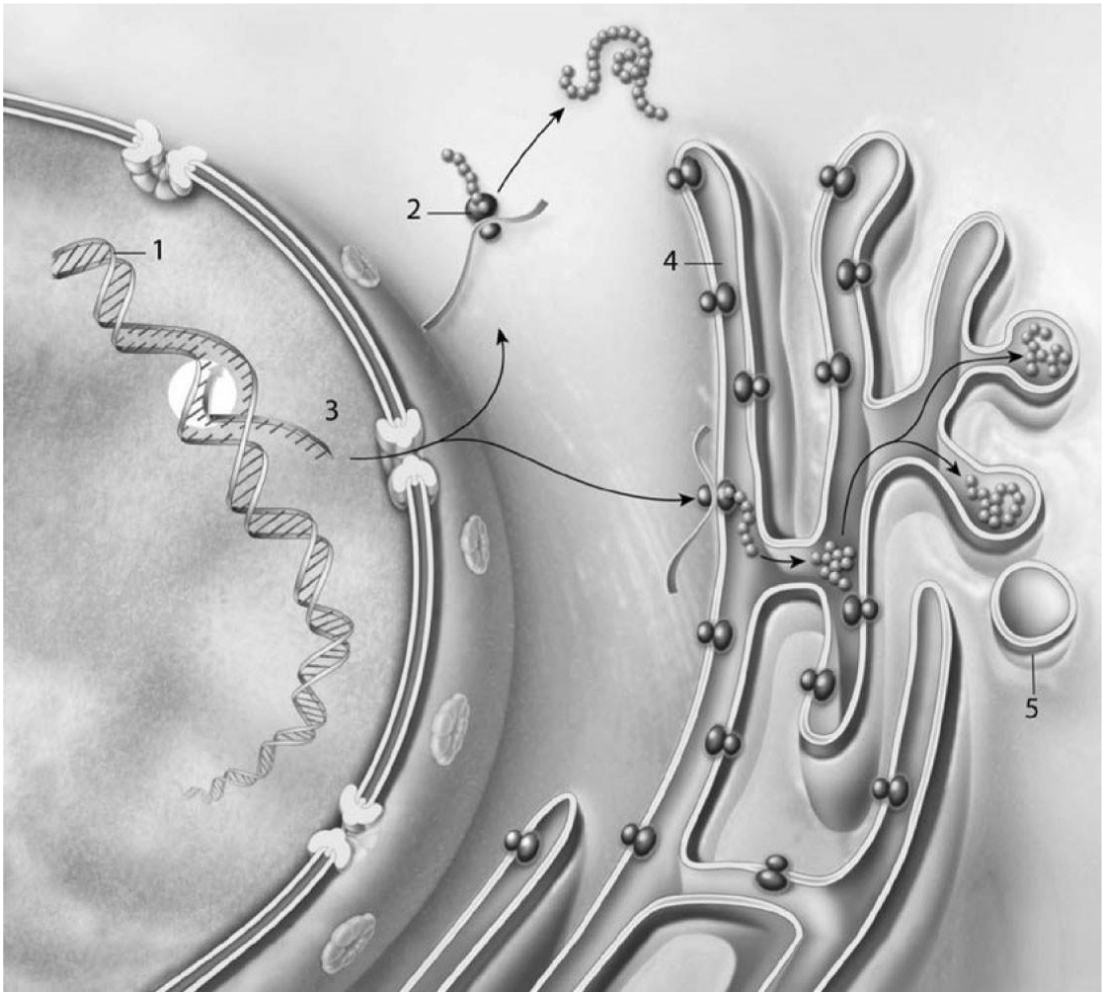

Figure 3-5 Protein Synthesis

Use Figure 3-5 to answer the following question:

60) Structure #4 is where the protein
A) folds into its 3D shape and is possibly modified.
B) is converted into mRNA.
C) is released out of the cell.
D) combined with DNA to form nucleoproteins.
E) is endocytosed.
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

61) The single structure that allows locomotion in some cells is the
A) histone.
B) cilium.
C) microfilament.
D) flagellum.
E) intermediate filament.
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

62) Which structure leaves the nucleus during transcription of protein synthesis?
A) DNA
B) transport vesicle
C) centrioles
D) fixed ribosome
E) mRNA
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Remembering

63) Synthesis of phospholipids is a function of the
A) ribosomes.
B) Golgi apparatus.
C) lysosomes.
D) mitochondria.
E) smooth endoplasmic reticulum.
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

64) Membrane renewal vesicles are formed by
A) the endoplasmic reticulum.
B) the Golgi apparatus.
C) lysosomes.
D) mitochondria.
E) nucleoli.
Answer: C
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

65) Synthesis of **most** ATP takes place in the
A) ribosomes.
B) rough ER.
C) smooth ER.
D) Golgi apparatus.
E) mitochondria.
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

66) When activated, lysosomes may function in
A) the formation of new cell membranes.
B) the synthesis of proteins.
C) autolysis.
D) the synthesis of lipids.
E) cell division.
Answer: C
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

67) Cilia 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 required to move fluids or secretions along the cell surface.
E) only on cells lining the reproductive tract.
Answer: D
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

68) Microtubules
A) are usually composed of myosin.
B) are hollow, filamentous structures.
C) attach the plasma membrane to the underlying cytoplasm.
D) interact with filaments composed of tubulin to produce muscle contractions.
E) are found on the ribosomes.
Answer: B
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

69) The cellular organelle responsible for removing and recycling damaged or denatured proteins is called the
A) mitochondrion.
B) nucleus.
C) nucleolus.
D) Golgi apparatus.
E) proteasome.
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

70) Peroxisomes are **most closely** related to
A) mitochondria.
B) nuclei.
C) nucleoli.
D) Golgi apparati.
E) lysosomes.
Answer: E
Learning Outcome: 3-5
Bloom's Taxonomy: Analyzing

71) Which of the following contains an unusual double membrane?
A) mitochondrion
B) nucleolus
C) Golgi apparatus
D) peroxisome
E) lysosome
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

72) If a cell lacked centrioles, it probably would **not** be able to
A) move.
B) produce DNA.
C) divide.
D) synthesize proteins.
E) metabolize sugars.
Answer: C
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

73) When a protein is synthesized on fixed ribosomes, it is threaded into the lumen of which structure(s)?
A) endoplasmic reticulum
B) the Golgi apparatus
C) nucleoli
D) transport vesicles
E) secretory vesicles
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Understanding

74) The job of a sperm cell, or spermatozoan, is to get to the egg as soon as possible and fertilize it. Sperm cells would be expected to have a lot of
A) mitochondria.
B) centrioles.
C) smooth endoplasmic reticula.
D) rough endoplasmic reticula.
E) peroxisomes.
Answer: A
Learning Outcome: 3-5
Bloom's Taxonomy: Applying

75) Examination of a sample of cells reveals large numbers of mitochondria compared to most other cells. Which of the following is a likely reason for this?
A) The cells produce digestive enzymes.
B) The cells produce steroid hormones.
C) The cells have very high energy requirements.
D) The cells synthesize transport proteins.
E) The cells make antibodies.
Answer: C
Learning Outcome: 3-5
Bloom's Taxonomy: Analyzing

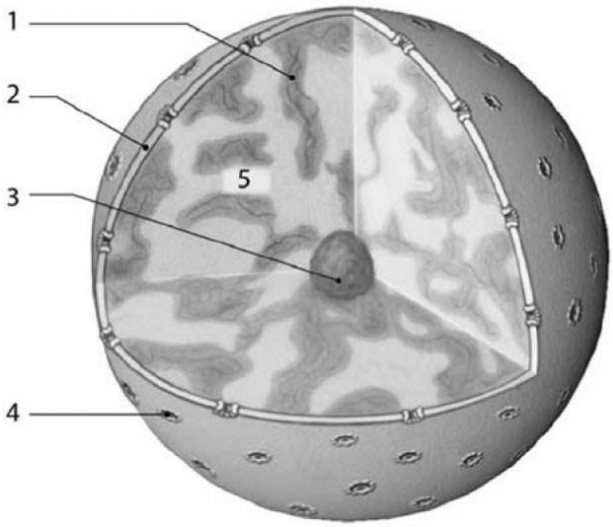

Figure 3-6 Nucleus

Use Figure 3-6 to answer the following question:

76) Identify the component of the nucleus in which rRNA synthesis and the assembly of ribosomal subunits occur.
A) 4
B) 3
C) 1
D) 5
E) 2
Answer: B
Learning Outcome: 3-6
Bloom's Taxonomy: Understanding

77) The cell's ribosomal RNA (rRNA) is produced by the
A) ribosomes.
B) nucleoli.
C) lysosomes.
D) smooth endoplasmic reticulum.
E) Golgi apparatus.
Answer: B
Learning Outcome: 3-6
Bloom's Taxonomy: Remembering

78) The nucleus is surrounded by a double membrane called the
A) nucleolus.
B) plasma membrane.
C) nuclear pore.
D) cell wall.
E) nuclear envelope.
Answer: E
Learning Outcome: 3-6
Bloom's Taxonomy: Remembering

79) The coils of nucleosomes found in non-dividing cells are called
A) nucleoplasms.
B) chromatin.
C) histones.
D) ribosomes.
E) nucleoli.
Answer: B
Learning Outcome: 3-6
Bloom's Taxonomy: Understanding

80) Loosely coiled nucleosomes are known as
A) lysosomes.
B) nucleoli.
C) chromatin.
D) the nuclear envelope.
E) histones.
Answer: C
Learning Outcome: 3-6
Bloom's Taxonomy: Understanding

81) The nucleus ultimately controls the synthesis of which of the following molecules?
A) carbohydrates
B) lipids
C) phospholipids
D) proteins
E) nu cholesterols
Answer: D
Learning Outcome: 3-6
Bloom's Taxonomy: Understanding

82) DNA contains the nucleotide thymine, but RNA uniquely contains _____, which is complementary to adenine.
A) uracil
B) guanine
C) thymidine
D) cytosine
E) adenine
Answer: A
Learning Outcome: 3-6
Bloom's Taxonomy: Understanding

83) One function of the nucleolus is to assemble
A) microtubules.
B) ribosomal subunits.
C) DNA.
D) lysosomes.
E) histones.
Answer: B
Learning Outcome: 3-6
Bloom's Taxonomy: Understanding

84) In cells that are not dividing, chromosomes form a loose network of fibers known as
A) centrioles.
B) chromatin.
C) centromeres.
D) nucleoli.
E) intermediate filaments.
Answer: B
Learning Outcome: 3-6
Bloom's Taxonomy: Understanding

85) Three nitrogenous base sequences on mRNA, which are complementary to gene triplets, are called
A) chromosomes.
B) amino acids.
C) codons.
D) anticodons.
E) histones.
Answer: C
Learning Outcome: 3-7
Bloom's Taxonomy: Remembering

86) The process of synthesizing a protein from mRNA instructions is called
A) replication.
B) transcription.
C) translation.
D) ribolation.
E) protein synthesis.
Answer: C
Learning Outcome: 3-7
Bloom's Taxonomy: Remembering

87) The process of synthesizing an mRNA chain through the use of a DNA molecule is called
A) transcription.
B) replication.
C) RNA matching.
D) differentiation.
E) translation.
Answer: A
Learning Outcome: 3-7
Bloom's Taxonomy: Remembering

88) Which molecule carries an amino acid to the site of protein synthesis during translation?
A) tRNA
B) rRNA
C) mRNA
D) snRNA
E) microRNA
Answer: A
Learning Outcome: 3-7
Bloom's Taxonomy: Remembering

89) The type of RNA that holds an initial copy of the genetic information is the
A) mRNA.
B) tRNA.
C) dRNA.
D) rRNA.
E) microRNA.
Answer: A
Learning Outcome: 3-7
Bloom's Taxonomy: Remembering

90) Anticodons are found on which molecule?
A) DNA
B) mRNA
C) ribosomal RNA
D) tRNA
E) rough ER
Answer: D
Learning Outcome: 3-7
Bloom's Taxonomy: Remembering

91) Transcription occurs in the
A) mitochondrion.
B) cytoplasm.
C) vesicles.
D) Golgi body.
E) nucleus.
Answer: E
Learning Outcome: 3-7
Bloom's Taxonomy: Understanding

92) The mRNA sequence that is complementary to the sequence UAG on a tRNA is
A) ATC.
B) TUC.
C) UAG.
D) AUC.
E) ACU.
Answer: D
Learning Outcome: 3-7
Bloom's Taxonomy: Understanding

93) Translation takes place on the
A) histone.
B) nucleolus.
C) ribosome.
D) DNA.
E) nuclear pore.
Answer: C
Learning Outcome: 3-7
Bloom's Taxonomy: Understanding

94) Which enzyme is required for the synthesis of mRNA?
A) RNA polymerase
B) helicase
C) transcriptase
D) DNA polymerase
E) RNA nucleotide
Answer: A
Learning Outcome: 3-7
Bloom's Taxonomy: Understanding

95) Amino acids are carried to the ribosomes to be incorporated into polypeptide chains by which molecule?
A) snRNA
B) DNA
C) rRNA
D) tRNA
E) mRNA
Answer: D
Learning Outcome: 3-7
Bloom's Taxonomy: Understanding

96) During transcription, a sequence of three nitrogenous bases along the new mRNA strand represents a(n) _____ that is complementary to the corresponding triplet along the gene.
A) triplet
B) tRNA
C) anticodon
D) antitriplet
E) codon
Answer: E
Learning Outcome: 3-7
Bloom's Taxonomy: Understanding

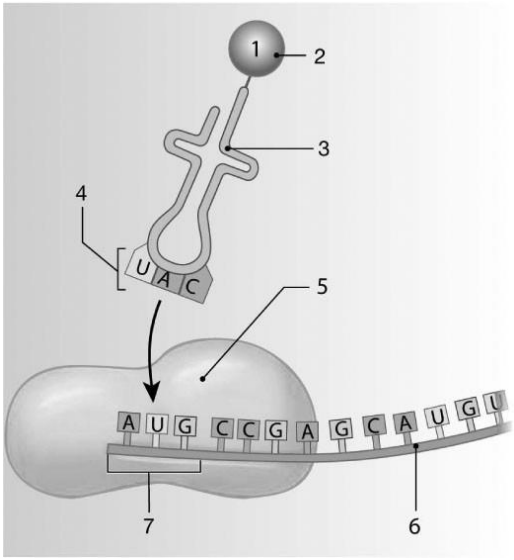

Figure 3-7 Translation

Use Figure 3-7 to answer the following questions:

97) Identify the anticodon in the image.
A) 4
B) 7
C) 5
D) 2
E) 6
Answer: A
Learning Outcome: 3-7
Bloom's Taxonomy: Remembering

98) Determine the identity of the structure labeled #7. The structure contains the specific base sequence AUG, which codes for
A) cysteine.
B) alanine.
C) methionine.
D) phenylalanine.
E) valine.
Answer: C
Learning Outcome: 3-7
Bloom's Taxonomy: Understanding

99) The tRNA anticodon for the DNA triplet TCA would be
A) UCA.
B) UGT.
C) AGT.
D) AGU.
E) TCA.
Answer: A
Learning Outcome: 3-7
Bloom's Taxonomy: Understanding

100) The commonly prescribed antibiotic Clindamycin blocks the peptide bond formation between amino acids during protein synthesis. This would happen during
A) transformation.
B) translation.
C) transcription.
D) replication.
E) mitosis.
Answer: B
Learning Outcome: 3-7
Bloom's Taxonomy: Analyzing

101) The DNA triplet is the same sequence as the _____, except that U replaces T.
A) chromatin
B) histone
C) codon
D) gene
E) anticodon
Answer: E
Learning Outcome: 3-7
Bloom's Taxonomy: Understanding

102) Mutations are permanent alterations in which of the following?
A) tRNA
B) DNA
C) mRNA
D) snRNA
E) ribosomes
Answer: B
Learning Outcome: 3-8
Bloom's Taxonomy: Remembering

103) Which process occurs during telophase?
A) coiling up and condensing of the chromatin
B) replication of the chromosomes
C) alignment of the chromosomes along the center of the cell
D) the pulling apart of the chromatids
E) the division of the cell cytoplasm
Answer: E
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

104) The cytoplasmic division that forms two daughter cells is called
A) synthesis.
B) cytokinesis.
C) growth.
D) meiosis.
E) mitosis.
Answer: B
Learning Outcome: 3-8
Bloom's Taxonomy: Remembering

105) The stage in a cell's life cycle in which the DNA of the chromosomes gradually uncoils and nucleoli reappear, is called
A) prophase.
B) interphase.
C) metaphase.
D) telophase.
E) anaphase.
Answer: D
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

106) During the process of mitosis, chromatids separate during
A) prophase.
B) metaphase.
C) interphase.
D) telophase.
E) anaphase.
Answer: E
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

107) Identify the phase of cell division in which the nuclear envelope disappears and the chromatids become attached to the spindle fibers.
A) anaphase
B) prophase
C) interphase
D) telophase
E) metaphase
Answer: B
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

108) During which phase of cell division do the chromatids line up along the equator of the cell?
A) anaphase
B) prophase
C) interphase
D) telophase
E) metaphase
Answer: E
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

109) The stage of the cell cycle during which DNA replication and synthesis of histones occur is called
A) telophase.
B) anaphase.
C) interphase.
D) metaphase.
E) prophase.
Answer: C
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

110) Identify the phase of mitosis, which ends when daughter chromosomes move to the centrioles at opposite poles of the cell.
A) prophase
B) metaphase
C) anaphase
D) telophase
E) interphase
Answer: C
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

111) **Before** a cell can divide by mitosis, which of the following must occur?
A) division of cytoplasm
B) synthesis of a new cell membrane
C) replication of the DNA
D) protein synthesis
E) sugar metabolism
Answer: C
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

112) During which process do DNA strands unwind and DNA polymerase begin attaching complementary DNA nucleotides along each strand?
A) replication
B) mitosis
C) transcription
D) mutation
E) translation
Answer: A
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

113) Shortly following DNA replication is a brief
A) G_3 phase.
B) anaphase.
C) G_2 phase.
D) synthesis phase.
E) G_1 phase.
Answer: C
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

114) As a result of cell damage, or in the event that a cell converts into a cancer cell, the immune system may set a chain of events in motion that cause the cell to kill itself. This is called
A) immolation.
B) peptidation.
C) cytokinesis.
D) exocytosis.
E) apoptosis.
Answer: E
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

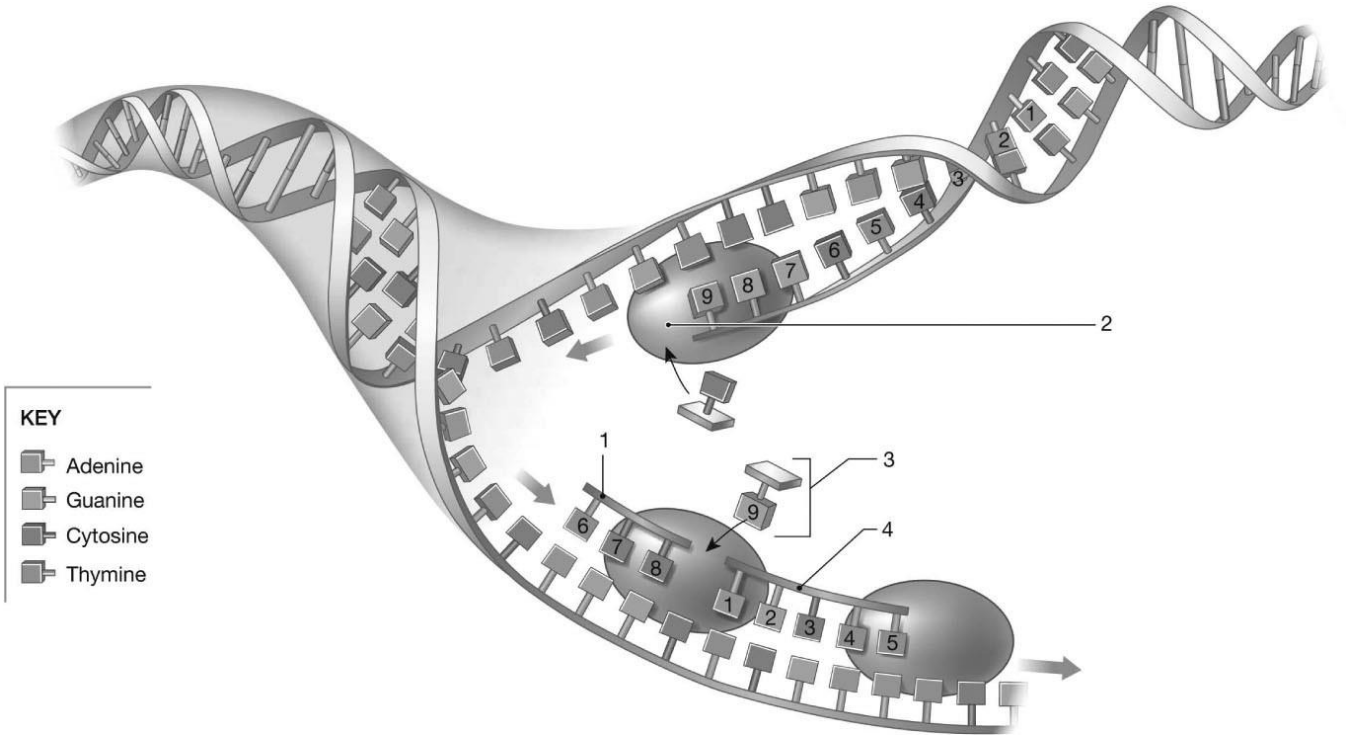

Figure 3-8 A Process

Use Figure 3-8 to answer the following questions:

115) Identify the process featured in the image.
A) translation
B) replication
C) transcription
D) mitosis
E) meiosis
Answer: B
Learning Outcome: 3-8
Bloom's Taxonomy: Understanding

116) Due to exposure to a chemical, a compound other than the correct structure #3 has been inserted into the DNA strand during replication. This could result in
A) blocking mitotic division of the cells.
B) changing the protein coded for by the DNA segment.
C) inhibiting the cells from performing cell respiration.
D) preventing the cell from making ATP.
E) making the enzyme DNA polymerase.
Answer: B
Learning Outcome: 3-8
Bloom's Taxonomy: Analyzing

117) The chemical cochicine, from a flowering plant, blocks the building of tubulin proteins into microtubules. This would cause cell damage by
A) reducing the production of ATP that the cell can make.
B) blocking cell division.
C) reducing cell transport.
D) inhibiting DNA replication.
E) inhibiting lipid production.
Answer: B
Learning Outcome: 3-8
Bloom's Taxonomy: Analyzing

118) A "benign tumor" refers to
A) any of various malignant neoplasms.
B) neoplasms that have the tendency to metastasize to new sites.
C) an illness characterized by malignant cells.
D) abnormal cells remaining in one place.
E) nonviable cells and/or tissue.
Answer: D
Learning Outcome: 3-9
Bloom's Taxonomy: Remembering

119) In a malignant tumor, which of the following is **true**?
A) Life-threatening issues seldom occur.
B) Cells remain within the epithelium.
C) Cells remain within the connective tissue capsule.
D) Cells do not respond to normal control mechanisms.
E) Invasion is often easy to control.
Answer: D
Learning Outcome: 3-9
Bloom's Taxonomy: Analyzing

120) Which statement is **true** about cancer and cancer cells?
A) Cancer cells use more oxygen and nutrients than normal cells.
B) Normal cells do not become cancer cells.
C) Benign cancers do not kill the host.
D) Malignant cancer cells directly kill normal cells by producing toxins.
E) Cancer cells undergo mitosis at a slower rate than normal cells.
Answer: A
Learning Outcome: 3-9
Bloom's Taxonomy: Applying

121) When genes are switched off to allow a cell to restrict or specialize its functions, the process is called
A) adaptation.
B) differentiation.
C) structural integration.
D) destabilization.
E) cellular activation.
Answer: B
Learning Outcome: 3-10
Bloom's Taxonomy: Remembering

122) The process by which cells become specialized is called
A) differentiation.
B) mutation.
C) growth.
D) synthesis.
E) mitosis.
Answer: A
Learning Outcome: 3-10
Bloom's Taxonomy: Remembering

123) Which statement is **true** about cells?
A) Different types of cells that perform different functions in the body contain different genes.
B) Differentiation increases the different functions that a cell can perform.
C) All of a cell's genes are always available for transcription.
D) As genes are turned off within a cell, that cell and its daughter cells become more specialized.
E) The proteins that can be produced by a cell are determined at fertilization and do not change over time.
Answer: D
Learning Outcome: 3-10
Bloom's Taxonomy: Analyzing

3.2 Essay Questions

1) What is the benefit of having some of the cellular organelles enclosed by a membrane similar to the 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, the concentration of enzymes necessary for energy production is in the mitochondrion.
Learning Outcome: 3-2
Bloom's Taxonomy: Analyzing

2) When a person receives intravenous fluids to help build up blood volume, why could it be detrimental to administer a hypotonic solution?
Answer: Intravenous fluids must be isotonic to prevent the cells from losing or gaining water. The introduction of hypotonic fluid would cause the cells to swell and possibly rupture, possibly causing massive hemolysis.
Learning Outcome: 3-3
Bloom's Taxonomy: Applying

3) Briefly explain the process of active transport as it relates to the sodium-potassium pump.
Answer: Active transport requires cellular energy, usually in the form of ATP. With the sodium-potassium pump, sodium is pumped out of the cell and potassium is pumped into the cell. Both ions are moving against their concentration gradient. In order to move the ions to oppose diffusion, ATP energy is utilized.
Learning Outcome: 3-4
Bloom's Taxonomy: Understanding