

Human Anatomy, 7e (Marieb/Mitchell/Smith)
Chapter 2 The Living Units

2.1 Multiple Choice Questions

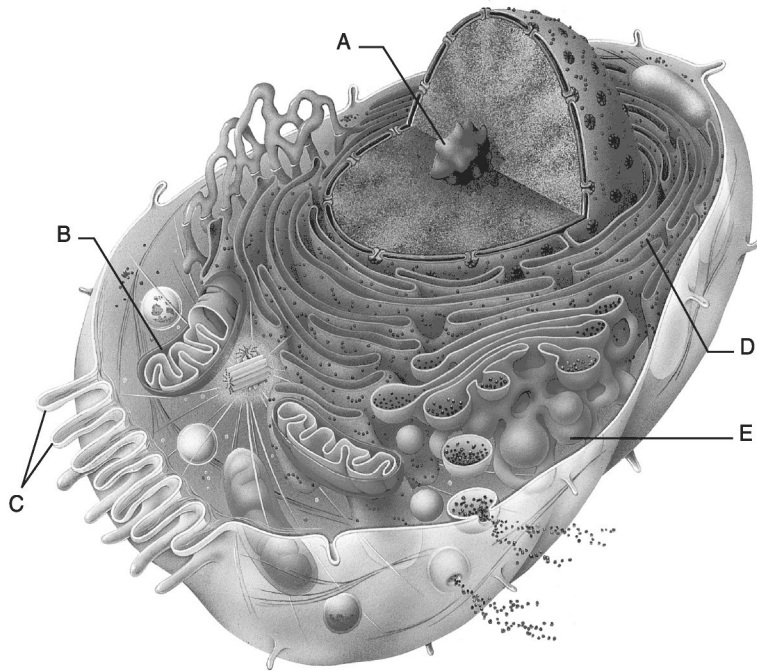


Figure 2.1

Use the diagram above to answer the following questions.

1) Which letter indicates the rough endoplasmic reticulum?

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

Answer: D

Diff: 2 Page Ref: 23

2) Which letter indicates the nucleolus?

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

Answer: A

Diff: 2 Page Ref: 23

3) Which letter indicates the microvilli?

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

Answer: C

Diff: 2 Page Ref: 23

4) Which letter indicates the mitochondrion?

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

Answer: B

Diff: 2 Page Ref: 23

5) Which letter indicates the Golgi apparatus?

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

Answer: E

Diff: 2 Page Ref: 23

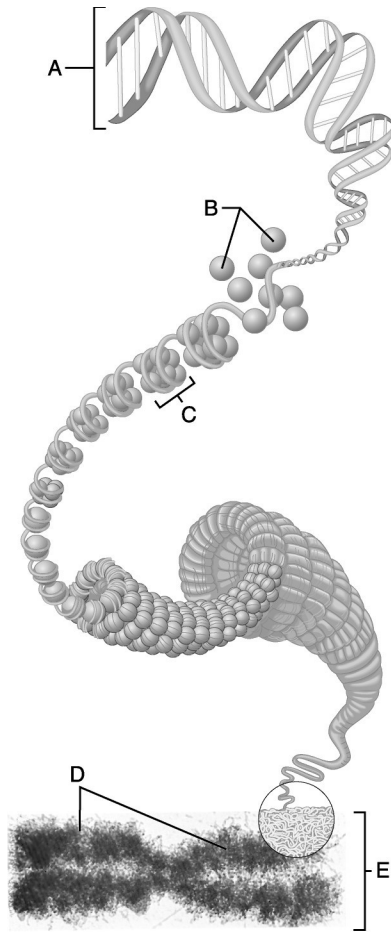


Figure 2.2

Use the diagram above to answer the following questions.

6) Which letter indicates the DNA molecule?

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

Answer: A

Diff: 2 Page Ref: 36

7) Which letter indicates the chromatid?

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

Answer: D

Diff: 2 Page Ref: 36

8) Which letter indicates a nucleosome?

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

Answer: C

Diff: 2 Page Ref: 36

9) Which letter indicates histones?

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

Answer: B

Diff: 2 Page Ref: 36

10) Which letter indicates the metaphase chromosome?

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

Answer: E

Diff: 2 Page Ref: 36

11) This organelle is involved in production of cellular energy.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: D

Diff: 1 Page Ref: 32

12) This organelle is characterized by folded membranes called cristae.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: D

Diff: 2 Page Ref: 32

13) When a phagocytic white blood cell ingests a foreign bacterial cell, the vesicle fuses with this organelle.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: B

Diff: 3 Page Ref: 31

14) This membranous organelle is the site of protein synthesis for proteins that are secreted by the cell.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: C

Diff: 2 Page Ref: 29-30

15) This organelle detoxifies a number of toxic substances.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: E

Diff: 2 Page Ref: 32

16) Cisternae of this organelle are continuous with the nuclear envelope.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: C

Diff: 3 Page Ref: 29-30

17) This organelle has both a cis and a trans face.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: A

Diff: 3 Page Ref: 30

18) This membranous organelle contains oxidase and catalase enzymes.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: E

Diff: 3 Page Ref: 32

19) These organelles are often called the "demolition crew" of the cell.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: B

Diff: 2 Page Ref: 31

20) This organelle primarily modifies products from the rough ER, and it resembles a stack of hollow saucers, one cupped inside the next.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: A

Diff: 2 Page Ref: 30

21) This organelle is primarily a sac of powerful digestive enzymes called acid hydrolases.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: B

Diff: 2 Page Ref: 31

22) This organelle is defective in the inherited disorder Tay-Sachs disease.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: B

Diff: 2 Page Ref: 31

23) This organelle is numerous in liver and kidney cells.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: E

Diff: 2 Page Ref: 32

24) This organelle produces ATP molecules.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: D

Diff: 2 Page Ref: 32

25) This organelle contains a single DNA molecule and is capable of self-replication.

- A) Golgi apparatus
- B) lysosome
- C) rough endoplasmic reticulum
- D) mitochondria
- E) peroxisome

Answer: D

Diff: 2 Page Ref: 32

26) Mitosis refers only to nuclear division. Separation of the entire cell following mitosis is

- A) meiosis.
- B) karyokinesis.
- C) cytokinesis.
- D) telophase.

Answer: C

Diff: 2 Page Ref: 40

27) Phospholipids of the plasma membrane are arranged

- A) around a central layer of cholesterol.
- B) in a single layer with polar heads facing outwards.
- C) as a bilayer with their nonpolar tails sandwiched between the polar heads.
- D) as a bilayer with their polar heads sandwiched between the nonpolar tails.

Answer: C

Diff: 2 Page Ref: 26

28) Which of the following cytoskeleton elements are the largest in diameter?

- A) microtubules
- B) microfilaments
- C) intermediate filaments
- D) centrioles

Answer: A

Diff: 2 Page Ref: 32-33

29) Which of the following statements about integral proteins in the plasma membrane is *false*?

- A) Most extend all the way through the membrane.
- B) Some attach to the glycocalyx.
- C) They determine which molecules are transported through the membrane.
- D) They are more abundant by volume than the membrane phospholipids.

Answer: D

Diff: 2 Page Ref: 26

30) Which type of endocytosis ingests the most specific type of molecule?

- A) fluid-phase endocytosis
- B) phagocytosis
- C) pinocytosis
- D) receptor-mediated endocytosis

Answer: D

Diff: 2 Page Ref: 27

31) Hormones are secreted by

- A) phagocytosis.
- B) pinocytosis.
- C) exocytosis.
- D) osmosis.

Answer: C

Diff: 2 Page Ref: 28

32) Of the following, the only organelle that has a double membrane structure is the

- A) centriole.
- B) Golgi apparatus.
- C) endoplasmic reticulum.
- D) mitochondrion.

Answer: D

Diff: 2 Page Ref: 32

33) Functions of the Golgi apparatus include all of the following *except*

- A) synthesis of lysosomes.
- B) DNA replication.
- C) plasma membrane formation.
- D) production of secretory granules.

Answer: B

Diff: 3 Page Ref: 30

34) Which of the following statements about the rough endoplasmic reticulum is *false*?

- A) It consists of stacked envelopes called cisternae.
- B) It makes the digestive enzymes contained in the lysosomes.
- C) It stores lipids as inclusions.
- D) It makes the integral proteins of the cell membrane.

Answer: C

Diff: 2 Page Ref: 29-30

35) Which of the following is *not* a cytoskeleton element?

- A) microtubule
- B) microfilament
- C) intermediate filament
- D) centriole

Answer: D

Diff: 1 Page Ref: 32-33

36) Which type of proteins are required for exocytosis?

- A) caveolin
- B) coatamer proteins
- C) clathrin
- D) SNARE proteins

Answer: D

Diff: 3 Page Ref: 28

37) In chromatin, the DNA molecule wraps around proteins called

- A) nucleotides.
- B) codons.
- C) integral protein.
- D) histones.

Answer: D

Diff: 1 Page Ref: 36

38) In the cell life cycle, DNA is replicated during

- A) interphase G₁.
- B) interphase S.
- C) prophase I.
- D) prophase II.

Answer: B

Diff: 2 Page Ref: 37

39) The longest arrays of microtubules that assemble from each centrosome during prophase form filaments called

- A) mitotic spindle fibers.
- B) kinetochores.
- C) asters.
- D) the nuclear envelope.

Answer: A

Diff: 3 Page Ref: 38-39

40) During anaphase, motor proteins attached to mitotic spindle fibers serve to

- A) pull the chromosomes to opposite poles of the cell.
- B) pull together the replicated chromosomal strands.
- C) re-form the nuclear envelope.
- D) form the aster.

Answer: A

Diff: 2 Page Ref: 38-39

41) The _____ face of the Golgi apparatus is _____ to receive spherical vesicles from the rough endoplasmic reticulum.

- A) cis; convex
- B) trans; concave
- C) cis; flattened
- D) trans; convex

Answer: A

Diff: 3 Page Ref: 30

42) Which membranous organelle stores calcium and is a primary site of lipid metabolism?

- A) Golgi apparatus
- B) smooth endoplasmic reticulum
- C) mitochondrion
- D) peroxisome

Answer: B

Diff: 3 Page Ref: 30

43) Which organelle is important in neutralizing free radicals?

- A) Golgi apparatus
- B) lysosome
- C) mitochondrion
- D) peroxisome

Answer: D

Diff: 2 Page Ref: 32

44) Which of the following statements accurately describes the function of the nuclear envelope?

- A) separation of nucleoplasm and cytoplasm
- B) regulation of passage of substances into and out of the cell membrane
- C) transcription of DNA
- D) protein synthesis

Answer: A

Diff: 3 Page Ref: 34

45) Peroxisomes function to

- A) synthesize and degrade hydrogen peroxide.
- B) store cellular free radicals.
- C) produce pigments.
- D) regulate membrane permeability.

Answer: A

Diff: 2 Page Ref: 32

46) Dyneins and kinesins are motor proteins that _____.

- A) enable a cell to send out and retract extensions called pseudopods.
- B) move organelles along microtubules through the cytoplasm.
- C) are molecular components of telomeres
- D) resist pulling forces that are placed on cells.

Answer: B

Diff: 3 Page Ref: 33

47) Cell division is analogous to

- A) two buildings duplicating their parts and fusing.
- B) a building duplicating its blueprint and then forming a new building by splitting in two.
- C) a building forming another building by random accumulation of materials.
- D) a building forming another building through a loss of some of its parts.

Answer: B

Diff: 2 Page Ref: 36

48) The plasma membrane is important for all the following reasons *except*

- A) it determines what substances enter and exit the cell.
- B) it separates the ECF from the ICF.
- C) it acts as a site for cell-to-cell interaction and recognition.
- D) it is an important site for DNA transcription.

Answer: D

Diff: 3 Page Ref: 24-27

49) The plasma membrane is composed of all of the following *except*

- A) glycoproteins.
- B) tubulin protein.
- C) cholesterol.
- D) phospholipids.

Answer: B

Diff: 2 Page Ref: 26

- 50) Materials that are to be exocytosed by cells are enclosed in vesicles synthesized by the
- A) nucleosome.
 - B) ribosome.
 - C) Golgi apparatus.
 - D) mitochondrion.

Answer: C

Diff: 2 Page Ref: 30

- 51) Which of the following does *not* pass through nuclear pores?

- A) chromatin
- B) messenger RNA
- C) proteins
- D) ribosomal RNA

Answer: A

Diff: 2 Page Ref: 34

- 52) Which of the following is associated with protein synthesis?

- A) mitochondria
- B) ribosomes
- C) chloroplasts
- D) smooth endoplasmic reticulum

Answer: B

Diff: 2 Page Ref: 29

- 53) Ribosomes may be either free within the cytoplasm or bound to a membrane system known as the

- A) Golgi apparatus.
- B) microtubule organizing center.
- C) cytoskeleton.
- D) rough endoplasmic reticulum.

Answer: D

Diff: 2 Page Ref: 29

- 54) Which is *not* part of interphase?

- A) G₁
- B) G₂
- C) M
- D) S

Answer: C

Diff: 1 Page Ref: 37

55) Embedded in the plasma membrane of cells, cholesterol molecules act to

- A) stabilize the membrane.
- B) make the membrane more resistant to freezing.
- C) destabilize the membrane, leading to heart attacks.
- D) participate in pinocytosis.

Answer: A

Diff: 2 Page Ref: 26

56) The endocytotic process in which small vesicles of fluid are brought into the cell is called

- A) phagocytosis.
- B) pinocytosis.
- C) exocytosis.
- D) xenocytosis.

Answer: B

Diff: 2 Page Ref: 27

57) The double membrane structure is unique to the

- A) lysosome.
- B) peroxisome.
- C) mitochondrion.
- D) nucleolus.

Answer: C

Diff: 2 Page Ref: 32

58) Peroxisomes

- A) are the toxic waste removal system of the cell.
- B) are involved in the production of ATP.
- C) contain some of the code necessary for their own duplication.
- D) synthesize proteins for use outside the cell.

Answer: A

Diff: 2 Page Ref: 32

59) The stiffest elements of the cytoskeleton, analogous to the bones of the human body, are

- A) microtubules.
- B) microfilaments.
- C) intermediate filaments.
- D) the cytosol.

Answer: A

Diff: 2 Page Ref: 32-33

60) The mitotic spindle forms from the

- A) nucleus.
- B) Golgi apparatus.
- C) centrosome matrix.
- D) nucleolus.

Answer: C

Diff: 2 Page Ref: 33

61) The nuclear envelope is continuous with the rough ER, but it differs from the rough ER in that it

- A) is not associated with ribosomes.
- B) has unique pores.
- C) consists of two membranes separated by a space.
- D) consists of tubes, like the smooth ER.

Answer: B

Diff: 3 Page Ref: 34

62) Membrane-bound organelles have the same type of membrane as the plasma membrane *except*

- A) for the absence of a glycocalyx.
- B) for the absence of cholesterol.
- C) the nonpolar tails face outward.
- D) they are all covered with ribosomes.

Answer: A

Diff: 3 Page Ref: 29

63) In the process of phagocytosis, the organelles whose enzymes break down ingested foreign cells are the

- A) nucleoli.
- B) smooth endoplasmic reticulum.
- C) peroxisomes.
- D) lysosomes.

Answer: D

Diff: 2 Page Ref: 27

64) During mitosis, the kinetochore microtubules of the mitotic spindle

- A) attach to chromatids and align them at the metaphase plate.
- B) push on the chromatids.
- C) anchor the centriole to the cell membrane.
- D) push the two poles of the cell apart.

Answer: A

Diff: 2 Page Ref: 38-39

65) The theory proposing that aging results from the effects of free radicals is primarily a theory of

- A) wear and tear.
- B) genetically programmed aging.
- C) progressive disorder of immunity.
- D) cross-linking of glucose.

Answer: A

Diff: 2 Page Ref: 41

66) The cytoskeletal elements that are analogous to the muscles of the body which generate pseudopodia and contractile forces in conjunction with myosin are

- A) microtubules.
- B) microfilaments.
- C) intermediate filaments.
- D) integral proteins.

Answer: B

Diff: 2 Page Ref: 32-33

67) Transcription of DNA requires the presence of

- A) centrosomes.
- B) extended chromatin.
- C) histones.
- D) nucleosomes.

Answer: B

Diff: 2 Page Ref: 36

68) The process of cellular aging may involve all of the following *except*

- A) accumulated damage by free radicals.
- B) decreased production of lysosomes.
- C) excessive metabolic rate.
- D) progressive shortening of telomeres.

Answer: B

Diff: 3 Page Ref: 41

69) During what phase of mitosis does the mitotic spindle break down and disappear?

- A) metaphase
- B) anaphase
- C) telophase
- D) late prophase

Answer: C

Diff: 2 Page Ref: 38-39

70) The cytoskeletal elements that form a ring to "squeeze" the two daughter cells apart during cytokinesis are

- A) microtubules.
- B) microfilaments.
- C) intermediate filaments.
- D) the microtrabecular lattice.

Answer: B

Diff: 2 Page Ref: 40

71) During what phase of the cell cycle is the DNA duplicated?

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

Answer: C

Diff: 2 Page Ref: 37

72) The plasma membrane is

- A) a single-layered membrane that surrounds the nucleus of the cell.
- B) a single-layered membrane enclosing the plasma.
- C) the membrane surrounding the cell.
- D) a membrane composed of tiny shelves or cristae.

Answer: C

Diff: 2 Page Ref: 24-27

73) The cell that gathers information and controls body functions is a

- A) macrophage.
- B) fat cell.
- C) sperm cell.
- D) neuron.

Answer: D

Diff: 2 Page Ref: 40-41

74) The temporary structures in the cytoplasm include all of the following *except*

- A) pigments.
- B) glycosomes.
- C) lipid droplets.
- D) the Golgi apparatus.

Answer: D

Diff: 2 Page Ref: 33

75) Which of the following is an inclusion, *not* an organelle?

- A) lysosome
- B) microtubule
- C) mitochondrion
- D) glycosome

Answer: D

Diff: 2 Page Ref: 33

2.2 True/False Questions

1) The smooth ER contains its own molecules of DNA.

Answer: FALSE

Diff: 3 Page Ref: 30

- 2) Hypercholesterolemia is an inherited disease in which the body's cells lack the protein receptors that bind to cholesterol-delivering LDLs.
Answer: TRUE
Diff: 3 Page Ref: 28
- 3) Ribosomes consist of two subunits, each surrounded by a membrane.
Answer: FALSE
Diff: 2 Page Ref: 29
- 4) Peroxisomes are important in detoxification of a number of toxic substances, for instance, hydrogen peroxide.
Answer: TRUE
Diff: 2 Page Ref: 32
- 5) The nucleolus serves as the cell's ribosome-producing machine.
Answer: TRUE
Diff: 2 Page Ref: 34-35
- 6) Microtubules are composed of actin.
Answer: FALSE
Diff: 2 Page Ref: 33
- 7) Chromatin is composed of DNA wound around proteins known as actin.
Answer: FALSE
Diff: 2 Page Ref: 36
- 8) An example of a type of cell with high rates of mitosis is a cell of the skin.
Answer: TRUE
Diff: 2 Page Ref: 37
- 9) During the S phase, cells are characterized by rapid growth.
Answer: FALSE
Diff: 2 Page Ref: 37
- 10) During the G₁ phase, DNA is replicated in the cytoplasm.
Answer: FALSE
Diff: 2 Page Ref: 37
- 11) Telomeres are structures that limit the maximum number of times cells can divide.
Answer: TRUE
Diff: 2 Page Ref: 41
- 12) Extended chromatin is tightly wound around histones.
Answer: FALSE
Diff: 2 Page Ref: 36

13) A mitotic spindle develops during early telophase of mitosis.

Answer: FALSE

Diff: 2 Page Ref: 38-39

14) During anaphase, the chromosomes are moved to the center of the cell.

Answer: FALSE

Diff: 2 Page Ref: 38-39

15) Cytokinesis is the physical division of the cytoplasm between the two newly formed cells that result from mitosis.

Answer: TRUE

Diff: 2 Page Ref: 40

2.3 Short Answer Questions

1) This phase is the physical division of the cytoplasm between the two newly formed cells that result from mitosis.

Answer: cytokinesis

Diff: 2 Page Ref: 40

2) What is the transport mechanism by which substances move from the cytoplasm to the outside of the cell?

Answer: exocytosis

Diff: 3 Page Ref: 28

3) Cell aging may be related to production of what charged molecules produced by the mitochondria?

Answer: radicals (free radicals)

Diff: 2 Page Ref: 41

4) Identify the two different types of membrane-associated molecules that comprise the glycocalyx.

Answer: glycolipids and glycoproteins

Diff: 2 Page Ref: 26

5) What would extended chromatin wrapped around a group of eight histones be called?

Answer: a nucleosome

Diff: 2 Page Ref: 36

6) This is the phase in which a cell grows and carries on all its usual metabolic activities.

Answer: G1 phase of interphase

Diff: 1 Page Ref: 37

7) These are the smallest living units in the body.

Answer: cells

Diff: 2 Page Ref: 22

8) This is the outermost continuous boundary of a human cell.

Answer: plasma membrane (plasmalemma)

Diff: 1 Page Ref: 24-27

9) This is the name for the currently held theory describing the plasma membrane structure.

Answer: fluid mosaic model

Diff: 2 Page Ref: 26

10) The phospholipid molecules of the plasma membrane are primarily composed of _____.

Answer: a non-polar tail comprised of 2 fatty acid chains attached to a polar head

Diff: 2 Page Ref: 26

11) This network of rods running throughout the cytosol acts as a cell's "bones," "muscles," and "ligaments."

Answer: cytoskeleton

Diff: 2 Page Ref: 32-33

12) This is the mechanism by which large particles and macromolecules enter a cell.

Answer: endocytosis

Diff: 2 Page Ref: 27

13) This is the diffusion of water molecules across a membrane.

Answer: osmosis

Diff: 3 Page Ref: 27

14) This is the type of protein involved in transport mechanisms across the plasma membrane.

Answer: integral proteins (transmembrane proteins)

Diff: 3 Page Ref: 26

15) This is an inherited disease that leads to an accumulation of undigested glycolipids especially in the lysosomes of neurons.

Answer: Tay-Sachs disease

Diff: 2 Page Ref: 31

2.4 Essay Questions

1) Differentiate phagocytosis from receptor-mediated endocytosis.

Answer: In phagocytosis, the cell extends pseudopods and engulfs the foreign protein/foreign cell, which is often degraded after the phagocytic vesicle fuses with a lysosome. In receptor-mediated endocytosis, specific membrane receptors bind specific extra-cellular molecules. Once bound, the membrane deforms inward, creating a vesicle with the receptors and molecules inside. The vesicle contents are released into the cytoplasm or fuse with a lysosome, with the receptors recycled back to the membrane.

Diff: 3 Page Ref: 27-28

2) Describe how cellular differentiation results in structural variation among cells in the human body.

Answer: Cellular differentiation is the result of highly regulated gene activation/inactivation in the developing embryo. The products of gene activation are proteins. As the embryo develops, certain cells will begin to produce proteins that neighboring cells do not produce. As development progresses, these unique protein "signatures" lead to differences in cellular function. For example, in muscle cells actin and myosin proteins predominate which results in their unique contractile properties.

Diff: 3 Page Ref: 40-41

3) Describe the two checkpoints that occur during interphase.

Answer: The G₁ checkpoint ensures that the cell has reached a maximum size and has replicated the necessary organelles and enzymes to synthesize DNA. The G₂ checkpoint checks to see whether replication errors or DNA damage has occurred during DNA synthesis.

Diff: 3 Page Ref: 37

4) Describe the mitochondria.

Answer: These are long, thin organelles, that have their own DNA molecule which allows for self-replication. They produce ATP molecules, which are the equivalent of cellular energy. They are bound by two membranes. The inner one is highly folded into cristae, where many of the critical molecules involved in ATP production are imbedded.

Diff: 2 Page Ref: 32

5) Describe the three major types of cytoskeletal elements.

Answer: Microtubules are the largest in diameter and are formed by the protein tubulin. They are stiff, but bendable. Microtubules are important in the trafficking of organelles within the cytoplasm. Microfilaments are the smallest in diameter. They are strands of the protein actin, are contractile proteins, which are typically very labile. Intermediate filaments are of intermediate diameter. They are very stable and permanent, functioning to resist shearing forces within and between adjacent cells.

Diff: 2 Page Ref: 32-33