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SKU: 9780134243818-TEST-BANK

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

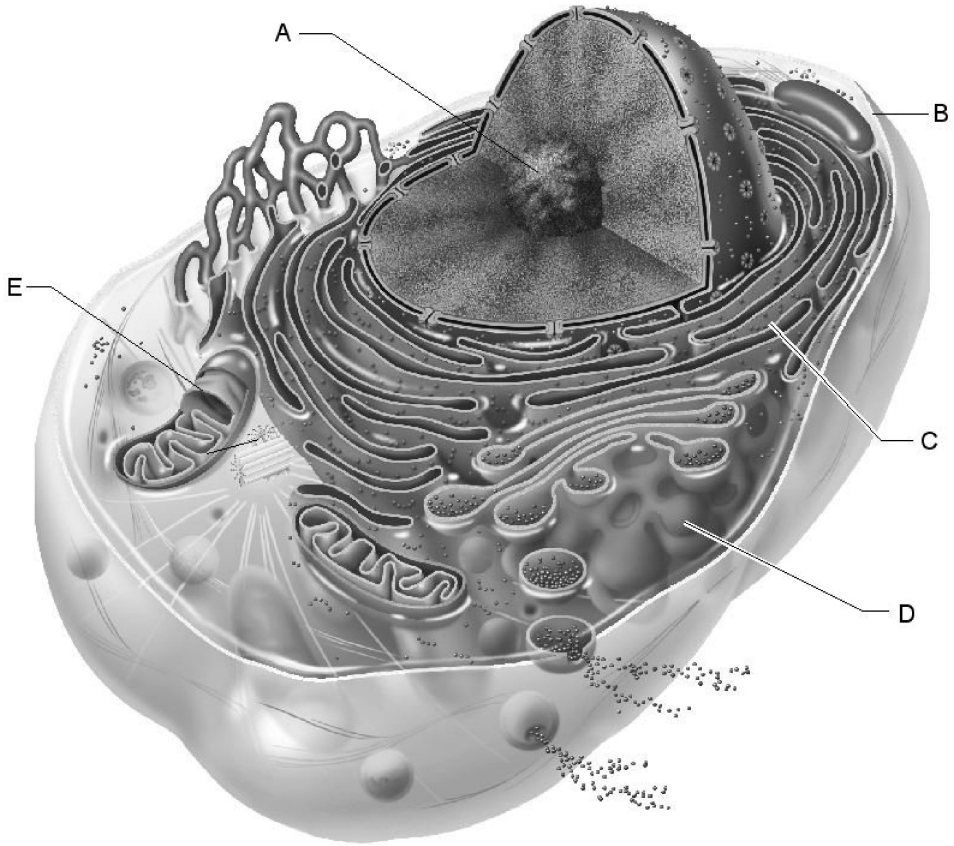

Figure 2.1

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: C

2) Which letter indicates the nucleolus?
A) A B) B C) C D) D E) E
Answer: A

3) Which letter indicates the plasma membrane?
A) A B) B C) C D) D E) E
Answer: B

4) Which letter indicates the mitochondrion?
A) A B) B C) C D) D E) E
Answer: E

5) Which letter indicates the Golgi apparatus?
A) A B) B C) C D) D E) E
Answer: D

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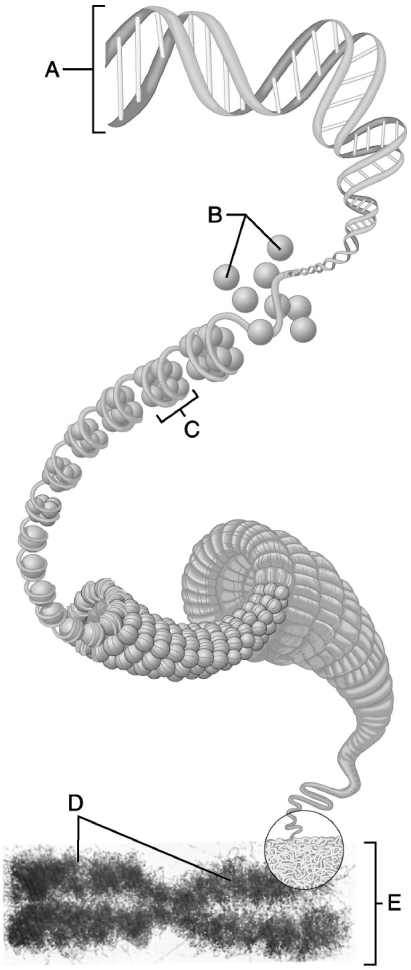

Figure 2.2

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

7) Which letter indicates the chromatid?
A) A B) B C) C D) D E) E
Answer: D

8) Which letter indicates a nucleosome?
A) A B) B C) C D) D E) E
Answer: C

9) Which letter indicates histones?
A) A B) B C) C D) D E) E
Answer: B

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10) Which letter indicates the metaphase chromosome?

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

Answer: E

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

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

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

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

15) This organelle detoxifies a number of toxic substances.

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

Answer: E

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

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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

18) This membranous organelle contains oxidase and catalase enzymes.
A) Golgi apparatus
B) lysosome
C) rough endoplasmic reticulum
D) mitochondria
E) peroxisome

Answer: E

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

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

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

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

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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

24) This organelle produces ATP molecules.
A) Golgi apparatus
B) lysosome
C) rough endoplasmic reticulum
D) mitochondria
E) peroxisome

Answer: D

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

26) Mitosis refers only to nuclear division. Separation of the entire cell following mitosis is
A) cytokinesis. B) karyokinesis. C) meiosis. D) telophase.

Answer: A

27) Phospholipids of the plasma membrane are arranged
A) as a bilayer with their nonpolar tails sandwiched between the polar heads.
B) around a central layer of cholesterol.
C) in a single layer with polar heads facing outwards.
D) as a bilayer with their polar heads sandwiched between the nonpolar tails.

Answer: A

28) Which of the following cytoskeleton elements are the largest in diameter?
A) microtubules B) centrioles
C) microfilaments D) intermediate filaments

Answer: A

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) They determine which molecules are transported through the membrane.
C) They are more abundant by volume than the membrane phospholipids.
D) Some attach to the glycocalyx.

Answer: C

30) Which type of endocytosis ingests the most specific type of molecule?
A) phagocytosis B) fluid–phase endocytosis
C) receptor–mediated endocytosis D) pinocytosis

Answer: C

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31) Hormones are secreted by
A) phagocytosis. B) osmosis. C) exocytosis. D) pinocytosis.
Answer: C

32) Of the following, the only organelle that has a double membrane structure is the
A) centriole. B) mitochondrion.
C) endoplasmic reticulum. D) Golgi apparatus.
Answer: B

33) Functions of the Golgi apparatus include all of the following *except*
A) production of secretory granules. B) plasma membrane formation.
C) synthesis of lysosomes. D) DNA replication.
Answer: D

34) Which of the following statements about the rough endoplasmic reticulum is *false*?
A) It stores lipids as inclusions.
B) It consists of stacked envelopes called cisternae.
C) It makes the digestive enzymes contained in the lysosomes.
D) It makes the integral proteins of the cell membrane.
Answer: A

35) Which of the following is *not* a cytoskeleton element?
A) microfilament B) microtubule
C) centriole D) intermediate filament
Answer: C

36) Which type of proteins are required for exocytosis?
A) SNARE proteins B) caveolin C) coatomer proteins D) clathrin
Answer: A

37) In chromatin, the DNA molecule wraps around proteins called
A) nucleotides. B) integral protein. C) histones. D) codons.
Answer: C

38) In the cell life cycle, DNA is replicated during
A) interphase S. B) prophase II. C) prophase I. D) interphase G_1.
Answer: A

39) The longest arrays of microtubules that assemble from each centrosome during prophase form filaments called
A) kinetochores. B) mitotic spindle fibers.
C) asters. D) the nuclear envelope.
Answer: B

40) During anaphase, motor proteins attached to mitotic spindle fibers serve to
A) form the aster.
B) pull together the replicated chromosomal strands.
C) re–form the nuclear envelope.
D) pull the chromosomes to opposite poles of the cell.
Answer: D

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

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

Answer: A

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

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

Answer: C

43) Which organelle is important in neutralizing free radicals?

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

Answer: C

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

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

Answer: D

45) Peroxisomes function to

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

Answer: A

46) Dyneins and kinesins are motor proteins that

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

Answer: C

47) Cell division is analogous to

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

Answer: C

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

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

Answer: D

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

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

Answer: C

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

51) Which of the following does *not* pass through nuclear pores?
A) chromatin B) proteins C) messenger RNA D) ribosomal RNA
Answer: A

52) Which of the following is associated with protein synthesis?
A) smooth endoplasmic reticulum B) chloroplasts
C) mitochondria D) ribosomes
Answer: D

53) Ribosomes may be either free within the cytoplasm or bound to a membrane system known as the
A) Golgi apparatus. B) cytoskeleton.
C) rough endoplasmic reticulum. D) microtubule organizing center.
Answer: C

54) Which is *not* part of interphase?
A) S B) M C) G_1 D) G_2
Answer: B

55) Embedded in the plasma membrane of cells, cholesterol molecules act to
A) stabilize the membrane.
B) participate in pinocytosis.
C) make the membrane more resistant to freezing.
D) destabilize the membrane, leading to heart attacks.
Answer: A

56) The endocytotic process in which small vesicles of fluid are brought into the cell is called
A) exocytosis. B) phagocytosis. C) xenocytosis. D) pinocytosis.
Answer: D

57) The double membrane structure is unique to the
A) nucleolus. B) peroxisome. C) mitochondrion. D) lysosome.
Answer: C

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

59) The stiffest elements of the cytoskeleton, analogous to the bones of the human body, are
A) the cytosol. B) microtubules.
C) microfilaments. D) intermediate filaments.
Answer: B

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60) The mitotic spindle forms from the
A) centrosome matrix.
B) nucleolus.
C) Golgi apparatus.
D) nucleus.

Answer: A

61) The nuclear envelope is continuous with the rough ER, but it differs from the rough ER in that it
A) consists of tubes, like the smooth ER.
B) has unique pores.
C) consists of two membranes separated by a space.
D) is not associated with ribosomes.

Answer: B

62) Membrane–bound organelles have the same type of membrane as the plasma membrane *except*
A) for the absence of a glycocalyx.
B) the nonpolar tails face outward.
C) for the absence of cholesterol.
D) they are all covered with ribosomes.

Answer: A

63) In the process of phagocytosis, the organelles whose enzymes break down ingested foreign cells are the
A) peroxisomes.
B) lysosomes.
C) nucleoli.
D) smooth endoplasmic reticulum.

Answer: B

64) During mitosis, the kinetochore microtubules of the mitotic spindle
A) push the two poles of the cell apart.
B) anchor the centriole to the cell membrane.
C) attach to chromatids and align them at the metaphase plate.
D) push on the chromatids.

Answer: C

65) The theory proposing that aging results from the effects of free radicals is primarily a theory of
A) wear and tear.
B) cross–linking of glucose.
C) genetically programmed aging.
D) progressive disorder of immunity.

Answer: A

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

Answer: D

67) Transcription of DNA requires the presence of
A) centrosomes.
B) histones.
C) extended chromatin.
D) nucleosomes.

Answer: C

68) The process of cellular aging may involve all of the following *except*
A) excessive metabolic rate.
B) progressive shortening of telomeres.
C) accumulated damage by free radicals.
D) decreased production of lysosomes.

Answer: D

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69) During what phase of mitosis does the mitotic spindle break down and disappear?
A) metaphase B) telophase C) anaphase D) late prophase
Answer: B

70) The cytoskeletal elements that form a ring to "squeeze" the two daughter cells apart during cytokinesis are
A) microtubules. B) microfilaments.
C) the microtrabecular lattice. D) intermediate filaments.
Answer: B

71) During what phase of the cell cycle is the DNA duplicated?
A) prophase B) anaphase C) metaphase D) interphase
Answer: D

72) The plasma membrane is
A) a membrane composed of tiny shelves or cristae.
B) a single–layered membrane that surrounds the nucleus of the cell.
C) a single–layered membrane enclosing the plasma.
D) the membrane surrounding the cell.
Answer: D

73) The cell that gathers information and controls body functions is a
A) fat cell. B) neuron. C) macrophage. D) sperm cell.
Answer: B

74) The temporary structures in the cytoplasm include all of the following *except*
A) the Golgi apparatus. B) lipid droplets.
C) glycosomes. D) pigments.
Answer: A

75) Which of the following is an inclusion, *not* an organelle?
A) glycosome B) mitochondrion C) lysosome D) microtubule
Answer: A

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

76) The smooth ER contains its own molecules of DNA.
Answer: True ✓ False

77) Hypercholesterolemia is an inherited disease in which the body's cells lack the protein receptors that bind to cholesterol–delivering LDLs.
Answer: ✓ True False

78) Ribosomes consist of two subunits, each surrounded by a membrane.
Answer: True ✓ False

79) Peroxisomes are important in detoxification of a number of toxic substances, for instance, hydrogen peroxide.
Answer: ✓ True False

80) The nucleolus serves as the cell's ribosome–producing machine.
Answer: ✓ True False

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81) Microtubules are composed of actin.

Answer: True ✓ False

82) Chromatin is composed of DNA wound around proteins known as actin.

Answer: True ✓ False

83) An example of a type of cell with high rates of mitosis is a cell of the skin.

Answer: ✓ True False

84) During the S phase, cells are characterized by rapid growth.

Answer: True ✓ False

85) During the G_1 phase, DNA is replicated in the cytoplasm.

Answer: True ✓ False

86) Telomeres are structures that limit the maximum number of times cells can divide.

Answer: ✓ True False

87) Extended chromatin is tightly wound around histones.

Answer: True ✓ False

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

Answer: True ✓ False

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

Answer: True ✓ False

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

Answer: ✓ True False

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

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

Answer: cytokinesis

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

Answer: exocytosis

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

Answer: radicals (free radicals)

94) Identify the two different types of membrane–associated molecules that comprise the glycocalyx.

Answer: glycolipids and glycoproteins

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

Answer: a nucleosome

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96) This is the phase in which a cell grows and carries on all its usual metabolic activities.
Answer: G1 phase of interphase

97) These are the smallest living units in the body.
Answer: cells

98) This is the outermost continuous boundary of a human cell.
Answer: plasma membrane (plasmalemma)

99) This is the name for the currently held theory describing the plasma membrane structure.
Answer: fluid mosaic model

100) 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

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

102) This is the mechanism by which large particles and macromolecules enter a cell.
Answer: endocytosis

103) This is the diffusion of water molecules across a membrane.
Answer: osmosis

104) This is the type of protein involved in transport mechanisms across the plasma membrane.
Answer: integral proteins (transmembrane proteins)

105) This is an inherited disease that leads to an accumulation of undigested glycolipids especially in the lysosomes of neurons.
Answer: Tay–Sachs disease

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

106) 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.

107) 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.

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108) Describe the two checkpoints that occur during interphase.

Answer: The $G_{1\ checkpoint}$ ensures that the cell has reached a maximum size and has replicated the necessary organelles and enzymes to synthesize DNA. The $G_{2\ checkpoint}$, checks to see whether replication errors or DNA damage has occurred during DNA synthesis.

109) 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.

110) 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 stabile and permanent, functioning to resist shearing forces within and between adjacent cells.

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