Chapter 2—Cell Physiology

MULTIPLE CHOICE

1. Which component below is not always found in a typical human cell?
   a. cytosol
   b. DNA
   c. flagellum
   d. plasma membrane
   e. water

   ANS: C PTS: 1 DIF: Knowledge

2. A typical human cell is about ____ micrometers in diameter.
   a. 1 to 2
   b. 10 to 20
   c. 80 to 100
   d. 150 to 200
   e. 200 to 300

   ANS: B PTS: 1 DIF: Knowledge

3. Select the structure that is not located in the cytosol of the cell.
   a. ER
   b. Golgi complex
   c. lysosome
   d. mitochondrion
   e. nucleolus

   ANS: E PTS: 1 DIF: Knowledge

4. Which organelle is not membrane-bound?
   a. Golgi body
   b. lysosome
   c. mitochondrion
   d. RER
   e. ribosome

   ANS: E PTS: 1 DIF: Knowledge

5. Which statement about cells is incorrect?
   a. They are the smallest things that can be alive.
   b. They are generally too small to be seen with the unaided eye.
   c. They are highly organized.
   d. Cells in large dogs are the same size as cells in smaller dogs.
   e. Most cells in dogs are quite different than cells in humans.

   ANS: E PTS: 1 DIF: Comprehension

6. Which statement about the plasma membrane is not true?
   a. It serves as a mechanical barrier to hold in the contents of the cell.
   b. It selectively controls movement of molecules between the ECF and the cytoplasm.
   c. It is the barrier that surrounds the blood vessels and separates the blood plasma from the interstitial fluid.
   d. It contains proteins that provides for various membrane functions.
   e. It consists mostly of lipids and proteins.

   ANS: C PTS: 1 DIF: Knowledge

7. The rough endoplasmic reticulum
   a. is in direct contact with certain nonmembranous organelles
   b. synthesizes lipids for secretion
   c. is called the sarcoplasmic reticulum in muscle cells
   d. transports proteins to its bound ribosomes
   e. exhibits all of the above characteristics

   ANS: A PTS: 1 DIF: Knowledge

8. Which of the following is synthesized inside certain cells and is eventually secreted.
   a. tRNA
   b. clathrin
   c. dynamin
   d. steroid hormone
   e. ATP

   ANS: D PTS: 1 DIF: Analysis

9. Which statement is true?
   a. Mitochondria are primarily sites where anaerobic respiration occurs.
   b. Vaults are inclusions in the cytoplasm that transport DNA.
   c. Peroxisomes are membranous sacs that contain hydrolytic enzymes.
   d. Ribosomes are membranous organelles that synthesize proteins.
   e. None of the statements are true.

   ANS: E PTS: 1 DIF: Comprehension

10. Which of the following is not contained within the cytoplasm?
    a. ribosomal subunits
    b. cytosol
    c. plasma membrane
    d. endoplasmic reticulum
    e. catalase

    ANS: C PTS: 1 DIF: Comprehension

11. Select the correct statement about a ribosome.
    a. It contains DNA.
    b. It synthesizes amino acids.
    c. It is often functional while attached to a nonmembranous organelle.
    d. It contains proteins that are synthesized at other ribosomes.
    e. All of the above statements are correct.

    ANS: D PTS: 1 DIF: Comprehension

12. Which of the following are involved directly in myosin synthesis?
    a. RNA
    b. actin
    c. DNA
    d. microfilaments
    e. All of the above

    ANS: A PTS: 1 DIF: Comprehension

13. The smooth endoplasmic reticulum
    a. is most abundant in cells specialized for protein secretion
    b. gives rise to transport vesicles containing newly synthesized molecules wrapped in a layer of smooth ER membrane
    c. consists of stacks of relatively flattened sacs called cristae
    d. has only a few ribosomes attached to it
    e. is a primary site for glycolysis

    ANS: B PTS: 1 DIF: Knowledge

14. In a human cell, DNA may be found within
    a. the nucleus
    b. mitochondria
    c. the cytoplasm
    d. all of the above
    e. none of the above

    ANS: D PTS: 1 DIF: Knowledge

15. Select the incorrect statement about the smooth ER.
    a. It is abundant in most cell types.
    b. It is found in liver cells.
    c. It specializes in lipid metabolism.
    d. In one type of cell, it is called sarcoplasmic reticulum.
    e. It does not contain ribosomes.

    ANS: A PTS: 1 DIF: Knowledge

16. Which structure is not associated with the secretion of proteins produced by ER?
    a. Golgi complex
    b. smooth ER
    c. transport vesicles
    d. lysosomal membrane
    e. plasma membrane

    ANS: D PTS: 1 DIF: Knowledge

17. Which characteristic of the Golgi complex is incorrect?
    a. It sorts and directs products to their final destination.
    b. It is a membranous organelle surrounded by cytosol.
    c. It produces lysosomes.
    d. It modifies proteins made at the rough ER.
    e. It receives secretory vesicles coming from the ER.

    ANS: E PTS: 1 DIF: Knowledge

18. Which of the following does not apply to lysosomes?
    a. They contain hydrolytic enzymes.
    b. They generate hydrogen peroxide.
    c. They aid in the breakdown of material that is taken into the cell through endocytosis.
    d. When they are abnormal, Tay-Sachs disease may result.
    e. They help remove damaged organelles.

    ANS: B PTS: 1 DIF: Knowledge

19. Which of the following does not always involve the plasma membrane?
    a. endocytosis
    b. secretion
    c. formation of an endocytic vesicle
    d. pinocytosis
    e. vesicle formation

    ANS: E PTS: 1 DIF: Comprehension

20. The form of endocytosis in which whole cells such as bacteria are brought in is
    a. exocytosis
    b. pinocytosis
    c. receptor-mediated endocytosis
    d. phagocytosis
    e. mitosis

    ANS: D PTS: 1 DIF: Knowledge

21. The SNARE complex provides
    a. allows recognition of foreign proteins after they enter a cell
    b. a way for a certain enzyme to bind with the correct substrate
    c. a means to deliver vesicles to an appropriate site
    d. a mechanism necessary for receptor mediated endocytosis to occur
    e. all of the functions listed above

    ANS: C PTS: 1 DIF: Knowledge

22. Select the incorrect characteristic of mitochondria.
    a. They have an inner fluid-filled space called the cristae.
    b. They possess their own DNA.
    c. They are the site of cellular respiration.
    d. Their inner membranes contain electron carriers.
    e. They possess two membranes.

    ANS: A PTS: 1 DIF: Knowledge

23. Where do the citric acid cycle reactions occur?
    a. cytoplasm
    b. cytosol
    c. inner-mitochondrial membrane
    d. outer-mitochondrial membrane
    e. mitochondrial matrix

    ANS: E PTS: 1 DIF: Knowledge

24. All of a muscle cell's lactate is synthesized
    a. in Krebs cycle reactions
    b. from acetyl CoA
    c. directly from glucose
    d. from pyruvate
    e. in chemiosmosis

    ANS: D PTS: 1 DIF: Comprehension

25. Where is CO_2 released in the aerobic cellular respiration process?
    a. glycolysis
    b. electron transport chain
    c. Krebs cycle
    d. just prior to pyruvate entering the Krebs cycle
    e. Krebs cycle and just prior to pyruvate entering the Krebs cycle

    ANS: E PTS: 1 DIF: Knowledge

26. Why do most cells in the body require oxygen molecules?
    a. Glucose cannot be broken down without it.
    b. It pulls electrons off the electron transport chains in the last part of cellular respiration.
    c. The electron transport system must pump it through the inner membrane for chemiosmosis.
    d. ATP synthase uses it to add a phosphate ion to ADP in order to make ATP.
    e. It pulls electrons off the electron transport chains in the last part of cellular respiration and ATP synthase uses it to add a phosphate ion to ADP in order to make ATP.

    ANS: B PTS: 1 DIF: Comprehension

27. What might happen if you took in less than optimum amounts of niacin in your diet?
    a. Fewer pyruvate molecules would be produced.
    b. Available FAD would increase.
    c. The number of hydrogen ions pumped through the ETS in a given amount of time would increase.
    d. The number of Krebs cycles occurring in a given amount of time would increase.
    e. Any of the above might happen.

    ANS: A PTS: 1 DIF: Comprehension

28. Which of the following is least related to glycolysis?
    a. NADH
    b. ATP
    c. pyruvate
    d. CO_2
    e. glucose

    ANS: D PTS: 1 DIF: Analysis

29. Identify the true statement(s) about anaerobic respiration.
    a. It completely oxidizes certain food molecules.
    b. It forms carbon dioxide.
    c. It donates hydrogens to NAD molecules.
    d. All of the above statements are true.
    e. It donates hydrogens to pyruvate molecules.

    ANS: C PTS: 1 DIF: Comprehension

30. Chemiosmosis
    a. releases O_2 onto a water molecule at the end of the ETS
    b. pumps H^+ ions into the mitochondrial matrix
    c. transfers hydrogens from the ETS to NAD^+
    d. generates GTP, which is then converted into ATP
    e. does not perform any of the above functions

    ANS: E PTS: 1 DIF: Comprehension

31. The complexes within electron transport chains
    a. are "circuits" for small amounts of electricity to pass through
    b. contain NADH that transports electrons
    c. transport H^+ into the mitochondrial matrix
    d. are responsible for transporting electrons and hydrogen ions
    e. perform all of the above functions

    ANS: D PTS: 1 DIF: Comprehension

32. Cristae are found in the
    a. lysosome
    b. mitochondrion
    c. nucleolus
    d. nucleus
    e. rough ER

    ANS: B PTS: 1 DIF: Knowledge

33. Select the incorrect association.
    a. ATP/high-energy bonds
    b. electron transport chain/mitochondrion
    c. glycolysis/anaerobic
    d. glycolysis/cytosol
    e. pyruvate/five-carbon molecule

    ANS: E PTS: 1 DIF: Analysis

34. During anaerobic conditions,
    a. more pyruvate is formed from lactate.
    b. the degradation of glucose cannot proceed beyond the Krebs cycle.
    c. mitochondrial processing of nutrient molecules takes place.
    d. the ETS continues to function, but the Krebs cycle does not.
    e. FAD is not converted to $FADH_2$.

    ANS: E PTS: 1 DIF: Comprehension

35. Which statement regarding the citric acid cycle is incorrect?
    a. It occurs in the mitochondrial matrix.
    b. It forms carbon dioxide.
    c. It forms two ATP molecules during each turn.
    d. Acetyl CoA and oxaloacetate react to form citric acid.
    e. Each turn forms one molecule of GTP.

    ANS: C PTS: 1 DIF: Knowledge

36. Which modified form of pyruvate enters the citric acid cycle?
    a. acetyl CoA
    b. adenosine diphosphate
    c. citric acid
    d. oxaloacetic acid
    e. pyruvic acid

    ANS: A PTS: 1 DIF: Knowledge

37. ATP synthase
    a. pumps H^+ ions into the intermembrane space
    b. transports oxygen
    c. accepts H^+ ions from NADH
    d. is not part of the ETS
    e. uses ATP to pump H+ out of the mitochondrial matrix

    ANS: D PTS: 1 DIF: Knowledge

38. NADH is
    a. an energy carrier
    b. used in cellular respiration
    c. produced in glycolysis
    d. produced in the citric acid cycle
    e. important in all of the above

    ANS: E PTS: 1 DIF: Knowledge

39. Glycolysis
    a. produces citric acid
    b. transfers energy to glucose
    c. produces more ATP molecules than does one turn of the Krebs cycle
    d. traps energy in $FADH_2$
    e. does not perform any of the functions listed above

    ANS: C PTS: 1 DIF: Knowledge

40. The term *aerobic* refers to reactions
    a. that occur in the lungs
    b. that require carbon dioxide
    c. that continue only when oxygen is available
    d. do not require an input of carbon dioxide
    e. that occur without oxygen

    ANS: C PTS: 1 DIF: Comprehension

41. Select the incorrect statement about vaults.
    a. They may play a role in drug resistance in cancer cells.
    b. They are numerous and relatively large organelles.
    c. They are specialized transport vesicles within nuclear pores.
    d. They may transport ribosomal subunits out of the nucleus.
    e. They are not visible by ordinary staining techniques.

    ANS: C PTS: 1 DIF: Knowledge

42. Select the item that is not a part of the cytoskeleton.
    a. inclusions
    b. intermediate filaments
    c. microfilaments
    d. microtubular lattice
    e. microtubules

    ANS: A PTS: 1 DIF: Knowledge

43. The bending movements of cilia and flagella
    a. are associated with microtubules and kinesin
    b. involve the alternate assembly and disassembly of actin filaments
    c. are produced when dynein motors pull adjacent microtubule doublets past each other
    d. involves dynein action on microfilaments
    e. involves myosin action on intermediate filaments

    ANS: C PTS: 1 DIF: Knowledge

44. Microtubules
    a. serve as a mechanical stiffener for microvilli
    b. form neurofilaments, which degrade in Lou Gehrig's disease
    c. form non-muscle contractile assemblies
    d. play an important structural role in parts of the cell subject to mechanical stress
    e. is responsible for nuclear division but not cytoplasmic division

    ANS: E PTS: 1 DIF: Comprehension

45. Which of the following organelles contains catalase?
    a. peroxisomes
    b. mitochondria
    c. lysosomes
    d. vaults
    e. a, b, and c

    ANS: A PTS: 1 DIF: Knowledge

46. Glycolysis
    a. yields two molecules of ATP for each molecule of glucose processed
    b. yields two molecules of NADH when converting one glucose into two pyruvates
    c. does not take place in the mitochondrion
    d. all of these
    e. yields two molecules of ATP for each molecule of glucose processed, and yields two molecules of NADH when converting one glucose into two pyruvates

    ANS: D PTS: 1 DIF: Knowledge

47. Identify the true statement(s).
    a. Kinesin always moves toward a centriole.
    b. Dynein always moves toward the plasma membrane.
    c. Dynein is responsible for movement of microvilli.
    d. Myosin motors move along actin proteins.
    e. Myosin motors move along actin proteins and Dynein always moves toward the plasma membrane.

    ANS: D PTS: 1 DIF: Knowledge

48. Nicotimamide adenine dinucleotide (NAD) is
    a. used in glycolysis and in the Krebs cycle
    b. found in the cytosol
    c. a hydrogen carrier molecule
    d. found in the mitochondrion
    e. characterized by all of the above

    ANS: E PTS: 1 DIF: Knowledge

49. Which of the following does not occur in the cytosol?
    a. replication of chromosomes
    b. enzymatic regulation of intermediary metabolism
    c. storage of fat and glycogen
    d. synthesis of proteins
    e. glycolysis

    ANS: A PTS: 1 DIF: Knowledge

50. Choose the incorrect statement about the cytoskeleton.
    a. It may help organize groups of enzymes.
    b. It is involved in replication of DNA.
    c. It serves as a mechanical stiffener.
    d. It is involved in cilia movement.
    e. It has components within microvilli.

    ANS: B PTS: 1 DIF: Knowledge

51. During axonal transport
    a. Kinesins carry axonal debris toward the axon terminal.
    b. Kinesins move toward the nucleus of the cell.
    c. Dyneins carry secretory vesicles toward the axon terminal.
    d. Dyneins move away from the nucleus.
    e. Microfilaments serve as the major intracellular "highway."

    ANS: A PTS: 1 DIF: Knowledge

52. Actin and myosin filaments are most abundant in ____ cells.
    a. epithelial
    b. muscle
    c. nerve
    d. red blood
    e. white blood

    ANS: B PTS: 1 DIF: Knowledge

53. Ribosomes
    a. are the only sites where proteins are made
    b. contain protein in their chemical makeup
    c. contain RNA in their chemical makeup
    d. consist of subunits that are constructed inside the nucleus
    e. are characterized by all of the above

    ANS: E PTS: 1 DIF: Knowledge

54. _____ transports secretory vesicles along microtubules is
    a. Actin
    b. Myosin
    c. Kinesin
    d. Tubulin
    e. Keratin

    ANS: C PTS: 1 DIF: Knowledge

55. Which characteristic regarding microfilaments is incorrect?
    a. They serve as mechanical stiffeners for microvilli.
    b. They are composed of actin subunits.
    c. They are the smallest elements of the cytoskeleton.
    d. They are involved in cell locomotion.
    e. They form mitotic spindles.

    ANS: E PTS: 1 DIF: Knowledge

56. Intermediate filaments
    a. comprise mitotic spindles
    b. are important in cell regions subject to mechanical stress
    c. comprise cilia and flagella
    d. form the basal bodies
    e. comprise cilia and flagella and form the basal bodies

    ANS: B PTS: 1 DIF: Knowledge

57. Identify all examples of inclusions.
    a. peroxisome
    b. glycogen granule
    c. centriole
    d. vault
    e. glycogen granule and vault

    ANS: B PTS: 1 DIF: Knowledge

58. Which of the following represents a site of storage for molecules that a cell uses as a source of energy?
    a. peroxisome
    b. inclusion
    c. lysosome
    d. nucleus
    e. Golgi complex

    ANS: B PTS: 1 DIF: Knowledge

59. Which of the following may help transport ribosomal subunits out of the nucleus?
    a. Golgi complex
    b. mitotic spindle
    c. vault
    d. centriole
    e. secretory vesicle

    ANS: C PTS: 1 DIF: Knowledge

60. Which of the following is not a principle of the cell theory?
    a. Most cells come from preexisting cells.
    b. Cells are the smallest things that can be alive.
    c. A cell's structure determines the cell's ability to function.
    d. All cells have certain fundamental structures and functions in common.
    e. Cells are the fundamental living building blocks of multicellular organisms.

    ANS: A PTS: 1 DIF: Comprehension

61. A cell in the pancreas that secretes an enzyme to hydrolyzes lipids would be expected to have
    a. a larger-than-normal nucleus
    b. an extensive rough ER
    c. a greater-than-normal number of free ribsomes
    d. an extensive smooth ER
    e. a and d

    ANS: B PTS: 1 DIF: Application

62. Docking markers are most closely associated with
    a. the nucleus
    b. mitochondria
    c. DNA
    d. Golgi complexes
    e. the ETS

    ANS: D PTS: 1 DIF: Knowledge

63. Identify the item that is not taken into a cell via receptor-mediated endocytosis.
    a. amino acid
    b. cholesterol
    c. vitamin B_{12}
    d. iron
    e. insulin

    ANS: A PTS: 1 DIF: Knowledge

64. Identify the pairing that has the least related items:
    a. pinocytosis, endocytosis
    b. catalase, peroxisome
    c. clathrin, secretory vesicle
    d. phagocytosis, pseudopods
    e. t-SNARE, plasma membrane

    ANS: C PTS: 1 DIF: Analysis

65. Identify the item that does not enter a cell through a coated pit:
    a. insulin
    b. iron
    c. cholesterol
    d. vitamin B_{12}
    e. cargo protein

    ANS: E PTS: 1 DIF: Knowledge

66. Which pairing is most out of place?
    a. Mitochondrion and vesicle formation
    b. Lysosome and autophagia
    c. Cytoskeleton and vesicle transport
    d. ER and lipid synthesis
    e. Golgi body and glycoprotein processing

    ANS: A PTS: 1 DIF: Comprehension

67. Which of the following is most closely associated with cilia?
    a. actin and myosin
    b. intermediate filaments
    c. dynein and microtubules
    d. microfilaments and actin
    e. myosin motor molecules and microfilaments

    ANS: C PTS: 1 DIF: Comprehension

TRUE/FALSE

1. Electron microscopes are about 1000 times more powerful than light microscopes.

   ANS: F PTS: 1 DIF: Knowledge

2. DNA's genetic code for a particular protein is transcribed into rRNA.

   ANS: F PTS: 1 DIF: Knowledge

3. The cytoplasm includes everything between the plasma membrane and nucleus of a cell.

   ANS: T PTS: 1 DIF: Knowledge

4. DNA in the nucleus has the genetic instructions to make dynein.

   ANS: T PTS: 1 DIF: Comprehension

5. The nucleus indirectly governs most cellular activities by directing the kinds and amounts of various enzymes and other proteins that are produced by the cell.

   ANS: T PTS: 1 DIF: Knowledge

6. The rough endoplasmic reticulum is most abundant in cells specialized for protein secretion, whereas smooth endoplasmic reticulum is abundant in cells that specialize in lipid metabolism.

   ANS: T PTS: 1 DIF: Knowledge

7. Proteins synthesized at the endoplasmic reticulum become permanently separated from the cytosol as soon as they have been synthesized.

   ANS: T PTS: 1 DIF: Comprehension

8. RER is most abundant in cells specialized for steroid production.

   ANS: F PTS: 1 DIF: Knowledge

9. The Golgi complex is functionally connected to the ER.

   ANS: T PTS: 1 DIF: Knowledge

10. The endoplasmic reticulum is one continuous organelle consisting of many tubules and cisternae.

    ANS: T PTS: 1 DIF: Knowledge

11. Lysosomes synthesize hydrolase enzymes.

    ANS: F PTS: 1 DIF: Comprehension

12. The rough ER synthesizes proteins within their interconnected sacs.

    ANS: F PTS: 1 DIF: Comprehension

13. Secretory vesicles are taken into a cell by means of phagocytosis.

    ANS: F PTS: 1 DIF: Knowledge

14. Secretory vesicles are about 200 times larger than transport vesicles.

    ANS: T PTS: 1 DIF: Knowledge

15. Coated vesicles bud off the Golgi complex and contain various proteins.

    ANS: T PTS: 1 DIF: Knowledge

16. All cell organelles are renewable.

    ANS: T PTS: 1 DIF: Knowledge

17. Vaults are presumably descendants of primitive bacterial cells.

    ANS: F PTS: 1 DIF: Knowledge

18. Endocytosis can only be accomplished by phagocytosis and pinocytosis.

    ANS: F PTS: 1 DIF: Knowledge

19. Phagocytosis is a specialized form of endocytosis used primarily for bringing ECF into the cytosol.

ANS: F PTS: 1 DIF: Knowledge

20. Peroxisomes are nonmembranous organelles that generate and degrade hydrogen peroxide.

ANS: F PTS: 1 DIF: Comprehension

21. Glycolysis utilizes most of the stored energy in glucose when synthesizing ATP molecules.

ANS: F PTS: 1 DIF: Knowledge

22. ATP synthase is located in the inner mitochondrial membrane.

ANS: T PTS: 1 DIF: Knowledge

23. Most intermediary metabolism is accomplished in the cytosol.

ANS: T PTS: 1 DIF: Knowledge

24. Oxidative phosphorylation generates more ATP per glucose molecule than does glycolysis.

ANS: T PTS: 1 DIF: Knowledge

25. Dynein is a mitochondrial enzyme.

ANS: F PTS: 1 DIF: Knowledge

26. Cytokinesis is the division of the nucleus during mitosis.

ANS: F PTS: 1 DIF: Knowledge

27. Amoeboid movement is accomplished by alternate assembly and disassembly of actin filaments.

ANS: T PTS: 1 DIF: Knowledge

28. The protective, waterproof outer layer of skin is formed by the tough skeleton of intermediate filaments that persist after the surface skin cells die.

ANS: T PTS: 1 DIF: Knowledge

29. Intermediate filaments account for about 85% of the protein present in muscle and liver cells.

ANS: F PTS: 1 DIF: Knowledge

30. Amyotrophic lateral sclerosis is likely associated with the disruption of microtubules and microfilaments within motor neurons.

ANS: F PTS: 1 DIF: Knowledge

31. The Golgi complex synthesizes recognition markers that recognize and attract specific sorting signals.

ANS: F PTS: 1 DIF: Comprehension

32. Secretion involves *v-SNARE* markers located on the plasma membrane.

ANS: F PTS: 1 DIF: Knowledge

33. Motor molecules cannot transport vesicles along intermediate filaments of the cytoskeleton.

ANS: T PTS: 1 DIF: Knowledge

34. Oxygen molecules are used in the Krebs cycle and at the end of the ETS.

ANS: F PTS: 1 DIF: Comprehension

35. Primary cilia are responsible for moving dust from the respiratory tract.

ANS: F PTS: 1 DIF: Knowledge

36. The cytoplasm is the same as the ICF.

ANS: F PTS: 1 DIF: Knowledge

37. The lipids within the ER's membrane must synthesize additional lipid molecules so the ER can grow as a cell grows.

ANS: F PTS: 1 DIF: Comprehension

38. Some enzymes inside the rough ER may pass through the ER's membrane and be used within the cytosol, but most enzymes used in the cytosol are made at free ribsomes.

ANS: F PTS: 1 DIF: Knowledge

39. Lipid synthesis does not occur in the rough ER.

ANS: F PTS: 1 DIF: Knowledge

40. The two primary organelles involved in detoxifying harmful substances are the peroxisomes and the Golgi complex.

ANS: F PTS: 1 DIF: Knowledge

41. The amount of smooth ER within liver cells may change dramatically over a period of days, depending on the amount of drug detoxification that is required.

ANS: T PTS: 1 DIF: Knowledge

42. Peroxisomes arise from vesicles produced at the rough ER, while lysosomes arise from vesicles produced at the Golgi complex.

ANS: F PTS: 1 DIF: Knowledge

43. Since lysosomes cannot make their own enzymes, those enzymes must be synthesized in the Golgi complex prior to the lysosome's formation.

ANS: F PTS: 1 DIF: Comprehension

44. The only time the contents of secretory vesicles come in contact with the cytosol is when the vesicle joins with the plasma membrane.

ANS: F PTS: 1 DIF: Knowledge

45. Coatomers form around endosomes formed during receptor-mediated endocytosis.

ANS: F PTS: 1 DIF: Knowledge

46. Dynamin is synthesized inside endosomes and is responsible for pinching off the endosome from the plasma membrane.

ANS: F PTS: 1 DIF: Comprehension

47. Skeletal muscle cells have numerous mitochondria within their endoplasmic reticulum and this special organization is called the mitochondrial reticulum.

ANS: F PTS: 1 DIF: Knowledge

48. If a candy bar is likened to a single glucose molecule, then a pyruvate molecule would be likened to two candy bars.

ANS: F PTS: 1 DIF: Comprehension

49. The Krebs cycle occurs within the mitochondria while the citric acid cycle occurs in the cytosol.

ANS: F PTS: 1 DIF: Knowledge

50. A pair of electrons released from one NADH molecule causes the formation of more ATP molecules than do a pair of electrons released from a $FADH_2$.

ANS: T PTS: 1 DIF: Knowledge

COMPLETION

Complete each of the following statements.

1. The three major subdivisions of a cell are the _____, the _____, and the _____.

ANS: plasma membrane, nucleus, cytoplasm

PTS: 1 DIF: Knowledge

2. The fluid contained within all of the cells of the body is known collectively as _____, and the fluid outside of the cells is referred to as _____.

   ANS: intracellular fluid, extracellular fluid

   PTS: 1 DIF: Knowledge

3. The two major parts of the cell's interior are the _____ and the _____.

   ANS: nucleus, cytoplasm

   PTS: 1 DIF: Knowledge

4. _____ RNA carries amino acids to the sites of protein synthesis in the cell.

   ANS: Transfer

   PTS: 1 DIF: Knowledge

5. The _____ is the central packaging and discharge site for molecules to be transported from the cell.

   ANS: Golgi apparatus

   PTS: 1 DIF: Knowledge

6. _____ is a motor molecule that moves toward the "plus" end of a cytoskeletal filament made of actin.

   ANS: Myosin

   PTS: 1 DIF: Knowledge

7. On a microtubule, the motor molecule called _____ moves toward a centriole.

   ANS: dynein

   PTS: 1 DIF: Knowledge

8. _____ is the most abundant protein inside skin cells, where it comprises the intermediate filaments of the cytoskeleton.

   ANS: Keratin

   PTS: 1 DIF: Knowledge

9. The ribosomes of the rough ER synthesize _____, whereas its membranous walls contain enzymes essential for the synthesis of _____.

   ANS: proteins, lipids

   PTS: 1 DIF: Knowledge

10. In muscle cells, the sarcoplasmic reticulum is a storage site for _____.

    ANS: calcium

    PTS: 1 DIF: Knowledge

11. _____ refers to the process of an intracellular vesicle fusing with the plasma membrane, then opening and emptying its contents to the exterior.

    ANS: Exocytosis

    PTS: 1 DIF: Knowledge

12. _____ is a protein responsible for pinching off an endocytic vesicle.

    ANS: Dynamin

    PTS: 1 DIF: Knowledge

13. Foreign material to be attacked by lysosomal enzymes is brought into the cell by the process of _____.

    ANS: endocytosis or phagocytosis

    PTS: 1 DIF: Knowledge

14. Organelles called _____ contain _____ enzymes that are capable of digesting and removing unwanted debris from the cell.

    ANS: lysosomes, hydrolytic

    PTS: 1 DIF: Knowledge

15. _____ are organelles that may possibly transport ribosomal subunits out of the nucleus.

    ANS: Vaults

    PTS: 1 DIF: Knowledge

16. _____, an enzyme found in peroxisomes, decomposes potentially toxic hydrogen peroxide.

    ANS: Catalase

    PTS: 1 DIF: Knowledge

17. ADP and P are formed from the breakdown of the molecule _____.

    ANS: adenosine triphosphate (ATP)

    PTS: 1 DIF: Knowledge

18. The decomposition of hydrogen peroxide produces the substances _____ and _____.

ANS: water, oxygen

PTS: 1 DIF: Knowledge

19. Enzymes referred to as _____ enzymes use O_2 to strip hydrogen from organic molecules.

ANS: oxidative

PTS: 1 DIF: Knowledge

20. One glucose molecule is converted into two molecules of _____ by the end of glycolysis.

ANS: pyruvic acid

PTS: 1 DIF: Knowledge

21. The metabolism of acetyl CoA into the citric acid cycle depends on the presence of _____ gas in the mitochondrion.

ANS: oxygen

PTS: 1 DIF: Knowledge

22. The chemiosmotic mechanism involves the transport of _____ ions across the inner membrane of the _____.

ANS: hydrogen, mitochondrion

PTS: 1 DIF: Knowledge

23. The most common inclusion within cells of adipose tissue is _____.

ANS: fat

PTS: 1 DIF: Knowledge

24. _____ are the dominant structural and functional components of cilia and flagella.

ANS: Microtubules

PTS: 1 DIF: Knowledge

25. Microfilaments are comprised of the protein _____, and are used as highways by motor molecules called _____.

ANS: actin, myosin

PTS: 1 DIF: Knowledge

26. One disease caused by neurofilament abnormalities is _____.

ANS: amyotropic lateral sclerosis

PTS: 1 DIF: Knowledge

27. A cilium or flagellum originates from a structure called a(n) _____.

ANS: basal body

PTS: 1 DIF: Knowledge

28. _____ serves as the final electron acceptor in the electron transport system.

ANS: Oxygen

PTS: 1 DIF: Knowledge

29. _____ refers to programmed cell death, whereas _____ refers to uncontrolled cell death.

ANS: Apoptosis, necrosis

PTS: 1 DIF: Knowledge

30. _____ is a motor molecule that travels toward the “plus” end of a microtubule, whereas _____ travels toward the “minus” end..

ANS: Kinesin, dynein

PTS: 1 DIF: Knowledge

31. _____ are part of the cytoskeleton and serve as mechanical stiffeners for microvilli.

ANS: Microfilaments

PTS: 1 DIF: Knowledge

32. The synthesis of ATP as a result of H+ flowing through an ATP synthase is called _____.

ANS: chemiosmosis

PTS: 1 DIF: Knowledge

MATCHING

Match the term to its description.
a. plasma membrane
b. nucleus
c. cytoplasm
d. cytosol
e. organelles
f. cytoskeleton

1. Houses the cell's DNA
2. Responsible for cell shape and movement
3. Highly organized membrane-bound intracellular structures
4. Selectively controls movement of molecules between the intracellular fluid and the extracellular fluid
5. Consists of organelles and cytosol
6. Site of intermediary metabolism
7. Permits incompatible chemical reactions to occur simultaneously in the cell
8. Separates contents of the cell from its surroundings
9. Site of fat and glycogen storage

1. ANS: B PTS: 1 DIF: Knowledge
2. ANS: F PTS: 1 DIF: Knowledge
3. ANS: E PTS: 1 DIF: Knowledge
4. ANS: A PTS: 1 DIF: Knowledge
5. ANS: C PTS: 1 DIF: Knowledge
6. ANS: D PTS: 1 DIF: Knowledge
7. ANS: E PTS: 1 DIF: Knowledge
8. ANS: A PTS: 1 DIF: Knowledge
9. ANS: D PTS: 1 DIF: Knowledge

Match the term to its description.
a. microtubules
b. microfilaments
c. intermediate filaments

10. Largest of the cytoskeletal elements
11. Present in parts of the cell subject to mechanical stress
12. Smallest element visible with a conventional electron microscope
13. Consist of actin
14. Form the mitotic spindle
15. Essential for creating and maintaining an asymmetrical cell shape
16. Composed of tubulin
17. Provide a pathway for axonal transport
18. Play a key role in muscle contraction
19. Slide past each other to cause ciliary bending

10. ANS: A PTS: 1 DIF: Knowledge
11. ANS: C PTS: 1 DIF: Knowledge
12. ANS: B PTS: 1 DIF: Knowledge
13. ANS: B PTS: 1 DIF: Knowledge
14. ANS: A PTS: 1 DIF: Knowledge

15. ANS: A PTS: 1 DIF: Knowledge
16. ANS: A PTS: 1 DIF: Knowledge
17. ANS: A PTS: 1 DIF: Knowledge
18. ANS: B PTS: 1 DIF: Knowledge
19. ANS: A PTS: 1 DIF: Knowledge

Match the term to its description.
a. ER
b. Golgi complex
c. lysosome
d. peroxisome
e. mitochondrion
f. vault
g. free ribosome
h. microtubule
i. microfilament

20. Contains enzymes important in detoxifying various wastes
21. Important component of cilia and flagella
22. Continuous extensive organelle consisting of a network of tubules and flattened filament
23. Removes unwanted cellular debris and foreign material
24. Produces most of the ATP for most cells
25. Acts as a mechanical stiffener
26. Synthesizes proteins for use in the cytosol
27. Consists of stacks of flattened sacs
28. May function as transporter of materials through the nuclear membrane
29. Used as "highway" for kinesin and dynein
30. Used as "highway" for myosin
31. Descendents of bacteria that were engulfed by primitive cells

20. ANS: D PTS: 1 DIF: Knowledge
21. ANS: H PTS: 1 DIF: Knowledge
22. ANS: A PTS: 1 DIF: Knowledge
23. ANS: C PTS: 1 DIF: Knowledge
24. ANS: E PTS: 1 DIF: Knowledge
25. ANS: I PTS: 1 DIF: Knowledge
26. ANS: G PTS: 1 DIF: Knowledge
27. ANS: B PTS: 1 DIF: Knowledge
28. ANS: F PTS: 1 DIF: Knowledge
29. ANS: H PTS: 1 DIF: Knowledge
30. ANS: I PTS: 1 DIF: Knowledge
31. ANS: E PTS: 1 DIF: Knowledge

Match the term to its description.
a. flagella
b. cilia
c. microvilli

32. Hair-like motile protrusions
33. Increase the surface area of the small intestine epithelium
34. Sweep mucus and debris out of respiratory airways

35. Increase the surface area of the kidney tubules
36. Enable sperm to move
37. Whip-like appendages
38. Guide egg to oviduct

32.	ANS: B	PTS: 1	DIF:	Knowledge
33.	ANS: C	PTS: 1	DIF:	Knowledge
34.	ANS: B	PTS: 1	DIF:	Knowledge
35.	ANS: C	PTS: 1	DIF:	Knowledge
36.	ANS: A	PTS: 1	DIF:	Knowledge
37.	ANS: A	PTS: 1	DIF:	Knowledge
38.	ANS: B	PTS: 1	DIF:	Knowledge

Match the cellular protein with its correct characteristic.

a. dynamin
b. tubulin
c. kinesin
d. actin
e. clathrin
f. dynein
g. myosin

39. Disassembles and reassembles within pseudopods
40. Moves along the smallest component of the cytoskeleton
41. Separates chromosomes during mitosis
42. Forms a covering around an endosome
43. Moves away from the minus end of the cytoskeleton's largest components
44. Causes pinching off of endocytic vesicles
45. Moves toward the centriole along tubulin protein

39.	ANS: D	PTS: 1	DIF:	Knowledge
40.	ANS: G	PTS: 1	DIF:	Comprehension
41.	ANS: B	PTS: 1	DIF:	Knowledge
42.	ANS: E	PTS: 1	DIF:	Knowledge
43.	ANS: C	PTS: 1	DIF:	Comprehension
44.	ANS: A	PTS: 1	DIF:	Knowledge
45.	ANS: F	PTS: 1	DIF:	Comprehension

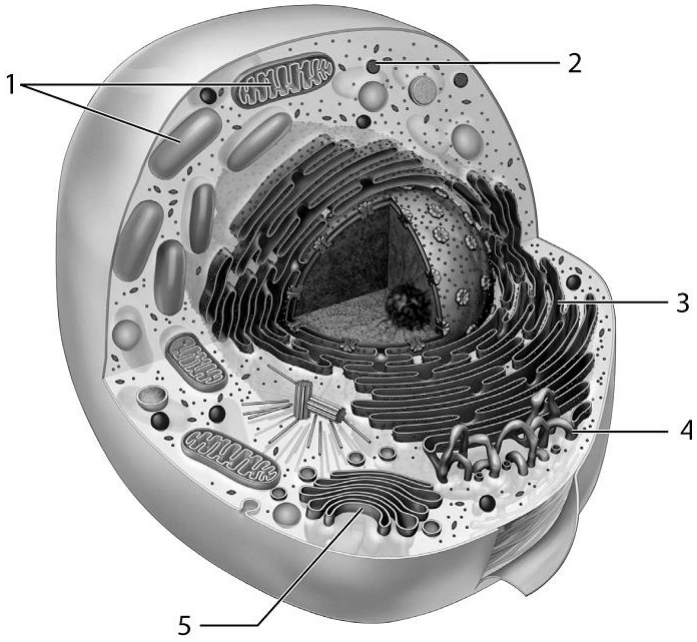
SHORT ANSWER

1. Indicate which of the characteristics applies to 1) glycolysis, 2) citric-acid cycle, or 3) oxidative phosphorylation.
   a. directly uses inspired oxygen
   b. does not directly use inspired oxygen
   c. takes place in the cytosol
   d. takes place in the mitochondrial matrix
   e. takes place on the inner mitochondrial membrane
   f. yields fewer than 5 ATP molecules for each glucose molecule
   g. yields more than 5 ATP molecules for each glucose molecule

ANS:
glycolysis: b, c, f;
citric-acid cycle: b, d, f;
oxidative phosphorylation: a, e, g

PTS: 1 DIF: Knowledge

ART-BASED QUESTIONS



Use the figure above to answer the corresponding questions.

1. Which number identifies the structure responsible for the synthesis of proteins that end up in secretory vesicles?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5

   ANS:
   c

   PTS: 1 DIF: Knowledge

2. Which number identifies the site of aerobic respiration?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5

   ANS:
   a

   PTS: 1 DIF: Comprehension

3. Which organelle gives rise to specialized vesicles that contain hydrolytic enzymes?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5

   ANS:
   e

   PTS: 1 DIF: Comprehension

4. Which organelle uses oxygen to strip hydrogens from organic molecules?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5

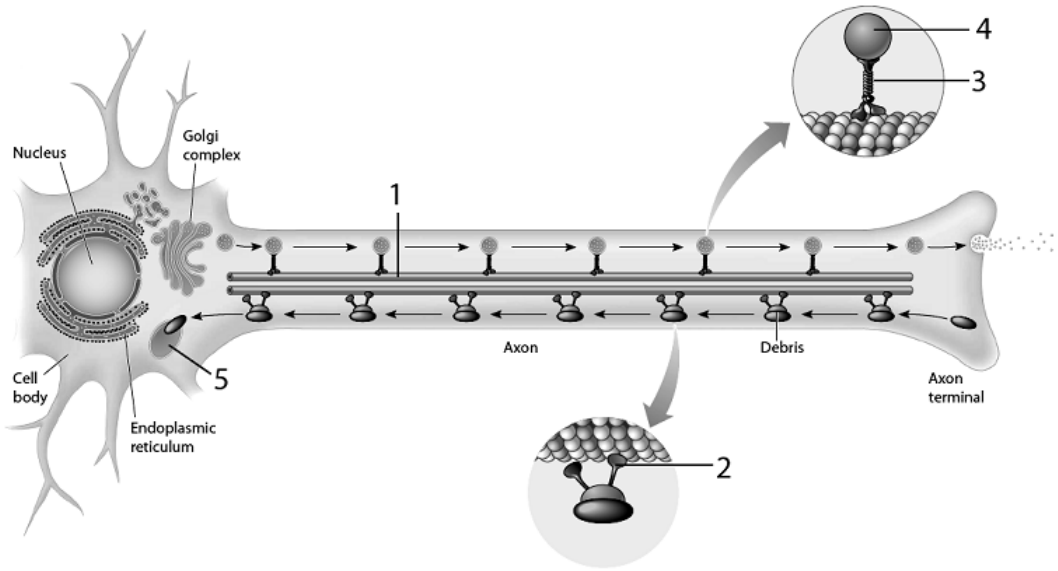
   ANS:
   b

   PTS: 1 DIF: Comprehension

5. Which organelle contains structures that bind to docking-marker acceptors?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5

   ANS:
   e

   PTS: 1 DIF: Comprehension



Use the figure above to answer the corresponding questions.

6. The structure labeled "1"
   a. is a microfilament
   b. is made of actin
   c. originates at a centriole
   d. is a "highway" for myosin motor molecules
   e. all of these

   ANS:
   c

   PTS: 1 DIF: Knowledge

7. Label "3" identifies
   a. a myosin motor moving along a microtubule
   b. a kinesin motor moving along a microfilament
   c. a dynein motor moving along a microtubule
   d. a dynein motor moving away from a centriole
   e. none of these

   ANS:
   e

   PTS: 1 DIF: Comprehension

8. Which number identifies a structure that utilizes hydrolases to perform its function?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5

   ANS:
   e

   PTS: 1 DIF: Knowledge

ESSAY

1. Describe the pathway that newly synthesized polypeptides take on route for secretion.

   ANS:
   The rough ER synthesizes proteins, which then make their way into the smooth ER. The smooth ER packages the proteins within transport vesicles that pass to the Golgi complex. The contents of the vesicle enter the Golgi complex where they may be modified. Eventually, the secretory products are packaged into secretory vesicles, which bud off the Golgi complex and make their way to the plasma membrane along components of the cytoskeleton. On appropriate stimulation, the secretory vesicles fuse with the plasma membrane and empty their contents into the ECF via exocytosis.

   PTS: 1 DIF: Comprehension

2. Describe two benefits of a cell carrying out anaerobic glycolysis. Be sure to include the following in your answer: pyruvate, electrons (in hydrogen atoms), oxygen, mitochondrion, Krebs cycle, ETS, and ATP.

   ANS:
   Glycolysis produces ATP in the cytosol and does not require oxygen. Therefore, when oxygen concentrations in the cell decrease below optimum, the cell can still synthesize ATP using energy extracted from glucose. Another advantage is that glycolysis provides substrates in the form of pyruvate and high-energy electrons that can be used within the mitochondria to generate more ATP. The pyruvate is modified into acetyl CoA, which enters the Krebs cycle; and high-energy electrons (within hydrogen atoms) that are taken out of glycolysis reactions can be used to power the electron transport system, which is important for oxidative phosphorylation within the mitochondrion.

   PTS: 1 DIF: Comprehension

3. How is ATP synthesized via electron transport and oxidative phosphorylation? Be sure to include the following items in your answer: electrons, glycolysis, Krebs cycle, NADH, $FADH_2$, hydrogen ion pump, intermembrane space, ATP synthase, ATP, and oxygen.

   ANS:
   Electrons (in hydrogen atoms) that are stripped out of reactions in glycolysis and the Krebs cycle are transported to the ETS via electron carriers (NADH and $FADH_2$). The electrons are passed along carriers within the ETS and the energy they release is used by hydrogen ion pumps to move hydrogen ions from the mitochondrial matrix into the intermembrane space of the mitochondrion. Hydrogen ions then diffuse back into the matrix through special enzymes called ATP synthases. The movement of H^+ through the enzymes energizes the enzymes, allowing them to phosphorylate ADP to form ATP. Oxygen serves as the final electron acceptor in the ETS, thus allowing the ETS to continue accepting electrons from NADH and $FADH_2$.

   PTS: 1 DIF: Comprehension

4. Describe the movement of vesicles along microtubules in the cytoskeleton. Include the following in your answer: microtubules, tubulin, kinesin, dynein, plus end, minus end, and centriole.

   ANS:
   Centrioles form microtubules, which are made of tubulin proteins. The microtubules radiate out from the centrioles, with their "minus" ends at the centrioles and their "plus" ends farthest away from the centriole. Motor molecules attach to vesicles and then move along the microtubules. Kinesin can only move toward the plus end of the microtubule; therefore, they always move away from the centriole. Dynein can only move toward the minus end of the microtubule; therefore, they always move toward the centriole.

   PTS: 1 DIF: Comprehension

5. Describe the structure and function of cilia and flagella. Be sure to include the following in your answer: basal body, doublets, triplets, dynein, fused, unfused, and "9+2."

   ANS:
   Flagella and cilia are motile extensions of a cell, and they contain nine fused pairs of microtubules (each pair is a doublet) arranged in a ring around two single unfused microtubules, yielding a "9+2" arrangement. Dynein motor molecules walk along adjacent microtubule doublets, causing the doublets to slide past each other; this is responsible for the bending and stroking actions of cilia and flagella. Cilia and flagella arise from basal bodies, which are similar to centrioles and have nine fused triplets rather than doublets of microtubules and do not surround any unfused microtubules.

   PTS: 1 DIF: Comprehension