

Chapter 2 - Cell Physiology

1. Which of these components is NOT always found in a typical human cell?

- a. cytosol
- b. DNA
- c. flagellum
- d. plasma membrane

ANSWER: c

2. What are the two major parts of a cell's interior?

- a. the intracellular fluid and matrix
- b. the nucleus and plasma membrane
- c. the nucleus and cytoplasm
- d. the DNA and cytoplasm

ANSWER: c

3. Which of these structures is located in the nucleus of the cell?

- a. the nuclide
- b. the lysosome
- c. the mitochondrion
- d. the nucleolus

ANSWER: d

4. Which of these statements refers to rough endoplasmic reticulum?

- a. It synthesizes phospholipids for export and does not contain ribosomes.
- b. It synthesizes proteins for export from the cell or for use in construction of a new cellular membrane.
- c. It is abundant in cells that specialize in lipid metabolism and it does not contain ribosomes.
- d. It is abundant in liver cells and it contains ribosomes.

ANSWER: b

5. Which of these organelles is associated with the rough endoplasmic reticulum?

- a. chromosomes
- b. lysosomes
- c. microfilaments
- d. ribosomes

ANSWER: d

6. Which of these organelles occurs in the lowest numbers within a typical human cell?

- a. mitochondria
- b. vaults
- c. peroxisomes
- d. nuclei

ANSWER: d

7. Which of the following can be found within the nucleus?

- a. deoxyribonucleic acid

Chapter 2 - Cell Physiology

- b. cytosol
- c. plasma membrane
- d. endoplasmic reticulum

ANSWER: a

8. Which of these statements does NOT apply to ribosomes?

- a. They are composed of RNA.
- b. They assemble polypeptides.
- c. They may be bound to endoplasmic reticulum.
- d. They are covered by a membrane.

ANSWER: d

9. Which of these structures is associated with the secretion of proteins produced by the ER?

- a. Golgi complex
- b. plasma membrane
- c. microtubules
- d. lysosomal membrane

ANSWER: a

10. Which of the following is NOT a function of the Golgi complex?

- a. to sort and direct products to their final destination
- b. to modify proteins chemically
- c. to produce secretory vesicles
- d. to synthesize proteins

ANSWER: d

11. Which of these statements applies to lysosomes?

- a. They contain powerful hydrolytic enzymes.
- b. They generate hydrogen peroxide.
- c. They facilitate intracellular reactions.
- d. They store excess nutrients.

ANSWER: a

12. Which of these statements describes mitochondria?

- a. They have an inner fluid-filled space called the crista.
- b. They act as energy-producing organelles.
- c. They are the site for cell reproduction.
- d. They serve as workbenches for protein synthesis

ANSWER: b

13. Where are cristae found?

- a. lysosome
- b. mitochondrion
- c. nucleolus

Chapter 2 - Cell Physiology

d. nucleus

ANSWER: b

14. Which of these statements describes vaults?

- a. They act as a selective barrier between cellular contents and extracellular fluid.
- b. Their shape tends to be oval or rounded.
- c. They serve as cellular trucks for transport from the nucleus to the cytoplasm.
- d. They store excess nutrients.

ANSWER: c

15. Which organelles contain oxidative enzymes?

- a. peroxisomes and lysosomes
- b. mitochondria and nuclei
- c. lysosomes and vaults
- d. ribosomes and microtubules

ANSWER: a

16. Which of the following is NOT an activity of the cytosol?

- a. duplication of chromosomes
- b. enzymatic regulation of intermediary metabolism
- c. storage of fat and glycogen
- d. synthesis of proteins for use in the cytosol

ANSWER: a

17. Which of these statements does NOT apply to microfilaments?

- 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 form mitotic spindles.

ANSWER: d

18. Which of these statements describes intermediate filaments?

- a. They comprise mitotic spindles.
- b. They are important in cell regions subject to mechanical stress.
- c. They comprise cilia.
- d. They comprise flagella.

ANSWER: b

19. Which of these statements applies to mitochondria?

- a. Their number per cell is the same for every cell.
- b. They and the cell nucleus contain DNA.
- c. They contain DNA that is a copy of our parents' DNA.
- d. Their DNA has unlimited ability to repair.

ANSWER: b

Chapter 2 - Cell Physiology

20. Which of these organelles is NOT membrane bound?

- a. lysosome
- b. ribosome
- c. mitochondrion
- d. peroxisome

ANSWER: b

21. The endoplasmic reticulum can be thought of as a cellular factory that produces which two compounds?

- a. organelles and protein
- b. ATP molecules and lipids
- c. ribosomes and ATP molecules
- d. proteins and lipids

ANSWER: d

22. Peroxisomes are membranous organelles that produce and decompose which compound?

- a. protein
- b. carbohydrates
- c. hydrogen peroxide
- d. triglycerides

ANSWER: c

23. What is the universal energy currency in cells?

- a. ATP
- b. glucose
- c. glycogen
- d. insulin

ANSWER: a

24. What is the function of ATP synthase?

- a. to act enzymatically
- b. to build membranes
- c. to carry hydrogen
- d. to synthesize ATP

ANSWER: d

25. In which cells are actin and myosin filaments commonly found?

- a. epithelial cells
- b. muscle cells
- c. nerve cells
- d. red blood cells

ANSWER: b

26. What accounts for the most ATP production?

Chapter 2 - Cell Physiology

- a. Krebs cycle
- b. citric acid cycle
- c. NADH
- d. electron transport and oxidative phosphorylation

ANSWER: d

27. In the aerobic respiration process of cells, when is CO₂ released?

- a. during glycolysis
- b. during the electron transport chain of events
- c. during the Krebs cycle
- d. during fermentation

ANSWER: c

28. Which of these compounds is the carbon-based end product (chain) of glycolysis?

- a. NADH
- b. ATP
- c. pyruvic acid
- d. FADH₂

ANSWER: c

29. Which of these statements describes glycolysis?

- a. It yields two molecules of ATP for each molecule of glucose processed.
- b. It always requires oxygen.
- c. It takes place in the mitochondrial matrix.
- d. It takes place in the mitochondrial inner membrane cristae.

ANSWER: a

30. What is the purpose of glycolysis?

- a. to produce citric acid
- b. to liberate energy from glucose
- c. to produce large numbers of ATP
- d. to trap energy in FADH₂

ANSWER: b

31. In which structure do the citric acid cycle reactions occur?

- a. cytoplasm
- b. cytosol
- c. inner-mitochondrial membrane
- d. mitochondrial matrix

ANSWER: d

32. Which of these statements describes NADH?

- a. It is an energy carrier.

Chapter 2 - Cell Physiology

- b. It plays a role in cellular respiration.
- c. It is used in glycolysis.
- d. It is used in the citric acid cycle.

ANSWER: a

33. What does chemiosmosis do?

- a. releases CO₂
- b. extracts energy from a H⁺ concentration gradient
- c. reduces NAD
- d. ferments pyruvic acid to lactic acid

ANSWER: b

34. Which of these statements describes electron transport chains?

- a. They are “circuits” for small amounts of electricity to pass through.
- b. They are made of proteins.
- c. They deliver energy to cytochrome to pump H⁺ into the intermembrane space.
- d. They do not need oxygen to be available.

ANSWER: c

35. Which of the following are NOT paired correctly?

- a. ATP and high-energy bonds
- b. electron transport chain and mitochondrion
- c. glycolysis and anaerobic
- d. pyruvic acid and 5-carbon molecule

ANSWER: d

36. Which of the following might happen if niacin is deficient in your diet?

- a. Glucose might not be able to be cleaved.
- b. Available FAD might decrease.
- c. When the 3-carbon chain is oxidized in glycolysis, electrons might not be able to be captured.
- d. Only fermentation would be possible.

ANSWER: c

37. Why does anaerobic respiration take place when O₂ is unavailable?

- a. to continue releasing at least some energy from molecules and generate ATP
- b. to prevent cell death
- c. to make use of available glucose
- d. to prevent protein breakdown

ANSWER: a

38. Which of these statements applies to an anaerobic condition?

- a. Oxygen is plentiful.
- b. The degradation of glucose cannot proceed beyond glycolysis.

Chapter 2 - Cell Physiology

- c. Mitochondrial processing of nutrient molecules takes place.
- d. It produces a high yield of oxygen molecules.

ANSWER: b

39. Which of these statements does NOT apply to the citric acid cycle?

- a. It occurs in the mitochondrial matrix.
- b. Carbon dioxide is released.
- c. Several ATP molecules are produced for each cycle.
- d. Acetyl CoA and oxaloacetic CoA initially react to form citric acid.

ANSWER: c

40. Which of these molecules enters the citric acid cycle directly?

- a. acetyl CoA
- b. adenosine diphosphate
- c. citric acid
- d. oxaloacetic acid

ANSWER: a

41. Which of the following is the definition of *aerobic*?

- a. in the blood
- b. with carbon dioxide
- c. with oxygen
- d. without carbon dioxide

ANSWER: c

42. Which of these statements describes ATP synthase?

- a. It transports hydrogen ions from the matrix to the intermembrane space of the mitochondrion.
- b. It is activated by the flow of hydrogen ions from the intermembrane space to the matrix.
- c. It enzymatically converts ATP to ADP.
- d. It yields two molecules of ATP.

ANSWER: b

43. Which of these statements describes nicotinamide adenine dinucleotide (NAD)?

- a. It converts ADP + P_i to ATP.
- b. It is found in the cytosol.
- c. It is a hydrogen carrier molecule.
- d. It is a hydrogen carrier molecule found in the cytosol.

ANSWER: c

44. Which statement does NOT describe the plasma membrane?

- 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 ICF.
- c. It contains proteins that provide receptor sites for membrane functions.

Chapter 2 - Cell Physiology

d. It has cholesterol to determine the fluidity of the membrane.

ANSWER: a

45. Which of these statements describes the plasma membrane?

- a. Under a light microscope, it appears as a trilaminar structure.
- b. The carbohydrates on the outer surface serve as receptor sites for binding chemical messengers in the environment of the cell.
- c. The lipid bilayer serves as a barrier to the passage of H₂O-soluble substances through the membrane.
- d. Carrier proteins shuttle back and forth across the membrane as they carry passenger molecules from one side to the other.

ANSWER: c

46. Which of these statements describes the plasma membrane?

- a. It appears under an electron microscope as a single dark line around the cell.
- b. It is composed of a double layer of phospholipid molecules with proteins interspersed throughout the phospholipids.
- c. It separates the intravascular and extracellular fluid.
- d. It separates the intravascular and intracellular fluid.

ANSWER: b

47. Which of these statements describes phospholipids?

- a. They consist of a polar, hydrophilic, phosphate-bearing head and two nonpolar hydrophobic, fatty-acid tails.
- b. They are lined as a single layer in membranes.
- c. They serve as carrier molecules.
- d. The small amount of membrane carbohydrate is located on the inner surface of the phospholipid layer.

ANSWER: a

48. What are the three important functions of the lipid bilayer of the plasma membrane?

- a. forms the basic membrane structure; hydrophilic interior acts as barrier; aids in RNA transfer
- b. forms the basic membrane structure; hydrophobic interior acts as barrier; responsible for fluidity
- c. forms the basic membrane structure; hydrophobic interior acts as barrier; aids in RNA transfer
- d. allows electrical flow via nerves; hydrophobic interior acts as barrier; responsible for fluidity

ANSWER: b

49. Which of these statements describes the plasma membrane?

- a. Under an electron microscope, it appears as two dark lines with a light space between.
- b. In its resting state, it is more permeable to Na⁺ than to K⁻.
- c. It does not contain cholesterol.
- d. It can be seen under an ordinary light microscope.

ANSWER: a

50. Which of the following is NOT a function of membrane proteins?

- a. to serve as channels
- b. to determine the fluidity of the membrane

Chapter 2 - Cell Physiology

- c. to serve as carriers
- d. to serve as receptor sites

ANSWER: b

51. Which one of the following is a function of membrane carbohydrates?

- a. to serve as channels
- b. to determine the fluidity of the membrane
- c. to assist in the aggregation of cells to form tissues
- d. to serve as receptor sites

ANSWER: c

52. Which of these statements does NOT apply to the plasma membrane?

- a. Cholesterol contributes to its stability.
- b. Its proteins are inserted in a lipid bilayer.
- c. It consists mostly of lipids and proteins.
- d. Its carbohydrates are on only its inner surface.

ANSWER: d

53. Which of the following are receptor sites on the outer surface of the plasma membrane?

- a. ATP
- b. carbohydrates
- c. cyclic AMP
- d. proteins

ANSWER: d

54. Which of these statements does NOT describe plasma membrane?

- a. According to the fluid mosaic model of membrane structure, it consists primarily of a bilayer of mobile phospholipid molecules studded with an ever-changing mosaic pattern of proteins.
- b. In its lipid bilayer, the hydrophobic tails of the phospholipids orient toward the centre of the membrane, away from water.
- c. The protective, waterproof outer layer of skin is formed by the tough skeleton of the microtrabecular lattice that persists after the surface skin cells die.
- d. The polar ends of the phospholipid molecules within it are hydrophilic.

ANSWER: c

55. Which of these statements describes the plasma membrane?

- a. The hydrophobic interior of its lipid bilayer blocks the passage of water-soluble substances.
- b. The surface carbohydrates within it serve as cell adhesion molecules (CAMs), which cells use to grip one another and surrounding connective tissue fibres.
- c. Its outer layer of carbohydrates is the primary barrier to the passage of water-soluble substances.
- d. Sheets of epithelial cells are joined by gap junctions.

ANSWER: a

56. What is the primary determinant of a membrane's selective permeability?

Chapter 2 - Cell Physiology

- a. the structures of the membrane phospholipids
- b. the amount of cholesterol present
- c. the number and types of membrane proteins
- d. the charge of the membrane

ANSWER: c

57. What is cystic fibrosis caused by?

- a. the buildup of thick mucus in respiratory airways and the pancreas
- b. the accumulation of salt, caused by dehydration
- c. the plasma membrane's impermeability to chloride
- d. the plasma membrane's impermeability to potassium

ANSWER: c

58. Which of these statements describes integrins?

- a. They create a filamentous meshwork in the inner surface of the membrane.
- b. They act as membrane-bound enzymes.
- c. They are used for cell recognition purposes.
- d. They span the membrane, providing a mechanical link between the outer membrane and the cell's surrounding.

ANSWER: d

59. Which of these statements does NOT describe membrane proteins?

- a. Their channels are water-filled pathways.
- b. Their channels may be highly selective.
- c. They may catalyze specific reactions.
- d. CAMs serve as binding sites for specific ligands.

ANSWER: d

60. Which of these statements describes collagen?

- a. It provides tensile strength.
- b. It is most abundant in tissues that must be capable of easily stretching and then recoiling.
- c. It promotes cell adhesion.
- d. It is a rubber-like protein fibre.

ANSWER: a

61. Which of the following is NOT part of the extracellular matrix?

- a. watery, gel-like, ground substance
- b. connexon
- c. collagen
- d. elastin

ANSWER: b

62. What kind of junctions are impermeable junctions that join the lateral edges of epithelial cells near their luminal borders, thus preventing movement of materials between the cells?

Chapter 2 - Cell Physiology

- a. gap junctions
- b. desmosomes
- c. luminal junctions
- d. tight junctions

ANSWER: d

63. Which of these substances promotes cell adhesion?

- a. calmodulin
- b. collagen
- c. elastin
- d. fibronectin

ANSWER: d

64. Which of these statements does NOT describe gap junctions?

- a. They are communicating junctions.
- b. They play an important role in transmission of electrical activity throughout an entire muscle mass.
- c. They are formed by small connecting tunnels that link two adjacent cells and permit exchange of small, water-soluble particles between the cells.
- d. Filaments of unknown composition extend between the plasma membranes of two closely adjacent but not touching cells, acting as “spot rivets” to anchor the cells together.

ANSWER: d

65. Which of the following describes tight junctions?

- a. They prevent passage of materials between epithelial cells.
- b. They force materials to pass between cells.
- c. They are commonly found in respiratory tract linings.
- d. They serve as avenues for the transfer of small molecules from one cell to the next.

ANSWER: a

66. Gap junctions are especially abundant in what kinds of tissue?

- a. skeletal muscles and epithelial tissues
- b. epithelial tissues and smooth muscle
- c. cardiac muscle and smooth muscle
- d. brain tissue and cardiac muscle

ANSWER: c

67. What type of junctions are desmosomes, tight, and gap junctions, respectively?

- a. adhering, communicating, and impermeable
- b. communicating, impermeable, and adhering
- c. adhering, impermeable, and communicating
- d. communicating, adhering, and impermeable

ANSWER: c

68. Which of these statements describes passive diffusion?

Chapter 2 - Cell Physiology

- a. It depends on random motion.
- b. It involves active forces.
- c. Its rate increases as temperature decreases.
- d. Molecules move from a lower concentration to a higher concentration.

ANSWER: a

69. Which of the following *decreases* the rate of diffusion of a substance through the plasma membrane?
- a. increasing the concentration gradient
 - b. increasing the molecular weight of the substance
 - c. increasing the permeability of the membrane
 - d. increasing the surface area of the membrane

ANSWER: b

70. Which of the following does diffusion result from?
- a. ATP-driven processes
 - b. ion gradients
 - c. inherent kinetic energy of matter
 - d. selective permeability

ANSWER: c

71. Which of these substances is most likely to diffuse passively across the plasma membrane by dissolving in the membrane?
- a. a cation
 - b. an anion
 - c. a nonpolar or nonionized molecule
 - d. a polar molecule

ANSWER: c

72. By osmosis, a water molecule always moves to an area of higher _____.
- a. electrical intensity
 - b. fluid pressure
 - c. mitochondrial activity
 - d. solute concentration

ANSWER: d

73. Which of the following happens during osmosis?
- a. Water moves down its own concentration gradient.
 - b. Water moves to an area of higher solute concentration.
 - c. The solute moves against its concentration gradient.
 - d. The solute moves down its own concentration gradient.

ANSWER: b

74. Osmosis is which of these types of processes?
- a. carrier-mediated transport

Chapter 2 - Cell Physiology

- b. diffusion
- c. exocytosis
- d. pinocytosis

ANSWER: b

75. If a typical body cell is placed in a 5 percent saline solution, what will happen to the cell?
- a. It will fill with water.
 - b. It will lyse.
 - c. It will lose water.
 - d. It will remain unchanged.

ANSWER: c

76. Insulin promotes the uptake of glucose into cells by which of these transport mechanisms?
- a. carrier-mediated transport
 - b. endocytosis
 - c. exocytosis
 - d. osmosis

ANSWER: a

77. Which of these statements describes carrier-mediated transport?
- a. It involves a specific membrane protein that serves as a carrier molecule.
 - b. It always transports substances against a concentration gradient.
 - c. It always requires energy expenditure.
 - d. It always transports substances along a concentration gradient.

ANSWER: a

78. Which of the following mechanisms is used by large polar molecules when they leave or enter the cell?
- a. by vesicular transport
 - b. by osmosis
 - c. by selective passive transport
 - d. with the help of large lipid carriers

ANSWER: a

79. Which of these statements describes facilitated diffusion?
- a. It involves a carrier molecule.
 - b. It requires energy expenditure.
 - c. It is how protein enters the cells.
 - d. It is about movement of molecules against their concentration gradient.

ANSWER: a

80. The rate of carrier-mediated transport is limited by which one of the following?
- a. protein location in the membrane
 - b. osmolarity
 - c. tonicity

Chapter 2 - Cell Physiology

d. competition with other molecules

ANSWER: d

81. Glucose is usually reabsorbed from the filtrate in the kidney back into the blood through carrier proteins; hence, glucose in the urine is considered abnormal. Which of these conditions can result in glucose in the urine?

- a. low levels of glucose in the blood
- b. transport maximum for renal glucose reached or competitors for glucose carriers
- c. low consumption of glucose
- d. increased availability of glucose carriers

ANSWER: b

82. With secondary active transport, the movement of _____

- a. Na^+ into the cell by the cotransport carrier is downhill.
- b. Na^+ into the cell by the cotransport carrier is uphill.
- c. glucose by the cotransport carrier is uphill.
- d. Cl^- into the cell by the cotransport carrier is downhill.

ANSWER: a

83. Which of these processes refers to extrusion of materials through the plasma membrane to the exterior of the cell?

- a. endocytosis
- b. exocytosis
- c. phagocytosis
- d. pinocytosis

ANSWER: b

84. Which of the following refers to the form of endocytosis in which whole cells such as bacteria are brought in?

- a. exocytosis
- b. pinocytosis
- c. receptor-mediated endocytosis
- d. phagocytosis

ANSWER: d

85. Which of these statements does NOT apply to endocytosis?

- a. provides a way to add specific components to the plasma membrane
- b. phagocytosis of large multimolecular particles such as bacteria or cellular debris
- c. a particle gaining entry to the interior of the cell without actually passing through the plasma membrane
- d. can be triggered by the binding of a particle to a receptor site on the plasma membrane

ANSWER: a

86. Which of these descriptions applies to the movement of molecules across the plasma membrane?

- a. If two similar molecules can both combine with the same carrier, the presence of one of these molecules increases the rate of entry of the other.
- b. In simple diffusion, the rate of transport of a molecule is inversely proportional to the molecule's extracellular concentration.

Chapter 2 - Cell Physiology

- c. When a carrier becomes saturated, the maximum rate of transport is reached.
- d. Large molecules can cross it via nonselective, receptor-mediated endocytosis.

ANSWER: c

87. Pinocytosis is a form of which of these processes?

- a. active transport
- b. cytokinesis
- c. endocytosis
- d. exocytosis

ANSWER: c

88. What is the term for a leukocyte fighting bacterial infection by sending out projections of its plasma membrane to surround an invading bacterium?

- a. exocytosis
- b. receptor-mediated endocytosis
- c. pinocytosis
- d. phagocytosis

ANSWER: d

89. What does the SNARE complex provide?

- a. recognition of foreign proteins in the cell
- b. binding of correct enzyme with correct substrate
- c. means to deliver vesicles to an appropriate site
- d. receptor-mediated endocytosis

ANSWER: c

90. What triggers the exocytosis of secretory products by entering a cell in response to a specific neural or hormonal stimulus?

- a. K^+
- b. Na^+
- c. Ca^{2+}
- d. ATP

ANSWER: c

91. Which of the following is a common means by which binding of an extracellular chemical messenger with a cell's receptor brings about a desired intracellular response?

- a. opening or closing of specific channels to regulate ionic movement across the plasma membrane
- b. activation of an extracellular, second messenger system
- c. alteration of DNA structure by attaching to the nucleus
- d. combination with surface receptor

ANSWER: a

92. Which of the following is known to be a second messenger?

- a. cyclic AMP

Chapter 2 - Cell Physiology

- b. potassium
- c. ATP
- d. hormone

ANSWER: a

93. What is the cellular component that, once activated by the binding of an extracellular messenger to a surface receptor, in turn activates cyclic AMP?

- a. phospholipase C
- b. adenylate cyclase
- c. calmodulin
- d. calcium

ANSWER: b

94. In the cyclic AMP second messenger system, binding of the first messenger to a surface receptor leads to activation of adenylate cyclase, which induces the conversion of which of the following to cyclic AMP?

- a. intracellular ATP
- b. intracellular ADP
- c. extracellular ATP
- d. extracellular ADP

ANSWER: a

95. Which of these statements applies to membrane potential?

- a. It refers to a separation of charges across the membrane, or to a difference in the relative numbers of + and – charges in the ECF and the ICF.
- b. It is measured in units of millivolts, with the sign always designating the charge on the outside.
- c. It is less at the equilibrium potential for K^+ than at resting membrane potential.
- d. It refers to the presence of K^+ inside the cell.

ANSWER: a

96. Which of these statements describes the electrical gradient for K^+ ?

- a. It favours the movement of K^+ out of the cell at resting potential.
- b. It favours the movement of K^+ into the cell at resting potential.
- c. It favours the concentration gradient for K^+ at the equilibrium potential for K^+ .
- d. The larger the electrical gradient, the less the equilibrium potential is.

ANSWER: b

97. Which of these statements describes the resting membrane potential?

- a. It is much closer to the equilibrium potential for Na^+ than to the equilibrium potential for K^+ .
- b. It is much closer to the equilibrium potential for K^+ than to the equilibrium potential for Na^+ .
- c. It is the same as the equilibrium potential for Cl^- .
- d. It refers to the presence of Na^+ inside the cell.

ANSWER: b

Chapter 2 - Cell Physiology

98. Which of these statements describes the concentration gradient for Na^+ ?

- a. It favours the movement of Na^+ into the cell at resting potential.
- b. It favours the movement of Na^+ out of the cell at resting potential.
- c. Na^+ equilibrium potential is -90 mV.
- d. Na^+ equilibrium potential is -60 mV.

ANSWER: a

99. For every 3 sodium ions that the sodium–potassium pump moves out of the cell, how many potassium ions does it move into the cell?

- a. 4
- b. 3
- c. 2
- d. 1

ANSWER: c

100. Which of these statements is an accurate representation of membrane permeability and ion potential?

- a. The concentration of potassium ions is the same extracellularly and intracellularly.
- b. The concentration of potassium is higher extracellularly than intracellularly.
- c. The concentration of sodium is higher extracellularly than intracellularly.
- d. The concentration of sodium is lower extracellularly than intracellularly.

ANSWER: c

101. Which of these statements describes the Na^+ – K^+ pump?

- a. It pumps Na^+ into the cell.
- b. It pumps K^+ into the cell.
- c. It pumps K^+ out of the cell.
- d. It has a higher affinity for K^+ when the carrier is phosphorylated.

ANSWER: b

102. Which of the following does NOT require energy expenditure?

- a. net movement of potassium into the cell
- b. net movement of sodium into the cell
- c. iodine uptake by thyroid gland cells
- d. transport of hydrogen ion into the stomach lumen in association with hydrochloric acid secretion during digestion of a meal

ANSWER: b

103. As the triggering event gets stronger, what type of gated channels open up more frequently or for longer duration?

- a. calcium channels
- b. sodium channels
- c. potassium channels

Chapter 2 - Cell Physiology

d. chloride channels

ANSWER: b

104. All the following statements describe the $\text{Na}^+\text{-K}^+$ pump EXCEPT which one?

- a. Its phosphorylated conformation has high affinity for K^+ when exposed to the ICF.
- b. It has ATPase activity.
- c. It establishes Na^+ and K^+ concentration gradients across the plasma membrane; these gradients are critically important in the ability of nerve and muscle cells to generate electrical impulses essential to their functioning.
- d. It helps regulate cell volume by controlling the concentration of solutes inside the cell to minimize osmotic effects that would induce swelling or shrinking of the cell.

ANSWER: a

105. Why can't the large, negatively charged intracellular proteins (A^-) permeate the cell membrane?

- a. They are greater than 0.8 nm in diameter and are not lipid soluble.
- b. There are carriers for them.
- c. No concentration or electrical gradient exists for them.
- d. There are no positively charged ions to carry them.

ANSWER: a

106. Assume that a membrane that is permeable to Na^+ but not to Cl^- separates two solutions. The concentration of sodium chloride on side 1 is much higher than on side 2. Which of these ionic movements will take place?

- a. Na^+ will move until its concentration gradient is dissipated (i.e., until the concentration of Na^+ on side 2 is the same as the concentration of Na^+ on side 1).
- b. Cl^- will move down its concentration gradient from side 1 to side 2.
- c. A membrane potential, negative on side 1, will develop.
- d. A membrane potential, positive on side 1, will develop.

ANSWER: c

107. Which of the following happens at resting membrane potential?

- a. The membrane is more permeable to K^+ than to Na^+ .
- b. The membrane is more permeable to Na^+ than to K^+ .
- c. Cl^- is not at its equilibrium potential.
- d. The membrane is more permeable to Cl^- .

ANSWER: a

108. What is the resting membrane potential of a typical nerve cell?

- a. +70 mV
- b. +50 mV
- c. -50 mV
- d. -70 mV

ANSWER: d

Chapter 2 - Cell Physiology

109. Which of these statements is an accurate representation of membrane permeability and ion potential?

- a. The concentration of potassium ions is the same extracellularly and intracellularly.
- b. The concentration of potassium is higher extracellularly than intracellularly.
- c. The concentration of sodium is higher extracellularly than intracellularly.
- d. The concentration of sodium is lower extracellularly than intracellularly.

ANSWER: c

110. Which of these statements is NOT an accurate representation of cells?

- a. All living cells have a membrane potential.
- b. Rapid changes in membrane potential in muscle cells trigger abnormal muscle twitching.
- c. The cell's interior (ICF) is slightly more negative than ECF.
- d. The cell's membrane is more permeable to K^+ than to Na^+ .

ANSWER: b

111. A change in a membrane potential from +30 mV to -70 mV is an example of _____.

- a. depolarization
- b. hyperpolarization
- c. polarization
- d. repolarization

ANSWER: d

112. Change of a resting potential from -70 mV to a more positive charge until it reaches a critical level known as _____.

- a. polarizing action
- b. electrical action
- c. depolarizing potential
- d. threshold potential

ANSWER: d

113. Which of the following describes graded potentials?

- a. They are local changes in membrane potential that occur as all or none.
- b. They serve as short-distance signals.
- c. They serve as long-distance signals.
- d. They are generated after action potential.

ANSWER: b

114. Which of the following is NOT a graded potential?

- a. end-plate potential
- b. action potential
- c. slow-wave potential
- d. receptor potential

ANSWER: b

115. Which of the following happens during the rising phase of the action potential?

Chapter 2 - Cell Physiology

- a. P_{K^+} is much greater than P_{Na^+} .
- b. P_{Na^+} is much greater than P_{K^+} .
- c. P_{K^+} is the same as P_{Na^+} .

ANSWER: b

116. The strength of a stimulus is coded by the _____.

- a. strength of action potentials
- b. frequency of action potentials
- c. duration of the resting period
- d. duration of the refractory periods

ANSWER: b

117. Extracellular messengers binding on surface receptors may exert effects on cells via all the following means EXCEPT which one?

- a. opening gated channels
- b. opening a gated channel through activation of a G protein
- c. activation of the adenylyl cyclase system
- d. binding to sites and then being endocytosed

ANSWER: d

118. The cells of excitable and nonexcitable tissues share which one of these properties?

- a. a threshold potential
- b. a resting membrane potential
- c. an ability to open the Na^+ gates
- d. an ability to open the K^+ gates

ANSWER: b

119. Which of these terms *best* describes an excitable condition when a resting membrane potential is present?

- a. polarized
- b. depolarized
- c. hyperpolarized
- d. repolarized

ANSWER: a

120. Which of these statements describes a threshold potential?

- a. It is the potential achieved when two opposing forces acting upon an ion (concentration and electrical gradients) achieve a state of equilibrium.
- b. It is the peak potential achieved during an action potential.
- c. It is the point at which there is an explosive increase in Na^+ permeability.
- d. It is the potential at which K^+ permeability increases.

ANSWER: c

Chapter 2 - Cell Physiology

121. A change in a membrane potential from -70 mV to -60 mV is an example of which of the following?

- a. depolarization
- b. hyperpolarization
- c. polarization
- d. repolarization

ANSWER: a

122. Which of the following is responsible for the falling phase of an action potential?

- a. opening of Na^+ gates
- b. Na^+-K^+ pump restoring the ions to their original locations
- c. greatly increased permeability to Na^+
- d. opening of K^+ gates and K^+ efflux

ANSWER: d

123. Under which of these circumstances does an action potential develop?

- a. when threshold voltage is reached
- b. when voltage-gated K^+ channels open and the membrane reaches about -40 mV
- c. when spatial and/or temporal summation of graded potentials are cancelled
- d. when Cl^- enters the cell

ANSWER: d

124. A recording electrode is placed into a nerve cell to measure the membrane potential at a particular point. When the physiologist glances at the recording and sees that the membrane at that instant has a potential of $+15$ mV, she knows that the portion of the membrane being recorded is which of the following?

- a. in the normal resting state
- b. in the reversal phase of an action potential
- c. more permeable to Ca^{2+} than normal
- d. in the after hyperpolarization phase of an action potential

ANSWER: b

125. The rising phase of the action potential is due to which of these conditions?

- a. calcium equilibrium
- b. potassium efflux
- c. potassium influx
- d. sodium influx

ANSWER: d

126. The falling phase of the action potential is due to which of these conditions?

- a. calcium equilibrium
- b. potassium efflux
- c. potassium influx
- d. sodium efflux

Chapter 2 - Cell Physiology

ANSWER: b

127. Which of the following occurs when an excitatory neurotransmitter binds to a nicotinic receptor?

- a. Voltage-gated Na⁺ channels open.
- b. Voltage-gated K⁺ channels open.
- c. Chemically gated Na⁺ channels open.
- d. Voltage-gated Cl⁻ channels open.

ANSWER: c

128. Which of the following happens to the membrane when chemically gated Na⁺ channels open?

- a. It hyperpolarizes.
- b. It repolarizes.
- c. It depolarizes.
- d. It becomes more negative.

ANSWER: c

129. Which of the following occurs when a membrane is stimulated due to opening of chemically gated Na⁺ channels?

- a. An impulse is propagated.
- b. A graded potential is established.
- c. An action potential is established.
- d. The voltage becomes more negative.

ANSWER: b

130. Where is the trigger zone of a neuron?

- a. in the terminal ganglion
- b. in the axon hillock
- c. in the chemically gated channels
- d. in dendrites

ANSWER: b

131. Where is the nucleus of a neuron housed?

- a. axon
- b. axon hillock
- c. cell body
- d. collaterals

ANSWER: c

132. Which of these statements describes why myelinated axons conduct impulses much faster than unmyelinated axons?

- a. because channels have to close at the nodes
- b. because voltage is not lost along myelinated areas
- c. because of shorter axons
- d. because of available energy

Chapter 2 - Cell Physiology

ANSWER: b

133. Because of the presence of both activation and inactivation gates, voltage-gated Na^+ channels can be in which of these states?

- a. closed but capable of opening
- b. inhibited
- c. partially closed
- d. partially opened

ANSWER: a

134. Which of these nerve fibres will have the highest conduction velocity?

- a. an unmyelinated nerve fibre with conduction velocity = 0.35 m/sec
- b. an unmyelinated nerve fibre smaller than nerve fibre a.
- c. a myelinated nerve fibre the same size as nerve fibre a.
- d. a myelinated fibre larger than nerve fibre a.

ANSWER: d

135. During the peak of the action potential, which of these ions has the greatest permeability?

- a. sodium
- b. potassium
- c. calcium
- d. chloride

ANSWER: b

136. Which of these statements does NOT apply to the absolute refractory period?

- a. It refers to the period of time during which another action potential cannot be initiated in a patch of membrane that has just undergone an action potential, no matter how strong the stimulus.
- b. It corresponds to the time period during which the Na^+ gates are first opened and then closed and inactivated.
- c. Immediately following it, the patch of nerve fibre membrane that has just undergone an action potential can be restimulated only by a stronger stimulus than is usually necessary.
- d. It occurs during the after hyperpolarization phase of the action potential.

ANSWER: d

137. Which of these statements describes the action potential?

- a. It has an all-or-none characteristic.
- b. It has no refractory period.
- c. It is triggered by repolarization to threshold.
- d. It speeds transmission by any type of summation.

ANSWER: a

138. Permeability of which of these ions is affected by a positive-feedback mechanism once threshold is reached?

- a. sodium
- b. potassium
- c. calcium

Chapter 2 - Cell Physiology

d. chloride

ANSWER: a

139. Which statement does NOT describe graded potentials?

- a. They are decremental.
- b. They travel only short distances.
- c. They are self-propagating.
- d. They may contribute to the development of an action potential.

ANSWER: c

140. Which of these statements describes the refractory period?

- a. It refers to the time period that promotes the spread of action potentials forward and backward.
- b. It refers to the time period when a recently activated patch of membrane is unresponsive to further stimulation.
- c. It places a lower limit on the frequency with which a neuron cannot conduct action potentials.
- d. It refers to the time period when the magnitude of potential change varies with the magnitude of the triggering event.

ANSWER: b

141. Which of these statements refers to the period of time following an action potential during which a membrane cannot be restimulated, no matter how strong the stimulus is?

- a. the relative refractory period
- b. the period after the Na^+ gates have opened and until they are restored to their “closed but capable of opening” conformation
- c. prevents the action potential from spreading back over the part of the membrane where the impulse has just passed
- d. the depolarization period

ANSWER: d

142. Which of the following describes the nodes of Ranvier?

- a. action potential recordings
- b. breaks in the myelin covering
- c. lipid paths
- d. spaces between neurons

ANSWER: b

143. Which of the following does NOT apply to graded potential?

- a. It can be depolarized.
- b. It can be hyperpolarized.
- c. It can be summated.
- d. It has a refractory period.

ANSWER: d

144. Why does the relative refractory period occur after the action potential is complete?

- a. because of the activation of the voltage-gated Na^+ channels

Chapter 2 - Cell Physiology

- b. because of the slowness of the voltage-gated channels
- c. because of the sodium–potassium pump
- d. because of quick potassium efflux

ANSWER: b

145. Which of the following describes saltatory conduction?

- a. occurs in unmyelinated nerve fibres
- b. is slower than conduction by local current flow because the myelin acts as an insulator to slow the impulse
- c. involves the impulse jumping from one node of Ranvier to the adjacent node
- d. refers to the action potential spreading from one Schwann cell to the adjacent Schwann cell

ANSWER: c

146. Which of these statements does NOT refer to propagation of action potentials?

- a. Saltatory conduction occurs in myelinated nerve fibres.
- b. During conduction by local current flow, there is a flow of current between the active and the adjacent inactive area of the cell membrane, thereby decreasing the potential in the inactive area to threshold.
- c. It jumps from one Schwann cell to the adjacent Schwann cell in a myelinated fibre.
- d. Saltatory conduction is faster than conduction by local current flow.

ANSWER: c

147. Which of these statements refers to neural stem cells?

- a. They come from any embryonic tissues.
- b. They could potentially be used to promote neurogenesis following injury and disease.
- c. They are capable of differentiating into pluripotent cells.
- d. They cannot be grown in culture for prolonged periods.

ANSWER: b

148. What is stored in synaptic vesicles?

- a. hormones
- b. neurotransmitters
- c. sodium ions
- d. glucose

ANSWER: b

149. The binding of a neurotransmitter to inhibitory synapses increases the permeability of the subsynaptic membrane to

-
- a. sodium or chloride
 - b. potassium or calcium
 - c. potassium or chloride
 - d. potassium or sodium

ANSWER: c

150. What is the correct sequence at a synapse?

- a. neurotransmitter diffuses across cleft; calcium induces exocytosis of neurotransmitter; permeability of

Chapter 2 - Cell Physiology

postsynaptic membrane is altered; neurotransmitter binds to receptor on chemically gated channel; ion channels open

- b. neurotransmitter diffuses across cleft; ion channels open; permeability of postsynaptic membrane is altered; calcium induces exocytosis of neurotransmitter; neurotransmitter binds to receptor on chemically gated channel
- c. calcium induces exocytosis of neurotransmitter; neurotransmitter diffuses across cleft; neurotransmitter binds to receptor on chemically gated channel; ion channels open; permeability of postsynaptic membrane is altered
- d. permeability of postsynaptic membrane is altered; neurotransmitter diffuses across cleft; ion channels open; neurotransmitter binds to receptor on chemically gated channel; calcium induces exocytosis of neurotransmitter

ANSWER: c

151. Which of the following is the last step for synaptic signalling when the action potential arrives at the axon terminal of a presynaptic neuron?

- a. A neurotransmitter is released by exocytosis.
- b. Calcium flows in the synaptic knob.
- c. The neurotransmitter combines with protein receptor sites on the subsynaptic membrane.
- d. The permeability is altered in a postsynaptic neuron.

ANSWER: d

152. Which of the following is the first step for synaptic signalling when the action potential arrives at the axon terminal of a presynaptic neuron?

- a. A neurotransmitter is released by exocytosis.
- b. Calcium flows in the synaptic knob.
- c. The neurotransmitter combines with protein receptor sites on the subsynaptic membrane.
- d. The permeability is altered in a postsynaptic neuron.

ANSWER: b

153. What is the normal direction for the movement of an action potential along part of a neuron?

- a. from axon hillock to cell body
- b. from axon terminals to collateral axon
- c. from axon to dendrites
- d. from dendrites to cell body to axon

ANSWER: d

154. What is the term for a branching of axon terminals in which a single cell synapses with and influences many other cells?

- a. divergence
- b. convergence
- c. integration
- d. termination

ANSWER: a

155. What happens to an action potential at an excitatory synapse?

- a. The postsynaptic neuron depolarizes the presynaptic cell membrane.

Chapter 2 - Cell Physiology

- b. The presynaptic neuron increases the permeability of the subsynaptic membrane of the postsynaptic cell to both Na^+ and K^+ .
- c. The presynaptic neuron increases the permeability of the subsynaptic membrane of the postsynaptic cell to K^+ only.
- d. A small hyperpolarization occurs.

ANSWER: b

156. Which of the following occurs at an excitatory synapse?

- a. There is increased permeability of the subsynaptic membrane to both Na^+ and K^+ .
- b. A small hyperpolarization occurs.
- c. An action potential in the presynaptic neuron always causes an action potential in the postsynaptic neuron.
- d. The presynaptic neuron increases the permeability of the subsynaptic membrane of the postsynaptic cell to K^+ only.

ANSWER: a

157. Which of these statements refers to IPSP?

- a. It is produced by increased Na^+ permeability and K^+ permeability.
- b. It is produced by increased K^+ permeability or increased Cl^- permeability.
- c. It is a small depolarization of the postsynaptic neuron.
- d. It is produced by increased Na^+ permeability only.

ANSWER: b

158. Which of these statements does NOT refer to neuronal integration?

- a. Inhibitory synapses cause postsynaptic hyperpolarization.
- b. An inhibitory synapse may result in a postsynaptic sodium channel opening.
- c. An inhibitory synapse may result in increased postsynaptic potassium efflux.
- d. An excitatory synapse causes depolarization of postsynaptic membranes.

ANSWER: b

159. Which of these statements does NOT refer to neuronal inhibition?

- a. With presynaptic inhibition, another neuron selectively excites an inhibitory presynaptic input.
- b. An IPSP depresses information fed into the cell from any excitatory presynaptic input.
- c. All the axon terminals of an inhibitory neuron will release inhibitory transmitter.
- d. An IPSP moves the potential of the postsynaptic neuron farther from threshold.

ANSWER: a

160. Which of these channel types is sensitive to serotonin?

- a. voltage-gated
- b. chemically gated
- c. mechanically gated
- d. acoustically gated

ANSWER: b

Chapter 2 - Cell Physiology

161. Which of the following occurs with presynaptic inhibition in a specific neuron?

- a. An IPSP occurs on the postsynaptic cells.
- b. All excitatory information being fed into the cell is depressed.
- c. The release of excitatory transmitter from a specific presynaptic excitatory input is depressed.
- d. An EPSP occurs in the postsynaptic cells.

ANSWER: c

162. Assume a hypothetical postsynaptic neuron has three presynaptic inputs, X, Y, and Z. When presynaptic neurons X and Y are stimulated simultaneously, the postsynaptic neuron reaches threshold and undergoes an action potential. Yet, when presynaptic neurons X and Z are stimulated simultaneously, there is no change in potential of the postsynaptic neuron. Which of these statements describes the presynaptic neurons Y and Z?

- a. Presynaptic neurons Y and Z are both excitatory.
- b. Presynaptic neurons Y and Z are both inhibitory.
- c. Presynaptic neuron Y is excitatory, and presynaptic neuron Z is inhibitory.
- d. Presynaptic neuron Y is inhibitory, and presynaptic neuron Z is excitatory.

ANSWER: c

163. Which of these statements describes the result of a neuron being experimentally stimulated at both ends simultaneously?

- a. The action potentials pass in the middle and travel to the opposite ends.
- b. The action potentials meet in the middle and are then propagated back to their starting positions.
- c. The action potentials stop as they meet in the middle.
- d. The stronger action potential overrides the weaker action potential.

ANSWER: c

164. Which of these statements describes what happens when temporal summation takes place?

- a. Two EPSPs from the same presynaptic input occur so closely together in time that they add together, or sum.
- b. An EPSP and an IPSP occur simultaneously and cancel each other out.
- c. Two EPSPs that occur simultaneously from different presynaptic inputs add together, or sum.
- d. Action potentials occurring in two presynaptic inputs simultaneously converge upon the postsynaptic cell, initiating two different action potentials in the postsynaptic cell.

ANSWER: a

165. Which of these statements describes when spatial summation occurs in a postsynaptic neuron?

- a. when several EPSPs from a single presynaptic input sum to reach threshold
- b. when EPSPs from several presynaptic inputs sum to reach threshold
- c. upon simultaneous interaction of an EPSP and an IPSP
- d. when several IPSPs from a single presynaptic input sum to hyperpolarize the membrane

ANSWER: b

166. Which of the following describes divergence?

- a. Thousands of synapses from many presynaptic neurons end on a single postsynaptic cell.
- b. The dendrites diverge from the cell body to contact as many presynaptic neurons as possible.
- c. The action potential initiated in the axon diminishes as it diverges into the axon terminals.

Chapter 2 - Cell Physiology

- d. The axon of a nerve cell branches to synapse with many other cells, so that activity in one neuron influences the excitability of many other cells.

ANSWER: d

167. Which of the following occurs in convergence?

- a. Thousands of synapses from many different presynaptic cells end on a single postsynaptic cell.
- b. The axon of a nerve cell branches so that the activity in one neuron influences many other cells.
- c. All the dendrites converge on the cell body.
- d. The action potential initiated in the axon diminishes as it diverges into the axon terminals.

ANSWER: a

168. Presynaptic facilitation results from which of the following?

- a. alteration of calcium permeability
- b. continued EPSP generations
- c. neuromodulator effects
- d. increased neurotransmitter production

ANSWER: a

169. Which of these statements describes neuromodulators?

- a. They bind to receptors at nonsynaptic sites.
- b. They contribute directly to EPSP and IPSP formation.
- c. They may influence neurotransmitter production.
- d. They directly alter membrane permeability.

ANSWER: c

170. Which of the following is NOT a neuropeptide?

- a. acetylcholine
- b. dopamine
- c. epinephrine
- d. glucagon

ANSWER: d

171. Which of these statements describes neuropeptides?

- a. They are sometimes cosecreted along with classical neurotransmitters.
- b. They are synthesized in the cytosol of the axon terminal.
- c. They act at the subsynaptic membrane of the postsynaptic neuron.
- d. They usually alter the potential of postsynaptic cells by opening specific ion channels.

ANSWER: a

172. Which of these statements describes tetanus toxin?

- a. It combines with glycine receptors, thus blocking the action of this inhibitory neurotransmitter.
- b. It destroys dopamine in the region of the brain that is involved in controlling complex movements.
- c. It prevents the release of gamma-aminobutyric acid from presynaptic inputs terminating on neurons that supply skeletal muscles.

Chapter 2 - Cell Physiology

d. It promotes presynaptic facilitation.

ANSWER: c

XYZ

For the following questions, assume a hypothetical postsynaptic neuron has three presynaptic inputs: X, Y, and Z. Also assume that presynaptic neurons Y and Z are excitatory.

173. Refer to the text. If presynaptic neuron X is stimulated, the postsynaptic cell membrane becomes slightly hyperpolarized. What kind of a synapse is involved between presynaptic neuron X and the postsynaptic neuron?

- a. excitatory synapse
- b. inhibitory synapse
- c. either an excitatory or an inhibitory synapse
- d. collateral axoaxonic

ANSWER: b

174. Refer to the text. What permeability changes would be expected to occur at the postsynaptic neuron when presynaptic neuron X is stimulated? (Remember that the postsynaptic neuron becomes hyperpolarized by presynaptic neuron X.)

- a. increased P_{Na^+} and P_{K^+}
- b. increased P_{K^+} or P_{Cl^-}
- c. increased P_{A^-}
- d. increased $P_{Ca^{2+}}$

ANSWER: b

175. Refer to the text. If presynaptic neuron Y is stimulated, the postsynaptic cell membrane becomes slightly depolarized. What kind of synapse is involved between presynaptic neuron Y and the postsynaptic neuron?

- a. excitatory synapse
- b. inhibitory synapse
- c. either an excitatory or an inhibitory synapse
- d. there is no synapse

ANSWER: a

176. Refer to the text. What permeability changes would be expected to occur at the postsynaptic neuron when presynaptic neuron Y is stimulated? (Remember that the postsynaptic neuron becomes depolarized by presynaptic neuron Y.)

- a. increased P_{Na^+} and P_{K^+}
- b. increased P_{K^+} or P_{Cl^-}
- c. increased P_{A^-}
- d. increased $P_{Ca^{2+}}$

ANSWER: a

177. Refer to the text. If presynaptic neurons Y and Z are stimulated simultaneously, what change would be expected to occur in the postsynaptic neuron?

Chapter 2 - Cell Physiology

- a. a single EPSP
- b. a single IPSP
- c. temporal summation of EPSPs
- d. spatial summation of EPSPs

ANSWER: d

178. Refer to the text. If presynaptic neurons X and Z are stimulated simultaneously, what change would be expected to occur in the postsynaptic neuron?

- a. a single EPSP
- b. a single IPSP
- c. temporal summation of EPSPs
- d. IPSP and EPSP would cancel each other out, so there would be essentially no change in potential in the postsynaptic neuron.

ANSWER: d

179. Refer to the text. If presynaptic neuron Z is repeatedly stimulated very rapidly, what change would be expected to occur in the postsynaptic neuron?

- a. a single EPSP
- b. a single IPSP
- c. temporal summation of EPSPs
- d. spatial summation of EPSPs

ANSWER: c

180. Electron microscopes are about 100 times more powerful than light microscopes.

- a. True
- b. False

ANSWER: True

181. DNA's genetic code is transcribed into messenger RNA.

- a. True
- b. False

ANSWER: True

182. The cytosol is the gel-like mass of the cytoplasm.

- a. True
- b. False

ANSWER: True

183. DNA in the nucleus has the genetic instructions to make enzymatic proteins.

- a. True
- b. False

ANSWER: True

184. The nucleus indirectly governs most cellular activities by directing the kinds and amounts of various

Chapter 2 - Cell Physiology

enzymes and other proteins that are produced by the cell.

- a. True
- b. False

ANSWER: True

185. 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.

- a. True
- b. False

ANSWER: True

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

- a. True
- b. False

ANSWER: True

187. Rough ER is most abundant in cells specialized for steroid production.

- a. True
- b. False

ANSWER: False

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

- a. True
- b. False

ANSWER: True

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

- a. True
- b. False

ANSWER: True

190. The lysosomes are one site of protein synthesis.

- a. True
- b. False

ANSWER: False

191. The smooth ER specializes in protein metabolism.

- a. True
- b. False

ANSWER: False

192. Secretory vesicles are released to the exterior of the cell by means of the process of phagocytosis.

- a. True

Chapter 2 - Cell Physiology

b. False

ANSWER: False

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

a. True

b. False

ANSWER: True

194. Coated vesicles enclose a representative mixture of proteins present in the Golgi sac before budding off.

a. True

b. False

ANSWER: False

195. All cell organelles are renewable.

a. True

b. False

ANSWER: True

196. Mitochondria are presumed to be descendants of primitive bacterial cells.

a. True

b. False

ANSWER: True

197. Endocytosis can be accomplished by phagocytosis and pinocytosis.

a. True

b. False

ANSWER: True

198. Phagocytosis is a specialized form of endocytosis used for bringing in extracellular fluids.

a. True

b. False

ANSWER: False

199. The peroxisomes mainly generate hydrogen peroxide.

a. True

b. False

ANSWER: True

200. Glycolysis generates ATP from glucose with high efficiency.

a. True

b. False

ANSWER: False

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

Chapter 2 - Cell Physiology

- a. True
- b. False

ANSWER: True

202. Most intermediary metabolism is accomplished in the cytosol.

- a. True
- b. False

ANSWER: True

203. Oxidative phosphorylation generates the most ATP per glucose molecule.

- a. True
- b. False

ANSWER: True

204. Vaults serve as cellular trucks for transport from cytoplasm to nucleus

- a. True
- b. False

ANSWER: False

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

- a. True
- b. False

ANSWER: False

206. Amoeboid movement is accomplished by transitions of the cytosol between a gel and a solid state as a result of alternate assembly and disassembly, respectively, of actin filaments.

- a. True
- b. False

ANSWER: True

207. The protective, waterproof outer layer of skin is formed by the tough skeleton of the microtrabecular lattice that persists after the surface skin cells die.

- a. True
- b. False

ANSWER: False

208. Cilia in the respiratory tract beat in the same direction to sweep inspired particles up and out of the airways.

- a. True
- b. False

ANSWER: True

209. Hockey is a winter sport that uses only an aerobic energy supply.

- a. True
- b. False

Chapter 2 - Cell Physiology

ANSWER: False

210. Lack of aerobic exercise can have negative health implications, such as heart disease and high blood pressure.

- a. True
- b. False

ANSWER: True

211. Under an electron microscope, the plasma membrane appears as a trilaminar structure consisting of two dark layers separated by a light middle layer.

- a. True
- b. False

ANSWER: True

212. According to the fluid mosaic model of membrane structure, the plasma membrane consists primarily of a bilayer of mobile phospholipid molecules studded with an ever-changing mosaic pattern of proteins.

- a. True
- b. False

ANSWER: True

213. In the lipid bilayer of the plasma membrane, the hydrophobic tails of the phospholipids orient toward the centre of the membrane, away from water.

- a. True
- b. False

ANSWER: True

214. In the plasma membrane, the polar ends of the phospholipid molecules are hydrophilic.

- a. True
- b. False

ANSWER: True

215. The hydrophobic interior of the lipid bilayer of the plasma membrane blocks the passage of water-soluble substances.

- a. True
- b. False

ANSWER: True

216. The surface carbohydrates within the plasma membrane serve as cell adhesion molecules (CAMs), which cells use to grip one another and surrounding connective tissue fibres.

- a. True
- b. False

ANSWER: False

217. The primary barrier to passage of water-soluble substances across the plasma membrane is the outer layer of carbohydrates.

- a. True

Chapter 2 - Cell Physiology

b. False

ANSWER: False

218. The carbohydrate found in plasma membranes is believed to be involved in the aggregation of cells to form tissue.

a. True

b. False

ANSWER: True

219. The two dark lines in the trilaminar appearance of the plasma membrane are believed to be caused by the preferential staining of the hydrophilic polar regions of the membrane constituents.

a. True

b. False

ANSWER: True

220. Sheets of epithelial cells are joined by gap junctions.

a. True

b. False

ANSWER: False

221. Gap junctions function as channels between cells.

a. True

b. False

ANSWER: True

222. Gap junctions play an important role in transmission of impulses for heart contraction.

a. True

b. False

ANSWER: True

223. A first messenger is an intracellular chemical messenger that triggers a preprogrammed series of biochemical events within a cell to bring about a desired response.

a. True

b. False

ANSWER: False

224. The only means by which an extracellular chemical messenger can bring about a desired intracellular response is to activate a second messenger system.

a. True

b. False

ANSWER: False

225. One extracellular messenger molecule can ultimately influence the activity of only one protein molecule within the cell.

a. True

b. False

Chapter 2 - Cell Physiology

ANSWER: False

226. One chemical messenger molecule can ultimately induce the production of millions of molecules of a secretory product by a cell.

- a. True
- b. False

ANSWER: True

227. The extracellular matrix and the local cells that secrete it are collectively known as connective tissue.

- a. True
- b. False

ANSWER: True

228. Because of the presence of tight junctions, passage of materials across an epithelial barrier must take place between the cells, not through them.

- a. True
- b. False

ANSWER: True

229. Fibronectin is the extracellular matrix component that provides tensile strength.

- a. True
- b. False

ANSWER: False

230. Because a solution of lower solute concentration has a higher concentration of water, it exerts a lower osmotic pressure than does a solution with a higher solute concentration.

- a. True
- b. False

ANSWER: True

231. Sodium and potassium ions are highly soluble in lipids.

- a. True
- b. False

ANSWER: False

232. Oxygen enters the blood from the lungs by net diffusion.

- a. True
- b. False

ANSWER: True

233. Carrier molecules always require energy to accomplish transport of a substance across the membrane.

- a. True
- b. False

ANSWER: False

Chapter 2 - Cell Physiology

234. Phosphorylation of a carrier can alter the affinity of its binding sites, accompanied by a change in its conformation.

- a. True
- b. False

ANSWER: True

235. The carrier molecule actually moves from side to side through the membrane as it transports material across.

- a. True
- b. False

ANSWER: False

236. All molecules greater than 0.8 nm in diameter are unable to penetrate the plasma membrane unless there is a carrier for the molecule.

- a. True
- b. False

ANSWER: False

237. If two similar molecules can both combine with the same carrier, the presence of one of these molecules decreases the rate of entry of the other.

- a. True
- b. False

ANSWER: True

238. Pinocytosis, or “cell drinking,” refers to the process of a cell engulfing a large, solid particle and bringing it into the contents of the cell.

- a. True
- b. False

ANSWER: False

239. Pinocytosis refers to the process of a cell engulfing a large, multimolecular particle and bringing the particle into the contents of the cell.

- a. True
- b. False

ANSWER: False

240. The predominant cation in the intracellular fluid is calcium.

- a. True
- b. False

ANSWER: False

241. Anions are attracted toward a more positively charged area along an electrical gradient.

- a. True
- b. False

ANSWER: True

242. Anions tend to move toward a negatively charged area.

Chapter 2 - Cell Physiology

- a. True
- b. False

ANSWER: False

243. Cations are attracted to a more positively charged area along an electrical gradient.

- a. True
- b. False

ANSWER: False

244. If a concentration or electrical gradient is present for a given substance, the substance will always passively permeate the membrane.

- a. True
- b. False

ANSWER: False

245. At the equilibrium potential for K^+ , the concentration and electrical gradients for K^+ are in opposition to each other and exactly balance each other so there is no net movement of K^+ .

- a. True
- b. False

ANSWER: True

246. According to the Nernst equation, the equilibrium potential for a given ion decreases as the difference in concentration of the ion outside and inside the cell increases.

- a. True
- b. False

ANSWER: False

247. The equilibrium potential for K^+ is less than the resting membrane potential.

- a. True
- b. False

ANSWER: False

248. Osmosis does not occur if the concentration gradients for water and solutes are absent in a system.

- a. True
- b. False

ANSWER: True

249. Facilitated diffusion is passive and does not require energy.

- a. True
- b. False

ANSWER: True

250. Movement of K^+ into the cell requires energy expenditure, whereas movement of Na^+ into the cell does not.

- a. True

Chapter 2 - Cell Physiology

b. False

ANSWER: True

251. Movement of potassium into cells always requires energy expenditure.

a. True

b. False

ANSWER: True

252. At resting membrane potential, no ionic fluxes are taking place across the membrane.

a. True

b. False

ANSWER: False

253. When equilibrium is achieved and no net diffusion is taking place, there is no movement of molecules.

a. True

b. False

ANSWER: False

254. At resting membrane potential, passive and active forces exactly balance each other so there is no net movement of ions across the membrane.

a. True

b. False

ANSWER: True

255. Net sodium movement into the cell occurs passively, whereas net sodium movement out of the cell occurs actively.

a. True

b. False

ANSWER: True

256. At resting potential, the outside of the cell is negative compared to the intracellular fluid.

a. True

b. False

ANSWER: False

257. The large protein anion does not leave the cell because there is no concentration or electrical gradient to drive it outward.

a. True

b. False

ANSWER: False

258. The sodium–potassium pump indirectly offers the energy source for glucose transport across intestinal cells.

a. True

b. False

ANSWER: True

Chapter 2 - Cell Physiology

259. In active transport, ATP energy is used in the phosphorylation–dephosphorylation cycle of the carrier.

- a. True
- b. False

ANSWER: True

260. Most of the membrane potential of the plasma membrane is established by the active transport of sodium and potassium ions.

- a. True
- b. False

ANSWER: True

261. In secondary active transport, energy is required directly by the carrier to move a substance uphill against a concentration gradient.

- a. True
- b. False

ANSWER: False

262. Nerve and muscle cells establish resting membrane potentials.

- a. True
- b. False

ANSWER: True

263. In a graded potential, the direction of current flow is designated by the movement of positive charges.

- a. True
- b. False

ANSWER: True

264. The passive current flow of a graded potential fades quickly.

- a. True
- b. False

ANSWER: True

265. The Na^+ and K^+ channels that open and close during an action potential are voltage-gated channels.

- a. True
- b. False

ANSWER: True

266. A spike is another name for the axon of a neuron.

- a. True
- b. False

ANSWER: False

267. Threshold potential is the peak potential achieved during an action potential.

- a. True
- b. False

Chapter 2 - Cell Physiology

ANSWER: False

268. After an action potential has occurred, there is more Na^+ inside the cell than outside the cell (before any Na^+-K^+ pump activity has taken place).

- a. True
- b. False

ANSWER: False

269. During the resting potential, many potassium channels are open in the plasma membrane.

- a. True
- b. False

ANSWER: True

270. Action potentials can be summed.

- a. True
- b. False

ANSWER: False

271. Action potentials may result from hyperpolarization or depolarization.

- a. True
- b. False

ANSWER: False

272. For graded potentials, the magnitude of triggering is coded for in frequency rather than amplitude of depolarizations.

- a. True
- b. False

ANSWER: False

273. Schwann cells promote axonal growth, while oligodendrocytes inhibit it.

- a. True
- b. False

ANSWER: True

274. The refractory period limits the frequency of action potentials.

- a. True
- b. False

ANSWER: True

275. The diffusion of potassium ions re-establishes the resting membrane potential in a neuron immediately after it develops an action potential.

- a. True
- b. False

ANSWER: True

276. During conduction by local current flow, current flows locally between the active and the adjacent inactive area of

Chapter 2 - Cell Physiology

the cell membrane, thereby decreasing the potential in the inactive area to threshold.

- a. True
- b. False

ANSWER: True

277. A high percentage of sodium and potassium ions move during each action potential.

- a. True
- b. False

ANSWER: False

278. Along a neuron, an action potential normally travels from the dendrites to the cell body to the axon.

- a. True
- b. False

ANSWER: True

279. The axon hillock occurs between the cell body and the axon of a neuron.

- a. True
- b. False

ANSWER: True

280. The nerve fibre is another name for the nucleus of a neuron.

- a. True
- b. False

ANSWER: False

281. The nodes of Ranvier are formed by Schwann cells or oligodendrocytes that wrap themselves “jelly roll fashion” around the axon.

- a. True
- b. False

ANSWER: False

282. The myelin on a myelinated fibre in the peripheral nervous system consists of Schwann cells wrapped around the axon.

- a. True
- b. False

ANSWER: True

283. The myelin covering the axon promotes the leakage of ions from the neuron.

- a. True
- b. False

ANSWER: False

284. The conduction velocity of a nerve impulse is slower in myelinated fibres than in unmyelinated fibres because myelin acts as an insulator that slows the flow of current.

- a. True

Chapter 2 - Cell Physiology

b. False

ANSWER: False

285. An unmyelinated fibre with a large diameter can conduct action potentials more rapidly than an unmyelinated fibre with a smaller diameter.

a. True

b. False

ANSWER: True

286. Myelinated fibres in both the central and the peripheral nervous systems are capable of regenerating when cut.

a. True

b. False

ANSWER: False

287. Oligodendrocytes form a regeneration tube to guide a regenerating nerve fibre to its proper destination.

a. True

b. False

ANSWER: False

288. The stronger the stimulus, the greater the frequency of action potentials generated in a neuron.

a. True

b. False

ANSWER: True

289. Action potentials are initiated at the axon hillock region because it has the lowest threshold voltage.

a. True

b. False

ANSWER: True

290. The period of time following an action potential during which a membrane cannot be restimulated, no matter how strong the stimulus, is known as the subminimal response period.

a. True

b. False

ANSWER: False

291. The refractory period prevents action potentials from spreading back over the part of the membrane where the impulse has just passed.

a. True

b. False

ANSWER: True

292. During the relative refractory period, a neuron is completely refractory and no response to any kind of stimulus

a. True

b. False

ANSWER: False

Chapter 2 - Cell Physiology

293. During the absolute refractory period, the Na^+ gates are not capable of opening again in response to another triggering event.

- a. True
- b. False

ANSWER: True

294. A stimulus that is too weak to depolarize the membrane to threshold produces an action potential smaller than normal.

- a. True
- b. False

ANSWER: False

295. A stronger stimulus above threshold produces a greater action potential in a neuron.

- a. True
- b. False

ANSWER: False

296. Spatial summation involves only one neuron influencing one other neuron.

- a. True
- b. False

ANSWER: False

297. A postsynaptic neuron can either excite or inhibit a presynaptic neuron.

- a. True
- b. False

ANSWER: False

298. The dendrites of a presynaptic neuron directly signal the axon of a postsynaptic neuron.

- a. True
- b. False

ANSWER: False

299. A single neuron may be presynaptic to one group of neurons and postsynaptic to another group of neurons.

- a. True
- b. False

ANSWER: True

300. The synapse is a specialized part of a neuron.

- a. True
- b. False

ANSWER: False

301. Increased permeability of the postsynaptic cell to Cl^- lessens the likelihood that the postsynaptic cell will undergo an action potential because the membrane potential is moved farther away from threshold.

Chapter 2 - Cell Physiology

- a. True
- b. False

ANSWER: True

302. A single synaptic knob contains two different transmitters—one that produces EPSPs and one that produces IPSPs.

- a. True
- b. False

ANSWER: False

303. A given synapse may produce EPSPs at one time and IPSPs at another time.

- a. True
- b. False

ANSWER: False

304. The release of a chemical messenger at the synapse immediately stimulates potassium permeability in the postsynaptic neuron.

- a. True
- b. False

ANSWER: False

305. A balance of IPSPs and EPSPs will negate each other so that the grand postsynaptic potential is essentially unaltered.

- a. True
- b. False

ANSWER: True

306. The only way in which a neurotransmitter-receptor combination can influence the postsynaptic cell is to directly alter its permeability to specific ions.

- a. True
- b. False

ANSWER: False

307. Neurotransmitters do not always bind to receptors attached to ion channels.

- a. True
- b. False

ANSWER: True

308. The summation of all IPSPs and EPSPs determines whether a postsynaptic neuron will fire.

- a. True
- b. False

ANSWER: True

309. Temporal summation occurs when EPSPs from several different excitatory presynaptic inputs occur simultaneously.

- a. True
- b. False

ANSWER: False

Chapter 2 - Cell Physiology

310. Neuropeptides are mainly neuromodulators.

- a. True
- b. False

ANSWER: True

311. The grand postsynaptic potential depends on the sum of activity of the presynaptic inputs.

- a. True
- b. False

ANSWER: True

312. Presynaptic neurons converging upon a postsynaptic cell will be either all excitatory or all inhibitory.

- a. True
- b. False

ANSWER: False

313. Divergence refers to the neuronal arrangement wherein the dendrites diverge to synapse with as many presynaptic inputs as possible.

- a. True
- b. False

ANSWER: False

314. Classical neurotransmitters and neuropeptides are sometimes cosecreted from the same axon terminal.

- a. True
- b. False

ANSWER: True

315. Canadian researchers have suggested that the increased production of mucus in Cystic Fibrosis may be associated with the body's immune system.

- a. True
- b. False

ANSWER: True

316. Describe the pathway that newly synthesized polypeptides take en route for secretion.

ANSWER: Answers will vary.

317. Describe aerobic cellular respiration from a mechanistic point of view.

ANSWER: Answers will vary.

318. How is ATP synthesized via electron transport and oxidative phosphorylation?

ANSWER: Answers will vary.

319. Describe the major aspects of the cytoskeleton.

ANSWER: Answers will vary.

Chapter 2 - Cell Physiology

320. Describe the structure and function of cilia and flagella.

ANSWER: Answers will vary.

321. Discuss the role of channel proteins in establishment of resting and action potentials.

ANSWER: Answers will vary.

322. How are action potentials propagated?

ANSWER: Answers will vary.

323. Describe neuronal integration.

ANSWER: Answers will vary.

324. Compare and contrast neuromodulation and presynaptic inhibition/facilitation.

ANSWER: Answers will vary.

325. Describe some of the ways in which drugs or disease can influence the nervous system at the neuronal level.

ANSWER: Answers will vary.

326. Michael is using the electron microscope at the hospital to review the structures of skeletal muscle cells. He notices that the skeletal muscle cells have many nuclei and are loaded with mitochondria. Why is this so?

ANSWER: Answers will vary.

327. Describe the differences between rough ER and smooth ER.

ANSWER: Answers will vary.

Match the terms, labelled a. through c., with their characteristics, labelled 1. (Options may be used more than once or not at all.)

a. glycolysis

b. citric acid cycle

c. oxidative phosphorylation

328. directly uses inspired oxygen

ANSWER: c

329. does not directly use inspired oxygen

ANSWER: a

330. takes place in the cytosol

ANSWER: a

331. takes place in the mitochondrial matrix

ANSWER: b

332. takes place on the inner mitochondrial membrane

ANSWER: c

Chapter 2 - Cell Physiology

333. low yield of ATP

ANSWER: a

334. high yield of ATP

ANSWER: c

Match the vesicles, labelled a. through c., with their characteristics. (Options may be used more than once or not at all.)

a. transport vesicles

b. coated vesicles

c. secretory vesicles

335. originate from the Golgi complex

ANSWER: b

336. originate from the endoplasmic reticulum

ANSWER: a

337. contain newly synthesized molecules

ANSWER: a

338. contents emptied to the exterior by exocytosis

ANSWER: c

339. enclosed in a clathrin framework

ANSWER: b

340. fuse with and enter the Golgi complex

ANSWER: a

341. contents become concentrated over time

ANSWER: c

342. contents are unloaded at a specific intracellular compartment

ANSWER: b

Match the terms, labelled a. through f., to their correct descriptions. (Options may be used more than once or not at all.)

a. plasma membrane

b. nucleus

c. cytoplasm

d. cytosol

e. organelles

f. cytoskeleton

Chapter 2 - Cell Physiology

343. houses the cell's DNA

ANSWER: b

344. responsible for cell shape and movement

ANSWER: f

345. highly organized membrane-bound intracellular structures

ANSWER: e

346. selectively controls movement of molecules between the intracellular fluid and the extracellular fluid

ANSWER: a

347. consists of organelles and cytosol

ANSWER: c

348. site of intermediary metabolism

ANSWER: d

349. permit incompatible chemical reactions to occur simultaneously in the cell

ANSWER: e

350. separates contents of the cell from its surroundings

ANSWER: a

351. site of fat and glycogen storage

ANSWER: d

Match the terms, labelled a. through i., to their descriptions. (Options may be used more than once or not at all.)

a. endoplasmic reticulum (ER)

b. Golgi complex

c. lysosome

d. peroxisome

e. mitochondrion

f. vault

g. free ribosome

h. microtubule

i. microfilament

352. contains powerful oxidative enzymes important in detoxifying various wastes

ANSWER: d

353. an important component of cilia and flagella

ANSWER: h

Chapter 2 - Cell Physiology

354. one continuous extensive organelle consisting of a network of tubules and flattened filament

ANSWER: a

355. removes unwanted cellular debris and foreign material

ANSWER: c

356. the powerhouse of the cell

ANSWER: e

357. acts as a mechanical stiffener

ANSWER: i

358. synthesizes proteins for use in the cytosol

ANSWER: g

359. consists of stacks of flattened sacs

ANSWER: b

360. shaped like an octagonal barrel

ANSWER: f

Match the terms, labelled a. through c., to their descriptions. (Options may be used more than once or not at all.)

a. flagella

b. cilia

c. microvilli

361. hair-like motile protrusions

ANSWER: b

362. increase the surface area of the small intestine's epithelium

ANSWER: c

363. sweep mucus and debris out of respiratory airways

ANSWER: b

364. increase the surface area of the kidney tubules

ANSWER: c

365. enable sperm to move

ANSWER: a

366. whip-like appendages

ANSWER: a

367. guide egg to oviduct

Chapter 2 - Cell Physiology

ANSWER: b

Match the terms, labelled a. through d., to their descriptions. (Options may be used more than once or not at all.)

- a. microtubules
- b. microfilaments
- c. intermediate filaments
- d. micro trabecular lattice

368. the largest of the cytoskeletal elements

ANSWER: a

369. present in parts of the cell subject to mechanical stress

ANSWER: c

370. smallest element visible with a conventional electron microscope

ANSWER: b

371. consist of actin

ANSWER: b

372. organizes the glycolytic enzymes in a sequential alignment

ANSWER: d

373. form the mitotic spindle

ANSWER: a

374. essential for creating and maintaining an asymmetrical cell shape

ANSWER: a

375. composed of tubulin

ANSWER: a

376. provide a pathway for axonal transport

ANSWER: a

377. visible only with a high-voltage electron microscope

ANSWER: d

378. play(s) a key role in muscle contraction

ANSWER: b

379. slide past each other to cause ciliary bending

ANSWER: a

Match the cellular proteins, labelled a. through e., with their correct characteristic.

Chapter 2 - Cell Physiology

- a. dynamin
- b. tubulin
- c. kinesin
- d. actin
- e. ribophorin

380. causes pinching off of endocytic vesicles

ANSWER: a

381. serves as binding site for ribosomes

ANSWER: e

382. comprises intermediate filaments

ANSWER: d

383. comprises microtubules

ANSWER: b

384. provides for transport of vesicles

ANSWER: c

Match the result, labelled a. or b., with the force and involved ion in question. (Options may be used more than once or not at all.)

- a. The ion tends to be moved into the cell by this force.
- b. The ion tends to be moved out of the cell by this force.

385. concentration gradient for K^+ at resting potential

ANSWER: b

386. electrical gradient for K^+ at resting potential

ANSWER: a

387. electrical gradient for K^+ at E_{K^+}

ANSWER: a

388. concentration gradient for Na^+ at resting potential

ANSWER: a

389. electrical gradient for Na^+ at resting potential

ANSWER: a

390. electrical gradient for Na^+ at E_{Na^+}

ANSWER: b

391. Na^+-K^+ pump for Na^+

Chapter 2 - Cell Physiology

ANSWER: b

392. Na^+ - K^+ pump for K^+

ANSWER: a

Match the ions, labelled a. through d., with their various roles. (Options may be used more than once or not at all.)

a. Na^+

b. K^+

c. A^-

d. Cl^-

393. cation in greatest concentration in the ICF

ANSWER: b

394. cation in greatest concentration in the ECF

ANSWER: a

395. anion in greatest concentration in the ICF

ANSWER: c

396. anion in greatest concentration in the ECF

ANSWER: d

397. ion whose equilibrium potential is greater than the resting membrane potential

ANSWER: b

398. ion whose equilibrium potential is opposite in charge of the resting membrane potential

ANSWER: a

399. ion whose equilibrium potential is exactly equal to the resting membrane potential

ANSWER: d

400. cation to which the membrane is most permeable under resting conditions

ANSWER: b

401. anion to which the membrane is impermeable

ANSWER: c

402. ion that has the predominant influence on the resting membrane potential

ANSWER: b

403. ion that is actively transported out of the cell

ANSWER: a

404. ion that is actively transported into the cell

ANSWER: b

Chapter 2 - Cell Physiology

405. ion whose concentration gradient is established by the membrane potential

ANSWER: d

The following questions refer to comparative concentrations, permeabilities, and potentials under various circumstances. Match the relationship between the two items, A. and B., with the qualifications labelled a. through c. (Options may be used more than once or not at all.)

a. A is greater than B

b. B is greater than A

c. A and B are equal

406. A. concentration of K^+ in the extracellular fluid

B. concentration of K^+ in the intracellular fluid of a resting nerve cell

ANSWER: b

407. A. concentration of Na^+ in the extracellular fluid

B. concentration of Na^+ in the intracellular fluid of a resting nerve cell

ANSWER: a

408. A. concentration of A^- in the extracellular fluid

B. concentration of A^- in the intracellular fluid of a resting nerve cell

ANSWER: b

409. A. permeability of a resting nerve cell membrane to K^+

B. permeability of a resting nerve cell membrane to A^-

ANSWER: a

410. A. permeability of a resting nerve cell membrane to K^+

B. permeability of a resting nerve cell membrane to Na^+

ANSWER: a

411. A. concentration gradient for K^+ at the equilibrium potential for K^+

B. electrical gradient for K^+ at the equilibrium potential for K^+

ANSWER: c

412. A. resting membrane potential in a typical nerve cell

B. equilibrium potential for K^+

ANSWER: b

413. A. amount of Na^+ transported out of the cell by the Na^+-K^+ pump

B. amount of K^+ transported into the cell by the Na^+-K^+ pump

ANSWER: a

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

Chapter 2 - Cell Physiology

ANSWER: plasma membrane; nucleus; cytoplasm
nucleus; cytoplasm; plasma membrane
cytoplasm; plasma membrane; nucleus

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

ANSWER: intracellular fluid; extracellular fluid

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

ANSWER: nucleus; cytoplasm
cytoplasm; nucleus

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

ANSWER: Messenger

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

ANSWER: smooth

419. The signal-recognition protein recognizes both the _____ on the ribosome and the _____ on the ER, then delivers the proper ribosome to the proper site on the rough ER for binding.

ANSWER: leader sequence; ribophorin

420. Insulin is a long _____ chain.

ANSWER: polypeptide

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

ANSWER: proteins; lipids

422. The sarcoplasmic reticulum stores _____ ions.

ANSWER: calcium

423. Products destined for intracellular transport are packaged in _____, whereas products for export are packaged in _____.

ANSWER: coated vesicles; secretory vesicles

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

ANSWER: Exocytosis

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

ANSWER: Dynamin

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

ANSWER: endocytosis

Name: _____ Class: _____ Date: _____

Chapter 2 - Cell Physiology

427. Lysosomes contain _____ enzymes that are capable of digesting and removing unwanted debris from the cell.

ANSWER: hydrolytic

428. Lysosomes that have completed their digestive activities are known as _____.

ANSWER: residual bodies

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

ANSWER: Catalase

430. ADP and P_i are formed from the breakdown of the molecule _____.

ANSWER: adenosine triphosphate
ATP

431. _____ refers collectively to the large set of intracellular chemical reactions that involve the degradation, synthesis, and transformation of small organic molecules.

ANSWER: Intermediary metabolism

432. The decomposition of hydrogen peroxide produces _____ and _____ molecules.

ANSWER: water; oxygen
oxygen; water

433. _____ is a peroxisomal enzyme that breaks down hydrogen peroxide.

ANSWER: Catalase

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

ANSWER: pyruvic acid

435. The metabolism of acetyl CoA into the citric acid cycle depends on the availability of _____ for the cell.

ANSWER: oxygen

436. _____ join the lateral edges of epithelial cells together near their luminal borders, thus preventing passage of materials between the cells.

ANSWER: Tight junctions

437. The plasma membrane is not impermeable, but it is _____.

ANSWER: semipermeable

438. Net diffusion of water down its own concentration gradient toward an area of higher solute concentration is known as _____.

ANSWER: osmosis

439. A/an _____ solution has the same osmolarity as normal body cells.

ANSWER: isotonic

Name: _____ Class: _____ Date: _____

Chapter 2 - Cell Physiology

440. If red blood cells are placed in a _____ solution, water enters, causing them to swell.

ANSWER: hypotonic

441. If red blood cells are placed in a _____ solution, water leaves the cells, causing them to crenate.

ANSWER: hypertonic

442. _____ diffusion allows materials to pass through the membrane by a carrier protein without the expenditure of energy.

ANSWER: Facilitated

443. In a(n) _____ transport, materials may be moved “uphill” and are concentrated in a cell.

ANSWER: active

444. The _____ refers to the maximum amount of a substance that can be transported across the plasma membrane via a carrier in a given time.

ANSWER: transport maximum

T_m

445. Active transport is a kind of _____ transport.

ANSWER: carrier-mediated

446. The three characteristics that determine the kind and amount of material that can be moved across a membrane by carrier-mediated transport are _____, _____, and _____.

ANSWER: competition; saturation; specificity (in any order)

447. In facilitated diffusion, particles move from a _____ concentration to a _____ concentration.

ANSWER: higher; lower

448. In active transport, a substance moves from an area of _____ concentration to an area of _____ concentration.

ANSWER: lower; higher

449. In active transport, the stomach pumps _____ ions into its lumen.

ANSWER: hydrogen

450. Endocytosis and exocytosis are both kinds of _____ transport.

ANSWER: vesicular

451. When a neuron fires a signal, a resting membrane potential is converted into a(n) _____ potential.

ANSWER: action

452. _____ are cave-like indentations on the outer surface of the plasma membrane.

ANSWER: Caveolae

453. The membrane potential that exists when the concentration and electrical gradients for a given ion exactly counterbalance each other is known as the _____.

Chapter 2 - Cell Physiology

ANSWER: equilibrium potential

454. _____ refers to a separation of opposite charges across the membrane.

ANSWER: Membrane potential

455. At the equilibrium potential for an ion, its _____ gradient is exactly counterbalanced by its electrical gradient.

ANSWER: concentration

456. The _____ equation equates the equilibrium potential for an ion with the ion's concentration difference outside and inside the cell.

ANSWER: Nernst

457. Communication between neurons occurs by the release of _____, which are chemical messengers.

ANSWER: neurotransmitters

458. _____ is the effector protein in the cyclic AMP pathway.

ANSWER: Adenylate cyclase

459. _____ is a positive ion that tends to leak out of cells passively.

ANSWER: Potassium

460. _____ is a positive ion that tends to leak into cells.

ANSWER: Sodium

461. The resting membrane potential of a typical nerve cell is about _____ millivolts.

ANSWER: -70

462. A plasma membrane has a polarization if it separates particles with an opposite _____.

ANSWER: charge

463. At _____ potential, typically around -55 mV, rapid depolarization occurs.

ANSWER: threshold

464. Electrical quantities called _____ are gated in the plasma membrane for the development of membrane potentials.

ANSWER: voltages

465. _____ is the hindrance to electrical charge movement.

ANSWER: Resistance

466. _____ along axons reduces resistance and, hence, increases impulse velocity.

ANSWER: Myelin

467. At the end of repolarization, the newly opened channels for _____ ions close.

ANSWER: potassium

Name: _____ Class: _____ Date: _____

Chapter 2 - Cell Physiology

468. When a neuron starts to depolarize, _____ ions move into the cell.

ANSWER: sodium

469. A single nerve cell, also called a(n) _____, typically consists of the following three basic parts: _____, _____, and _____.

ANSWER: neuron
axon; cell body; dendrites (in any order)

470. The _____, or _____, of a nerve cell is a single, elongated tubular process that conducts action potentials away from the cell body and eventually terminates at other cells.

ANSWER: axon; nerve fibre
nerve fibre; axon

471. Axons can range in length from less than a millimetre to over one _____.

ANSWER: metre

472. During the resting membrane potential, the inside of a neuron is net _____ by charge.

ANSWER: negative

473. An increase in the size of the _____ of a nerve fibre increases its rate of conduction.

ANSWER: diameter

474. The junction between two neurons is known as a(n) _____.

ANSWER: synapse

475. An action potential in a presynaptic neuron induces opening of voltage-gated _____ channels in the synaptic knob, which triggers exocytosis of synaptic vesicles.

ANSWER: Na^+
sodium ion

476. _____ cells form myelin around neurons in the peripheral nervous system.

ANSWER: Schwann

477. Myelinated fibres conduct impulses about _____ times faster than unmyelinated fibres of the same diameter.

ANSWER: 50
fifty

478. Large, myelinated fibres can conduct impulses near the rate of _____ metres per second.

ANSWER: 120

479. _____ are chemical messengers that bind to neuronal receptors at nonsynaptic sites and alter the effectiveness of ongoing synaptic activity.

ANSWER: Neuromodulators

480. When EPSPs occurring simultaneously from two different presynaptic inputs add together or sum to bring the postsynaptic cell to threshold, it is called _____.

ANSWER: spatial summation

Name: _____ Class: _____ Date: _____

Chapter 2 - Cell Physiology

481. A neuron fires an impulse by the _____ law.

ANSWER: all-or-none

482. At the synapse, a presynaptic neuron signals a _____ neuron.

ANSWER: postsynaptic

483. When EPSPs originating from a single presynaptic input occur so close together in time that they add together, or sum, thereby bringing the postsynaptic cell to threshold, it is called _____.

ANSWER: temporal summation

484. The neuronal relationship in which a single presynaptic cell branches to terminate on many other cells is called _____.

ANSWER: divergence

485. The neuronal relationship in which many presynaptic cells terminate on a single postsynaptic cell is called _____.

ANSWER: convergence

486. A given synapse is always excitatory or _____.

ANSWER: inhibitory

487. Neurotransmitters are small, _____ acting molecules.

ANSWER: rapid

488. Neuropeptides are large, _____ acting molecules.

ANSWER: slow

489. Repeated firings of one presynaptic neuron can produce _____ summation.

ANSWER: temporal

490. Neuropeptides are stored in _____ vesicles.

ANSWER: dense-core

491. Axon terminals possess _____ voltage-gated channels that, when operational, induce neurotransmitter release.

ANSWER: calcium

492. _____ are molecules produced by nerve cells and that bind to nonsynaptic receptors.

ANSWER: Neuromodulators