

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

*Indicate whether the statement is true or false.*

1. Secretory vesicles are about 200 times larger than transport vesicles.
  - a. True
  - b. False
2. Sheets of epithelial cells are joined by gap junctions.
  - a. True
  - b. False
3. The stronger the stimulus, the greater the frequency of action potentials generated in a neuron.
  - a. True
  - b. False
4. Temporal summation occurs when EPSPs from several different excitatory presynaptic inputs occur simultaneously.
  - a. True
  - b. False
5. When equilibrium is achieved and no net diffusion is taking place, there is no movement of molecules.
  - a. True
  - b. False
6. Action potentials can be summed.
  - a. True
  - b. False
7. Action potentials are initiated at the axon hillock region because it has the lowest threshold voltage.
  - a. True
  - b. False
8. 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
9. If a concentration or electrical gradient is present for a given substance, the substance will always passively permeate the membrane.
  - a. True
  - b. False
10. A postsynaptic neuron can either excite or inhibit a presynaptic neuron.
  - a. True
  - b. False
11. Carrier molecules always require energy to accomplish transport of a substance across the membrane.
  - a. True
  - b. False

**chapter 2**

12. The cytosol is the gel-like mass of the cytoplasm.
  - a. True
  - b. False
  
13. Presynaptic neurons converging upon a postsynaptic cell will be either all excitatory or all inhibitory.
  - a. True
  - b. False
  
14. 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
  
15. A given synapse may produce EPSPs at one time and IPSPs at another time.
  - a. True
  - b. False
  
16. 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
  
17. 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
  
18. 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
  
19. Net sodium movement into the cell occurs passively, whereas net sodium movement out of the cell occurs actively.
  - a. True
  - b. False
  
20. All cell organelles are renewable.
  - a. True
  - b. False
  
21. 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
  
22. Schwann cells promote axonal growth, while oligodendrocytes inhibit it.
  - a. True

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

b. False

23. 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

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

a. True

b. False

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

a. True

b. False

26. Dynein is a mitochondrial enzyme.

a. True

b. False

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

a. True

b. False

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

a. True

b. False

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

a. True

b. False

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

a. True

b. False

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

a. True

b. False

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

a. True

b. False

33. During the relative refractory period, a neuron is completely refractory.

a. True

b. False

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

34. Endocytosis can be accomplished by phagocytosis and pinocytosis.
- True
  - False
35. The nucleus indirectly governs most cellular activities by directing the kinds and amounts of various enzymes and other proteins that are produced by the cell.
- True
  - False
36. Gap junctions play an important role in transmission of impulses for heart contraction.
- True
  - False
37. A high percentage of sodium and potassium ions move during each action potential.
- True
  - False
38. The grand postsynaptic potential depends on the sum of activity of the presynaptic inputs.
- True
  - False
39. The refractory period limits the frequency of action potentials.
- True
  - False
40. The axon hillock occurs between the cell body and the axon of a neuron.
- True
  - False
41. Anions tend to move toward a negatively charged area.
- True
  - False
42. The carrier molecule actually moves from side to side through the membrane as it transports material across.
- True
  - False
43. In the lipid bilayer of the plasma membrane, the hydrophobic tails of the phospholipids orient toward the centre of the membrane, away from water.
- True
  - False
44. The lysosomes are one site of protein synthesis.
- True
  - False

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

45. The myelin on a myelinated fibre in the peripheral nervous system consists of Schwann cells wrapped around the axon.
- a. True
  - b. False
46. The passive current flow of a graded potential fades quickly.
- a. True
  - b. False
47. Facilitated diffusion is passive and does not require energy.
- a. True
  - b. False
48. Most of the membrane potential of the plasma membrane is established by the active transport of sodium and potassium ions.
- a. True
  - b. False
49. Mitochondria are presumed to be descendants of primitive bacterial cells.
- a. True
  - b. False
50. During the resting potential, many potassium channels are open in the plasma membrane.
- a. True
  - b. False
51. Fibronectin is the extracellular matrix component that provides tensile strength.
- a. True
  - b. False
52. The myelin covering the axon promotes the leakage of ions from the neuron.
- a. True
  - b. False
53. In a graded potential, the direction of current flow is designated by the movement of positive charges.
- a. True
  - b. False
54. Osmosis does not occur if the concentration gradients for water and solutes are absent in a system.
- a. True
  - b. False
55. 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

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

56. One chemical messenger molecule can ultimately induce the production of millions of molecules of a secretory product by a cell.
- True
  - False
57. During conduction by local current flow, current flows locally between the active and the adjacent inactive area of the cell membrane, thereby decreasing the potential in the inactive area to threshold.
- True
  - False
58. At resting potential, the outside of the cell is negative compared to the intracellular fluid.
- True
  - False
59. The  $\text{Na}^+$  and  $\text{K}^+$  channels that open and close during an action potential are voltage-gated channels.
- True
  - False
60. At resting membrane potential, no ionic fluxes are taking place across the membrane.
- True
  - False
61. Rough ER is most abundant in cells specialized for steroid production.
- True
  - False
62. The nerve fibre is another name for the nucleus of a neuron.
- True
  - False
63. Glycolysis generates ATP from glucose with high efficiency.
- True
  - False
64. Cations are attracted to a more positively charged area along an electrical gradient.
- True
  - False
65. The synapse is a specialized part of a neuron.
- True
  - False
66. Neuropeptides are mainly neuromodulators.
- True
  - False
67. Spatial summation involves only one neuron influencing one other neuron.

**chapter 2**

- a. True
  - b. False
68. 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
69. Cilia in the respiratory tract beat in the same direction to sweep inspired particles up and out of the airways.
- a. True
  - b. False
70. DNA's genetic code is transcribed into messenger RNA.
- a. True
  - b. False
71. Increased permeability of the postsynaptic cell to  $\text{Cl}^-$  lessens the likelihood that the postsynaptic cell will undergo an action potential because the membrane potential is moved farther away from threshold.
- a. True
  - b. False
72. 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
73. At the equilibrium potential for  $\text{K}^+$ , the concentration and electrical gradients for  $\text{K}^+$  are in opposition to each other and exactly balance each other so there is no net movement of  $\text{K}^+$ .
- a. True
  - b. False
74. After an action potential has occurred, there is more  $\text{Na}^+$  inside the cell than outside the cell (before any  $\text{Na}^+-\text{K}^+$  pump activity has taken place).
- a. True
  - b. False
75. 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
76. A single neuron may be presynaptic to one group of neurons and postsynaptic to another group of neurons.
- a. True
  - b. False
77. The smooth ER specializes in protein metabolism.

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

- a. True
- b. False

78. 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

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

- a. True
- b. False

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

- a. True
- b. False

81. Action potentials may result from hyperpolarization or depolarization.

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

86. 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

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

- a. True
- b. False



Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

88. One extracellular messenger molecule can ultimately influence the activity of only one protein molecule within the cell.
- True
  - False
89. At resting membrane potential, passive and active forces exactly balance each other so there is no net movement of ions across the membrane.
- True
  - False
90. Movement of  $K^+$  into the cell requires energy expenditure, whereas movement of  $Na^+$  into the cell does not.
- True
  - False
91. Oligodendrocytes form a regeneration tube to guide a regenerating nerve fibre to its proper destination.
- True
  - False
92. Oxidative phosphorylation generates the most ATP per glucose molecule.
- True
  - False
93. A single synaptic knob contains two different transmitters—one that produces EPSPs and one that produces IPSPs.
- True
  - False
94. For graded potentials, the magnitude of triggering is coded for in frequency rather than amplitude of depolarizations.
- True
  - False
95. The diffusion of potassium ions re-establishes the resting membrane potential in a neuron immediately after it develops an action potential.
- True
  - False
96. 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.
- True
  - False
97. 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.
- True
  - False
98. All molecules greater than 0.8 nm in diameter are unable to penetrate the plasma membrane unless there is a carrier for the molecule.

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

- a. True
- b. False

99. 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

100. Most intermediary metabolism is accomplished in the cytosol.

- a. True
- b. False

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

- a. True
- b. False

102. During the absolute refractory period, the Na<sup>+</sup> gates are not capable of opening again in response to another triggering event.

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

105. 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

106. Nerve and muscle cells establish resting membrane potentials.

- a. True
- b. False

107. 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

108. The peroxisomes mainly generate hydrogen peroxide.

- a. True
- b. False

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

112. 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
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

117. Gap junctions function as channels between cells.

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

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

- a. True
- b. False

121. 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

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

128. 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

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

- a. True
- b. False

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

- a. True

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

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

- a. True
- b. False

*Indicate the answer choice that best completes the statement or answers the question.*

136. Select the substance that promotes cell adhesion.

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

137. Which of the following statements correctly describes carrier-mediated transport?

- a. It involves a specific membrane protein that serves as a carrier molecule.
- b. It always moves substances against a concentration gradient.
- c. It always requires energy expenditure.
- d. It always moves substances along a concentration gradient.

138. Which of these statements is correct for NADH?

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

139. Which of the following is NOT a neuropeptide?

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

**chapter 2**

d. glucagon

140. Which of the following correctly 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.

141. Where is the trigger zone of a neuron?

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

142. The falling phase of the action potential is due to which of the following conditions?

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

143. Which of the following statements concerning cells is correct?

- a. Not every cell can perform certain basic functions essential to its own survival.
- b. The average human cell is about 100 times smaller than the smallest particle visible by the unaided eye.
- c. The cells of all organisms are fundamentally different in structure and function.
- d. Every muscle cell contains a single nucleus.

144. Which of these statements is correct for “neuromodulators”?

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

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

- a. NADH
- b. ATP
- c. pyruvic acid
- d. FADH<sub>2</sub>

146. Which of these substances is most likely to passively diffuse 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

**chapter 2**

147. 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.

148. Which of the following 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

149. 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  $FADH_2$

150. Which of the following statements concerning gap junctions is NOT correct?

- a. Gap junctions are communicating junctions.
- b. At a gap junction, 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.
- c. Gap junctions are formed by small connecting tunnels that link two adjacent cells and permit exchange of small water-soluble particles between the cells.
- d. Gap junctions play an important role in transmission of electrical activity throughout an entire muscle mass.

151. Which of the following descriptions of movement of molecules across the plasma membrane is correct?

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

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

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

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

**chapter 2**

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

154. What is the universal energy currency in cells?

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

155. What is the correct sequence at a synapse?

- (1) neurotransmitter diffuses across cleft
  - (2) calcium induces exocytosis of neurotransmitter
  - (3) permeability of postsynaptic membrane altered
  - (4) ion channels open
  - (5) neurotransmitter binds to receptor on chemically gated channel
- a. 1, 2, 3, 5, 4
  - b. 1, 4, 3, 2, 5
  - c. 2, 1, 5, 4, 3
  - d. 3, 1, 4, 5, 2

156. The cellular component that, once activated by the binding of an extracellular messenger to a surface receptor, in turn activates cyclic AMP is \_\_\_\_\_.

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

157. What accounts for the most ATP production?

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

158. What 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.

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

- a. opening of  $\text{Na}^+$  gates
- b.  $\text{Na}^+-\text{K}^+$  pump restoring the ions to their original locations



**chapter 2**

- c. greatly increased permeability to  $\text{Na}^+$
  - d. opening of  $\text{K}^+$  gates and  $\text{K}^+$  efflux
160. What is the primary determinant of a membrane's selective permeability?
- 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
161. Which of the following is the correct statement about passive diffusion?
- a. It depends on random motion.
  - b. It involves active forces.
  - c. Its rate increases as the temperature decreases.
  - d. Molecules move from a lower concentration to a higher concentration.
162. Under which of these circumstances does an action potential develop?
- a. when threshold voltage is reached
  - b. when voltage-gated  $\text{K}^+$  channels open and the membrane reaches about  $-40$  millivolts
  - c. when spatial and/or temporal summation of graded potentials are cancelled
  - d. when  $\text{Cl}^-$  enters the cell
163. 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
164. Which of these statements correctly 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.
165. Which of these statements correctly describes the concentration gradient for  $\text{Na}^+$ ?
- a. It favours its movement into the cell at resting potential.
  - b. It favours its movement out of the cell at resting potential.
  - c. Net outward movement is continued until equilibrium.
  - d.  $\text{Na}^+$  equilibrium potential is  $-60$  mV.
166. What type of junctions are desmosomes, tight, and gap junctions, respectively?
- a. adhering, communicating, and impermeable, respectively
  - b. communicating, impermeable, and adhering, respectively
  - c. adhering, impermeable, and communicating, respectively

**chapter 2**

d. communicating, adhering, and impermeable, respectively

167. By osmosis, a water molecule always moves to an area of higher \_\_\_\_\_.

- a. electrical intensity
- b. fluid pressure
- c. mitochondrial activity
- d. solute concentration

168. Insulin promotes the uptake of glucose into cells by \_\_\_\_\_.

- a. carrier-mediated transport
- b. endocytosis
- c. exocytosis
- d. osmosis

169. Which of these statements correctly 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.

170. Which of these organelles is associated with the rough ER?

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

171. 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

172. Two adjacent presynaptic knobs, one from neuron A and the other from neuron B, synapse on a third neuron C. The two presynaptic knobs simultaneously release transmitter, as a result of which an action potential is initiated in neuron C. This is an example of \_\_\_\_\_.

- a. temporal summation
- b. spatial summation
- c. divergence
- d. depolarization

173. What is cystic fibrosis caused by?

- a. thick mucus build-up
- b. salt accumulation by increased levels of insulin
- c. chloride channels in plasma membranes
- d. potassium channels in plasma membranes

**chapter 2**

174. A leukocyte, a type of white blood cell, fights bacterial infections by sending out projections of its plasma membrane that surround an invading bacterium. The membrane then fuses together, entrapping the bacterium in a vesicle inside the cell. What is this an example of?

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

175. Which of the following is the correct statement about 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.

176. Which of the following statements about membrane permeability and ion potential is correct?

- 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.

177. Presynaptic facilitation results from which of the following?

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

178. What is the function of ATP synthase?

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

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

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

180. 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

**chapter 2**

181. What is the resting membrane potential of a typical nerve cell?
- +70 mV
  - +50 mV
  - 50 mV
  - 70 mV
182. Which of the following occurs at an excitatory synapse?
- There is increased permeability of the subsynaptic membrane to both  $\text{Na}^+$  and  $\text{K}^+$ .
  - A small hyperpolarization occurs.
  - An action potential in the presynaptic neuron always causes an action potential in the postsynaptic neuron.
  - Presynaptic neuron increases the permeability of the subsynaptic membrane of the postsynaptic cell to  $\text{K}^+$  only.
183. Which of the following correctly describes the nodes of Ranvier?
- action potential recordings
  - breaks in the myelin covering
  - lipid paths
  - spaces between neurons
184. Which of these statements correctly describes the result of a neuron being experimentally stimulated at both ends simultaneously?
- The action potentials would pass in the middle and travel to the opposite ends.
  - The action potentials would meet in the middle and then be propagated back to their starting positions.
  - The action potentials would stop as they met in the middle.
  - The stronger action potential would override the weaker action potential.
185. Which of the following is NOT part of the extracellular matrix?
- watery, gel-like ground substance
  - connexon
  - collagen
  - elastin
186. Which of the following organelles is NOT membrane bound?
- lysosome
  - ribosome
  - mitochondrion
  - peroxisome
187. Which of the following statements does NOT correctly describe cells?
- All living cells have a membrane potential.
  - Rapid changes in membrane potential in muscle cells trigger abnormal muscle twitching.
  - The cell's interior (ICF) is slightly more negative than ECF.
  - The cell's membrane is more permeable to  $\text{K}^+$  than to  $\text{Na}^+$ .

**chapter 2**

188. Which of the following 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  $\text{Na}^+$  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

189. Which of the following structures is located in the nucleus of the cell?

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

190. Which of the following correctly 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.
- 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.

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.

191. If presynaptic neurons Y and Z are stimulated simultaneously, what change would you expect to occur in the postsynaptic neuron?

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

192. Which of these statements is correct for nicotinamide adenine dinucleotide (NAD)?

- a. It converts  $\text{ADP} + \text{P}_i$  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.

193. Which of the following correct describes the refractory period?

- a. It promotes the spread of action potentials forward and backward.
- b. It refers to the time period during which a portion of the membrane that has just undergone an action potential cannot undergo another action potential in response to normal triggering events because the channels opened during the action potential have not been restored to their “closed but capable of opening” conformation.
- c. It places a lower limit on the frequency with which a neuron cannot conduct action potentials
- d. It refers to the repolarizing period.

**chapter 2**

194. Which of the following can be found within the nucleus?
- deoxyribonucleic acid
  - cytosol
  - plasma membrane
  - endoplasmic reticulum
195. The rising phase of the action potential is due to which of the following conditions?
- calcium equilibrium
  - potassium efflux
  - potassium influx
  - sodium influx
196. A change in a membrane potential from  $-70$  mV to  $-60$  mV is an example of which of the following?
- depolarization
  - hyperpolarization
  - polarization
  - repolarization
197. Permeability of which of these ions is affected by a positive feedback mechanism once threshold is reached?
- sodium
  - potassium
  - calcium
  - chloride
198. Which of the following molecules directly enters the citric acid cycle?
- acetyl CoA
  - adenosine diphosphate
  - citric acid
  - oxaloacetic acid
199. Where is the nucleus of a neuron housed?
- axon
  - axon hillock
  - cell body
  - collaterals
200. Which of these statements is correct for neural stem cells?
- They come from any embryonic tissues.
  - They could potentially be used to promote neurogenesis following injury and disease.
  - They are capable of differentiating into pluripotent cells.
  - They cannot be grown in culture for prolonged periods
201. Which of the following occurs when a membrane is stimulated due to opening of chemically gated  $\text{Na}^+$  channels?
- An impulse is propagated.
  - A graded potential is established.

**chapter 2**

- c. An action potential is established.
  - d. The voltage becomes more negative.
202. What 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.
203. Which of these statements about the action potential is correct?
- 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.
204. Which of the following is NOT an action 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
205. What is the definition of *aerobic*?
- a. in the blood
  - b. with carbon dioxide
  - c. with oxygen
  - d. without carbon dioxide
206. Which statement is NOT correct regarding the Golgi complex?
- a. It sorts and directs products to their final destination.
  - b. It modifies proteins chemically.
  - c. It produces secretory vesicles.
  - d. It is responsible for protein synthesis.
207. Which of the following is NOT a function of membrane proteins?
- a. to serve as channels
  - b. to determine the fluidity of the membrane
  - c. to serve as carriers
  - d. to serve as receptor sites
208. What does chemiosmosis do?
- a. releases CO<sub>2</sub>
  - b. extracts energy from a H<sup>+</sup> concentration gradient
  - c. reduces NAD

**chapter 2**

d. ferments pyruvic acid to lactic acid

209. 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 correctly 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.

210. Which of the following does NOT correctly describe graded potential?

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

211. Which of the following statements concerning propagation of action potentials is NOT correct?

- 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. The action potential 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.

212. Which of these statements is correct for 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.

213. 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.

214. Which of these statements is correct for 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.

215. Which of the following regarding "saltatory conduction" is correct?

- a. Saltatory conduction occurs in unmyelinated nerve fibres.
- b. Saltatory conduction is slower than conduction by local current flow because the myelin acts as an insulator to slow the impulse.



**chapter 2**

- c. Saltatory conduction involves the impulse jumping from one node of Ranvier to the adjacent node.
  - d. Saltatory conduction refers to the action potential spreading from one Schwann cell to the adjacent Schwann cell.
216. Which of the following statements correctly describes the electrical gradient for  $K^+$ ?
- a. It favours its movement out of the cell at resting potential.
  - b. It favours its movement 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 lesser is the equilibrium potential.
217. A change in a membrane potential from +30 mV to -70 mV is an example of \_\_\_\_\_.
- a. depolarization
  - b. hyperpolarization
  - c. polarization
  - d. repolarization
218. Which of the following statements concerning the absolute refractory period is NOT accurate?
- a. The absolute refractory period 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. The absolute refractory period corresponds to the time period during which the  $Na^+$  gates are first opened and then closed and inactivated.
  - c. Immediately following the absolute refractory period, 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. The absolute refractory period occurs during the after hyperpolarization phase of the action potential.
219. Which of the following statements is correct for 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.
220. 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
221. 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  $Cl^-$ .

**chapter 2**

222. Why does anaerobic respiration take place when O<sub>2</sub> is unavailable?
- to continue releasing at least some energy from molecules and generate ATP
  - to prevent cell death
  - to make use of available glucose
  - to prevent protein breakdown

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.

223. What permeability changes would you expect to occur at the postsynaptic neuron when presynaptic neuron X is stimulated? (Remember that the postsynaptic neuron becomes hyperpolarized by presynaptic neuron X.)
- increased P<sub>Na<sup>+</sup></sub> and P<sub>K<sup>+</sup></sub>
  - increased P<sub>K<sup>+</sup></sub> or P<sub>Cl<sup>-</sup></sub>
  - increased P<sub>A<sup>-</sup></sub>
  - increased P<sub>Ca<sup>2+</sup></sub>

224. Which of the following does NOT require energy expenditure?
- net movement of potassium into the cell
  - net movement of sodium into the cell
  - iodine uptake by thyroid gland cells
  - transport of hydrogen ion into the stomach lumen in association with hydrochloric acid secretion during digestion of a meal

225. Extracellular messengers binding on surface receptors may exert effects on cells via all the following means EXCEPT which one?
- opening gated channels
  - opening a gated channel through activation of a G protein
  - activation of the adenylyl cyclase system
  - binding to sites and then being endocytosed

226. What does the SNARE complex provide?
- recognition of foreign proteins in the cell
  - binding of correct enzyme with correct substrate
  - means to deliver vesicles to an appropriate site
  - receptor-mediated endocytosis

227. Which statement regarding microfilaments is NOT correct?
- They serve as mechanical stiffeners for microvilli.
  - They are composed of actin subunits.
  - They are the smallest elements of the cytoskeleton.
  - They form mitotic spindles.

228. Which of the following occurs when an excitatory neurotransmitter binds to a nicotinic receptor?
- Voltage-gated Na<sup>+</sup> channels open.

**chapter 2**

- b. Voltage-gated  $K^+$  channels open.
  - c. Chemically gated  $Na^+$  channels open.
  - d. Voltage-gated  $Cl^-$  channels open.
229. Which of the following channel types is sensitive to serotonin?
- a. voltage-gated.
  - b. chemically gated.
  - c. mechanically gated.
  - d. acoustically gated.
230. In which cells are actin and myosin filaments found commonly?
- a. epithelial cells
  - b. muscle cells
  - c. nerve cells
  - d. red blood cells
231. Which of the following statements correct describes 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.
232. Which of the following statements regarding facilitated diffusion is correct?
- 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 its concentration gradient.
233. Which of the following concerning the plasma membrane is correct?
- a. It appears under an electron microscope as a single dark line.
  - b. It is composed primarily of a double layer of phospholipid molecules with proteins interspersed throughout the phospholipids in a mosaic pattern.
  - c. It separates the intra vascular and extracellular fluid.
  - d. It separates the intravascular and intracellular fluid.
234. Where are cristae found?
- a. lysosome
  - b. mitochondrion
  - c. nucleolus
  - d. nucleus
235. Which of these organelles occurs in the lowest numbers within a typical human cell?
- a. mitochondria

**chapter 2**

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

236. Where do the citric acid cycle reactions occur?

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

237. Which of the following statements is correct about 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.

238. Which of the following statements correctly describes mitochondria?

- a. They have an inner fluid-filled space called the crista.
- b. They possess their own DNA.
- c. They are the site for cell reproduction.
- d. They serve as workbenches for protein synthesis

239. Which of the following statements is correct for the 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.

240. Which of the following statements correctly 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.
- d. It promotes presynaptic facilitation.

241. 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.

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

- a. end-plate potential
- b. action potential

**chapter 2**

- c. slow-wave potential
- d. receptor potential

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

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

244. 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 when the inside of the cell becomes more positive than the outside
- c. more permeable to  $\text{Ca}^{2+}$  than normal
- d. in the after hyperpolarization phase of an action potential

245. What does diffusion result from?

- a. ATP-driven processes
- b. ion gradients
- c. inherent kinetic energy of matter
- d. selective permeability

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.

246. If presynaptic neurons X and Z are stimulated simultaneously, what change would you expect 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.

247. The rate of carrier-mediated transport is limited by which one of the following?

- a. protein location in the membrane
- b. osmolarity
- c. tonicity
- d. competition with other molecules

248. 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.

**chapter 2**

249. Assume that a membrane that is permeable to  $\text{Na}^+$  but not to  $\text{Cl}^-$  separates two solutions. The concentration of sodium chloride on side 1 is much higher than on side 2. Which of the following ionic movements will take place?
- $\text{Na}^+$  will move until its concentration gradient is dissipated (i.e., until the concentration of  $\text{Na}^+$  on side 2 is the same as the concentration of  $\text{Na}^+$  on side 1).
  - $\text{Cl}^-$  will move down its concentration gradient from side 1 to side 2.
  - A membrane potential, negative on side 1, will develop.
  - A membrane potential, positive on side 1, will develop.
250. Which of the following are receptor sites on the outer surface of the plasma membrane?
- ATP
  - carbohydrates
  - cyclic AMP
  - proteins

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.

251. 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?
- excitatory synapse
  - inhibitory synapse
  - either an excitatory or an inhibitory synapse
  - collateral axoaxonic
252. Which of the following statements is correct for the  $\text{Na}^+-\text{K}^+$  pump?
- It pumps  $\text{Na}^+$  into the cell.
  - It pumps  $\text{K}^+$  into the cell.
  - It pumps  $\text{K}^+$  out of the cell.
  - It has a higher affinity for  $\text{K}^+$  when the carrier is phosphorylated.
253. Which of the following occurs in convergence?
- Thousands of synapses from many different presynaptic cells end on a single postsynaptic cell.
  - The axon of a nerve cell branches so that the activity in one neuron influences many other cells.
  - The dendrites all converge on the cell body.
  - The action potential initiated in the axon diminishes as it diverges into the axon terminals.
254. All the following statements concerning the  $\text{Na}^+-\text{K}^+$  pump are correct EXCEPT which one?
- The phosphorylated conformation of the  $\text{Na}^+-\text{K}^+$  pump has high affinity for  $\text{K}^+$  when exposed to the ICF.
  - The  $\text{Na}^+-\text{K}^+$  pump has ATPase activity.
  - The  $\text{Na}^+-\text{K}^+$  pump establishes  $\text{Na}^+$  and  $\text{K}^+$  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.
  - The  $\text{Na}^+-\text{K}^+$  pump 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.

**chapter 2**

255. Which of the following is NOT a correct association?

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

256. Which statement regarding the plasma membrane is NOT correct?

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

257. What happens during the rising phase of the action potential?

- 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  $P_{Na^+}$ .

258. Which of the following statements is NOT correct?

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

259. Which of the following statements concerning the plasma membrane is correct?

- a. Under a light microscope, the plasma membrane appears as a trilaminar structure.
- b. The carbohydrates on the outer surface of the membrane 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  $H_2O$ -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.

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

- a. 3
- b. 2
- c. 1
- d. 0

261. Which of these statements concerning a threshold potential is correct?

- 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.

**chapter 2**

- c. It is the point at which there is an explosive increase in  $\text{Na}^+$  permeability.
  - d. It is the potential at which  $\text{K}^+$  permeability increases.
262. Which of the following 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  $\text{K}^+$  than at resting membrane potential.
  - d. It refers to the presence of  $\text{K}^+$  inside the cell.
263. Which of the following statements is correct for 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.
264. Which of the following is correct for 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.
265. Which of the following applies to lysosomes?
- a. They contain powerful hydrolytic enzymes.
  - b. They generate hydrogen peroxide.
  - c. They facilitate intracellular reactions.
  - d. They store excess nutrients
266. Which of the following occurs when chemically gated  $\text{Na}^+$  channels open?
- a. The membrane hyperpolarizes.
  - b. The membrane repolarizes.
  - c. The membrane depolarizes.
  - d. The membrane becomes more negative.
267. Because of the presence of both activation and inactivation gates, voltage-gated  $\text{Na}^+$  channels can be in which of these states?
- a. closed but capable of opening
  - b. inhibited
  - c. partially closed
  - d. partially opened
268. Which of the following is the normal direction for the movement of an action potential along part of a neuron?
- a. axon hillock to cell body
  - b. axon terminals to collateral axon



**chapter 2**

- c. axon to dendrites
- d. dendrites to cell body

269. Which organelles contain oxidative enzymes?

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

270. Which of the following statements is correct for an anaerobic condition?

- a. Oxygen is plenty.
- b. The degradation of glucose cannot proceed beyond glycolysis.
- c. Mitochondrial processing of nutrient molecules takes place.
- d. It produces a high yield of oxygen molecules.

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.

271. 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. axosomatic

272. 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

273. Which of the following is correct about 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.

274. 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  $\text{Na}^+$  gates
- d. an ability to open the  $\text{K}^+$  gates

275. With secondary active transport, the movement of \_\_\_\_\_.

**chapter 2**

- a.  $\text{Na}^+$  into the cell by the cotransport carrier is downhill
  - b.  $\text{Na}^+$  into the cell by the cotransport carrier is uphill
  - c. glucose by the cotransport carrier is uphill
  - d.  $\text{Cl}^-$  into the cell by the cotransport carrier is downhill
276. Why can't the large, negatively charged intracellular proteins ( $\text{A}^-$ ) 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.
277. Which of the following statements regarding membrane proteins is NOT correct?
- a. Membrane protein channels are water-filled pathways.
  - b. Membrane protein channels may be highly selective.
  - c. Membrane proteins may catalyze specific reactions.
  - d. CAMs serve as binding sites for specific ligands.
278. Which of the following statements is correct for integrins?
- a. They create a filamentous meshwork in the inner surface of the membrane.
  - b. They act as membrane-bounded 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.
279. Which of the following is known to be second messengers?
- a. cyclic AMP
  - b. potassium
  - c. ATP
  - d. hormone
280. Which of these processes refers to extrusion of materials to the exterior of the cell through the plasma membrane?
- a. endocytosis
  - b. exocytosis
  - c. phagocytosis
  - d. pinocytosis
281. Which of these statements is correct for smooth endoplasmic reticulum?
- a. It is most abundant in cells specialized for protein secretion.
  - b. It gives rise to transport vesicles containing newly synthesized molecules wrapped in a layer of smooth ER membrane.
  - c. It consists of stacks of relatively flattened sacs called cisternae.
  - d. It has many ribosomes.

**chapter 2**

282. Which of the following statements correctly describes when spatial summation occurs in a postsynaptic neuron?
- when several EPSPs from a single presynaptic input sum to reach threshold
  - when EPSPs from several presynaptic inputs sum to reach threshold
  - upon simultaneous interaction of an EPSP and an IPSP
  - when several IPSPs from a single presynaptic input sum to hyperpolarize the membrane
283. 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 neurotransmitter is released by exocytosis.
  - Calcium flows in the synaptic knob.
  - The neurotransmitter combines with protein receptor sites on the subsynaptic membrane.
  - The permeability is altered in a postsynaptic neuron.
284. Why does the relative refractory period occur after the action potential is complete?
- because of the activation of the voltage-gated  $\text{Na}^+$  channels
  - because of the slowness of the voltage-gated channels
  - because of the sodium-potassium pump
  - because of quick potassium efflux
285. Which of these statements is correct for the rough endoplasmic reticulum?
- It does not contain ribosomes.
  - It synthesizes proteins for export from the cell or for use in construction of a new cellular membrane.
  - It is abundant in cells that specialize in lipid metabolism.
  - It is abundant in liver cells.
286. Osmosis is which of these types of processes?
- carrier-mediated transport
  - diffusion
  - exocytosis
  - pinocytosis

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.

287. If presynaptic neuron Z is repeatedly stimulated very rapidly, what change would you expect to occur in the postsynaptic neuron?
- a single EPSP
  - a single IPSP
  - temporal summation of EPSPs
  - spatial summation of EPSPs
288. 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. What of these conditions can result in glucose in the urine?
- low levels of glucose in the blood
  - transport maximum for renal glucose reached or competitors for glucose carriers
  - low consumption of glucose

**chapter 2**

d. increased availability of glucose carriers

289. Which of the following statements regarding the citric acid cycle is NOT correct?

- 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.

290. In the aerobic respiration process of the cells, when is CO<sub>2</sub> released?

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

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.

291. What permeability changes would you expect 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  $P_{Ca^{2+}}$

292. Which of the following are 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

293. Which of these statements regarding neuronal integration is NOT correct?

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

294. Which of the following statements is NOT correct about the plasma membrane?

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

295. Which statement is NOT correct regarding ribosomes?

**chapter 2**

- 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.

296. Which of these statements correctly describes the resting membrane potential?

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

297. Which of these statements concerning the plasma membrane is correct?

- a. Under an electron microscope, the plasma membrane appears as two dark lines with a light space between.
- b. In its resting state, the plasma membrane is more permeable to  $\text{Na}^+$  than to  $\text{K}^+$ .
- c. The plasma membrane does not contain cholesterol.
- d. The plasma membrane can be seen under an ordinary light microscope.

298. Pinocytosis is a form of which of the following processes?

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

299. Which of the following statements is correct for mitochondria?

- a. The number of mitochondria per cell is the same for every cell.
- b. DNA is enclosed within the cell nucleus and the mitochondria.
- c. The mitochondrial DNA in our cells are copies of our parents' DNA.
- d. Mitochondrial DNA has unlimited ability to repair.

300. Which of the following organelles is NOT covered by a membrane?

- a. the Golgi body
- b. the lysosome
- c. the mitochondrion
- d. the ribosome

301. Which of the following statements concerning neuronal inhibition is NOT correct?

- 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.

302. Which statement regarding graded potentials is NOT correct?

- a. They are decremental.

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

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

303. Which of the following components is NOT always found in a typical human cell?

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

*Enter the appropriate word(s) to complete the statement.*

304. In active transport, a substance moves from an area of \_\_\_\_\_ concentration to an area of \_\_\_\_\_ concentration.

305. At the equilibrium potential for an ion, its \_\_\_\_\_ gradient is exactly counterbalanced by its electrical gradient.

306. If red blood cells are placed in a \_\_\_\_\_ solution, water leaves the cells, causing them to crenate.

307. The sarcoplasmic reticulum stores \_\_\_\_\_ ions.

308. In facilitated diffusion, particles move from a \_\_\_\_\_ concentration to a \_\_\_\_\_ concentration.

309. Insulin is a long \_\_\_\_\_ chain.

310. Repeated firings of one presynaptic neuron can produce \_\_\_\_\_ summation.

311. Lysosomes contain \_\_\_\_\_ enzymes that are capable of digesting and removing unwanted debris from the cell.

312. Axon terminals possess \_\_\_\_\_ voltage-gated channels that, when operational, induce neurotransmitter release.

313. \_\_\_\_\_ diffusion allows materials to pass through the membrane by a carrier protein without the expenditure of energy.

314. 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 \_\_\_\_\_.

315. In active transport, the stomach pumps \_\_\_\_\_ ions into its lumen.

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

317. Large, myelinated fibres can conduct impulses near the rate of \_\_\_\_\_ metres per second.

318. During the resting membrane potential, the inside of a neuron is net \_\_\_\_\_ by charge.

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

319. \_\_\_\_\_ refers to the process of an intracellular vesicle fusing with the plasma membrane, then opening and emptying its contents to the exterior.
320. The three characteristics that determine the kind and amount of material that can be moved across a membrane by carrier-mediated transport are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.
321. A/an \_\_\_\_\_ solution has the same osmolarity as normal body cells.
322. When EPSPs occurring simultaneously from two different presynaptic inputs add together or sum to bring the postsynaptic cell to threshold, it is called \_\_\_\_\_.
323. \_\_\_\_\_ refers to a separation of opposite charges across the membrane.
324. The \_\_\_\_\_ refers to the maximum amount of a substance that can be transported across the plasma membrane via a carrier in a given time.
325. \_\_\_\_\_ cells form myelin around neurons in the peripheral nervous system.
326. \_\_\_\_\_ is a positive ion that tends to leak into cells.
327. Active transport is a kind of \_\_\_\_\_ transport.
328. Endocytosis and exocytosis are both kinds of \_\_\_\_\_ transport.
329. Foreign material to be attacked by lysosomal enzymes is brought into the cell by the process of \_\_\_\_\_.
330. The \_\_\_\_\_ ER is the central packaging and discharge site for molecules to be transported from the ER.
331. A plasma membrane has a polarization if it separates particles with an opposite \_\_\_\_\_.
332. ADP and P<sub>i</sub> are formed from the breakdown of the molecule \_\_\_\_\_.
333. \_\_\_\_\_ is the effector protein in the cyclic AMP pathway.
334. The neuronal relationship in which a single presynaptic cell branches to terminate on many other cells is called \_\_\_\_\_.
335. \_\_\_\_\_ are cave-like indentations on the outer surface of the plasma membrane.
336. The ribosomes of the rough ER synthesize \_\_\_\_\_, whereas its membranous walls contain enzymes essential for the synthesis of \_\_\_\_\_.
337. Axons can range in length from less than a millimetre to over one \_\_\_\_\_.
338. Lysosomes that have completed their digestive activities are known as \_\_\_\_\_.
339. Neuropeptides are large, \_\_\_\_\_ acting molecules.
340. The neuronal relationship in which many presynaptic cells terminate on a single postsynaptic cell is called \_\_\_\_\_.

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

\_\_\_\_\_.

341. The fluid contained within all the cells of the body is known collectively as \_\_\_\_\_, and the fluid outside the cells is referred to as \_\_\_\_\_.

342. When a neuron starts to depolarize, \_\_\_\_\_ ions move into the cell.

343. 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.

344. At the end of repolarization, the newly opened channels for \_\_\_\_\_ ions close.

345. Myelinated fibres conduct impulses about \_\_\_\_\_ times faster than unmyelinated fibres of the same diameter.

346. At the synapse, a presynaptic neuron signals a \_\_\_\_\_ neuron.

347. The metabolism of acetyl CoA into the citric acid cycle depends on the availability of \_\_\_\_\_ for the cell.

348. The decomposition of hydrogen peroxide produces \_\_\_\_\_ and \_\_\_\_\_ molecules.

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

350. \_\_\_\_\_ along axons reduces resistance and, hence, increases impulse velocity.

351. 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.

352. At \_\_\_\_\_ potential, typically around  $-55$  mV, rapid depolarization occurs.

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

354. The resting membrane potential of a typical nerve cell is about \_\_\_\_\_ millivolts.

355. \_\_\_\_\_ is the hindrance to electrical charge movement.

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

357. Net diffusion of water down its own concentration gradient toward an area of higher solute concentration is known as \_\_\_\_\_.

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

359. Electrical quantities called \_\_\_\_\_ are gated in the plasma membrane for the development of membrane potentials.



Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

360. A neuron fires an impulse by the \_\_\_\_\_ law.
361. \_\_\_\_\_ is a protein responsible for pinching off an endocytic vesicle.
362. An increase in the size of the \_\_\_\_\_ of a nerve fibre increases its rate of conduction.
363. The two major parts of the cell's interior are the \_\_\_\_\_ and the \_\_\_\_\_.
364. The three major subdivisions of a cell are the \_\_\_\_\_, the \_\_\_\_\_, and the \_\_\_\_\_.
365. When a neuron fires a signal, a resting membrane potential is converted into a(n) \_\_\_\_\_ potential.
366. A given synapse is always excitatory or \_\_\_\_\_.
367. An action potential in a presynaptic neuron induces opening of voltage-gated \_\_\_\_\_ channels in the synaptic knob, which triggers exocytosis of synaptic vesicles.
368. Neurotransmitters are small, \_\_\_\_\_ acting molecules.
369. Products destined for intracellular transport are packaged in \_\_\_\_\_, whereas products for export are packaged in \_\_\_\_\_.
370. \_\_\_\_\_ is a peroxisomal enzyme that breaks down hydrogen peroxide.
371. The \_\_\_\_\_ equation equates the equilibrium potential for an ion with the ion's concentration difference outside and inside the cell.
372. If red blood cells are placed in a \_\_\_\_\_ solution, water enters, causing them to swell.
373. Neuropeptides are stored in \_\_\_\_\_ vesicles.
374. \_\_\_\_\_ join the lateral edges of epithelial cells together near their luminal borders, thus preventing passage of materials between the cells.
375. \_\_\_\_\_, an enzyme found in peroxisomes, decomposes potentially toxic hydrogen peroxide.
376. \_\_\_\_\_ are molecules produced by nerve cells and that bind to nonsynaptic receptors.
377. Communication between neurons occurs by the release of \_\_\_\_\_, which are chemical messengers.
378. \_\_\_\_\_ is a positive ion that tends to leak out of cells passively.
379. \_\_\_\_\_ RNA carries amino acids to the sites of protein synthesis in the cell.
380. One glucose molecule is converted into two molecules of \_\_\_\_\_ by the end of glycolysis.
381. The plasma membrane is not impermeable, but it is \_\_\_\_\_.

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

382. The junction between two neurons is known as a(n) \_\_\_\_\_.

*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

- 383. the largest of the cytoskeletal elements
- 384. present in parts of the cell subject to mechanical stress
- 385. smallest element visible with a conventional electron microscope
- 386. consist of actin
- 387. organizes the glycolytic enzymes in a sequential alignment
- 388. form the mitotic spindle
- 389. essential for creating and maintaining an asymmetrical cell shape
- 390. composed of tubulin
- 391. provide a pathway for axonal transport
- 392. visible only with a high-voltage electron microscope
- 393. play(s) a key role in muscle contraction
- 394. slide past each other to cause ciliary bending

*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

- 395. houses the cell's DNA
- 396. responsible for cell shape and movement

**chapter 2**

- 397. highly organized membrane-bound intracellular structures
- 398. selectively controls movement of molecules between the intracellular fluid and the extracellular fluid
- 399. consists of organelles and cytosol
- 400. site of intermediary metabolism
- 401. permit incompatible chemical reactions to occur simultaneously in the cell
- 402. separates contents of the cell from its surroundings
- 403. site of fat and glycogen storage

*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

- 404. A. concentration of  $K^+$  in the extracellular fluid  
B. concentration of  $K^+$  in the intracellular fluid of a resting nerve cell
- 405. A. concentration of  $Na^+$  in the extracellular fluid  
B. concentration of  $Na^+$  in the intracellular fluid of a resting nerve cell
- 406. A. concentration of  $A^-$  in the extracellular fluid  
B. concentration of  $A^-$  in the intracellular fluid of a resting nerve cell
- 407. A. permeability of a resting nerve cell membrane to  $K^+$   
B. permeability of a resting nerve cell membrane to  $A^-$
- 408. A. permeability of a resting nerve cell membrane to  $K^+$   
B. permeability of a resting nerve cell membrane to  $Na^+$
- 409. A. concentration gradient for  $K^+$  at the equilibrium potential for  $K^+$   
B. electrical gradient for  $K^+$  at the equilibrium potential for  $K^+$
- 410. A. resting membrane potential in a typical nerve cell  
B. equilibrium potential for  $K^+$
- 411. 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

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

- a.  $Na^+$

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

- b.  $K^+$
- c.  $A^-$
- d.  $Cl^-$

- 412. cation in greatest concentration in the ICF
- 413. cation in greatest concentration in the ECF
- 414. anion in greatest concentration in the ICF
- 415. anion in greatest concentration in the ECF
- 416. ion whose equilibrium potential is greater than the resting membrane potential
- 417. ion whose equilibrium potential is opposite in charge of the resting membrane potential
- 418. ion whose equilibrium potential is exactly equal to the resting membrane potential
- 419. cation to which the membrane is most permeable under resting conditions
- 420. anion to which the membrane is impermeable
- 421. ion that has the predominant influence on the resting membrane potential
- 422. ion that is actively transported out of the cell
- 423. ion that is actively transported into the cell
- 424. ion whose concentration gradient is established by the membrane potential

*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

- 425. contains powerful oxidative enzymes important in detoxifying various wastes
- 426. an important component of cilia and flagella
- 427. one continuous extensive organelle consisting of a network of tubules and flattened filament

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

428. removes unwanted cellular debris and foreign material

429. the powerhouse of the cell

430. acts as a mechanical stiffener

431. synthesizes proteins for use in the cytosol

432. consists of stacks of flattened sacs

433. shaped like an octagonal barrel

*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

434. hair-like motile protrusions

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

436. sweep mucus and debris out of respiratory airways

437. increase the surface area of the kidney tubules

438. enable sperm to move

439. whip-like appendages

440. guide egg to oviduct

*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.

441. concentration gradient for  $K^+$  at resting potential

442. electrical gradient for  $K^+$  at resting potential

443. electrical gradient for  $K^+$  at  $E_{K^+}$

444. concentration gradient for  $Na^+$  at resting potential

445. electrical gradient for  $Na^+$  at resting potential

446. electrical gradient for  $Na^+$  at  $E_{Na^+}$

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

447.  $\text{Na}^+ - \text{K}^+$  pump for  $\text{Na}^+$

448.  $\text{Na}^+ - \text{K}^+$  pump for  $\text{K}^+$

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

a. dynamin

b. tubulin

c. kinesin

d. actin

e. ribophorin

449. causes pinching off of endocytic vesicles

450. serves as binding site for ribosomes

451. comprises intermediate filaments

452. comprises microtubules

453. provides for transport of vesicles

*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

454. originate from the Golgi complex

455. originate from the endoplasmic reticulum

456. contain newly synthesized molecules

457. contents emptied to the exterior by exocytosis

458. enclosed in a clathrin framework

459. fuse with and enter the Golgi complex

460. contents become concentrated over time

461. contents are unloaded at a specific intracellular compartment

*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

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

c. oxidative phosphorylation

462. directly uses inspired oxygen

463. does not directly use inspired oxygen

464. takes place in the cytosol

465. takes place in the mitochondrial matrix

466. takes place on the inner mitochondrial membrane

467. low yield of ATP

468. high yield of ATP

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

470. 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?

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

472. How are action potentials propagated?

473. Describe the major aspects of the cytoskeleton.

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

475. Describe neuronal integration.

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

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

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

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

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

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

**Answer Key**

1. True

2. False

3. True

4. False

5. False

6. False

7. True

8. False

9. False

10. False

11. False

12. True

13. False

14. False

15. False

16. False

17. False

18. True

19. True

20. True

21. True

22. True

23. False

24. True

25. False

26. False



Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

27. False

28. False

29. False

30. True

31. True

32. True

33. False

34. True

35. True

36. True

37. False

38. True

39. True

40. True

41. False

42. False

43. True

44. False

45. True

46. True

47. True

48. True

49. True

50. True

51. False

52. False

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

53. True

54. True

55. False

56. True

57. True

58. False

59. True

60. False

61. False

62. False

63. False

64. False

65. False

66. True

67. False

68. True

69. True

70. True

71. True

72. True

73. True

74. False

75. False

76. True

77. False

78. False

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

79. True

80. True

81. False

82. True

83. True

84. False

85. False

86. True

87. False

88. False

89. True

90. True

91. False

92. True

93. False

94. False

95. True

96. True

97. True

98. False

99. True

100. True

101. True

102. True

103. False

104. True

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

105. False

106. True

107. True

108. True

109. True

110. False

111. False

112. False

113. True

114. True

115. True

116. True

117. True

118. True

119. False

120. False

121. True

122. True

123. False

124. False

125. True

126. False

127. False

128. False

129. True

130. False

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

131. True

132. False

133. True

134. True

135. False

136. d

137. a

138. a

139. d

140. b

141. b

142. b

143. b

144. c

145. c

146. c

147. d

148. c

149. b

150. b

151. c

152. a

153. d

154. a

155. c

156. b

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

157. d

158. c

159. d

160. c

161. a

162. d

163. b

164. a

165. a

166. c

167. d

168. a

169. a

170. d

171. c

172. b

173. c

174. d

175. c

176. c

177. a

178. d

179. b

180. a

181. d

182. a

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

183. b

184. c

185. b

186. b

187. b

188. d

189. d

190. d

191. d

192. c

193. b

194. a

195. d

196. a

197. a

198. a

199. c

200. b

201. b

202. c

203. a

204. a

205. c

206. d

207. b

208. b

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

209. c

210. d

211. c

212. a

213. d

214. b

215. c

216. b

217. d

218. d

219. a

220. b

221. a

222. a

223. b

224. b

225. d

226. c

227. d

228. c

229. b

230. b

231. b

232. a

233. b

234. b



Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

235. d

236. d

237. c

238. b

239. c

240. c

241. c

242. b

243. b

244. b

245. c

246. d

247. d

248. c

249. c

250. d

251. b

252. b

253. a

254. a

255. d

256. a

257. b

258. a

259. c

260. b

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

261. c

262. a

263. a

264. a

265. a

266. c

267. a

268. d

269. a

270. b

271. a

272. a

273. b

274. b

275. a

276. a

277. d

278. d

279. a

280. b

281. b

282. b

283. b

284. b

285. b

286. b

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

287. c

288. b

289. c

290. c

291. a

292. a

293. b

294. d

295. d

296. b

297. a

298. c

299. b

300. d

301. a

302. c

303. c

304. lower; higher

305. concentration

306. hypertonic

307. calcium

308. higher; lower

309. polypeptide

310. temporal

311. hydrolytic

312. calcium

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

313. Facilitated

314. temporal summation

315. hydrogen

316. Intermediary metabolism

317. 120

318. negative

319. Exocytosis

320. competition; saturation; specificity (in any order)

321. isotonic

322. spatial summation

323. Membrane potential

324. transport maximum

$T_m$

325. Schwann

326. Sodium

327. carrier-mediated

328. vesicular

329. endocytosis

330. smooth

331. charge

332. adenosine triphosphate

ATP

333. Adenylate cyclase

334. divergence

335. Caveolae

336. proteins; lipids

337. metre

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

338. residual bodies

339. slow

340. convergence

341. intracellular fluid; extracellular fluid

342. sodium

343. axon; nerve fibre  
nerve fibre; axon

344. potassium

345. 50  
fifty

346. postsynaptic

347. oxygen

348. water; oxygen  
oxygen; water

349. active

350. Myelin

351. leader sequence; ribophorin

352. threshold

353. neuron  
axon; cell body; dendrites (in any order)

354. -70

355. Resistance

356. equilibrium potential

357. osmosis

358. Neuromodulators

359. voltages

360. all-or-none

361. Dynamin

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

362. diameter

363. nucleus; cytoplasm  
cytoplasm; nucleus

364. plasma membrane; nucleus; cytoplasm  
nucleus; cytoplasm; plasma membrane  
cytoplasm; plasma membrane; nucleus

365. action

366. inhibitory

367. Na<sup>+</sup>  
sodium ion

368. rapid

369. coated vesicles; secretory vesicles

370. Catalase

371. Nernst

372. hypotonic

373. dense-core

374. Tight junctions

375. Catalase

376. Neuromodulators

377. neurotransmitters

378. Potassium

379. Messenger

380. pyruvic acid

381. semipermeable

382. synapse

383. a

384. c

385. b

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

386. b

387. d

388. a

389. a

390. a

391. a

392. d

393. b

394. a

395. b

396. f

397. e

398. a

399. c

400. d

401. e

402. a

403. d

404. b

405. a

406. b

407. a

408. a

409. c

410. b

411. a

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

412. b

413. a

414. c

415. d

416. b

417. a

418. d

419. b

420. c

421. b

422. a

423. b

424. d

425. d

426. h

427. a

428. c

429. e

430. i

431. g

432. b

433. f

434. b

435. c

436. b

437. c



Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

438. a

439. a

440. b

441. b

442. a

443. a

444. a

445. a

446. b

447. b

448. a

449. a

450. e

451. d

452. b

453. c

454. b

455. a

456. a

457. c

458. b

459. a

460. c

461. b

462. c

463. a

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

**chapter 2**

464. a

465. b

466. c

467. a

468. c

469. Answers will vary.

470. Answers will vary.

471. Answers will vary.

472. Answers will vary.

473. Answers will vary.

474. Answers will vary.

475. Answers will vary.

476. Answers will vary.

477. Answers will vary.

478. Answers will vary.

479. Answers will vary.

480. Answers will vary.