Chapter 3--The Plasma Membrane and Membrane Potential

1. A single phospholipid in the plasma membrane

   A. has its hydrophobic end next to either the ECF or the cytosol
   B. spans the entire width of the membrane
   C. can function as carrier molecule
   D. all of these
   E. none of these

2. Which statement about the plasma membrane is true?

   A. It appears trilaminar under a light microscope.
   B. Its glycocalyx serves as receptor sites for binding chemical messengers in the ECF.
   C. It is impermeable to lipid-soluble substances.
   D. Some of its carriers transport ions.
   E. Its channels are impermeable to any substance smaller than 0.8 nm in diameter.

3. The plasma membrane

   A. appears under an electron microscope as a double dark line with a light space between
   B. is composed primarily of a double layer of protein molecules with cholesterol molecules interspersed between them
   C. has a hydrophilic region between two hydrophobic regions
   D. all of these
   E. none of these

4. The plasma membrane

   A. has a slight excess of positive charges along its cytosol side during the resting state
   B. is composed primarily of cholesterol surrounded by carbohydrates
   C. is more permeable to K^+ than to Na^+ at the resting state
   D. has peripheral proteins that act as carriers
   E. all of these, except it is composed primarily of cholesterol surrounded by carbohydrates

5. Which of the following is not a function of membrane proteins?

   A. Some act as channels.
   B. They determine the fluidity of the membrane.
   C. Some will transport glucose.
   D. They include docking-marker acceptors.
   E. Some act as enzymes.

6. Identify the true statement(s) about the plasma membrane.

   A. Its lipid region allows most ions to diffuse between the cytosol and ECF.
   B. Its channels allow cholesterol to diffuse between the ECF and cytosol.
   C. Some of its carriers transport sodium.
   D. Its phospholipids are held to one another by CAMs.
   E. All except its phospholipids are held to one another by CAMs.

7. Identify the true statement(s) about the plasma membrane.

   A. Its transmembrane proteins are also peripheral proteins.
   B. Its glycocalyx functions in cell recognition.
   C. Its carriers contain cholesterol.
   D. Its channels allow passage of substances between 0.8 nm and 1 nm in diameter.
   E. Its transmembrane proteins are also peripheral proteins, and its channels allow passage of substances between 0.8 nm and 1 nm in diameter.

8. Identify the incorrect statement about the plasma membrane.

   A. Cholesterol contributes to its stability.
   B. Its lipids may surround CAMs.
   C. Its primary components are glycoproteins and cholesterol.
   D. Its lipid bilayer is flexible.
   E. Its glycocalyx is in contact with ECF.

9. Receptor sites on the outer surface of the plasma membrane are made of

   A. CAMs
   B. carbohydrate
   C. lipid
   D. keratin
   E. proteins

10. Which extracellular fiber does not develop properly in scurvy?

    A. actin
    B. collagen
    C. elastin
    D. fibronectin
    E. myosin

11. Select the substance that promotes cell adhesion.

    A. GLUT
    B. collagen
    C. elastin
    D. fibronectin
    E. glycolipid

12. Which of the following is not associated with an extracellular chemical binding with a membrane-bound receptor?

    A. decreased activity within a certain cell
    B. activation of an ATPase
    C. a change in shape of a transmembrane protein
    D. increased activity within a certain cell
    E. opening of a sodium channel that allows Na^+ to diffuse out of the cell

13. The rate at which "X" can diffuse through a plasma membrane is inversely proportional to the

    A. lipid solubility of X
    B. concentration gradient for X
    C. molecular weight of X
    D. membrane's surface area
    E. lipid solubility and molecular weight of X

14. Cystic fibrosis is caused by abnormal

    A. accumulation of mucus
    B. levels of insulin
    C. chloride channels in plasma membranes
    D. potassium channels in plasma membranes
    E. none of these

15. Integrins

    A. create a filamentous meshwork in the inner surface of the membrane
    B. act as membrane-bounded enzymes
    C. are used for cell recognition purposes
    D. span the membrane, providing a mechanical link between the outer membrane and the cell's surrounding
    E. none of these

16. Which statement about membrane proteins is incorrect?

    A. Channels are water-filled pathways.
    B. Channels are not highly selective.
    C. Carriers are highly selective.
    D. CAMs serve as binding sites for specific ions.
    E. Proteins may work in conjunction with carbohydrates to provide recognition of "self."

17. Which one of the following requires assisted membrane transport?

    A. glucose moving into a cell
    B. K^+ ions moving out of a cell
    C. water moving toward a hypertonic solution
    D. movement of ECF into a cell via pinocytosis
    E. movement of Na^+ through a symporter

18. Collagen

A. provides tensile strength to the cytoskeleton
B. is most abundant in tissues that stretch and then recoil
C. forms the intercellular filaments of desmosomes
D. is the most abundant protein in the ECM
E. all of these

19. Which of the following is not part of the extracellular matrix?

A. complex carbohydrates
B. connexons
C. collagen
D. elastin
E. fibronectin

20. Which statement about gap junctions is incorrect?

A. They consist of protein.
B. They are anchored to plaques on the inside surface of the plasma membrane.
C. They allow materials to pass from one cell into an adjacent cell.
D. They play a role in transmitting electrical activity through the heart.
E. They consist of connexons.

21. Which of the following solutions has a lower osmotic pressure than a human cell's cytosol?

A. one containing only 2% NaCl
B. one containing only 200 mOsm of NaCl
C. one containing only 0.9% NaCl
D. one containing only 300 mOsm of NaCl
E. one containing only 280 mOsm of glucose

22. Tight junctions

A. prevent passage of materials into epithelial cells
B. force materials to pass between cells
C. are commonly found in digestive tract linings
D. all of these
E. none of these

23. ____ are adhering junctions, ____ are impermeable junctions, and ____ are communicating junctions.

A. Tight junctions, gap junctions, desmosomes
B. Desmosomes, gap junctions, tight junctions
C. Gap junctions, desmosomes, tight junctions
D. Gap junctions, tight junctions, desmosomes
E. none of these

24. Selective permeability of the membrane is primarily determined by

    A. membrane phospholipids
    B. how much cholesterol is present
    C. the number and type of membrane proteins
    D. the charge of the membrane
    E. none of these

25. Carrier-mediated transport

    A. involves a specific membrane protein
    B. always moves substances against a concentration gradient
    C. always requires energy expenditure
    D. involves protein channels
    E. all of these

26. Facilitated diffusion

    A. involves a protein channel
    B. requires energy expenditure
    C. is how glucose in the intestinal lumen moves into cells in the digestive lining
    D. involves a protein channel and is how glucose in the intestinal lumen moves into cells in the digestive lining
    E. all of these

27. Select the correct statement about diffusion through a membrane.

    A. It depends on random motion.
    B. It involves active forces.
    C. Its rate increases as the membrane's surface area decreases.
    D. Ions move from a lower concentration to a higher concentration.
    E. Large molecules diffuse faster than small molecules.

28. The rate of diffusion for water-soluble substances through a membrane decreases as

    A. their concentration gradient increases
    B. their molecular weight increases
    C. the number of cholesterol molecules in the membrane increases
    D. the membrane's surface area increases
    E. the number of membrane carbohydrates increases

29. Which of the following is correct?

A. Exocytosis increases the surface area of the plasma membrane.
B. Phagocytosis can help remove cytoplasmic debris from the cytosol.
C. Exocytosis is triggered by the binding of a particle in the ECF to a receptor site on the plasma membrane.
D. Exocytosis increases the surface area of the plasma membrane, and is triggered by the binding of a particle in the ECF to a receptor site on the plasma membrane.
E. None of these.

30. Which statement about movement into the cytosol is false?

A. If glucose and sodium can both combine with the same carrier, the presence of one of these molecules decreases the rate of entry of the other.
B. In simple diffusion, the rate of entry of an ion is directly proportional to its concentration in the cytosol.
C. When a glucose symporter becomes saturated, the rate of glucose entry decreases.
D. None of the statements are false.
E. All of the statements are false.

31. In a plasma membrane, simple diffusion of various substances can occur

A. through channels
B. through carriers
C. between phospholipid molecules
D. all of these
E. through channels and between phospholipid molecules

32. Which of the following can diffuse between a membrane's phospholipids into the cytosol?

A. glucose
B. sodium
C. carbon dioxide
D. integrin molecule
E. a small secretory product

33. By osmosis, water always moves to an area of

A. lower osmotic pressure
B. higher hydrostatic pressure
C. higher solute concentration
D. higher water concentration
E. lower osmotic pressure and higher water concentration

34. If a typical body cell is placed into a 1% saline solution, the cell

A. will gain more water than it loses
B. has a higher osmotic pressure than the ECF
C. has a lower hydrostatic pressure than the ECF
D. will gain and lose water at the same rate
E. none of these

35. Which of the following is <u>least</u> related to glucose uptake by different cells in the body?

A. receptor-mediated endocytosis
B. facilitated diffusion
C. carrier-mediated transport
D. secondary active transport
E. cotransport

36. An electrical gradient

A. favors the movement of K^+ out of the cell at resting potential
B. favors the movement of Na^+ into the cell at resting potential
C. opposes the concentration gradient for Na^+ at the equilibrium potential for Na^+
D. all of these
E. favors the movement of Na^+ into the cell at resting potential and opposes the concentration gradient for Na^+ at the equilibrium potential for Na^+

37. The concentration gradient for

A. K^+ favors its movement into the ECF
B. Na^+ favors its movement out of the cytosol
C. K^+ and Na^+ are maintained by active transport
D. all of these
E. none of these

38. Two ATP molecules could provide energy for a sodium-potassium pump to move ____ ions out of the cell for every ____ ions it moves into the cell.

A. 6 Na^+; 3 K^+
B. 2 Na^+; 3 K^+
C. 3 K^+; 6 Na^+
D. 3 K^+; 2 Na^+
E. 12 Na^+; 6 K^+

39. 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. All of these.
E. Water moves down its own concentration gradient and moves to an area of higher solute concentration.

40. Solution 1 has two solutes (A and B) and an osmotic pressure of 250 mOsm. Solution 2 has only one solute (C) and an osmotic pressure of 300 mOsm. If a membrane between these solutions is permeable to only water and B, then

A. Solution 1 will gain water from solution 2.
B. Solution 2 will gain water from solution 1.
C. Some of solute C will move into solution 1.
D. Solution 1 has a higher osmotic pressure.
E. Solution 2 will gain water from solution 1, and solution 1 has a higher osmotic pressure.

41. Which of the following may not require a carrier?

A. movement of potassium into the cell
B. movement of sodium into the cell
C. iodine uptake by thyroid gland cells
D. glucose uptake by body cells
E. all of these

42. According to Fick's law of diffusion, which of the following changes would decrease the rate of net diffusion of "X" across a membrane?

A. an increase in the X's concentration gradient
B. an increase in the permeability of the membrane to X
C. an increase in the surface area of the membrane
D. an increase in the thickness of the membrane
E. a decrease in the size of X

43. If a human cell is placed into solution X, containing water and a nonpenetrating solute, then

A. Water will diffuse into solution X until the cytosol and solution X are isotonic.
B. Water will diffuse across the membrane until a state of equilibrium is established.
C. Water will diffuse into the cell until stopped by an opposing hydrostatic pressure in the cytosol.
D. Neither the cell nor solution X will experience a net gain of water.
E. It is not possible to predict what will happen.

44. Exocytosis of secretory products from neuron terminals is triggered by the entry of ____ into the ____.

A. K^+; cytosol
B. Na^+; ECF
C. Ca^{2+}; cytosol
D. ATP; plasma membrane
E. A^-; ECF

45. Pinocytosis is a form of

A. active transport
B. cytokinesis
C. endocytosis
D. exocytosis
E. hemolysis

46. Osmosis is a type of

A. carrier-mediated transport
B. diffusion
C. exocytosis
D. pinocytosis
E. primary active transport

47. With secondary active transport, the movement of

A. H^+ out of a cell by antiport is downhill
B. amino acids into the cell by symport is uphill
C. glucose into a cell by cotransport is downhill
D. amino acids into the cell by symport is uphill and glucose into a cell by cotransport is downhill
E. none of these

48. Which of the following statements about the Na^+-K^+ pump is correct?

A. Phosphorylation of the pump must occur before Na^+ can attach to its binding site.
B. It has ATP synthase activity.
C. It helps decrease Na^+ and K^+ concentration gradients across the plasma membrane.
D. It regulates cell volume by controlling the concentration of solutes inside the cell.
E. It is a countertransporter for secondary active transport.

49. The rate of carrier-mediated transport is limited by

A. protein location in the membrane
B. osmolarity
C. tonicity
D. competition with other molecules
E. none of these

50. Glucose enters some cells

A. through primary active transport
B. through secondary active transport
C. through facilitated diffusion
D. all of these
E. through secondary active transport and facilitated diffusion

51. A Ca^{2+} pump in the plasma membrane

A. pumps Ca^{+} into the cell
B. is a secondary active transport carrier
C. is an ATPase
D. is a symporter
E. All of these

52. Large, anionic intracellular proteins (A^{-}) cannot pass through carriers because A^{-} proteins are

A. greater than 0.8 nm in diameter
B. lipid soluble
C. in about the same concentration in the cytosol and ECF
D. not water soluble
E. lipid soluble and not water soluble

53. A membrane potential

A. refers to a difference in electrical charge on opposite sides of a membrane
B. is measured in millivolts, with the sign always designating the charge on the outside
C. exists because the ECF as a whole is positively-charged and the cytosol as a whole is negatively charged
D. is always positive during the resting state
E. all of these

54. Solution 1 has a higher concentration of NaCl than solution 2. A membrane permeable only to Na^{+} and water separates the two membranes. Which of the following is true?

A. Na^{+} will diffuse into solution 2 until the two solutions become isotonic.
B. Solution 2 has a higher osmotic pressure.
C. A membrane potential will develop, with the negative region being on the side with solution 1.
D. Solution 2 will gain water from solution 1.
E. Solution 2 has a higher osmotic pressure and will gain water from solution 1.

55. The resting membrane potential is

A. much closer to the equilibrium potential for Na^+ than to the equilibrium potential for K^+
B. much closer to the equilibrium potential for K^+ than to the equilibrium potential for Na^+
C. the same as the equilibrium potential for Cl^-
D. much closer to the equilibrium potential for Na^+ than to the equilibrium potential for K^+ and the same as the equilibrium potential for Cl^-
E. much closer to the equilibrium potential for K^+ than to the equilibrium potential for Na^+ and the same as the equilibrium potential for Cl^-

56. 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 at its equilibrium potential.
D. The membrane is more permeable to K^+ than to Na^+, and Cl^- is at its equilibrium potential.
E. The membrane is more permeable to Na^+ than to K^+, and Cl^- is at its equilibrium potential.

57. During the resting potential

A. K^+ ions leave the cell along a concentration gradient and along an electrical gradient.
B. K^+ ions leave the cell against a concentration gradient but along an electrical gradient.
C. Na^+ ions enter the cell along a concentration gradient and along an electrical gradient.
D. Na^+ ions enter the cell along a concentration gradient but against an electrical gradient.
E. Cl^- ions enter the cell along a concentration gradient and along an electrical gradient.

58. The resting membrane potential of a typical nerve cell is ____ mV.

A. -60
B. +70
C. -90
D. -50
E. -70

59. Cell X has a resting potential of -80 mV. If a ____ opens and causes the potential to change 10 mV, the resulting potential will be ____.

A. Na^+ channel; -90 mV
B. K^+ channel; -70 mV
C. Ca^{2+} channel; -70 mV
D. Cl^- channel; -70 mV
E. Ca^{+2} channel; -90 mV

60. What is primarily responsible for the development of a resting membrane potential?

A. having more diffusion and active transport of cations out of the cell than into the cell
B. pumping 2 K^+ ions out of the cell for every three Na^+ ions pumped into the cell
C. having more K^+ ions diffuse into the cell than there are Na^+ ions diffusing out of the cell
D. having more anions diffuse into the cell than are diffusing out of the cell
E. none of these

61. Which one of the following requires the cell to expend energy?

A. ECF moving into a cell via pinocytosis
B. glucose moving through a facilitated diffusion carrier
C. K^+ ions moving out of a cell
D. water moving through an aquaporin
E. Na^+ ions moving through a leak channel

62. Which statement is false?

A. Binding of Na^+ to the SGLT carrier increases the carrier's affinity for ATP.
B. The release of Na^+ from the SGLT carrier increases the carrier's affinity for glucose.
C. Glucose enters the luminal side of an intestinal cell through a GLUT carrier.
D. The GLUT carrier is a symporter.
E. The SGLT carrier is a symporter.

63. Which of the following is not a function of membrane proteins?

A. transport of polar molecules
B. transport of H^+ into the cell
C. binding sites for vesicles
D. cell recognition
E. passageway for water molecules

64. All of the following transport certain substances from regions of high concentration to low concentration <u>except</u>

A. carriers
B. facilitated diffusion
C. SGLT
D. GLUT
E. Ca^{2+} pump

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

True False

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

True False

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

True False

68. Na^+ ions can move from the ECF into the ICF by passing through secondary active transport carriers, simple diffusion channels, and the sodium-potassium pumps.

True False

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

True False

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

True False

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

True False

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

True False

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

True False

74. The dark lines in the trilaminar appearance of the plasma membrane are likely caused by the preferential staining of the hydrophobic, nonpolar regions of the membrane constituents.

True False

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

True False

76. Gap junctions function as channels in between cells.

True False

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

True False

78. Connexons are carbohydrate building blocks of gap junctions that allow ions to pass from the cytosol of one cell into the cytosol of an adjacent cell.

True False

79. Some cell adhesion molecules are peripheral proteins and some are integral proteins.

True False

80. Cadherins are docking-marker acceptors to which secretory vesicles bind prior to exocytosis.

True False

81. Gap junctions contain carrier proteins that transport ions from one cell into another cell.

True False

82. Fibronectin and the fibroblasts that secrete it are primary components of connective tissues.

True False

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

True False

84. Fibronectin is a strong carbohydrate in the extracellular matrix of connective tissues that holds adjacent cells together.

True False

85. 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.

True False

86. Most gases and small ions are highly soluble in lipids and can, therefore, pass easily between phospholipid molecules in the plasma membrane.

True False

87. Carbon dioxide leaves the blood and enters cells by simple diffusion between phospholipid molecules in the plasma membrane.

True False

88. Some carrier molecules do not require energy to accomplish transport of a substance across the membrane.

True False

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

True False

90. A carrier molecule moves from the ECF side to cytosol side of the membrane as it transports material into the cell.

True False

91. Molecules greater than 0.8 nm in diameter are unable to pass from the ECF into the cytosol unless there is a carrier for the molecule.

True False

92. Oxygen gas, cholesterol, and glucose molecules are lipid-soluble, whereas proteins, amino acids, and ions are water-soluble.

True False

93. 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

94. Pinocytosis refers to the process of a cell engulfing ECF, and this process increases the cell's surface area.

True False

95. Exocytosis involves expelling a substance when the plasma membrane unites with a special carrier protein.

True False

96. Calcium and sodium ions are in a higher concentration in the ECF than in the cytosol, whereas potassium and chloride ions are in a higher concentration in the cytosol.

True False

97. Potassium ions are attracted toward a more positively charged area along an electrical gradient, while chloride ions are attracted toward a more negatively charged area.

True False

98. Opening a potassium channel during the resting potential would cause potassium ions to move along their concentration gradient but against the electrical gradient.

True False

99. Opening a sodium channel during the resting potential would cause sodium ions to move along an electrical gradient and along a concentration gradient.

True False

100. If an electrical gradient is present for a given substance, the substance may be able to get through the membrane without going through a carrier or channel.

True False

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

True False

102. 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.

True False

103. A membrane potential of -50 mV is greater than a membrane potential of -70 mV.

True False

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

True False

105. Carriers that perform facilitated diffusion or secondary active transport of glucose do not split ATP.

True False

106. The SGLT and GLUT carriers do not split ATP.

True False

107. Under normal conditions, the movement of potassium into a cell always requires the splitting of ATP.

True False

108. At resting membrane potential, sodium and potassium ions are no longer moving across the membrane.

True False

109. At equilibrium, when no net diffusion of Na^+ or K^+ is occurring through the membrane, Na+-K^+ pumps do not have to pump Na^+ or K^+.

True False

110. 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

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

True False

112. If a cell begins to swell after being placed into a salt solution, the salt solution must have a lower osmotic pressure than the cytosol.

True False

113. Large protein anions do not leave the cell because there is no concentration or electrical gradient to drive it outward.

True False

114. Sodium-potassium pumps indirectly provide the energy source for SGLT carriers in intestinal cells.

True False

115. Placing pure water around cells causes the cells to swell because the cytosol has a lower osmotic pressure than the pure water.

True False

116. Most of a membrane potential is established by the passive movement of different cations into and out of a cell.

True False

117. With secondary active transport, sodium ions move along a concentration gradient but against an electrical gradient.

True False

118. Dephosphorylation of the Na^+-K^+ pump causes three Na+ ions to move out of a cell against a concentration gradient.

True False

119. Leak channels for sodium are closed during the resting potential but open with appropriate stimulation.

True False

120. In cystic fibrosis, defective chloride channels allow too many chloride ions to enter the cell, causing the cell to become hypertonic to the ECF and swell.

True False

121. Opening a gated channel that allows Na^+ to diffuse through the plasma membrane would cause the membrane potential to increase.

True False

122. Scurvy is caused by a vitamin C deficiency that prevents the proper development of desmosomes; hence, tissue cells do not hold together.

True False

123. **Complete each of the following statments.**

The model of the plasma membrane as a lipid bilayer studded and penetrated by proteins is known as the _____ model of membrane structure.

_____

124. **Complete each of the following statments.**

Of the lipids in the plasma membrane, _____ are most abundant, with lesser amounts of _____.

_____

125. **Complete each of the following statments.**

_____ is responsible for maintaining the fluid nature of the plasma membrane in human cells.

_____

126. **Complete each of the following statments.**

Membrane carbohydrates in the plasma membrane combine with other molecules to form glycoproteins and _____.

_____

127. **Complete each of the following statments.**

A deficiency in channels that allow _____ ions to pass through cell membranes is responsible for cystic fibrosis.

_____

128. **Complete each of the following statments.**

_____ refers to the transfer of a phosphate group from ATP to a protein, thereby bringing about a change in the shape and function of the protein.

_____

129. **Complete each of the following statments.**

Ions pass into or out of the cell through protein _____ and _____ in the plasma membrane.

_____

130. **Complete each of the following statments.**

Cell adhesion proteins include _____ and _____.

_____

131. **Complete each of the following statments.**

Vesicles bind to _____ acceptors on the plasma membrane prior to exocytosis

_____

132. **Complete each of the following statments.**

_____ are cell-to-cell connections through which materials can pass from the cytosol of one cell into the cytosol of an adjacent cell.

_____

133. **Complete each of the following statments.**

_____ is a rubber-like protein found in tissues in organs such as the lungs.

_____

134. **Complete each of the following statments.**

Cell connections called _____ force materials to pass *through* cells and not between them.

_____

135. **Complete each of the following statments.**

_____ are cell connections that utilize CAMs to hold adjacent cells together while being anchor to intermediate filaments of each cell's cytoskeleton.

_____

136. **Complete each of the following statments.**

Simple diffusion of different substances through the cell membrane can occur through the phospholipid region and through _____.

_____

137. **Complete each of the following statments.**

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

_____

138. **Complete each of the following statments.**

A solutions containing the same concentration of solute particles as human cells is said to be _____ to the cell.

_____

139. **Complete each of the following statments.**

A solution containing _____ mOsm of solute is isotonic to human cells.

_____

140. **Complete each of the following statments.**

Glucose moves against its concentration gradient through the cell membrane by passing through carriers that simultaneously transport _____ ions.

_____

141. **Complete each of the following statments.**

In _____ diffusion, water-soluble materials move through specific channels in the cell membrane.

_____

142. **Complete each of the following statments.**

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

_____

143. **Complete each of the following statments.**

The two types of _____ transport include active transport and _____.

_____

144. **Complete each of the following statments.**

Secondary active transport in which two substances pass through the membrane in the same direction is called _____.

_____

145. **Complete each of the following statments.**

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

_____

146. **Complete each of the following statments.**

In facilitated diffusion, particles move from a(n) _____ concentration to a(n) _____ concentration.

_____

147. **Complete each of the following statments.**

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

_____

148. **Complete each of the following statments.**

A transport maximum is associated with carriers that perform _____ or _____ in the cell membrane.

_____

149. **Complete each of the following statments.**

Endocytosis and exocytosis are both examples of _____ transport.

_____

150. **Complete each of the following statments.**

Opening a sodium channel during the resting membrane potential will cause the potential to become less _____.

_____

151. **Complete each of the following statments.**

Surrounding a blood cell with a 0.5% NaCl solution would cause the cell to _____, because this NaCl solution is _____ to the cell.

_____

152. **Complete each of the following statments.**

In many cells, the hormone called _____ promotes the insertion of glucose carriers into the plasma membranes.

_____

153. **Complete each of the following statments.**

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

_____

154. **Complete each of the following statments.**

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

_____

155. **Complete each of the following statments.**

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

_____

156. **Complete each of the following statments.**

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

_____

157. **Complete each of the following statments.**

A common antiporter transports _____ ions out of the cell while it transports _____ ions into the cell.

_____

158. **Complete each of the following statments.**

The SGLT carrier moves _____ molecules uphill against a concentration gradient while moving _____ ions down a concentration gradient.

_____

159. **Complete each of the following statments.**

The _____ pump moves two _____ ions into the cell for every three _____ ions it moves out the cell.

_____

160. **Complete each of the following statments.**

The GLUT carrier moves glucose molecules _____ their concentration gradient while moving _____ ions down their concentration gradient.

_____

161. **Complete each of the following statments.**

Scurvy is the result of a vitamin _____ deficiency and results in abnormal formation of the protein called _____.

_____

162. **Complete each of the following statments.**

"Kiss" sites are associated with cell-to-cell connections called _____.

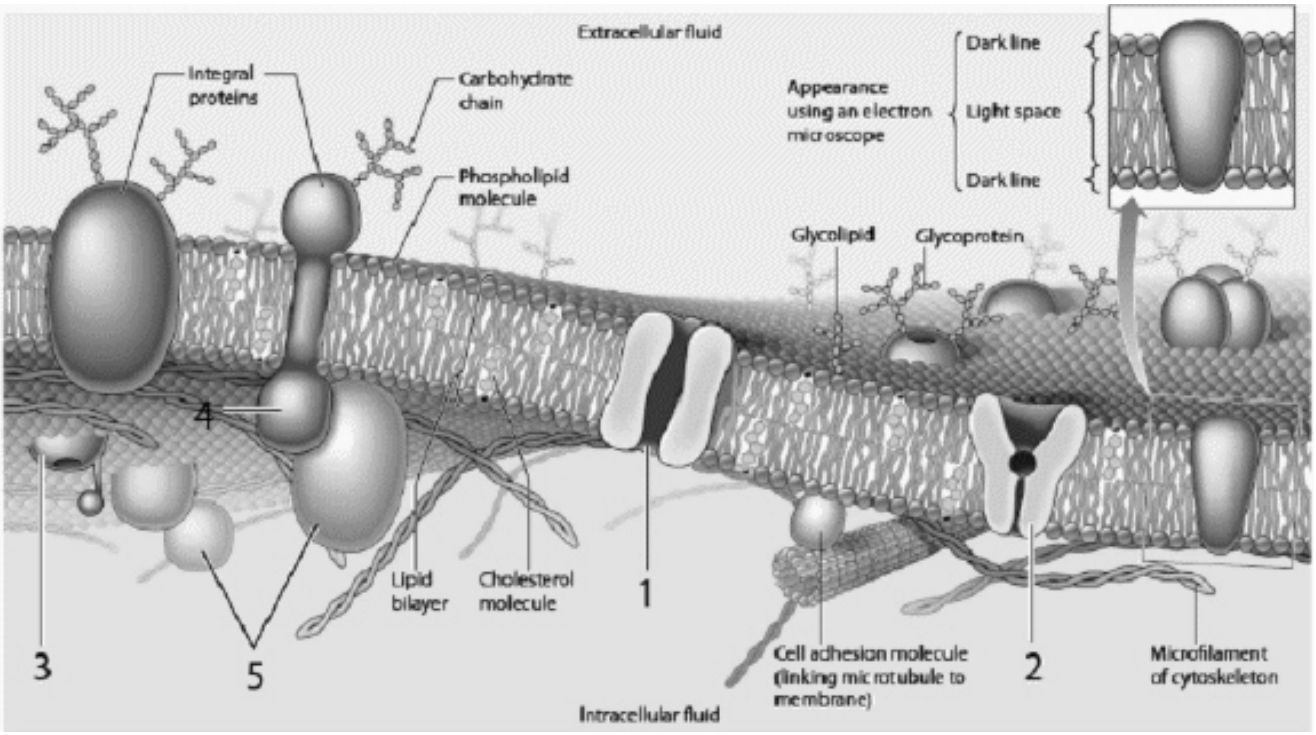
_____

163. Match the term to the correct description.

1. Provides tensile strength to the ECM	collagen	____
2. Extracellular protein promoting cell adhesion	keratin	____
3. Intracellular protein that supports desmosomes	fibronectin	____
4. Enables tissues to stretch and recoil	elastin	____

164. Indicate which characteristic of a mediated-transport system is referred to in each item by filling in the blank using the following answer code.

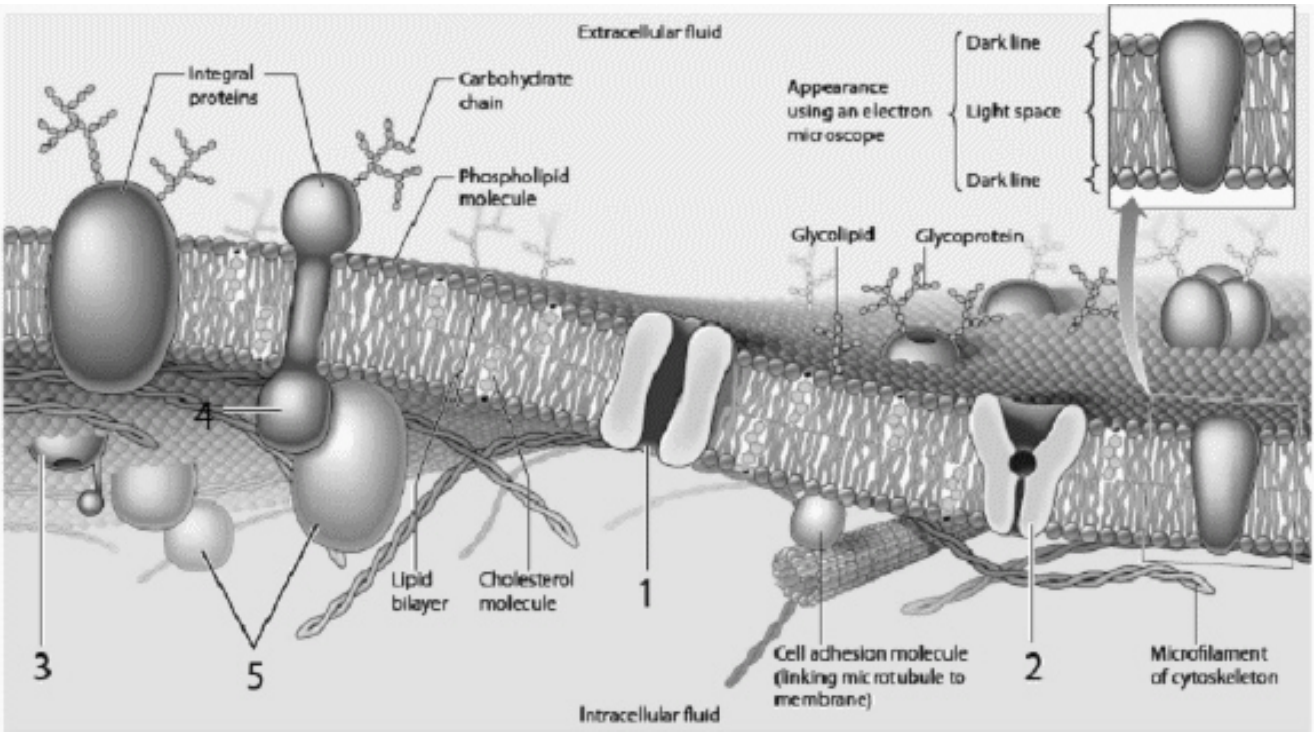
1. The concentration of substance X outside the cell continues to increase but the rate of substance X's transport into the cell remains constant.	specificity	____
2. In the presence of substance Z there is a decreased rate of entry of substance X.	competition	____
3. Carrier can handle substance X but not substance Y.	saturation	____

165. 

Use the figure above to answer the corresponding questions.

Which protein might require ATP in order to transport a particle through the membrane?

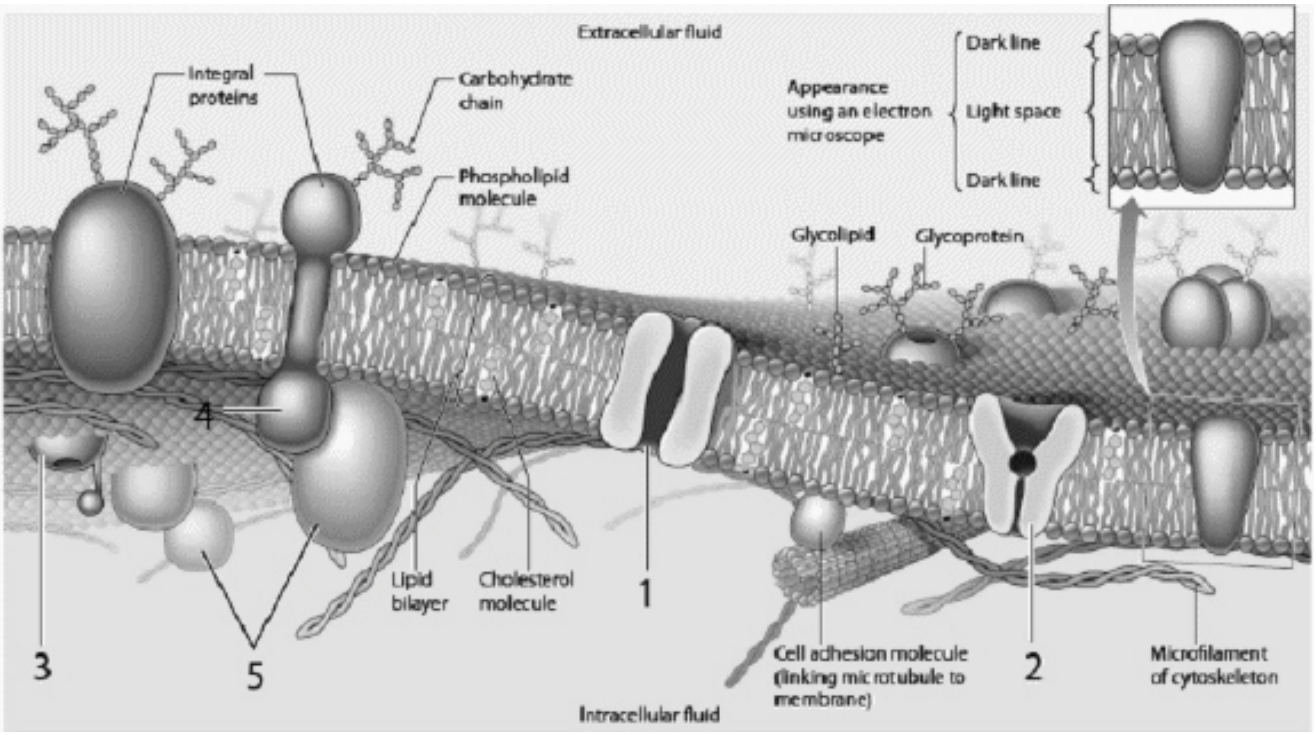
a. 1
b. 2
c. 3
d. 4
e. 5

166. 

Use the figure above to answer the corresponding questions.

Which protein could be associated with active movement of a substance through the membrane?

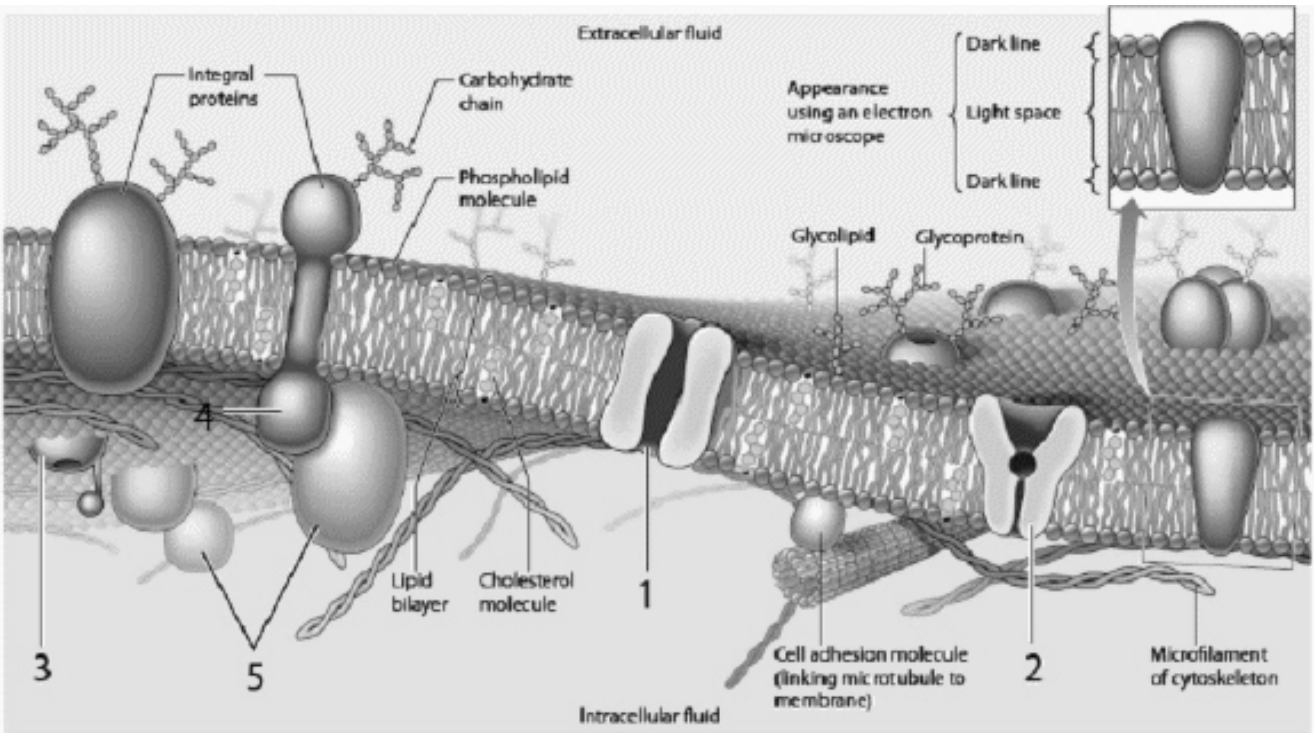
a. 1
b. 2
c. 3
d. 4
e. 5

167. 

Use the figure above to answer the corresponding questions.

Which protein could represent the GLUT protein in the membrane of an intestinal cell?

a. 1
b. 2
c. 3
d. 4
e. 5

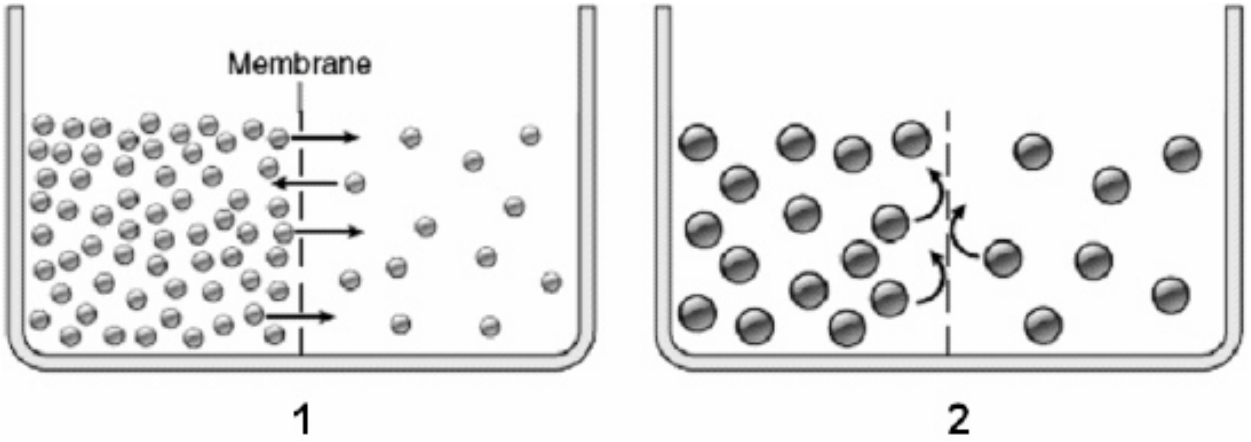
168. 

Use the figure above to answer the corresponding questions.

Which protein might be an ATPase?

a. 1
b. 2
c. 3
d. 4
e. 5

169.

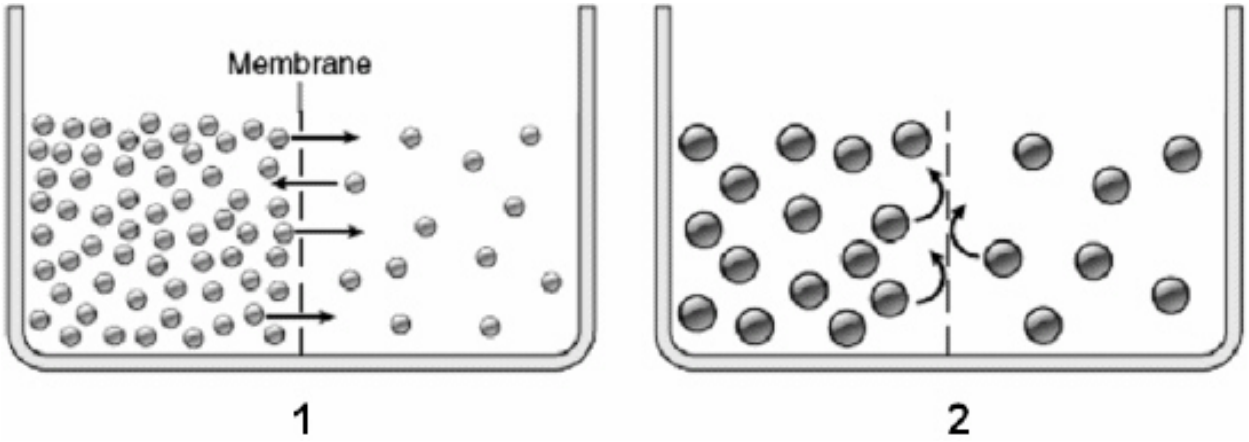


Use the figure above to answer the corresponding questions. Assume the membrane is always permeable to water.

In beaker 1, the solution on the right side of the membrane

a. has a lower osmolarity than the solution on the left side of the membrane
b. will gain water from the solution on the left side of the membrane
c. has a higher osmotic pressure than the solution on the left side of the membrane
d. has a lower osmolarity than the solution on the left side of the membrane and will gain water from the solution on the left side of the membrane
e. will gain water from the solution on the left side of the membrane and has a higher osmotic pressure than the solution on the left side of the membrane

170.

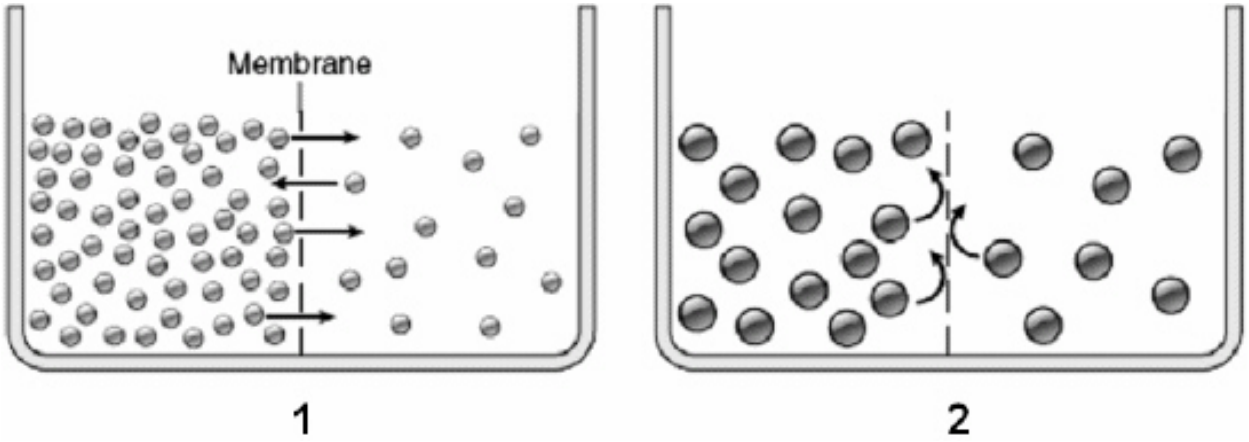


Use the figure above to answer the corresponding questions. Assume the membrane is always permeable to water.

In beaker 1, the solution on the right side of the membrane

a. could eventually have the same concentration of green solute particles as the solution on the left side of the membrane
b. could eventually have the same osmolarity as the solution on the left side of the membrane
c. currently has a lower osmotic pressure than the solution on the left side of the membrane
d. is currently losing water
e. all of these

171.

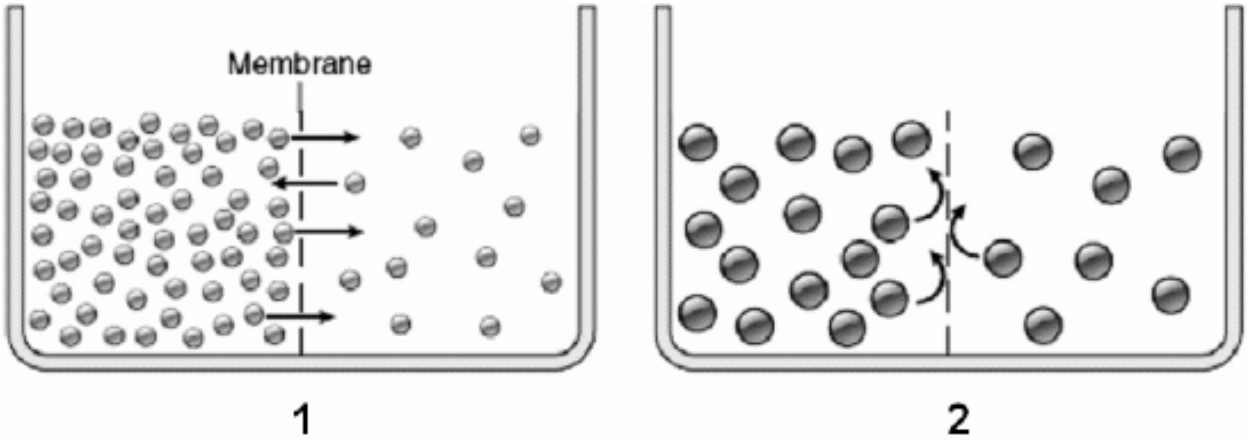


Use the figure above to answer the corresponding questions. Assume the membrane is always permeable to water.

In beaker 2, the solution on the right side of the membrane

a. has a higher osmolarity than the solution on the left side of the membrane
b. will gain water from the solution on the left side of the membrane
c. has a lower osmotic pressure than the solution on the left side of the membrane
d. has a higher osmolarity than the solution on the left side of the membrane and will gain water from the solution on the left side of the membrane
e. none of these

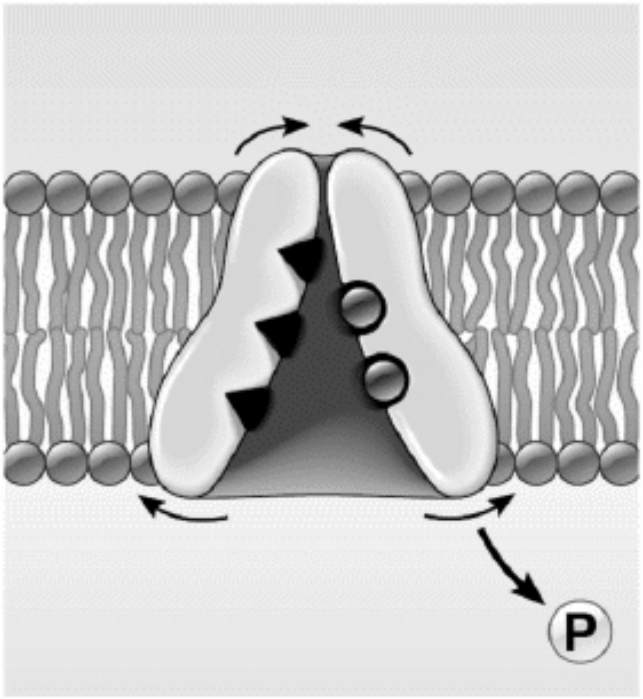
172.



Use the figure above to answer the corresponding questions. Assume the membrane is always permeable to water.

In beaker 2, the solution on the right side of the membrane

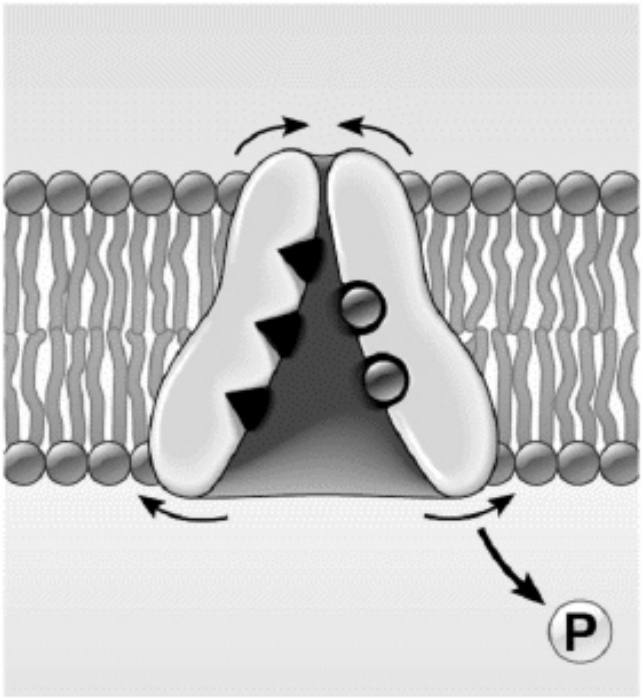
a. could eventually have the same number of red solute particles as the solution on the left side of the membrane
b. could eventually have the same concentration of red particles as the solution on the left side of the membrane
c. currently has a higher osmotic pressure than the solution on the left side of the membrane
d. is currently gaining water
e. all of these

173. 

Use the figure above to answer the corresponding questions.

In this figure, the carrier is

a. transporting Na^+ ions into the ECF
b. transporting K^+ ions into the ICF
c. about to become phosphorylated.
d. performing secondary active transport
e. transporting K^+ ions into the ICF and performing secondary active transport

174. 

Use the figure above to answer the corresponding questions.

Which step will come immediately after the carrier releases the ions shown in this figure?

a. The carrier will become phosphorylated.
b. The carrier will pick up ions from the ECF.
c. The carrier will pick up ions from the ICF.
d. The carrier will split ATP.
e. The carrier will become phosphorylated and The carrier will split ATP.

175. Describe the transport of glucose from the intestinal lumen into the intestinal cells and mention how Na^+-K^+ pumps make this process possible.

176. Describe the transport of glucose out of an intestinal cell and into the blood.

177. Describe the various functions of proteins in membranes.

178. Describe the action of a Na^+-K^+ pump.

179. Describe what would happen to red blood cells if a person received a transfusion of distilled (pure) water.

180. Describe the concentration gradients associated with the resting membrane potential.

181. Describe the effects of the concentration and electrical gradients on the movement of Na^+ and K^+ ions through the membrane.

182. Describe how an ATP is important to the SGLT carrier.

Chapter 3--The Plasma Membrane and Membrane Potential Key

1. A single phospholipid in the plasma membrane

   A. has its hydrophobic end next to either the ECF or the cytosol
   B. spans the entire width of the membrane
   C. can function as carrier molecule
   D. all of these
   E. none of these

2. Which statement about the plasma membrane is true?

   A. It appears trilaminar under a light microscope.
   B. Its glycocalyx serves as receptor sites for binding chemical messengers in the ECF.
   C. It is impermeable to lipid-soluble substances.
   D. Some of its carriers transport ions.
   E. Its channels are impermeable to any substance smaller than 0.8 nm in diameter.

3. The plasma membrane

   A. appears under an electron microscope as a double dark line with a light space between
   B. is composed primarily of a double layer of protein molecules with cholesterol molecules interspersed between them
   C. has a hydrophilic region between two hydrophobic regions
   D. all of these
   E. none of these

4. The plasma membrane

   A. has a slight excess of positive charges along its cytosol side during the resting state
   B. is composed primarily of cholesterol surrounded by carbohydrates
   C. is more permeable to K^+ than to Na^+ at the resting state
   D. has peripheral proteins that act as carriers
   E. all of these, except it is composed primarily of cholesterol surrounded by carbohydrates

5. Which of the following is not a function of membrane proteins?

   A. Some act as channels.
   B. They determine the fluidity of the membrane.
   C. Some will transport glucose.
   D. They include docking-marker acceptors.
   E. Some act as enzymes.

6. Identify the true statement(s) about the plasma membrane.

A. Its lipid region allows most ions to diffuse between the cytosol and ECF.
B. Its channels allow cholesterol to diffuse between the ECF and cytosol.
C. Some of its carriers transport sodium.
D. Its phospholipids are held to one another by CAMs.
E. All except its phospholipids are held to one another by CAMs.

7. Identify the true statement(s) about the plasma membrane.

A. Its transmembrane proteins are also peripheral proteins.
B. Its glycocalyx functions in cell recognition.
C. Its carriers contain cholesterol.
D. Its channels allow passage of substances between 0.8 nm and 1 nm in diameter.
E. Its transmembrane proteins are also peripheral proteins, and its channels allow passage of substances between 0.8 nm and 1 nm in diameter.

8. Identify the incorrect statement about the plasma membrane.

A. Cholesterol contributes to its stability.
B. Its lipids may surround CAMs.
C. Its primary components are glycoproteins and cholesterol.
D. Its lipid bilayer is flexible.
E. Its glycocalyx is in contact with ECF.

9. Receptor sites on the outer surface of the plasma membrane are made of

A. CAMs
B. carbohydrate
C. lipid
D. keratin
E. proteins

10. Which extracellular fiber does not develop properly in scurvy?

A. actin
B. collagen
C. elastin
D. fibronectin
E. myosin

11. Select the substance that promotes cell adhesion.

A. GLUT
B. collagen
C. elastin
D. fibronectin
E. glycolipid

12. Which of the following is not associated with an extracellular chemical binding with a membrane-bound receptor?

A. decreased activity within a certain cell
B. activation of an ATPase
C. a change in shape of a transmembrane protein
D. increased activity within a certain cell
E. opening of a sodium channel that allows Na^+ to diffuse out of the cell

13. The rate at which "X" can diffuse through a plasma membrane is inversely proportional to the

A. lipid solubility of X
B. concentration gradient for X
C. molecular weight of X
D. membrane's surface area
E. lipid solubility and molecular weight of X

14. Cystic fibrosis is caused by abnormal

A. accumulation of mucus
B. levels of insulin
C. chloride channels in plasma membranes
D. potassium channels in plasma membranes
E. none of these

15. Integrins

A. create a filamentous meshwork in the inner surface of the membrane
B. act as membrane-bounded enzymes
C. are used for cell recognition purposes
D. span the membrane, providing a mechanical link between the outer membrane and the cell's surrounding
E. none of these

16. Which statement about membrane proteins is incorrect?

A. Channels are water-filled pathways.
B. Channels are not highly selective.
C. Carriers are highly selective.
D. CAMs serve as binding sites for specific ions.
E. Proteins may work in conjunction with carbohydrates to provide recognition of "self."

17. Which one of the following requires assisted membrane transport?

A. glucose moving into a cell
B. K^+ ions moving out of a cell
C. water moving toward a hypertonic solution
D. movement of ECF into a cell via pinocytosis
E. movement of Na^+ through a symporter

18. Collagen

A. provides tensile strength to the cytoskeleton
B. is most abundant in tissues that stretch and then recoil
C. forms the intercellular filaments of desmosomes
D. is the most abundant protein in the ECM
E. all of these

19. Which of the following is not part of the extracellular matrix?

A. complex carbohydrates
B. connexons
C. collagen
D. elastin
E. fibronectin

20. Which statement about gap junctions is incorrect?

A. They consist of protein.
B. They are anchored to plaques on the inside surface of the plasma membrane.
C. They allow materials to pass from one cell into an adjacent cell.
D. They play a role in transmitting electrical activity through the heart.
E. They consist of connexons.

21. Which of the following solutions has a lower osmotic pressure than a human cell's cytosol?

A. one containing only 2% NaCl
B. one containing only 200 mOsm of NaCl
C. one containing only 0.9% NaCl
D. one containing only 300 mOsm of NaCl
E. one containing only 280 mOsm of glucose

22. Tight junctions

A. prevent passage of materials into epithelial cells
B. force materials to pass between cells
C. are commonly found in digestive tract linings
D. all of these
E. none of these

23. ____ are adhering junctions, ____ are impermeable junctions, and ____ are communicating junctions.

A. Tight junctions, gap junctions, desmosomes
B. Desmosomes, gap junctions, tight junctions
C. Gap junctions, desmosomes, tight junctions
D. Gap junctions, tight junctions, desmosomes
E. none of these

24. Selective permeability of the membrane is primarily determined by

A. membrane phospholipids
B. how much cholesterol is present
C. the number and type of membrane proteins
D. the charge of the membrane
E. none of these

25. Carrier-mediated transport

A. involves a specific membrane protein
B. always moves substances against a concentration gradient
C. always requires energy expenditure
D. involves protein channels
E. all of these

26. Facilitated diffusion

A. involves a protein channel
B. requires energy expenditure
C. is how glucose in the intestinal lumen moves into cells in the digestive lining
D. involves a protein channel and is how glucose in the intestinal lumen moves into cells in the digestive lining
E. all of these

27. Select the correct statement about diffusion through a membrane.

A. It depends on random motion.
B. It involves active forces.
C. Its rate increases as the membrane's surface area decreases.
D. Ions move from a lower concentration to a higher concentration.
E. Large molecules diffuse faster than small molecules.

28. The rate of diffusion for water-soluble substances through a membrane decreases as

A. their concentration gradient increases
B. their molecular weight increases
C. the number of cholesterol molecules in the membrane increases
D. the membrane's surface area increases
E. the number of membrane carbohydrates increases

29. Which of the following is correct?

A. Exocytosis increases the surface area of the plasma membrane.
B. Phagocytosis can help remove cytoplasmic debris from the cytosol.
C. Exocytosis is triggered by the binding of a particle in the ECF to a receptor site on the plasma membrane.
D. Exocytosis increases the surface area of the plasma membrane, and is triggered by the binding of a particle in the ECF to a receptor site on the plasma membrane.
E. None of these.

30. Which statement about movement into the cytosol is false?

A. If glucose and sodium can both combine with the same carrier, the presence of one of these molecules decreases the rate of entry of the other.
B. In simple diffusion, the rate of entry of an ion is directly proportional to its concentration in the cytosol.
C. When a glucose symporter becomes saturated, the rate of glucose entry decreases.
D. None of the statements are false.
E. All of the statements are false.

31. In a plasma membrane, simple diffusion of various substances can occur

A. through channels
B. through carriers
C. between phospholipid molecules
D. all of these
E. through channels and between phospholipid molecules

32. Which of the following can diffuse between a membrane's phospholipids into the cytosol?

A. glucose
B. sodium
C. carbon dioxide
D. integrin molecule
E. a small secretory product

33. By osmosis, water always moves to an area of

A. lower osmotic pressure
B. higher hydrostatic pressure
C. higher solute concentration
D. higher water concentration
E. lower osmotic pressure and higher water concentration

34. If a typical body cell is placed into a 1% saline solution, the cell

A. will gain more water than it loses
B. has a higher osmotic pressure than the ECF
C. has a lower hydrostatic pressure than the ECF
D. will gain and lose water at the same rate
E. none of these

35. Which of the following is least related to glucose uptake by different cells in the body?

A. receptor-mediated endocytosis
B. facilitated diffusion
C. carrier-mediated transport
D. secondary active transport
E. cotransport

36. An electrical gradient

A. favors the movement of K^+ out of the cell at resting potential
B. favors the movement of Na^+ into the cell at resting potential
C. opposes the concentration gradient for Na^+ at the equilibrium potential for Na^+
D. all of these
E. favors the movement of Na^+ into the cell at resting potential and opposes the concentration gradient for Na^+ at the equilibrium potential for Na^+

37. The concentration gradient for

A. K^+ favors its movement into the ECF
B. Na^+ favors its movement out of the cytosol
C. K^+ and Na^+ are maintained by active transport
D. all of these
E. none of these

38. Two ATP molecules could provide energy for a sodium-potassium pump to move ____ ions out of the cell for every ____ ions it moves into the cell.

A. 6 Na^+; 3 K^+
B. 2 Na^+; 3 K^+
C. 3 K^+; 6 Na^+
D. 3 K^+; 2 Na^+
E. 12 Na^+; 6 K^+

39. 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. All of these.
E. Water moves down its own concentration gradient and moves to an area of higher solute concentration.

40. Solution 1 has two solutes (A and B) and an osmotic pressure of 250 mOsm. Solution 2 has only one solute (C) and an osmotic pressure of 300 mOsm. If a membrane between these solutions is permeable to only water and B, then

A. Solution 1 will gain water from solution 2.
B. Solution 2 will gain water from solution 1.
C. Some of solute C will move into solution 1.
D. Solution 1 has a higher osmotic pressure.
E. Solution 2 will gain water from solution 1, and solution 1 has a higher osmotic pressure.

41. Which of the following may not require a carrier?

A. movement of potassium into the cell
B. movement of sodium into the cell
C. iodine uptake by thyroid gland cells
D. glucose uptake by body cells
E. all of these

42. According to Fick's law of diffusion, which of the following changes would decrease the rate of net diffusion of "X" across a membrane?

A. an increase in the X's concentration gradient
B. an increase in the permeability of the membrane to X
C. an increase in the surface area of the membrane
D. an increase in the thickness of the membrane
E. a decrease in the size of X

43. If a human cell is placed into solution X, containing water and a nonpenetrating solute, then

A. Water will diffuse into solution X until the cytosol and solution X are isotonic.
B. Water will diffuse across the membrane until a state of equilibrium is established.
C. Water will diffuse into the cell until stopped by an opposing hydrostatic pressure in the cytosol.
D. Neither the cell nor solution X will experience a net gain of water.
E. It is not possible to predict what will happen.

44. Exocytosis of secretory products from neuron terminals is triggered by the entry of ____ into the ____.

A. K^+; cytosol
B. Na^+; ECF
C. Ca^{2+}; cytosol
D. ATP; plasma membrane
E. A^-; ECF

45. Pinocytosis is a form of

A. active transport
B. cytokinesis
C. endocytosis
D. exocytosis
E. hemolysis

46. Osmosis is a type of

A. carrier-mediated transport
B. diffusion
C. exocytosis
D. pinocytosis
E. primary active transport

47. With secondary active transport, the movement of

A. H^+ out of a cell by antiport is downhill
B. amino acids into the cell by symport is uphill
C. glucose into a cell by cotransport is downhill
D. amino acids into the cell by symport is uphill and glucose into a cell by cotransport is downhill
E. none of these

48. Which of the following statements about the Na^+-K^+ pump is correct?

A. Phosphorylation of the pump must occur before Na^+ can attach to its binding site.
B. It has ATP synthase activity.
C. It helps decrease Na^+ and K^+ concentration gradients across the plasma membrane.
D. It regulates cell volume by controlling the concentration of solutes inside the cell.
E. It is a countertransporter for secondary active transport.

49. The rate of carrier-mediated transport is limited by

A. protein location in the membrane
B. osmolarity
C. tonicity
D. competition with other molecules
E. none of these

50. Glucose enters some cells

A. through primary active transport
B. through secondary active transport
C. through facilitated diffusion
D. all of these
E. through secondary active transport and facilitated diffusion

51. A Ca^{2+} pump in the plasma membrane

A. pumps Ca^{+} into the cell
B. is a secondary active transport carrier
C. is an ATPase
D. is a symporter
E. All of these

52. Large, anionic intracellular proteins (A^{-}) cannot pass through carriers because A^{-} proteins are

A. greater than 0.8 nm in diameter
B. lipid soluble
C. in about the same concentration in the cytosol and ECF
D. not water soluble
E. lipid soluble and not water soluble

53. A membrane potential

A. refers to a difference in electrical charge on opposite sides of a membrane
B. is measured in millivolts, with the sign always designating the charge on the outside
C. exists because the ECF as a whole is positively-charged and the cytosol as a whole is negatively charged
D. is always positive during the resting state
E. all of these

54. Solution 1 has a higher concentration of NaCl than solution 2. A membrane permeable only to Na^{+} and water separates the two membranes. Which of the following is true?

A. Na^{+} will diffuse into solution 2 until the two solutions become isotonic.
B. Solution 2 has a higher osmotic pressure.
C. A membrane potential will develop, with the negative region being on the side with solution 1.
D. Solution 2 will gain water from solution 1.
E. Solution 2 has a higher osmotic pressure and will gain water from solution 1.

55. The resting membrane potential is

A. much closer to the equilibrium potential for Na^+ than to the equilibrium potential for K^+
B. much closer to the equilibrium potential for K^+ than to the equilibrium potential for Na^+
C. the same as the equilibrium potential for Cl^-
D. much closer to the equilibrium potential for Na^+ than to the equilibrium potential for K^+ and the same as the equilibrium potential for Cl^-
E. much closer to the equilibrium potential for K^+ than to the equilibrium potential for Na^+ and the same as the equilibrium potential for Cl^-

56. 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 at its equilibrium potential.
D. The membrane is more permeable to K^+ than to Na^+, and Cl^- is at its equilibrium potential.
E. The membrane is more permeable to Na^+ than to K^+, and Cl^- is at its equilibrium potential.

57. During the resting potential

A. K^+ ions leave the cell along a concentration gradient and along an electrical gradient.
B. K^+ ions leave the cell against a concentration gradient but along an electrical gradient.
C. Na^+ ions enter the cell along a concentration gradient and along an electrical gradient.
D. Na^+ ions enter the cell along a concentration gradient but against an electrical gradient.
E. Cl^- ions enter the cell along a concentration gradient and along an electrical gradient.

58. The resting membrane potential of a typical nerve cell is ____ mV.

A. -60
B. +70
C. -90
D. -50
E. -70

59. Cell X has a resting potential of -80 mV. If a ____ opens and causes the potential to change 10 mV, the resulting potential will be ____.

A. Na^+ channel; -90 mV
B. K^+ channel; -70 mV
C. Ca^{2+} channel; -70 mV
D. Cl^- channel; -70 mV
E. Ca^{+2} channel; -90 mV

60. What is primarily responsible for the development of a resting membrane potential?

A. having more diffusion and active transport of cations out of the cell than into the cell
B. pumping 2 K^+ ions out of the cell for every three Na^+ ions pumped into the cell
C. having more K^+ ions diffuse into the cell than there are Na^+ ions diffusing out of the cell
D. having more anions diffuse into the cell than are diffusing out of the cell
E. none of these

61. Which one of the following requires the cell to expend energy?

A. ECF moving into a cell via pinocytosis
B. glucose moving through a facilitated diffusion carrier
C. K^+ ions moving out of a cell
D. water moving through an aquaporin
E. Na^+ ions moving through a leak channel

62. Which statement is false?

A. Binding of Na^+ to the SGLT carrier increases the carrier's affinity for ATP.
B. The release of Na^+ from the SGLT carrier increases the carrier's affinity for glucose.
C. Glucose enters the luminal side of an intestinal cell through a GLUT carrier.
D. The GLUT carrier is a symporter.
E. The SGLT carrier is a symporter.

63. Which of the following is not a function of membrane proteins?

A. transport of polar molecules
B. transport of H^+ into the cell
C. binding sites for vesicles
D. cell recognition
E. passageway for water molecules

64. All of the following transport certain substances from regions of high concentration to low concentration except

A. carriers
B. facilitated diffusion
C. SGLT
D. GLUT
E. Ca^{2+} pump

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

FALSE

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

TRUE

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

TRUE

68. Na^+ ions can move from the ECF into the ICF by passing through secondary active transport carriers, simple diffusion channels, and the sodium-potassium pumps.

FALSE

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

TRUE

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

TRUE

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

FALSE

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

FALSE

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

TRUE

74. The dark lines in the trilaminar appearance of the plasma membrane are likely caused by the preferential staining of the hydrophobic, nonpolar regions of the membrane constituents.

FALSE

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

FALSE

76. Gap junctions function as channels in between cells.

TRUE

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

TRUE

78. Connexons are carbohydrate building blocks of gap junctions that allow ions to pass from the cytosol of one cell into the cytosol of an adjacent cell.

FALSE

79. Some cell adhesion molecules are peripheral proteins and some are integral proteins.

TRUE

80. Cadherins are docking-marker acceptors to which secretory vesicles bind prior to exocytosis.

FALSE

81. Gap junctions contain carrier proteins that transport ions from one cell into another cell.

FALSE

82. Fibronectin and the fibroblasts that secrete it are primary components of connective tissues.

FALSE

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

TRUE

84. Fibronectin is a strong carbohydrate in the extracellular matrix of connective tissues that holds adjacent cells together.

FALSE

85. 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.

TRUE

86. Most gases and small ions are highly soluble in lipids and can, therefore, pass easily between phospholipid molecules in the plasma membrane.

FALSE

87. Carbon dioxide leaves the blood and enters cells by simple diffusion between phospholipid molecules in the plasma membrane.

FALSE

88. Some carrier molecules do not require energy to accomplish transport of a substance across the membrane.

TRUE

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

TRUE

90. A carrier molecule moves from the ECF side to cytosol side of the membrane as it transports material into the cell.

FALSE

91. Molecules greater than 0.8 nm in diameter are unable to pass from the ECF into the cytosol unless there is a carrier for the molecule.

FALSE

92. Oxygen gas, cholesterol, and glucose molecules are lipid-soluble, whereas proteins, amino acids, and ions are water-soluble.

FALSE

93. 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

94. Pinocytosis refers to the process of a cell engulfing ECF, and this process increases the cell's surface area.

FALSE

95. Exocytosis involves expelling a substance when the plasma membrane unites with a special carrier protein.

FALSE

96. Calcium and sodium ions are in a higher concentration in the ECF than in the cytosol, whereas potassium and chloride ions are in a higher concentration in the cytosol.

FALSE

97. Potassium ions are attracted toward a more positively charged area along an electrical gradient, while chloride ions are attracted toward a more negatively charged area.

FALSE

98. Opening a potassium channel during the resting potential would cause potassium ions to move along their concentration gradient but against the electrical gradient.

TRUE

99. Opening a sodium channel during the resting potential would cause sodium ions to move along an electrical gradient and along a concentration gradient.

TRUE

100. If an electrical gradient is present for a given substance, the substance may be able to get through the membrane without going through a carrier or channel.

FALSE

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

TRUE

102. 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.

FALSE

103. A membrane potential of -50 mV is greater than a membrane potential of -70 mV.

FALSE

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

TRUE

105. Carriers that perform facilitated diffusion or secondary active transport of glucose do not split ATP.

TRUE

106. The SGLT and GLUT carriers do not split ATP.

TRUE

107. Under normal conditions, the movement of potassium into a cell always requires the splitting of ATP.

TRUE

108. At resting membrane potential, sodium and potassium ions are no longer moving across the membrane.

FALSE

109. At equilibrium, when no net diffusion of Na^+ or K^+ is occurring through the membrane, Na+-K^+ pumps do not have to pump Na^+ or K^+.

FALSE

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

TRUE

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

TRUE

112. If a cell begins to swell after being placed into a salt solution, the salt solution must have a lower osmotic pressure than the cytosol.

TRUE

113. Large protein anions do not leave the cell because there is no concentration or electrical gradient to drive it outward.

FALSE

114. Sodium-potassium pumps indirectly provide the energy source for SGLT carriers in intestinal cells.

TRUE

115. Placing pure water around cells causes the cells to swell because the cytosol has a lower osmotic pressure than the pure water.

FALSE

116. Most of a membrane potential is established by the passive movement of different cations into and out of a cell.

TRUE

117. With secondary active transport, sodium ions move along a concentration gradient but against an electrical gradient.

FALSE

118. Dephosphorylation of the Na^+-K^+ pump causes three Na+ ions to move out of a cell against a concentration gradient.

FALSE

119. Leak channels for sodium are closed during the resting potential but open with appropriate stimulation.

FALSE

120. In cystic fibrosis, defective chloride channels allow too many chloride ions to enter the cell, causing the cell to become hypertonic to the ECF and swell.

FALSE

121. Opening a gated channel that allows Na^+ to diffuse through the plasma membrane would cause the membrane potential to increase.

FALSE

122. Scurvy is caused by a vitamin C deficiency that prevents the proper development of desmosomes; hence, tissue cells do not hold together.

FALSE

123. **Complete each of the following statments.**

The model of the plasma membrane as a lipid bilayer studded and penetrated by proteins is known as the _____ model of membrane structure.

fluid mosaic

124. **Complete each of the following statments.**

Of the lipids in the plasma membrane, _____ are most abundant, with lesser amounts of _____.

phospholipids, cholesterol

125. **Complete each of the following statments.**

_____ is responsible for maintaining the fluid nature of the plasma membrane in human cells.

Cholesterol

126. **Complete each of the following statments.**

Membrane carbohydrates in the plasma membrane combine with other molecules to form glycoproteins and _____.

glycolipids

127. **Complete each of the following statments.**

A deficiency in channels that allow _____ ions to pass through cell membranes is responsible for cystic fibrosis.

chloride

128. **Complete each of the following statments.**

_____ refers to the transfer of a phosphate group from ATP to a protein, thereby bringing about a change in the shape and function of the protein.

Phosphorylation

129. **Complete each of the following statments.**

Ions pass into or out of the cell through protein _____ and _____ in the plasma membrane.

carriers, channels

130. **Complete each of the following statments.**

Cell adhesion proteins include _____ and _____.

cadherins, integrins

131. **Complete each of the following statments.**

Vesicles bind to _____ acceptors on the plasma membrane prior to exocytosis

docking-marker

132. **Complete each of the following statments.**

_____ are cell-to-cell connections through which materials can pass from the cytosol of one cell into the cytosol of an adjacent cell.

Gap junctions

133. **Complete each of the following statments.**

_____ is a rubber-like protein found in tissues in organs such as the lungs.

Elastin

134. **Complete each of the following statments.**

Cell connections called _____ force materials to pass *through* cells and not between them.

tight junctions

135. **Complete each of the following statments.**

_____ are cell connections that utilize CAMs to hold adjacent cells together while being anchor to intermediate filaments of each cell's cytoskeleton.

Desmosomes

136. **Complete each of the following statments.**

Simple diffusion of different substances through the cell membrane can occur through the phospholipid region and through _____.

channels

137. **Complete each of the following statments.**

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

osmosis

138. **Complete each of the following statments.**

A solutions containing the same concentration of solute particles as human cells is said to be _____ to the cell.

isotonic

139. **Complete each of the following statments.**

A solution containing _____ mOsm of solute is isotonic to human cells.

300

140. **Complete each of the following statments.**

Glucose moves against its concentration gradient through the cell membrane by passing through carriers that simultaneously transport _____ ions.

sodium

141. **Complete each of the following statments.**

In _____ diffusion, water-soluble materials move through specific channels in the cell membrane.

simple

142. **Complete each of the following statments.**

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

transport maximum (Tm)

143. **Complete each of the following statments.**

The two types of _____ transport include active transport and _____.

carrier-mediated, facilitated diffusion

144. **Complete each of the following statments.**

Secondary active transport in which two substances pass through the membrane in the same direction is called _____.

symport (or cotransport)

145. **Complete each of the following statments.**

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

specificity, saturation, competition

146. **Complete each of the following statments.**

In facilitated diffusion, particles move from a(n) _____ concentration to a(n) _____ concentration.

higher, lower

147. **Complete each of the following statments.**

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

lower, higher

148. **Complete each of the following statments.**

A transport maximum is associated with carriers that perform _____ or _____ in the cell membrane.

active transport, facilitated diffusion

149. **Complete each of the following statments.**

Endocytosis and exocytosis are both examples of _____ transport.

vesicular

150. **Complete each of the following statments.**

Opening a sodium channel during the resting membrane potential will cause the potential to become less _____.

negative

151. **Complete each of the following statments.**

Surrounding a blood cell with a 0.5% NaCl solution would cause the cell to _____, because this NaCl solution is _____ to the cell.

swell, hypotonic

152. **Complete each of the following statments.**

In many cells, the hormone called _____ promotes the insertion of glucose carriers into the plasma membranes.

insulin

153. **Complete each of the following statments.**

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

equilibrium potential

154. **Complete each of the following statments.**

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

Membrane potential

155. **Complete each of the following statments.**

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

concentration, electrical

156. **Complete each of the following statments.**

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

Nernst

157. **Complete each of the following statments.**

A common antiporter transports _____ ions out of the cell while it transports _____ ions into the cell.

H+, Na+

158. **Complete each of the following statments.**

The SGLT carrier moves _____ molecules uphill against a concentration gradient while moving _____ ions down a concentration gradient.

glucose, Na+

159. **Complete each of the following statments.**

The _____ pump moves two _____ ions into the cell for every three _____ ions it moves out the cell.

Na+-K+, Na+, K+

160. **Complete each of the following statments.**

The GLUT carrier moves glucose molecules _____ their concentration gradient while moving _____ ions down their concentration gradient.

down, Na+

161. **Complete each of the following statments.**

Scurvy is the result of a vitamin _____ deficiency and results in abnormal formation of the protein called _____.

C, collagen

162. **Complete each of the following statments.**

"Kiss" sites are associated with cell-to-cell connections called _____.

tight junctions

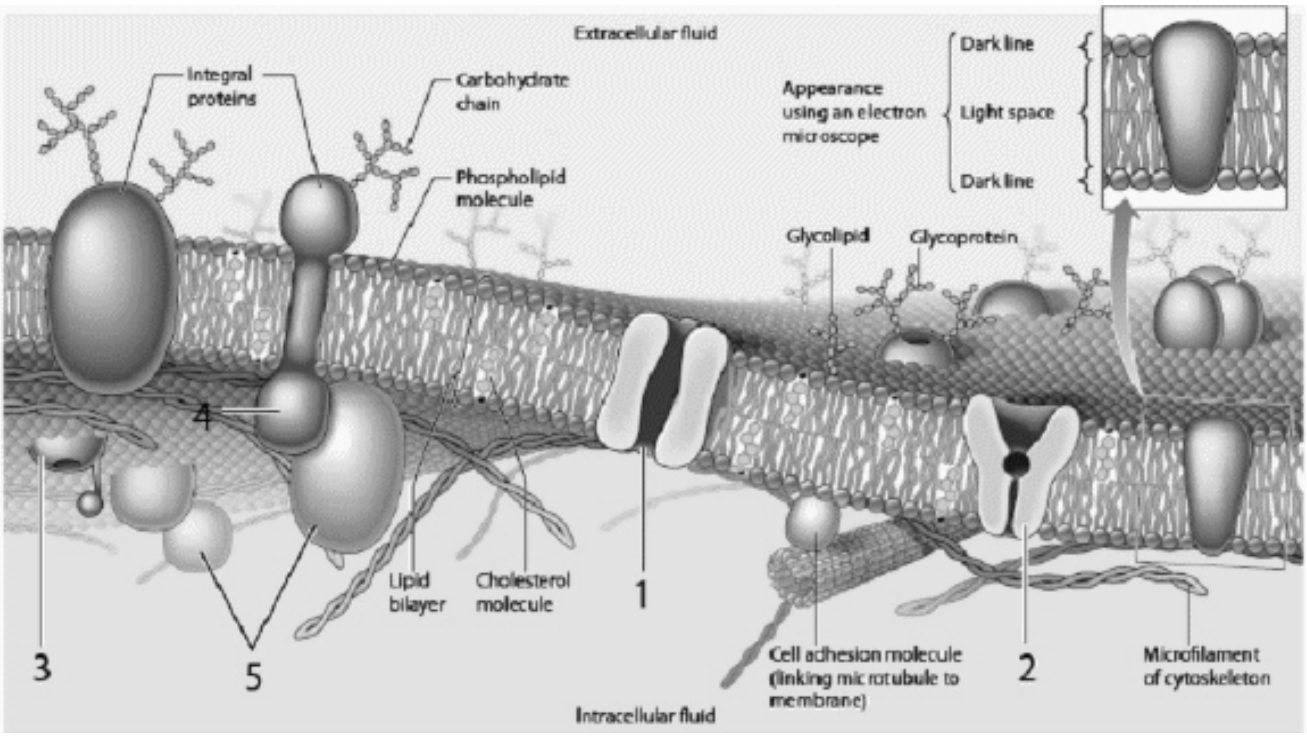
163. Match the term to the correct description.

1. Provides tensile strength to the ECM	collagen	**1**
2. Extracellular protein promoting cell adhesion	keratin	**3**
3. Intracellular protein that supports desmosomes	fibronectin	**2**
4. Enables tissues to stretch and recoil	elastin	**4**

164. Indicate which characteristic of a mediated-transport system is referred to in each item by filling in the blank using the following answer code.

1. The concentration of substance X outside the cell continues to increase but the rate of substance X's transport into the cell remains constant.	specificity	**3**
2. In the presence of substance Z there is a decreased rate of entry of substance X.	competition	**2**
3. Carrier can handle substance X but not substance Y.	saturation	**1**

165.



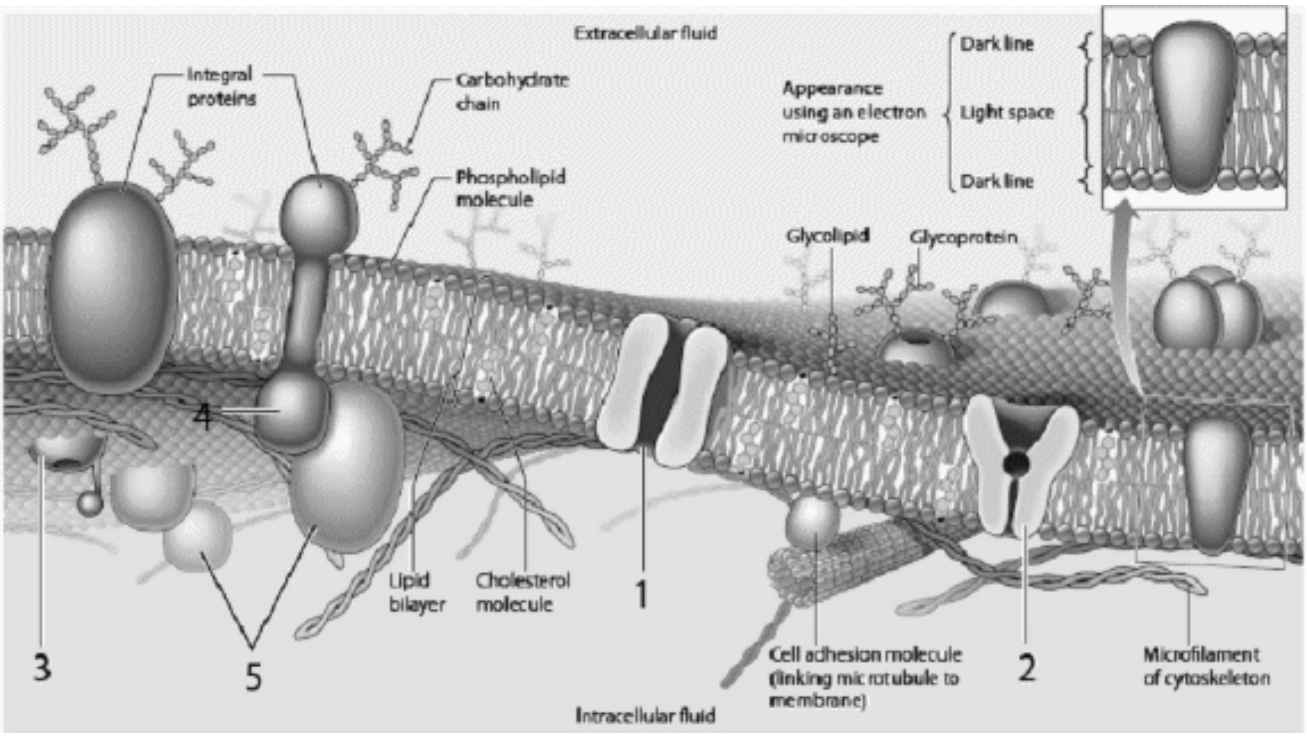
Use the figure above to answer the corresponding questions.

Which protein might require ATP in order to transport a particle through the membrane?

a. 1
b. 2
c. 3
d. 4
e. 5

b

166.



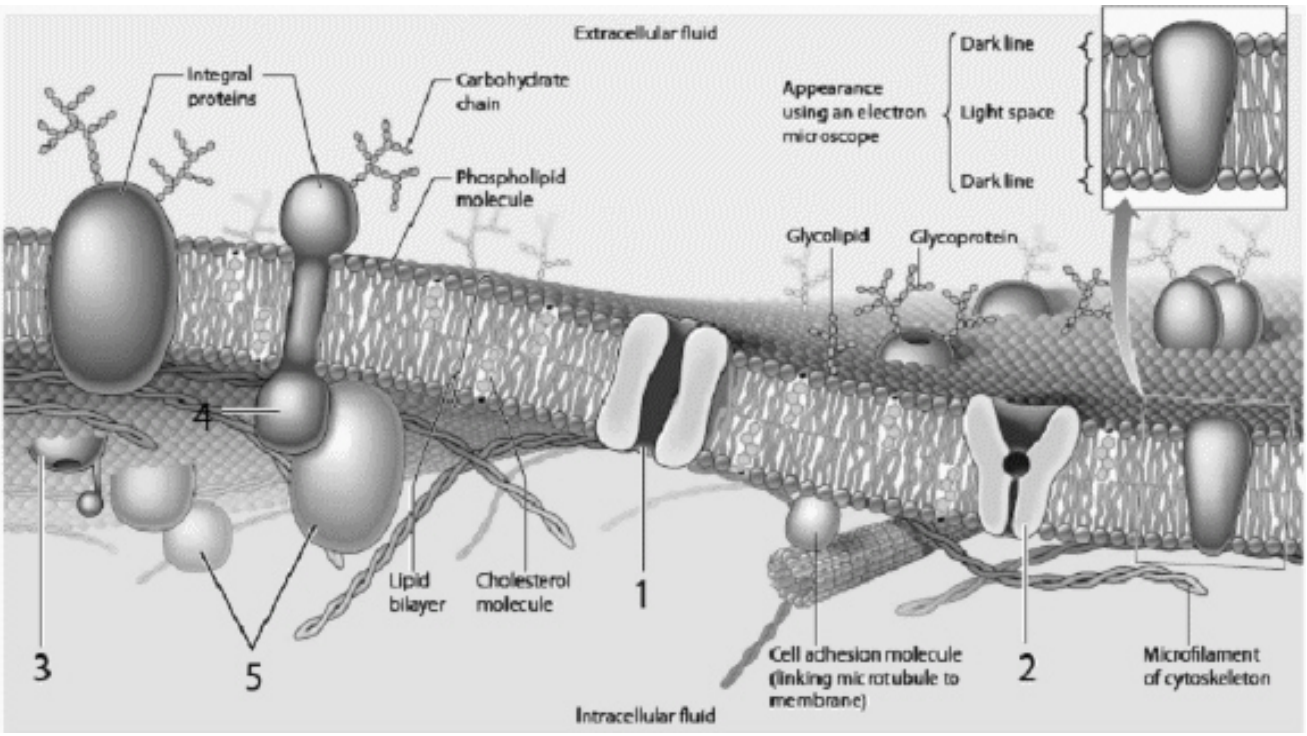
Use the figure above to answer the corresponding questions.

Which protein could be associated with active movement of a substance through the membrane?

a. 1
b. 2
c. 3
d. 4
e. 5

b

167.



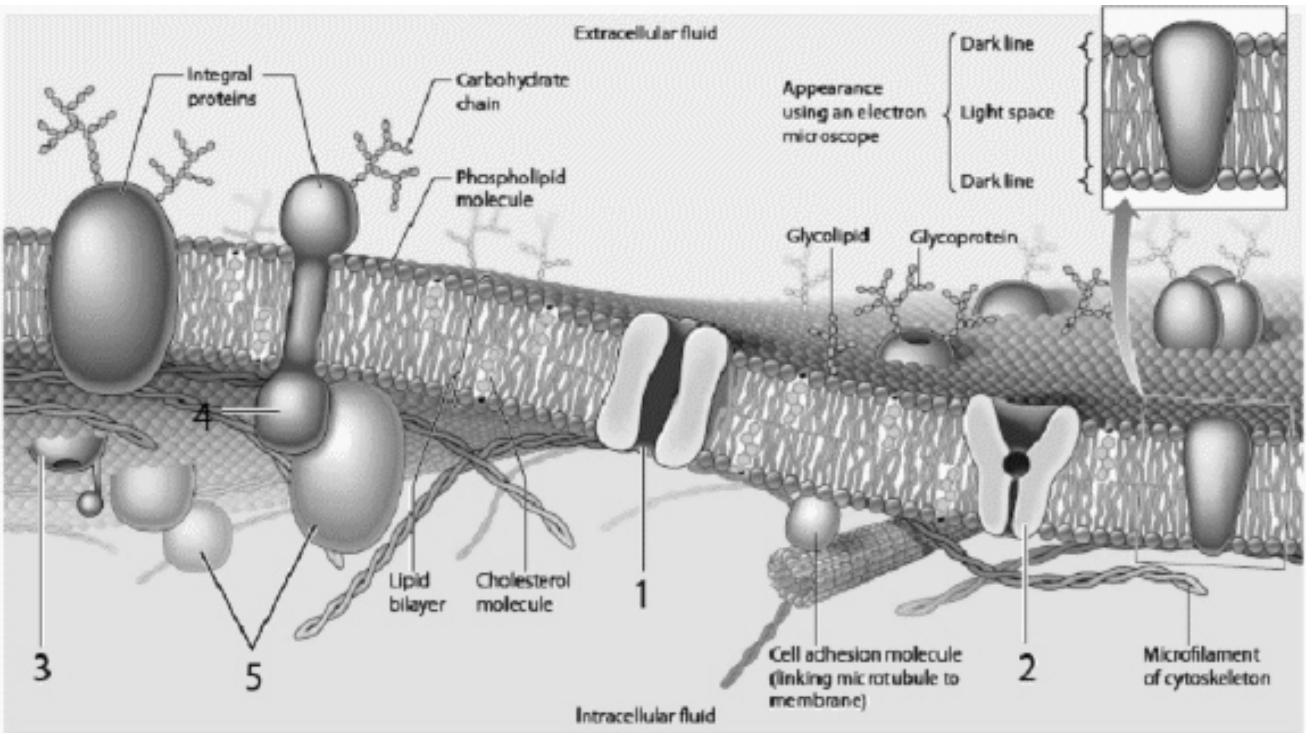
Use the figure above to answer the corresponding questions.

Which protein could represent the GLUT protein in the membrane of an intestinal cell?

a. 1
b. 2
c. 3
d. 4
e. 5

b

168.



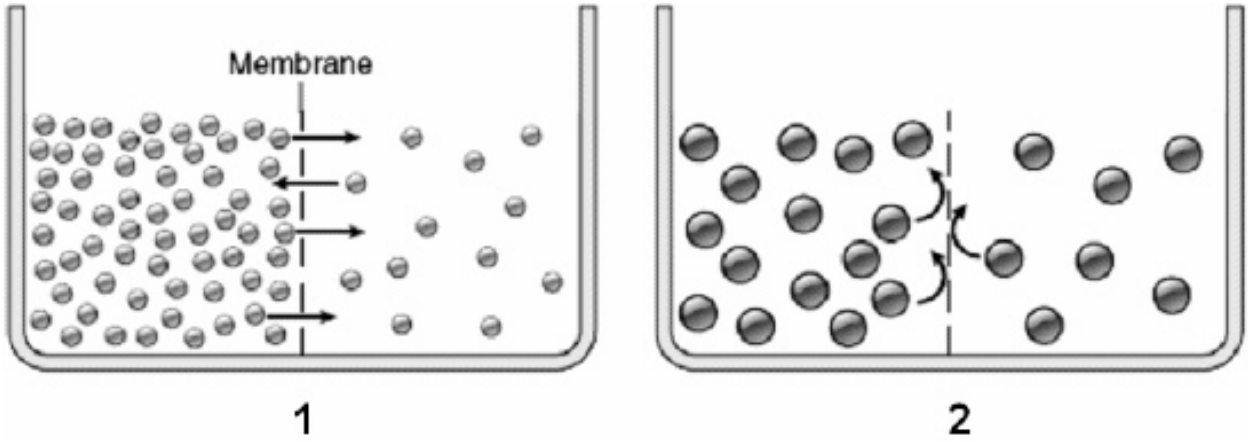
Use the figure above to answer the corresponding questions.

Which protein might be an ATPase?

a. 1
b. 2
c. 3
d. 4
e. 5

b

169.



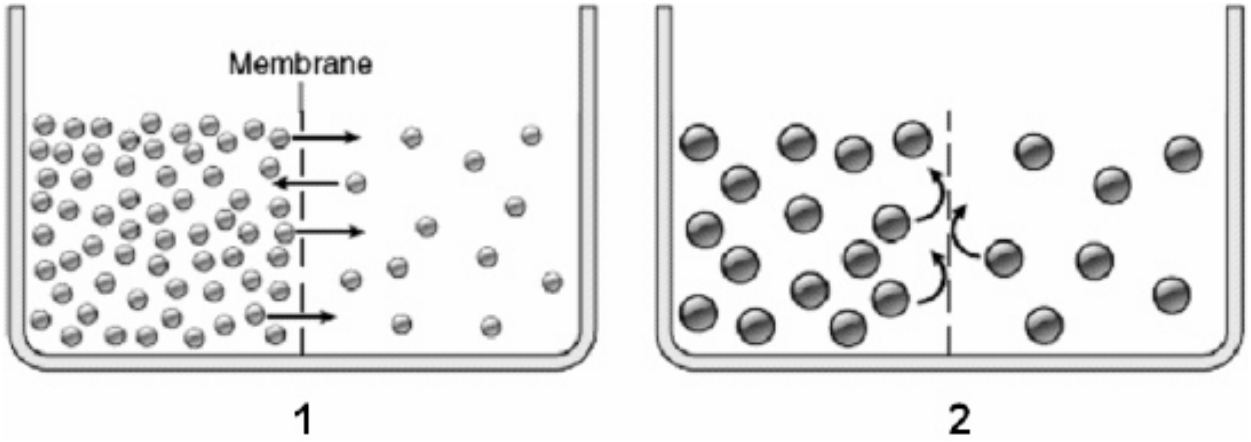
Use the figure above to answer the corresponding questions. Assume the membrane is always permeable to water.

In beaker 1, the solution on the right side of the membrane

a. has a lower osmolarity than the solution on the left side of the membrane
b. will gain water from the solution on the left side of the membrane
c. has a higher osmotic pressure than the solution on the left side of the membrane
d. has a lower osmolarity than the solution on the left side of the membrane and will gain water from the solution on the left side of the membrane
e. will gain water from the solution on the left side of the membrane and has a higher osmotic pressure than the solution on the left side of the membrane

a

170.



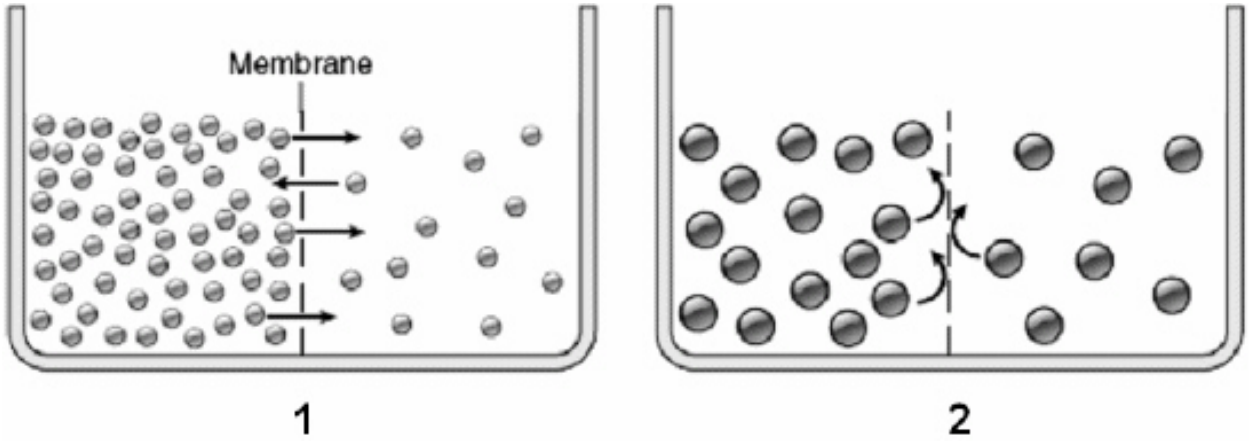
Use the figure above to answer the corresponding questions. Assume the membrane is always permeable to water.

In beaker 1, the solution on the right side of the membrane

a. could eventually have the same concentration of green solute particles as the solution on the left side of the membrane
b. could eventually have the same osmolarity as the solution on the left side of the membrane
c. currently has a lower osmotic pressure than the solution on the left side of the membrane
d. is currently losing water
e. all of these

e

171.



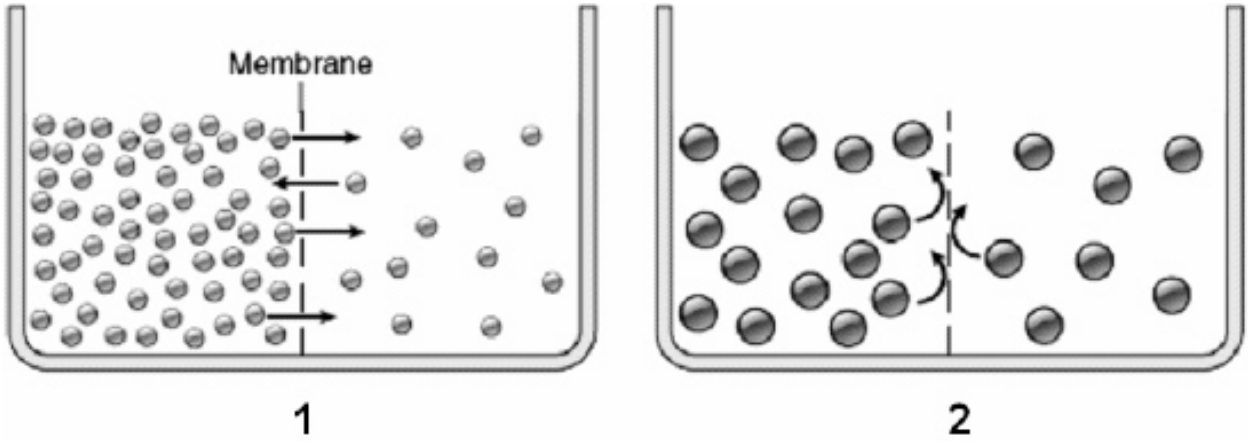
Use the figure above to answer the corresponding questions. Assume the membrane is always permeable to water.

In beaker 2, the solution on the right side of the membrane

a. has a higher osmolarity than the solution on the left side of the membrane
b. will gain water from the solution on the left side of the membrane
c. has a lower osmotic pressure than the solution on the left side of the membrane
d. has a higher osmolarity than the solution on the left side of the membrane and will gain water from the solution on the left side of the membrane
e. none of these

c

172.



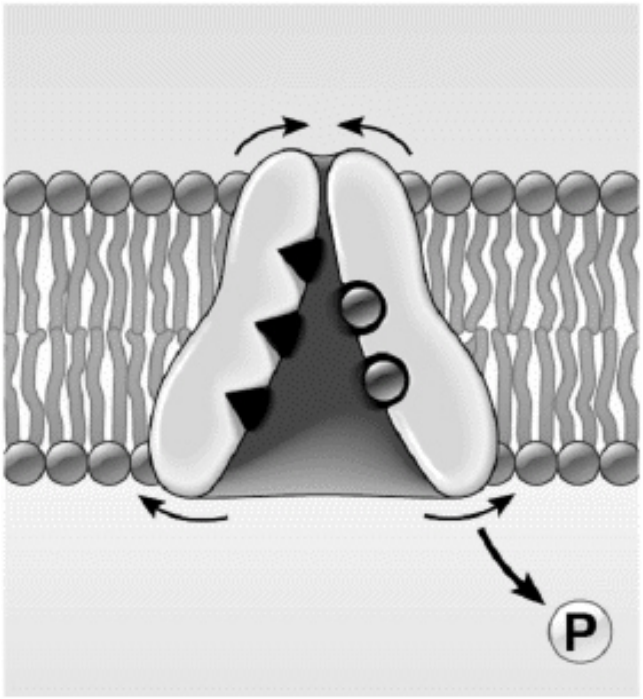
Use the figure above to answer the corresponding questions. Assume the membrane is always permeable to water.

In beaker 2, the solution on the right side of the membrane

a. could eventually have the same number of red solute particles as the solution on the left side of the membrane
b. could eventually have the same concentration of red particles as the solution on the left side of the membrane
c. currently has a higher osmotic pressure than the solution on the left side of the membrane
d. is currently gaining water
e. all of these

b

173.



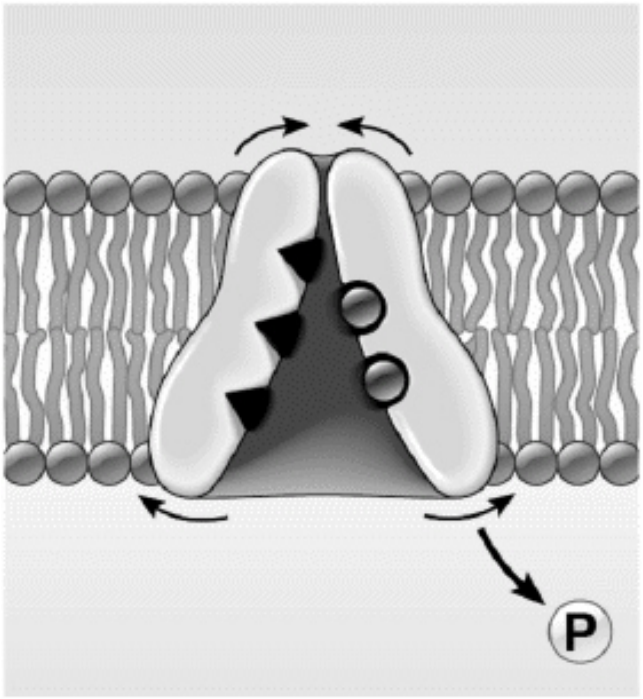
Use the figure above to answer the corresponding questions.

In this figure, the carrier is

a. transporting Na^+ ions into the ECF
b. transporting K^+ ions into the ICF
c. about to become phosphorylated.
d. performing secondary active transport
e. transporting K^+ ions into the ICF and performing secondary active transport

b

174.



Use the figure above to answer the corresponding questions.

Which step will come immediately after the carrier releases the ions shown in this figure?

a. The carrier will become phosphorylated.
b. The carrier will pick up ions from the ECF.
c. The carrier will pick up ions from the ICF.
d. The carrier will split ATP.
e. The carrier will become phosphorylated and The carrier will split ATP.

d

175. Describe the transport of glucose from the intestinal lumen into the intestinal cells and mention how Na^+-K^+ pumps make this process possible.

Glucose is transported from the intestinal lumen into the intestinal cells via cotransport (secondary active transport) with Na^+ ions. The symporter for this process is called SGLT (sodium-glucose transporter). A sodium ion attaches to the SGLT and increases the carrier's affinity for glucose. A glucose molecule then binds to the luminal side of the SGLT. Having a Na^+ ion and glucose attached simultaneously causes the SGLT to change shape and transport the Na^+ and glucose into the cell. The Na^+ ion is moved down its concentration gradient, while the glucose is moved against its concentration gradient. By constantly pumping Na^+ ions out of the cell, the Na^+-K^+ pumps in the membrane of the intestinal cell maintain a steep gradient for Na^+. Therefore, Na^+ ions have a greater tendency to attach to the luminal side of the SGLT, which, in turn, allows more glucose to enter the cell.

176. Describe the transport of glucose out of an intestinal cell and into the blood.

Glucose is transported from the intestinal cell into the blood via facilitated transport. The carrier for this process is called GLUT (glucose transporter). After entering the intestinal cell via the SGLT, glucose moves through the cytosol and attaches to the GLUT in the plasma membrane on the basolateral (blood) side of the cell. This causes the GLUT to change shape and transport the glucose down its concentration gradient out of the cell. The glucose then diffuses through the interstitial fluid and into the blood vessel, a process that also requires facilitated diffusion carriers.

177. Describe the various functions of proteins in membranes.

The different types of proteins in the plasma membrane may function as the following: (a) channels that allow the movement of specific ions or polar molecules down a concentration gradient; (b) carriers, which change shape to transport substances either down or up a concentration gradient; (c) docking-marker acceptors, which bind to secretory vesicles and trigger exocytosis; (d) membrane-bound enzymes that facilitate specific chemical reactions; (e) receptors, which bind to chemical messengers in the ECF and can then trigger reactions inside the cell; (e) cell adhesion molecules (CAMs) that can help hold adjacent cells together; and (f) cell-recognition markers that allow the body to recognize its own cells.

178. Describe the action of a Na^+-K^+ pump.

Three Na^+ ions bind to the ICF side of the pump, which allows the pump to then split ATP into ADP and phosphate. The phosphate binds to the pump (i.e., the pump is phosphorylated), which then changes shape and transports the Na^+ ions to the ECF. After the Na^+ ions leave the pump, two K^+ ions attach to the ECF side of the pump, which then causes the phosphate group to detach from the pump. Dephosphorylation causes the pump to change shape and transport the K^+ ions into the cell. When the K^+ ions detach from the pump, the pump is now ready to repeat the process.

179. Describe what would happen to red blood cells if a person received a transfusion of distilled (pure) water.

Since the distilled water contains no solute, it would be very hypotonic to the cells. Consequently, water would rapidly enter the red blood cells causing them to swell and possibly rupture (lyse).

180. Describe the concentration gradients associated with the resting membrane potential.

The cytosol contains a much higher concentration of K^+ ions than the ECF, while the ECF contains a much higher concentration of Na^+ ions than the cytosol. The membrane is "leakier" to the K^+ ions than to the Na^+ ions; therefore, more K^+ ions leak out of the cell than there are Na^+ ions leaking into the cell. This is partly responsible for the resting membrane potential being positive on the ECF side and negative on the ICF side of the membrane. In addition, the Na^+ - K^+ pumps actively transport three Na^+ ions out of the cell for every two K^+ ions it transports into the cell. Coupling the unequal diffusion and the unequal pumping of these two cations is responsible for the establishment of the resting membrane potential.

181. Describe the effects of the concentration and electrical gradients on the movement of Na^+ and K^+ ions through the membrane.

The unequal diffusion and unequal pumping of cations (Na^+ and K^+) causes the ECF side of the plasma membrane to be positively charged while the ICF side is negatively charged. As the inside border of the membrane becomes more negative, it exerts a stronger attraction for the K^+ ions, which prevents an excessive amount of K^+ diffusion out of the cell. Although the negative inside border has a very strong attraction for the Na^+ ions in the ECF, the membrane is not very "leaky" to these ions. However, if a channel opens and allows these ions to passively move through the membrane, Na^+ ions will move into the cell down its concentration gradient and down the electrical gradient (i.e., from a positive region toward a negative region). Potassium ions can diffuse out of the cell along their concentration gradient, but it would be against an electrical gradient, unless the outside border becomes negatively charged.

182. Describe how an ATP is important to the SGLT carrier.

Since the SGLT is a secondary active transporter, it does not rely on ATP directly. However, it relies on a steep concentration gradient for Na^+ ions, which is maintained by the Na^+-K^+ pumps that use ATP directly. The SGLT binds to Na^+ ions and also glucose molecules in the ECF. Only by binding to both substances can the SGLT transport them into the cell. The Na^+ ions move down their concentration gradient while the glucose moves up its own gradient.