

## Chapter 7 Membrane Structure and Function

### Multiple-Choice Questions

- 1) Who was/were the first to propose that cell membranes are phospholipid bilayers?
- A) H. Davson and J. Danielli
  - B) I. Langmuir
  - C) C. Overton
  - D) S. Singer and G. Nicolson
  - E) E. Gorter and F. Grendel

Answer: E

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 2) Who proposed that membranes are a phospholipid bilayer between two layers of hydrophilic proteins?
- A) H. Davson and J. Danielli
  - B) I. Langmuir
  - C) C. Overton
  - D) S. Singer and G. Nicolson
  - E) E. Gorter and F. Grendel

Answer: A

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 3) Who proposed that the membrane is a mosaic of protein molecules bobbing in a fluid bilayer of phospholipids?
- A) H. Davson and J. Danielli
  - B) I. Langmuir
  - C) C. Overton
  - D) S. Singer and G. Nicolson
  - E) E. Gorter and F. Grendel

Answer: D

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 4) Which of the following types of molecules are the major structural components of the cell membrane?
- A) phospholipids and cellulose
  - B) nucleic acids and proteins
  - C) phospholipids and proteins
  - D) proteins and cellulose
  - E) glycoproteins and cholesterol

Answer: C

Topic: Concept 7.1

Skill: Knowledge/Comprehension

For the following questions, match the labeled component of the cell membrane (Figure 7.1) with its description.

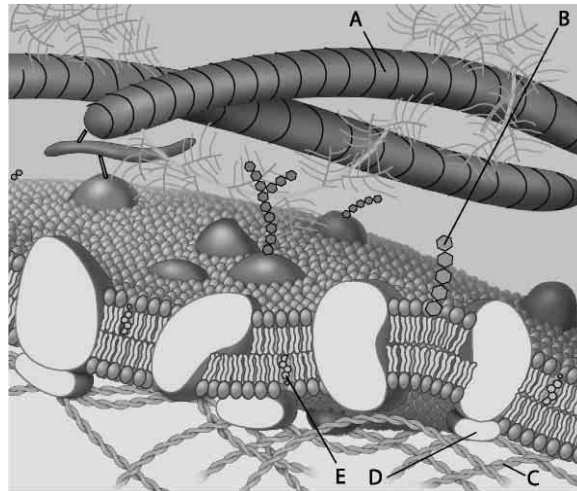


Figure 7.1

5) peripheral protein

Answer: D

Topic: Concept 7.1

Skill: Knowledge/Comprehension

6) cholesterol

Answer: E

Topic: Concept 7.1

Skill: Knowledge/Comprehension

7) fiber of the extracellular matrix

Answer: A

Topic: Concept 7.1

Skill: Knowledge/Comprehension

8) microfilament of the cytoskeleton

Answer: C

Topic: Concept 7.1

Skill: Knowledge/Comprehension

9) glycolipid

Answer: B

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 10) When biological membranes are frozen and then fractured, they tend to break along the middle of the bilayer. The best explanation for this is that
- A) the integral membrane proteins are not strong enough to hold the bilayer together.
  - B) water that is present in the middle of the bilayer freezes and is easily fractured.
  - C) hydrophilic interactions between the opposite membrane surfaces are destroyed on freezing.
  - D) the carbon-carbon bonds of the phospholipid tails are easily broken.
  - E) the hydrophobic interactions that hold the membrane together are weakest at this point.

Answer: E

Topic: Concept 7.1

Skill: Application/Analysis

- 11) The presence of cholesterol in the plasma membranes of some animals
- A) enables the membrane to stay fluid more easily when cell temperature drops.
  - B) enables the animal to remove hydrogen atoms from saturated phospholipids.
  - C) enables the animal to add hydrogen atoms to unsaturated phospholipids.
  - D) makes the membrane less flexible, allowing it to sustain greater pressure from within the cell.
  - E) makes the animal more susceptible to circulatory disorders.

Answer: A

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 12) According to the fluid mosaic model of cell membranes, which of the following is a *true* statement about membrane phospholipids?
- A) They can move laterally along the plane of the membrane.
  - B) They frequently flip-flop from one side of the membrane to the other.
  - C) They occur in an uninterrupted bilayer, with membrane proteins restricted to the surface of the membrane.
  - D) They are free to depart from the membrane and dissolve in the surrounding solution.
  - E) They have hydrophilic tails in the interior of the membrane.

Answer: A

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 13) Which of the following is one of the ways that the membranes of winter wheat are able to remain fluid when it is extremely cold?
- A) by increasing the percentage of unsaturated phospholipids in the membrane
  - B) by increasing the percentage of cholesterol molecules in the membrane
  - C) by decreasing the number of hydrophobic proteins in the membrane
  - D) by co-transport of glucose and hydrogen
  - E) by using active transport

Answer: A

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 14) In order for a protein to be an integral membrane protein it would have to be which of the following?
- A) hydrophilic
  - B) hydrophobic
  - C) amphipathic
  - D) completely covered with phospholipids
  - E) exposed on only one surface of the membrane

Answer: C

Topic: Concept 7.1

Skill: Synthesis/Evaluation

- 15) When a membrane is freeze-fractured, the bilayer splits down the middle between the two layers of phospholipids. In an electron micrograph of a freeze-fractured membrane, the bumps seen on the fractured surface of the membrane are
- A) peripheral proteins.
  - B) phospholipids.
  - C) carbohydrates.
  - D) integral proteins.
  - E) cholesterol molecules.

Answer: D

Topic: Concept 7.1

Skill: Application/Analysis

- 16) Which of the following is a reasonable explanation for why unsaturated fatty acids help keep any membrane more fluid at lower temperatures?
- A) The double bonds form kinks in the fatty acid tails, forcing adjacent lipids to be further apart.
  - B) Unsaturated fatty acids have a higher cholesterol content and therefore more cholesterol in membranes.
  - C) Unsaturated fatty acids permit more water in the interior of the membrane.
  - D) The double bonds block interaction among the hydrophilic head groups of the lipids.
  - E) The double bonds result in shorter fatty acid tails and thinner membranes.

Answer: A

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 17) Which of the following is true of integral membrane proteins?
- A) They lack tertiary structure.
  - B) They are loosely bound to the surface of the bilayer.
  - C) They are usually transmembrane proteins.
  - D) They are not mobile within the bilayer.
  - E) They serve only a structural role in membranes.

Answer: C

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 18) Of the following functions, which is most important for the glycoproteins and glycolipids of animal cell membranes?
- A) facilitated diffusion of molecules down their concentration gradients
  - B) active transport of molecules against their concentration gradients
  - C) maintaining the integrity of a fluid mosaic membrane
  - D) maintaining membrane fluidity at low temperatures
  - E) a cell's ability to distinguish one type of neighboring cell from another

Answer: E

Topic: Concept 7.1

Skill: Knowledge/Comprehension

- 19) An animal cell lacking oligosaccharides on the external surface of its plasma membrane would likely be impaired in which function?
- A) transporting ions against an electrochemical gradient
  - B) cell-cell recognition
  - C) maintaining fluidity of the phospholipid bilayer
  - D) attaching to the cytoskeleton
  - E) establishing the diffusion barrier to charged molecules

Answer: B

Topic: Concept 7.1

Skill: Application/Analysis

20) In the years since the proposal of the fluid mosaic model of the cell membrane, which of the following observations has been added to the model?

- A) The membrane is only fluid across a very narrow temperature range.
- B) Proteins rarely move, even though they possibly can do so.
- C) Unsaturated lipids are excluded from the membranes.
- D) The concentration of protein molecules is now known to be much higher.
- E) The proteins are known to be made of only acidic amino acids.

Answer: D

Topic: Concept 7.1

Skill: Knowledge/Comprehension

21) Which of the following span the phospholipids bilayer, usually a number of times?

- A) transmembrane proteins
- B) integral proteins
- C) peripheral proteins
- D) integrins
- E) glycoproteins

Answer: A

Topic: Concept 7.1

Skill: Knowledge/Comprehension

22) Which of these are not embedded in the lipid bilayer at all?

- A) transmembrane proteins
- B) integral proteins
- C) peripheral proteins
- D) integrins
- E) glycoproteins

Answer: C

Topic: Concept 7.1

Skill: Knowledge/Comprehension

23) Which of these are attached to the extracellular matrix?

- A) transmembrane proteins
- B) integral proteins
- C) peripheral proteins
- D) integrins
- E) glycoproteins

Answer: D

Topic: Concept 7.1

Skill: Knowledge/Comprehension

24) Which of these often serve as receptors or cell recognition molecules on cell surfaces?

- A) transmembrane proteins
- B) integral proteins
- C) peripheral proteins
- D) integrins
- E) glycoproteins

Answer: E

Topic: Concept 7.1

Skill: Knowledge/Comprehension

25) The formulation of a model for a structure or for a process serves which of the following purposes?

- A) It asks a scientific question.
- B) It functions as a testable hypothesis.
- C) It records observations.
- D) It serves as a data point among results.
- E) It can only be arrived at after years of experimentation.

Answer: B

Topic: Concept 7.1

Skill: Synthesis/Evaluation

26) Cell membranes are asymmetrical. Which of the following is a most likely explanation?

- A) The cell membrane forms a border between one cell and another in tightly packed tissues such as epithelium.
- B) Cell membranes communicate signals from one organism to another.
- C) Cell membrane proteins are determined as the membrane is being packaged in the ER and Golgi.
- D) The "innerness" and "outerness" of membrane surfaces are predetermined by genes.
- E) Proteins can only span cell membranes if they are hydrophobic.

Answer: C

Topic: Concept 7.1

Skill: Synthesis/Evaluation

27) Which of the following is true of the evolution of cell membranes?

- A) Cell membranes have stopped evolving now that they are fluid mosaics.
- B) Cell membranes cannot evolve if proteins do not.
- C) The evolution of cell membranes is driven by the evolution of glycoproteins and glycolipids.
- D) As populations of organisms evolve, different properties of their cell membranes are selected for or against.
- E) An individual organism selects its preferred type of cell membrane for particular functions.

Answer: D

Topic: Concept 7.1

Skill: Synthesis/Evaluation

28) Why are lipids and proteins free to move laterally in membranes?

- A) The interior of the membrane is filled with liquid water.
- B) There are no covalent bonds between lipid and protein in the membrane.
- C) Hydrophilic portions of the lipids are in the interior of the membrane.
- D) There are only weak hydrophobic interactions in the interior of the membrane.
- E) Molecules such as cellulose can pull them in various directions.

Answer: C

Topic: Concept 7.1

Skill: Knowledge/Comprehension

29) What kinds of molecules pass through a cell membrane most easily?

- A) large and hydrophobic
- B) small and hydrophobic
- C) large polar
- D) ionic
- E) monosaccharides such as glucose

Answer: B

Topic: Concept 7.2

Skill: Knowledge/Comprehension

30) Which of the following is a characteristic feature of a carrier protein in a plasma membrane?

- A) It is a peripheral membrane protein.
- B) It exhibits a specificity for a particular type of molecule.
- C) It requires the expenditure of cellular energy to function.
- D) It works against diffusion.
- E) It has few, if any, hydrophobic amino acids.

Answer: B

Topic: Concept 7.2

Skill: Knowledge/Comprehension

31) After a membrane freezes and then thaws, it often becomes leaky to solutes. The most reasonable explanation for this is that

- A) transport proteins become nonfunctional during freezing.
- B) the lipid bilayer loses its fluidity when it freezes.
- C) aquaporins can no longer function after freezing.
- D) the integrity of the lipid bilayer is broken when the membrane freezes.
- E) the solubility of most solutes in the cytoplasm decreases on freezing.

Answer: D

Topic: Concept 7.2

Skill: Application/Analysis

32) Which of the following would likely move through the lipid bilayer of a plasma membrane most rapidly?

- A) CO<sub>2</sub>
- B) an amino acid
- C) glucose
- D) K<sup>+</sup>
- E) starch

Answer: A

Topic: Concept 7.2

Skill: Application/Analysis

33) Which of the following statements is *correct* about diffusion?

- A) It is very rapid over long distances.
- B) It requires an expenditure of energy by the cell.
- C) It is a passive process in which molecules move from a region of higher concentration to a region of lower concentration.
- D) It is an active process in which molecules move from a region of lower concentration to one of higher concentration.
- E) It requires integral proteins in the cell membrane.

Answer: C

Topic: Concept 7.2

Skill: Knowledge/Comprehension

34) Water passes quickly through cell membranes because

- A) the bilayer is hydrophilic.
- B) it moves through hydrophobic channels.
- C) water movement is tied to ATP hydrolysis.
- D) it is a small, polar, charged molecule.
- E) it moves through aquaporins in the membrane.

Answer: E

Topic: Concept 7.2

Skill: Knowledge/Comprehension

*The following information should be used to answer the following questions.*

Cystic fibrosis is a genetic disease in humans in which chloride ion channels in cell membranes are missing or nonfunctional.

35) Chloride ion channels are membrane structures that include which of the following?

- A) gap junctions
- B) aquaporins
- C) hydrophilic proteins
- D) carbohydrates
- E) sodium ions

Answer: C

Topic: Concept 7.2

Skill: Knowledge/Comprehension

36) Which of the following would you expect to be a problem for someone with nonfunctional chloride channeling?

- A) inadequate secretion of mucus
- B) buildup of excessive secretions in organs such as lungs
- C) buildup of excessive secretions in glands such as the pancreas
- D) sweat that includes no NaCl
- E) mental retardation due to low salt levels in brain tissue

Answer: B

Topic: Concept 7.2

Skill: Application/Analysis

37) If a young male child has cystic fibrosis, which of the following would affect his fertility?

- A) inability to make sperm
- B) incomplete maturation of the testes
- C) failure to form genital structures appropriately
- D) incorrect concentrations of ions in semen
- E) abnormal pH in seminal fluid

Answer: D

Topic: Concept 7.2

Skill: Application/Analysis



Use the diagram of the U-tube in Figure 7.2 to answer the questions that follow.

The solutions in the two arms of this U-tube are separated by a membrane that is permeable to water and glucose but not to sucrose. Side A is half filled with a solution of 2 M sucrose and 1 M glucose. Side B is half filled with 1 M sucrose and 2 M glucose. Initially, the liquid levels on both sides are equal.

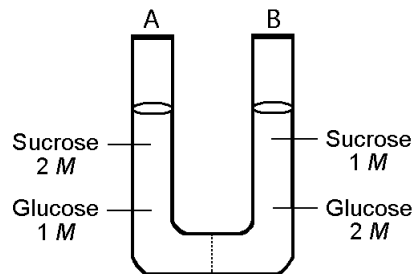


Figure 7.2

- 38) Initially, in terms of tonicity, the solution in side A with respect to that in side B is
- A) hypotonic.
  - B) plasmolyzed.
  - C) isotonic.
  - D) saturated.
  - E) hypertonic.

Answer: C

Topic: Concept 7.3

Skill: Application/Analysis

- 39) After the system reaches equilibrium, what changes are observed?
- A) The molarity of sucrose and glucose are equal on both sides.
  - B) The molarity of glucose is higher in side A than in side B.
  - C) The water level is higher in side A than in side B.
  - D) The water level is unchanged.
  - E) The water level is higher in side B than in side A.

Answer: C

Topic: Concept 7.3

Skill: Application/Analysis

- 40) A patient has had a serious accident and lost a lot of blood. In an attempt to replenish body fluids, distilled water, equal to the volume of blood lost, is transferred directly into one of his veins. What will be the most probable result of this transfusion?
- A) It will have no unfavorable effect as long as the water is free of viruses and bacteria.
  - B) The patient's red blood cells will shrivel up because the blood fluid is hypotonic compared to the cells.
  - C) The patient's red blood cells will swell because the blood fluid is hypotonic compared to the cells.
  - D) The patient's red blood cells will shrivel up because the blood fluid is hypertonic compared to the cells.
  - E) The patient's red blood cells will burst because the blood fluid is hypertonic compared to the cells.

Answer: C

Topic: Concept 7.3

Skill: Application/Analysis

- 41) Celery stalks that are immersed in fresh water for several hours become stiff and hard. Similar stalks left in a salt solution become limp and soft. From this we can deduce that the cells of the celery stalks are
- hypotonic to both fresh water and the salt solution.
  - hypertonic to both fresh water and the salt solution.
  - hypertonic to fresh water but hypotonic to the salt solution.
  - hypotonic to fresh water but hypertonic to the salt solution.
  - isotonic with fresh water but hypotonic to the salt solution.

Answer: C

Topic: Concept 7.3

Skill: Application/Analysis

- 42) A cell whose cytoplasm has a concentration of 0.02 molar glucose is placed in a test tube of water containing 0.02 molar glucose. Assuming that glucose is not actively transported into the cell, which of the following terms describes the tonicity of the external solution relative to the cytoplasm of the cell?

- turgid
- hypertonic
- hypotonic
- flaccid
- isotonic

Answer: E

Topic: Concept 7.3

Skill: Application/Analysis

Refer to Figure 7.3 to answer the following questions.

The solutions in the arms of a U-tube are separated at the bottom of the tube by a selectively permeable membrane. The membrane is permeable to sodium chloride but not to glucose. Side A is filled with a solution of 0.4 M glucose and 0.5 M sodium chloride (NaCl), and side B is filled with a solution containing 0.8 M glucose and 0.4 M sodium chloride. Initially, the volume in both arms is the same.

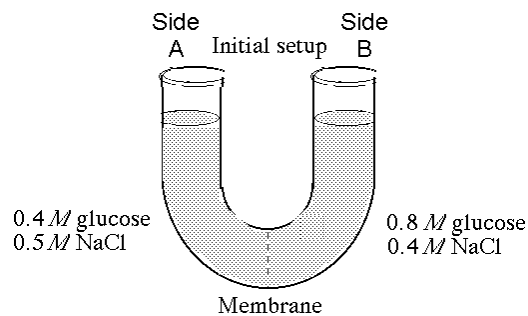


Figure 7.3

- 43) At the beginning of the experiment,
- side A is hypertonic to side B.
  - side A is hypotonic to side B.
  - side A is isotonic to side B.
  - side A is hypertonic to side B with respect to glucose.
  - side A is hypotonic to side B with respect to sodium chloride.

Answer: B

Topic: Concept 7.3

Skill: Application/Analysis

- 44) If you examine side A after 3 days, you should find
- A) a decrease in the concentration of NaCl and glucose and an increase in the water level.
  - B) a decrease in the concentration of NaCl, an increase in water level, and no change in the concentration of glucose.
  - C) no net change in the system.
  - D) a decrease in the concentration of NaCl and a decrease in the water level.
  - E) no change in the concentration of NaCl and glucose and an increase in the water level.

Answer: D

Topic: Concept 7.3

Skill: Application/Analysis

- 45) Which of the following statements *correctly* describes the normal tonicity conditions for typical plant and animal cells?
- A) The animal cell is in a hypotonic solution, and the plant cell is in an isotonic solution.
  - B) The animal cell is in an isotonic solution, and the plant cell is in a hypertonic solution.
  - C) The animal cell is in a hypertonic solution, and the plant cell is in an isotonic solution.
  - D) The animal cell is in an isotonic solution, and the plant cell is in a hypotonic solution.
  - E) The animal cell is in a hypertonic solution, and the plant cell is in a hypotonic solution.

Answer: D

Topic: Concept 7.3

Skill: Knowledge/Comprehension

Read the following information and refer to Figure 7.4 to answer the following questions.

Five dialysis bags, constructed from a semi-permeable membrane that is impermeable to sucrose, were filled with various concentrations of sucrose and then placed in separate beakers containing an initial concentration of 0.6 M sucrose solution. At 10-minute intervals, the bags were massed (weighed) and the percent change in mass of each bag was graphed.

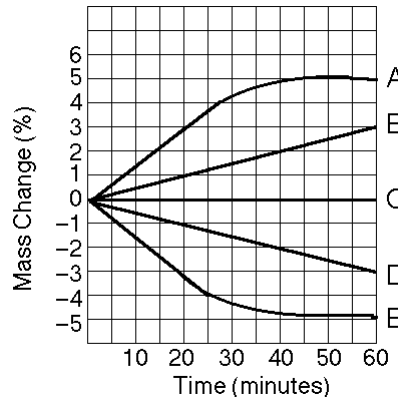


Figure 7.4

- 46) Which line represents the bag that contained a solution isotonic to the 0.6 molar solution at the beginning of the experiment?

Answer: C

Topic: Concept 7.3

Skill: Application/Analysis

- 47) Which line represents the bag with the highest initial concentration of sucrose?

Answer: A

Topic: Concept 7.3

Skill: Application/Analysis

- 48) Which line or lines represent(s) bags that contain a solution that is hypertonic at the end of 60 minutes?
- A) A and B
  - B) B
  - C) C
  - D) D
  - E) D and E

Answer: B

Topic: Concept 7.3

Skill: Application/Analysis

- 49) You are working on a team that is designing a new drug. In order for this drug to work, it must enter the cytoplasm of specific target cells. Which of the following would be a factor that determines whether the molecule enters the cell?
- A) blood or tissue type of the patient
  - B) non-polarity of the drug molecule
  - C) lack of charge on the drug molecule
  - D) similarity of the drug molecule to other molecules transported by the target cells
  - E) lipid composition of the target cells' plasma membrane

Answer: D

Topic: Concept 7.3

Skill: Application/Analysis

- 50) In which of the following would there be the greatest need for osmoregulation?
- A) an animal connective tissue cell bathed in isotonic body fluid
  - B) a terrestrial animal such as a snake
  - C) a red blood cell surrounded by plasma
  - D) a lymphocyte before it has been taken back into lymph fluid
  - E) a plant being grown hydroponically (in a watery mixture of designated nutrients)

Answer: B

Topic: Concept 7.3

Skill: Synthesis/Evaluation

- 51) When a plant cell, such as one from a peony stem, is submerged in a very hypotonic solution, what is likely to occur?
- A) the cell will burst
  - B) the cell membrane will lyse
  - C) plasmolysis will shrink the interior
  - D) the cell will become flaccid
  - E) the cell will become turgid

Answer: E

Topic: Concept 7.3

Skill: Application/Analysis

- 52) Which of the following membrane activities require energy from ATP hydrolysis?
- A) facilitated diffusion.
  - B) movement of water into a cell
  - C) Na<sup>+</sup> ions moving out of the cell
  - D) movement of glucose molecules
  - E) movement of water into a paramecium

Answer: C

Topic: Concept 7.4

Skill: Application/Analysis

53) What are the membrane structures that function in active transport?

- A) peripheral proteins
- B) carbohydrates
- C) cholesterol
- D) cytoskeleton filaments
- E) integral proteins

Answer: E

Topic: Concept 7.4

Skill: Knowledge/Comprehension

54) Glucose diffuses slowly through artificial phospholipid bilayers. The cells lining the small intestine, however, rapidly move large quantities of glucose from the glucose-rich food into their glucose-poor cytoplasm. Using this information, which transport mechanism is most probably functioning in the intestinal cells?

- A) simple diffusion
- B) phagocytosis
- C) active transport pumps
- D) exocytosis
- E) facilitated diffusion

Answer: E

Topic: Concept 7.4

Skill: Application/Analysis

55) What is the voltage across a membrane called?

- A) water potential
- B) chemical gradient
- C) membrane potential
- D) osmotic potential
- E) electrochemical gradient

Answer: C

Topic: Concept 7.4

Skill: Knowledge/Comprehension

56) In most cells, there are electrochemical gradients of many ions across the plasma membrane even though there are usually only one or two electrogenic pumps present in the membrane. The gradients of the other ions are most likely accounted for by

- A) cotransport proteins.
- B) ion channels.
- C) carrier proteins.
- D) B and C only
- E) A, B, and C

Answer: A

Topic: Concept 7.4

Skill: Knowledge/Comprehension

57) The sodium-potassium pump is called an electrogenic pump because it

- A) pumps equal quantities of  $\text{Na}^+$  and  $\text{K}^+$  across the membrane.
- B) pumps hydrogen ions out of the cell.
- C) contributes to the membrane potential.
- D) ionizes sodium and potassium atoms.
- E) is used to drive the transport of other molecules against a concentration gradient.

Answer: C

Topic: Concept 7.4

Skill: Knowledge/Comprehension

- 58) If a membrane protein in an animal cell is involved in the cotransport of glucose and sodium ions into the cell, which of the following is most likely true?
- A) The sodium ions are moving down their electrochemical gradient while glucose is moving up.
  - B) Glucose is entering the cell along its concentration gradient.
  - C) Sodium ions can move down their electrochemical gradient through the cotransporter whether or not glucose is present outside the cell.
  - D) Potassium ions move across the same gradient as sodium ions.
  - E) A substance that blocked sodium ions from binding to the cotransport protein would also block the transport of glucose.

Answer: E

Topic: Concept 7.4

Skill: Application/Analysis

- 59) The movement of potassium into an animal cell requires
- A) low cellular concentrations of sodium.
  - B) high cellular concentrations of potassium.
  - C) an energy source such as ATP or a proton gradient.
  - D) a cotransport protein.
  - E) a gradient of protons across the plasma membrane.

Answer: C

Topic: Concept 7.4

Skill: Knowledge/Comprehension

- 60) Ions diffuse across membranes down their
- A) chemical gradients.
  - B) concentration gradients.
  - C) electrical gradients.
  - D) electrochemical gradients.
  - E) A and B are correct.

Answer: D

Topic: Concept 7.4

Skill: Knowledge/Comprehension

- 61) What mechanisms do plants use to load sucrose produced by photosynthesis into specialized cells in the veins of leaves?
- A) an electrogenic pump
  - B) a proton pump
  - C) a cotransport protein
  - D) A and C only
  - E) A, B, and C

Answer: E

Topic: Concept 7.4

Skill: Knowledge/Comprehension

- 62) The sodium-potassium pump in animal cells requires cytoplasmic ATP to pump ions across the plasma membrane. When the proteins of the pump are first synthesized in the rough ER, what side of the ER membrane will the ATP binding site be on?
- A) It will be on the cytoplasmic side of the ER.
  - B) It will be on the side facing the interior of the ER.
  - C) It could be facing in either direction because the orientation of proteins is scrambled in the Golgi apparatus.
  - D) It doesn't matter, because the pump is not active in the ER.

Answer: A

Topic: Concept 7.4

Skill: Application/Analysis

- 63) Proton pumps are used in various ways by members of every kingdom of organisms. What does this most probably mean?
- A) Proton pumps must have evolved before any living organisms were present on the earth.
  - B) Proton pumps are fundamental to all cell types.
  - C) The high concentration of protons in the ancient atmosphere must have necessitated a pump mechanism.
  - D) Cells with proton pumps were maintained in each Kingdom by natural selection.
  - E) Proton pumps are necessary to all cell membranes.

Answer: D

Topic: Concept 7.4

Skill: Synthesis/Evaluation

- 64) Several seriously epidemic viral diseases of earlier centuries were then incurable because they resulted in severe dehydration due to vomiting and diarrhea. Today they are usually not fatal because we have developed which of the following?
- A) antiviral medications that are efficient and work well with all viruses
  - B) antibiotics against the viruses in question
  - C) intravenous feeding techniques
  - D) medication to prevent blood loss
  - E) hydrating drinks that include high concentrations of salts and glucose

Answer: E

Topic: Concept 7.4

Skill: Application/Analysis

- 65) An organism with a cell wall would have the most difficulty doing which process?
- A) diffusion
  - B) osmosis
  - C) active transport
  - D) phagocytosis
  - E) facilitated diffusion

Answer: D

Topic: Concept 7.5

Skill: Knowledge/Comprehension

- 66) White blood cells engulf bacteria through what process?
- A) exocytosis
  - B) phagocytosis
  - C) pinocytosis
  - D) osmosis
  - E) receptor-mediated exocytosis

Answer: B

Topic: Concept 7.5

Skill: Knowledge/Comprehension

- 67) Familial hypercholesterolemia is characterized by which of the following?
- A) defective LDL receptors on the cell membranes
  - B) poor attachment of the cholesterol to the extracellular matrix of cells
  - C) a poorly formed lipid bilayer that cannot incorporate cholesterol into cell membranes
  - D) inhibition of the cholesterol active transport system in red blood cells
  - E) a general lack of glycolipids in the blood cell membranes

Answer: A

Topic: Concept 7.5

Skill: Application/Analysis

- 68) The difference between pinocytosis and receptor-mediated endocytosis is that
- A) pinocytosis brings only water into the cell, but receptor-mediated endocytosis brings in other molecules as well.
  - B) pinocytosis increases the surface area of the plasma membrane whereas receptor-mediated endocytosis decreases the plasma membrane surface area.
  - C) pinocytosis is nonselective in the molecules it brings into the cell, whereas receptor-mediated endocytosis offers more selectivity.
  - D) pinocytosis requires cellular energy, but receptor-mediated endocytosis does not.
  - E) pinocytosis can concentrate substances from the extracellular fluid, but receptor-mediated endocytosis cannot.

Answer: A

Topic: Concept 7.5

Skill: Knowledge/Comprehension

- 69) In receptor-mediated endocytosis, receptor molecules initially project to the outside of the cell. Where do they end up after endocytosis?
- A) on the outside of vesicles
  - B) on the inside surface of the cell membrane
  - C) on the inside surface of the vesicle
  - D) on the outer surface of the nucleus
  - E) on the ER

Answer: C

Topic: Concept 7.5

Skill: Knowledge/Comprehension

## Self-Quiz Questions

- 1) In what way do the membranes of a eukaryotic cell vary?
- A) Phospholipids are found only in certain membranes.
  - B) Certain proteins are unique to each membrane.
  - C) Only certain membranes of the cell are selectively permeable.
  - D) Only certain membranes are constructed from amphipathic molecules.
  - E) Some membranes have hydrophobic surfaces exposed to the cytoplasm, while others have hydrophilic surfaces facing the cytoplasm.

Answer: B

Topic:

Skill:



- 2) According to the fluid mosaic model of membrane structure, proteins of the membrane are mostly
- A) spread in a continuous layer over the inner and outer surfaces of the membrane.
  - B) confined to the hydrophobic core of the membrane.
  - C) embedded in a lipid bilayer.
  - D) randomly oriented in the membrane, with no fixed inside-outside polarity.
  - E) free to depart from the fluid membrane and dissolve in the surrounding solution.

Answer: C

Topic:

Skill:

- 3) Which of the following factors would tend to increase membrane fluidity?
- A) a greater proportion of unsaturated phospholipids
  - B) a greater proportion of saturated phospholipids
  - C) a lower temperature
  - D) a relatively high protein content in the membrane
  - E) a greater proportion of relatively large glycolipids compared with lipids having smaller molecular masses

Answer: A

Topic:

Skill:

- 4) Which of the following processes includes all others?
- A) osmosis
  - B) diffusion of a solute across a membrane
  - C) facilitated diffusion
  - D) passive transport
  - E) transport of an ion down its electrochemical gradient

Answer: D

Topic:

Skill:

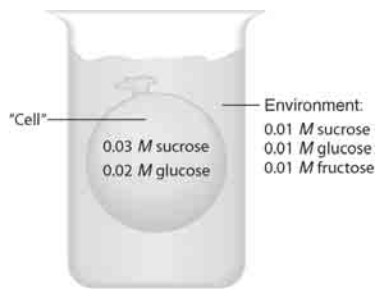
- 5) Based on Figure 7.19 in your textbook, which of these experimental treatments would increase the rate of sucrose transport into the cell?
- A) decreasing extracellular sucrose concentration
  - B) decreasing extracellular pH
  - C) decreasing cytoplasmic pH
  - D) adding an inhibitor that blocks the regeneration of ATP
  - E) adding a substance that makes the membrane more permeable to hydrogen ions

Answer: B

Topic:

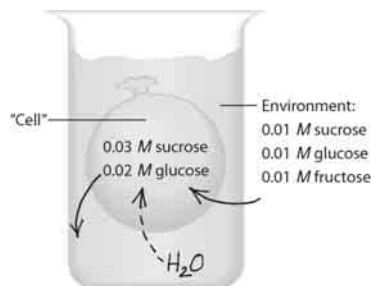
Skill:

- 6) An artificial cell consisting of an aqueous solution enclosed in a selectively permeable membrane is immersed in a beaker containing a different solution. The membrane is permeable to water and to the simple sugars glucose and fructose but impermeable to the disaccharide sucrose.



- (A) Draw solid arrows to indicate the net movement of solutes into and/or out of the cell.  
 (B) Is the solution outside the cell isotonic, hypotonic, or hypertonic?  
 (C) Draw a dashed arrow to show the net osmotic movement of water, if any.  
 (D) Will the artificial cell become more flaccid, more turgid, or stay the same?  
 (E) Eventually, will the two solutions have the same or different solute concentrations?

Answer: (A)



- (B) The solution outside is hypotonic. It has less sucrose, which is a nonpenetrating solute.  
 (C) See answer for A.  
 (D) The artificial cell will become more turgid.  
 (E) Eventually, the two solutions will have the same solute concentrations. Even though sucrose can't reach the same concentration on each side, water flow (osmosis) will lead to isotonic conditions

Topic:

Skill: