

Cell membrane

Multiple Choice

Identify the choice that best completes the statement or answers the question.

- ___ 1. Which of the following types of molecules are the major structural components of the cell membrane?
- phospholipids and cellulose
 - nucleic acids and proteins
 - phospholipids and proteins
 - proteins and cellulose
 - glycoproteins and cholesterol
- ___ 2. 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
- the integral membrane proteins are not strong enough to hold the bilayer together.
 - water that is present in the middle of the bilayer freezes and is easily fractured.
 - hydrophilic interactions between the opposite membrane surfaces are destroyed on freezing.
 - the carbon-carbon bonds of the phospholipid tails are easily broken.
 - the hydrophobic interactions that hold the membrane together are weakest at this point.
- ___ 3. The presence of cholesterol in the plasma membranes of some animals
- enables the membrane to stay fluid more easily when cell temperature drops.
 - enables the animal to remove hydrogen atoms from saturated phospholipids.
 - enables the animal to add hydrogen atoms to unsaturated phospholipids.
 - makes the membrane less flexible, allowing it to sustain greater pressure from within the cell.
 - makes the animal more susceptible to circulatory disorders.
- ___ 4. According to the fluid mosaic model of cell membranes, which of the following is a *true* statement about membrane phospholipids?
- They can move laterally along the plane of the membrane.
 - They frequently flip-flop from one side of the membrane to the other.
 - They occur in an uninterrupted bilayer, with membrane proteins restricted to the surface of the membrane.
 - They are free to depart from the membrane and dissolve in the surrounding solution.
 - They have hydrophilic tails in the interior of the membrane.
- ___ 5. 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?
- by increasing the percentage of unsaturated phospholipids in the membrane
 - by increasing the percentage of cholesterol molecules in the membrane
 - by decreasing the number of hydrophobic proteins in the membrane
 - by co-transport of glucose and hydrogen

- e. by using active transport
- ___ 6. 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
- ___ 7. 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.
- ___ 8. 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
- ___ 9. 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
- ___ 10. 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
- ___ 11. 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
- ___ 12. Which of these are attached to the extracellular matrix?
- a. transmembrane proteins
 - b. integral proteins

- c. peripheral proteins
- d. integrins
- e. glycoproteins

- ___ 13. 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
- ___ 14. 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.
- ___ 15. 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
- ___ 16. 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.
- ___ 17. Which of the following would likely move through the lipid bilayer of a plasma membrane most rapidly?
- a. CO₂
 - b. an amino acid
 - c. glucose
 - d. K⁺
 - e. starch
- ___ 18. 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.

- ___ 19. 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.

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.

- ___ 20. Which of the following would you expect to be a problem for someone with nonfunctional chloride channeling?
- a. inadequate secretion of mucus in the lungs
 - 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
- ___ 21. 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

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.

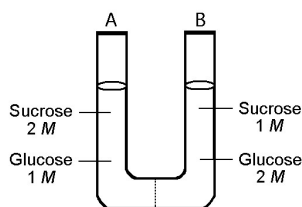


Figure 7.2

- ___ 22. Initially, in terms of tonicity, the solution in side A with respect to that in side B is
- hypotonic.
 - plasmolyzed.
 - isotonic.
 - saturated.
 - hypertonic.
- ___ 23. After the system reaches equilibrium, what changes are observed?
- The molarity of sucrose and glucose are equal on both sides.
 - The molarity of glucose is higher in side A than in side B.
 - The water level is higher in side A than in side B.
 - The water level is unchanged.
 - The water level is higher in side B than in side A.
- ___ 24. 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?
- It will have no unfavorable effect as long as the water is free of viruses and bacteria.
 - The patient's red blood cells will shrivel up because the blood fluid is hypotonic compared to the cells.
 - The patient's red blood cells will swell because the blood fluid is hypotonic compared to the cells.
 - The patient's red blood cells will shrivel up because the blood fluid is hypertonic compared to the cells.
 - The patient's red blood cells will burst because the blood fluid is hypertonic compared to the cells.
- ___ 25. 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.
- ___ 26. 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

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.

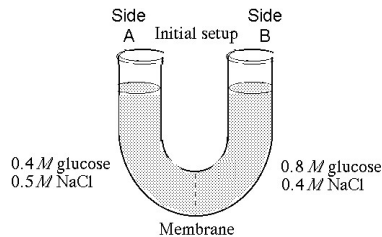


Figure 7.3

- ___ 27. 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.
- ___ 28. If you examine side A after 3 days, you should find
- a decrease in the concentration of NaCl and glucose and an increase in the water level.
 - a decrease in the concentration of NaCl, an increase in water level, and no change in the concentration of glucose.
 - no net change in the system.
 - a decrease in the concentration of NaCl and a decrease in the water level.
 - no change in the concentration of NaCl and glucose and an increase in the water level.
- ___ 29. 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?
- blood or tissue type of the patient
 - non-polarity of the drug molecule
 - lack of charge on the drug molecule
 - similarity of the drug molecule to other molecules transported by the target cells
 - lipid composition of the target cells' plasma membrane
- ___ 30. When a plant cell, such as one from a peony stem, is submerged in a very hypotonic solution, what is likely to occur?
- the cell will burst
 - the cell membrane will lyse
 - plasmolysis will shrink the interior

- d. the cell will become flaccid
- e. the cell will become turgid

- ___ 31. What are the membrane structures that function in active transport?
- a. peripheral proteins
 - b. carbohydrates
 - c. cholesterol
 - d. cytoskeleton filaments
 - e. integral proteins
- ___ 32. 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
- ___ 33. Ions diffuse across membranes down their
- a. chemical gradients.
 - b. concentration gradients.
 - c. electrical gradients.
 - d. electrochemical gradients.
 - e. A and B are correct.
- ___ 34. 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.
- ___ 35. 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
- ___ 36. 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

- ___ 37. White blood cells engulf bacteria through what process?
- a. exocytosis
 - b. phagocytosis
 - c. pinocytosis
 - d. osmosis
 - e. receptor-mediated exocytosis
- ___ 38. 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.
- ___ 39. 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.
- ___ 40. 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
- ___ 41. 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

Cell membrane Answer Section

MULTIPLE CHOICE

1. ANS: C	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
2. ANS: E	PTS: 1	TOP: Concept 7.1	SKL: Application/Analysis
3. ANS: A	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
4. ANS: A	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
5. ANS: A	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
6. ANS: C	PTS: 1	TOP: Concept 7.1	SKL: Synthesis/Evaluation
7. ANS: C	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
8. ANS: E	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
9. ANS: B	PTS: 1	TOP: Concept 7.1	SKL: Application/Analysis
10. ANS: A	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
11. ANS: C	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
12. ANS: D	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
13. ANS: E	PTS: 1	TOP: Concept 7.1	SKL: Knowledge/Comprehension
14. ANS: D	PTS: 1	TOP: Concept 7.1	SKL: Synthesis/Evaluation
15. ANS: B	PTS: 1	TOP: Concept 7.2	SKL: Knowledge/Comprehension
16. ANS: B	PTS: 1	TOP: Concept 7.2	SKL: Knowledge/Comprehension
17. ANS: A	PTS: 1	TOP: Concept 7.2	SKL: Application/Analysis
18. ANS: C	PTS: 1	TOP: Concept 7.2	SKL: Knowledge/Comprehension
19. ANS: E	PTS: 1	TOP: Concept 7.2	SKL: Knowledge/Comprehension
20. ANS: B	PTS: 1	TOP: Concept 7.2	SKL: Application/Analysis
21. ANS: D	PTS: 1	TOP: Concept 7.2	SKL: Application/Analysis
22. ANS: C	PTS: 1	TOP: Concept 7.3	SKL: Application/Analysis
23. ANS: C	PTS: 1	TOP: Concept 7.3	SKL: Application/Analysis
24. ANS: C	PTS: 1	TOP: Concept 7.3	SKL: Application/Analysis
25. ANS: C	PTS: 1	TOP: Concept 7.3	SKL: Application/Analysis
26. ANS: E	PTS: 1	TOP: Concept 7.3	SKL: Application/Analysis
27. ANS: B	PTS: 1	TOP: Concept 7.3	SKL: Application/Analysis
28. ANS: D	PTS: 1	TOP: Concept 7.3	SKL: Application/Analysis
29. ANS: D	PTS: 1	TOP: Concept 7.3	SKL: Application/Analysis
30. ANS: E	PTS: 1	TOP: Concept 7.3	SKL: Application/Analysis
31. ANS: E	PTS: 1	TOP: Concept 7.4	SKL: Knowledge/Comprehension
32. ANS: E	PTS: 1	TOP: Concept 7.4	SKL: Application/Analysis
33. ANS: D	PTS: 1	TOP: Concept 7.4	SKL: Knowledge/Comprehension
34. ANS: D	PTS: 1	TOP: Concept 7.4	SKL: Synthesis/Evaluation
35. ANS: E	PTS: 1	TOP: Concept 7.4	SKL: Application/Analysis
36. ANS: D	PTS: 1	TOP: Concept 7.5	SKL: Knowledge/Comprehension
37. ANS: B	PTS: 1	TOP: Concept 7.5	SKL: Knowledge/Comprehension
38. ANS: C	PTS: 1	TOP: Concept 7.5	SKL: Knowledge/Comprehension
39. ANS: B	PTS: 1	TOP: Self-Quiz Questions	
40. ANS: A	PTS: 1	TOP: Self-Quiz Questions	
41. ANS: D	PTS: 1	TOP: Self-Quiz Questions	

