3 Singer and Nicolson's fluid mosaic model of the membrane proposed that
A) membranes are a phospholipid bilayer.
B) membranes are a phospholipid bilayer between two layers of hydrophilic proteins.
C) membranes are a single layer of phospholipids and proteins.
D) membranes consist of protein molecules embedded in a fluid bilayer of phospholipids.
E) membranes consist of a mosaic of polysaccharides and proteins.

Answer: D

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
Answer: C

5 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 hydrophobic interactions that hold the membrane together are weakest at this point.

Answer: E

6 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.
Answer: A

7 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.
Answer: A

8 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 cotransport of glucose and hydrogen
Answer: A

9 In order for a protein to be an integral membrane protein it would have to be
A) hydrophilic. B) hydrophobic.
C) amphipathic, with at least one hydrophobic region. D) completely covered with phospholipids.
Answer: C

11 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, preventing adjacent lipids from packing tightly.
B) Unsaturated fatty acids have a higher cholesterol content and therefore more cholesterol in membranes.
C) Unsaturated fatty acids are more polar than saturated fatty acids.
D) The double bonds block interaction among the hydrophilic head groups of the lipids.
Answer: A

12 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.
Answer: C

13 The primary function of polysaccharides attached to the glycoproteins and glycolipids of animal cell membranes is
A) to facilitate diffusion of molecules down their concentration gradients.
B) to actively transport molecules against their concentration gradients.
C) to maintain the integrity of a fluid mosaic membrane.
D) to maintain membrane fluidity at low temperatures.
E) to mediate cell-to-cell recognition.

Answer: E

A protein that spans the phospholipid bilayer one or more times is
A) a transmembrane protein. B) an integral protein.
C) a peripheral protein. D) an integrin.
Answer: A

17 Which of these are not embedded in the hydrophobic portion of the lipid bilayer at all?
A) transmembrane proteins B) integral proteins
C) peripheral proteins D) integrins
Answer: C

21 Cell membranes are asymmetrical. Which of the following is the 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) The two sides of a cell membrane face different environments and carry out different functions.
D) The "innerness" and "outerness" of membrane surfaces are predetermined by genes.
E) Proteins can only be associated with the cell membranes on the cytoplasmic side.

Answer: C

Why are lipids and proteins free to move laterally in membranes?
A) The interior of the membrane is filled with liquid water.
B) Lipids and proteins repulse each other 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.
Answer: D

24 What kinds of molecules pass through a cell membrane most easily?
A) large and hydrophobic B) small and hydrophobic C) large polar D) ionic
Answer: B

25 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.
Answer: B

27 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

Answer: A

28 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.
Answer: C

29 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 moves through aquaporins in the membrane.

Answer: E

30 Mammalian blood contains the equivalent of 0.15 M NaCl. Seawater contains the equivalent of 0.45 M NaCl. What will happen if red blood cells are transferred to seawater?
A) Water will leave the cells, causing them to shrivel and collapse.
B) NaCl will be exported from the red blood cells by facilitated diffusion.
C) The blood cells will take up water, swell, and eventually burst.
D) NaCl will passively diffuse into the red blood cells.
Answer: A

32 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

34 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 turgid.

Answer: E

35 The phosphate transport system in bacteria imports phosphate into the cell even when the concentration of phosphate outside the cell is much lower than the cytoplasmic phosphate concentration. Phosphate import depends on a pH gradient across the membrane–more acidic outside the cell than inside the cell. Phosphate transport is an example of
A) passive diffusion.
B) facilitated diffusion.
C) active transport.
D) osmosis.
E) cotransport.

Answer: E

37

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

38

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

39

40

The sodium-potassium pump is called an electrogenic pump because it
A) pumps equal quantities of Na⁺ and 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

41

42

43

Ions diffuse across membranes through specific ion channels
A) down their chemical gradients.
B) down their concentration gradients.
C) down the electrical gradients.
D) down their electrochemical gradients.
E) down the osmotic potential gradients.

Answer: D

44

Which of the following would increase the electrochemical potential across a membrane?
A) a chloride channel
B) a sucrose-proton cotransporter
C) a proton pump
D) a potassium channel
E) both a proton pump and a potassium channel

Answer: C

45

46

Proton pumps are used in various ways by members of every domain of organisms: Bacteria, Archaea, and Eukarya. What does this most probably mean?
A) Proton pumps must have evolved before any living organisms were present on Earth.
B) Proton gradients across a membrane were used by cells that were the common ancestor of all three domains of life.
C) The high concentration of protons in the ancient atmosphere must have necessitated a pump mechanism.
D) Cells of each domain evolved proton pumps independently when oceans became more acidic.
E) Proton pumps are necessary to all cell membranes.

Answer: B

47

Several epidemic microbial diseases of earlier centuries incurred high death rates 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

48

An organism with a cell wall would most likely be unable to take in materials through
A) diffusion.
B) osmosis.
C) active transport.
D) phagocytosis.
E) facilitated diffusion.

Answer: D

49

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

Answer: B

50

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

51

The difference between pinocytosis and receptor-mediated endocytosis is that
A) pinocytosis brings only water molecules 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: C

52

53

A bacterium engulfed by a white blood cell through phagocytosis will be digested by enzymes contained in
A) peroxisomes.
B) lysosomes.
C) Golgi vesicles.
D) vacuoles.
E) secretory vesicles.

Answer: B

54



Which component is the peripheral protein?
A) A
B) B
C) C
D) D
E) E

Answer: D

55



Which component is cholesterol?
A) A
B) B
C) C
D) D
E) E

Answer: E

56

57



Which component is a microfilament of the cytoskeleton?
A) A
B) B
C) C
D) D
E) E

Answer: C

58

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.

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

60

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

61



66

67