

LECTURES 9 & 10 – Lipids**QUESTIONS TO TRY FOR PRACTICE**

- 1) The term phospholipid can best be described by which of the following?
 - A) a nonpolar lipid molecule that is made polar by the addition of a phosphate
 - B) a nonpolar lipid molecule that is made amphipathic by the addition of a phosphate
 - C) a polar lipid molecule that fully interacts with water
 - D) a polar lipid molecule that fully repels water

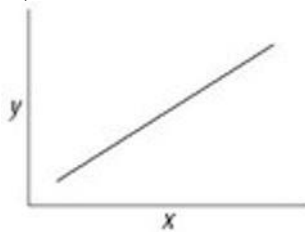
- 2) What region of a steroid is hydrophilic?
 - A) the methyl (-CH₃) groups
 - B) the terminal hydroxyl group
 - C) the ring structures
 - D) the long hydrocarbon chain

- 3) What most distinguishes lipids from other biomolecules is
 - A) that only lipids contain hydrogen atoms.
 - B) their molecular weight (size).
 - C) their chemical properties.
 - D) where they are found in the body.

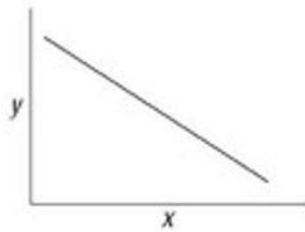
- 4) Cooking oil and gasoline (a hydrocarbon) are not amphipathic molecules. Why?
 - A) They do not have a polar or charged region.
 - B) They do not have a hydrophobic region.
 - C) They are highly reduced molecules.
 - D) They spontaneously form micelles or liposomes in solution.

5) You make a phospholipid bilayer with short, saturated hydrocarbon tails. You measure the permeability of this membrane to oxygen. You then double the length of the hydrocarbon tails and remeasure membrane permeability. You then double the length of the hydrocarbon tails again and make a third measurement of membrane permeability. You graph membrane permeability as a function of hydrocarbon tail length. Which of the following graphs best represents the data you expect?

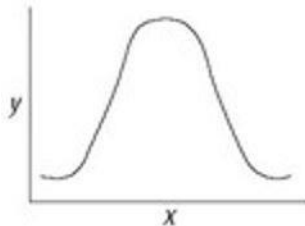
A)



B)



C)



D)



6) In marshes and other wet areas where vegetation is rotting, the water surface often has an oily sheen due to insoluble compounds. What are these molecules?

- A) nucleic acids
- B) proteins
- C) lipids
- D) carbohydrates

7) You want to view the surface of a particular cell or tissue (group of related cells) at magnifications above 1000x. What tool would you use?

- A) scanning electron microscope
- B) transmission electron microscope
- C) light microscope
- D) confocal microscope

8) Which characteristic would be expected in the plasma membranes of a plant that can survive winters in Northern Ontario, compared to a plant growing in a warmer region?

- A) a higher percentage of saturated fatty acids
- B) a higher percentage of unsaturated fatty acids
- C) higher levels of cholesterol
- D) additional glycerol molecules packed in between fatty acid tails

9) Steroids are

- A) a class of lipid with a four-ring structure.
- B) a class of transmembrane transport proteins.
- C) a portion of all phospholipids.
- D) powered by ATP.

10) Phospholipids can form all of the following structures in water EXCEPT which one?

- A) micelles
- B) bilayers
- C) monolayers
- D) vesicles

11) Phospholipid bilayer membranes are selectively permeable. What does that mean?

- A) They allow everything but water to cross.
- B) They allow only water to cross.
- C) They allow everything nonpolar to cross.
- D) They allow some things to cross while restricting others.

12) Which of the following substances would most likely require a protein to facilitate its diffusion across a cell membrane?

- A) water
- B) glycerol
- C) fatty acid
- D) oxygen gas (O₂)

13) If you mechanically shook a mixture of amphipathic lipids and water, what would you expect to see when the solution is observed with an electron microscope?

- A) The lipids and water will have separated into two distinct layers because the lipids are partially nonpolar.
- B) The lipids will have formed tiny vesicles filled with water.
- C) The lipids will have formed planar bilayer membranes.
- D) The lipids will have completely dissolved in the solution because they are partially polar.

14) What do phospholipids and triglycerides have in common?

- A) They both contain serine or some other organic compound.
- B) They both have three fatty acids.
- C) They both have a glycerol backbone.
- D) They both have a phosphate.

15) What type of functional group results when the alcohol group on glycerol reacts with the carboxylic acid group on a fatty acid?

- A) ester
- B) hydrocarbon
- C) peptide bond
- D) glycosidic bond

16) In an experiment involving planar bilayers, a solution of table salt (sodium and chloride ions in water) is added on the left side of the membrane, while pure water is added on the right side. After 30 minutes, the researchers test for the presence of ions on each side of the membrane. The right side tests negative for ions. What can you conclude?

- A) The experiment failed.
- B) The water somehow blocked the movement of ions across the membrane.
- C) The left side would probably also test negative for ions.
- D) Ions cannot cross planar bilayers.

17) Which of the following phospholipid membranes would be most permeable to glycerol?

- A) one with long and saturated fatty-acid tails
- B) one with long and unsaturated tails
- C) one with short and saturated tails
- D) one with short and unsaturated tails

18) Which of the following is the best explanation for why vegetable oil is a liquid at room temperature, while animal fats are solid?

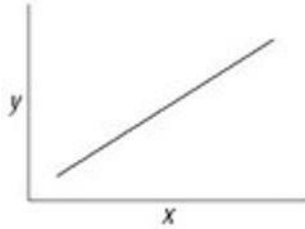
- A) Vegetable oil has more double bonds than animal fats.
- B) Vegetable oil has fewer double bonds than animal fats.
- C) Animal fats have no amphipathic character.
- D) Vegetable oil has longer fatty-acid tails than animal fats have.

19) Which of the following is the best explanation for why cholesterol decreases the permeability of biological membranes?

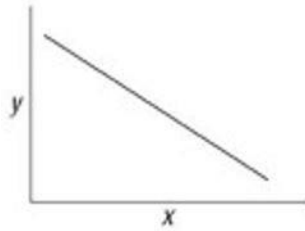
- A) Cholesterol binds to the outside surface of a membrane, thus blocking the movement of solutes.
- B) Because cholesterol is amphipathic, it forms tiny vesicles that trap solutes.
- C) Because cholesterol is amphipathic, it fits in between the phospholipids and blocks diffusion through the membrane.
- D) Cholesterol has four rings in its structure that can sequester (trap) solutes.

20) You make a phospholipid bilayer with short, saturated hydrocarbon tails. You measure the permeability of this membrane to oxygen. You are going to change the length of the hydrocarbon tails and remeasure membrane permeability, but first your boss asks you to graph the data you expect if there is no effect of hydrocarbon tail length on membrane permeability (your null hypothesis). Which of the following graphs best represents the data you expect if your null hypothesis is correct?

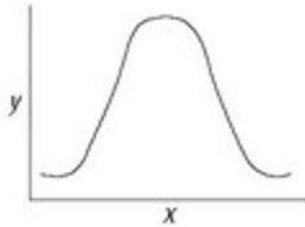
A)



B)



C)



D)



21) Which aspect of phospholipids is most important to the formation of bilayers?

- A) They are amphipathic.
- B) Their size is large, relative to cholesterol.
- C) Their size is small, relative to fats.
- D) Their hydrocarbon tails can consist of fatty acids or isoprene subunits.

22) Which of the following increases the strength of the hydrophobic interactions in lipid bilayers and thus makes them less permeable to polar molecules?

- A) the presence of double bonds
- B) increasing temperature
- C) removing cholesterol
- D) increasing length of the hydrocarbon chains

23) Why do lipid bilayers form spontaneously?

- A) The process is endergonic.
- B) The process is exergonic.
- C) The process leads to a huge decrease in entropy and no change in potential energy.
- D) The process is endothermic.

24) Which of the following crosses lipid bilayers the fastest?

- A) a sodium ion
- B) a small, polar molecule like water
- C) a large, polar molecule like glucose
- D) a small, nonpolar molecule like oxygen (O₂)

25) Which of the following crosses lipid bilayers the slowest?

- A) a sodium ion
- B) a small, polar molecule like water
- C) a large, polar molecule like glucose
- D) a small, nonpolar molecule like oxygen (O₂)

26) Why does cholesterol lower membrane permeability?

- A) It is polar.
- B) It fills gaps in membranes and increases hydrophobic interactions.
- C) It participates in hydrogen bonding in the membrane interior.
- D) It is small relative to most phospholipids.

27) You have just discovered an organism that lives in extremely cold environments. Which of the following would you predict to be true about the phospholipids in its membranes, compared to phospholipids in the membranes of organisms that live in warmer environments?

- A) The membrane phospholipids of cold-adapted organisms will have longer hydrocarbon tails.
- B) The membrane phospholipids of cold-adapted organisms will have more saturated hydrocarbon tails.
- C) The membrane phospholipids of cold-adapted organisms will have more unsaturated hydrocarbon tails.

28) You have a planar bilayer with equal amounts of saturated and unsaturated phospholipids. After testing the permeability of this membrane to glucose, you increase the proportion of unsaturated phospholipids in the bilayer. What will happen to the membrane's permeability to glucose?

- A) You can't predict the outcome. You simply have to make the measurement.
- B) Permeability to glucose will increase.
- C) Permeability to glucose will decrease.
- D) Permeability to glucose will stay the same.

29) You have a planar bilayer at a relatively warm temperature. After testing the permeability of this membrane to glucose, you increase the quantity of cholesterol in the bilayer. What will happen?

- A) You can't predict the outcome. You simply have to make the measurement.
- B) Permeability to glucose will increase.
- C) Permeability to glucose will decrease.
- D) Permeability to glucose will stay the same.

30) The text states that ribonucleotides can diffuse through some types of liposomes. It's likely that the lipids present early in chemical evolution had short chains. Would liposomes formed from these types of lipids be more or less permeable to ribonucleotides than if early cells formed from long-chained lipids?

- A) more permeable
- B) less permeable
- C) same permeability

31) What will happen to a red blood cell (rbc), which has an internal ion concentration of about 0.9 percent, if it is placed into a beaker of pure water?

- A) Nothing.
- B) The cell would shrink because the water in the beaker is hypotonic relative to the cytoplasm of the rbc.
- C) The cell would shrink because the water in the beaker is hypertonic relative to the cytoplasm of the rbc.
- D) The cell would swell because the water in the beaker is hypotonic relative to the cytoplasm of the rbc.