

Membrane Structure and Function

Part A – Multiple Choice

- The fluid mosaic model describes membranes as having
 - a set of protein channels separated by phospholipids.
 - a bilayer of phospholipids in which specialized proteins are embedded.
 - a sugar-phosphate backbone that interconnects specific transport molecules.
 - two sheets of protein with a layer of phospholipids sandwiched between them.
- Which of the following transportation mechanisms does **NOT** obey the “laws of diffusion”?
 - Osmosis.
 - Diffusion.
 - Active transport.
 - Facilitated transport.
- Which of the following shapes of cells would have the **LOWEST** SA/V ratio?
 - Flat.
 - Square.
 - Irregular.
 - Spherical.
- Which of the following is absolutely necessary for diffusion to occur?
 - A living cell.
 - A true solution.
 - A concentration difference.
 - A selectively permeable membrane.
- A cell in a hypotonic solution
 - loses water.
 - gains water.
 - neither loses or gains water.
 - gains and loses water equally.
- A wilted plant tissue placed in cold water for several hours becomes stiffer and harder because
 - plasmolysis has occurred.
 - water has passed into the cells.
 - the cells have gained cellulose.
 - the cells' salt concentration has increased.
- Pinocytosis and phagocytosis are accomplished by the
 - nucleus.
 - mitochondria.
 - cell membrane.
 - endoplasmic reticulum.
- If a 0.9% NaCl solution is isotonic to an animal cell, then a hypertonic solution would be
 - 0.7% NaCl.
 - 0.8% NaCl.
 - 0.9% NaCl.
 - 1.0% NaCl.
- When a substance is moved from an area of low concentration to an area of high concentration,
 - energy is needed.
 - cells begin to rupture.
 - diffusion has occurred.
 - the SA/V ratio changes.

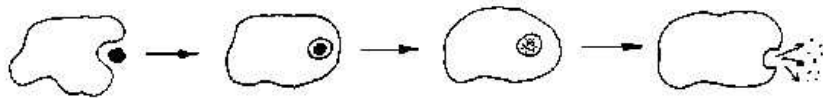
10. The fact that lipids move relatively easily through cell membranes is due to
 - A. osmosis.
 - B. their size.
 - C. active transport.
 - D. their chemical composition.

11. Which of the following requires the expenditure of energy?
 - A. Osmosis.
 - B. Diffusion.
 - C. Active transport.
 - D. Facilitated transport.

12. Proteins do not pass freely through membranes because
 - A. they contain nitrogen.
 - B. they would get denatured.
 - C. they are very large molecules.
 - D. membranes, themselves, are made of protein.

13. Which of the following substances does **NOT** move through a membrane without the use of a vesicle?
 - A. Starch.
 - B. Glycerol.
 - C. Amino acids.
 - D. Monosaccharides.

Use the following diagram to answer the next question.



14. Which series of cellular activities is depicted in the illustration?
 - A. Cell eating, then cell drinking.
 - A. Phagocytosis, digestion, then exocytosis.
 - B. Endocytosis, translation, then exocytosis.
 - C. Active transport, digestion, then exocytosis.

15. What component of a cell membrane functions as a carrier molecule?
 - A. Protein.
 - B. Glycolipid.
 - C. Glycoprotein.
 - D. Phospholipid.

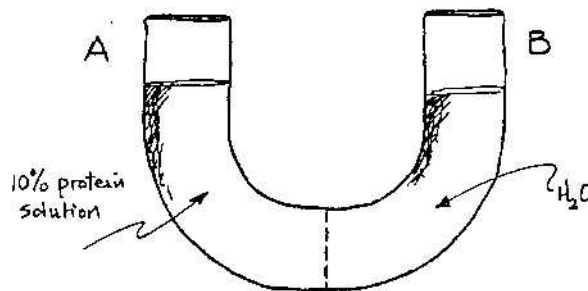
16. The name of a process expelling particles from a cell is
 - A. exocytosis.
 - B. endocytosis.
 - C. phagocytosis.
 - D. reverse osmosis.

17. Which of the following crosses a cell membrane by active transport?
 - A. Water.
 - B. Oxygen.
 - C. Sodium ions.
 - D. Carbon dioxide.

18. When glucose crosses a membrane, it
 - A. uses a carrier molecule.
 - B. enters through a vesicle.
 - C. passes between phospholipids.
 - D. goes through protein channels.

19. The difference in solute concentration between two areas/regions is called
- hypotonic.
 - hypertonic.
 - absolute difference.
 - concentration gradient.
20. Some small lipid molecules pass easily through cell membranes because
- of the availability of ATP energy.
 - they are assisted by protein carriers.
 - membranes are partially made of lipids.
 - phagocytosis encloses lipids in membranes.
21. Which term **BEST** refers to the bursting of an animal cell?
- Lysis.
 - Turgor.
 - Crenation.
 - Plasmolysis.
22. If the solute concentration of solution A is greater than the solute concentration in solution B, it can be said that solution A is
- isotonic to solution B.
 - osmotic to solution B.
 - hypotonic to solution B.
 - hypertonic to solution B.
23. Which of the following is an example of endocytosis?
- The effect of diffusion.
 - The activity of transport proteins.
 - The activity of secretory vesicles.
 - The formation of vesicles by cell membranes.
24. A transport (or carrier) molecule in a cell membrane is a molecule that
- moves in and out of a membrane through a pore.
 - dissolves part of the membrane so that substances can get through.
 - moves substances through the membrane by interacting with them.
 - reacts with substances and propels the products through a membrane.
25. According to the "Laws of Diffusion", substances will move
- up a concentration gradient with the use of ATP.
 - up a concentration gradient without the use of ATP.
 - down a concentration gradient with the use of ATP.
 - down a concentration gradient without the use of ATP.

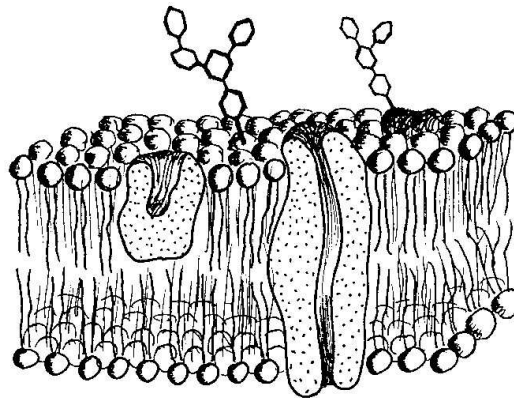
Use the following diagram to answer the next question.



26. During this experiment, the water level on side A will
- lower due to the loss of water causing a decrease in its protein concentration.
 - lower due to the loss of water causing an increase in its protein concentration.
 - rise due to water moving to that side thus increasing its protein concentration.
 - rise due to water moving to that side thus decreasing its protein concentration.

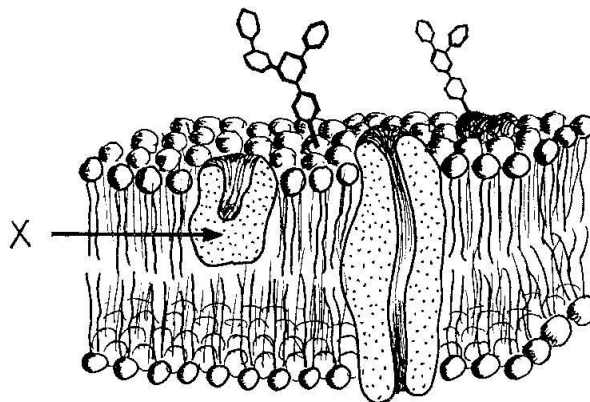
27. Which of the following would be **MOST** directly affected if the mitochondria in a cell were **NOT** functioning properly?
- Absorption of fatty acids by the cell.
 - The accumulation of sugar by the cell.
 - Movement of water into and out of the cell.
 - Movement of oxygen across the cell membrane.
28. Osmotic pressure is **BEST** described as the measure of the
- force of water against a membrane.
 - amount of water crossing a membrane.
 - size of water compared to solute particles.
 - movement of water to higher solute concentrations.
29. Visible changes would be **LEAST** obvious in which of the following?
- A plant cell in a hypotonic solution.
 - A plant cell in a hypertonic solution.
 - An animal cell in a hypotonic solution.
 - An animal cell in a hypertonic solution.
30. The thyroid gland has a high concentration of iodine (relative to plasma). This is an example of
- pinocytosis.
 - active transport.
 - passive transport.
 - facilitated transport.

Use the following diagram to answer the next question.



31. The structure indicated by the sketch represents a model of
- a plant cell's cell wall.
 - RER in an animal cell.
 - an animal cell's nuclear envelope.
 - an animal cell's plasma membrane.
32. Red blood cells are put into an isotonic solution. When salt is added to the solution
- the cells burst.
 - the cells crenate.
 - water enters the cells.
 - proteins pump salt into the cells.
33. An animal cell will always take in water when placed in a solution that is
- osmotic.
 - isotonic.
 - hypotonic.
 - hypertonic.

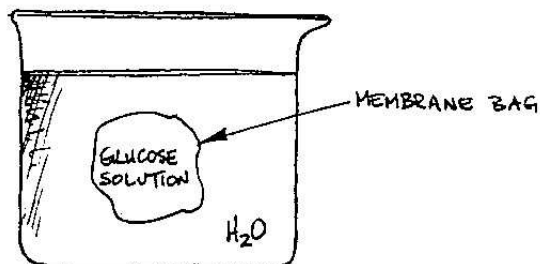
Use the following diagram to answer the next question.



34. Structure X in the diagram is **MOST** likely a
- A. receptor site.
 - B. feeding structure.
 - C. protective feature.
 - D. secretory structure.
35. Which of the following processes would be the **FIRST** to be affected by the lack of oxygen in a cell?
- A. Osmosis.
 - B. Diffusion.
 - C. Active transport.
 - D. Facilitated transport.

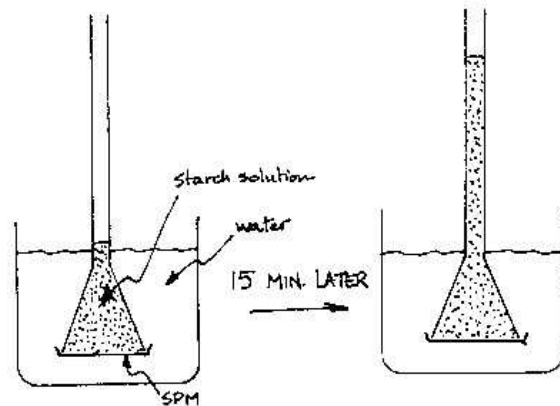
Part B – Written Answers

1. Identify the mechanism by which each of the following substances would **MOST** likely leave a cell. Support each of your answers with a short explanation.
 - a. water
 - b. amino acids
 - c. proteins
 2. Explain **THREE** different functions of membrane proteins.
- a. A student set up the experiment illustrated below and kept it at room temperature.



- After five minutes, the only apparent difference was that the membrane bag was swollen into a spherical shape.
- a. Explain this observation.
 - b. What **TWO** statements can be made about the selective permeability of this membrane?
 - c. If this same experiment were to be conducted at 5 degrees, explain how and why the results could differ?

4.
 - a. Describe the effect of increasing the solute concentration in a cell's environment.
 - b. Describe the effect of decreasing the solution concentration in a cell's environment.
 - c. Explain why both of these changes could have an impact on the cell's ability to function normally.
5. List **THREE** factors that will affect the rate of diffusion of sodium ions through a solution.
6. Does osmosis obey the Laws of Diffusion? Explain.
7. Explain how the following apparatus can be used to determine osmotic pressure.



8. The following experiment was conducted to determine the concentration of sugar in potato. Four identical sized and shaped discs of a given potato were prepared and weighed. Each had a mass of 2.0 g. The discs were each put into sugar solutions and left for 24 hours. They were weighed again and changes in mass were noted as follows:

Disc A in a 0.8% sugar solution now had a mass of 1.5 g
 Disc B in a 1.5% sugar solution now had a mass of 1.9 g
 Disc C in a 2.5% sugar solution now had a mass of 2.2 g
 Disc D in a 3.0% sugar solution now had a mass of 2.3 g

Plot this data and determine the concentration of sugar in the potato.