

Membrane Structure and Function

Part A - Multiple Choice Questions

1. B
2. C
3. D
4. C
5. B
6. B
7. C
8. D
9. A
10. D
11. C
12. C
13. A
14. B
15. A
16. A
17. C
18. A
19. D
20. C
21. A
22. D
23. D
24. C
25. D
26. D
27. B
28. A
29. A
30. B
31. D
32. B
33. C
34. A
35. C

Part B – Written Answers

Note: The answers provided here are correct, but they may NOT be the only possible answers.

1.
 - a. Osmosis. Water is a small molecule that passes freely across most membranes according to concentration imbalances.
 - b. Facilitated transport. Amino acids are of such a chemical nature and size that they do not pass freely through membranes. Instead, they cross with the assistance of carrier proteins. Cells use the amino acids for protein synthesis, so their concentration in cells is less than in the extracellular fluids, therefore their movement is not active transport.
 - c. Proteins are so large that they require the interaction of vesicles on cell membranes to get out of cells. Examples of this type of movement include hormone secretion, enzyme secretion, and neurotransmitter release. Cell generally do not take in proteins, they take in the amino acids and make their own proteins.
2. There are several kinds of proteins that can be found embedded in the phospholipid bilayer of a cell. Three examples of them are:
 - a. receptor sites, which receive environmental molecules causing a response in the cell
 - b. enzymes, which react with environmental molecules
 - c. transmembrane proteins, which move substances through the membrane

3.
 - a. Deplasmolysis has occurred, where water has moved by the process of osmosis into the membrane bag due to the higher concentration of glucose in the bag than outside of the bag.
 - b. The bag is not permeable to glucose. The bag is permeable to water. If either of these statements were not true, the membrane bag would not have swollen to a spherical shape.
 - c. According to the Kinetic Molecular Theory the movement of particles is affected by temperature. It follows that water would have moved by osmosis more slowly and it would take longer to reach the same final observation.
4.
 - a. If the concentration of solutes in a cell's environment were to increase, plasmolysis would occur. In this process, water moves out of the cell according to the laws of diffusion.
 - b. If the concentration of solutes in a cell's environment were to decrease, deplasmolysis would occur. In this process, water moves into the cell according to the laws of diffusion. The extent to which this process occurs is countered by the increasing turgidity in the cell.
 - c. The intake and release of materials by the cell occurs through its membrane (e.g., oxygen enters and CO₂ leaves by diffusion. Both of these changes affect the surface area / volume ratio of the cell. Cells depend on a delicate balance of surface area to volume in order to maintain normal functions.
5. (If one assumes that there is no membrane in the solution) their concentration, the temperature, and whether or not the solution was being agitated or stirred in any way would affect the rate of diffusion of the ions.
6. Yes, it does. The result of the movement of particles by diffusion is the evening out of concentration differences. Osmosis has the same effect therefore it is obeying the same natural law.
7. This piece of apparatus is set up so that there is a concentration of starch separated from water by a SPM. Osmosis occurs which dilutes the starch and increases the volume of the starch solution, thus the starch solution rises in the glass tube. The extent to which it rises is a measure of the amount of osmosis. The force of gravity will counteract the force up the tube. Quantifying this force would provide one with osmotic pressure, which is a measure of the force of the water being drawn into the starch solution.

8.

| % Sugar | Δ mass |
|---------|---------------|
| 0.8 | -25% |
| 1.5 | -5% |
| 2.5 | +10% |
| 3.0 | +15% |

