

Cell Membrane Structure and Function

1. Define:

Plasma membrane – The plasma membrane (cell membrane) is an invisible surface layer that surrounds and limits a cell. This layer is very thin so is not visible with a light microscope. It is dynamic (ever changing) and is selectively and differentially permeable. It controls what enters and exits the cell.

Amphipathic (amphiphilic) - Molecules that have both polar (hydrophilic) and non-polar (hydrophobic) parts in their structure are amphipathic or amphiphilic molecules. The phospholipids and many of the proteins associated with cell membranes have this characteristic.

Osmosis – Osmosis is the movement of solvents across semi-permeable membranes. In biological systems, the solvent is usually water, and it moves from an area of low solute concentration into areas with higher solute concentrations (passively). Some texts suggest osmosis is simply the diffusion of water, but this is not true, because osmosis requires a membrane and diffusion does not. Many biology texts describe water molecules as moving from an area of high concentration to areas of lower concentration (down a concentration gradient); however, effective osmotic pressure (tonicity) is determined by solute concentration, not by water concentration.

Phototaxis – Phototaxis is the movement of a cell through its environment that is directed by light. (Taxis = directed movement). Phototaxis involves light sensitive receptors in the cell membrane. The movement may be directed toward light (positive phototaxis) or away from light (negative phototaxis).

Quorum sensing – Quorum sensing is a type of regulatory mechanism allowing bacteria (and other organisms) to modify their behavior based on population density. Bacteria release chemicals (pheromones) into the environment, and have receptors capable of detecting these. As population densities increase, more chemical is released and detected, and in response, certain genes are activated (or deactivated). Behaviors including biofilm formation, bioluminescence, production of virulence factors, and digestive enzymes are regulated through quorum sensing.

2. Plasma membrane or cell membrane
3. Lipid/ protein
4. Integral or intrinsic/ Na^+ , K^+ , H^+ , etc./ facilitated diffusion
5. Phospholipids/ fatty acid
6. Simple diffusion/ concentration
7. Osmosis/ hypertonic
8. Gain or take in

9. Concentration and/or electrical
10. Antiport
11. Facilitated diffusion allows particles to move down their concentration and/or electrical gradients, while active transport can be used to move particles "uphill" or against their concentration and/or electrical gradients. Facilitated diffusion is a passive process, while active transport requires the cell to expend energy. Both require membrane protein complexes.
12. Phagocytosis (endocytosis involving large particles)/ pinocytosis (endocytosis involving molecular sized particles - not visible with a light microscope).
13. Positive chemotaxis
14. Negative phototaxis
15. Quorum sensing/ genes
16. Cholesterol/ ATP