AP Biology 1/12/15

Cell Membrane and Transport Review

1. What is the contribution of the phospholipid bilayer to the cell membrane’s selective permeability?

Phospholipids are amphipathic (maintain dual properties) in that they have a hydrophilic head regions composed of a phosphate group and two hydrophobic fatty acid tails. Together , in aqueous environments, phospholipid molecules will form bilayers where their polar heads shield their polar tails from the environment. This bilayer is what composes cell membranes. The largely nonpolar/hydrophobic interior of cell membranes keeps even small polar/hydrophilic molecules from diffusing rapidly through the membrane. Therefore, small, nonpolar molecules diffuse most easily through the membrane.

2. What is the contribution of transport proteins to the cell membrane’s selective permeability?

Transport proteins are modeled for their specific transport cargo only, which is generally, a couple molecules at most. No matter how similar other molecules may be structurally, the protein maintains its specificity due to its form, providing another mechanism behind the selective permeability of the cell membrane.

3. What substances can easily diffuse through a cell’s membrane? Why?

See #1. Small, nonpolar molecules (like O2 and CO2).

4. What substances require the help of a transport protein? When is this considered active transport and when is this considered facilitated diffusion (passive)?

Larger molecules, even if they are nonpolar, will sometimes have a protein that is specific to them to speed up the diffusion process. However, small polar and large polar molecules require the most assistance crossing the membrane (large more so than small).

5. How does the presence of cholesterol in the cell membrane affect its fluidity?

While cholesterol adds firmness and integrity to the plasma membrane and prevents it from becoming overly fluid, it also helps maintain its fluidity. At the high concentrations it is found in our cell's plasma membranes cholesterol helps separate the phospholipids so that the fatty acid chains can't come together and cyrstallize. Therefore, cholesterol helps prevent extremes (whether too fluid, or too firm) in the consistency of the cell membrane.

6. When does osmosis occur?

Osmosis occurs when water diffuses from an area of lower solute concentration to an area of higher solute concentration. This occurs if the solute cannot move.

1. What would happen to a cell that contains 4.0 moles of solute inside it if it were placed in a cup of water of water with 2.0 moles of sodium chloride?

A. shrivel B. burst C. stay the same

2. Which of the following compounds will require a carrier protein in order to cross the cellular membrane?

A. Glucose B. Oxygen C. Protein D. Steroid

1. Of the following, which is most likely to pass through the cell membrane via passive transport?

Glucose B. water C. Protein D. Steroid

1. How are integral proteins introduced into the cellular membrane of a eukaryotic cell?

A. exocytosis supplies the membrane with the necessary proteins, which are present on the secretory vesicle

B. Cytoplasmic ribosomes translate the necessary proteins and send them to the membrane.

C. Cells have all of the necessary membrane proteins upon completing mitosis

D. Endocytosis

1. Which of the following molecules can freely diffuse through the cell membrane?

A. Glucose (C6H12O6)

B. Water (H2O)

C. Insulin

D. Sodium Ions (Na+)

E. Oxygen (O2)

1. Where would aspartic acid, an amino acid with a negatively charged side chain, most likely be found in a transmembrane protein?

A. within the membrane interior, outside the cell, or inside the cell

B. inside the cell

C. Within the membrane interior

D. Outside or inside the cell

E. Outside the cell