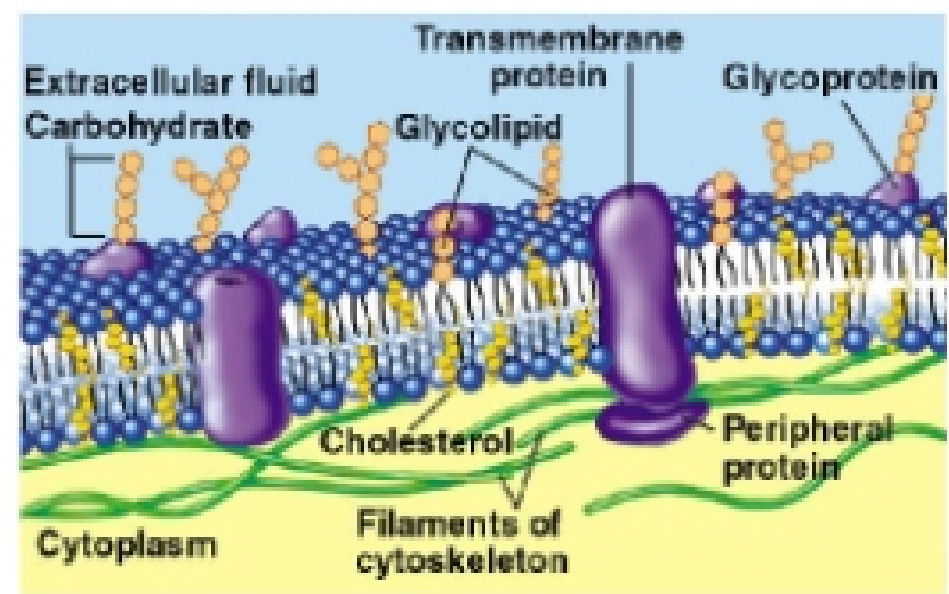


Fluid Mosaic Model



Anatomy and Physiology Exam 1- Figueroa

The Plasma Membrane

- The fluid mosaic model
- Membrane lipids
 - Lipid bilayer forms the fabric of the membrane
 - Composed of phospholipid molecules
 - Head = polar and hydrophilic (philic means it likes water/ if water soluble)
 - Tail = hydrophobic (phobic means it is afraid of water/ insoluble in water). Uncharged, nonpolar. It is made up of two fatty acid chains
- Membrane Proteins
 - Integral proteins: firmly inserted into the lipid bilayer
 - some only protrude from only one membrane surface
 - most are transmembrane: span the entire width of the membrane and stick out both sides
 - most are involved in transport
 - some clump together to form channels, or pores, through which water-soluble molecules or ions can move through
 - others are carriers that bind to a substance and then move it through the membrane
 - receptors
 - Peripheral proteins: are not embedded in the lipid
 - they attach loosely to integral proteins
- Functions
 - transport from one side to the other
 - enzymatic activity
 - substrate to produce products
 - Receptors for signal transduction
 - Neurotransmitters
 - Hormones
- Membrane Transport
 - Passive process= no energy used
 - Diffusion: the tendency of molecules or ions to move from high concentration to low concentration along their concentration gradient
 - passive transport
 - occurs if:
 - lipid soluble
 - small

- assisted by carrier molecule
- Simple Diffusion: unassisted diffusion
 - lipid soluble substances and nonpolar
 - oxygen and carbon dioxide
 - dependent on the concentration gradient
- Facilitated Diffusion: assisted
 - Limited by the number of protein channels available
 - Amino acids, ions, and Glucose
 - travel via:
 - Carriers: binding to protein carriers in the membrane and ferried across
 - for bigger molecules
 - amino acids and glucose
 - Channels: moves through water-filled protein channels
 - ions/ electrolytes use channels
- Osmosis: the diffusion of a solvent, such as water, through a selectively permeable membrane
 - Solutes attract water
 - Occurs when the concentration of a solvent is different on opposite sides of a membrane
 - Osmolarity: total concentration of a solute in a solution
- Tonicity
 - Isotonic: solutions with the same solute concentration as the cytosol
 - nothing happens
 - Hypertonic: solution has a higher solute concentration than the cytosol
 - loses water-> shrivels up
 - Hypotonic: solution has a lower solute concentration
 - gains water -> cell expands. if RBC ruptures= hemolysis
- Active Process
 - Active Transport
 - Carrier-mediated facilitated diffusion
 - Requires carrier protein that combine specifically and reversibly with the transported substance
 - Solute pumps move solutes, most ions, against their concentration gradient
 - ATP is needed
 - Primary Active transport
 - requires carrier proteins
 - Antiports: transport mechanism that moves two substances in opposite directions
 - ATP is energy.

- ATPase breaks ATP into ADP as well as transports it
- Ex. Sodium- Potassium Pump
 - Carrier is called: sodium-potassium ATPase
 - K⁺ inside the cell is 10x higher in concentration than outside of the cell
 - Na⁺ is higher in concentration outside
 - never have more Na⁺ inside
 - 3 Na⁺ leaves (goes out of the cell) and 2 K⁺ move into the cell
- the result the Na⁺/K⁺ pump (the Na⁺) provides energy for the Secondary Active transport

- Secondary Active transport
 - transport driven indirectly by energy stored in ionic gradients created by the primary active transport pumps
 - Symports: transport mechanism that moves the substance in the same direction
 - Glucose and Amino Acids need Na⁺ to enter
 - Glucose has a different transporter than AAs but move in the same direction

- If Na⁺ goes from high->low ALONE: it is using facilitated diffusion
- If Na⁺ goes from low -> high in a TRANSPORTER w/ ATP: it is using Primary Active transport
- if Na⁺ goes from high -> low w/ AA or Glucose: it is using Secondary Active transport

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- Vesicular Transport
 - transport of large particle and macromolecules across the plasma membrane
 - Ex. Receptor- mediated Endocytosis
 - Phospholipid bilayer is main component of plasma membrane
 - Exocytosis: move substances from the cell's interior to the extracellular space
 - Endocytosis: move substances from the outside of the cell to the inside
 - Phagocytosis: cell's "eat" large particles
 - think of the particle as a large burger...you need to take bites to eat it
 - Pinocytosis: the cell "drinks" the small particles
 - think of the particle as a pill... you don't need to break it down, you just swallow it
 - Vesicles fuse to the lysosome

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- Cytoplasm: consists of everything between the nucleus and the cell membrane
- Cytosol: the intracellular fluid
 - mostly water but also contains dissolved chemicals
 - between the plasma membrane and the nuclear membrane (both have a lipid bilayer)
- Organelles: structures that each perform specific functions for the cell
- Ribosomes: the site of Protein Synthesis