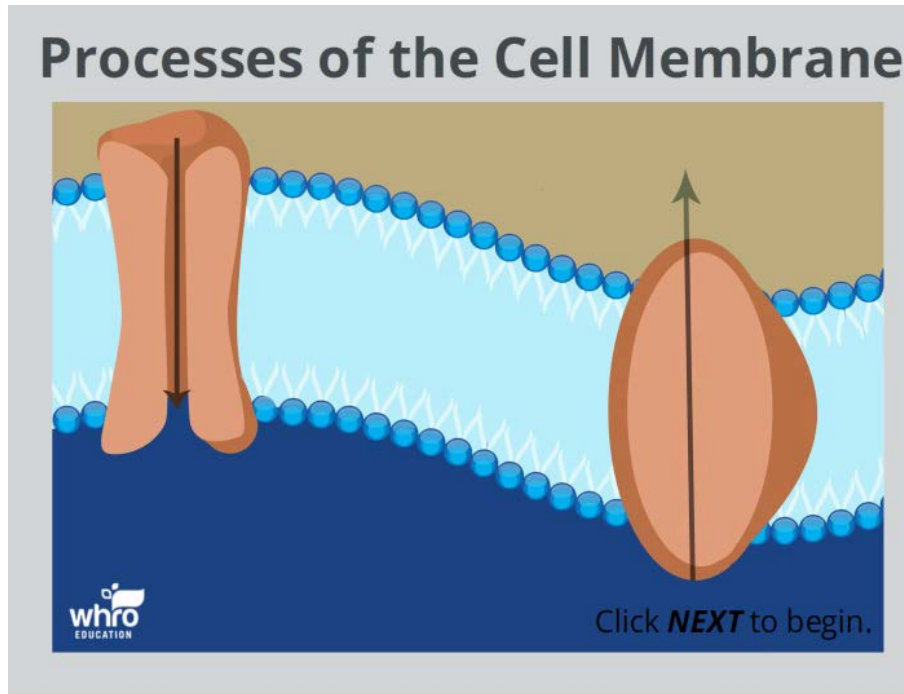


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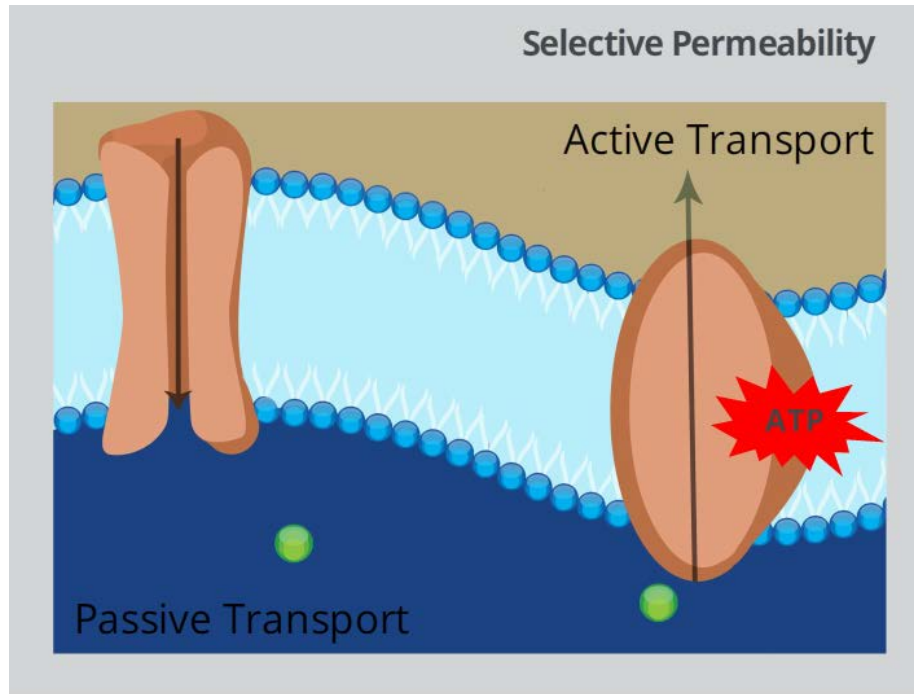
Introduction



Process of the Cell Membrane.

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Selective Permeability

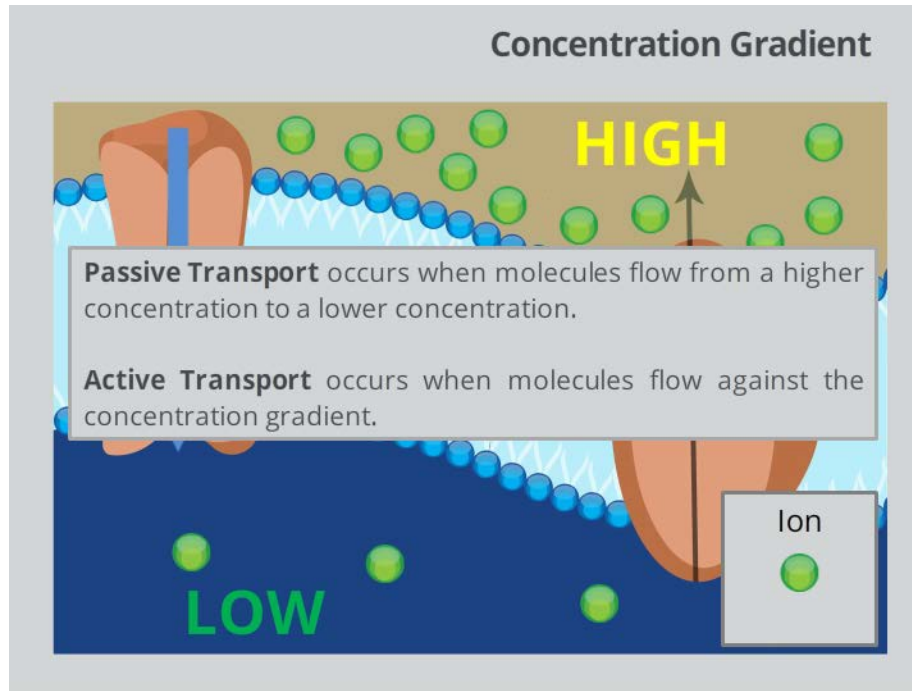


Molecules needed for the survival of the cell can enter and exit the cell through active or passive transport. The cell has the ability to select which molecules are allowed to enter and leave through the process of selective permeability. In this interactivity, investigate the processes involved with the cell membrane.

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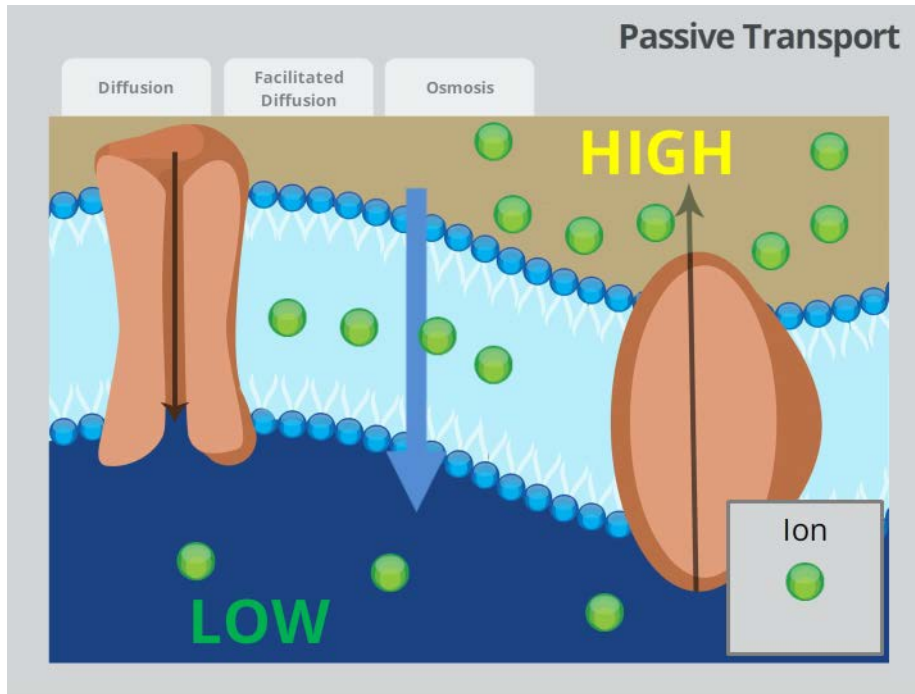
Concentration Gradient



Molecules move in and out of a cell because of a condition known as the concentration gradient. Inside the cell is the watery environment of the cytoplasm. Because there is a higher concentration of salt ions in the cytoplasm on the internal side of the cell membrane, and there is a lower concentration of salt ions in the watery environment outside the cell membrane, ions will move from higher concentration to lower concentration. In the example shown here, a high concentration exists in the extracellular fluid and a low concentration exists in the cytoplasm. The difference in concentration causes substances to move from areas of higher concentration to areas of lower concentration. Passive transport occurs when molecules flow from higher concentration to lower concentration. Active transport occurs when molecules flow against the concentration gradient.

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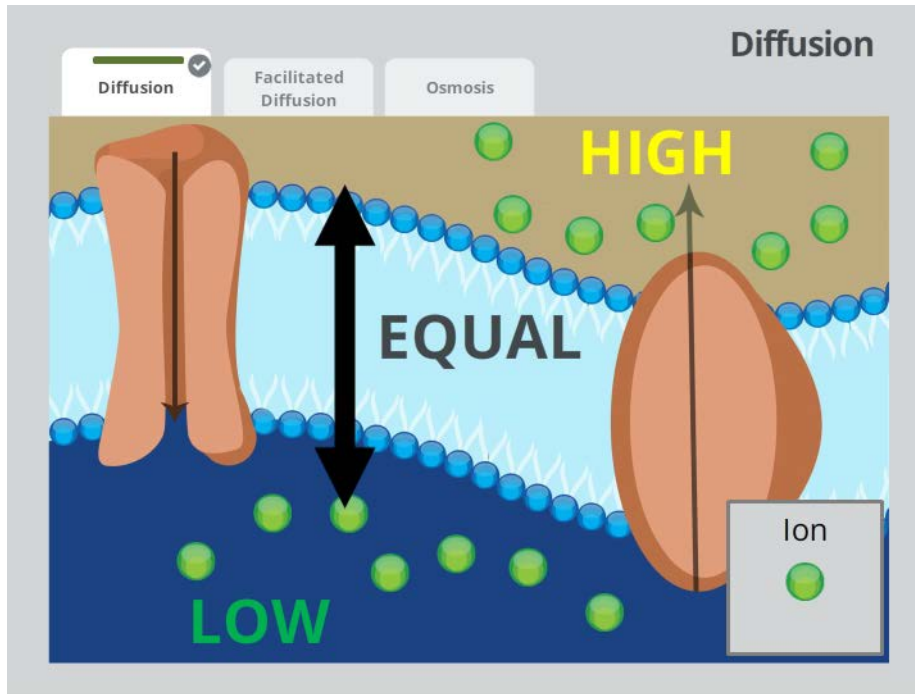
Passive Transport



Passive transport is the movement of materials across a membrane from an area of higher concentration to an area of lower concentration. Since the movement of materials occurs as part of the cell's environment and does not require any additional input of energy by the cell to occur, scientists call this spontaneous movement. There are three types of passive transport: diffusion, facilitated diffusion, and osmosis.

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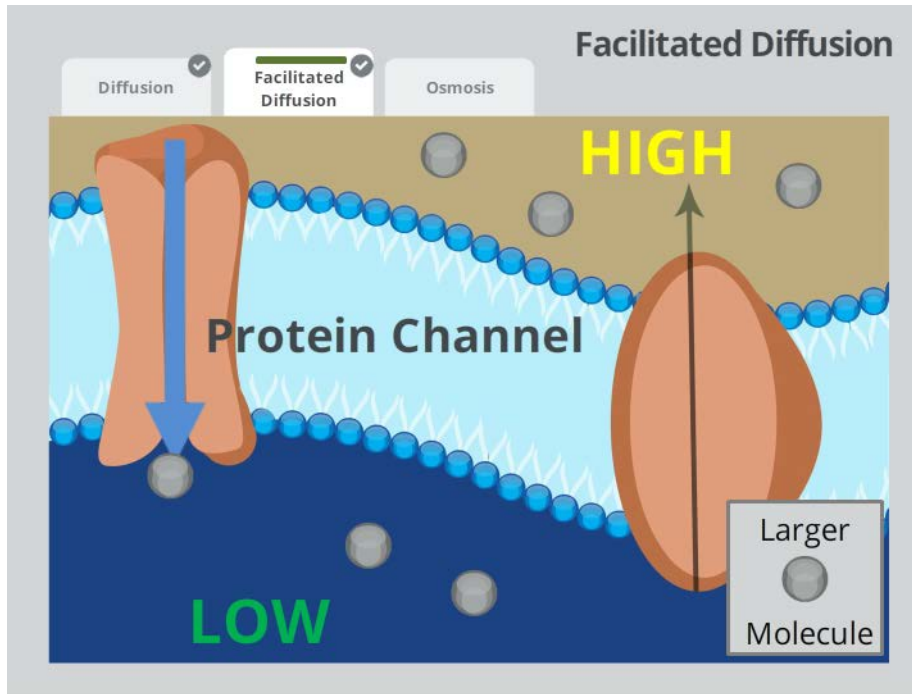
Diffusion



In diffusion, molecules spread from areas of higher concentration to areas of lower concentration without the use of energy. The molecules pass through the cell membrane and spread out until equilibrium is reached. Molecules always move from an area of higher concentration to an area of lower concentration.

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Facilitated Diffusion

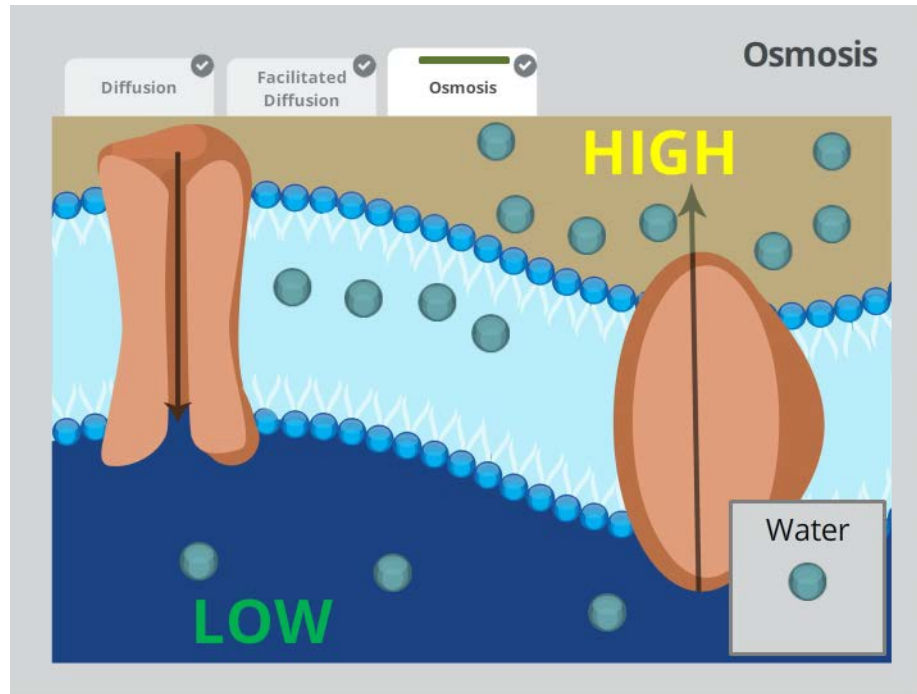


Some materials, such as glucose, salt, and amino acid molecules, are too large to pass through the cell membrane unaided. They need another way through. In facilitated diffusion, the cell allows these molecules to diffuse through the cell membrane by opening and closing special transport protein channels. As with diffusion, this process occurs spontaneously, and only happens if there is a difference in concentration of materials on either side of the cell membrane.

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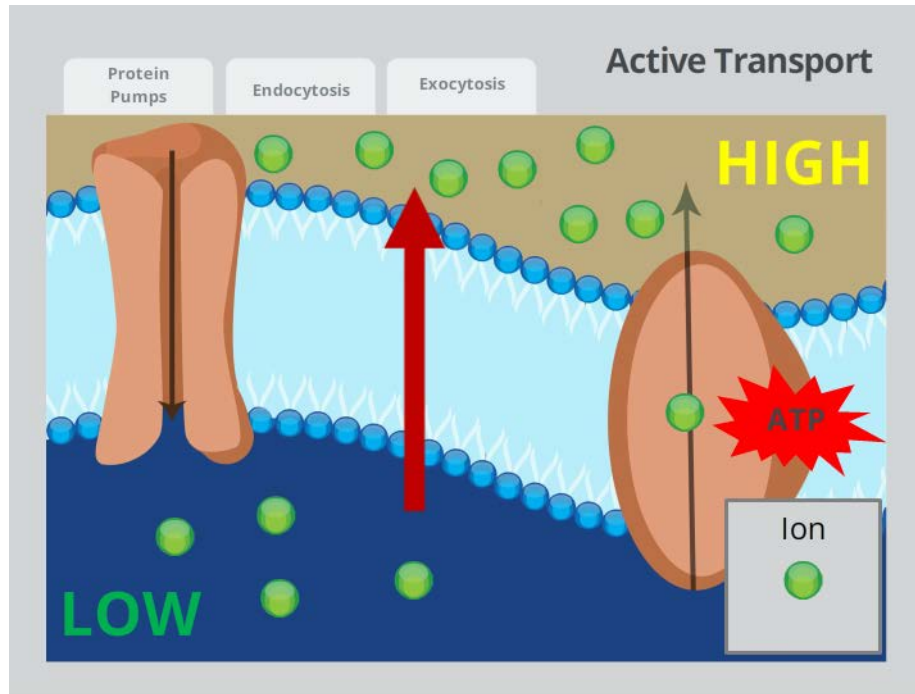
Osmosis



To maintain homeostasis, a cell relies on a process of passive transport called osmosis, which is the spontaneous movement of water across a membrane from an area of higher concentration to an area of lower concentration. As with diffusion and facilitated diffusion, this process only happens when there is a difference in concentration on either side of the cell membrane

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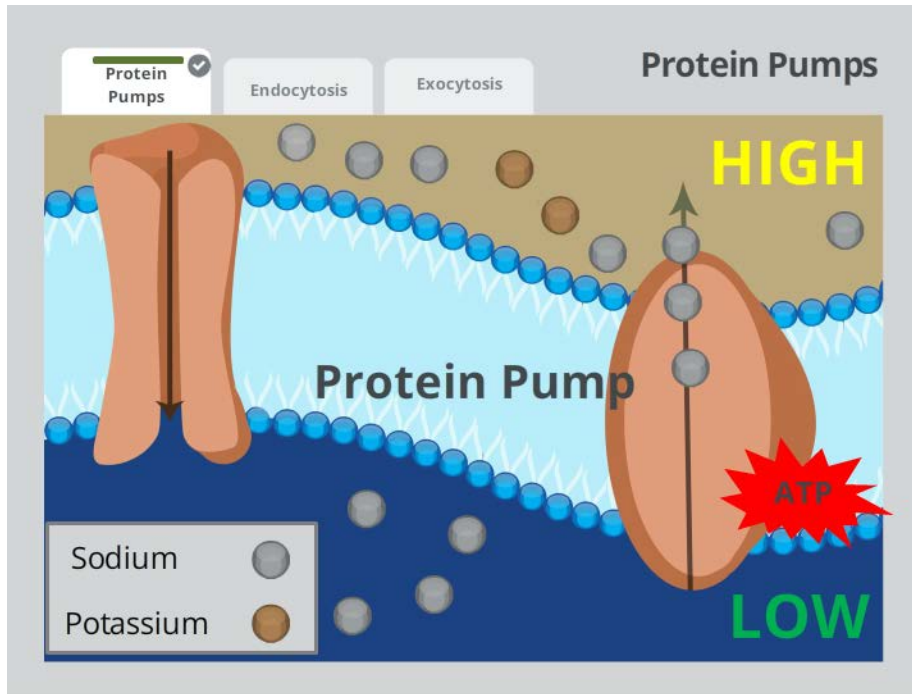
Active Transport



A cell must move some materials against the concentration gradient in a process called active transport. Like pumping up a flat tire or paddling a boat upstream, this type of transport requires the input of energy to move various materials through the cell membrane from an area of lower concentration to an area of higher concentration. There are three types of active transport: protein pumps, endocytosis, and exocytosis.

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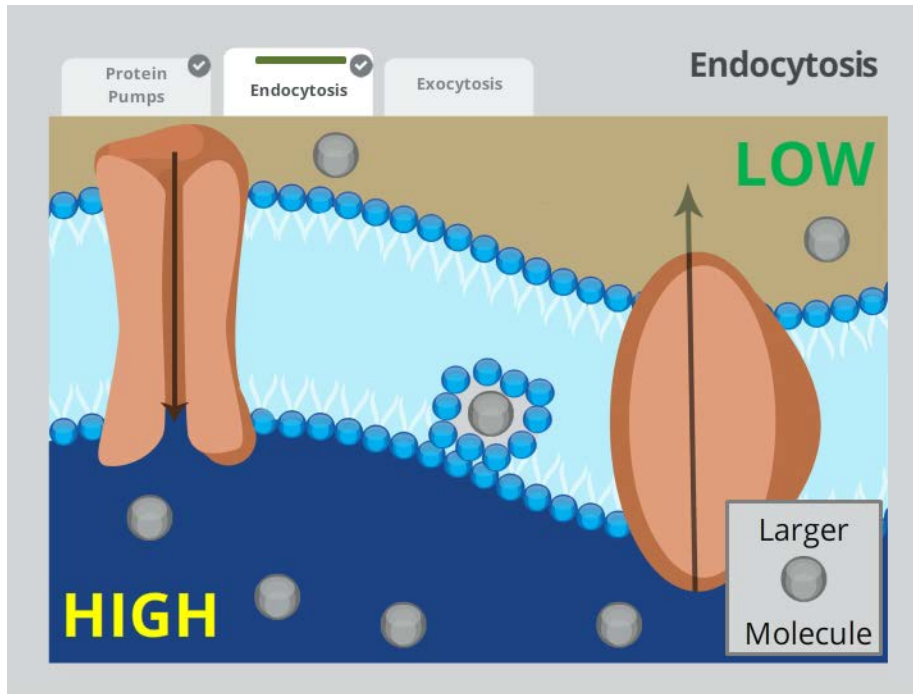
Protein Pumps



An important part of how a cell maintains homeostasis is exchanging sodium ions for potassium ions. The higher concentration of sodium ions outside of the cell means that additional sodium ions will not move via diffusion from the inside to the outside of the cell. To accomplish this, the cell uses special protein pumps that attach to these ions and move them through the cell membrane's protein channels. These protein pumps are enzymes that speed up the breakdown of an ATP molecule. The energy from one ATP molecule is used to move three sodium ions out of the cell and two potassium ions into the cell.

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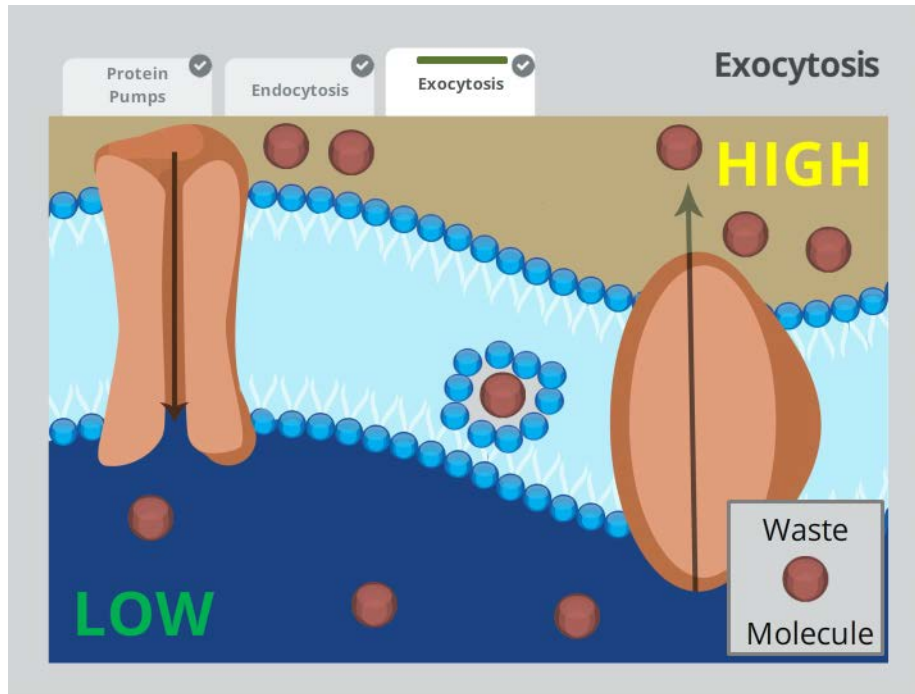
Endocytosis



Another type of active transport is endocytosis. Some large materials like glucose molecules are too large to pass through the cell membrane. In these situations, the cell membrane folds itself around the material to create a pocket, or vacuole. Once the cell membrane completely envelopes the material inside the vacuole, it gradually moves the vacuole through the other side, opening up and allowing the contents to enter the cell.

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Exocytosis



Exocytosis is the opposite of endocytosis in two ways. First, the cell is moving materials out of, instead of pulling them in through, the cell membrane. Second, the cell forms a vacuole inside, which then moves toward and fuses with the cell membrane. Cells use exocytosis to move waste and to secrete substances like hormones, out of the cell.