

**BIOLOGY**

Topic Summary

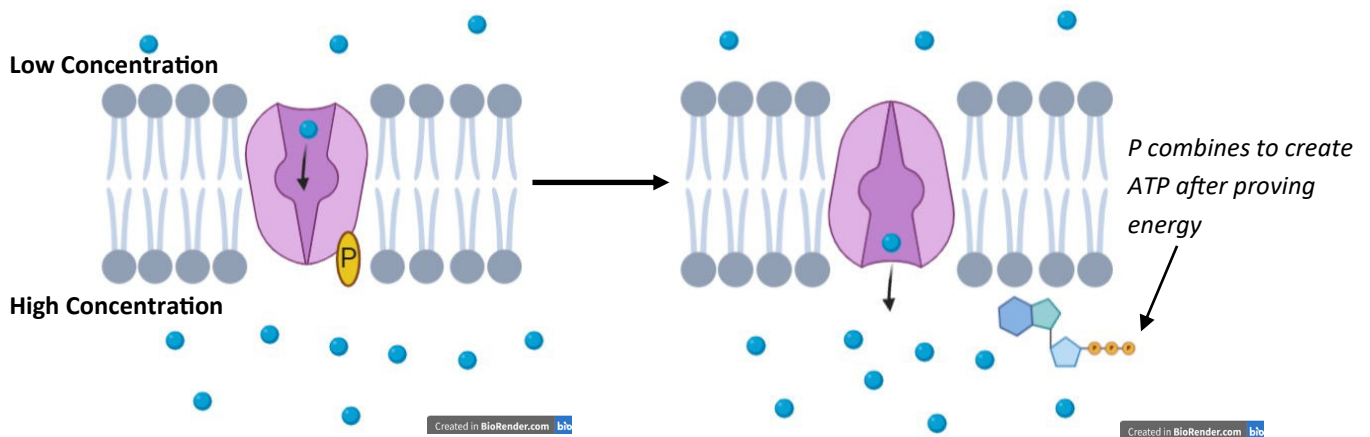
**LT13 - ACTIVE TRANSPORT & BULK TRANSPORT**

Active transport is another method of transporting substances between cells and their environments. Unlike diffusion and osmosis, this process requires energy. Endocytosis and exocytosis are two types of active transport, also known as bulk transport. This is when large substances are transported across the membrane

**Active Transport**

Active transport is defined as the movement of molecules/ ions from a region of lower concentration to a region of higher concentration, requiring energy. This happens against the concentration gradient.

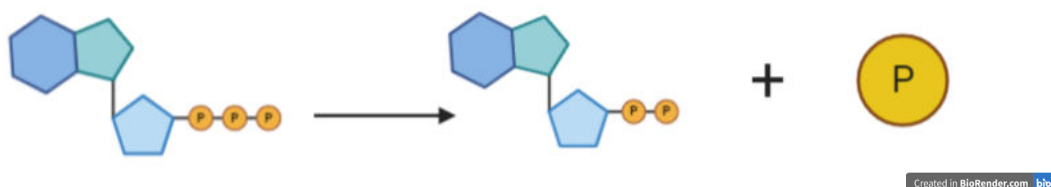
The energy used by this process is in the form of ATP (adenosine-tri-phosphate). Active transport is very selective in the molecules transported. This means only certain molecules can be transported through the cell membrane using certain proteins embedded (carrier proteins).



In active transport, first the molecule binds to the receptors on the carrier proteins. This molecule must be specific as otherwise the carrier protein would not open.

ATP is hydrolysed to form ADP (adenosine-di-phosphate) and a phosphate group (the 'P' on the diagram). This phosphate group now binds to the carrier proteins on the other side, providing energy for the carrier protein to change shape.

The molecule can now pass through the membrane against its concentration gradient and the phosphate now recombines with the ADP to make ATP. The carrier protein returns to its original shape.



*ATP is broken down during active transport to form ADP and P, providing energy.*

## Bulk Transport

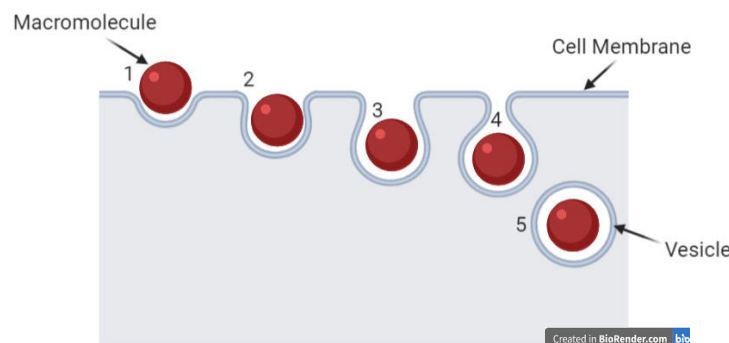
Some substances are too large to be able to diffuse through the membrane or to use transmembrane proteins. Therefore two other types of active transport are used to move these in and out of the cell.

These two processes are known as endocytosis and exocytosis. They are both methods of bulk transport and, just like active transport, require energy. Energy is required in these processes as vesicles which transport substances, are moved throughout the cell using cytoskeleton which require energy. They both allow substances to fuse with the membrane in order to transport large substances.

## Endocytosis

Endocytosis is the bulk transport of materials into the cells. Phagocytosis is the endocytosis of solids while pinocytosis is the endocytosis of liquids.

Endocytosis 'captures' a molecule outside of the cell and engulfs it within the cell. The cell surface bends inwards as the molecule comes into contact with it. The membrane closes around the substance, enclosing it completely and forming a vesicle in the process. The vesicle containing the substance is pinched off and moves into the cytoplasm.

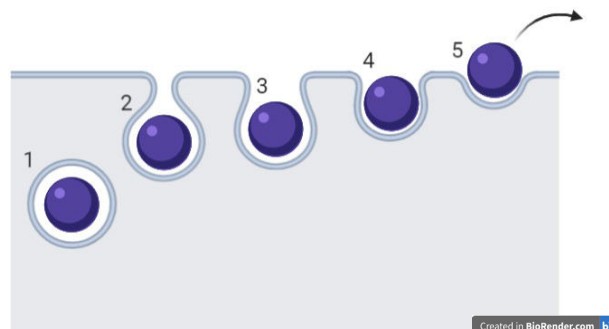


*Process of endocytosis in cells. Substances are brought IN the cell.*

## Exocytosis

Exocytosis is the bulk transport of materials out of the cell.

Exocytosis usually takes place when new proteins or lipids are made in the cell which need to be transported out of the cell. In this process, vesicles with substances enclosed within them fuse with the cell membrane. As the membrane and vesicle fuse, the molecules being transported are released out of the cell.



*The process of exocytosis in cells. Substances are moved OUT of the cell*