MEMBRANE TRANSPORT

1.4

ENDOCYTOSIS

The fluidity of membranes allows materials to be taken in to cells by endocytosis or released by exocytosis.

It is an extracellular process in which the substances are brought into the cell.

Vesicle

- it is a small sack of membrane with a droplet of fluid inside.
- spherical and are normally present in eukaryotic cells.
- they are constructed, moved around and then deconstructed → this happens because of the fluidity of membranes, which allows the structures surrounded by a membrane to change shape or move.

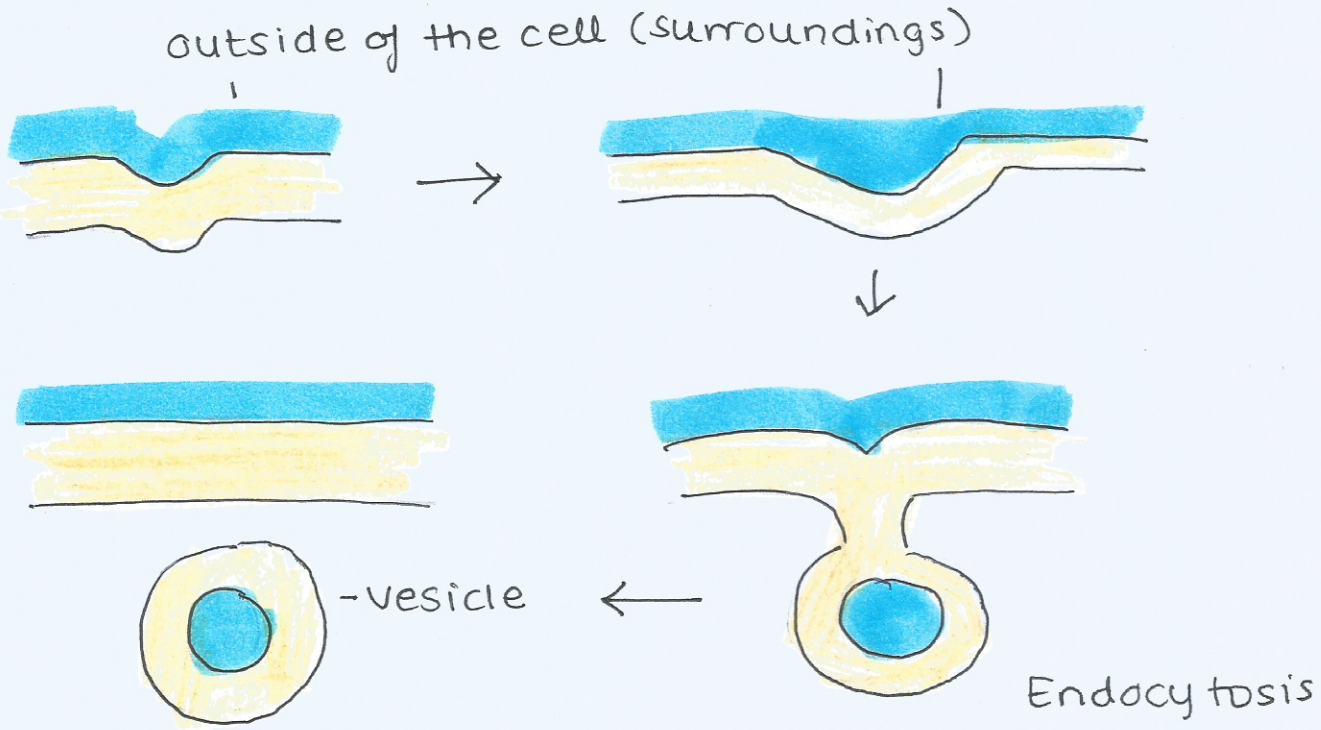
Formation of a vesicle

- A small region of a membrane is pulled from the rest of the membrane and is pinched off.
- Proteins from the membrane carry out this process using energy from ATP.
- it is formed inside of the plasma membrane

The vesicles contain water and solutes from outside the cell but also contain larger molecules needed by the cell. These molecules can't pass through the membrane.

Examples

- In the placenta, proteins and antibodies from mother's blood is absorbed into the fetus by endocytosis.
- Amoeba and Paramecium take in large undigested food particles by endocytosis.
- White blood cells take in pathogens including bacteria and viruses by endocytosis and then kill them



VESICLE MOVEMENT

- Vesicles can be used to move materials within the cells.
- In some cases content of the vesicles need to be moved and in other cases it is the proteins in the membrane of the vesicle that are the reason for vesicle movement.
- Endoplasmic Reticulum → Golgi Apparatus → Plasma membrane

EXOCYTOSIS

If a vesicle fuses with the plasma membrane, the contents are then outside the membrane and therefore outside the cell. This process is called exocytosis.

- It is used to release materials from the cell and can also be used to expel waste products or un wanted materials.

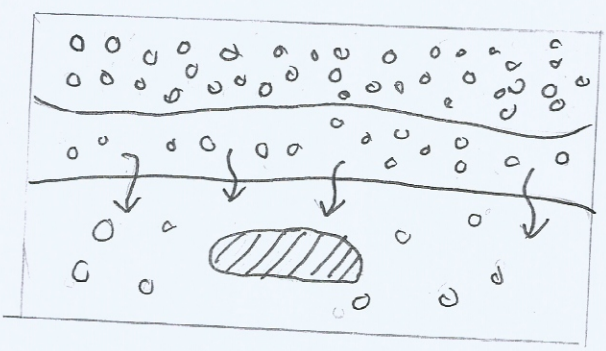
Examples of exocytosis:

- Removal of excess water from the cells of unicellular organisms. → Eg:- Paramecium.
- The water is loaded into a vesicle, sometimes called a contractile vacuole, which is then moved to the plasma membrane for expulsion by exocytosis.

DIFFUSION

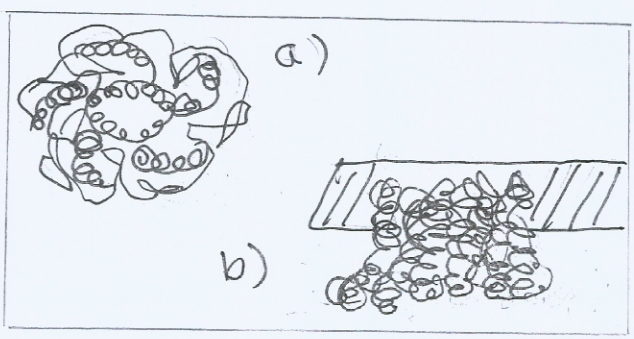
Simple Diffusion

- Spreading out of particles in liquids and gases that happens because of the continuous motion of particles.
- particles move from an area of higher concentration to an area of lower concentration.
- passive process as there is no sufficient energy.
- it can only happen if the phospholipid bilayer is permeable.
- non-polar particles can diffuse easily - oxygen.



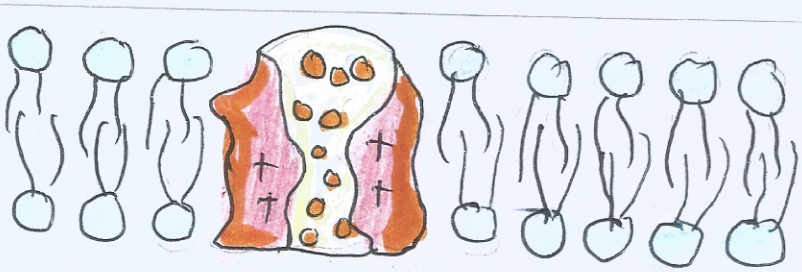
Facilitated Diffusion

- ions and other particles that cannot diffuse between phospholipids can pass in & out using the channels in the plasma membrane of the cell.
- because the channels help particles pass through the membrane, from higher to lower concentration, it is called facilitated diffusion.
- cells can control which type of channels are synthesised & placed in the membrane & this way it can control which substances diffuse in & out.



OSMOSIS

- Happens due to differences in the concentration of substances dissolved in water.
- water molecules move from areas of high concentration to areas of low concentration through the plasma membrane.
- water molecules despite being hydrophillic, are small enough to pass through the phospholipid bilayer.
- some cells have water channels called aquaporins, which increase membrane permeability to water. eg:- Kidney cells.



ACTIVE TRANSPORT

- when a substance is absorbed against the concentration gradient, it uses ATP energy to carry out the transport that is why it is called active transport.
- It is usually carried out by globular proteins in membranes, usually called pump proteins.
- the cell membranes contain many different pump proteins allowing the cell to control the content of its cytoplasm precisely.

Understandings:

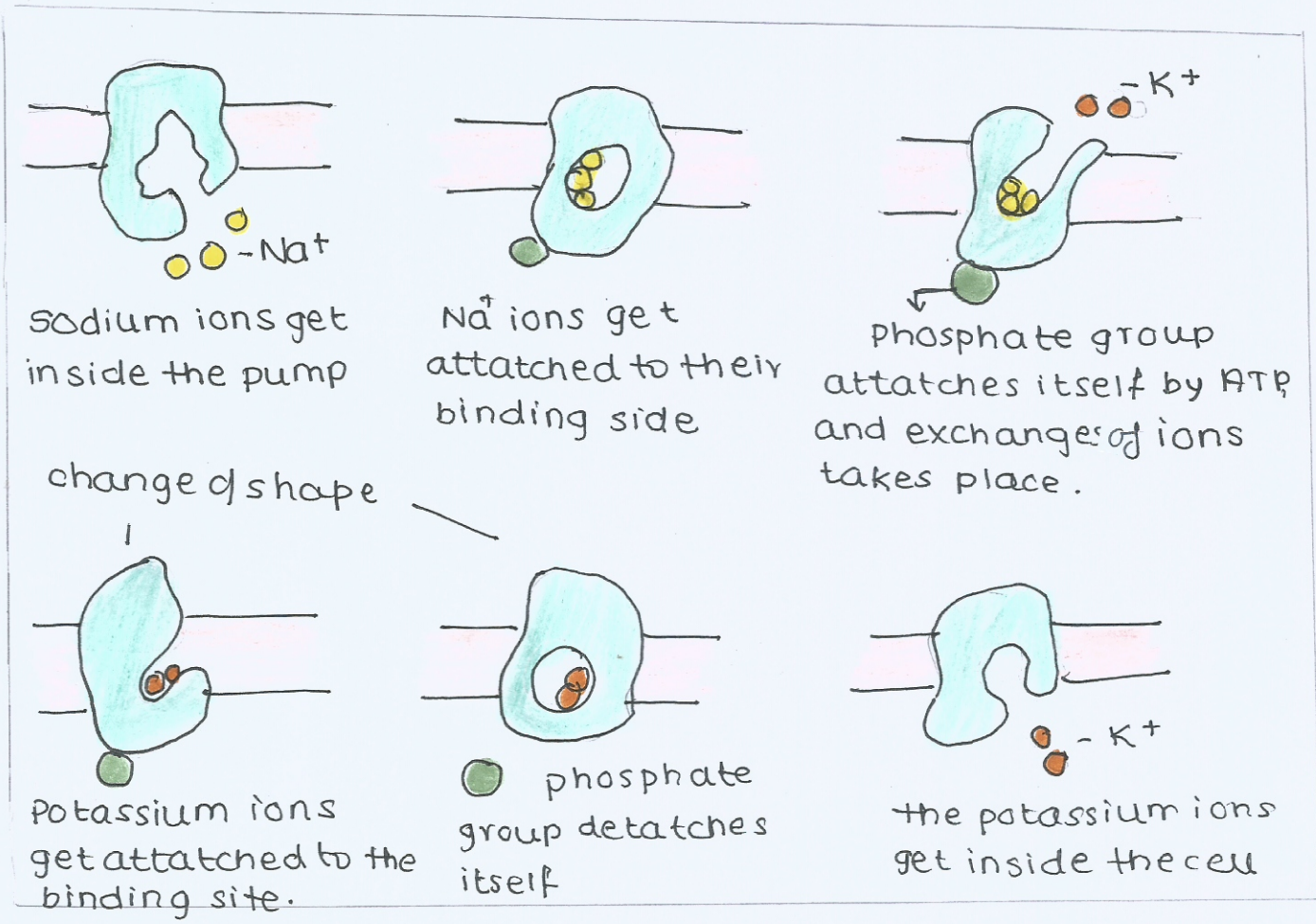
- Particles move across membranes by simple diffusion, facilitated diffusion, osmosis and active transport
- The fluidity of membranes allows materials to be taken into cells by endocytosis or exocytosis
- Vesicles move materials within the cells

Applications: structure and function of Na-K pumps for active transport and potassium channels for facilitated diffusion

SODIUM-POTASSIUM PUMP

An integral protein that exchanges 3 sodium ions OUTSIDE THE CELL with 2 potassium ions INTO THE CELL.

- A phosphate group is transferred to the pump by the use of ATP.
- The protein changes its shape allowing the sodium to cross the membrane.
- This change allows the potassium ions to go to the binding sites on the surface of the pump.
- The phosphate group gets released which causes the protein to go back into its original shape.
- This completes the ion exchange by letting in the potassium ions.



ADVANTAGE OF LIGHT MICROSCOPE OVER ELECTRON MICROSCOPE.

- Light microscopes are

CHEAPER

EASIER TO USE

EASILY AVAILABLE

SHOW COLOURED IMAGE

LIGHT WEIGHT

ADVANTAGE OF ELECTRON MICROSCOPE OVER LIGHT MICROSCOPE.

- Electron microscopes can

SHOW ULTRASTRUCTURE OF THE CELL

MAGNIFY MORE THAN LIGHT MICROSCOPE

HIGHER RESOLUTION

MORE ADVANCED