Membrane Transport …….

Introduction

- A highly selective filter process that permits the nutrients and removes waste products from the cell.
- Maintain homeostasis.
- Play an important role in cell to cell communication.
- Detects chemical messengers arriving at the cell surface.

Types

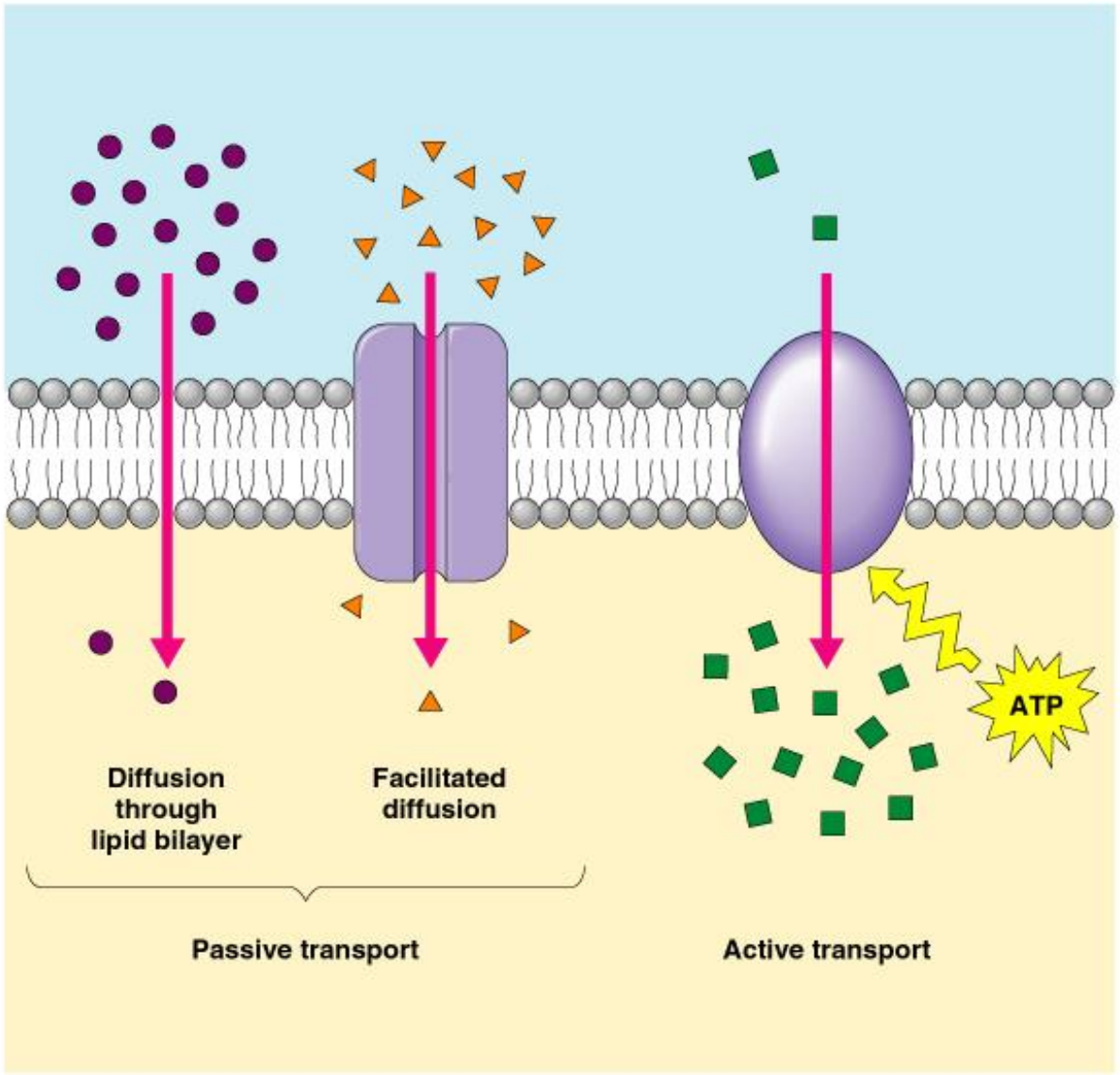
Classified into two types

- ✓ Passive transport
- ✓ Active transport

Passive transport

- movement of molecules
- Across a semi permeable membrane
- Down a concentration gradient.
- From an area of higher to lower concentration.
- No energy required.

Passive/Active Transport



Simple diffusion

- Transport across a membrane without the assistance of membrane proteins.
- Occurs with small neutral molecules (e.g oxygen)
- Continues untill equilibrium is achieved.

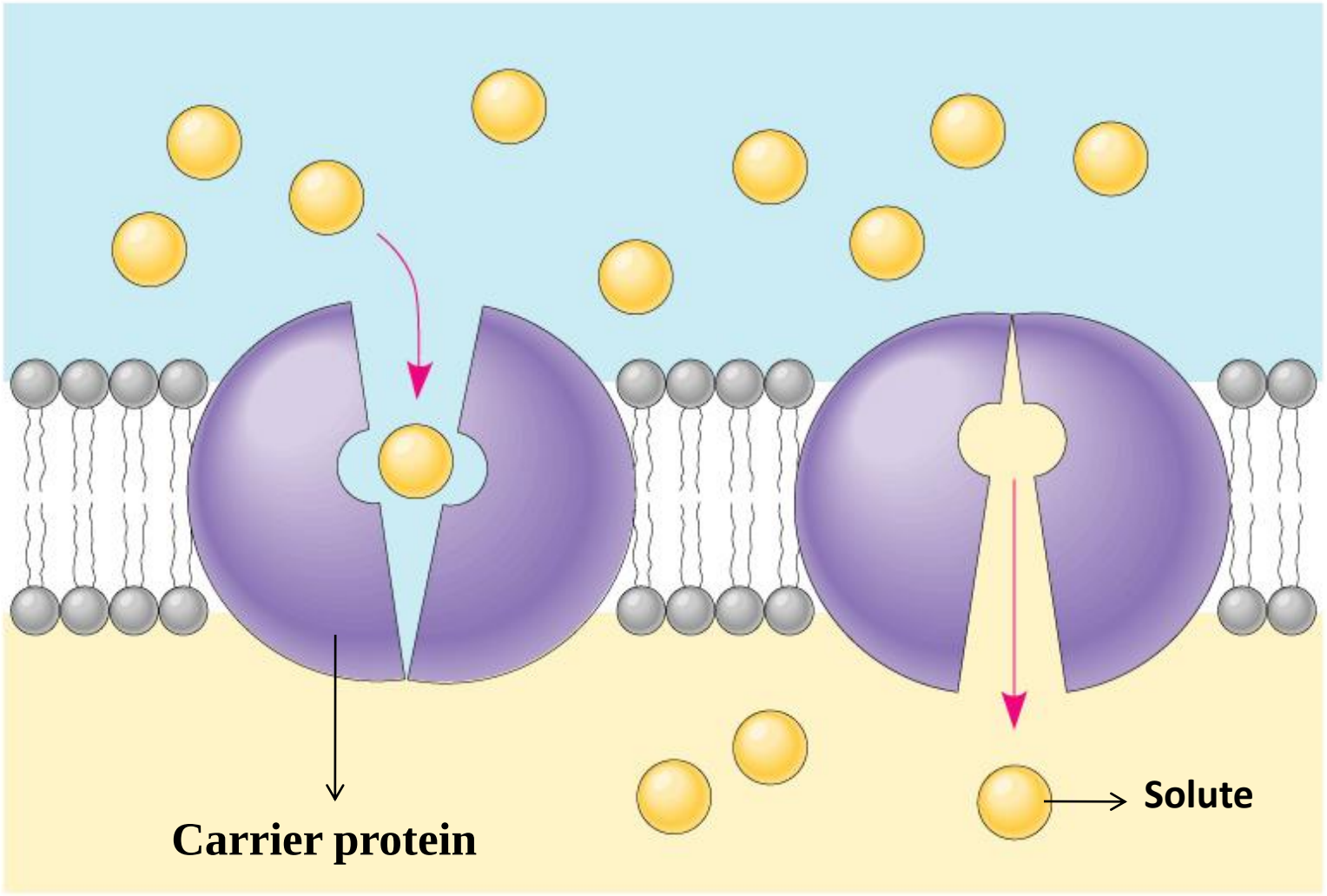
Facilitated diffusion

- Transports large and polar molecules.
- Transport proteins are involved in the movement of molecules.
- E.g channel and carrier proteins.

Carrier proteins

- Moves large uncharged molecules (e.g glucose)
- Proteins change shape to allow molecules for transport.
- Acts like a gate or door.
- Also called as permeases or transporters.

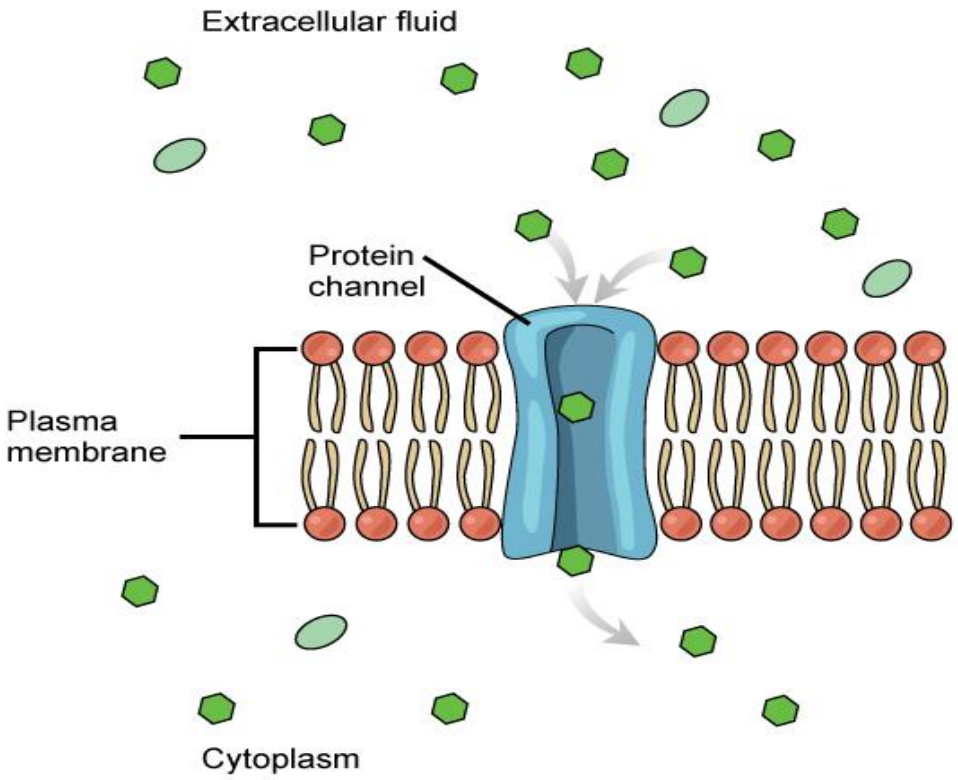
Facilitated Transport



Channel proteins

- Move small charged molecules (e.g ions)
- Charged particles need help in crossing the hydrophobic core.
- Particles transported have the opposite charge to that of the protein.
- Acts like a tunnel.

Channel proteins



Direction of transport

Uniport

- ✓ Movement of a single molecule in one direction
- ✓ E.g all channel proteins

symport

Movement of two molecules in the same direction.

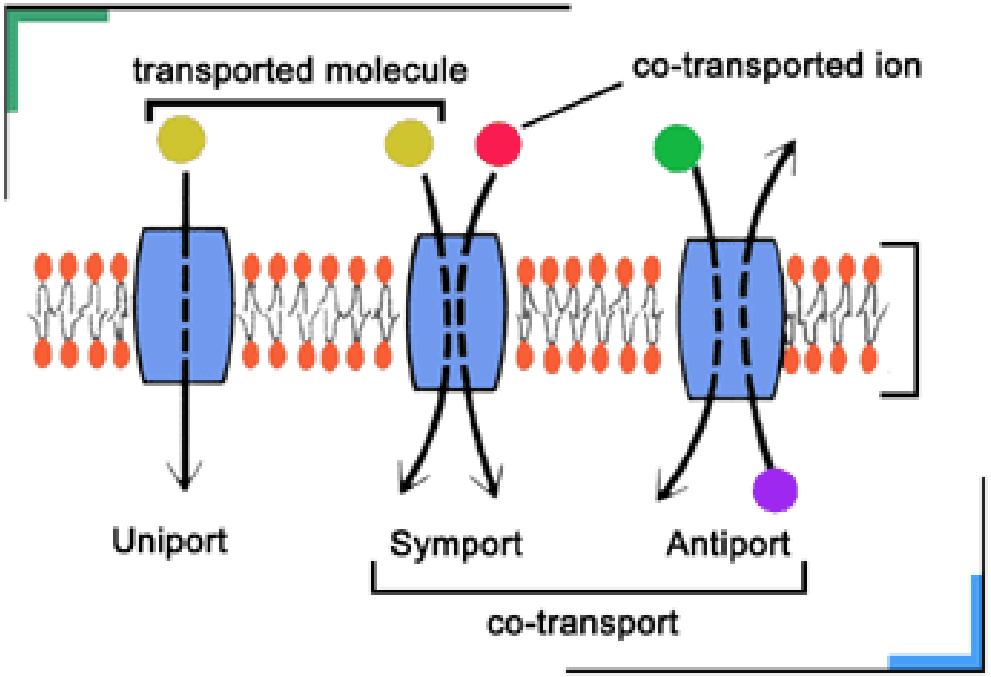
Na/ glucose symporter

Antiport

Movement of two molecules in opposite directions.

e.g Na/K pump

Direction of transport



Active transport/ion pumping

- Movement of molecules against the concentration gradient.
- From low to high concentration.
- Requires energy in the form of ATP.
- Requires a transport proetin (pump).
- ATP induces a conformational change in the transporter pump to allow specific molecules to enter/exit cell against concentration gradient.

Pumps

- Pumps often function same as the carrier proteins except that they move molecules against the concentration gradient and thus require energy.
- 3 pumps

➢ Coupled transporters

➢ Light driven pumps

➢ **ATP driven pupms**

✓ P-type pumps

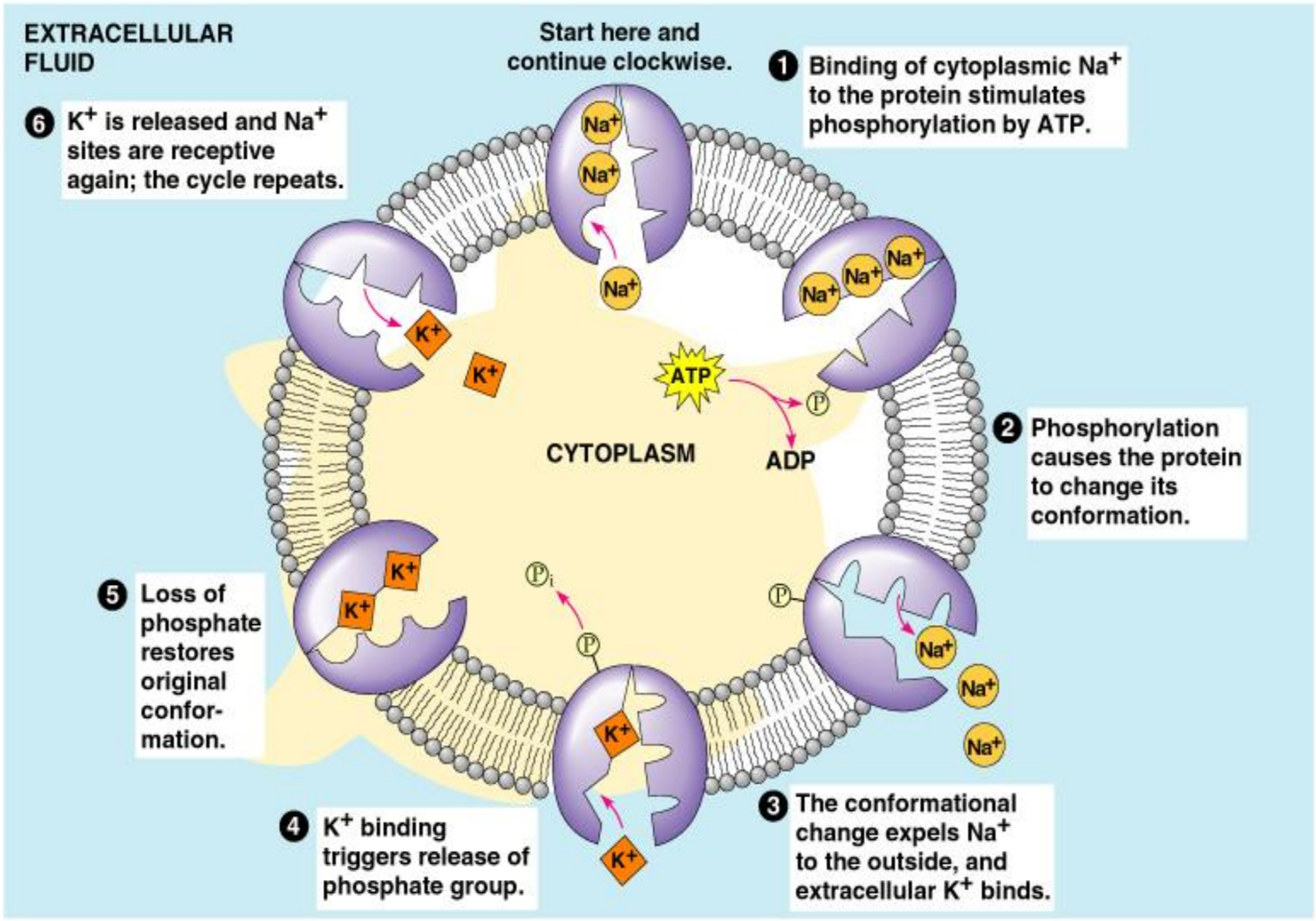
✓ F-type pumps

✓ ABC transporters

Na-K pump

- Active transport
- antiport
- Pump oscillates between two conformational states
- ✓ 3 Na into the cell.
- ✓ 2k out of the cell.

Example- Na-K Pump



Bulk membrane transport

- Transport of molecules too large or too polar to pass through the membrane.
- Involves the folding of the membrane to form a vesicle.

Types

Endocytosis (Entry into the cell)

- phagocytosis
- pinocytosis
- Receptor mediated endocytosis

Exocytosis (exiting the cell)

Phagocytosis

- Cellular eating
- Cells ingest other cells or large particles.
- Found in simpler forms of life for feeding (amoebas)
- Used in higher order organisms as a defensive mechanism against invasion by foreign particles.

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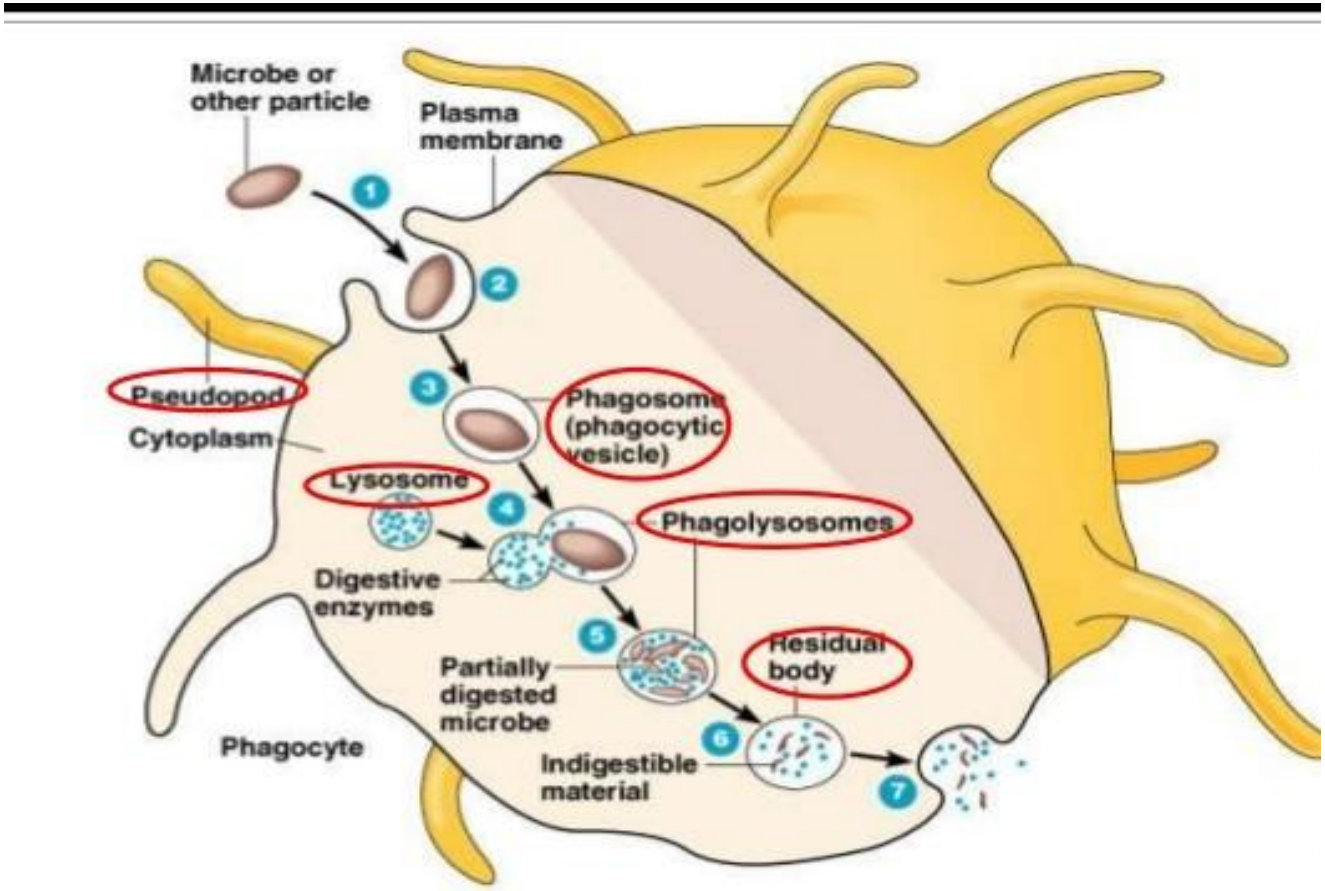
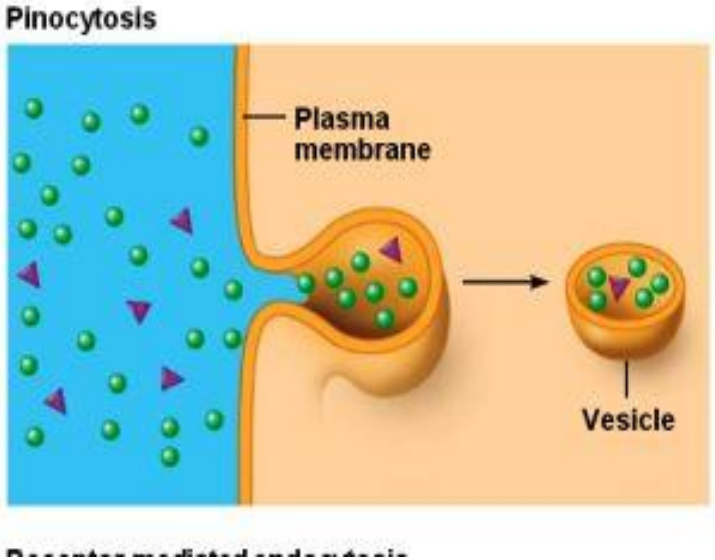
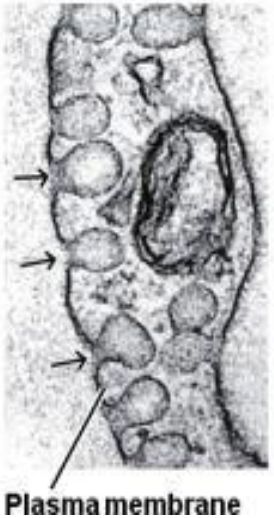
Phagocytosis



Pinocytosis

- Cellular drinking
- Ingestion of dissolved material
- Cell folds inwards (invaginates) to take in fluid containing the desired substance.

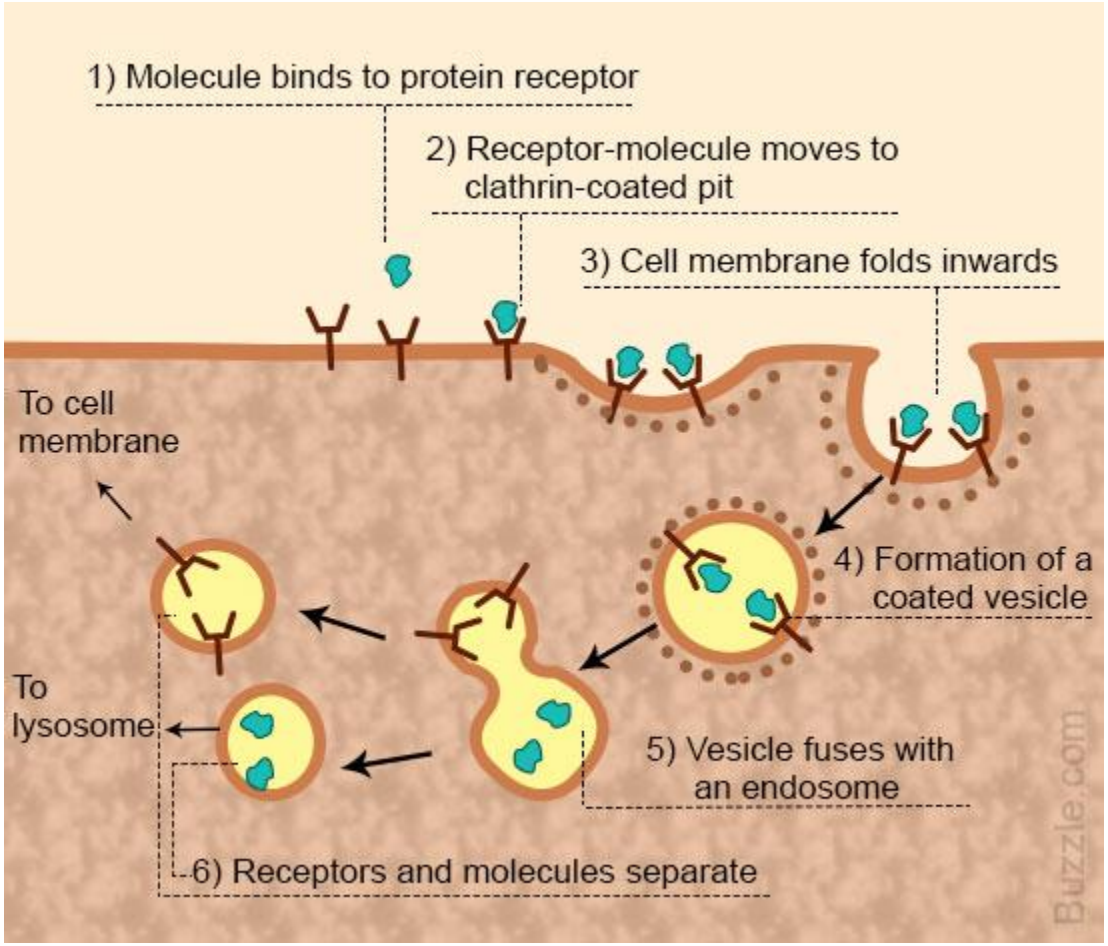




Receptor medaited endocytosis

- Intake of molecules that bind specifically to a receptor on the surface of the cell.
- Receptor proteins are usually clustered in regions of the membrane called coated pits which contain coat proteins that help them form vesicles for endocytosis.

Receptor mediated endocytosis



Exocytosis

- Movement of the materials from the cell to the cell surface within membrane bound vesicles
- Secretion ,release of the waste, toxins and signalling molecules.
- Restoring the cell membrane