## cell types

| | |
|---|---|
| prokaryotic cells | simple cells that have no nucleus - unicellular bacteria |
| eukaryotic cells | complex cells with a nucleus & organelles - all fungi, flants, animals |

## plasmalemma (plasma membrane) function

- flexible yet sturdy semi-permeable regulator
- covers & protects the cell
- controls what goes in & out
- links to other cells
- flies 'flags' to tell other cells ' who' it is
- lipids act as barrier to certain polar substances
- transmembrane (integral) proteins act as 'gatekeepers' allowing passage of specific molecules & ions

## plasma membrane proteins

| | |
|---|---|
| ion channel (integral) | allows specific ion to move through water-filled pore |
| carrier (integral) | carries specific substances across membrane by changing shape. carrier proteins = transporters. |
| receptor (integral) | recognises specific ligand & alters cell's function in some way |
| enzyme (integral & peripheral) | catalyses reaction inside/outside cell depending on which direction the active site faces) |
| linker (integral & peripheral) | anchors filaments inside & outside plasma membrane, providing structural stability & shape for the cell. may also participate in movement of the cell/link two cells together |
| cell-identity marker (glycoprotein) | distinguishes your cells from anyone else's (except identical twin) |

small, neutrally-charged, lipid-soluble substances can freely pass. water is unique - it is highly polar yet is still freely permeable

## diffusion (passive)

the passive, random spread of particles from [high] -> [low]

depends on: amount of substance, concentration gradient, temperature, SA & diffusion distance



Sponsored by **Readable.com**
Measure your website readability!
https://readable.com

## ion channels (passive)

allow passive movement of specific ions down electrochemical gradient

distinguished by their ion selectivity

regulated/ 'gated' holes through membrane

flow through ion channels is near thermodynamic equilibrium

gating mechanisms dependent on: voltage, ligands, temperature, pH, mechanical stress

## transporters (carriers)

allow passive movement of solutes across membrane down concentration gradient

example is GLUT1 - glucose transporter - binds to carrier at membrane side where concentration is highest, protein changes shape, releases solute on other side

concentration-gradient dependant

exhibit saturation kinetics

## osmosis (passive)

- the passive net movement of water through a selectively permeable membrane from an area of high water concentration to one of lower water concentration & is opposed by hydrostatic pressure
- occurs when membrane is permeable to water but not solutes
- water can pass through plasma membrane through lipid bilayer by simple diffusion or through aquaporins (integral membrane proteins)

tonicity = a measure of a solution's ability to change the volume of cells by altering their water content. semi-permeable membranes separate fluid compartments therefore osmosis of water is free to occur between any fluid space & another.

## primary active transport mechanisms (pumps)

required for solutes that need to move against concentration gradient

requires energy through hydrolysis of ATP

exhibit saturation kinetics

crucial for maintaining cell volume & ionic gradients responsible for setting resting membrane potential & generating action potentials

## secondary active transport mechanisms

use energy stored in Na+ or H+ concentration gradients to drive transport of other solutes against their concentration gradients

gradients are already established by primary active transport

indirectly use energy from ATP hydrolysis

antiporters carry two substances across membrane in opposite directions

symporters carry two substances across membrane in same direction



Sponsored by **Readable.com**
Measure your website readability!
https://readable.com

## vesicular transport

| | |
|---|---|
| vesicle | small, spherical sac formed by budding off from a membrane |
| endocytosis (3 x types) | materials move into a cell in a vesicle |
| exocytosis | vesicles fuse with the plasma membrane, releasing their contents into the extracellular fluid, important for neurotransmitter signalling |
| transcytosis | combination of endocytosis & exocytosis |

## (1) receptor mediated endocytosis

- receptor protein recognises & binds a specific particle: cholesterol containing low density proteins (LDL's), vitamins, antibodies, hormones
- clatharin molecules form a basketlike structure on cytosolic side of membrane forming a vesicle
- fuses with endosome
- receptors recycled
- vesicles bud off endosome to transport particle were required in cell

## (2) phagocytosis

- cell engulfs large particles such as viruses, bacteria or dead cells
- two main phagocytes: macrophages & neutrophils

## (3) bulk-phase endocytosis (pinocytosis)

- no receptor proteins involved
- transport of extracellular fluid
- plasma membrane folds inward

## cytoplasm

| | |
|---|---|
| cytosol | intracellular fluid surrounding the organelles, site of many chemical reactions which usually release energy & provide building blocks for cell maintenance, structure, function & growth |
| organelles | specialised structures within cell |

## cytoskeleton

microfilament

> actin/myosin, generate movement, mechanical support

intermediate filament

> stabilise organelle position, attach cells together

microtubule

> made of tubulin, determine cell shape, movement of organelles/vesicles

network of protein filaments throughout cytosol, provides structural support for cell, three types ^



Sponsored by **Readable.com**
Measure your website readability!
https://readable.com

| motile projections of cell surface | |
|---|---|
| cilia | short, hair-like projections from cell surface, move fluids along surface |
| flagella | longer than cilia, move entire cell, sperm's tail |

| organelles/structures | |
|---|---|
| ribosomes | site of protein synthesis, large amounts of rRNA, attached to outer surface of nuclear membrane & ER |
| endoplasmic reticulum | network of membranes in shape of flattened sacs/tubules |
| RER | connected to nuclear envelope, series of flattened sacs, surface studded with ribosomes, produces secretory, membrane & organellar proteins. attach carbohydrates to proteins (glycoproteins) |
| SER | network of membrane tubules, no ribosomes, synthesises fatty acids/steroids, detoxifies certain drugs (alcohol, pesticides & carcinogens) |
| golgi | consists of 3-20 flattened, membrane sacs called cisternae. modify, sort & package proteins for transport to different destinations. proteins are transported by various vesicles (secretory, membrane & transport) |
| lysosomes | vesicles that form from golgi & contain powerful digestive enzymes. low internal pH (5) due to H+-ATPase |
| peroxisomes | smaller than lysosomes, detoxify several toxic substances such as alcohol using oxidase enzymes, abundant in liver |
| proteasomes | continuously destroy unneeded, damaged or faulty proteins, found in cytosol & nucleus, contain a multitude of protease enzymes |
| mitochondria | generate ATP by aerobic respiration, prevalent in active cells: muscle/liver/kidneys, self-replicate during times of increased cellular demand or before cell division, contain own DNA - inherited only from your mother, plays important role in apoptosis, cristae = series of folds of inner membrane, matrix = large central fluid-filled cavity |
| nuclear envelope | double membrane separating nucleus from cytoplasm |
| nuclear pores | numerous openings in nuclear envelope, control movement of substances between nucleus & cytoplasm |
| nucleolus | spherical body that produces ribosomes |



Sponsored by **Readable.com**
Measure your website readability!
https://readable.com