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

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

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 ^

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