

Cell theory		Prokaryotic or Eukaryotic (cont)		Organelles (cont)		Organelles (cont)	
1. All living things are made up of cells	unicellular or multicellular	smaller cells	larger cells	Nucleus	genetic material that's surrounded by a nuclear membrane with nuclear pores that control what goes in and out that protects the DNA that controls the activities of the cell	Smooth Endoplasmic Reticulum	has no ribosomes and is attached to the Rough ER that makes lipids (membranes), destroy toxins (liver), and regulates calcium (muscles)
2. Cells are the smallest and most basic unit of life	prokaryotic or eukaryotic	bacterial cells	animal or plant cells				
3. All cells come from pre-existing cells.		all cells have cell membrane, cytoplasm, ribosomes, genetic material (DNA or RNA)					
Prokaryotic or Eukaryotic		Organelles					
Prokaryotic	no nucleus	Cell (plasma) membrane	Phospholipid bilayer that surrounds the cell to control what goes in and out of the cell	Nucleolus	inside the cell that makes mRNA which makes ribosomes	Golgi Apparatus	folded membrane that gets vesicles of protein from ER to process, sort, and ship proteins where needed
	no membrane bound organelles	Cytoskeleton	Network of threadlike fibers made of proteins to give the cell shape, move organelles around, provide structural support for animal cells	Ribosomes	located on the Rough ER and floating in cytoplasm that make proteins in a process called translation	Vesicles	"mini-cart" that transports proteins around the cell
	division process is binary fission	mitosis				Lysosomes	Contains enzymes that break down the dead stuff and apoptosis
	unicellular	unicellular or multicellular		Rough Endoplasmic Reticulum	Hugs the nucleus and has ribosomes on it that makes proteins	Vacuoles	small and numerous in animal cells but one large one in plants cells that act as a storage
	cell wall made of peptidoglycan	in fungi or plants with cell walls made of chitin or cellulose	jelly-like substance mainly made up of H ₂ O that holds everything in place and provides solution for chemical reactions to take place in				



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Organelles (cont)

Centrioles/Centrosomes made of microtubules that happen in cell division helping cells divide by pulling chromosomes apart

Cilia shorter, more numerous, like tiny oars (hairs) that move fluid across cell surface

Flagella longer, fewer (tail) that move entire cell

Mitochondria inner membrane and matrix (fluid) where cellular respiration happens (breaks down food to release energy as ATP)

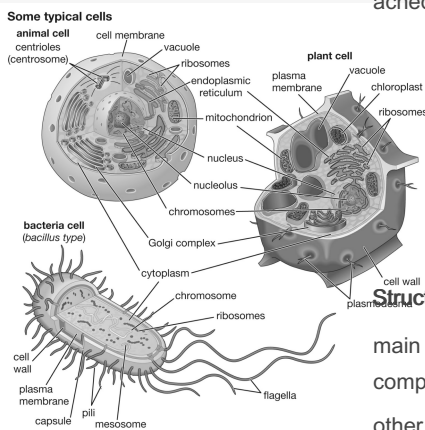
Chloroplast grana (stacks) and stroma (fluid) where photosynthesis happens (converts energy from sun to energy in sugar)

Organelles (cont)

Cell Wall Provides structural support and protection for bacteria, plant and fungi cells. Bacteria's made with peptidoglycan. Plant's made with cellulose. Fungi's made with chitin.

Peroxisomes membrane-bound organelles primarily involved in lipid metabolism and the conversion of reactive oxygen species

Animal, Plant, Prokaryotic cells



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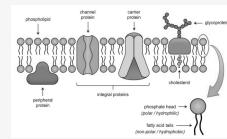
Plant Cell:

chloroplast
central vacuole
cell wall

Animal Cells:
cilia and flagella
centrioles
lysosomes

Bacterial Cells
capsules

Cell membrane



Phospholipid Bilayer: amphipathic
- hydrophilic heads
- hydrophobic tails

Fluid Mosaic Model

membrane is a fluid structure with "mosaic" of various proteins embedded/attached to bilayer

phospholipids provides fluidity and elasticity

proteins and other molecules embedded in membrane

Structure of Cellular Membrane

main components other important molecules
phospholipids and proteins
cholesterol and carbohydrates

Proteins

Functions transport, enzymatic activity, signal transduction, cell to cell recognition, intercellular joining, attachment to cytoskeleton and extracellular matrix

Proteins (cont)

Integral Proteins embedded in
Peripheral Proteins attached to surface

Cholesterol

at warm temperatures restrains the movement of phospholipids and reduces fluidity
at cool temperatures maintains fluidity by preventing tight packing

Carbohydrates

cell to cell recognition cell's ability to distinguish one type of neighboring cell from another
membrane carbohydrates interact with the surface molecules of other cells, facilitating cell to cell recognition

Selective Permeability

Allows some materials, but not all to go through

Selective Permeability (cont)		Passive Transport (cont)		Passive Transport (cont)		Active Transport (cont)	
can easily pass: small, non polar, nonionic hydrophobic, neutral molecules and H ₂ O	cannot easily pass: large (must use vesicles), polar (must go through proteins), ionic, hydrophilic	Simple Diffusion	The spreading out of molecules	Hypotonic solutions = less solutes, more water; water moves into the cell to SWELL/-BURST		Cotransport	single ATP-powered pump that transports solute indirectly
		ion channels	transport proteins allow ion to flow from a high to low concentration	Isotonic Solution = equal solutes and water; cell STAYS THE SAME		Exocytosis	cell uses energy to export materials out of the cell with a vesicle
		Facilitated Diffusion	transport protein (channel or carrier) helps to facilitate the diffusion of molecules	aquaporins: tunnel that allows water to go through the membrane		Endocytosis	cell uses energy to import materials into the cell with a vesicle
		Osmosis	Simple diffusion of water across a semipermeable membrane	Hypertonic solutions = more solutes, less water; water moves out of cell to SHRIVEL			Phagocytosis = cell "eating" (cell engulfs solids into vesicle and digests them)
Cellular Transport				Active Transport			
Concentration	# of molecules of a substance in a given volume			molecules moving AGAINST the concentration gradient from LOW to HIGH concentration			
Concentration Gradient	difference in concentration (mass) of a substance from one location to another			Molecular Pumps	Cell uses energy to pump molecules across a membrane through a protein channel (sodium potassium pump and proton pump)		
Passive or Active Transport							
Homeostasis							
the need for an organism to maintain and regulate constant or stable internal conditions	Growth and homeostasis are maintained by the constant movement of molecules across membranes.						Pinocytosis = cell "drinking" (cell engulfs liquids into vesicle and digests them)
Passive Transport							
Molecules moving DOWN their concentration gradient from HIGH to LOW with NO ENERGY until EQUILIBRIUM is reached							



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SA:V Ratio

Formulas Surface Area: $6(lw)$

Volume: lwh

Steps to find SA:V
1. calculate SA

2. calculate V

3. Divide SA by V

As cell size increases, the SA:V ratio decreases and the cell becomes less efficient at moving things in and out of the cell = cell must stop growing or dividing

Cell size

Why are cells small? To maintain a larger surface area to volume ratio. The smaller the cells are, the faster and more efficient things can go in and out of the cell.

Water Potential

$\Psi = \Psi_S + \Psi_P$
 Ψ_S : solute potential
 Ψ_P : pressure potential

$\Psi_S = -iCRT$
i: ionization constant
C: concentration (M)

Water Potential (cont)

R: pressure constant (0.0821 liters bars/mole K)

T: temperature in Kelvin ($^{\circ}\text{C} + 273$)

Osmotic Potential the potential of H_2O moving from hypotonic solutions to hypertonic solutions (High water potential to low water potential)

Turgor Pressure: When a plant cell is placed in a hypotonic solution and gains a lot of water, the cell wall presses back on the cell membrane to prevent the cell from bursting.

Osmoregulation

the control of water balance

organisms without cell walls that live in hypertonic or hypotonic environment Osmoregulation maintains water balance and allows organisms to control their internal solute composition/water potential.



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