Cell Structure and Organelles

Nucleus:	Double-membrane organelle that contains and organizes the DNA. It has pores that allow for the exchange between the nucleoplasm and cytoplasm.
Nucleolus:	A region of condensed chromatin where rRNA is synthesized and ribosomes are assembled.
Cytoplasm:	The region of the cell from the nuclear membrane to the plasma membrane.
Rough ER:	Extension of the outer nuclear membrane that has ribosomes attached to its membrane. The ribosomes synthesize proteins destined for transport through the endomembrane system(also synthesizes phospholipids).
Smooth ER:	Has no ribosomes attached to its membrane and synthesizes many compounds such as carbohydrates, lipids, and steroids. Stores calcium ions and detoxifies medications and toxins
Ribosomes:	Macromolecules composed of proteins associated with ribosomal RNA(rRNA). Translate genetic material by reading the messenger RNA(mRNA) and performing dehydration reactions between amino acids.

Cell Structure and Organelles (cont)

Golgi Apparatus:	Lipids and proteins that add short chains of carbohydrates to proteins to ensure the proteins travel to their target destination, usually through vesicles. This plays a part in cell wall synthesis for plant cells.
Vesicles:	Phospholipid bubbles that are formed when the ER and Golgi pinch a part of their membrane off. Vesicles can also be formed when the cell membrane itself pinches off(endocytosis).
Lysosomes:	Specialized vesicles that come from the Golgi and stay in the cytoplasm. Environment of a lysosome is very acidic and it fuses with organelles to break down the contents of the organelle. The contents are broken down to simple building blocks and the cell can use these for its own purpose.
Peroxisomes:	Responsible for lipid metabolism. Peroxisomes break down fatty acid tails into smaller components and send them to the mitochondria for further oxidation. They destroy reactive oxygen species such as hydrogen peroxide and is important for the synthesis of cholesterol.

Cell Structure and Organelles (cont)

Mitochondria:	Extracts energy from organic molecules, primarily carbohydrates and lipids, to generate ATP.
Cell Membrane:	Selectively permeable membrane that regulates the movement of substances into and out of the cell. The more surface area a cell has relative to its volume, the more efficient the cell is at exchanging material with its environment.
Vacuoles:	There are three types of vacuoles; the central, the food, and the contractile. The central vacuole takes up the majority of space in the cytoplasm. It helps the plant cell maintain high water pressure. A contractile vacuole collects excess water in the cytoplasm. The cytoskeleton squeezes the contractile vacuole, expelling the excess water out of the cell. This is important for single-celled organisms that live in freshwater environments. A food vacuole is essentially a vesicle formed through phagocytosis (cellular eating). The membrane folds inward around the food particle(s) and pinches off to form a vesicle.

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Not published yet.
Last updated 10th December, 2023.

Prokaryotic and Eukaryotic Cells

Similarities:	Both enclosed by a plasma membrane, has a cytoplasm, has ribosomes, and has genetic material(DNA)
Differences:	Eukaryotes are much larger and have membrane-bound organelles that compartmentalize their cytoplasm. They have a membrane-bound nucleus where genetic material is found. Eukaryotes can be single-celled or multicellular and its genetic material is fragmented into linear chromosomes Prokaryotes are single-celled organisms that contain one single circular chromosome in the nucleoid region.

Function

Organelles work together in a coordinated manner to exchange materials, signals, and energy through membrane transport and other processes. This maintains cellular function and support the survival of the cell.

Cell Wall

Structure and Function: The cell wall provides strength and protection against pressure and stress on the cell. It provides the framework for the cell to prevent expansion and regulates diffusion by allowing some substances in and our of the cell.

Diffusion

Simple Diffusion:	The movement of molecules through a cell membrane without the help from any transport proteins.
Facilitated Diffusion:	The movement of molecules through a cell membrane with the help of transport proteins.

Diffusion (cont)

Passive Transport:	Diffusion of molecules along their concentration gradient(from high to low concentration).
Active Transport:	Movement of molecules against their concentration gradient(from low to high concentration) by using ATP.
Endocytosis:	A process where cells absorb external materials by engulfing it with their cell membrane into a vesicle.
Exocytosis:	A process where cells move large material from inside the cell to the outside through vesicles.

Evolution

Endosymbiosis:	Mitochondria and classic membrane-bound organelles of eukaryotic cells used to once be its own cell that was then engulfed by another cell to make eukaryotic cells.
Cell Theory:	Cell is the most fundamental unit of life, all living things are made up of one ore more cells, and cells come from cells.
What makes something alive?:	It can reproduce, respond, has metabolism, does homeostasis, can evolve, and has organization

Cell Size

Surface Area to Volume Ratio:	Cells need to transport molecules through their cytoplasm efficiently and surface area and volume play a role in this. Cells can only grow to a certain size due to their surafec area to volume ratio. Surface area us the area of the outside of the cell and volume is how much space is inside the cell. The ratio measures the efficiency of a cell with the larger the ratio being more effcient and the smaller the ratio being less efficient.
Specialized Structures and Strategies:	Cells have developed strategies to efficiently exchnage materials in a cell. An example of this could be active transport, osmosis, and facilitated diffusion.

Structure of Plasma Membrane

Plasma Membrane: Made up of a phosphilipid bilayer with hyrophbic tails facing the interior of the membrane and hydrophilic heads facing the outside of the membrane. Channel proteins and cholesterol can be found on the membrane as well.

Structure of Plasma Membrane (cont)

Result: The structure of the plasma membrane results in selective permeability. Selective permeability is the movement of molecules across the membrane through osmosis, active transport, and facilitated diffusion. This maintains homeostasis in the cell as the cell determines what leaves and enters the cell.

Molecules: Due to the structure of the plasma membrane only certain molecules can pass through it. Small hydrophobic molecules(no bigger than a water molecule) can pass through the membrane. **No charged molecules can pass through the plasma membrane at all**

Osmosis and Tonicity

Tonicity:	The capability of a solution to modify the volume of cells by altering their water content.
Osmosis:	The net movement of water across a plasma membrane. Water will tend to move from an areas of low concentration of solute to areas of high concentration of solute.
Water Potential:	A measure of the difference in potential energy between water with solutes and pure water. Water moves from area of high water potential to areas of lower water potential.