All Cells have	
Plasma Membrane	Bound by selective barrier that allows passage of enough O, nutrients, and wastes for the entire cell
Cytosol	Semi-fluid, jelly-like substance, where organelles are suspended
Chromosomes	Gene ares carried in from of DNA
Ribosomes	Tiny complexes that make proteins according to instructions from DNA
Cytoplasm	place of Cytosol

Pro vs Eu	
Prokaryote	Eukaryote
DNA is in *nucleus*, which is bound in **nuclear envelope**	DNA is concentrated in a region called **nucleoid**
Evolved before Eu	Evolved after Pro
Very low amounts of Organelles	Many complex organelles
Much Smaller than Pro	Much Larger than Pro

Size relates to **Function**

Plant vs Animal Organelles	
Plant	Animal
Nucleus - nuclear envelope, nucleolus, chromatin	Nucleus - nuclear envelope, nucleolus, chromatin
Plasma Membrane	Plasma Membrane
Ribosomes	Ribosomes
Golgi Apparatus	Golgi Apparatus
No Lyosome	Lyosome
Endoplasmic Reticulum - rough ER, smooth ER	Endoplasmic Reticulum - rough ER, smooth ER
No Flaggellum	Flaggellum
No Centrosome	Centrosome
Cytoskeleton - microfilaments, microtubules	Cytoskeleton - microfilaments, intermediate filaments, microtubules
No Microvilli	Microvilli
Peroxisome	Peroxisome
Mitochondrion	Mitochondrion
Chloroplast	No Chloroplast
Central Vacuole	No Central Vacuole
Plasmodesmata	No Plasmodesmata
Cell Wall	No CEll Wall

Eukaryotic Cells - extensive, elaborately arranged internal membranes that *divide* the cell into compartments
Compartments provide *different local environments* that support specific metabolic functions, so *incompatible functions* can take place simultaneously

Function of Organelles in Eukaryotes		
Name	Function	Plant vs Animal
Nucleus	Contains most genes of eukaryotic cells	Both
Nuclear Envelope	Encloses the nucleus, separating its content from the cytoplasm. Is a double membrane made of a lipid bilayer	Both
Necleolus	associated with many proteins	Both
Chromo-somes	DNA's discrete units taht c arry genetic information, Each one contains one long DNA molecules soociate	Both
Chromatin	complex of DNA and proteins making up chromosomes	
Plasma Membrane	membrane enclosing teh cell	Both
Ribosomes	complexes that make proteins: free in cystosol or bound to rough ER or nuclear envelope	Both
Golgi Apparatus	organelle active in synthesis, modification and secretion of cell products	Both
Lysosome	digesive organelle where macromolecules are hydrolyzed	Animal
Endoplasmic reticulum	network of membranous sacs and tubes: active in membrane synthesis and other synthetic and metabolic processes	Both
Rough ER	is studded with ribosomes: Involved in the synthesis of proteins and also a membrane factory for the cell	Both
Smooth ER	not studded ribosomes: functions are the synthesis of lipids, steroid hormones, the detoxification of harmful metabolic byproducts and the storage and metabolism of calcium ions within the cell	Both
Flaggellum	motility structure composed of cluster of microtubules w/i an extension of the plasma membrane	Animals
Centro-somes	region where the cell's microtubules are initiated; contains a pair of centrioles	Animals

Function of Organelles in Eukaryotes (cont)		
Cytoskeleton	reinfores cell's shape: functions in a cell movement: components are made of proteins: includes microfilaments, intermediate microfilaments, and microtubules maintenance	Both
Microfilaments	made of actin protein subunits: maintennance of cell shape: changes in cell shape: muscle contradiction: cell motility: division of animal cells	Both
Intermediate Microfilaments	maintenance of cell shape: anchorage of nucleus and certain other organelles: formation of nuclear lamina	Animals
Microtubules	maintenance of cell shape: cell motility like cilia or flagella: chromosomes movements in cell division: organelle movements	Both
Microvilli	projections that increase the cell's surface area	Animals
Peroxisome	organelle with various specialized metabolic functions: produces hydrogen peroxide as a by-product and then converts it to water	Both
Mitochondrion	organelle where cellur respiration occurs and most ATP is generated	Both
Central Vacuole	prominent organelle in older plant cells: functions include storage, breakdown of waste products, and hrdrolysis of macromolecules: enlargement of the vacuole is a major mechanism of plant growth	Plant
Chloroplast	photosynthetic organelle: converts energy of sunlight to chemical energy stored in sugar molecules	Plant
Plasmo-desmata	cytoplasmic channels through cell walls that connect the cytoplasms of adjacent cells	Plant

Function of Organelles in Eukaryotes (cont)		
Cell Wall	outer layer that maintains cell's shape and protects cell from mechanical damage, made of cellulose, other polysaccharides, and proteins	Plant
Endomembrane System	Nuclear Envelope, ENdoplasmic Reticulum, Golgi Apparatus, Lysosomes, various vesicles and vacuoles, Plasma Membrane	Not all parts are in both types
Vesicles	small sac or cyst containing fluid or gas	Both
Vacuoles	a small cavity or space in the tissues of an organism containing air or fluid	Both

Origins of Life		
Theory Name	Definition	Evidence
Abioge-nesis	life evolved from nonliving chemical systems	Oparin-Haldane hypothesis and Miller-Urey Experiment
Hypo/Exp	Definition	Evidence
Oparin-Haldane hypothesis	life arose gradually from inorganic molecules, with “building blocks” like amino acids forming first and then combining to make complex polymers.	Miller-Urey Experiment
Miller-Urey experiment	organic molecules needed for life could be formed from inorganic components	Used a sparking device to mimic a lightning storm on early Earth. Their experiment produced a brown broth rich in amino acid
RNA world hypothesis	that the first life was self-replicating RNA	Scientists think RNA building blocks (nucleotides) emerged in a chaotic soup of molecules on early Earth. These nucleotides bonded together to make the first RNAs. RNA store of genetic information, self-replicate, and act as a cellular catalyst

Origins of Life (cont)		
Metabolism-first hypothesis	metabolic networks before DNA or RNA	origin of life is triggered by the accumulation of very simple organic molecules in thermodynamically favorable circumstances. Simple organic molecules can then be combined in various ways that result in simple amino acids, lipids, etc. These, in turn, could act as catalysts for the formation of more organic molecules. This is the beginning of metabolism.

Origins of Life (cont)		
Organic compounds came on meteorites	Simple organic compounds might have come to early Earth on meteorites.	One scientist tested this - used guns - samples had main organic acids - gun will stimulate pressures of comets - results = the amino acids had survived and transformed into a compound - peptide molecules were formed. § One scientist tested this - used guns - samples had main organic acids - gun will stimulate pressures of comets - results = the amino acids had survived and transformed into a compound - peptide molecules were formed. ○ Don Brownley - designed experiment to know of space had building blacks of life - commissioned former spy plane to collect space dust - discovered that these particles had seeds of life - but not only possible source of life - asteroids and meteoroids have building blocks for life - had amino acids (blocks of life) § Enough meteoroids - 70 kinds of amino acids found on them - delivered by comets - comments size of mountains that could have contained organic compounds
Life in Sea	life could have started in the oceans.	Yes - life is there despite scalding temperatures and no sunlight, many typed of creatures are surviving here § Yes - life is there despite scalding temperatures and no sunlight, many typed of creatures are surviving here

Origins of Eukaryotes

Theory Name	Definition	Evidence
Endosymbiotic theory	Eukaryotic cells are believed to have evolved from early prokaryotes that were engulfed by phagocytosis	Mitochondrion and Chloroplast have double meb=mbarnecs, can reprodece in a fission-like process, have their own DNA which is similar to prokaryotic DNA, and has ribisomes similiar to prokaryotes.

SA; V Ratio

Why are Cells So Small?

> The higher the difference between SA:V ratio, the more amount of diffusion takes place

What could a cell do in response to a shrinking SA/V ratio?

> A cell could slow down its processes in response to shrinking SA: V because a smaller ratio of SA: V could mean more space available inside the cell. The cell could also start to divide or evolve

Justify “Numerous small cells are evolutionarily advantageous in regard to maintaining homeostasis in multicellular organisms”

> This is true because having smaller cells maximize the surface area to volume ratio, helping the diffusion rate go up.

As the mitochondria metabolize the glucose, they produce carbon dioxide waste. Would the CO2 be able to leave the cell faster if the cell had a smaller volume or larger volume?

> CO2 would be able to leave the cell with a smaller volume faster than a cell with a larger volume due to there being less surface area to journey.

Is bigger always better for a cell?

> Bigger is not always better for the cell because cell’s with a larger surface area would have waste and other unwanted objects in their cell for a longer time. This additional time traveling could also create more time objects to travel that a cell might need immediately.

Is it more desirable for a cell to have a small surface-area-to-volume ratio or a large surface-area-to-volume function of a cell?

> It would not be desirable for cells to have a small surface-area-to-volume because as seen above a lower surface-area-to-volume ratio would guarantee a larger cell that has more processes occuring and having a lower rate of diffusion (so waste would leave the cell slower).

What might be some reasons why these unicellular organisms have larger cells than cells with similar traits (heterotrophic, lacking cell walls) that are found in multicellular organisms?

> Unicellular organisms have larger cells because they depend on only themselves for protection and nutrients. That one cell has to be specialized in different jobs, unlike multicellular cells that can work with each other.

Plasma membrane structure and function

How are phospholipids arranged in the cell membrane?

> Heads facing out toward the water and the tail face each other.

Remembering the characteristics of a lipid, why must one of the fatty acid chains be replaced with a phosphate group?

> So the lipid can become hydrophilic. Lipids are naturally hydrophobic, so adding a phosphate group will change the lipid and give it a hydrophilic part.

What do you have to put into the membrane to help stabilize it?

> Cholesterol will help stabilize the membrane.

What does Cholesterol do for the membrane?

> Cholesterol acts as a Buffer for the membrane, it will dampen the effects of temperature

What is selectively permeable?

> That the membrane allows some substance to pass through, but not others.

What 2 molecules easily pass through the membrane?

> Simple Diffusion - O2 moves high concentration (outside the cell) to lower concentration (inside the cell) and Simple Diffusion - CO2 moves high concentration (outside the cell) to lower concentration (inside the cell

What does polar mean?

> Molecules that have areas where there is a partial positive or negative charge.

Why are CHANNEL PROTEINS part of the cell membrane?

> TO help transportation of substances that couldn't pass easily through the membrane

Compare and contrast diffusion and facilitated diffusion.

> DIffusion happens naturally, but facilitated diffusion happens with help from channel proteins. Both do not require energy.

Why is energy (ATP) sometimes required for the transport of materials?

> ATP is needed for active transport, this is when the substance needs to go against its concentration gradient. This type of transport is called active transport. What type of materials are moved via this transport mechanism? Negative charges substances

What do Carbohydrates do in plasma membranes?

> Carbohydrates are like identification badges. Cells that have different membrane carbohydrates do different jobs/functions. The immune system uses the carbohydrates to recognize that your cells belong to you and are not viruses, bacteria, or other foreign cells.

What is dynamic equilibrium?

> Dynamic equilibrium is a state where no change is occurring but individual molecules still react continuously.

Why can't sugar diffuse across the membrane?

> Because it is polar and too large.

Why did diffusion stop after a certain period of time? .

> Because there was nothing left to diffuse

What is Osmosis?

> Water moves into and out of the cell by osmosis. This is when the diffusion of water across the membrane from an area of high concentration to an area of low concentration.

Plasma membrane structure and function (cont)

What are solutes?

> Solutes are the substances that are dissolved in water.

What is Hypotonic?

> When there is a low amount of solutes in water.

What is Hypertonic?

> When there is a high amount of solutes in water.

What is Isotonic?

> When there is an equal amount of solutes in water

What is Water Potenial?

> This measures the concentration of free water molecules. It is a measure of the tendency of these molecules to diffuse to another area. The more free water molecules, the higher the Water Potential.

Define Toncity

> The ability of an extracellular solution to make water move into or out of a cell by osmosis

What will happen when a cell is placed in a hypertonic solution?

> There will be a net flow of water out of the cell, and the cell will lose volume. A plasmolyzed plant cell has gaps between the cell wall and the cell membrane. This occurs when a plant cell is placed in a hypotonic solution. Water molecules move out of the cell resulting in the loss of turgor pressure

What will happen when a cell is placed in a hypotonic solution?

> There will be a net flow of water into the cell, and the cell will gain volume. . A turgid cell is a cell that has turgor pressure. A plant cell that is placed in a hypotonic solution would cause the water to move into the cell by osmosis, resulting in large turgor pressure being exerted against the plant cell wall.

What will happen when a cell is placed in a isotonic solution?

> There will be no net flow of water into or out of the cell, and the cell's volume will remain stable. A flaccid plant cell is not swollen and the cell membrane does not press against the cell wall tightly.