

### Scientific Method

#### Steps of the Scientific Method

- 1) Observation
- 2) Question
- 3) Hypothesis
- 4) Prediction
- 5) Experiment
- 6) Record and Analyze data

### Types of Variables

#### Controlled Variable

The variable that stays constant throughout the experiment

#### Independent Variable

The variable that you are changing ( I-vary)

#### Dependent Variable

The variable that responds to the changes from the independent variable

#### Negative Control Variable

A control variable that does not result in any changes

#### Positive Control Variable

A control variable that results in a change

### Single Blind v.s Double Blind Experiment

#### Single-Blind

When the participants of the experiment do not know which group they are in

#### Double-Blind

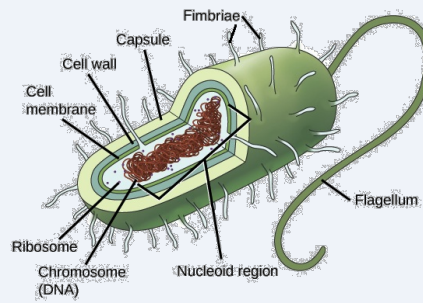
When both the researcher and the participants do not know which group they are in

#### Why is this important?

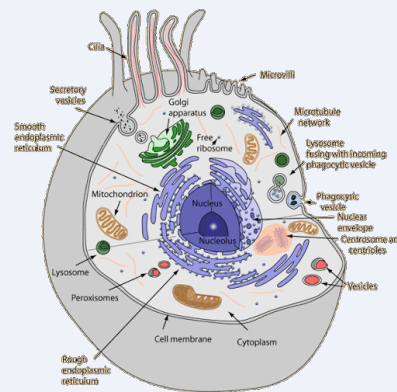
It helps eliminate bias in an experiment and help obtain honest results



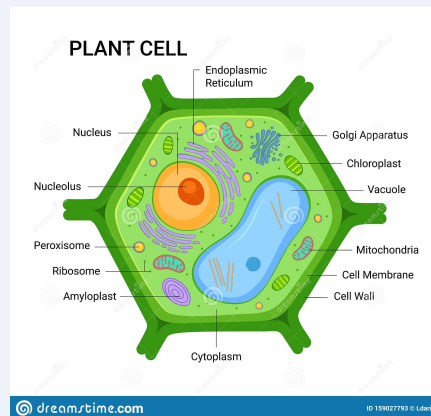
### Prokaryotic Cell Structure



### Eukaryotic Cell Structure



### Plant Cell Structure



By **msingh25**  
[cheatography.com/msingh25/](http://cheatography.com/msingh25/)

Published 25th September, 2020.  
 Last updated 25th September, 2020.  
 Page 2 of 13.

Sponsored by **CrosswordCheats.com**  
 Learn to solve cryptic crosswords!  
<http://crosswordcheats.com>

### Phospholipids

A phospholipid has 2 parts:

- 1) **Polar region** (*hydrophilic*)
- 2) **Non-polar** (*hydrophobic*)

Phospholipids form a bilayer in the membrane (*phospholipid bilayer*)

### Passive transport

-> requires no energy

-> Spontaneous movement of a substance across a membrane from an area **high concentration** to an area of **low concentration** (*spreading out*)

*ex: a ball rolls down a hill*

-> **Non-polar substances** can dissolve through the non-polar lipid bilayer.

-> (*sex hormones, pesticides*)

-> **Small, unchanged molecules:** *O<sub>2</sub> & the CO<sub>2</sub>*

### Active transport

-> **REQUIRES AN INPUT OF ENERGY**

-> The movement of a substance across a membrane from an area of **low** concentration to an area of **high** concentration

-> **LOWER CONCENTRATION TO HIGHER CONCENTRATION**

-> *ex: we must work to roll the ball back uphill*

### Active transport v.s Passive transport

#### Active

Molecules **need energy** to move across the membrane

*ex: requires transport proteins*

#### Passive

Molecules move spontaneously (**no input of energy**)

*ex: Diffusion & Osmosis*

### What is excluded from passing the membrane?

#### Ions (*Ca<sup>2+</sup>, H<sup>+</sup>, Na<sup>+</sup>, Cl<sup>-</sup>*)

-> even though they are small, their charges cause them to be repelled by the hydrophobic tails of the membrane

#### Large polar molecules

(*glucose & amino acids*) cannot pass the hydrophilic tails of the membrane

#### Transport membranes

help these molecules pass through the lipid bilayer

-> **Facilitated Diffusion:** is when the passive movement of a substance *with* the help of membrane transport proteins: *channels carriers*



### Hydrophilic v.s Hydrophobic

Hydrophilic

Hydrophobic

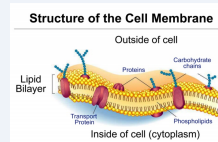
Attracts Water Molecules

Repels Water Molecules

### What is the monomer unit of a protein?

Answer: **Amino Acids**

### What is the main component of the plasma membrane?



### Membrane

What characteristic makes a membrane semi-permeable

Substances move in & out of the cell through proteins or between phospholipids

### Characteristics of All Living things

- 1) Are made up of 1 or more cells
- 2) Can reproduce using DNA
- 3) Obtain energy from the environment around them
- 4) Able to grow & develop
- 5) able to evolve as a group

### Prokaryotic v.s Eukaryotic

#### Prokaryotic(Unicellular)

The entire organism is made up of one cell

This cell carries out all the functions for survival

ex: *Bacteria & Archea*

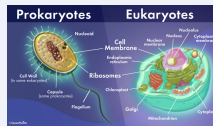
#### Eukaryotic(Multicellular)

Are composed of many specialized cells working together

ex: *small plants and animals*



### Prokaryotic v.s Eukaryotic



### DNA v.s RNA

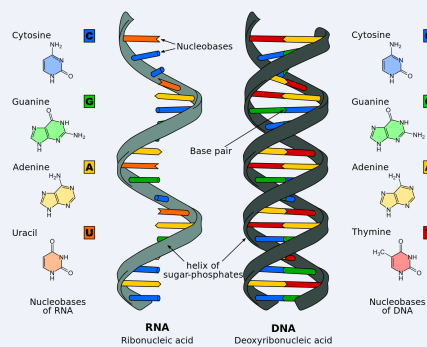
#### DNA

- > deoxyribose nucleic acid
- > gene carry an ATCG code
- > are the blueprint for protein molecules

#### RNA

- > ribonucleic acid
- > acts as a messenger carrying out orders from the DNA
- > controls synthesis of protein
- > The genetic code is AGCT

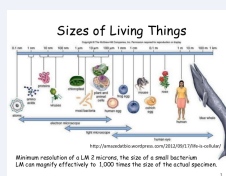
### DNA v.s RNA



### Macromolecules comparison

Macromolecule	Monomer	Function
Carbohydrate	Sugar	Energy storage
Protein	Amino acid	Enzymes, structural
Nucleic acid	Nucleotide	Genetic information

### Size Ranges of Biological Structure



### Cell Structures; to real life ex

**Nucleus** = Town Hall ( controls the cell)

**Golgi** = USPS/ UPS (packages and delivers)

**ER**= Factories (make lipids/ Proteins)

**Ribosomes** = Factory workers (makes lipids proteins)

**Chloroplast**= Solar Panel ( Captures light)

**Mitochondria** = Power House ( Convert Energy)

**Lysosomes** = break down bacteria and worn out (sanitation)

**Vacuoles** = Break down bacteria etc.and store energy (sanitation)

**Cell membrane** = to regulate what gets in and out of the cell (Bouncer )

**Cytoskeleton** = structures and movement of chromosomes (infrastructure of town/ highway)

**Cytoplasm** = holds all the organelles together & cellular respiration (air)

**Vesicles** = storage and move things around move proteins out of the cell ( mailman/ mail truck)

### Diffusion

-> **Diffusion**= substances moving spontaneously

-> Diffusion stops when the substance is equally distributed -**Equilibrium**

-> There is no net movement of molecules, even though the molecules are still moving

-> They are moving in a space at the same rate as they are leaving the space

#### What factors can affect the rate of diffusion?

-> **Temperature**(*heat/cold*): Heat causes particles to move faster

Cold slows down the movement of particles

-> **Size of particles**: Small molecules will move faster than the large ones

### Osmosis

-> is the movement of water across a selectively permeable membrane

-> Through polar, water molecules are small enough to weave through the lipid bilayer

-> If a large amount of water is needed, the movement is done through a protein channel -**Aquaporin**

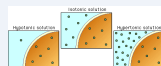
-> The diffusion of water across the membrane is **PASSIVE**

-> **NO INPUT OF ENERGY IS REQUIRED**

-> Water moves from an area of **high** concentration to an area of **low** concentration

-> Water moves from areas of **low solute** (*salt,sugar*) to **high solute**

### Solution types



**Isotonic** = having the same/equal

**Hypotonic** = having a lower concentration of solute than the other solution{

**Hypertonic** = having higher osmotic pressure than the comparison solution



### Solution differences



### Intracellular v.s Extracellular

**Intracellular:** located **Inside** of the cell

**Extracellular:** located **outside** of the cell

### Producers v.s Consumers

#### Producer

- > Plants obtain energy from the non-living part of the environment
- > Autotrophs = Producers

#### Consumer

- > Animals obtain energy from the living part of the environment
- Heterotrophs = Consumers

### Linnean Hierarchy of Classification



#### 8 category system

**Top to bottom = Least specific to most**

**Bottom to the top = Most specific to least**

### Biological Organization



### 4 Biological Molecules

- 1) **Proteins**
- 2) **Lipids**
- 3) **Carbohydrates**
- 4) **Nucleic Acids**

### Monomer v.s Polymer

#### Monomer

- > is any molecule that contains at least 1 **C-H** bond
- > *Small Building Blocks*

#### Polymer

- > are small organic molecules that are used as repeating links together via covalent bonds to form a macromolecule (polymers)



### Dehydration Reaction v.s Hydrolysis Reaction

#### Dehydration Reaction

- > connects a monomer to another monomer or a polymer
- > In a dehydration reaction the 2 reactants(monomer/polymer) contributes a part of the water molecule released in the reaction
- > *one contributes the -OH(hydroxyl group) & the other H (Hydrogen)*
- > Continuous reaction

#### Hydrolysis

- > breaks down polymers into monomers
- The bond btwn the monomers attaching to one monomer and the hydroxyl attaching to the other monomer

### The Order of Making Protein

**DNA -> RNA -> Protein**

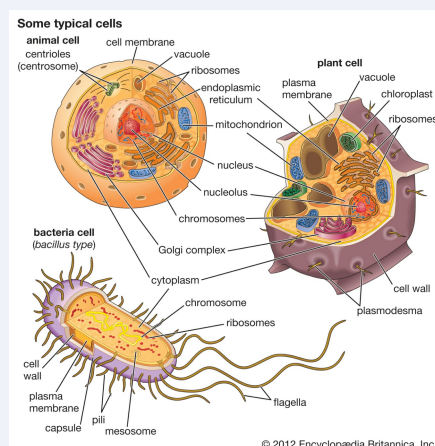
### The Plasma Membrane

- > Forms the external boundary of all types of cells
- > Separates the inside contents of the cell from the outside
- > Controls communication and exchange of some materials
- > Is **Selectively Permeable**  
the membrane regulates the passage of materials
- > Membrane allows some substances to pass through, more easily than others.
- > Some molecules can enter and exit the cell freely
- Some molecules can pass under some circumstances
- > Others have some trouble

#### Functions of a Plasma Membrane:

- > They keep toxic substances out of the cell
- > They contain receptors and channels that allow molecules *such as ions, nutrients, waste, and metabolic product*
- > Regulates the **transport** of substances in and out of the cell
- > Protects the cell by acting as a barrier

### Cells





### 4 Macromolecules Functions & Examples

Macromolecules	Building Blocks	Functions	
<b>Lipids</b>	Fatty acids & glycerol	to provide cells with long-term energy & make-up biological membranes	E
<b>Nucleic acids</b>	Nucleotides	to store and pass on genetic info	F
<b>Carbohydrates</b>	Monosaccharides ( <i>simple sugars</i> )	to provide cells with short term energy & source of fiber	D
<b>Proteins</b>	Amino Acids	to provide cell structure, send chemical signals, speed up chemical reactions, & more	C

### key role in cell communication

*Answer:* The plasma membrane plays a key role in communication btwn cells & their environment

### Active Transport & Channels

<b>Ion Channels</b>	Integral pores that allow specific ions to get in/out of the cell
<b>Transporters</b>	Integral proteins that selectively move a polar substance/ion to one side of the membrane
<b>Receptors</b>	Integral proteins that serve as recognition sites. Each binds to a specific type of molecule
<b>Ligand</b>	A specific molecule that binds to a receptor
<b>Enzymes</b>	Integral proteins that catalyze specific chemical reactions at the cell surface
<b>Linkers</b>	Integral proteins that hold down proteins in the plasma membrane. Helps form structure of cells and link cells together



By [msingh25](#)  
[cheatography.com/msingh25/](https://cheatography.com/msingh25/)

Published 25th September, 2020.  
 Last updated 25th September, 2020.  
 Page 9 of 13.

Sp  
 Le  
 htt

### Signal Transduction Pathway

A series of steps linking a mechanical/chemical stimulus to a specific cellular response

### Local v.s Long Distance(animal cells)

Local	Both	Long
	target only specific target cells recognize & respond to a given signal molecule	
<b>Panacrine Signaling</b>	A secreting cell acts on nearby target cells by discharging molecules of a local regulator into extracellular fluid	
<b>Synaptic Signaling</b>	A nerve cell releases neurotransmitter molecules into a synapse stimulating the target cell	
	<b>Hormonal Signaling</b>	Specialized endocrine cells secrete hormones into body fluids, <i>often blood</i> Hormones may

### Regulators

**Local Regulators:** a secreted molecule that influences cells near where it was secreted

**G-protein-coupled receptors:** a signal receptor protein that responds to the binding of a signal molecule by activating a G-protein

**Ion Channel receptors:** a ligand-gated ion channel is a type of membrane receptor containing a region that can act as a "gate" when the receptor

### mono v.s di v.s poly (saccharides)

MONOSACCHARIDES VS DISACCHARIDES VS POLYSACCHARIDES		
Monosaccharides are single sugar molecules which act as the building blocks of disaccharides and polysaccharides	Disaccharides are sugar molecules composed of two monosaccharides	Polysaccharides are carbohydrates made out of a number of monosaccharides linked via glycosidic bonds
Water soluble	Water soluble	Insoluble in water
Taste sweet	Taste sweet	Do not taste sweet
Reducing sugars	Some are reducing sugars	Non-reducing carbohydrates
Have a single monomer	Composed of two monomers	Composed of a large number of monomers
Have simple, linear, unbranched structures	Have simple, linear, unbranched or branched structures	Have complex, branched structures
Have a single ring structure	Have two ring structures	Have a number of ring structures
		Visit <a href="http://www.pediaa.com">www.pediaa.com</a>



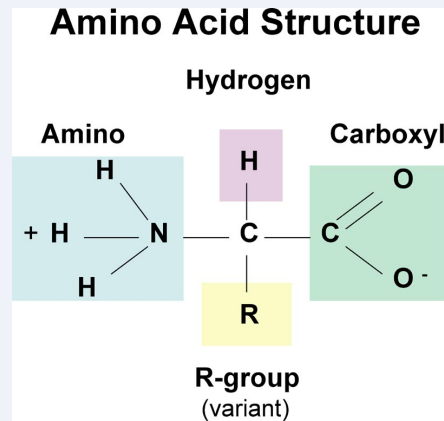
### Amino Acid Monomers

-> are organic molecules with carboxyl and an amino acid group

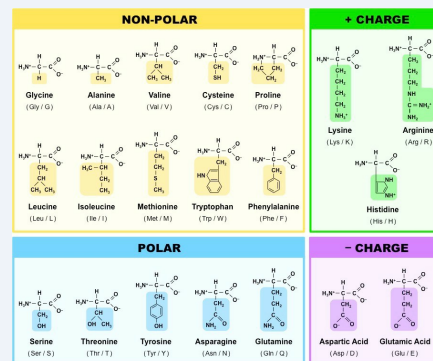
-> at the center of the small molecules is the carbon atom called "**Alpha Carbon**"

-> surrounded by amino group, carboxyl group, a hydrogen group with a "**-R**" group

### Amino Acid Structure



### 20 amino acids



### Protein Structure & Function

-> A functional protein consists of 1 or more polypeptides

3 Levels of Structure:

- 1) Primary Structure
- 2) Secondary Structure
- 3) Teritary Structure
- 4) Quaternary Structure

### Protein Structure & Function (cont)

**Primary Structure:** is the proteins linear sequence

**Secondary Structure:** is when polypeptide chains coil or fold to the backbone of the polypeptide interact and form bonds

**Tertiary Structure:** happens through the interactions of the amino acids. Determines the overall shape of the polypeptide

**Quaternary Structure:** is when 2 or more polypeptides combine (aggregate)

### Endomembrane System

-> Nuclear Envelope

-> Endoplasmic Reticulum

-> Golgi Body

-> Lysosomes

-> Plasma Membranes

-> Vacuoles

### Plasma membrane

What macromolecule makes up the majority of the plasma membrane of cells?

- A) Proteins
- B) Carbohydrates
- C) Lipids -->> Phospholipids**
- D) Nucleic Acids

Proteins and carbohydrates also compose the membrane

### Amphipathic

having both hydrophilic & hydrophobic parts

### Concentration Gradient

occurs when the concentration of particle in one area than another is higher

### Permeable

allowing cells/ions to pass through

### Turgid

Swollen or congested



### Solution vocab

**Solvent:** able to dissolve other solutions

**Solution:** a homogenous (*balanced*) mixture of solvent or solute molecules

**Solute:** is a substance that can be dissolved by a solvent to create a solution



By [msingh25](#)  
[cheatography.com/msingh25/](https://cheatography.com/msingh25/)

Published 25th September, 2020.  
Last updated 25th September, 2020.  
Page 13 of 13.

Sponsored by [CrosswordCheats.com](#)  
Learn to solve cryptic crosswords!  
<http://crosswordcheats.com>