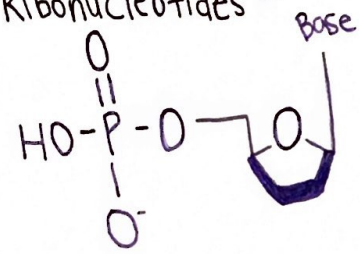
Intro to RNA and DNA

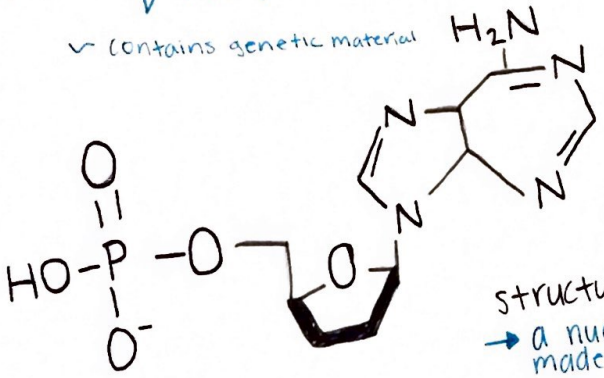
RNA → Ribonucleotides



Structure
- Single stranded
- base pairs with itself
- bases are often more modified

DNA → Nucleotides

~ contains genetic material



Structure
- a nucleotide is made up of a sugar, a phosphate, and a base
- 4 types of base pairs: adenine, thyamine, guanine, and cytosine

Nucleic Acid Double Helix "Shape of DNA"

- adenine
- thymine
- guanine
- cytosine

★ Each base pair is joined together by hydrogen bonds

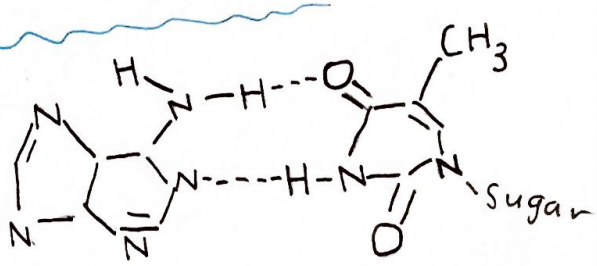
★ The 2 strands that are antiparallel run 5' to 3' and 3' to 5'

DNA Mutations

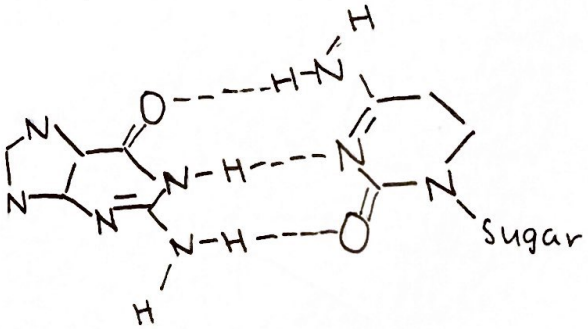
~ changes in DNA ~

Normal → ATCG
Subtraction → ATACG
Insertion → ATG
Substitution → ATGG

Base Pairing:



Adenine (A) Thymine (T)



Guanine (G) Cytosine (C)

The pairs of nitrogenous bases in a DNA double helix are held together by hydrogen bonds.

DEFINITIONS

Genotype: the genetic constitution of an individual organism, set of genes responsible for a trait

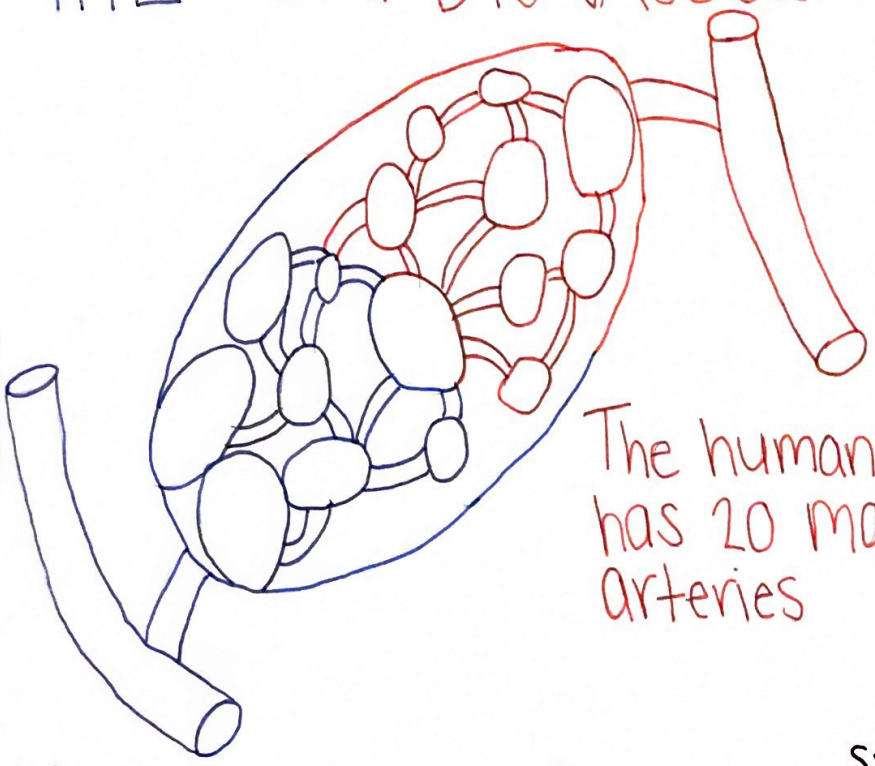
Phenotype: the biochemical characteristic of an organism as a result of the interaction of its genotype

Allele: a viable DNA code that occupies a position on a chromosome

Chromosome: a structure in all living cells that has DNA molecule thats bonded to proteins

The Cardiovascular System

Heart and Circulatory System



The human body has 20 major arteries ⇨ Carries Oxygen-rich blood away from heart

Veins carry low-oxygen blood back to the heart ⇩ Veins are formed from Venules

Capillaries (Smaller branch) Arterioles ⇩ Deliver oxygen and nutrients to the body's cells, and they get rid of carbon dioxide ⇨ They are so tiny that blood cells move single file

If you were to extend all of the vessels in your body, it would be 60,000 miles long. That's two times the distance around the earth.

The Cell Membrane

What is it?

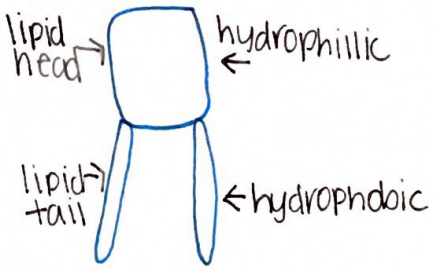
The cell membrane holds all other organelles inside of the cell. It controls movement of materials that enter and exit the cell.

IN → Sugars, Proteins, minerals, Water(h_2O), Oxygen (O_2)

OUT → Carbon dioxide (CO_2) and waste

Structure:

The cell membrane is made up of fat layers called lipids. There are lots of proteins embedded between the lipids.



Permeability:

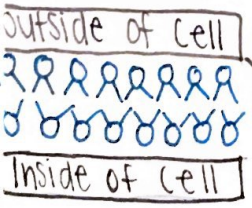
The cell membrane only lets certain materials through based off of certain criteria, such as size. This is called being selectively permeable.

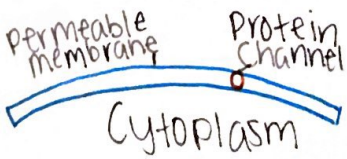
Key Vocabulary

hydrophillic - likes h_2O

hydrophobic - does not like h_2O

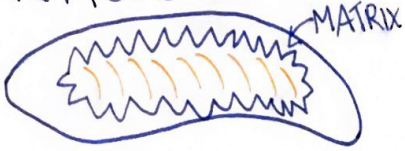
What does it look like?





Kerbs Cycle ~ Citric acid cycle

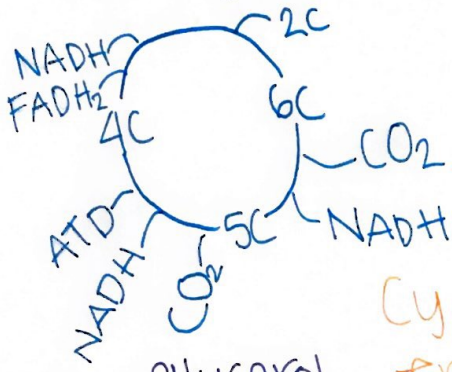
Where is it?



It is in the mitochondriol matrix in cells

What does it do?

It transfers energy from the C-C bond of acetyl-CCA to chemiosmosis



Lipids < glyceroll
fatty acids
↓
acetyl COA

How does this work? This Cycle involves intermediate enzymes. Acetyl COA is added to an existing 4C Skeleton and the 6C molecule moves to produce molecules that carry energy.

Kerbs Cycle ⇒ energy generation for Chemiosmosis

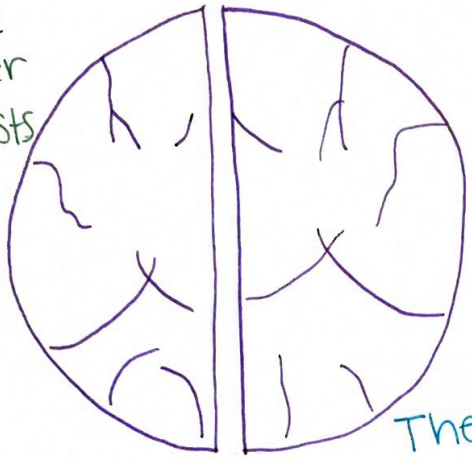
Respiration is required for NADH and $FADH_2$ energy source

Start with Acetyl-COA ⇒ Attach 4C Skeleton ⇒ Bonds broke Released Energy

C-C C-C-C-C-C-C

Neurotransmitters

Neurotransmitters are chemicals that are released at the end of a nerve fiber When a nerve thrusts When a synapse diffuses, it causes another nerve or muscle fiber to thrust.



Transmitters are on the ends of nerve fibers

The human brain

Types of Transmitters

adrenaline - fight or flight

Produced in stressful situations, increases heart rate and blood flow, Physical boost and awareness heightens

noradrenaline - Concentration

affects attention and responding actions in the brain contracts blood vessels, increasing blood flow.

acetylcholine - learning

activates muscle action, associated with attention and awakening

glutamate - memory

most common transmitter, involved in learning and memory, regulates creation of nerve contacts

gaba - Calming

Calms firing nerves in the central nervous system, high levels improve focus, low levels cause anxiety

endorphins - euphoria

released during exercise and excitement, reduces pain

Serotonin - mood

related to happiness, helps sleep cycle and digestive system regulation

dopamine - pleasure

feelings of pleasure, addiction movement, and motivation

Viruses, Bacteria, and Fungi

Viruses

- have Protein coats, and DNA or RNA
- Use ATP from host cells
- needs host cell to reproduce
- mature viruses are called Virions
- 2 life cycles:
  - short: Lytic
    - Infected cells are lyses
  - long: Lysogenic
    - dormant
    - caused by stress, UV light or carcinogens

Viral Infections:

Land ⇒ Attach to Chemical receptor ⇒ Contract the tail ⇒ Penetrate and inject nucleic acid

Bacteria

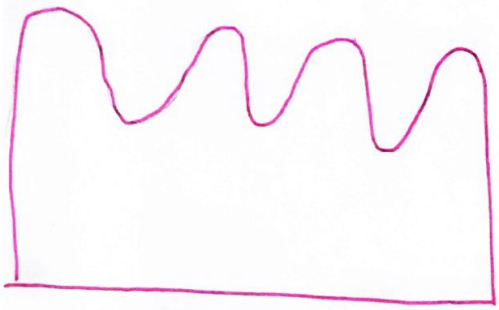
- Cell wall is made of peptidoglycan
- gram positive bacteria have thick cell walls, they are Purple
- gram negative have thin cell walls, they are pink
- transduction: produces harmless DNA fragments

Fungi

- eukaryotic heterotrophs
- Saphrophytic
- Cells walls are made of chitin
- Spends life cycle in a haploid State

Digestion

high to low [Na^+]



beginning of a meal

high [Na^+] lumen	low [glucose] lumen
low [Na^+] cell	high [glucose] cell
high [Na^+] blood	low [glucose] blood

- glucose against concentration

Want: glucose in bloodstream
Problem: higher glucose inside cell than outside
Solution: create electrochemical gradient with Na^+ to power secondary active transport

Na^+ - glucose Cotransporter

- requires both Na^+ and glucose to cross the membrane
- natural flow of Na^+ drives the Cotransporter

8 hours after you ate, trying to get the last bit of nutrients of the food. It tries to get the amino acid to push against concentration gradient by secondary active transport.

low [Na^+] lumen	low [Na^+] lumen
high [Na^+] cell	high [Na^+] cell
low [Na^+] blood	low [Na^+] blood

[Move the Na^+/K^+ ATPase to Lumen + Cell Side]

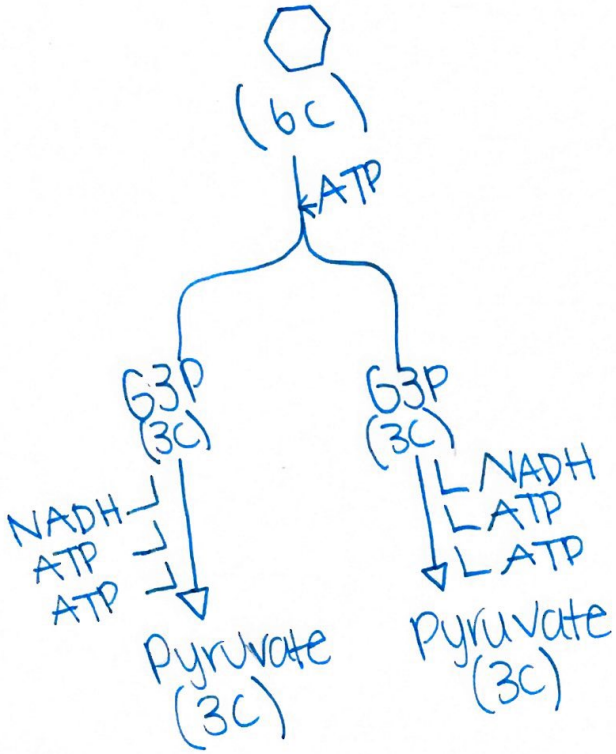
Glycosis ⇒ Cytoplasm in Cells

What does it do?

⇒ transfers energy in sugarmolecule to ATP → readily usable form of cellular energy

⇒ transfers energy in bonds between c atoms to bond in ATP

One glycosis molecule



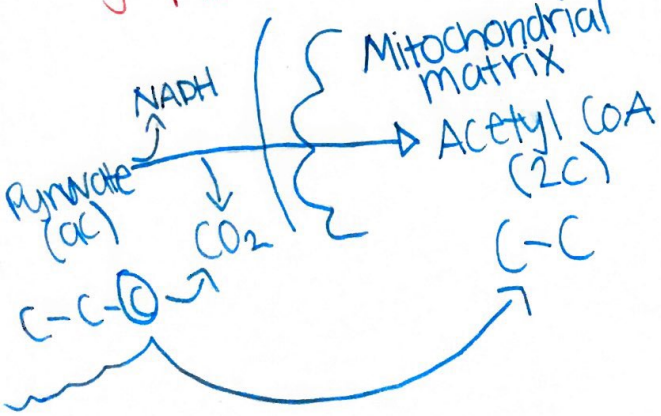
How does it do it?

⇒ involves multiple enzymes

⇒ glucose is split into 2 G3P which are metabolized into pyruvate

⇒ 6 c sugar splits into 2 3 c molecules yields energy which transfers to the bonds in ATP

Cytoplasm



LIPIDS

- glycerol ⇒ G3P
- fatty acids ⇒ acetyl CoA