2) Why Chemistry matters:

I. Matter is anything that ~~mass~~ has mass and takes up space

a. Elements are substances that cannot be broken down by Chemical reactions

1. Hydrogen, Oxygen, Nitrogen and carbon are 96% of our bodies.

B. Compounds are substances consisting of two or more different elements.

II. Atomic structure

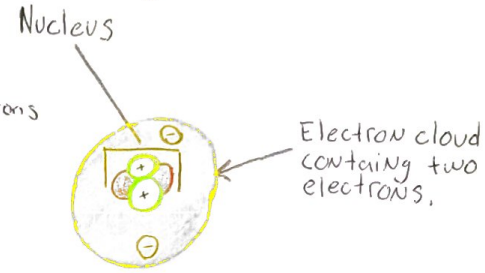
a. Atoms consist of 2 regions that hold 3 subatomic particles

1. Nucleus is the center of an atom and is held together by a strong nuclear force.

1B. Protons have a positive charge with a mass of 1. It determines the identity of the atom.

2B. Neutrons have a neutral charge and have a mass of 1.

3B. The electron surrounds the nucleus and contains electrons. Electrons determine the chemical property of the atom.



~ The mass and atomic number help you find the quantities of subatomic particles in an Atom

1. Atomic Number: # of Protons and Electrons
2. Mass Number: Amount of Neutrons

* Protons − Mass Number = Neutrons *

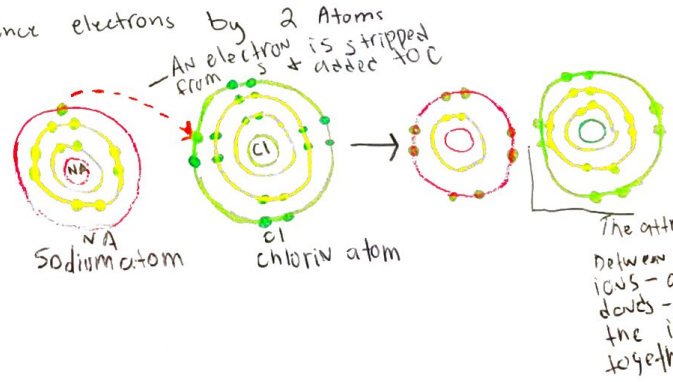
ISOTOPES − different versions of an atom and have a different # of Neutrons

− Radioactive isotopes are Atoms w/ unstable neutrons

Chemical Bonding and Molecules

↳ Attractions between atoms w/ incomplete valence shells

Covalent Bonds − The sharing of a pair of valence electrons by 2 Atoms



Ch1

Biosphere - all environments on earth supporting life

Ecosystems - Consist of the non living and living things in an environment

Communities - all organisms in an ecosystem

Populations - group of 1 spieces interacting with eachother

Organism - 1 individual living thing

Scientific Method

Observe → Question → Hypothesis → predict → experiment

Building blocks of DNA = A G T C

Adenine, Guanine, thymine, Cytosine

Controlled Experiment = running same test of 2 or more that differ with one variable

Properties of Life

Order, regulation, energy processing reproduction, evolution, cells

Natural Selection

Darwin - Favorable mutations to their environment will result with those mutations to be passed to next generations.

Ch2

Matter - anything occupying space and has mass

Mass - amount of material in an object

Element - substance that cannot be broken down further by chemical reaction

Atom - smallest unit of matter still retaining properties of an element

Subatomic particles

1. Proton - positive charge living in the nucleus
2. Electron - negative charge living around the nucleus
3. Neutron - no charge living in the nucleus

Atomic Number - atoms with their unique number of protons

Atomic Mass - Sum of protons and neutrons

1	← #
H	
1.00794	← mass

Compounds - substance containing 2 or more elements in a fixed ratio

Isotopes - Elements where Protons and neutrons are not equivalent

Radioactive Isotopes - when nucleus decays spontaneously shedding particle and energy / radiation

Ionic bonds = give and take electrons

Covalent Bonds = atoms share electrons

Hydrogen Bonds = weak bond between 2 molecules resulting another attraction

Chemical reactions - changes in chemical composition of matter

reactants - start reactions | Product form from reactions

Solution - homogeneous mix of 2 or more substances

Solvent - dissolving agent

Acid compound - release H^+ | Base compound - accepts H^+

Three branches of life

Bacteria - lack nuclei, unicellular

Eukarya - contains nuclei, both uni + multicellular

Archaea - lack nuclei, unicellular 25% bio mass

stable hydrogen bonds hold molecules apart ie making ice denser than water

polular molecule - is on with an uneven distribution of charge that creates two poles one negative one positive

4 macromolecules: Carbs, lipid, protein, nucleic acid

Made by:

William Welsh, Kimberly D, kate T, Evan N

Chapter 1 & 2 Review:

Brunella Alegria
Alexa Ancillo
Edwin Caoili

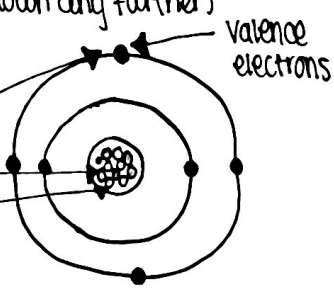
- Chapter 1

- Key Terms
  - Characteristics of Life
    - organization - atoms make up molecules, molecules make up cells, cells make tissues, etc.
    - energy use - a kitten uses energy from its mother's milk to fuel its growth. Plants use light energ
    - maintenance of internal constancy homeostasis - your kidneys regulate your body's water balance by adjusting the concentration or urine
    - reproduction, growth & development - a seed germinates and grows into a seedling, it then grows into an adult form and reproduces.
    - evolution - Drug-resistant bacteria survive treatment and produce a drug resistance population
- The tree of life includes 3 main branches:
  - Bacteria - cells lack nuclei
    - most are unicellular
  - Archea - cells lack nuclei, most are unicellular, ~ 25% of biomass
  - Eukarya - cells contain nuclei, both unicellular and multicellular
    - ↳ protista, fungi, plantae, and animalia
- How Science Works
  - Before you publish a paper: Observations → Curiosity & Question → Read the Literature → Form a Hypothesis → Experiment
  - The Experiment
    - simple & direct is best!
    - control - what else might be indirectly tested that you should account for?
    - statistical power - what is your sample size? What variables will you change?
    - data collection - what data will you collect?
    - analysis - did you gather data to fit that analytical model?
    - independent variable - what is being manipulated
    - dependent variable - response, output, or effect under investigation

- Chapter 2: The Chemistry of Life

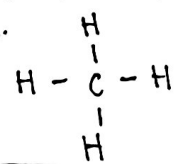
- Elements - elements are fundamental types of matter (can't be broken down any further)
  - Atoms are particles of elements

Particle	Charge	Mass	Location
electron	negative (-)	0	surrounding nucleus
neutron	none	1	nucleus
proton	positive (+)	1	nucleus



- Bonds - electrons determine bonding
  - Ionic Bonds - the attraction between oppositely charged ions
    - Ex. Na – Cl
  - Covalent Bonds - two atoms share one or more pair of electrons

Ex.

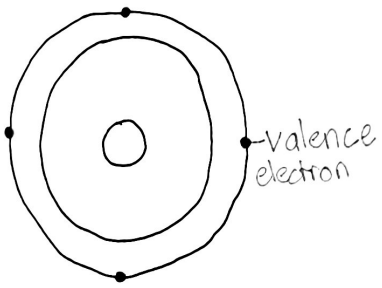


Unit 2: Essential Chemistry

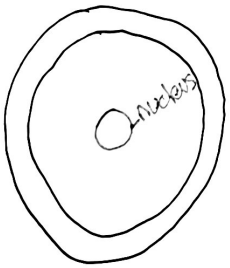
Atoms

- proton - positive charge, determine element
- neutron - no charge, determine isotope
- electron - negative charge, participant in chemical reactions, outer most determine chemical behavior
- nucleus - consists of protons and nuetron, nucleus most important part of cell

valence electron



nucleus



Water and Life:

- The cohesion of water molecules is essential to life.
- Water molecules expanding = ice
- Water molecules erratic = steam
- Water molecules active = liquid

Monosaccharides

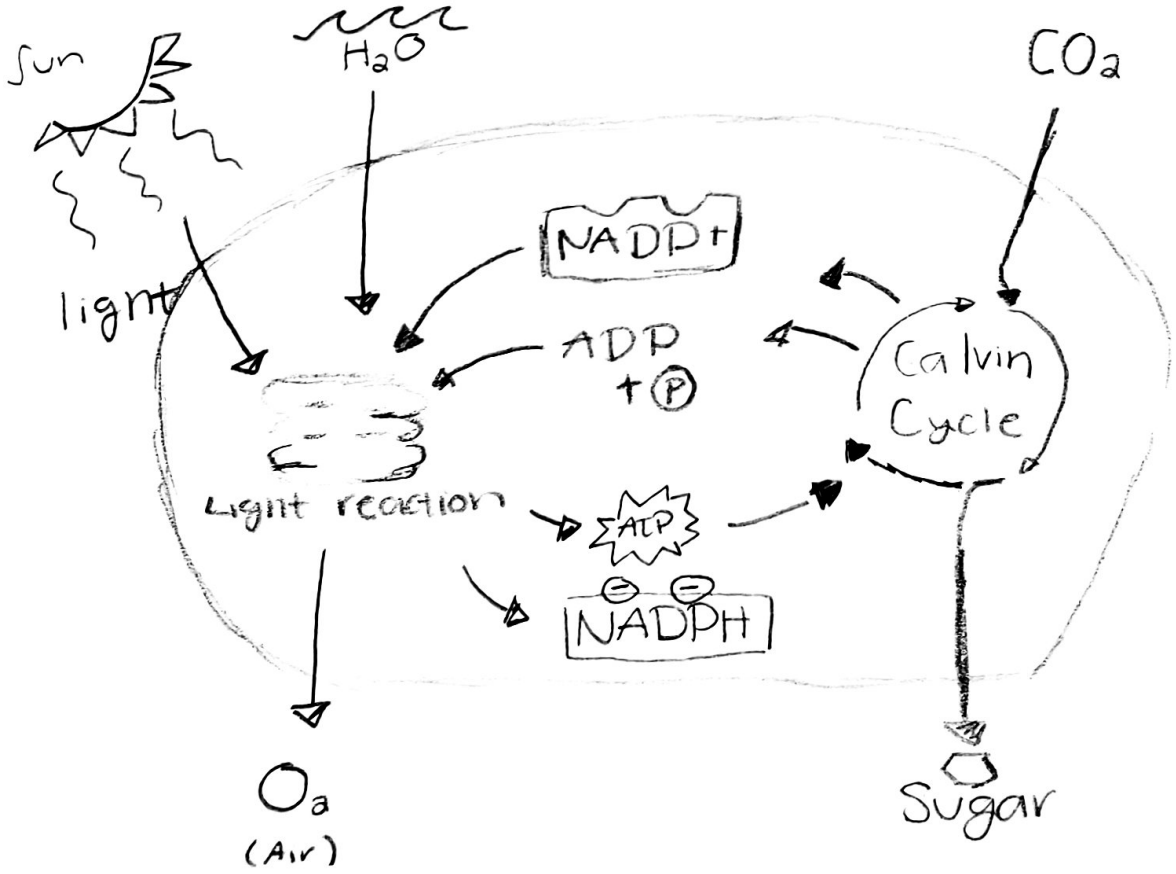
- Simple sugar
-

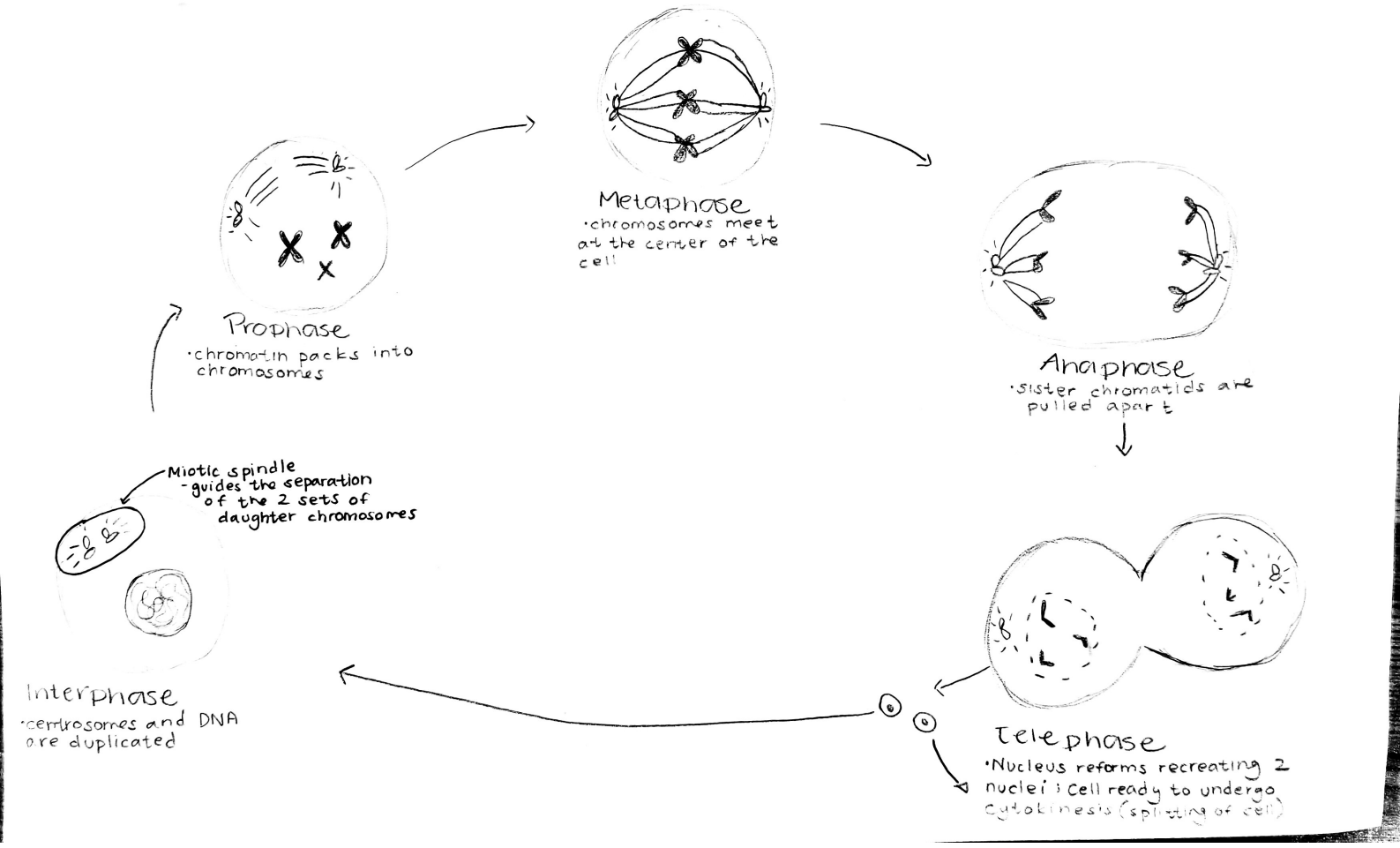
Disaccharides

- double sugar

Carbohydrates

- molecules that include sugars and polymers of sugars


Sun
H_2O
CO_2
light
NADP+
ADP
+ P
Calvin
Cycle
Light reaction
ATP
NADPH
O_2
(Air)
Sugar

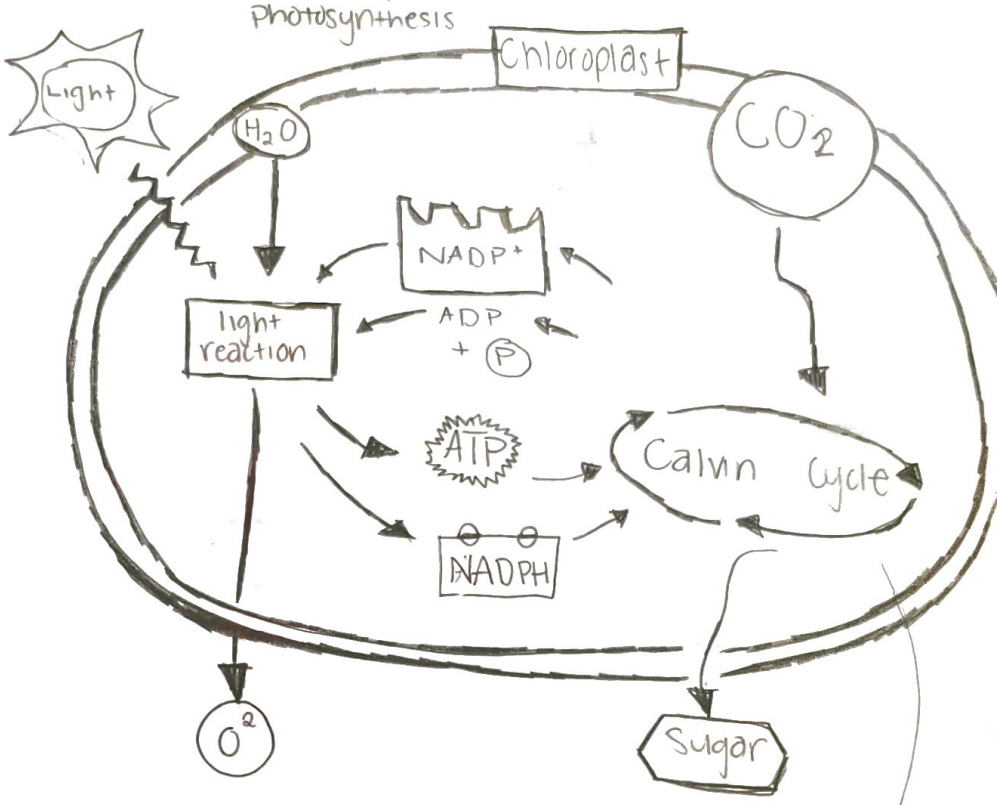

Metaphase
·chromosomes meet at the center of the cell
Prophase
·chromatin packs into chromosomes
Anaphase
·sister chromatids are pulled apart
Miotic spindle
-guides the separation of the 2 sets of daughter chromosomes
Interphase
·centrosomes and DNA are duplicated
Telephase
·Nucleus reforms recreating 2 nuclei ; Cell ready to undergo cytokinesis (splitting of cell)

Jessica Sabio
Rachel Friend

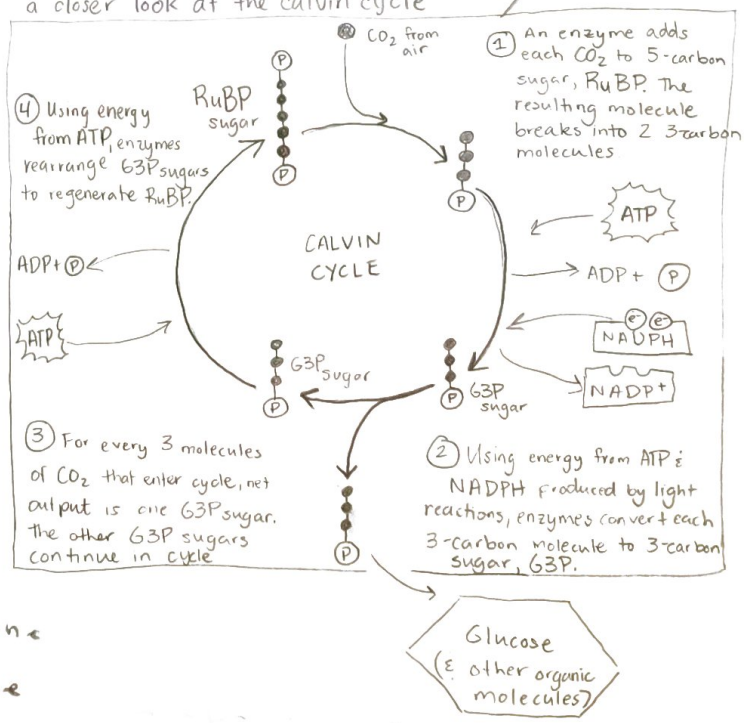
Chapter 7: PHOTOSYNTHESIS

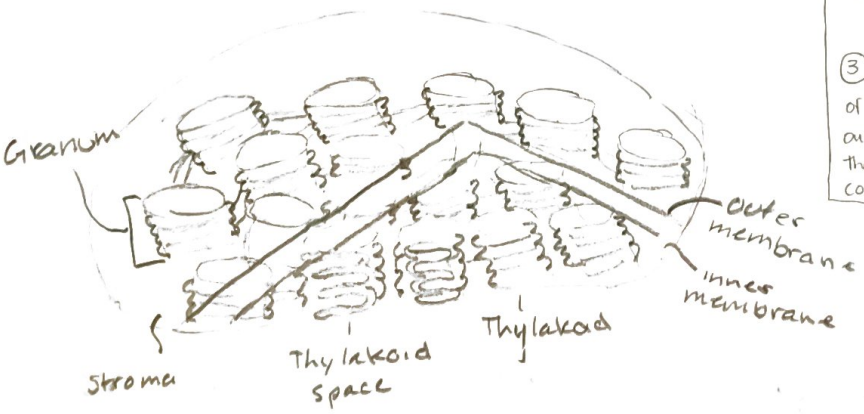
Using Light to Make Food

road map for photosynthesis



a closer look at the calvin cycle





CHAPTER 3

LARGE Biological Molecule

LARGE Biological MOLECULES	DEFINITION	FUNCTION	EXAMPLES
CARBOHYDRATES	• Simple sugars provide cells with energy and building materials. • Double sugar, such as sucrose, consist of two monosaccharides joined by a dehydration reaction • Polysaccharides are long polymers of sugar monomers.	Dietary energy storage; plant structure.	Glucose, fructose, lactose, sucrose cellulose and starch.
LIPIDS	• Lipids are hydrophobic • Fats are a major form of long-term energy storage in animals	Long terms energy storage (fats) Hormones (steroids)	fats (triglycerides) sterolas (testosterone, estrogen)
PROTEINS	• A protein consist of one or more polypeptides folded into a specific three dimensional shape.	enzymes, structure, storage, contraction, transport, etc	LACTASE, (an enzyme) hemoglobin (a transport protein)
NUCLEIC ACIDS	• DNA takes the form of a double helix, two DNA strands (polymers of nucleotides)	information storage	DNA, RNA

CHAPTER 4

The Endomembrane System: Manfacturing and distributing cellular products.

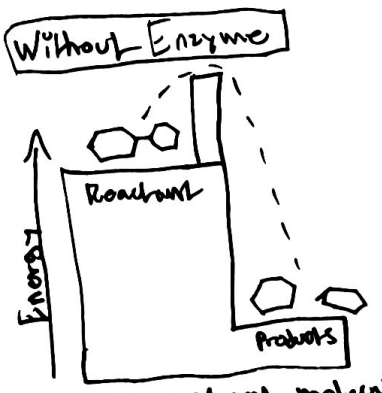
The Endoplasmic Reticulum:
Rough ER: the ribosomes attached to its surface, makes membrane and secretory proteins.
Smooth ER: lipid synthesis and detoxification

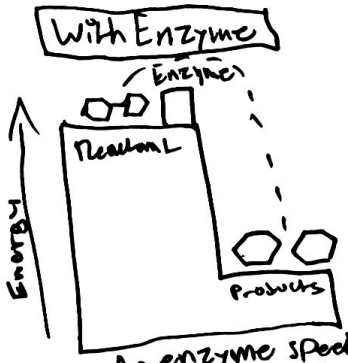
The golgi Apparatus:
refines certain ER products and Packages them in transport vesicles targeted for other organelles or export from the cell

Lysosomes:
Sac

vacuoles:

Activation Energy (Enzymes)





• a reactant molecule must overcome the activation energy barrier before a chemical reaction can break the molecule into products

• An enzyme speeds the chemical reaction by lowering the activation energy barrier

Activation Energy: The energy that must be invested to start a reaction.

Enzyme Activity

- **Substrate**: A specific molecule an enzyme acts on.
- **Active Site**: A region of the enzyme that has a shape and chemistry, that fit the substrate molecule
- **Induced Fit**: The active site changes shape slightly to embrace the substrate and catalyze the reaction, because the entry of the substrate induces the enzyme to change shape slightly.
- **Enzyme Inhibitors**: Inhibits a metabolic reaction by binding to an enzyme and disrupting it's function.

Membrane Function:

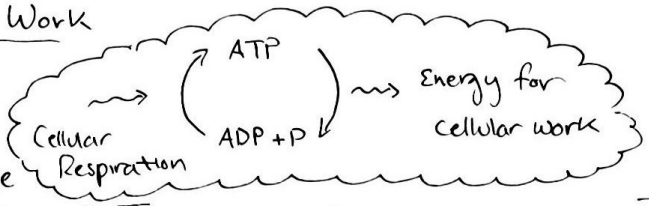
Diffusion: The movement of molecules spreading out evenly into the available space.

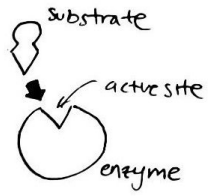
Membrane Proteins: cell signaling, cytoskeleton, extracellular matrix, transport, intercellular joining, cell-cell recognition, enzyme activity

Passive Transport: transport that does'n use energy for diffusion

Chapter 5 The Working Cell

- ATP & Cellular Work





Key Topics / Words:

- Energy - ability to do work/change
- Kinetic - energy of movement (molecules)
- heat
- conservation
- entropy - energy unavailable to work
- potential - stored energy used for work
- chemical energy - energy released from ATP or glucose during chemical reaction
- calorie - measure of energy in food
- metabolism - sum of chemical reactions that provide energy for vital processes
- activation energy - energy required to start a reaction

Enzymes: speed up chemical reactions w/o being consumed

Enzyme activity:

- substrate - molecule upon which an enzyme acts
- active site - region of enzyme where substrates bind & undergo chemical reaction
- induced fit - interaction between enzyme & substrate

- Membrane - selectively permeable barrier w/in living things

- Diffusion - net passive movement of particles from a high concentration to a low concentration area
- Passive vs Active Transport: Passive doesn't require energy to move ions while Active requires energy
- Concentration Gradient - process of particles moving from area of higher # of particles to lower # of particles
- Osmosis - substance crosses semipermeable membrane to balance concentration of another substance
- Phagocytosis - phagocytes ingest other cells or particles

Chapter 6: Cellular Respiration

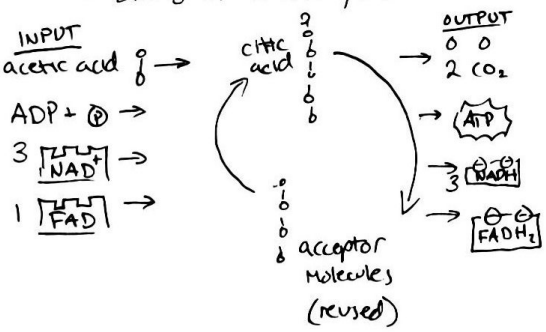
Photosynthesis - sunlight energy converted to chemical energy of sugars + other organic molecules

Autotroph - make their own organic matter from CO_2 in the air, water, & soil nutrients (producers)

Heterotroph - have to eat organic matter to get nutrients (consumers)

Glycolysis - a group of enzymes splits glucose, forming 2 pyruvic acid molecules

CAC. - (Krebs) - starts w/ 2 ATP, ends w/ 4 ATP



Electron Transport:

1. NADH & FADH transfer electrons to Electron Transport Chain
2. ETC uses this to pump H^+ across the inner Mitochondrial membrane
3. Oxygen pulls electrons down the transport chain
4. H^+ concentrated on one side of the membrane rushes back through an ATP sythase (think how water turns turbines in a dam)
5. This rotation activates parts of the synthase molecule that attach phosphate groups to ADP to generate ATP

CHAPTER 4:

1. WHAT ARE THE 2 MAJOR CATEGORIES OF CELLS? - PROKARYOTC / EUKARYOTIC
2. WHAT ARE THE 3 DOMAINS OF LIFE? - BACTERIA, ARCHAEA, & EUKARYA.
3. THE DIFFERENCES BETWEEN PROKARYOTIC & EUKARYOTIC CELLS:

PROKARYOTIC	EUKARYOTIC
• SMALLER	• LARGER
• SIMPLER	• MORE COMPLEX
• LACK MEMBRANE-BOUND ORGANELLE	• HAVE MEMBRANE_ BOUND ORGANELLES
• FOUND IN BACTERIA & ARCHAEA	• FOUND IN PROTISTS, PLANTS, FUNI, ANIMALS

4. THE MITOCHONDRIA IS: THE BASIC POWERHOUSE OF THE CELL.
5. RIBOSOME FUNCTION: PROTEIN SYNTHESIS
6. MICROTUBULES FUNCTION: MOVEMENT
7. MITOCHONDRIA FUNCTION: CELLULAR RESPIRATION
8. CHLOROPLASTS FUNCTION: PHOTOSYNTHESIS
9. LIBOSOMES FUNCTION: DIGESTION

Chapter 6: Cellular Respiration Pg. 9 Obtaining Energy From Fo

Key Concepts: Pg.104

Autotrophs (Producers) make Organic molecules from Inorganic Nutrient by photosynthesis.

Heterotrophs (consumers) must consume Organic material and obtain Energy by cellular respiration.

Chemical Cycling / Photosynthesis / Cellular Respiration Pg.9

Molecular output of cellular Respiration - CO_2 and H_2O - are molecular inp of photosynthesis.

Cellular Respiration pg.94-95 overview

The overall equation of cellular resperation simplifies many chemical steps into one formula:

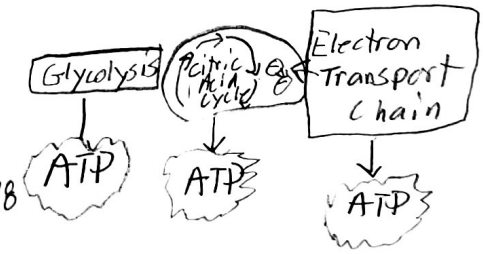
$$C_6H_{12}O_6 + 6\,O_2 \rightarrow \rightarrow \rightarrow 6\,CO_2 + 6\,H_2O + \text{Approx. } 32\ ATP$$

The Three Stages of Cellular Respiration Pg.96

Stage 1: Glycolysis pg.96

Stage 2: Citric Acid Cycle pg.97

Stage 3: Electron transport chain pg.98



Fermentation in Human Muscle Cells: Pg.101-103

Muscle cell consumes more ATP faster than O_2

↓

Conditions become anaerobic.

↓

ATP is regenerated by fermentation.

↓

Latic Acid is produced as a waste product

CHAPTER 3:

1. WHAT DOES DNA STAND FOR?
(DEOXYRIBONUCLEIC ACIDS)

2. DNA IS: [A BLUEPRINT FOR MAKING PROTEINS.]

3. THE CENTRAL DOGMA STATES [THE TRANSFER FROM PROTEIN TO PROTEIN, OR PROTEIN TO NUCLEIC ACID IS IMPOSSIBLE.
-NUCLEIC ACID TO PROTEIN IS POSSIBLE/BUT PROTEIN CANNOT PASS INFORMATION.]

4. WHAT ARE THE 4 NITROGENOUS BASES? [ADENINE, THYMINE, GUANINE, CYTOSINE.]

5. BASE PAIRS CAN ONLY ATTATCH TO: [OTHER BASE PAIRS.]

6. WHAT IS A GENE? [STRAND OF GENETIC INFO INSIDE THE NUCLEUS.]

7. WHERE CAN MUTATIONS OCCUR? [MOST LIKELY IN THE DNA.]

8. RNA IS: [TYPE OF NUCLEIC ACID, SINGLE-STRANDED; FUNCTIONS IN PROTEIN SYNTHESIS AND AS THE GENOME]

. AN ERROR CAN BE: [DURING MITOSIS/MEIOSIS, -DUE TO: RADIATION, VIRUSES, MUTAGENS.]

. THERE ARE 4 STAGES OF MITOSIS: [PROPHASE/METAPHASE/ANAPHASE/TELEPHASE]

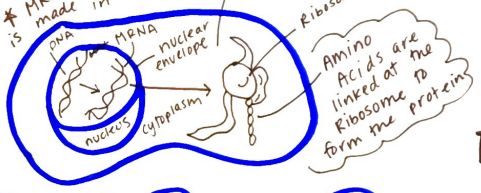
Chapter 10: The structure & function of DNA

The structure of DNA

- Double Helix Shape
- 4 Nitrogen Bases

↓ Adenine ⟷ Thymine (PAIRED)
↓ Guanine ⟷ cytisine (PAIRED)

* MRNA copy is made in the nucleus



VOCAB: (key terms)

Mutation: DNA | RNA error
Can occur during:
- Mitosis
- Radiation
- chemicals
- Meiosis
- viruses

Translation | Transcription

DNA: Deox yribonucleic Acids
- nucleic acids
- genetic code

BLUEPRINT:
- Central Dogma
- Transcription / Translation

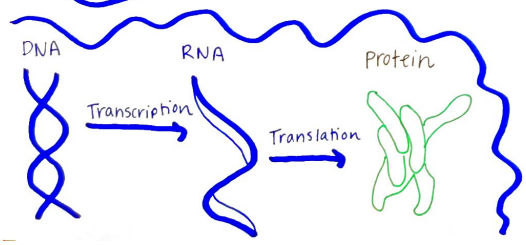
once info has passed into protein it cannot get out

Ex of mutation

* insertion
* Deletion
* Substitution
* Point mutation

TRANSLATION

TRANSCRIPTION



CHAPTER 21: unifying concepts of Animal Structure & Function

ORGANIZATION

#1 Cells: Basic unit of all living organisms

#2 Tissue: collection of similar cells performing a specific function

#3 organs: multiple tissues forming a structure to perform a specific function

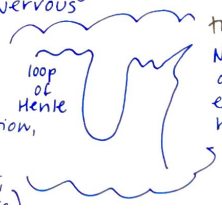
#4 organ system: A team of organs that work together

#5 organisms: A living being that depends on structural levels for the coordination of all Homeostasis & survival

KEY SYSTEMS!

- Skeletal
- Circulatory
- Respitory
- Muscular
- Digestive
- Endocrine
- Reproductive
- Integumentary
- lymphatic/immune
- Nervous

- URINARY → Kidney is the primary excretory organ
  ↓ Filtration, Reabsorption, secretion, and excretion.
  (Kidneys, ureter, bladder, Urethra)



* DIGESTIVE *

Herbivore vs omnivore vs. carnivore
Autotroph vs. Heterotroph

Mechanical:
* chewing * Gizzard
* Breaks into pieces

Types of tissues

- Connective tissues: examples: Blood
- muscular tissues: cardiac, skeletal, smooth
- Nervous tissues: made of neurons
- Epithelial Tissues: skin cells, thin layers

KEY TERMS

- Negative Feedback
  A form of regulation in which the results of a proccess inhibit that same proccess
- Positive Feedback
  The results of a proccess intensify that same proccess
- Thermoregulation
  the homeostatic mechanism that controls temprature.
- Osmoregulation
  the regulation of osmois/water balance

Nephron: functional unit of the kidney.

excretion: helps maintain homeostasis through defecation/elimination

CHAPTER 22 NUTRITION & DIGESTION

4 stages of Food Processing:

- Ingestion: eating
- Digestion: break down of Food molecules
- Absorbtion: uptake of small nutrient molecules by cells lining the digestive track
- Elimination: disposal of undigested materials left over from food

Mechanical Breakdown:

→ breaks food into smaller pieces, increasing surface area for Chemical digestion

Chemical Breakdown:

→ starts in the mouth w/ secretion of saliva
↳ contains the digestive enzyme 'salivary amylase'
↳ breaks down starch

Human Digestive system

- The Pharynx: located in throat, intersection of pathways for swallowing & breathing
- The Esophagus: muscular tube that connects the pharynx to the stomach
  ↳ the peristalsis ↓ how esophagus moves food
- The stomach: large organ that acts as an expandable storage tank
  ↳ gastric juice: digestive fluid in the stomach
    ↳ pepsin: enzyme that breaks proteins into smaller pieces
  → Chyme: mix of food and gastric juice
- The small Intestine: (20 ft) a major organ for chemical digestion & absorption of nutrients into the bloodstream
  — takes about 5-6 hours for food to pass through

↓

Chemical Digestion (small intestine):

- The duodenum: first 25 cm of the small intestine
- The Pancreas: large gland that secretes pancreatic juice
- The Liver: produces bile
  ↳ stored in gall bladder

Nutrition: Essential Nutrients ↓

- Essential Amino Acid: required for protein production
- Vitamins: organic molecules required in very small amounts
- Minerals: essential chemical elements from inorganic compounds
- Essential Fatty Acids: required to make cell membranes

Ch 22:

animal diets
- herbivore : eats plants and/or algae
- carnivore: eats other animals
- omnivore : eats plants, animals, &/or algae

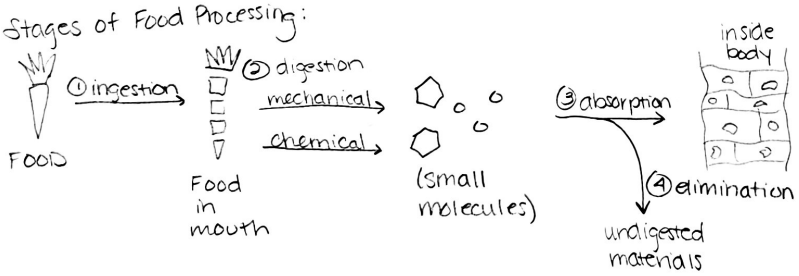
Stages of Food Processing
1. ingestion: eating
2. digestion: breakdown of food → molecules to eat
3. absorption. uptake of small nutrient molecules by cells lining digestive tracts
4. elimination: disposal of undigested materials of food

ain Types of Digestion
-astrovascular Cavity (compartment w/a single opening)
.intentary Canal (Digestive Tract) - (tube from mouth to anus)

ll proteins are built from 20 different kinds of amino acids. The adult body can anufacture 12 of those the other 8 are essential amino acids.

ssential Nutrients :.essential amino acids - required for protein production
· vitamins - organic molecules required in very small amounts
· minerals - essential chemical from inorganic compounds
·essential fatty acids - required to make cell membrane

4 Stages of Food Processing:



Chapter 25: Hormones. made out of lipids

Endocrine System: group of interacting glands & tissues throughout the animal body that produce & secrete chemicals to initiate & maintain body functions.

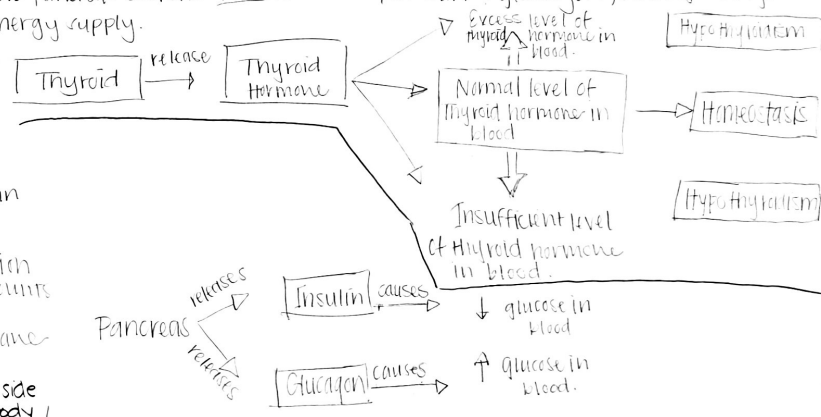
Target Cell: only hormones can bind them to, with receptors for specific hormone.

HGH (Human growth hormone): stimulates growth & metabolic functions

Adrenocorticotropic hormone (ACTH): stimulates the adrenal glands to produce stress hormones

Hypothalamus: gland in brain; acts as main control center of the endocrine system

The Pancreas secretes TWO hormones, insulin & glucagon; manages body's energy supply.



CHAPTER 25 HORMONES

- Hormones: chemical signals carried by the circulatory system that communicate regulatory messages throughout the body

The Endocrine system: consists of about a dozen glands that secrete several dozen hormones

- Hypothalamus: master control center of endocrine system
- Pituitary Gland:
  1) Posterior: stores and secretes hormones from hypothalamus
  2) Anterior: controlled by hypothalamus, produces & secretes own hormones
- Thyroid Gland: regulate animals development & metabolism
- Pancreas: secretes insulin & glucagon
- Adrenal Glands: maintain homeostasis when stressed, produces epinephrine & norepinep (adreniline) (adrenal medula)
- The Gonads & sex Hormones: → estrogens & progesterone, stimulate the development of female characteristics
  → androgens (testosterone) triggers development of male characteristics

Hormones:

- ADH: promotes conservation of water
- Oxytocin: stimulates smooth muscle contraction
- CH: stimulates tissue growth
- FSH & LH: stimulates sex hormones
- Endorphines: pain relief
- Insulin: uptake of glucose
- Melatonin: regulates light/dark cycles
- Leptin: makes you feel full