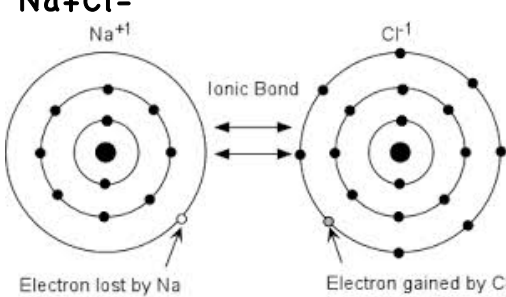
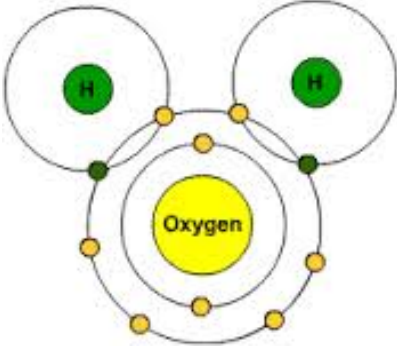
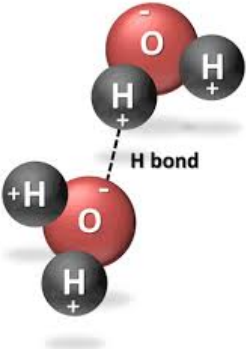
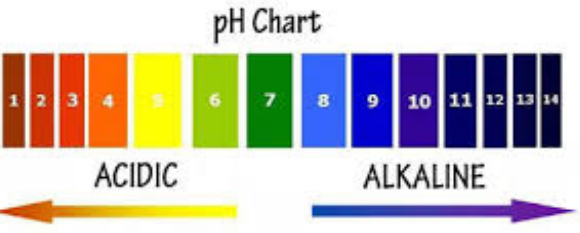
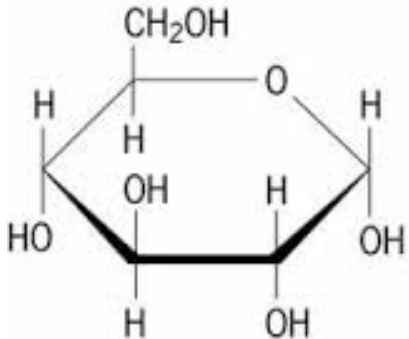
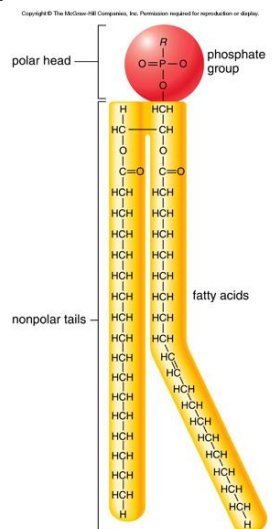
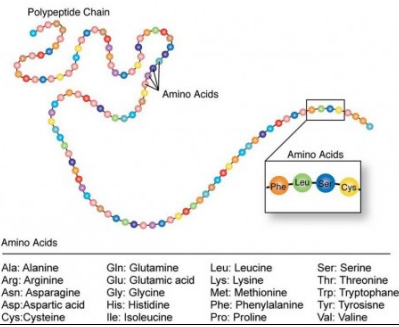


<p>1. Scientific Method</p>	<p>Observation Form Hypothesis Perform Experiment Collect Data Conclusion Retest (Trials)</p>
<p>2. Variables</p>	<p><i>Independent variable:</i> the variable that is manipulated or changed (X-axis) <i>Dependent Variable:</i> the variable that is measured (Y-axis) <i>Controlled Variable:</i> the variable that is kept constant throughout the experiment</p>
<p>3. Levels of Organization</p>	<p>Biosphere Ecosystem Community Population Organism Organ System Organ Tissue Cells Molecules Atoms</p>
<p>4. Characteristics of Living Things</p>	<p>Have cells Reproduce Have DNA Grow & Develop Obtain & use energy Maintain homeostasis Evolve</p>
<p>5. Ionic Bond</p>	<p>Formed when atoms TRANSFER electrons creating ions. Positive charge = when atom loses e- Negative charge = when atom gains e- Example : Na+Cl-</p> 

<p>6. Covalent Bond</p>	<p>Formed when atoms SHARE electrons and form a molecule</p> 
<p>7. Properties of Water</p>  <p>Water is POLAR - with the hydrogen end being slightly + and the Oxygen end being slightly -.</p>	<ol style="list-style-type: none"> 1: Universal solvent 2: COHESION - when molecules of the <u>same</u> substance are strongly attracted to one another (Surface tension) 3: ADHESION - when molecules of <u>different</u> substances are strongly attracted to one another (capillary action) 4: Water is less dense in solid form so ice floats 5: High Specific heat
<p>8. pH</p> 	<p>Measure using a pH scale</p> <p>Acid = 0-6.9 Neutral = 7 Base = 7.1-14</p>
<p>9. Acid</p>	<ul style="list-style-type: none"> • Solutions that release a HIGH concentration of H⁺ ions • Lower the pH the stronger the acid • Higher the pH the weaker the acid
<p>10. Base</p>	<ul style="list-style-type: none"> • Solution that release LOW concentration of H⁺ and HIGH OH⁻ • Higher the pH the stronger the base

	<ul style="list-style-type: none"> • Lower the pH the weaker the base
<p>11. Buffer</p>	<p>Weak acids or bases that can react strong bases to prevent sudden changes in pH</p>
<p>12. CARBON - Earth's most abundant element</p>	<ul style="list-style-type: none"> • Has 4 valence electrons • Forms up to 4 covalent bonds with other atoms • Compounds that contain carbon are called ORGANIC • Carbon based molecules include: CARBOHYDRATES, LIPIDS, PROTEINS, NUCLEIC ACIDS
<p>13. Carbohydrates</p> 	<ul style="list-style-type: none"> • Made of: C,H, O in a 1:2:1 ratio • Monomer: Monosaccharide • Function: Major energy source for all living things; Gives Structure to plants • Examples: end in -ose - Glucose, galactose, fructose, glycogen, cellulose, and starch • Special info: Animals store glucose as glycogen; large molecules are called polysaccharide
<p>14. Lipids</p>  <p>Phospholipid structure</p>	<ul style="list-style-type: none"> • Made of: Long chains of C, H, O • Monomer: Glycerol + Fatty Acid • Function: Energy storage; Major component of cell membrane • Examples: Fats, oils, waxes, steroids, hormones, cholesterol, phospholipids • Special info: Saturated fats all C-C single bonds & Unsaturated fats at least 1 C=C double bond; non-polar

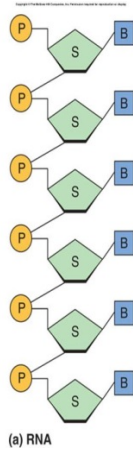
15. Proteins



- Made of: C, H, O, N
- Monomer: Amino Acid
- Function: Controls rate of chemical reaction; Regulates cell processes; transports material in & out of cell fights disease; building block for muscles
- Examples: Enzymes; protein channels
- Special info: amino acids bonded together by peptide bond; 20 different amino acids

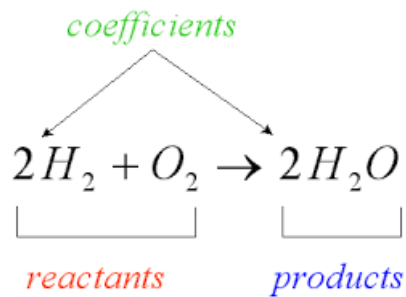
16. Nucleic Acid

Fig. 2.20a



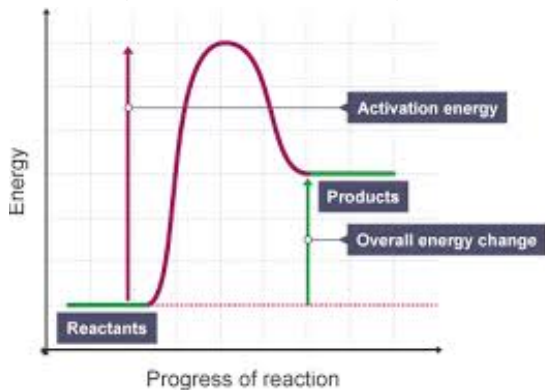
- Made of: C, H, O, P, N
- Monomer: Nucleotide (5-Carbon sugar + Phosphate group + Nitrogen base)
- Function: Store and transmit genetic information
- Examples: RNA & DNA

17. Chemical Reaction

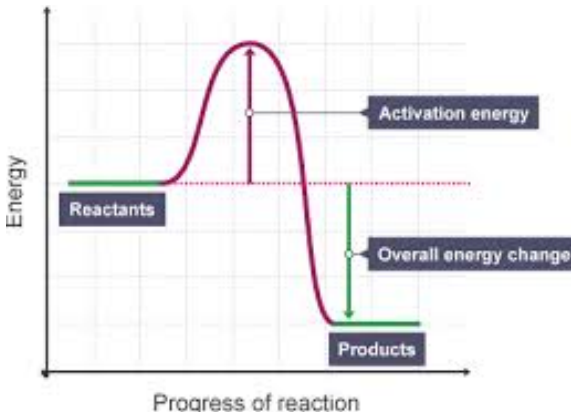
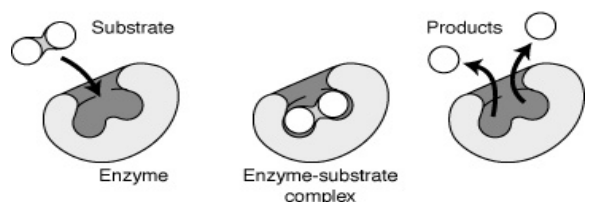
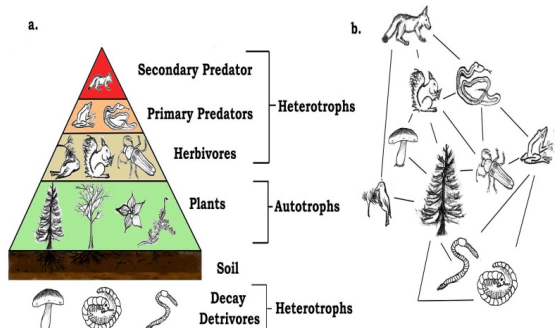


- Changing of substances into different substances by breaking or forming chemical bonds
- Reactants - what is put into the reaction (left side of arrow)
- Product - What come out of the reaction (right side of arrow)

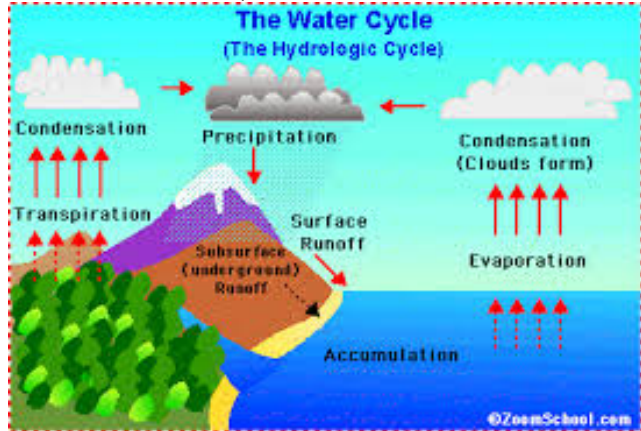
18. Endothermic Reaction



- Chemical reactions that absorb energy and have high activation energy
- Reactants have less energy than the products
- Most require an enzyme

<p>19. Exothermic Reaction</p> 	<ul style="list-style-type: none"> • Chemical reactions that release energy and have lower activation energy • Reactants have more energy than the products • Can occur spontaneously
<p>20. Enzymes</p> <p>Mechanism of enzyme activity</p> 	<ul style="list-style-type: none"> • Biological catalysts that speed up the rate of a chemical reaction by LOWERING THE ACTIVATION ENERGY. • Small range of conditions: pH & Temperature • Lock & Key Model- enzymes are specific & only work on 1 set of substrates
<p>21. Abiotic Factor</p>	<ul style="list-style-type: none"> • Nonliving aspects of an ecosystem such as rainfall, temperature, wind, sunlight, and soil
<p>22. Biotic Factors</p>	<ul style="list-style-type: none"> • Living aspects of an ecosystem such as plants, animals, fungi, and bacteria
<p>23. Producers (Autotrophs)</p>	<ul style="list-style-type: none"> • Get their energy from nonliving factors; make their own food • Photosynthetic: form sugars using sunlight • Chemosynthetic: form sugars using chemicals • Located at the bottom of food web
<p>24. Consumers (Heterotrophs)</p>	<ul style="list-style-type: none"> • Get energy from eating other living or once-living resources • Herbivores, Carnivores, Omnivores, Detritivores, Decomposers
<p>25. Food Web</p>	

26. Water Cycle



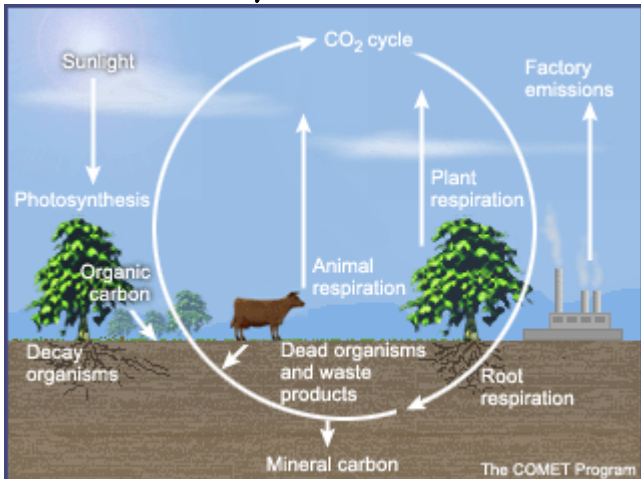
Condensation: Water vapor changes into liquid water

Transpiration: evaporation of water from leave of plants

Evaporation: water changes from liquid to gas

Precipitation: water that falls to earth's surface as rain, snow, sleet, hail

27. Carbon Cycle



C is removed from atmosphere: Photosynthesis

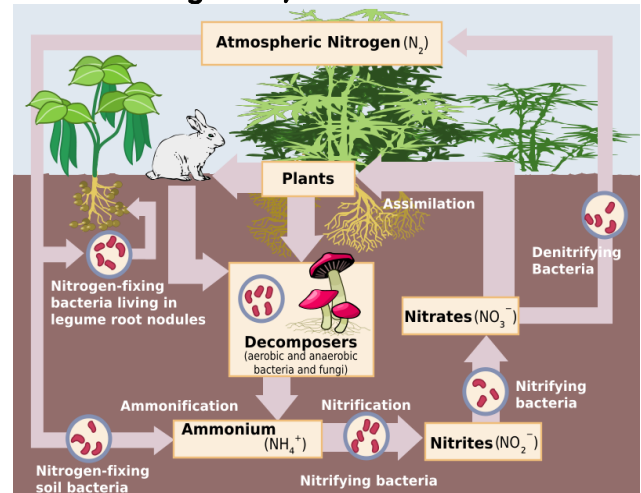
C is returned by:

Respiration

Combustion

Burning of fossil Fuels

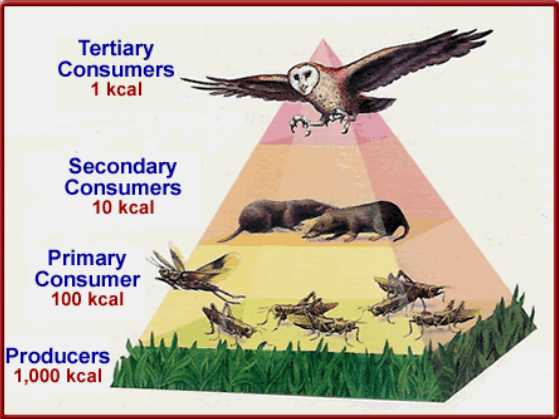
28. Nitrogen Cycle

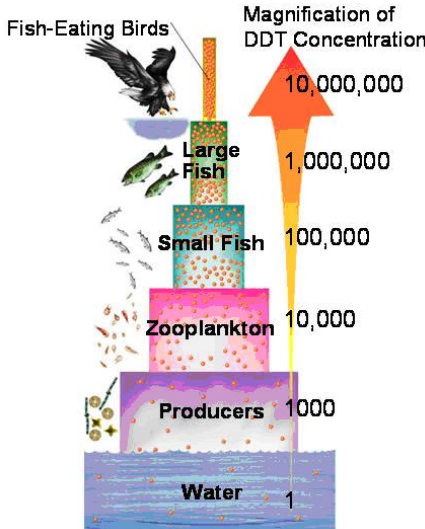


Nitrogen Fixation: Conversion of nitrogen gas into ammonia by bacteria found on the roots of legume plants

Nitrification: Converting ammonia into nitrates by bacteria and is taken up by plants to be converted into Amino acids and proteins

Denitrification: Converting nitrates back into nitrogen gas by bacteria

<p>29. Ecological Pyramids</p>	<p>Biomass pyramid: Shows the measure of total dry mass and is measured in kg/M^2</p> <p>Energy Pyramid: Energy distribution throughout the trophic levels in a food web; measured in Kcal</p> <p>Pyramid of numbers: Shows the actual number of individual organisms at each trophic level (Can be an inverted pyramid)</p>
<p>30. Energy Pyramid</p> 	<ul style="list-style-type: none"> • Original source of energy comes from the sun. • Only 10% of that original energy is available in each trophic level
<p>31. Habitat vs. Niche</p>	<p>Habitat: a description of all the abiotic and biotic factors in the area where an organism lives (Address)</p> <p>Niche: How an organism interacts within the habitat (Occupation)</p>
<p>32. Symbiosis</p>	<p>Mutualism: Both organisms benefit (insect & flower)</p> <p>Commensalism: One benefits and other is neither harmed nor benefits (Whale & barnacle)</p> <p>Parasitism: One benefits and other is harmed (tape worm & human)</p>
<p>33. Population Growth</p>	<p>Exponential growth: dramatic increase in population over time; J shaped curve; due to abundance of resources</p> <p>Logistic growth: period of exponential growth followed by a leveling off due to a limiting factor; S shaped curve</p>

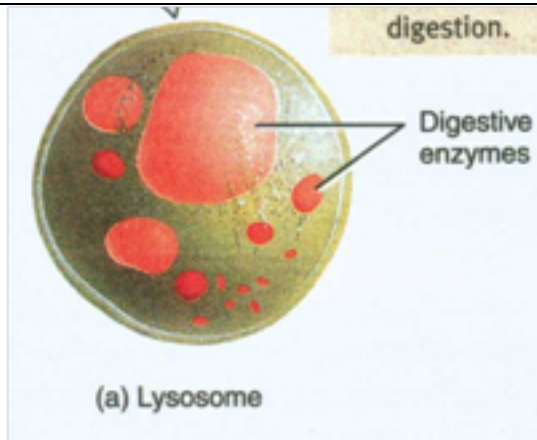
<p>34. Primary Succession</p>	<p>Occurs in a previously uninhabited area with no soil; caused by volcanic eruption, melting glaciers, and strip mines Pioneer species: first species to inhabit the area; lichens & mosses; break down rock to eventually form soil.</p>
<p>35. Secondary Succession</p>	<p>Reestablishment of a damaged ecosystem where soil is still intact; caused by floods, forest fires, and farming</p>
<p>36. Biomagnification</p> 	<p>When a pollutant is introduced into an ecosystem, it will move up the food chain as predators eat prey, accumulating in higher concentrations</p> <p>Indicator species: species that are most affected by a pollutant and tested first when a pollutant is suspected (amphibians & top predators)</p>
<p>37. Tropical Rain Forest</p>	<ul style="list-style-type: none"> • Warm, rainy all year • Lush broadleaf, evergreens; vine growing to reach sunlight • Soil is thin and low in nutrients due to shade from canopy • Most biodiversity; animals are very vocal to compete
<p>38. Tropical Savanna (Tropical grassland)</p>	<ul style="list-style-type: none"> • Warm temps; dry and wet season • Short grasses, scattered trees and shrubs
<p>39. Temperate Grassland (Prairie)</p>	<ul style="list-style-type: none"> • Warm summers and cool winters; windy • Tall grasses that are susceptible to grass fires; helps with germination • Most precipitation falls as snow • Hooved animals that graze; smaller animals burrow to hide from wind
<p>40. Desert</p>	<ul style="list-style-type: none"> • Very arid, hot and dry all year • Succulents (cacti) store water; deep root system • Animals are camouflaged; large thin ears; nocturnal

<p>41. Temp Deciduous Forest</p>	<ul style="list-style-type: none"> • Hot summers, cold winters (defined seasons) • Rain is evenly spaced throughout the year • Deciduous trees that lose their leaves during the cold seasons • Migrating birds during warmer month; hibernating animals
<p>42. Taiga (Boreal Forest)</p>	<ul style="list-style-type: none"> • Long cold winters lasting 6 months or more; short very mild summers • Evergreen, coniferous trees; shaped to prevent branch breaks from heavy snowfall • Mammals have thick fur
<p>43. Tundra</p>	<ul style="list-style-type: none"> • Long subzero temp winters; very little precipitation • Permafrost: Soil is frozen most of the year, top layer thaws just long enough for low, ground hugging plants to grow • Lichens, mosses, algae • Lightly colored feathers; very thick fur and layers of blubber to withstand the cold temperatures

<p>44. Cell Theory</p> <ol style="list-style-type: none"> 1. All living things are composed of cells 2. Cells are the basic unit of life 3. New cells are produced from existing cells 	<p style="text-align: center;">Scientists involved</p> <p><u>Hooke</u> - First to identify cells and name them</p> <p><u>Leeuwenhoek</u> - Made a single lense microscope and observed cells in greater detail</p> <p><u>Schleiden & Schwann</u> - concluded that both plants and animals are made of cells</p> <p><u>Virchow</u> - concluded that cells came from other cells (Cell reproduction)</p>
<p>45. Types of cells</p>	<p>Prokaryotic</p> <ul style="list-style-type: none"> • No nucleus or membrane bound organelles • DNA is one chromosome in a circular strand suspended in the cytoplasm • Single celled • Examples: Bacteria <p>Eukaryotic</p> <ul style="list-style-type: none"> • Nucleus containing DNA with multiple chromosomes

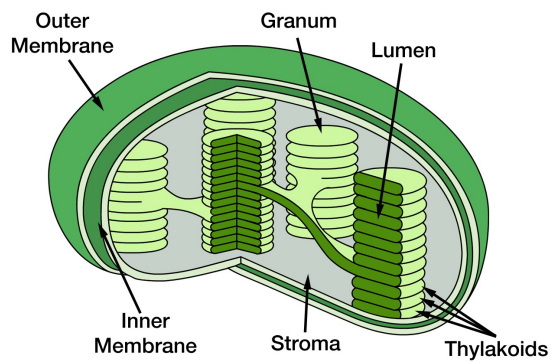
	<ul style="list-style-type: none"> • Multicellular • Many membrane bound organelles • Examples: Plant, animal, protists
<p>46. Animal vs. Plant cell</p> <p>Major differences:</p> <p>1: Central vacuole is larger in a plant cell</p> <p>2: Chloroplasts & cell wall are only present in a plant cell</p> <p>3: Centrioles are found only in a animal cell</p> <p>**Know the function of all of the organelles identified in the image</p>	
<p>47. Nucleus: Control center of the cell; contains the nucleolus which makes ribosomes; Stores DNA</p>	
<p>48. Endoplasmic Reticulum:</p> <p>(Rough) The site at which proteins are assembled by ribosomes</p> <p>(Smooth) The site where lipids and complex carbohydrates are assembled</p>	

49. Lysosome: contains enzymes that helps to break down waste in the cell

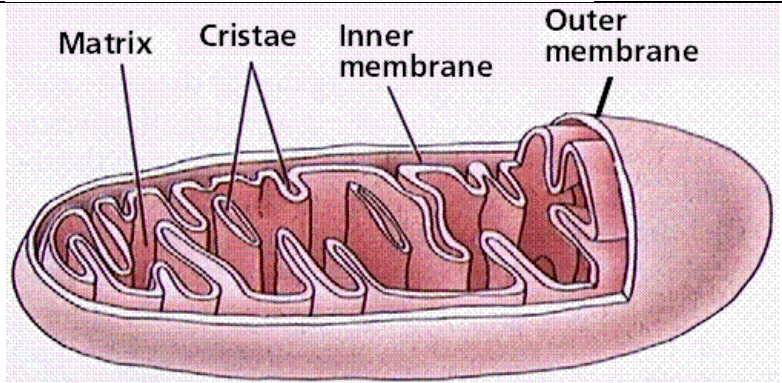


50. Chloroplasts: An organelle found only in plant cells; site of photosynthesis; contains thylakoids that stores chlorophyll which is responsible for collecting energy from sunlight to make glucose; contains its own DNA

Chloroplast

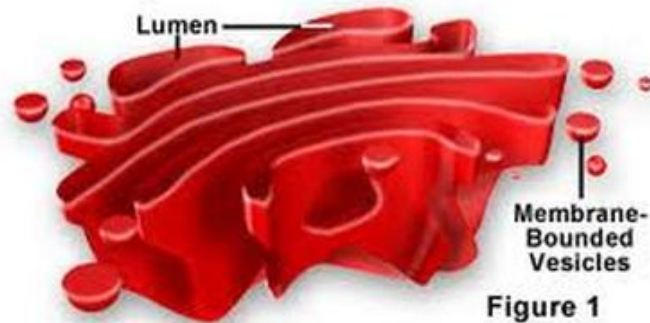


51. Mitochondria: site of cell respiration found in both plant and animal cells



52. Golgi Body: organizes, packages, sorts and transports proteins in vesicles where it is shipped to its final destination within the cell.

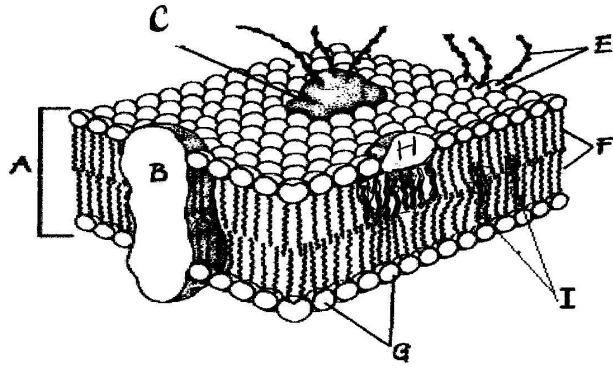
Golgi Apparatus



53. Cell membrane

- 1: Made of a phospholipid bilayer
- 2: Controls what goes in and out of the cell
- 3: Semi permeable

- A: Phospholipid bilayer (Phosphate head + Fatty acid tails)
- B: Protein channel
- C: Protein carrier
- E: Carbohydrates
- F: Fatty Acid tails
- H: Transport Protein

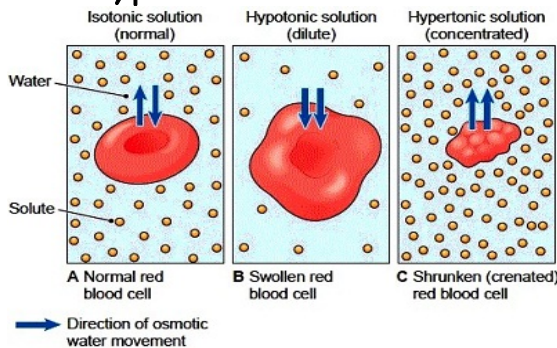


54. Passive Transport - The movement of molecules across a cell membrane WITHOUT energy; moves from high concentration to low. (moves "down the concentration gradient")

EXAMPLES:

- Simple diffusion - movement of molecules in a fluid or gas
- Osmosis - diffusion of WATER molecules
- Facilitated diffusion - diffusion with the use of a transport PROTEIN.

55. Types of osmotic solutions



ISOTONIC: a solution that has the same concentration of solute as that inside a cell which causes equal amounts of water to move in and out of the cell. (state of equilibrium)

HYPOTONIC = a solution that is lower in solute concentration than that inside a cell which causes water to move inside the cell and the cell will SWELL.

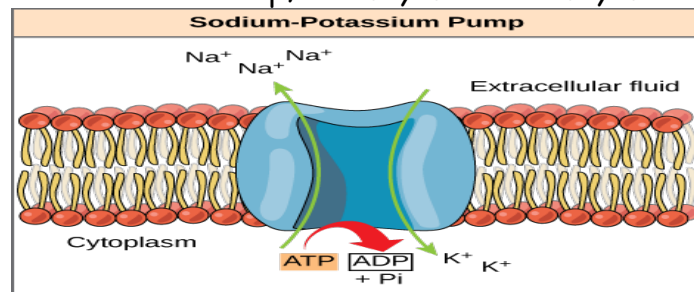
HYPERTONIC = a solution that is higher in solute concentration than that inside a cell which causes water to move out of the cell and the cell SHRINKS.

56.

Active Transport - the movement of molecules across a cell membrane WITH the use of energy and a protein channel or pump: moves from low concentration to high concentration (moves "against the concentration gradient")

EXAMPLES

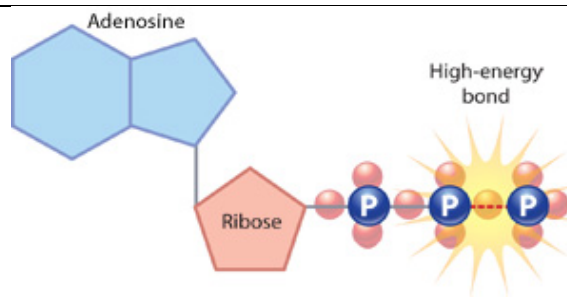
- $\text{Na}^+ \text{K}^-$ Pump; Endocytosis & Exocytosis



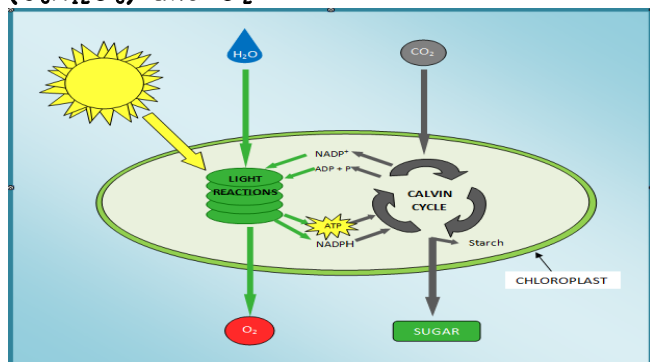
57. ATP

The main form of energy for living organisms; a chemical compound that is used to store and release chemical energy.

****Remember that ATP is like a rechargeable battery $ADP \leftrightarrow ATP$**



58. Photosynthesis: The process that occurs in a plant cell in which CO_2 and H_2O are broken down to make glucose ($C_6H_{12}O_6$) and O_2

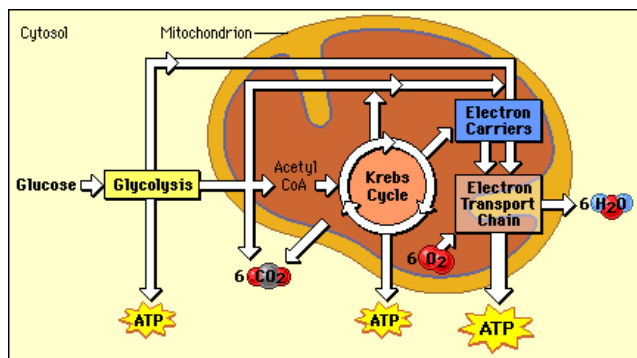


$6H_2O + 6CO_2 + \text{light energy} \rightarrow C_6H_{12}O_6 + 6O_2$
1: Light Dependent Rxn (Light Rxn) - occurs in thylakoid membranes
 $6H_2O$ splits to give off $6O_2 + NADPH + ATP$

2: Light Independent/Calvin Cycle - occurs in the stroma
 $6CO_2 + ATP + NADPH$ gives glucose

Factors that affect the rate: Water, temperature, and light intensity

59. Cell Respiration (Aerobic Respiration): Process that occurs when oxygen is present in plant, animal, and some bacteria cells in which glucose is broken down to release energy in the form of ATP



$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + \text{Energy release (36 ATP)}$

- 1: Glycolysis - Occurs in the cytoplasm
 $\text{Glucose} \rightarrow 2 \text{ pyruvic Acid} \rightarrow \text{Acetyl CoA} + 2 \text{ ATP}$
- 2: Citric Acid Cycle (Kreb Cycle) - occurs in the matrix of mitochondria
 $2 \text{ Acetyl CoA} \rightarrow 6CO_2 + 2 \text{ ATP}$
- 3: Electron Transport Chain - occurs in the inner membrane of the mitochondria
 $NADH \ \& \ FADH_2 + 6O_2 \rightarrow 6H_2O + 32 \text{ ATP}$

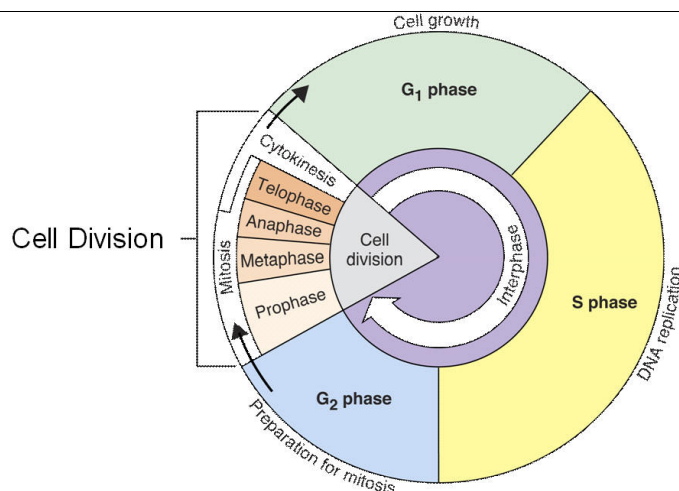
60.

Fermentation (Anaerobic Respiration): A process that occurs in the absence of oxygen in which bacteria, yeast, and some animal cells break down glucose to make 2 ATP

2 Types of Fermentation
Alcoholic (occurs plants and yeasts cells)
 $\text{Glucose} \rightarrow 2 \text{ Pyruvate} + 2 \text{ ATP} \rightarrow \text{Ethyl alcohol} + 2 \text{ CO}_2$
 * used in mbeer, wine and bread
Lactic Acid (occurs in muscle cells & bacteria)
 $\text{Glucose} \rightarrow 2 \text{ Pyruvate} + 2 \text{ ATP} \rightarrow \text{Lactic Acid}$

*allows muscles to continue working during strenuous exercise and can cause muscle soreness; also used in making cheese and yogurt)

61. Cell Cycle



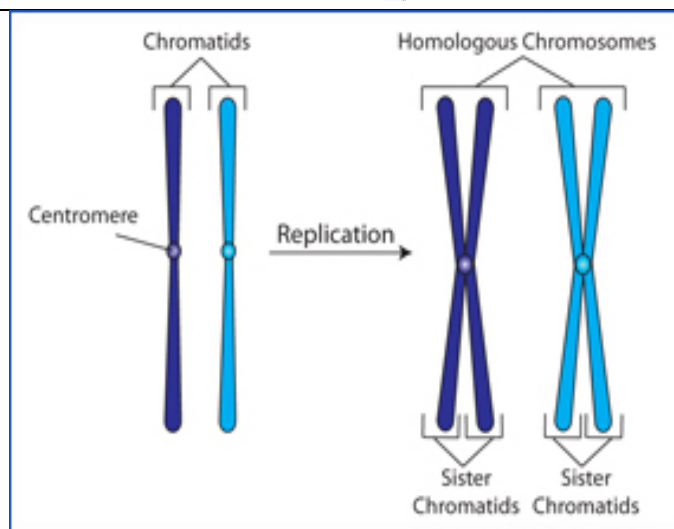
62. DNA is stored in the nucleus of a cell in the form of chromatin and chromosomes

Chromatin: The loose combination of DNA

Chromosomes: long continuous strand of DNA that consist of numerous genes

Chromatid: one half of an identical chromosome (called sister chromatids)

Homologous Chromosomes: chromosomes that are similar in size, length, shape, appearance, and same genes for traits but alleles may differ for the genes. (one comes from mom and one comes from dad)



63. Asexual Reproduction- creation of off spring from a single parent

Binary Fission: division of single-celled organism into two equal parts that are identical (Bacteria)

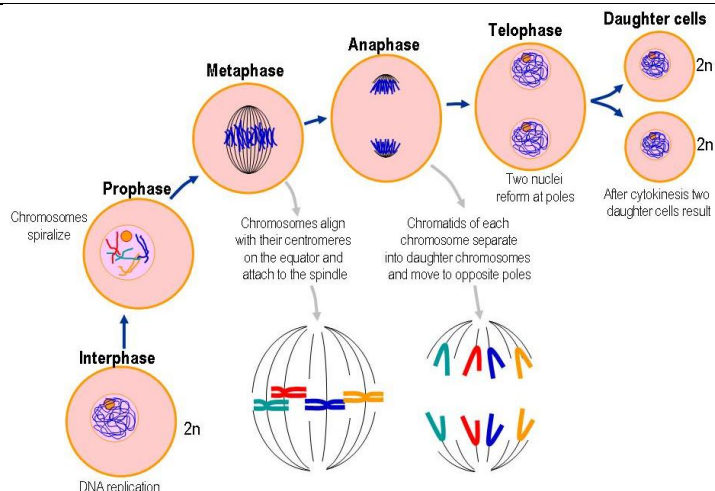
Mitosis: division of the cell nucleus that occurs in all cells except sex cells in eukaryotic organisms

Budding: small projection grows on the surface of the parent organism and forms a separate individual (Hydras and Yeast)

Fragmentation: parent organism splits into pieces that grow into a new organism (salamanders, flat worms and starfish)

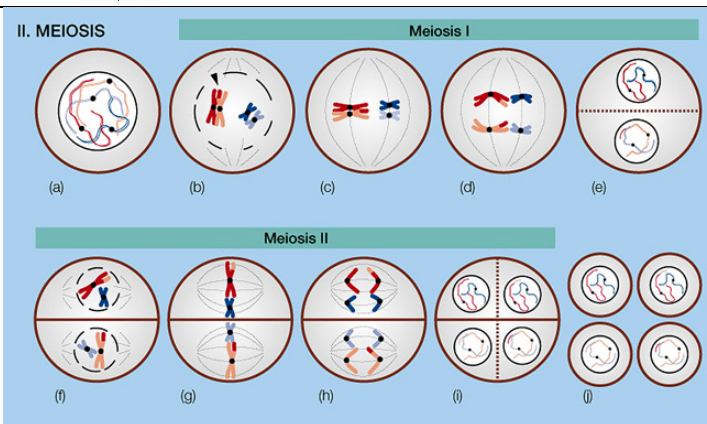
Vegetative reproduction: modification of a stem or underground structure that grows a new organism that is attached to the parent through structures called runners (strawberries, potatoes and other root based plants)

64. Mitosis: process that occurs in somatic cells and is the division of a cell's nucleus into two genetically identical nuclei that are diploid (2n)



65. Sexual Reproduction – Meiosis: Occurs in sex cells and produces genetically unique/different gametes that are haploid (n)

egg = female gamete
sperm = male gamete



Meiosis I – Homologous Chromosomes are separated/ chromosome number is decreased to n

Meiosis II – Sister chromatids are separated to give 4 genetically unique cells that will mature into gametes.

66. Genetics

- **Gregor Mendel: Father of Genetics**
- **Studied the pea plant**
- **Have two genes for every trait (due to homologous chromosomes)**

Alleles: different forms of a single trait
Dominant: “stronger” of the two genes and shows in phenotype if present in genotype (Bb or BB)
Recessive: “weaker” of the 2 alleles and only shows up if both alleles are recessive.
Homozygous: When 2 alleles are the same (BB or bb)
Heterozygous: When 2 alleles are different (Bb)

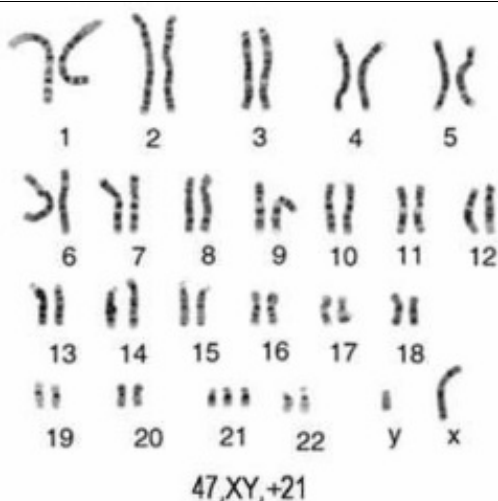
67. Monohybrid punnett squares – shows the probability of gene combinations of ONE trait

Show the cross of a homozygous dominant brown (BB) haired rabbit with a rabbit that has white hair (bb). Carry it to the F₂ generation

<p>68. Dihybrid punnett square - shows the probability of gene combinations of TWO traits</p>	<p>Show the cross of a pea plant with homozygous dominant yellow seeds and short with a homozygous green seeds and homozygous dominant tall. (Don't forget the "Go Skating Rule")</p>
<p>69. Incomplete Dominance: 2 dominant alleles blend together and neither is completely dominant over the other; the phenotype is somewhere in between the two homozygous phenotypes.</p>	<p>Cross a red snapdragon (RR) with a white (R'R') snapdragon</p>
<p>70. Codominance Occurs when 2 dominant genes are completely expressed and are seen in the offspring's phenotype</p>	<p>Cross a Black chicken (BB) with a white chicken (WW)</p>
<p>71. Multiple alleles When a trait consists of more than 2 alleles</p>	<p>Examples: Blood Type A, B, AB, O Cross a mother who is homozygous blood type A with a parent who is heterozygous Type B Type A: $I^A I^A$ or $I^A i$ Type B: $I^B I^B$ or $I^B i$ Type AB: $I^A I^B$ Type O: ii</p>
<p>72. Polygenic Traits</p>	<p>Traits that are produced by two or more genes such as skin color, eye color, height and hair color</p>

73. Karyotype: a picture of chromosomes arranged in homologous pairs; used to determine chromosomal disorders that are a result of duplicated chromosomes that usually are a result of Non-disjunction (the failure of chromosomes to separated during meiosis)

***Circle the chromosomal abnormality in the karyotype. What type of disorder is this?

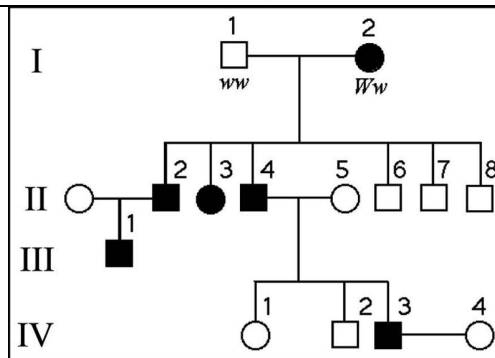


74. Pedigree: A Chart used to show relationships within a family and shows inheritance of traits through generations

Is this a automsomal or sex linked trait?
How do you know?

Dominant or Recessive? How do you know?

What is the probablity that III-1 is heterozygous?



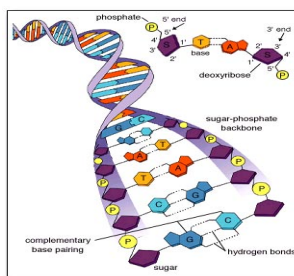
75. Genetic Disorders

Autosomal Dominant: Huntington’s , Achondroplasia
Autosomal Recessive: Cystic Fibrosis, Tay-Sachs, PKU
Autosomal Codominant: Sickle Cell
Sex Linked Recessive: Hemophelia, Duchenne Muscular Distrophy, Colorblindness

Why do more males have sex-linked disorders than females?

76. DNA

- Deoxribonucleic Acid: Organic molecule that makes up chromosomes located in the nucleus of a eukaryotic cell.
- Double Helix Shape
- Monomer is a nucleotide: Nitrogen Base, phosphate group and 5- Carbon Sugar
- Base Pair Rule: A-T and C-G



78. Scientists responsible for the discovery of DNA

1. *Griffith*: Mouse & Pneumonia Experiment; Some material that “Transformed” and was passed to offspring.
2. *Oswald and Avery*: identified “transforming” material

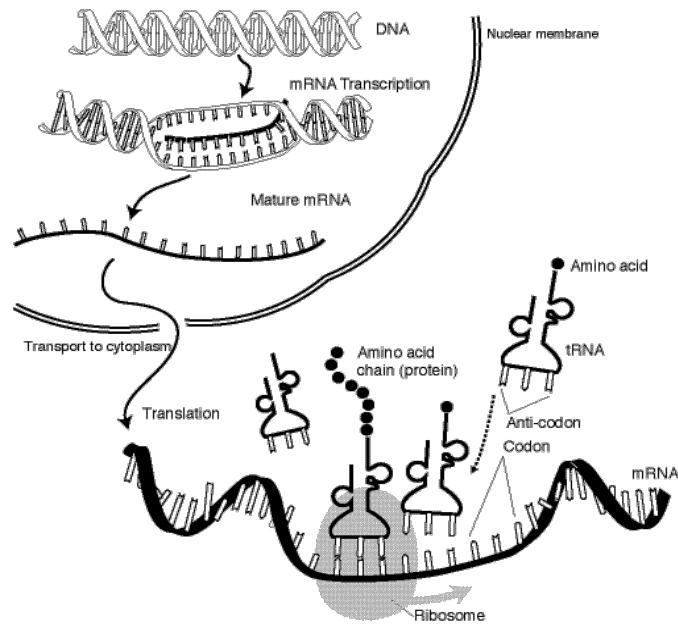
as DNA with digestive enzymes specific to DNA.
 3. *Hershey & Chase*: Blender experiment with bacteriophage; confirmed genetic material in virus was also DNA
 4. *Rosalind Franklin*: X-Ray experiment led to first picture of what DNA structure looked like.
 5. *Watson & Crick*: Used Franklin's image to create first model of DNA calling it a double helix

79. Protein Synthesis

Central Dogma: States that protein is formed in the following way
 DNA → RNA → Protein

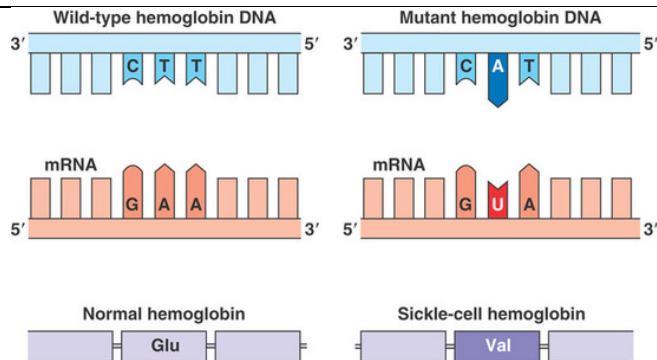
Transcription: DNA → mRNA (Occurs in the nucleus)

Translation: mRNA → Protein (Occurs in the cytoplasm on rRNA)

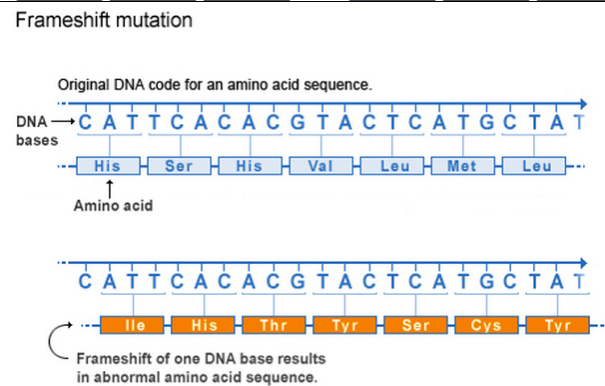


80. Gene Mutations: Point mutation

Caused by substitution in which one base is changed into another base; usually affect no more than one single amino acid



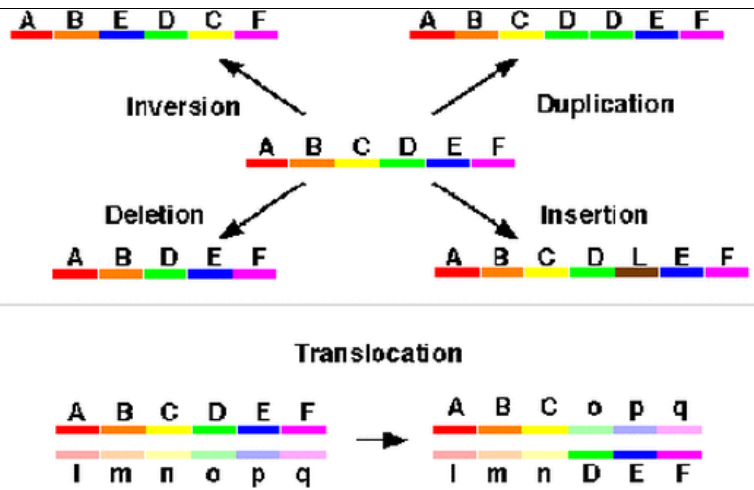
81. Gene Mutations: Frameshift mutation occurs when a nitrogen base is deleted or added from the mRNA sequence causing a shift in the "Reading Frame" of the genetic message. (Insertion or Deletion); Affect is much more dramatic and may change EVERY amino acid that follows the point of mutation.



U.S. National Library of Medicine

82. Chromosomal Mutations: a type of mutation that affect the whole chromosome and every gene located on the chromosome

1. Deletion
2. Duplication
3. Inversion
4. Translocation
5. Non-disjunction (failure of chromosomes to separate)



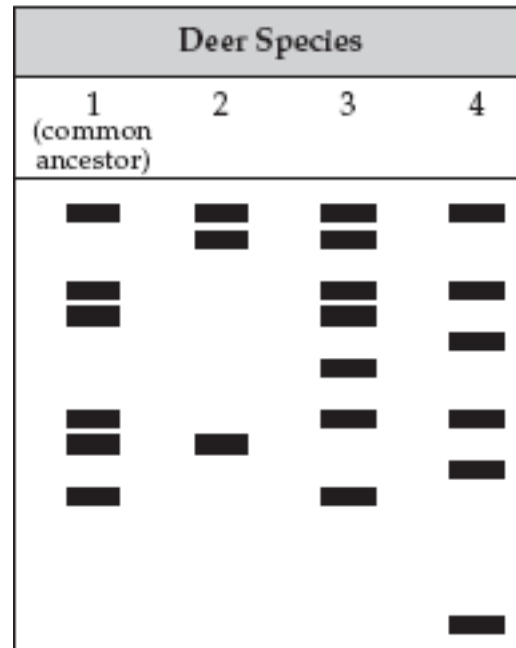
83. Gel Electrophoresis

DNA is cut into pieces with restriction enzymes and run through a gel-like substance using an electrical current.

Creates "bands" in the gel based on the length of the DNA sequence. The shorter pieces move faster and land towards the bottom of the plate. The longer ones stay towards the top.

Which species of Deer is most closely related to the common ancestor?

ELECTROPHORESIS GEL OF DEER SPECIES



84. Theory of Evolution

Charles Darwin is known as the father of the theory of evolution based on NATURAL SELECTION which simply states the diversity of organisms is due to natural variations in traits that allow adaptations to their environment. Those that are most adapted or most fit for their environment will survive and produce more offspring. He also believed that we are all derived from a common ancestor through descent with modification.

Evidence used to support Darwin's Theory today

1. Fossil Records
2. Anatomical Structures (homologous, vestigial and analogous structures)
3. Similarities of embryonic development
4. Similarities of DNA
5. Geographic distribution of organisms

<p>85. Scientists who contributed to Darwin's Theory</p>	<p><i>Hutton & Lyell:</i> Earth was shaped by gradualism and uniformitarianism and argued the earth had to be billions of years old and not just a few thousand <i>Lamarck:</i> Inheritance of Acquired traits through use and disuse of certain body parts which were then passed on to offspring. Malthus: predicted human population would grow faster than resources available to sustain it Wallace: prompted Darwin to publish his findings; had some ideas and theory as Darwin</p>
<p>86. Early Ideas of Life – Spontaneous Generation</p>	<p>Aristotle – Spontaneous Generation (Biogenesis) – Life comes from non-living matter Francesco Redi – disproved biogenesis for large organisms using the “meat in the jars” experiment John Needham – Supported abiogenesis; believed there was a “life force” in the air to give rise to microorganisms; “Boiled broth in flask” experiment Lazzaro Spallanzani – repeated Needham’s experiment; Boiled it longer; skeptics said he “kept the life force out” when he covered the flask Louis Pasteur – believed that microbes were carried on dust particles in the air and NOT by some “life force”; used the S-shaped flask with boiled broth experiment</p>
<p>87 Early Ideas of Life – Origin of life theories</p>	<p>Miller-Urey– first organic molecules were created by lightening and mixture of early gases which gave rise to the first amino acids and carbohydrates Lynn Margulis– endosymbiotic theory which states that the first eukaryotic cells were formed when prokaryotic cells began forming symbiotic relationships with other prokaryotes; explains why Mitochondria and Chloroplasts have their own DNA</p>
<p>88. Time line of origin of life</p>	<ol style="list-style-type: none"> 1. Conditions on earth gave rise to first organic molecules 2. Anaerobic chemosynthetic prokaryotes 3. Photosynthetic cyanobacteria – produced oxygen 4. Cooling of ozone layer led to land dwelling organisms 5. Endosymbiosis formed eukaryotic cells 6. Eukaryotic cells colonized to form tissues 7. Sexual reproduction creates diversity
<p>89. Evolution in Populations</p>	<p>Genetic Variation– stored in a population’s gene pool and is needed to increase the chances of species survival in a changing environment Speciation – the rise of two species from one existing</p>

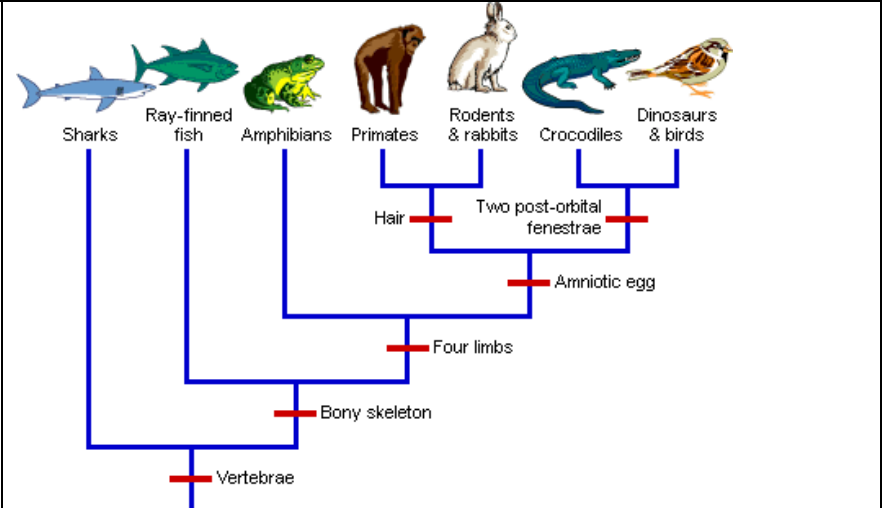
species
 Causes in speciation: Reproductive isolation & geographic isolation
 Types of evolution: Convergent & divergent evolution

90. Taxonomy – The science of classifying living things

Carolus Linnaeus – binomial nomenclature; Latin language; genus + species
 Linnaean Classification System- Kingdom (Largest most broad), Phylum, Class, Order, Family, Genus
 Species (smallest most specific)
 Six kingdoms – Archaeabacteria, Eubacteria, Protista, Fungi, Plantae, Animalia

91. Cladogram – Evolutionary Tree that proposes how species in the order in which they descended from a common ancestor

Identify the derived characters and a clade



92. Characteristics of Kingdoms

SIX KINGDOMS CHARACTERISTICS CHART

	Eubacteria	Archaeobacteria	Protista	Fungus	Plant	Animal
Cell Type	prokaryotic	prokaryotic	eukaryotic	eukaryotic	eukaryotic	eukaryotic
Number of Cells	unicellular	unicellular	most unicellular	most multicellular	multicellular	multicellular
Level of Organization	cell	cell	most cell	most tissue	systems	systems
Cell Wall	peptidoglycan	contains uncommon lipids	pectin or none (green algae: cellulose)	chitin	cellulose	none
Mode of Nutrition	auto/heterotroph	auto/heterotroph	auto/heterotroph	heterotroph (absorption)	autotroph	heterotroph
Reproduction	asexual	asexual	sexual/asexual	sexual/asexual	sexual/asexual	sexual/asexual
Motility	some motile	nonmotile	motile/nonmotile	most nonmotile	nonmotile	motile
Symbiotic Relationship	fix nitrogen many pathogenic aid in human digestion	aid in digestion	many pathogenic (malaria, African sleeping sickness, amoebic dysentery) cellulose digestion	many pathogenic (athlete's foot, yeast infection, ringworm) lichen	epiphyte mycorrhizae mistletoe	parasitic worms, barnacles, clownfish
Ecological Importance	fix nitrogen decomposers	decomposers	algae major aquatic oxygen & food producers algal bloom	decomposers	major oxygen & food source (photosynthesis - trophic level 1)	human impact on environment
Other	gave rise to eukaryote organelles	can live in extreme conditions ancestors of eukaryotes	toothpaste teeth whiteners	fermented food products food source antibiotics	can't live without 'em medicine source	invertebrates vertebrates
Examples	<i>Escherichia coli</i> <i>Streptococcus</i>	methanobacteria	algae, diatoms, amoebas,	lichen, yeast, mushrooms	trees flowers grass	sponges ↓ mammals

This chart sets the content to be covered in the Six Kingdoms Unit. Limit your content for teaching/testing purposes to these concepts.

93. Plants

Study Plant Booklet