Name_____

KEYSTONE BIOLOGY STUDY GUIDE

Keystone Biology Review - Module 1 – CELLS AND CELL PROCESSES

All living things have the following characteristics:

- They are all made of cells: either one cell (**unicellular**) or many cells (**multicellular**).
- They reproduce **sexually** (using **2 parents**) or **asexually** (**1 parent**).
- They perform **respiration** to make energy available to the cell.
- They carry on **metabolic** activities (chemical reactions).
    - This includes: **Synthesizing** larger compounds
      Digesting larger compounds to smaller
- They grow and develop
- They respond to environmental stimuli and maintain homeostasis (constant internal condition despite external conditions)

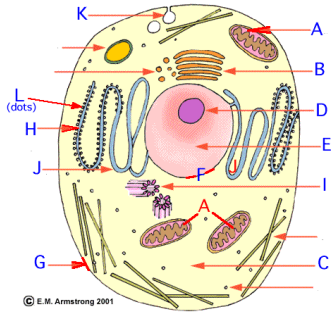
There are 2 Major Cell Types**: Prokaryotes** and **Eukaryotes**.
Differences are shown below:

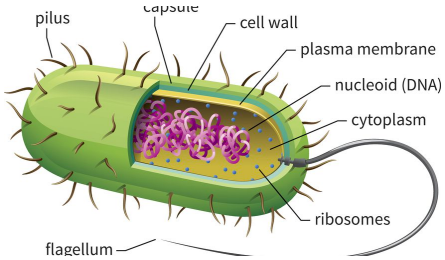
Prokaryotes	Eukaryotes
Simpler; Unicellular Smaller No true nucleus because there is no membrane around their DNA No complex organelles Includes Bacteria	More complex; Multicellular; Cell specialization Larger A membrane around their DNA (A Nucleus!) Complex organelles (Mitochondria, Endoplasmic reticulum, Golgi, Chloroplasts Includes Animals, Plants, Fungi

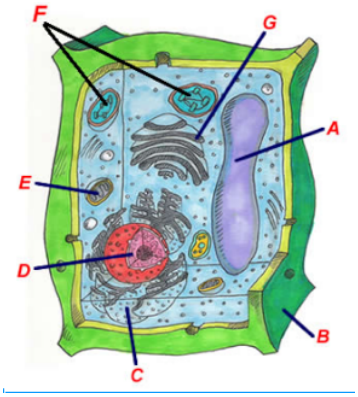
Similarities between Prokaryotes and Eukaryotes
Both have:
Cell membrane/plasma membrane – semi-permeable
and regulates what enters and exists the cell
Ribosomes – make proteins for the cell
Cytoplasm – site of various chemical reactions

What are some complex organelles in Eukaryotic cells?

- **Mitochondria** – makes energy (ATP) for the cell using the process of cellular respiration
- **Chloroplasts** – make sugar and oxygen using the process of photosynthesis
- **Rough Endoplasmic reticulum** –transports proteins
- **Smooth Endoplasmic reticulum** – makes lipids
- **Golgi Complex** – modifies and packages proteins
- **Nucleus** – control center of the cell, houses the cells DNA
- **Lysosomes** – "suicide sac of the cell" contains strong digestive enzymes







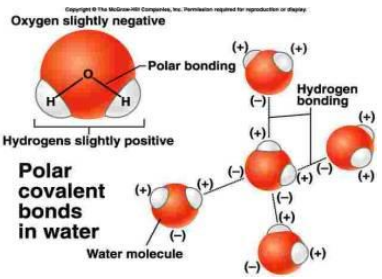
Living things are organized in the following way:

Organelles Cells Tissue Organs Organ Systems Organism

Smallest ⟶ **Largest**

All cells and organs have a specific shape because they do a specific function.
Example: Alveoli are structures in the lungs. They are little sacs with lots of little spaces

to increase surface area for exchange of oxygen and carbon dioxide. The cells around them are VERY thin to allow gases to be exchanged.



Water is unique because it is **POLAR**.
(It has opposite charges on the oxygen and hydrogens.) Because of this, individual water molecules are attracted to each other and form **hydrogen bonds.**
Because of this, water has the following properties:
Cohesion – water molecules stick together because they are attracted to each other. (Helps move water up trees)
Adhesion –water molecules stick to other stuff. (Helps move water up trees)
Capillary action - water moves up tiny tubes using adhesion and cohesion(like in trees!)
High specific heat – it takes a lot of heat energy to raise the temperature of water. (Good for living things because they are made of mostly water, so it keeps them from heating up too quickly. Buffers coastal areas.)
High heat vaporation – it takes a lot of heat energy to make liquid water molecules evaporate as gas molecules. (Because of this, water is good at cooling off living things.)
Good at cooling organisms – when you sweat, it cools you off because water takes a lot of heat energy with it as it evaporates.
Water is less dense as a solid than a liquid – this means ice floats on lakes and things can live under it!

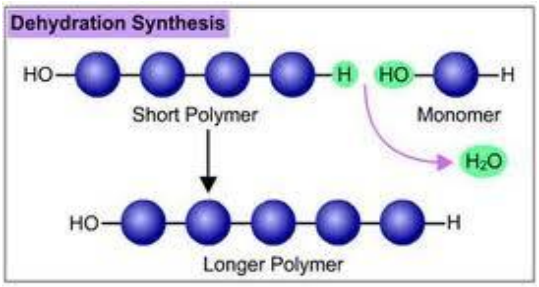
ACIDS have a pH below 7 and **BASES** are above 7 on the pH scale.
- pH of 1 or 2 is a very strong acid
- pH of 13 or 14 is a very strong base

Carbon is unique because it can for **4 bonds.**
This allows it to:
- Make long chains
- Form rings
- Bond with other carbons and other types of atoms
- Form double bonds
- Form very complex molecules

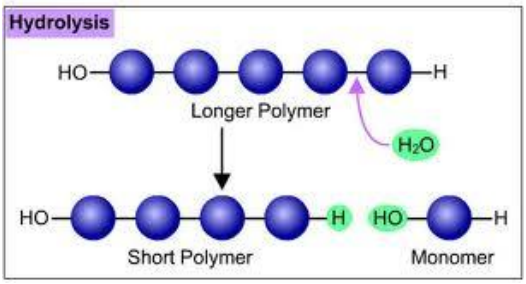
(like carbohydrates, lipids like fat, proteins and nucleic acids like DNA)

The four compounds are: **Carbohydrates, Lipids, Proteins and Nucleic Acids**

Each group of compounds has **small building blocks** (**monomers**) that make up the larger **macromolecule** (**polymer**)of the group.



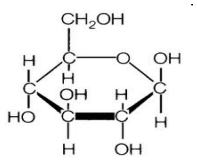
Macromolecules are made by **removing a water molecule (H_2O)** from 2 polymers in a process called **dehydration synthesis**.



The process of **hydrolysis adds a molecule of water (H_2O)** to break down larger molecules into smaller monomers.

The characteristics of each group of compounds are show below:

Carbohydrates
Monomers – **monosaccharides** (simple sugars like **glucose**)
Polymers – **polysaccharides**(complex carbohydrates like starches)
Functions – short term **energy storage**



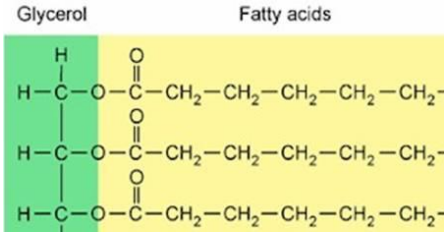
Structure of a carbohydrate-glucose

Lipids

Monomers – **Glycerol and fatty acids**

Polymers - fats and oils

Functions – long term **energy storage**, make up the plasma membrane as **phospholipids, hormone messengers**



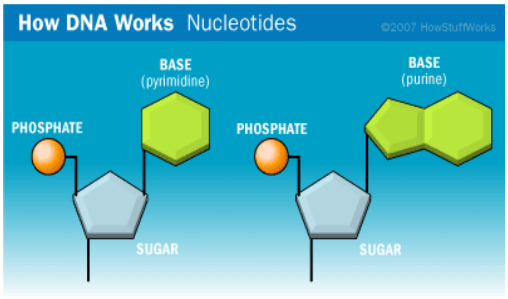
Structure of a Lipid

Nucleic Acids

Monomers – **nucleotides** made of a sugar, phosphate and a nitrogen base

Polymers – DNA and RNA

Functions – Store and transmit **hereditary** information



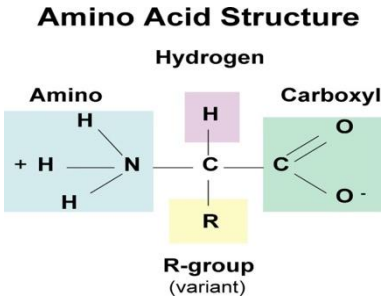
Protein

Monomers – **amino acids**

Polymers –**chains of amino acids a.k.a. polypeptides**

Functions –

- Help in chemical reactions as **enzymes**
- Act as chemical messengers like hormones in the body
- Help in movement, like muscles
- Transporters, like hemoglobin carrying oxygen in your blood
- Immunity (antibodies are made of proteins)
- Pump molecules across the plasma membrane

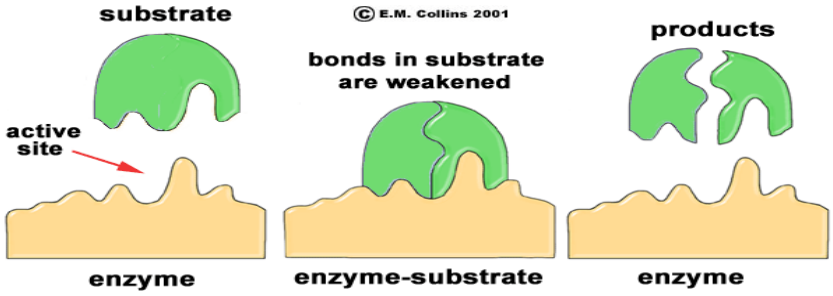


Structure of an Amino Acid -

- You can identify an amino acid by a **nitrogen atom**.
- The **R** in the structure below represents different elements that make up 20 different kinds of amino acids

Enzymes:

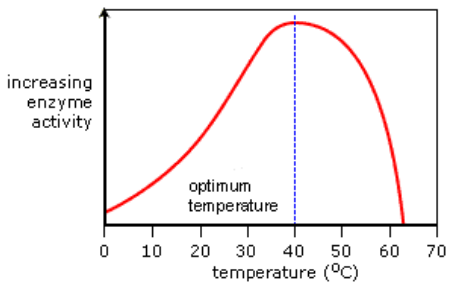
- Are a special group of proteins that act as **catalysts** to speed up the rate of chemical reactions.
- **Lower the energy** needed to activate the chemical reaction.
- There are **MANY** different enzymes in your body
- Have specific shape to compound they work on (called the **substrate**).



Enzymes can either play a role in a **hydrolysis reaction** or **dehydration synthesis**. The above reaction is hydrolysis because it shows a larger substrate being broken down into 2 smaller products.

Factors that can affect enzyme's ability to interact with the substrate.

- **pH** changes can **change the enzyme active site shape** . It may not fit the substrate. The reaction rate will **decrease**
- **Temperature** changes:
  - **Lower** temperatures slow down the molecules and slow down the enzyme activity. The reaction rate is **decreased**.
  - **Higher** temperatures speed up molecular movement and increase enzyme activity **UNLESS THE TEMPERATURE**



GETS TOO HIGH. If it is too high, **the enzyme active site shape will change** and it will not fit the substrate. The reaction rate decreases and eventually stops.

- **Substrate** and **enzyme** concentrations changes can effect enzyme activity. Higher concentrations increase enzyme activity to a maximum rate.

Cell Respiration and Photosynthesis

For each of these processes you need to focus on energy transfer during each process. Think about where the energy is going from and transferred to.

Cellular Respiration is the process by which cells make **energy** from **glucose**, with the help of **oxygen.** This occurs in the **mitochondria**.

$$C_6H_{12}O_6 + 6O_2 \rightarrow 6H_20 + 6CO_2 + \text{energy}$$

(glucose + oxygen → water + carbon dioxide + energy)

Overall reaction for cellular respiration:

Energy is transferred from the bonds between atoms in a glucose molecule to a molecule of **ATP**.

When energy is released from the bonds in glucose, it is transferred to a molecule of ATP. ATP is made from bonding a phosphate group to a molecule of ADP with the energy from glucose. Every time an ATP is made, this is what occurs:

ADP + Phosphate + Energy → ATP

ATP can then be used to do cell work by releasing the phosphate and releasing the energy that was stored with the ATP molecule.

ATP → ADP + Phosphate + Energy

Photosynthesis is the process by which cells make **glucose** (organics) from **carbon dioxide, water, and light energy**. This occurs in the **chloroplast**.

Overall reaction for photosynthesis:

$$\text{Carbon Dioxide + Water} \xrightarrow{\text{Light}} \text{Glucose + Oxygen}$$

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{} C_6H_{12}O_6 + 6O_2$$

Light energy is transferred to the bonds in a molecule of **glucose**. Photosynthesis occurs with the help of pigment called **chlorophyll**. Chlorophyll helps by **capturing light energy**.

The Cell Membrane

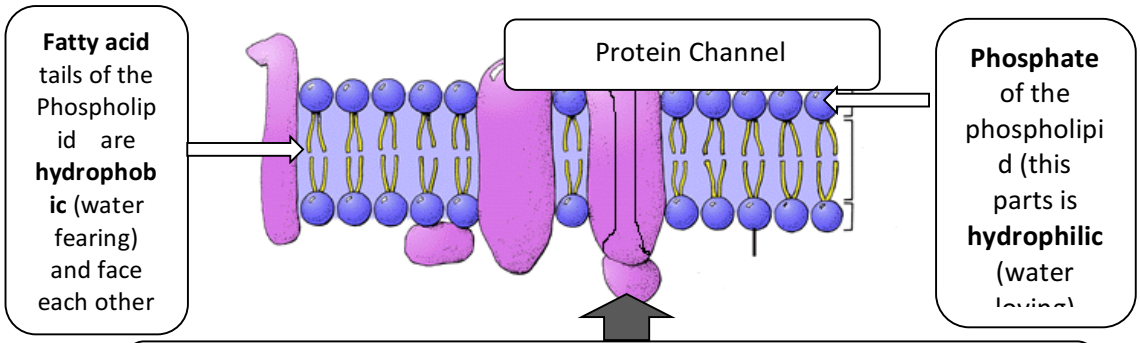
Makeup – Phospholipids and Proteins

The membrane is selectively permeable (semi-permeable) and allows some substrates to enter the cell while keeping others out.

There are two types of transport:

1. **Passive transport** – moves molecules across the membrane through **diffusion. Diffusion** moves molecule from high to low concentration (from more crowded to less crowded together). Substances that dissolve in lipids can easily diffuse across the lipid barrier. Substances that are larger, like glucose, or electrically charge, like ions, will move across the protein channels in a process called **facilitated diffusion.**

Cell Membrane

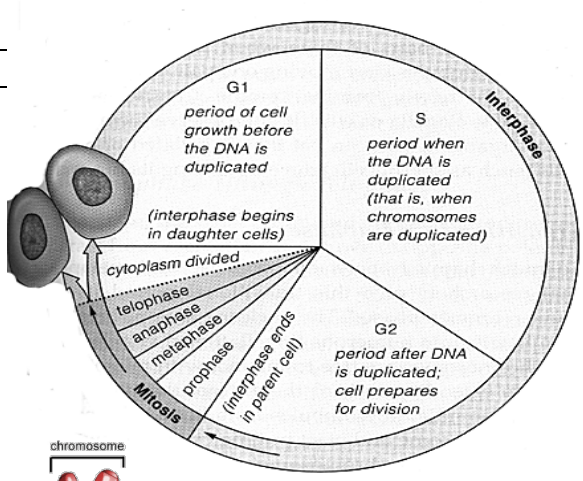


2. **Active Transport** – when the cell uses **energy** to move substances across the cell membrane **AGAINST the concentration gradient (difference)** (less crowded to more crowded).
Protein Pumps – moves individual ions across the membrane AGAINST the concentration gradient
Endocytosis - when large quantities of substances are surrounded by the cell membrane and **taken IN**. (Example- an ameba ingesting food)
Exocytosis – when large quantities of substances are **pushed OUT** of the cell (Example – waste removal, a paramecium pumps water out)

Keystone Biology Review - Module 2 – CONTINUITY AND UNITY OF LIFE

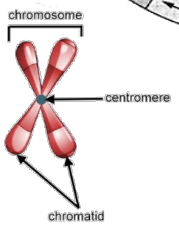
Cell Division and Growth

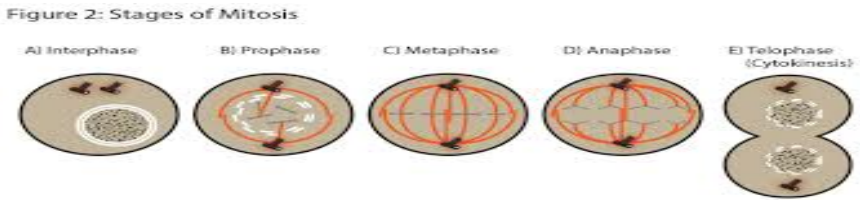
Cells divide for growth, repair and asexual reproduction.
The **cell cycle** shows what cells are doing in the stages of their life and the relative amounts of time they spend in each phase: See below:



Notice that **G_1, S and G_2** are the phases of **interphase**.
Mitosis is a process that divides up the genetic information in the nucleus.
Cytokinesis is a process that occurs after mitosis. It divides up the cytoplasm and cell organelles.

Before a cell divides, ALL of the genetic information (on chromosomes) must be copied EXACTLY.
The result is a chromosome that looks like an X:

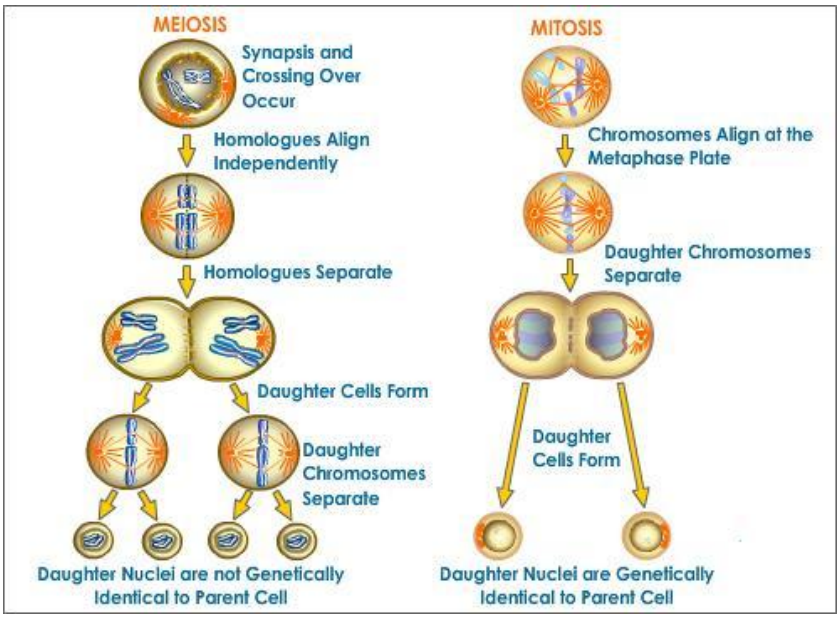




The results of mitosis are **two IDENTICAL** daughter cells.
Both cells have the **same chromosome number** as the parent cell.

The stages of mitosis are shown to the right and compared with meiosis:

Notice that DNA Replication occurs before mitosis AND meiosis.



Meiosis is a special type of cell division that produces **gametes** (sex Cells) for sexual reproduction.

Homologous chromosomes – they carry genes that code for the same types of traits.
Example – Both chromosomes carry the gene for eye color, but one may be brown and one a blue.

Meiosis splits up each pair of the 23 types of **homologous chromosomes** you have in your cells.

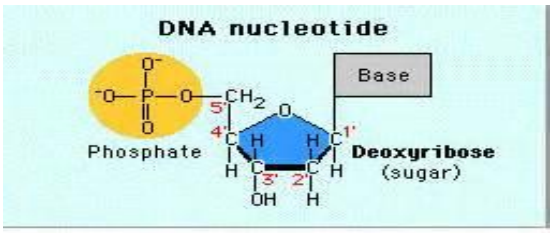
Your sex cells will have 1 copy of your 2 genes for eye color.

Meiosis Summary:

- Meiosis includes 2 divisions
- Meiosis makes **4 daughter cells**. Each will become a **sperm or egg** (gametes).
- Each cell has **½ the chromosome** number of the parent cell (only one of each type of chromosome).

During Meiosis, there a **2 divisions** of the nucleus. The first splits up homologous chromosomes, and the second splits up the replicated chromosomes.

Nondisjunction disorder – a disorder giving an individual extra or missing chromosomes. It occurs as a result of chromosomes not separating during the first or second division of meiosis.

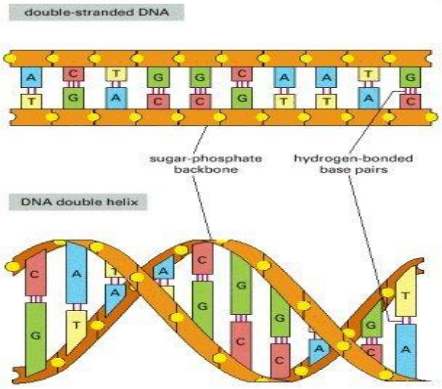


DNA Replication and Protein Synthesis

DNA is made of **nucleotide monomers**, which contain:

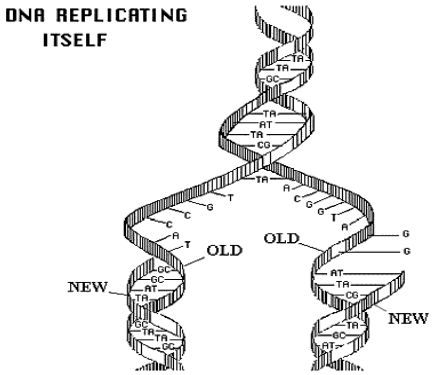
a sugar, phosphate and a nitrogen base.

Nucleotides are put together into a **double helix** as seen here:



The **order** or **sequence** of the nitrogen **bases** in a segment of DNA makes up **1 gene** that codes for a **protein** that shows a trait. Each **chromosome** has hundreds of **thousands of genes** on it.

Remember, DNA will be **replicated** before any type of cell division!



DNA is **replicated** (copied) with the help of an enzyme called **DNA polymerase**, which adds new nucleotide bases by matching up the correct base from the original strand:

A pairs with **T** **C** pairs with **G**

The old strand unwinds, and new nucleotides are added, resulting in **2 exact copies** of the original strand. They are **½ old and ½ new**.

Protein Synthesis

- **turning a message in DNA into a series of amino acids (AKA a Protein)**
- Genes contain instructions for assembling proteins.

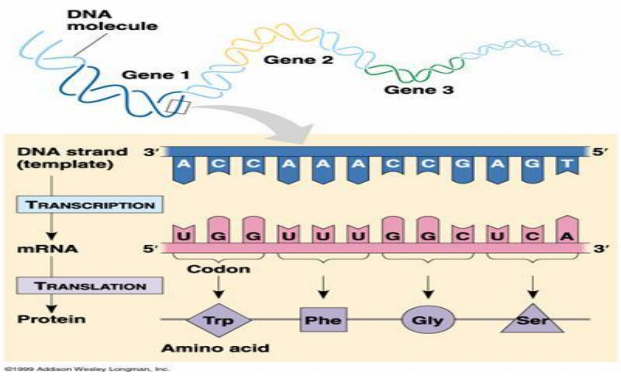
Transcription - copying DNA message – copying genes in DNA into mRNA
- mRNA molecules are produced as a result of transcription
- the mRNA mow has the information for the ribosome to use to assembe a protein

Unlike DNA, RNA contains uracil.
All types of RNA are involved in protein synthesis.
Codon:
- 3 bases on mRNA that recognizes and codes for a specific amino acid
- 3 codons are needed to specify three amino acids

Translation – from language of nucleic acids to language of proteins
- taking the mRNA and turning it into an amino acid sequence using the ribosome
- ❖ Messenger RNA (mRNA): template for amino acid assembly
- ❖ Transfer RNA (tRNA): puts amino acids into place

mRNA is read by ribosome so that the cell can assemble the correct order of amino acids into a protein

The result of translation is a specific sequence of amino acids that make up a 3-dimensional polypeptide chain (protein).



Genetics and Heredity

Gene – a section of **DNA** thata codes for a **protein**.
Mendel observed that an organism has two genes for every trait.

In a 2 trait cross 1 allele from each trait will be passed to gametes.

Allele – a form that a gene may be found in (dominant or recessive alleles).
Genotype – a combination of alleles that an organism has for a trait. Example: AA or Aa or aa
Phenotype – the **physical or visible** characteristics that is determined by genes.
Homozygous – having the **same** alleles for a trait. Example: AA or aa
Heterozygous – having **different** alleles for a trait. Example: Aa
Genetics – the study of heredity.
Heredity – the passing on of traits from parents to offspring.

Types of Inheritance

Recessive trait – a gene that is "masked" or hidden by another "stronger" gene.
Dominant trait – a gene that shows over a "weaker" gene if it is present.
Codominance – when 2 genes are **both dominant** and both will show in the phenotype
Example: 2 hair colors are present in a heterozygous individual
Incomplete dominance – when one gene is partially dominant over another.
(Example: the phenotype **shows a blending** of the two alleles in a heterozgote)

Sex-linked traits – when genes for a trait are found on the **X chromosome**.
Multiple alleles – when **more than** the normal 2 alleles codes for a trait. (Example: blood typing)
Polygenic inheritance – When more than the usual 2 genes code for a trait.
(Example: height, skin color)

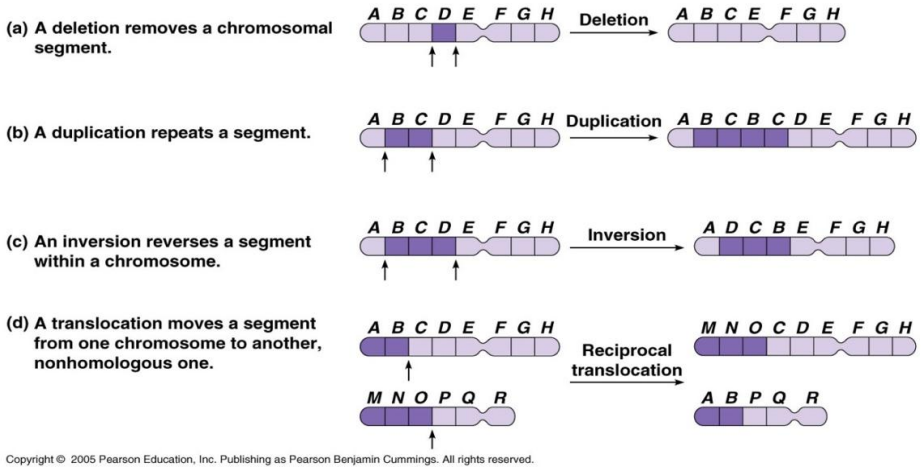
Multiple Allele Cross

Two parents think their baby was switched at the hospital. The mother has blood type A (homozygous), the father has blood type B and the baby has blood type AB.
Father's Genotype: BB or BO
Baby's Genotype: AB
Mothers Genotype: AA

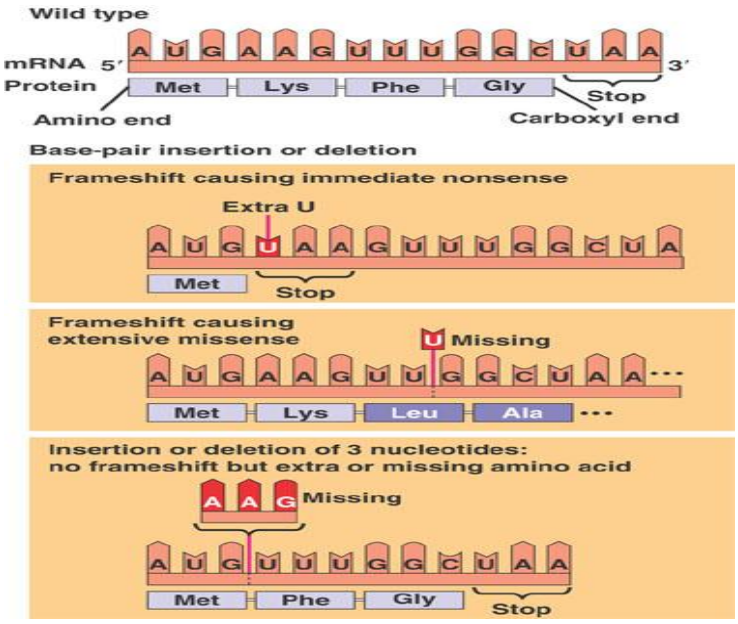
Was the baby switched? Unsure.
There are many people with the same Blood Type. Will need a DNA test.
Also in rabbits, black eyes are dominant to red eyes. A male rabbit that is homozygous for grey hair and has red eyes is crossed with a female rabbit with white hair that is heterozygous for black eyes.

Genotype of Mother: ggBb Genotype of Father: GGbb

Mutation Chromosomal:



Gene Mutations:



Genetic Engineering

Selective breeding – the process of breeding organisms that results in offspring with desired genetic traits. Genetic engineering allows scientists to put genes from one organism into another.

Genetically modified organism – organism whose genetic material has been altered through genetic engineering technology.

Gene splicing – a tool used in genetic engineering used to take genes from one organism and mix them with the DNA from another organism.

Scientists can put human genes into bacterial cells and get the bacteria to produce human **proteins** that the genes codes for. Example: Bacteria make human insulin for diabetes patients because the bacteria have been genetically engineered to carry human genes.

Scientists can use genetic engineering to give desirable traits to plants in **agriculture** .
Example: Drought-resistant plants, plants with pest resistance, plants with extra nutrients.

Gene therapy – the intentional insertion, alteration, or deletion of genes within an individual's cells and tissues for the purpose of treating a disease.

Cloning – a technique where scientists make a new organism with the genetic information from another.

DNA Fingerprinting is a process used to compare fragments of DNA. It can be used for the following:

- Paternity/Maternity testing
- linking a suspect to a crime scene
- testing for disease alleles

Evolution

Evolution is the process of change in a population of organisms over time.
There is evidence that shows that evolution has occurred:

1. The evidence of **fossils**: shows evidence of life in the past and changes over time.
2. **Homologous Structures**: similar bone and muscle arrangement when the anatomy of different organisms is compared. Although they are similar, they are often adapted for different functions when organisms are adapted to different environments.
3. **Comparative Biochemistry**: similar DNA and protein(amino acid) sequences between species. This shows a shared common ancestor.
4. **Comparative Embryology**: when organism share similar early stages of development.
5. **Vestigial Structures**: Structures that are useless in an organism. They show there is a common ancestor with other species that have a functioning structure. Example: human appendix; snake leg bones

Evolution by Natural Selection

1. **Overproduction** of offspring
2. Variation exists among offspring. The source of these variations are:
    - **Sexual Reproduction** (meiosis, crossing over, independent assortment, and fertilization
    - Mutations
    - ❖ Darwin did not know about any of these causes for variation at the time
3. Offspring struggle to survive (competition).
    - They compete for food, mates, territory, shelter, hide from predators.
4. Survival of the **fittest** or the **best adapted**.
5. Best adapted to reproduce and pass their genes to their offspring (high fitness)

Nature determines which organisms survive and reproduce.
Acquired characteristics (traits you get during your lifetime) are NOT passed to offspring!

Gene Pool – all of the alleles represented by individuals in a population.

Allele frequency – how common one allele appears in the population in comparison to another.
Example: For tongue rolling, **R** is dominant and makes up 55% of all the tongue-rolling alleles in a population, and **r** makes up 45% of the alleles for this trait.
If one of the tongue rolling traits is selected for (favored) then the frequency of that allele will increase over generations and the frequency of the other allele will decrease.

Sometimes the allele frequency of a population can change even when there is no natural selection. Often this is in a small population and is due to chance. This is known as **genetic drift.**

Founders effect – when a small number of organisms breaks off of an original population and forms a new one and does not accurately represent the gene pool of the original population.
The founder population may become **reproductively isolated** from the original population even if the populations are re-introduced.
This may happen through:

- **Geographic Isolation** (separation by physical geographic barriers)
- **Temporal Isolation** (they may mate at different times of the year)
- **Behavioral Isolation** (they develop different mating songs, rituals, colors)
- **Migration** of new individuals into the population may also change allele frequencies.

Ecology
Ecology is the study of the relationships between organisms and between organism and their physical environment.

Population – a population is all members of a species living in a given location.
Community – all of the populations interacting in a given location is known as a community.
Habitat – the physical location where a community lives is known as a habitat.
Ecosystem – all the members of a community and the physical environment in which they live is known as an ecosystem. This includes living and nonliving parts and all their reactions with each other.
Diversity - of an ecosystem measures the numbers of species living there and how common each species is.
Biosphere – the region of the Earth's surface where living things exist is known as the biosphere. This area includes soil, water and air.

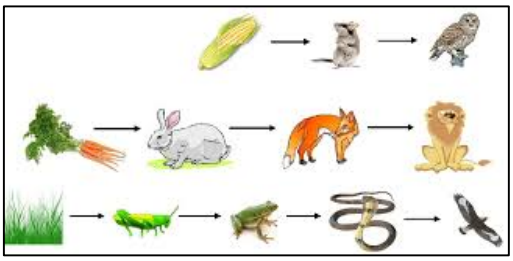
- An ecosystem must have a constant flow of energy through it
- There must be organisms that can use the energy for synthesis of organic compounds
- The main source of energy on the Earth's surface is sunlight, which is used by green plants, algae and other photosynthetic autotrophs.
- There must be a cycle of materials between living organisms and the environment in an ecosystem.

Abiotic Factors – abiotic factors in an ecosystem are physical factors that sustain the lives and reproductive cycles of organisms in that ecosystem. Example: sunlight, temperature, water and gases
These abiotic factors determine the types of organisms that live in a particular area. Therefore, they are **limiting factors.**
Biotic Factors – biotic factors are all of the living organisms in an environment. These directly or indirectly affect the environment. These interactions can include nutritional and symbiotic relationships.
Nutrition – all organisms in an ecosystem must obtain energy from somewhere.
Producers – Producers take in energy from their surroundings and store it as complex molecules. Most organisms do this through photosynthesis. Examples: plants, algae, some bacteria A
Autotrophic Nutrition – when organisms have the ability to make their own food. This means they can make organic compounds from inorganic compounds-usually through photosynthesis. **ALL <u>PRODUCERS</u> ARE <u>AUTOTROPHIC</u>**
Consumers – consumers must obtain their energy from other organisms (from consuming/eating them). Example: most bacteria, protists, fungi and animals.
Decomposers – decomposers eat organic wastes from other organisms and dead bodies.
DECOMPOSERS ARE <u>CONSUMERS.</u>
Heterotrophic Nutrition – a type of nutrition in which organisms must ingest preformed organic nutrients to obtain energy. **They must east something that is or was once living. ALL <u>CONSUMERS</u> ARE <u>HETROTROPHS</u>**
Herbivores - organisms that eat mostly producers (plants and algae)
Carnivores – organisms that eat mostly consumers (meat)

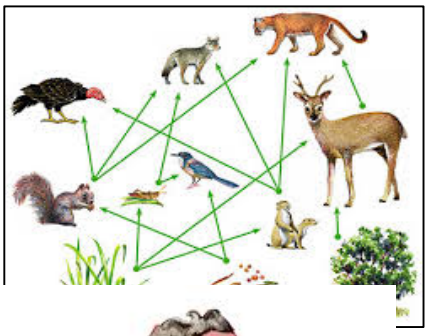
- Two types:
  - **Predators** – carnivores that hunt and kill their prey
  - **Scavengers** – carnivores that eat organisms that are already dead

Omnivores – organisms that eat both consumers and producers (meat and plants)
Saprophytes – organisms that obtain nutrients from the remains of other organisms.

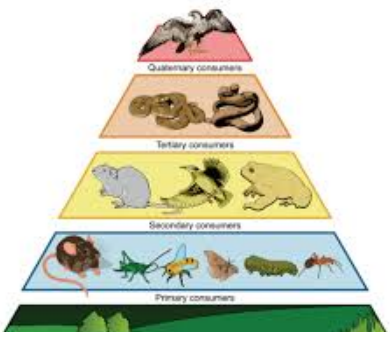
<u>Food chains-</u>Indicate energy flow between organisms



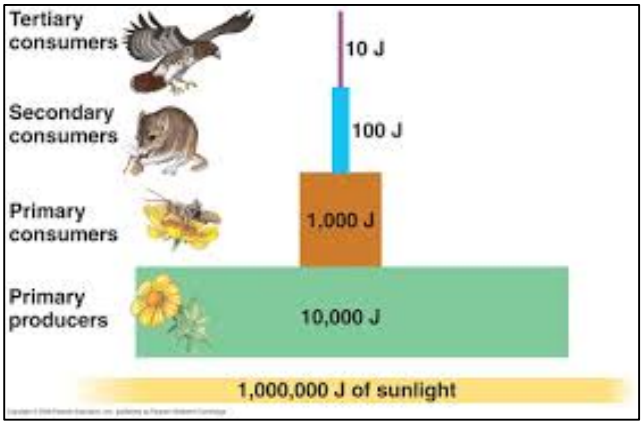
<u>Food webs</u>- Indicate energy flow in an ecosystem



<u>Trophic levels</u> –
Are assigned to indicate where organisms fit within an ecosystem and the feeding levels that they occupy.



Energy Pyramids-show the distribution of energy within an ecosystem as a numerical value.



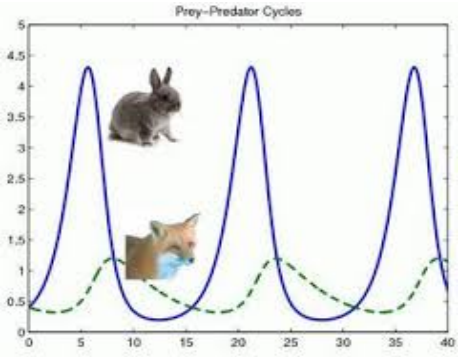
The 10% rule- indicates that only 10% of energy raises to each level of the pyramid because the majority of energy in a ecosystem is lost (or released as heat)

Biodiversity-refers to the number (and variety) of organisms found in an ecosystem.

Ecosystems favor ***greater biodiversity*** because the likelihood of adaptations to environmental changes increases as does genetic variation when the number of species increases.

Limiting factors on populations- the obvious requirement for all living things is a constant source of energy, however organisms also require: shelter, mates, etc to thrive, without these necessitates (populations will be limited) or if there are not enough of these requirements to go around competition can result. Competition can give rise to different ecological relationships.

Ecological relationships-



Organisms depend on each other for survival. Therefore changes in one population leave an impact on subsequent populations. This common graph of a predator and prey **(Predation)** show the direct relationships that are affected by population shifts.

This is indicative of only one ecological relationship. The other relationships in an environment may include: **mutualism, commensalism and parasitism.**

Mutalism-refers to a relationship where two organisms benefit each other, example: bees and flowers

Commensalism: is where one organism benefits and the other is unaffected, example: egrets and cattle- egrets are birds that benefit from the cattle because the cattle attracts insects which the egrets eat.

Parasitism- one organism is benefited and the other (the host) is harmed, example: ticks (helped) and dogs (harmed)

Nutrient cycling is the movement and exchange of organic inorganic matter back into the production of living matter. As stated above, organisms require other living (biotic) matter and non-living (abiotic) factors survival. These processes are regulated by food web pathways that decompose matter into mineral **nutrients**. **Nutrient cycles** occur within ecosystems.

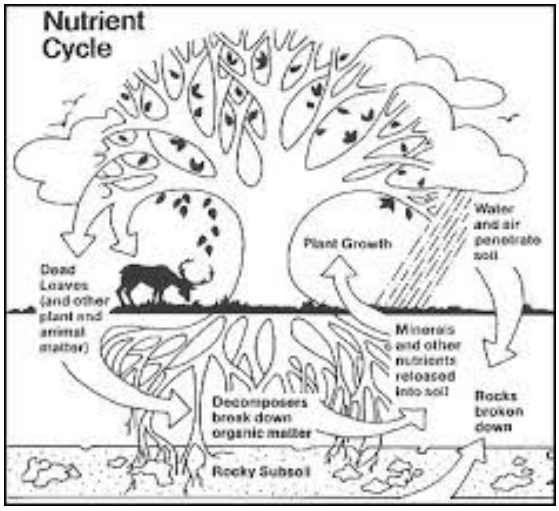
Commonly studied nutrient cycles-

-Water-this occurs through evaporation, condensation, precipitation, etc. and

-Oxygen- occurring as a result of (cell) respiration and photosynthesis for

Carbon- also occurs as a result of respiration and photosynthesis, but carbon is also added to the atmosphere through the burning of fossil fuels and other human activities.

Phosphorus- mostly commonly enters in to the ecosystem through the weathering of rocks.



-Nitrogen- this cycle involves several steps; nitrogen **fixation**, makes nitrogen usable by plants. Here bacteria change nitrogen into ammonium. **Nitrification** – occurs when ammonium gets changed into nitrates by bacteria. Nitrates are what the plants can then absorb. **Assimilation** - This is how plants obtain nitrogen through the absorption of nitrates from the soil into their roots. Then the nitrogen gets used in amino acids, nucleic acids, and chlorophyll. **Ammonification**-is part of the decaying process. When a plant or animal dies, decomposers like fungi and bacteria turn the nitrogen back into ammonium so it can reenter the nitrogen cycle. **Denitrification** – occurs when extra nitrogen in the soil gets put back out into the air. There are special bacteria that perform this task as well.

Biomes-are designated areas of land categorized by the climate and vegetation that they exhibit. Common examples include >>>>>>>>>>>>>>>>>>>>>>>>>>>>>

Terrestrial Biome	Common Plants/ Animals	Interesting Features	Weather/Climate
Rainforest	Gorilla, Vine snake Banyan Tree, Peacock plant	Two types of rainforest: Temperate and Tropical	Warm weather (tropical) Cold (temperate)
Tundra	Arctic Fox Caribou, Lichen	Permanent ice exists meters from surface	-60F (Winter) 50F (Warmest weather)
Taiga	Moose, hawk owl Needles, conifer	Winters are cold Summers are warm	-65F (Winter) 20F (Summer)
Desert	Yucca, cactus Dingo	Deserts are caused by rainshadow effect	excess of 100 degrees
Temperate	Cardinal, turkey	Changes seasons	50 degrees Fahrenheit
Grasslands	Lion, Ostrich Prarie flowers	No bushes in grasslands	10-30 inches of rain per year