

Name: _____ Biology Teacher: _____ Period: _____

SOL Review Packet

Use the attached informational packet to CREATE products to earn Extra Credit Points for Marking Period 4.
Making a product IS studying for the SOL!!

What you need to do:

For as many sections as you'd like extra credit points, create one of the following:

- Mind Map
- Informative Brochure
- Flashcards/Notecards
- Informative Poster
- Foldable
- Comic
- 3-D Model
- Sample T.E.I. Question

There are 21 sections total. If you make **one** product for **each** section (21 products), that gives you 21 points to add anywhere* in the gradebook for 4th marking period!!!!

When is it due?

No later than 2:05, Friday, April 17th. You must turn it in to your Biology teacher. If your teacher is absent on the 17th, turn it in to any other BIOLOGY teacher. You do not have to turn in all products at once. You can turn them in as you complete them.

Absolutely no late products will be accepted.

How do you know WHAT to make?

It's up to you. Look at the information and do what makes sense. You have creative control.

What if I need help?

Biology teachers will be staying after school Tuesday, March 31; Tuesday, April 14th and Thursday, April 16th. However, this assignment is for YOU to do. Teachers will help you with materials and answer questions you may have about the content, but they WILL NOT tell you exactly what to do or have examples for you to copy.

*Points cannot be added to assignments you failed to do; you may not add points to an assignment with a ZERO.

You CAN Pass Your Biology SOL!

Scientific Method

****Scientists use the **SCIENTIFIC METHOD** to help them answer questions and solve problems about the natural world.****

Step 1: Make an **OBSERVATION**. The two types are:

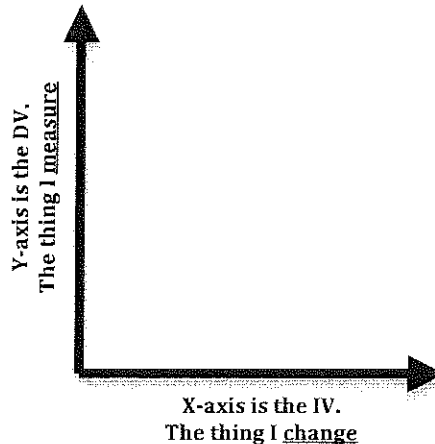
- **QUALITATIVE:** Descriptions without number. (Ex) The book is heavy.
- **QUANTITATIVE:** Descriptions that use numbers. (Ex) The book has 250 pages.

Step 2: Make a **HYPOTHESIS**. This is an educated guess based on qualitative and quantitative data.

⇒ Scientist should look for 2 variables in trying to find answers to the problem.

- ◇ **INDEPENDENT VARIABLE (IV)**
-The thing I change
- ◇ **DEPENDENT VARIABLE (DV)**
-The thing I measure

How to Identify Variables on a Graph:



Step 3: Setup a **CONTROLLED EXPERIMENT**. Each has:

1. **CONTROL GROUP:** the group that stays the same (doesn't receive the IV). It's needed to compare.
2. **EXPERIMENTAL GROUP:** the group that is manipulated (the group you are performing the experiment on). This group receives the IV.

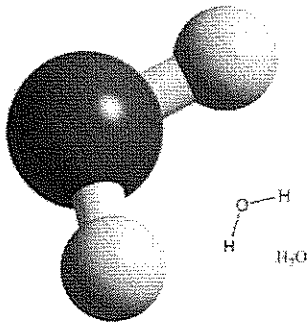
Step 4: Make a **CONCLUSION** or **THEORY**

- ⇒ If the data gathered from your controlled experiment support your hypothesis, you accept your conclusion.
- ⇒ If the data doesn't support your hypothesis, start over!

Water & its Properties

Water makes life possible! It's a universal solvent, comes in three states, and has a high specific heat to regulate temperature

The chemical formula of water is H_2O . It has 2 hydrogen and 1 oxygen.

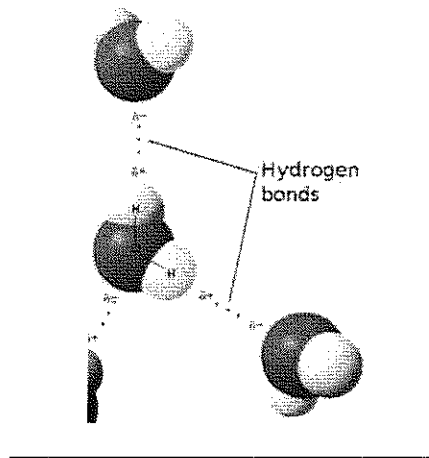


Water has a positive side (hydrogen) and a negative side (oxygen). These charges allow water to stick to other things that also have a charge.

HYDROGEN BONDS hold water to itself and to other charged substances.

When water sticks to other things (like a car window) **ADHESION** is taking place.

When water sticks to itself **COHESION** is taking place



Water comes in 3 states: solid, liquid or gas. In the solid state (ice), water is less dense than the liquid state. Ice floats!

Water has a **HIGH SPECIFIC HEAT**. It can absorb a lot of energy without increasing its own temperature. This is why water takes so long to boil!

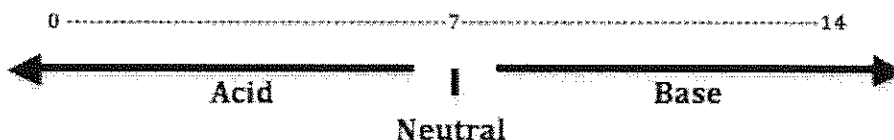
- We use this property to help us regulate our body temperature. When our body temperature gets too high, we start to **PERSPIRE** (sweat).

We do not want our body temperature to fluctuate very much because it would alter chemical reactions (**METABOLISM**). When metabolism is thrown off, **HOMEOSTASIS** (balance) is also thrown off. This can lead to death!!!!

pH Scale

Substances with a pH below 7 are called **Acids**. Substances with a pH above 7 are called **Bases**. Substances with a pH of 7 are **Neutral**. Water is the only neutral substance.

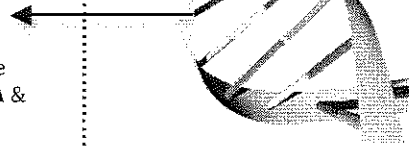
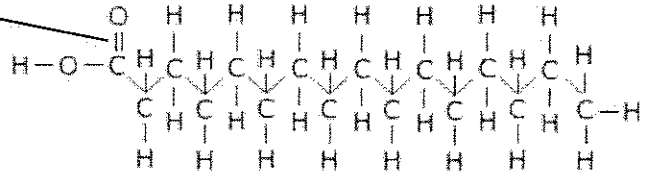
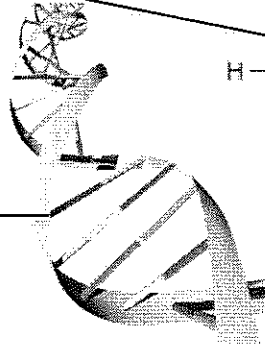
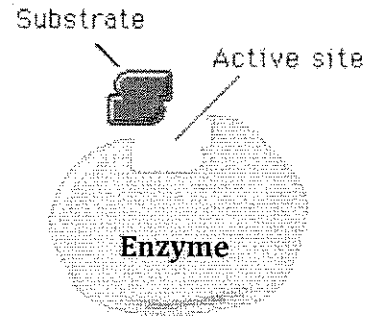
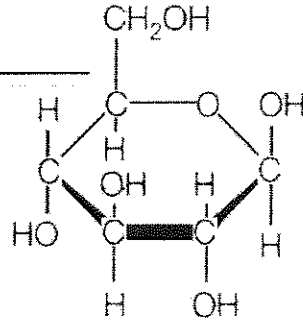
The pH scale actually measures the amount of **HYDROGEN IONS (H⁺)** that are present in a solution. pH could stand for "THE POWER OF HYDROGEN." The **lower** the pH value, the **greater** the amount of hydrogen ions (H⁺) present in the solution



Macromolecules

*All living things are composed of 4 macromolecules. Macromolecules are large **polymers** (the prefix "poly" means "many") that are composed of lots of smaller building blocks called **monomers** (the prefix "mono" means "one").*

1. **Carbohydrates:** The only macromolecule that is used for **ENERGY**. Carbohydrate is a fancy word for **SUGAR**. The most important sugar is **GLUCOSE** ($C_6H_{12}O_6$). The building blocks of carbohydrates are **MONOSACCHARIDES**.
2. **Lipids:** The only macromolecule used to **STORE ENERGY** and to provide **INSULATION**. There are three classes of lipids (fats, oils & waxes). The building blocks of lipids are **FATTY ACIDS**.
3. **Proteins:** The only macromolecule that can **SPEED UP CHEMICAL REACTIONS** and provide **STRUCTURE & SUPPORT**. The building blocks of proteins are **AMINO ACIDS**.
4. **Nucleic Acids:** The only macromolecules that **TRANSMITS HEREDITY INFORMATION**. There are two types of nucleic acids: **DNA & RNA**. Their building blocks are **NUCLEOTIDES**.



Enzymes are biological catalysts. They speed up chemical reactions and regulate metabolism. Enzymes are proteins that can lower a chemical reaction's activation energy

Enzymes

Enzymes are **CATALYSTS**. Catalysts **SPEED** things up!

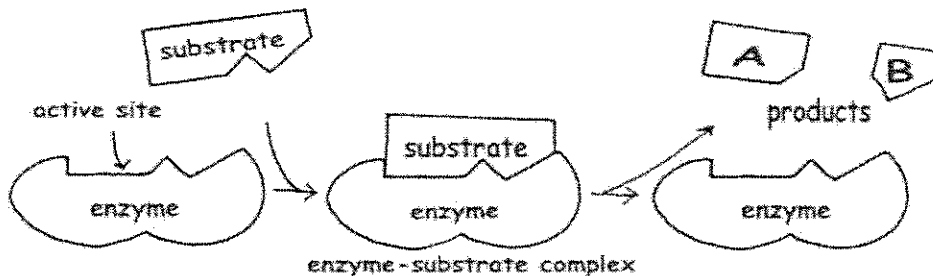
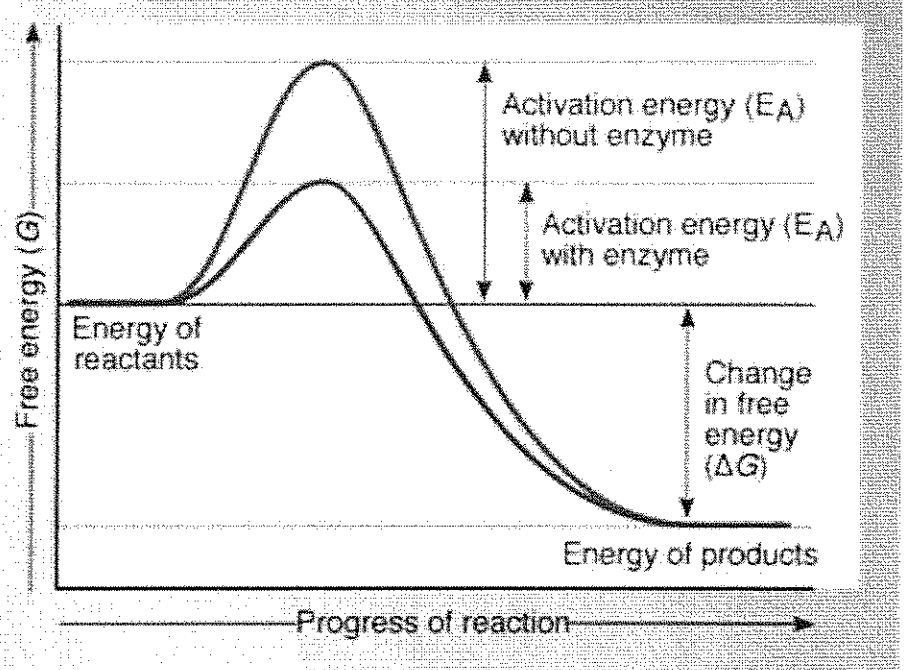
Without enzymes, chemical reactions (metabolism) would happen too slowly to keep you alive.

Enzymes are shape specific. Enzymes can only catalyze reactants (**Substrates**) if they can fit inside the enzyme's **ACTIVE SITE**.

Enzymes speed up chemical reactions by **LOWERING ACTIVATION ENERGY**. Activation energy is the amount of energy needed to start a chemical reaction.

Activation Energy works like a speed bump.

- The **bigger** the activation energy the **slower** the chemical reaction
- The **smaller** the activation energy the **faster** the chemical reaction.



The microscope is one of the most important tools in biology. It allowed scientists to discover the cell and all of its structures.

There are only 2 things that you need to know about microscopes:

- Determining Total Magnification:** Multiply the eyepiece (that is always 10x) by the objective lens (the lenses that can be rotated)

10 x Objective Lens = Total Mag.

- Making a Wet-Mount Slide:** Always place the cover slip on at a 45° Angle to prevent air bubbles.

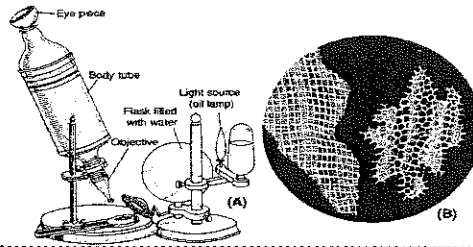
Microscopes & the Cell

Once the microscope was invented, **ROBERT HOOKE** was able to see and name the tiny structures that make up life while studying cork. He was the first person to use the word **CELL**.

With the help of Hooke and other scientists working with the microscope, the **CELL THEORY** was created.

THE CELL THEORY:

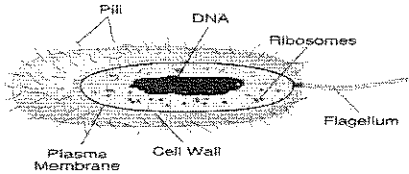
- All living things are composed of cells.
- Cells are the basic units of structure and function of life.
- Cells can only come from pre-existing cells.



****Everything living things is made up of at least one cell. Cells are the lowest level of structure of living things that can still perform all the activities (metabolism).****

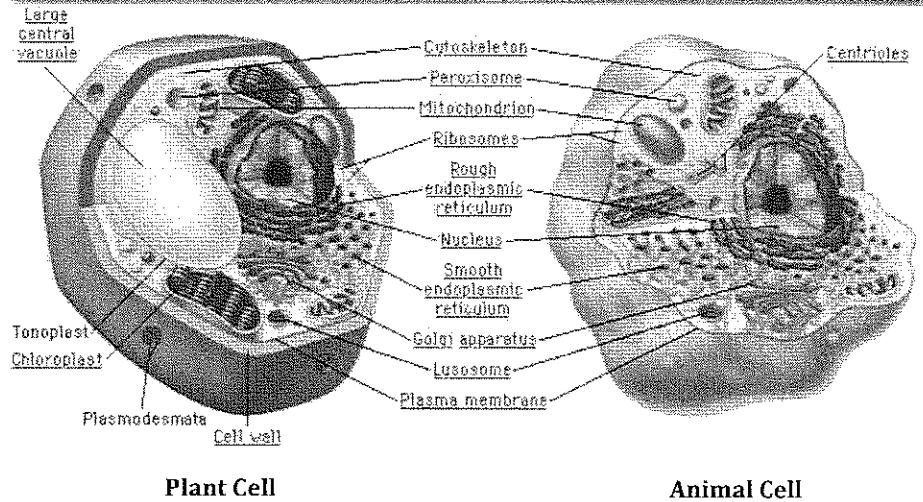
All living things are made up of only one of two type of cells: **PROKARYOTIC CELLS** or **EUKARYOTIC CELLS**.

- Prokaryotes** are simple, small, and lack a nucleus. The only example of a prokaryote is **BACTERIA**.



- Eukaryotes** are complex, large, and contain a nucleus and lots of organelles. All protists, fungi, plants and animals are made up of eukaryotic cells.

Cell of Eukaryotes

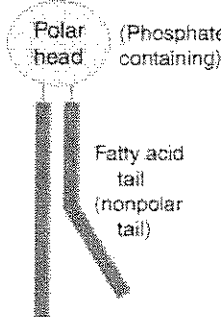


Plant Cell

Animal Cell

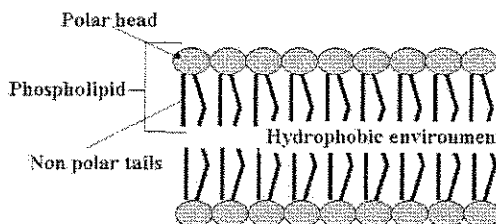
****Eukaryotes contain membrane-bound **ORGANELLES**. Each organelle performs a specific job in the cell to help maintain metabolism and homeostasis.****

- NUCLEUS:** This is the control center of the cell. It contains the cell's DNA and controls the cell's metabolism and homeostasis.
- MITOCHONDRIA:** This is the power plant of the cell. The cell's energy supply (ATP) is made here via **CELLULAR RESPIRATION**.
- RIBOSOMES:** These are the sites of protein synthesis for the cell.
- GOLGI APPARATUS:** This is the post office of the cell. It packages and exports materials in and around the cell.
- ENDOPLASMIC RETICULUM:** There are two kinds: smooth and rough. Both help to move things around the cell. They work like a system of roads in the cell.
- LYSOSOMES:** These are the garbage cans of the cell. They break down waste.



- CHLOROPLAST:** This is found in plants and is the site of photosynthesis.
- CELL WALL:** This is a rigid layer found on the outside of plant cells. It gives plant cells their unique rectangular shape.
- CELL MEMBRANE:** This surrounds all cells. It maintains homeostasis by controlling what can enter and leave the cell.
 - It's composed of two layers of **PHOSPHOLIPIDS**.
 - The **PHOSPHOLIPID BILAYER** has a polar head and two non-polar tails. This allows things that are **small** and **non-polar** to cross the membrane without asking for permission.

Plasma membrane



- Food and raw materials for chemical reactions must be able to cross the membrane.
- Waste must be able to leave the membrane.

Transport

****Substances need to be able to travel into and out of cell across the cell membrane. This movement can either happen spontaneously (by itself) or with the input of energy (ATP)****

There are two types of transport: **PASSIVE** & **ACTIVE**

1. **PASSIVE TRANSPORT:** This moves substances across membranes from regions of high concentration to low concentration without energy.
2. **ACTIVE TRANSPORT:** This moves substances across membranes from regions of low concentration to high concentration with energy (ATP)
 - Examples: **Endocytosis** & **Exocytosis**

There are 3 types of **PASSIVE Transport:**

1. **DIFFUSION:** the movement of substances from a region of high concentration to low concentration.
2. **OSMOSIS:** the movement of water from a region of high concentration to low concentration.
3. **FACILITATED DIFFUSION:** the movement of substances from high to low with the help of a transport protein.



******CELLULAR RESPIRATION** and **PHOTOSYNTHESIS** are processes that allow cells to use and make energy to keep the cell alive. They have a cyclical relationship with one another. They depend on one another!****

Cellular Respiration

CELLULAR RESPIRATION is a process that turns sugar (**glucose** $C_6H_{12}O_6$) into usable energy for the cell (**ATP**).

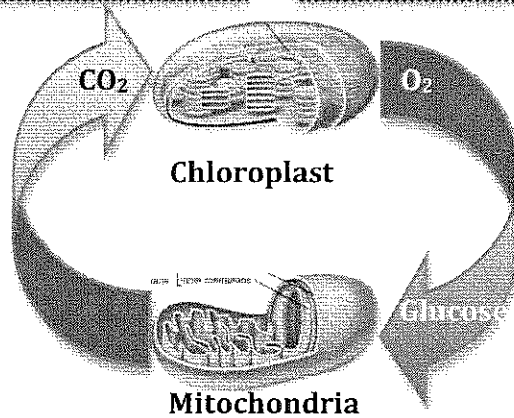
HETEROTROPHS (organisms who cannot make their own food) use this process to release ATP from food in the **MITOCHONDRIA**.

- **INPUT (Reactants):** Mitochondria take in **oxygen** and **glucose**
- **OUTPUTS (Products):** Mitochondria release **carbon dioxide** and **ATP!!!!**

Photosynthesis

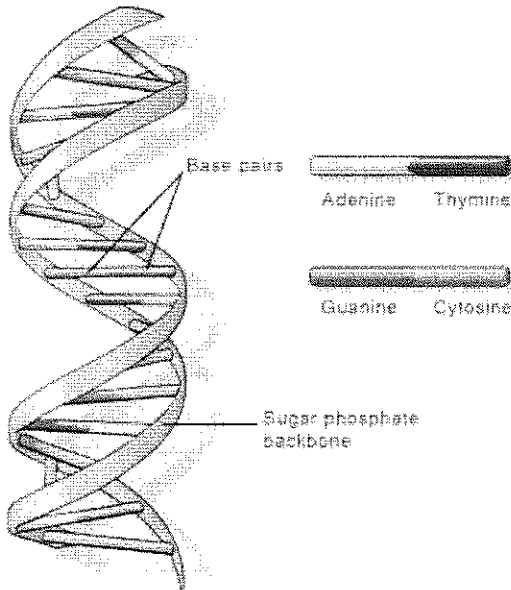
PHOTOSYNTHESIS is a process that turns light energy from the sun into food (**glucose**) for plants. Plants and organisms that make their own food are called **AUTOTROPHS**. Autotrophs perform photosynthesis in their **CHLOROPLASTS**.

- **INPUT (Reactants):** Chloroplasts take in **carbon dioxide** and sunlight.
- **OUTPUTS (Products):** Chloroplasts release **oxygen** and **glucose**.

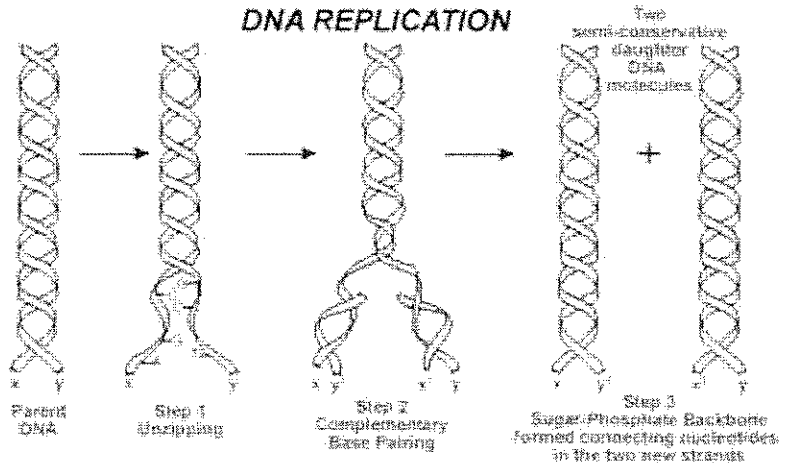


Metabolism

******DNA** is a double-helix composed of 2 complementary strands. It has 4 nucleotides composed of either A, T, C, or G: A pairs with T, G pairs with C. This structure makes **DNA REPLICATION** and **PROTEIN SYNTHESIS** possible!****



DNA REPLICATION

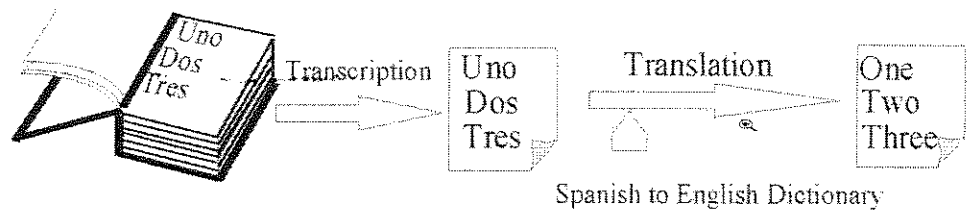


When DNA needs to divide, **DNA REPLICATION** begins. The weak **hydrogen bonds** that are holding the two strands of DNA together break apart and the DNA "unzips." The two original strands of DNA then become templates for new daughter strands of DNA that will form.

DNA

****The process of turning DNA into proteins follows a specific order. It starts in the nucleus and ends at the ribosome.****

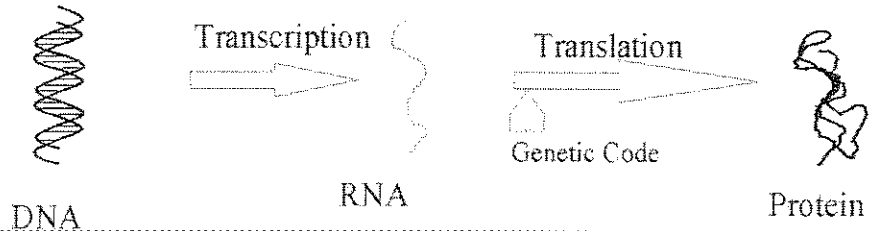
First, DNA is turned into **MESSENGER RNA (mRNA)**. RNA is the skinny cousin of DNA which means it can leave the nucleus. RNA is single-stranded. It one strand looks almost identical to DNA with the exception of the nitrogen base **URACIL**. Uracil takes the place of thymine, so **U** pairs with **A**.



- ◆ Making RNA from DNA is called **TRANSCRIPTION**.

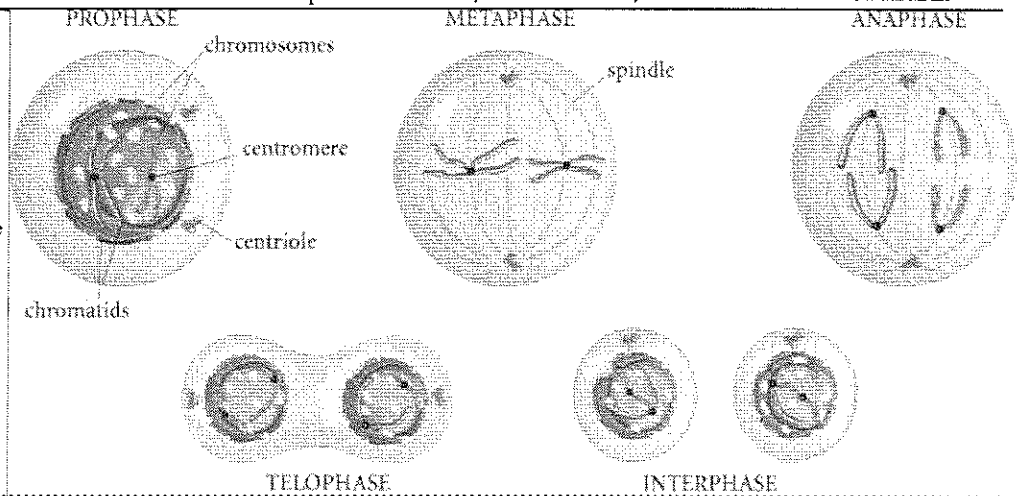
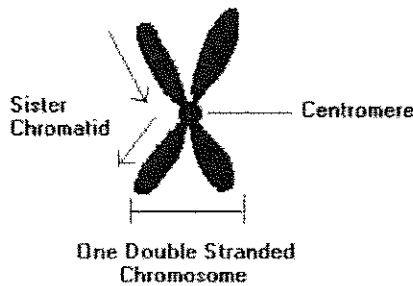
Next, the message transferred from DNA to mRNA makes its way to the ribosome (the site of protein synthesis).

- ◆ Making proteins from mRNA is called **TRANSLATION**.



****DNA is the cell's genetic material. It must be copied before the cell can divide. To help with this, the DNA is packaged into structures called **CHROMOSOMES**. Humans have 46 chromosomes that must be copied exactly before the cell can divide. The process of cell division is called **MITOSIS**. Mitosis has 4 steps: **PROPHASE, METAPHASE, ANAPHASE & TELOPHASE**.****

Chromosome Structure:



******GENETICS** is the study of heredity. A **GENE** is a basic unit of heredity. An **ALLELE** is one of two or more alternative forms of a specific gene. Two alleles make up a gene. **GREGOR MENDEL** crossed peas to develop the genetic theory we still use.****

There are two types of alleles:

- DOMINANT ALLELES:** The expressed trait. Represented by a capital letter.
- RECESSIVE ALLELES:** The unexpressed trait. Represented by a lowercase letter.

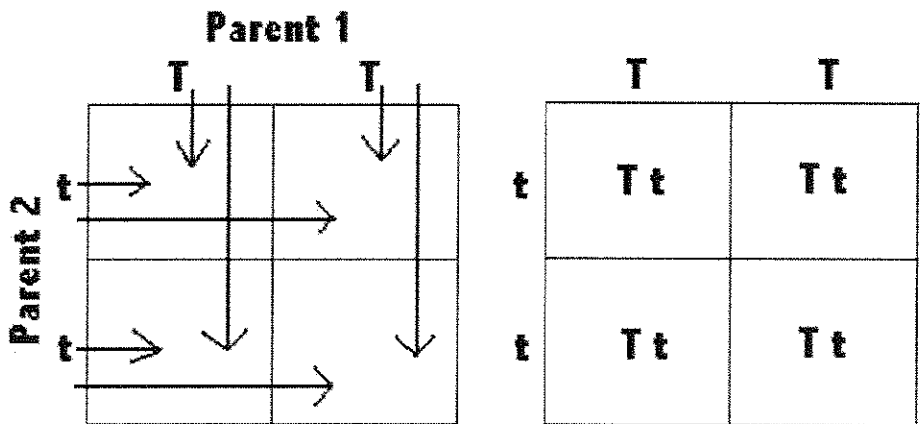
The two letters (representing two alleles) represent an organism's **GENOTYPE**. There are two types of genotypes:

- HOMOZYGOUS:** two identical alleles (TT) or (tt)
- HETEROZYGOUS:** two different alleles (Tt)

The expression of the genotype (physical appearance of the gene) is the **PHENOTYPE**.

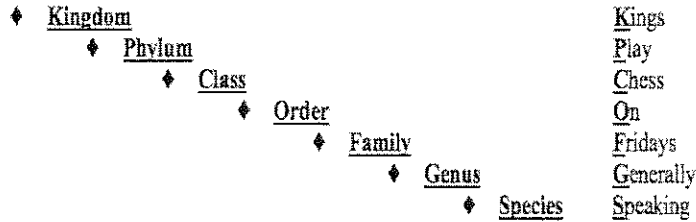
We can use the parent genotypes to predict what offspring might look like. **Monohybrid crosses** can be completed by using a **PUNNET SQUARE**.

Example of a monohybrid cross: Consider a cross between a true breeding tall plant (TT) and a true breeding short plant (tt).



****All of life can be classified in one of 6 kingdoms. Each kingdom can be broken down into even smaller units for classification. The modern day classification system is based on a two-word naming system called **BINOMIAL NOMENCLATURE**. This naming system involves an organism's **GENUS** and **SPECIES**.****

Taxonomic Ranking System:



The 6 kingdoms of the life are:

1. **Archaeobacteria:** Prokaryotic organisms that are only found in extreme environments.
2. **Eubacteria:** Single-celled, prokaryotic organisms that can cause sickness (Example: streptococcus & salmonella)
3. **Protist:** Single-celled, eukaryotic organisms that can be either heterotrophic (protozoa) or autotrophic (algae).
4. **Fungi:** Multicellular eukaryotic organisms with cell walls composed of **chitin**. These organisms are external digesters (heterotrophic).
5. **Plant:** Multicellular eukaryotic autotrophs with cell walls composed of **cellulose**.
6. **Animal:** Multicellular eukaryotic heterotrophs that do not have cell walls.

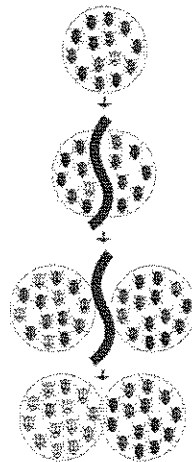
Remember...

- ⇒ Similar genera are united into a **family**
- ⇒ Similar families are combined into an **order**
- ⇒ Similar orders are collected into a **class**
- ⇒ Similar classes are united into a **phylum**
- ⇒ Similar phyla are collected into a **kingdom**

******EVOLUTION** is the process by which species change over time. It's brought on by the process of **NATURAL SELECTION**. Natural selection allows for individuals with certain traits to successfully survive and reproduce, passing those traits to the next generation.****

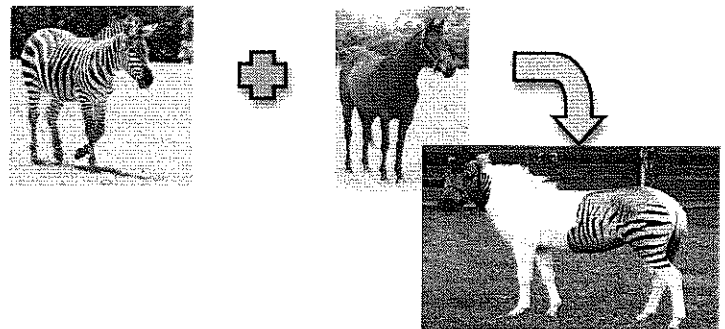
SPECIATION is the process by which new species arise.

- There are two mechanisms that can lead to new species:
 - **Geographic Isolation:** the physical separation of species populations by geographic barriers (Example: oceans and mountains)
 - **Reproductive Isolation:** Isolation **WITHOUT** the presence of a physical barrier. (Example: One group of individuals only mates in the fall, and another only reproduces in the spring.)



A **SPECIES** is a group of individuals that can interbreed and produce fertile offspring.

-The horse and zebra are both members of their own species. How do we know? When we force them to mate, their offspring (a zebroid) is not fertile.



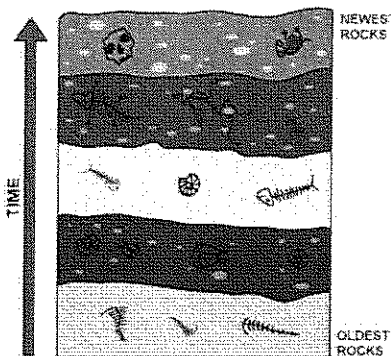
Evidence for Evolution

****Scientists have 3 areas of focus that provide evidence for evolution.****

1. Fossils

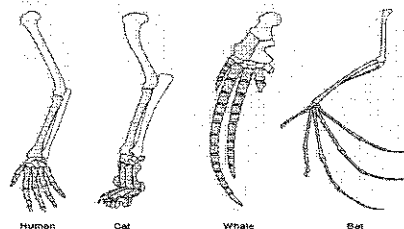
Scientists can use layers of undisturbed rock to determine the relative age of fossilized organisms. The **OLDEST** fossils will always be at the bottom of the column and the **YOUNGEST** at the top.

➢ This technique is called the **PRINCIPLE OF SUPERPOSITION**.



2. Anatomy

HOMOLOGOUS STRUCTURES: Structures that look **SIMILAR** to one another. These demonstrate descent from a **COMMON ANCESTOR (Divergent Evolution)**



ANALOGOUS STRUCTURES: Different structures that perform similar functions. The environment forces unrelated individuals to develop structures to perform similar function. **NO COMMON ANCESTOR! (Convergent Evolution)**

3. Biochemistry

Remember: Organisms that have more DNA in common are closely related! This means that organisms that have more proteins in common are also closely related.

Look at the amino acid chain of unknown animal:

Met-Gly-Ser-Tyr-Tyr-Arg-His-His-Glu-Lys

It most closely resembles?

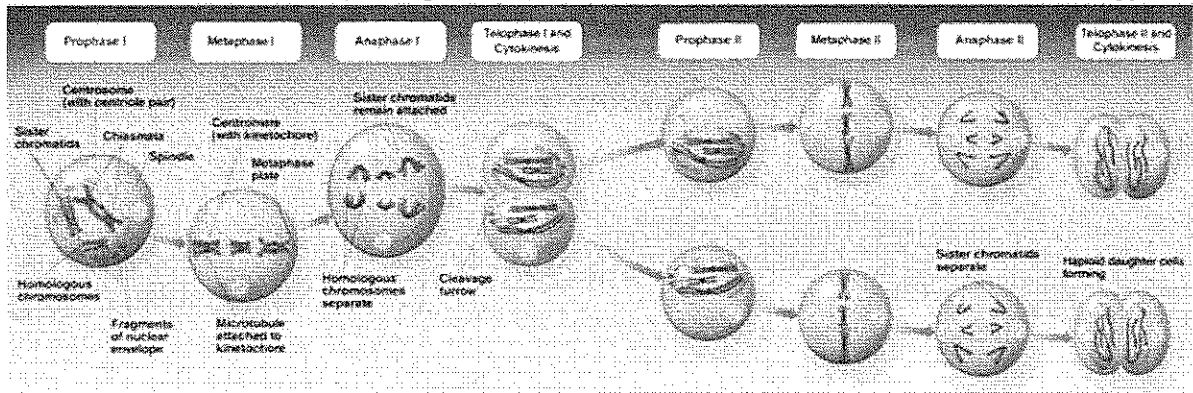
- Horse: Met-Gly-Ser-Ser-Tyr-Arg-Arg-Asp-His-Glu
- Dog: Met-Gly-Ser-Tyr-Tyr-Arg-His-Asp-Glu-Lys
- Cat: Met-Gly-Ser-Tyr-Tyr-Arg-His-Arg-Cys
- Mouse: Met-Gly-Ser-Tyr-Tyr-Arg-His-Glu-Val-Val

Our unknown animal is most closely related to the **dog!** There's only 1 difference in the protein sequence.

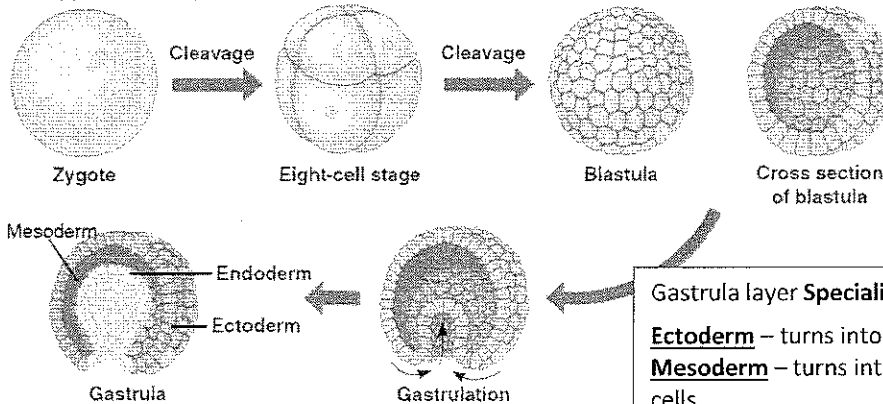
Met-Gly-Ser-Tyr-Tyr-Arg-His-**Asp**-Glu-Lys

Meiosis, Gametes & Development

Meiosis is a specialized cell division that reduces the chromosome count in half (**Haploid**). The process occurs in the **gonads (testes & ovaries)** and produces the sex cells (**gametes or sperm & egg**). Meiosis includes 2 sets of cell divisions: **PMAT 1** and **PMAT 2** (see stages below). The result in males is **4 sperm**, in females is **1 viable egg**.



In sexual reproduction, the sperm and egg unite, called **fertilization**, which create the first cell of the baby, called the **zygote**. The **zygote** goes through the following developmental stages as it grows:



The embryo reaches the **Gastrula** stage in which it folds in on itself forming 3 main **germ layers**. The cells in these layers become **specialized** for specific functions.

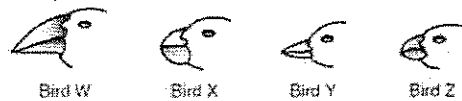
Gastrula layer Specialization:
Ectoderm – turns into skin and nervous system cells
Mesoderm – turns into muscle and cardiovascular cells
Endoderm turns into digestive and respiratory cells

Taxonomy

When new species are discovered, taxonomists must give them a **scientific name**. These names are based on a formal naming system of **Binomial Nomenclature** developed by **Carolus Linnaeus**. The **scientific name** consists of the **genus** (first letter of genus is capitalized) & **species** (written in lower case) names, usually come in **latin** or **greek**, and are *italicized* if typed and underlined if handwritten. For example:

Humans: *Homo sapiens* or Homo sapiens

A **Dichotomous Key** is a tool used by scientists to identify species of organisms. It consists of a group of paired statements/choices, based on characteristics, that the reader chooses between, that will eventually narrow the physical traits down to a specific species name/scientific name.

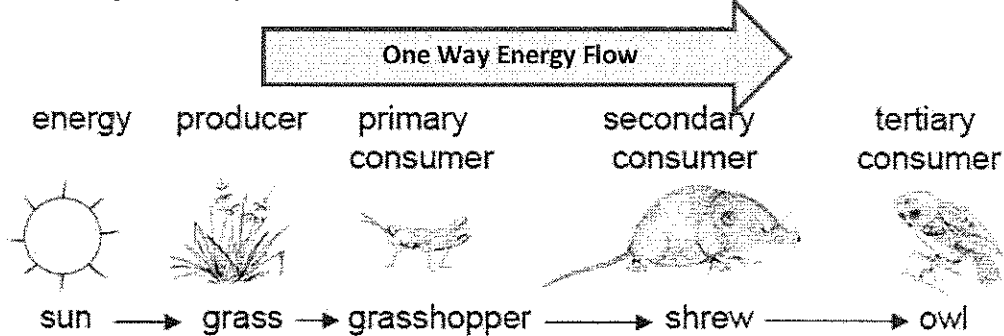


Dichotomous Key to Representative Birds	
1. a. The beak is relatively long and slender.....	Certhia
b. The beak is relatively stout and heavy.....	go to 2
2. a. The bottom surface of the lower beak is flat and straight.....	Geopelia
b. The bottom surface of the lower beak is curved.....	go to 3
3. a. The lower edge of the upper beak has a distinct bend.....	Camathyrachus
b. The lower edge of the upper beak is mostly flat.....	Platysura

Living systems can be organized into groups. Each word below contains the group that comes before it. For example: Tissues are a group of cells. A community is a group of populations.

Cells → Tissues → Organs → Organ Systems → Organism → Population → Community → Ecosystem → Biome → Biosphere

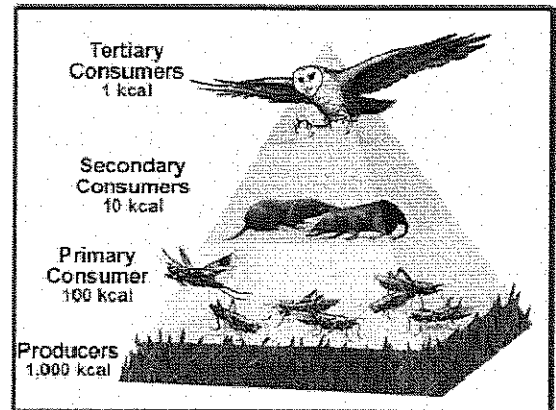
Energy flows through an ecosystem in **one direction** as seen in the Food Chain below:



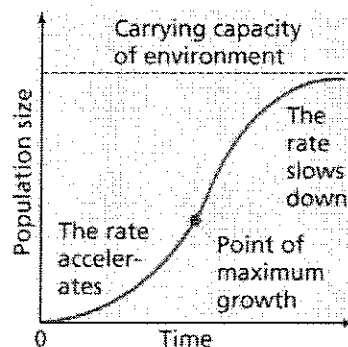
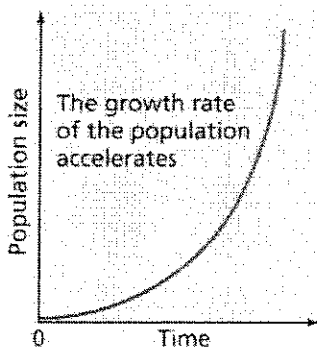
Decomposers & Saprobies (ex: Fungi & Bacteria) and Detritivores (ex: Earthworms & Maggots) are responsible to breaking down dead organic matter.

The **10% Rule** tells us that only 10% of the **energy** available in a trophic level is transferred to the next level. The other **90%** is lost as heat.

The **Energy pyramid** pictured to the right displays the available energy at each level in kilocalories (kcal). Each level is reduced by 90% - 1,000 kcal, 100 kcal, 10 kcal, 1 kcal (lost as heat). Less energy is available at the top of the food chain, therefore there is less **Biomass** at this level. (**Biomass** = amount of living matter)



Growth of a Population can be **Exponential**, as seen in the **J-Curve graph** (below left). This occurs when a population grows quickly in a short amount of time. Organisms that are able to produce large quantities of offspring in a short time such as **Bacteria** or **insects** will usually show a J-curve population graph. An **S-Curve graph** (below on right), displays a



population whose **Initial Growth** is slow, but quickly has a period of **Exponential Growth**, and then reaches a phase where it levels off and tries to maintain the **Carrying Capacity**. **Carrying Capacity** is the number of organisms an environment can support based on availability of resources. It is usually represented by a **dotted line** on a graph, or by the letter **"K"**.

Organisms can live in close physical association with one another. There are 3 types:

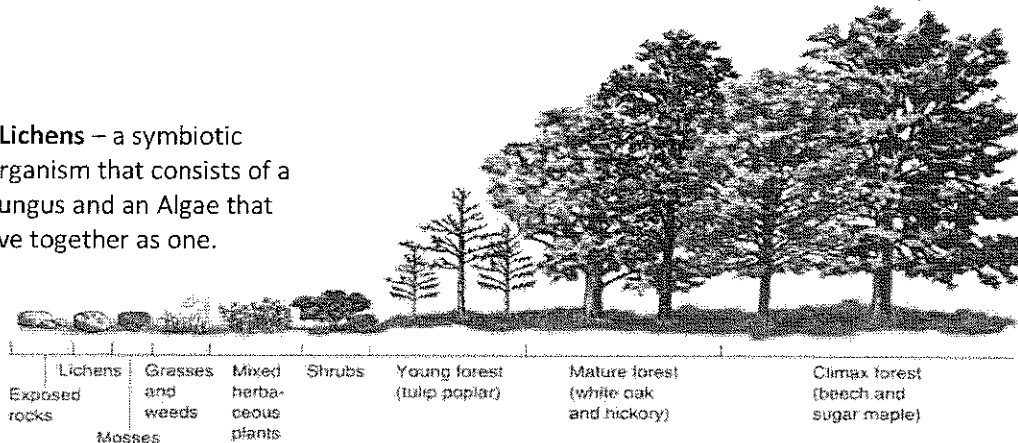
- **Mutualism** - both organisms benefit from the relationship (ex: bacteria in the human gut)
- **Commensalism** – one benefits, the other neither benefits or is harmed (ex: barnacles on a whale)
- **Parasitism** – one benefits, but the other is harmed (ex. Parasites – ticks on a dog)

Communities change over time. This is called **Succession**. There are 2 types of **Succession**:

Primary Succession	Secondary Succession
Begins with no life	Follows removal of existing biota
No soil present	Soil already present
New area (e.g. volcanic island)	Old area (e.g. following a bush fire)
Lichen and moss come first	Seeds and roots already present
Biomass is low	Biomass is higher

Pictured below is a community undergoing **Primary Succession**. The **Pioneer Species** is the first to colonize an area. In this community, the **Pioneer Species** is **Lichens***. A **Climax Community** is the mature, final stage of a community. The **Climax Community** includes the **Beech & Maple Trees**.

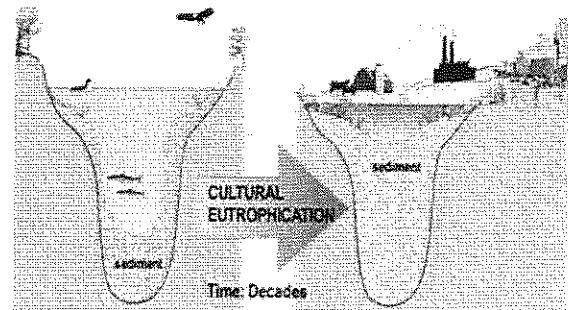
*Lichens – a symbiotic organism that consists of a Fungus and an Algae that live together as one.



Our planet is constantly changing. Natural **cycles** balance and regulate **Earth** and its atmosphere. Human activities can cause changes to these natural **cycles**.

Nitrogen Cycle processes:

- Nitrogen-Fixation by bacteria on plant roots
- Fertilizer run-off from agriculture
- **Eutrophication** is the enrichment of an ecosystem with chemical nutrients, typically compounds containing nitrogen, phosphorus, or both. **Eutrophication** can be a natural process in lakes, occurring as they age through time.



Carbon Cycle processes:

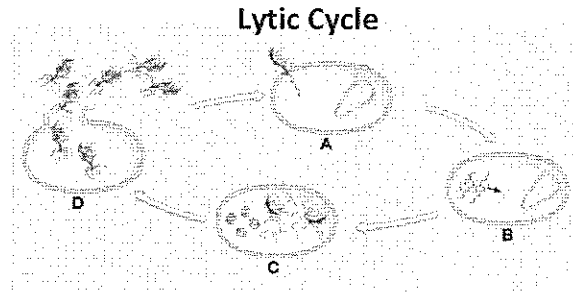
- Photosynthesis uses Carbon Dioxide
- Cell Respiration produces Carbon Dioxide
- Human Activities such as burning Fossil Fuels/Combustion produces Carbon Dioxide

Viruses are not considered to be living things. This is because:

- (1) They are not made of at least one cell
- (2) They cannot reproduce on their own, and depend on a **host cell** to multiply

Viruses reproduce within a **host cell** by a process known as the **Lytic Cycle**.

The virus injects its genetic code into the host cell. The viral DNA or RNA uses the host cell's metabolism to break down cell parts to use as raw materials to build new viruses. New viruses are assembled and break out of the cell (**lyse**), killing the cell in the process. Each new virus that is released can potentially repeat this process with surrounding cells.



Viruses are made of a **protein coat** surrounded by either **DNA** or **RNA** (one type of RNA virus is called a **Retrovirus**, such as **HIV**). **Viruses** cause disease. Common examples are:

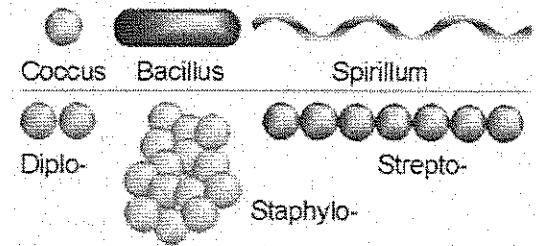
Viral diseases cannot be treated using antibiotics. Some viral diseases can be prevented by receiving a **Vaccination**. **Vaccines** are substances prepared from a dead or weakened form of the virus, that stimulates the production of **antibodies** without causing the person to get sick. **Antibodies** are **proteins** in the blood that are part of the **Immune System** & fight off **pathogens**.

Virus Name	Disease Name
HIV	Aids
Influenza	Flu
Rhinovirus	Common Cold
Varicella Zoster	Chicken Pox
Rubella	Measles

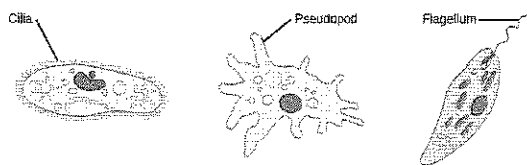
Bacteria are microorganisms that are unicellular and made of **Prokaryotic** cells. Bacteria are found everywhere! They can live in colonies. Bacteria have 3 main shapes and arrangements:

Bacteria are very important for the following reasons:

- ✓ **Symbiotic** – they live within other organisms, such as cows and humans to help with processes such as digestion
- ✓ **Nitrogen-Fixation** – another symbiosis, but with plant roots, where they convert atmospheric nitrogen into a useable form
- ✓ **Cause Disease** – such as Strep Throat, Tuberculosis & Lyme Disease



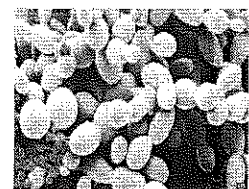
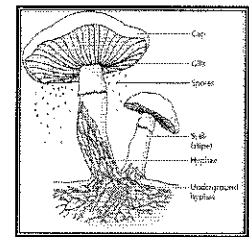
PROTISTS



There are **Plant-Like**, **Animal-Like (Protozoans)** & **Fungus-Like** protists. **Algae** is a multicellular Plant-like protist. There is red, green and brown algae. **Diatoms** are a type of protist made of geometrically shaped shells of silica (glass). **Dinoflagellates** cause the **Red Tide**, which causes toxic build up in the water & can make people sick if they eat shellfish from these areas. **Trypanosoma** is a protist that causes African Sleeping Sickness & **Plasmodium** causes **malaria**.

FUNGI

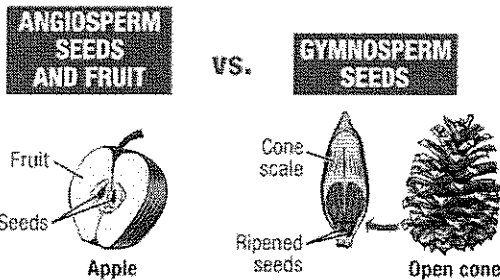
Most fungi are multicellular, such as **Mushrooms, Mold & Bracket Fungi**. **Yeast** is an example of a unicellular fungus. Fungi can reproduce asexually by **Budding & Spores**. Diseases such as **Ringworm, Athlete's Foot & Jock Itch** are caused by fungi. Fungi are **decomposers**, they do **NOT** photosynthesize. When they decompose, they break down dead organic matter and absorb it.



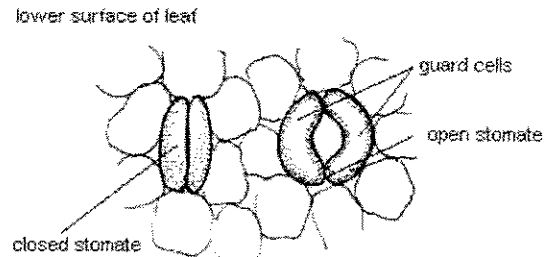
There are 2 main groups of **Animals: Vertebrates & Invertebrates.**

Invertebrates (no backbone)		Vertebrates (backbone)	
Porifera	Filter feeders; asymmetry, Sponges	Jawless Fish	No jaw, some parasitic, Hagfish
Cnidaria	Soft body, radial symmetry, Jellyfish	Cartilaginous Fish	Cartilage skeleton, Sharks, Rays
Flatworms	Bilateral, tissues, Planaria, Tapeworm	Bony Fish	True bones, Bass, Perch, Tuna, Trout
Roundworms	Many are parasitic, Hookworms	Amphibians	No scales, no claws, Frogs, Salamander
Segmented worms	Segmented, mouth & anus, Earthworm	Reptiles	Scales, claws, Snakes, Lizards, Turtles
Mollusks	Soft body, muscular foot, Octopus	Birds	Feathers, hollow bones, beak
Arthropods	Exoskeleton, jointed legs, Bugs, Crabs	Mammals	Fur, feed young milk, Humans, cows
Echinoderms	Spiny skin, tube feet, starfish		

Plants can be **vascular** or **non-vascular**. **Vascular plants** are divided into 2 main groups: **Gymnosperms & Angiosperms.**



Leaves are covered with small holes called **Stomata** that regulate the movement of gases. **Transpiration** is a process that also occurs through these openings.

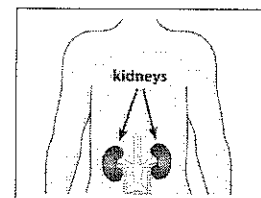
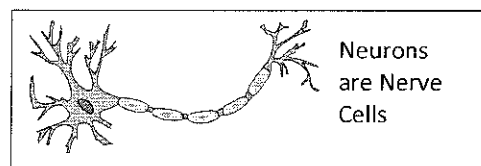
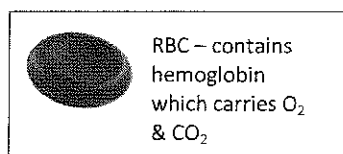


Plant responses to their environment are called **tropisms**.

- **Phototropism** – bend toward light
- **Gravitropism** – roots grow down, stems up
- **Thigmotropism** – respond to touch & wrap around objects as they grow

There are **11 organ systems** in the human body.

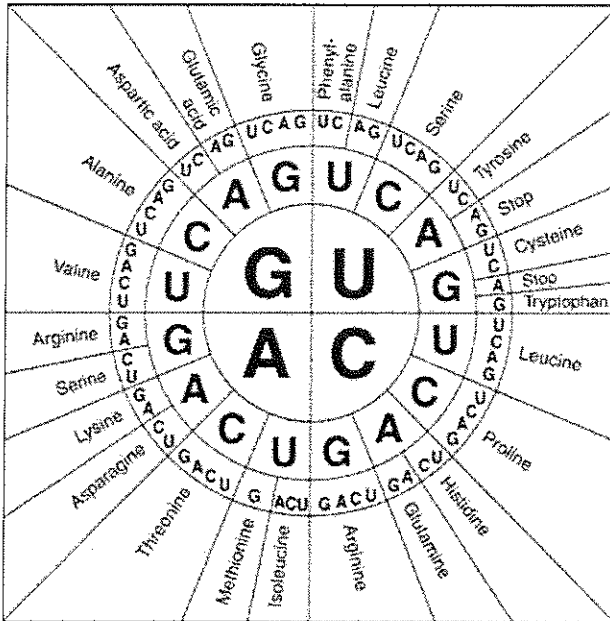
- ❖ **Integumentary System** – maintains homeostasis, first line of defense against germs, insulation – includes skin, nails, hair
- ❖ **Skeletal System** – support and protection, blood is made in the red bone marrow – includes bones & ligaments
- ❖ **Muscular System** - movement and support – includes muscles and tendons
- ❖ **Nervous System** – to respond to stimuli, controls body functions, internal communication – includes brain, spinal cord and neurons
- ❖ **Endocrine System** – excretion of hormones; works to control body functions – includes adrenal glands, testes, ovaries, pituitary gland – hormones such as insulin, testosterone, estrogen, adrenaline
- ❖ **Cardiovascular System** – transport of oxygen and nutrients via blood – includes heart, veins, arteries
- ❖ **Lymphatic (Immune) System** – fights off disease – includes tonsils, spleen, lymph nodes, WBCs
- ❖ **Respiratory System** – obtains oxygen & releases carbon dioxide – includes lungs, trachea (windpipe)
- ❖ **Digestive System** – breaks down food to obtain nutrients – includes esophagus, stomach, intestines
- ❖ **Urinary System** – removes metabolic wastes from blood – includes kidneys, urinary bladder
- ❖ **Reproductive System** – creation of gametes, production of offspring – includes ovaries, uterus, vagina, testes, penis



Coding for Proteins

DNA carries the genetic code for how to build Proteins. Proteins build important structures in your body such as: **muscles, antibodies, hemoglobin & hormones**. Amino acids are the building blocks for Proteins. RNA functions to build Proteins using the code from DNA. mRNA copies DNA in the nucleus and forms **codons**. Codons are 3 nitrogenous base sequences that code for amino acids. 1 **codon** codes for 1 **amino acid**. mRNA carries the code out to the **Ribosomes** in the cytoplasm and tRNA reads mRNA's codons and brings in the correct **amino acids** to build the **polypeptide** a.k.a. **Protein**.

Two versions of the **codon chart** are pictured below & have all known **amino acids** along with the **codons** that code for each:



Codons Found in Messenger RNA

		Second Base				
		U	C	A	G	
First Base	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Stop Stop Stop	Cys Cys Stop Trp	U C A G
	C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
	G	Val Val Val Val	Ala Ala Ala Ala	Asp Asp Glu Glu	Gly Gly Gly Gly	U C A G
						Third Base

Online Study Resources

The following sites are good resources to help you study for your Biology SOL:

www.solpass.org

<http://education.jlab.org/solquiz/>

http://www.doe.virginia.gov/testing/sol/practice_items/

<http://www.iq.poquoson.org/science.htm>

http://www.wise.k12.va.us/alted/sol/sol.htm#BIOLOGY_TUTORIAL_SITES

<http://www.bozemanscience.com/>