

New Bedford Public Schools
Division of Adult & Continuing Education

New Bedford High School Evening Extension

2019 – 2020 School Year
Trimester III

Learning Packet
for
Biology

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this packet at the email address listed above.

Due date: **April 7, 2020**

☺ The Big Picture: A Review of General Biology ☺

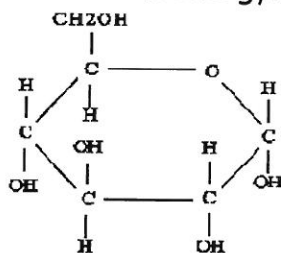
Cells and Their Processes

Organic Compounds

- A compound is a combination of 2 or more atoms
- An organic compound is a compound that contains carbon atoms that have combined with each other
 - Carbon can bond to a number of different atoms so carbon can form many different types of compounds
- An inorganic compound is a compound with no combination of carbon atoms
- 6 most common elements in organic molecules: SPONCH-sulfur, phosphorus, oxygen, nitrogen, carbon, hydrogen

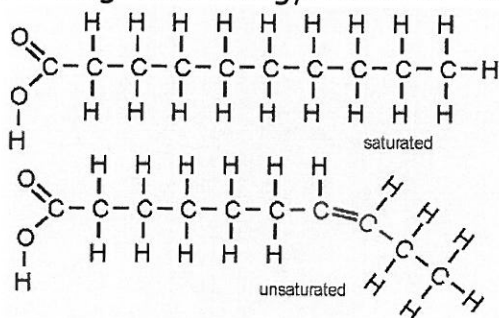
The Four Types of Organic Compounds (The Molecules of Life)

- Carbohydrates: Sugars used for short term energy; Made of monosaccharides

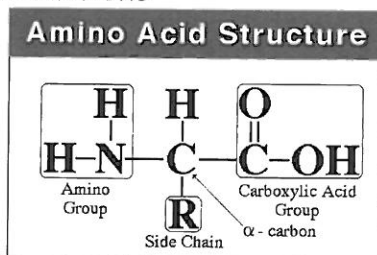


Glucose

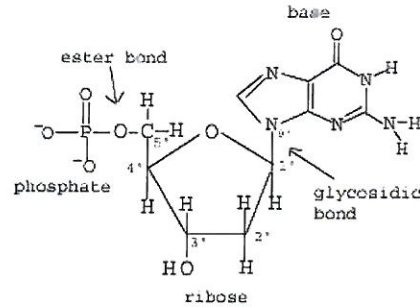
- Lipids: Fats and oils used for long term energy; Made of fatty acids



- Proteins (also called a polypeptide): Made up of amino acids; used for construction materials and chemical reactions in the body
 - Enzymes: Special types of proteins that speed up chemical reactions in the body but are not changed by the reactions



- Nucleic acids: DNA and RNA; contains genetic information; made up of nucleotides

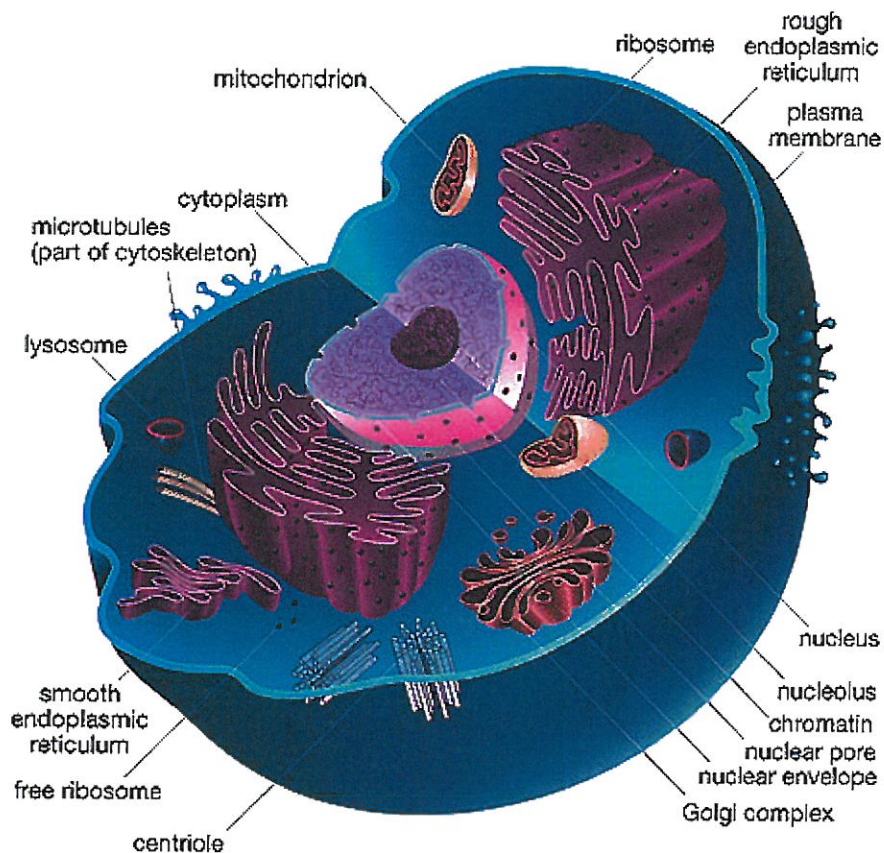


Cells

- A cell is the smallest unit that is alive and can carry on all the processes of life
- Cells make up organisms (living things)
 - Unicellular organisms are made up of 1 cell
 - Multicellular organisms are made up of many cells
- Cells contain organelles, which are specialized compartments that carry out a specific function
- Types of cells
 - Eukaryotic cells contain a nucleus, such as animal and plant cells
 - Prokaryotic cells contain no nucleus, such as bacteria

Animal Cells

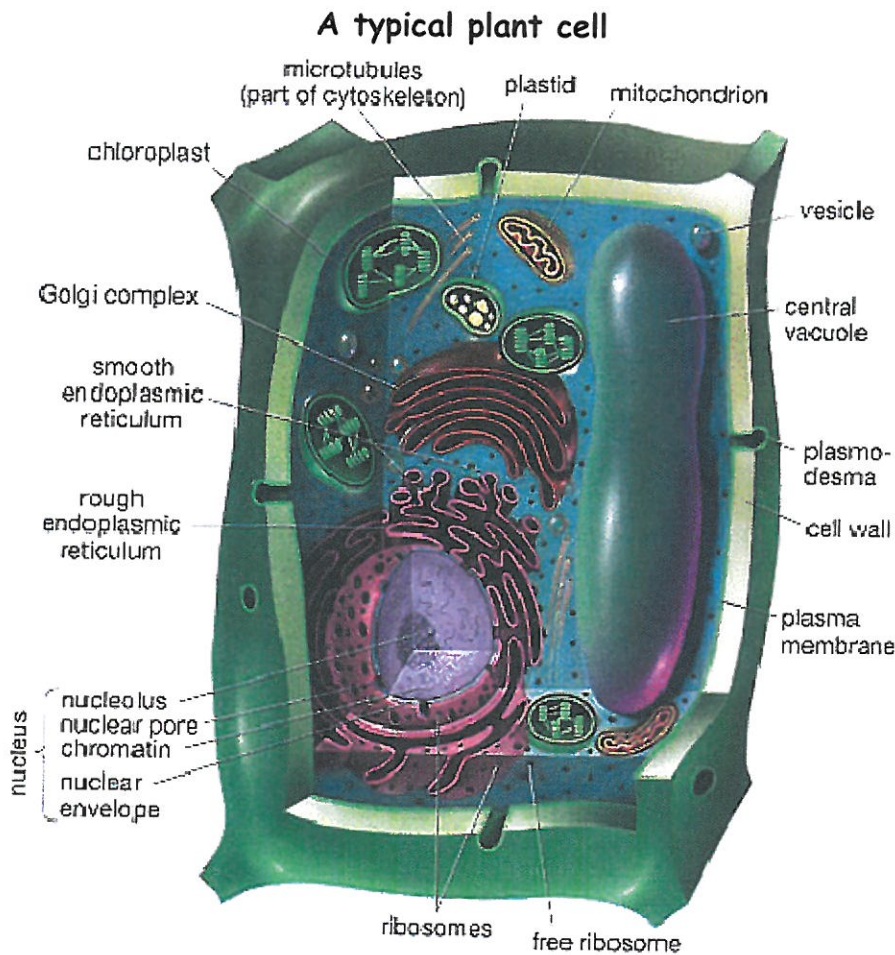
- Usually round



- Organelles include
 - nucleus: controls cell activities
 - cell membrane: controls what enters and leaves the cell and also protects the cell
 - endoplasmic reticulum (ER): tunnels for compounds to move through the cell
 - Golgi body: processes and stores protein
 - Ribosomes: make proteins
 - Mitochondria: Makes energy for the cell
 - Lysosome: Has enzymes that digest waste and old organelles
 - Cytoplasm: Fills the empty space of the cell
 - Vacuole: Stores food, water, and waste
 - Centrioles: Help in cell division and is only found in animal, not plant, cells

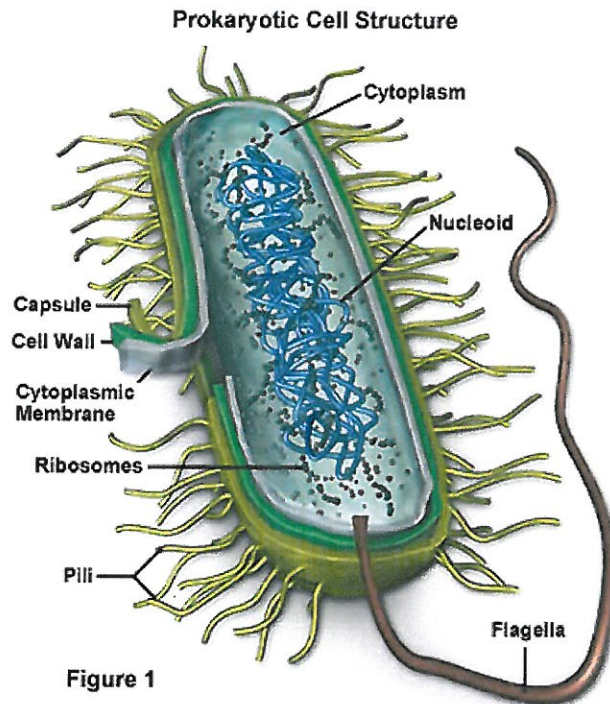
Plant Cells

- Usually square



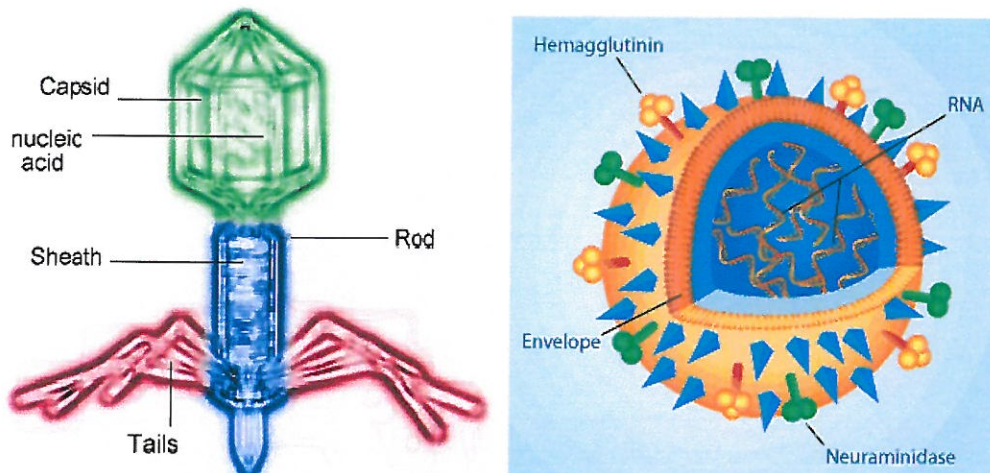
- Organelles include
 - Everything that an animal cell has plus more
 - Chloroplast: Traps sunlight to make food for the plant
 - Cell wall: Protects the cell

Bacterial cells



- Smaller and simpler than plant or animal cells
- Bacteria are unicellular
- No nucleus
- Have a single closed loop of DNA, cell wall, cell membrane, cytoplasm and ribosomes
- Some have a capsule (shell for protection), pili (short hair like structures to hold onto host cells), and flagella (whip like structure for movement)

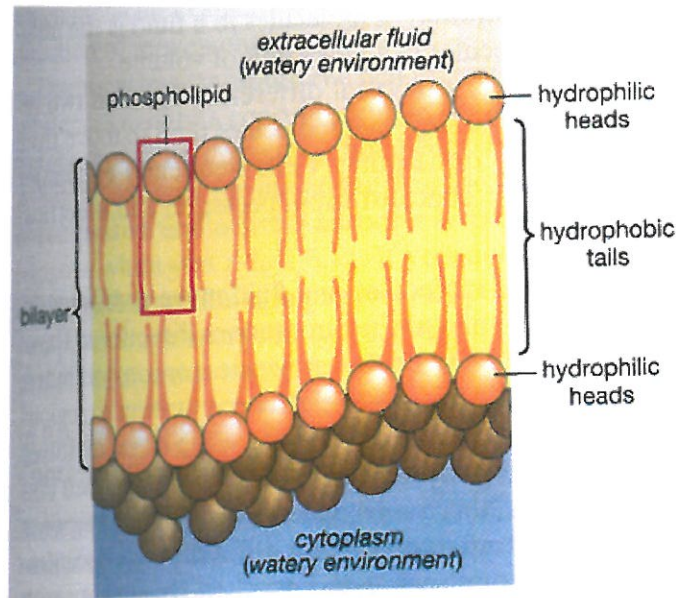
Viruses



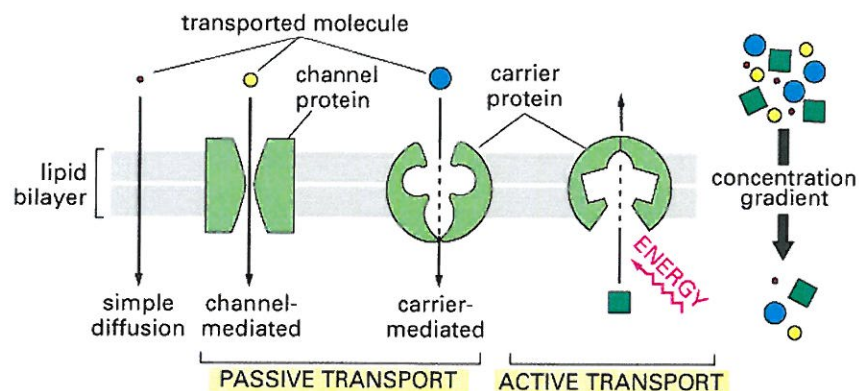
- Noncellular entities with a simple structure and cannot reproduce on their own
- Much smaller than a bacterial, animal or plant cell
- Parts of a virus
 - Nucleic acid inside the virus - can be either DNA or RNA
 - Capsid: protein coat to protect the nucleic acid inside the virus
 - Spikes: help the virus to attach to host cells

- There is much controversy on whether viruses are alive or not because they cannot reproduce on their own—They do not have the organelles needed to reproduce
 - Viruses must invade a living cell and use the cell's tools to reproduce
 - Host cell: An animal, plant or bacterial cell that is invaded by a virus
 - Viruses harm and/or kill the host cell that they infect

Cell membrane



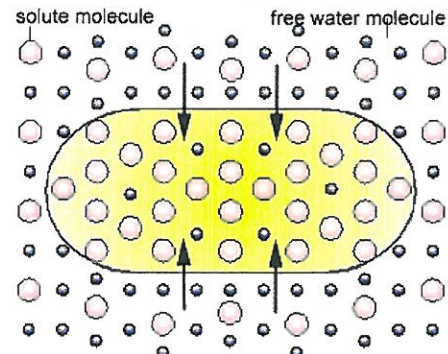
- Made up of molecules called phospholipids
- Phospholipid bilayer is the 2 layers of phospholipids that make up the cell membrane
- Cell membrane is fluid, which means that it is constantly flowing and moving over the cell
- Cell membrane is selectively permeable, which means that it allows small compounds, but not large ones, to pass right through
- There are different ways that materials are transported across the cell membrane



- Passive transport: requires no energy
 - Diffusion: compounds move from high to low concentration
 - Osmosis: diffusion of water
- Active transport: requires energy
 - Endocytosis: large compound are brought into the cell
 - Exocytosis: large compounds are exported out of the cell

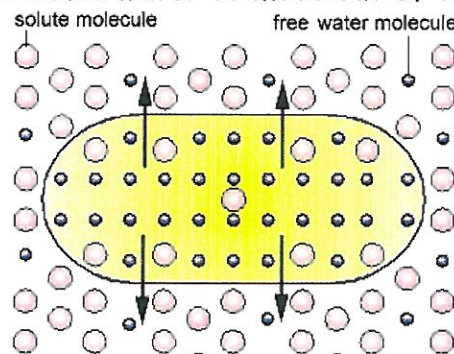
- Types of solutions

- Hypotonic solutions cause water to move into the cell so the cell swells up



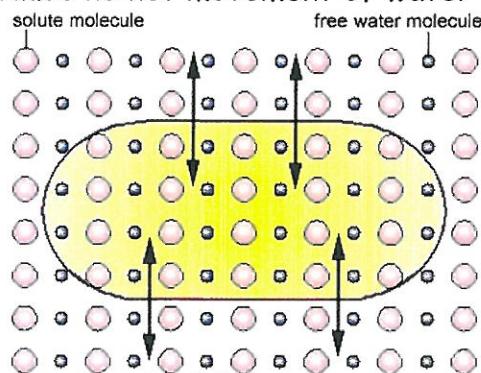
Hypotonic Environment:
The solute concentration is greater inside the cell;
the free water concentration is greater outside.
Free water flows into the cell.

- Hypertonic solutions cause water to move out of the cell so the cell shrivels up



Hypertonic Environment:
The solute concentration is greater outside the
cell; the free water concentration is greater inside.
Free water flows out of the cell.

- Isotonic solutions cause no net movement of water into or out of the cell



Isotonic Environment:
The solute concentration and the free water
concentration are the same inside and
outside the cell.
Water flows in and out of the cell at an equal rate.

Photosynthesis

- Process by which organisms use energy from sunlight to make their own food (glucose)
- Glucose is a simple sugar
- Photosynthesis occurs in the chloroplasts of plant cells and some bacteria
- Chloroplasts have a green pigment called chlorophyll

- Steps of photosynthesis
 - 1. Light reaction: chlorophyll in the chloroplasts absorbs sunlight
 - 2. Dark reaction: The energy from the sunlight is used to make glucose
- Light energy is completely changed into chemical energy (glucose)
- Chemical equation for photosynthesis

$$6\text{CO}_2 + 6\text{H}_2\text{O} + \text{light energy} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$$

Cellular Respiration

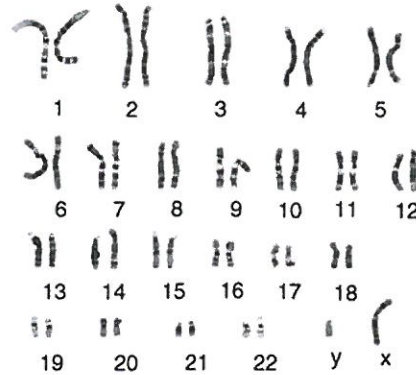
- Process that breaks down glucose in order to make energy for an organism
- ATP: compound that stores energy in an organism
- Occurs in the mitochondria of the cell
- Two types of cellular respiration
 - Aerobic respiration: requires oxygen to occur
 - Mostly happens in animals and plants
 - There are 3 steps in aerobic respiration
 - Step 1 is glycolysis: glucose is cut in half
 - Step 2 is the citric acid cycle: glucose halves get electrons chopped off of them
 - Step 3 is the electron transport chain: electrons combine with oxygen and are used to make a lot of ATP
 - Chemical equation for respiration

$$\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{ATP energy}$$
 - Aerobic respiration is the opposite of photosynthesis
 - Anaerobic respiration: does not require oxygen to occur
 - Mostly happens in bacteria and yeast
 - Also called fermentation
 - Makes less ATP than aerobic respiration

Chromosomes

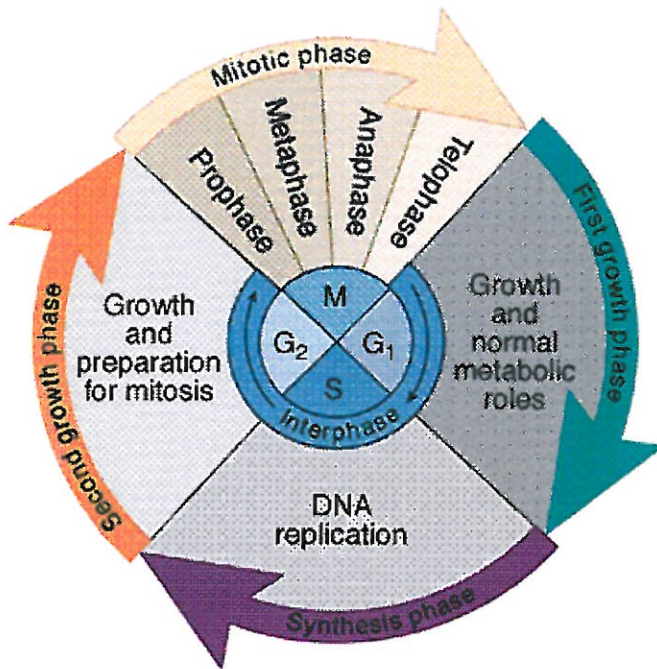
- DNA strands in the nucleus that contain the directions on how to make and keep an organism alive
- Made up of genes, which are traits of an organism
- Cells will die if their DNA is damaged or removed
- Humans have mostly diploid cells, which means that we have 2 of each type of chromosome
 - Homologous chromosomes are 2 of the same type of chromosome
 - We have 23 types of chromosomes but...
 - We have 46 chromosomes in all,
 - 23 chromosomes from mom + 23 chromosomes from dad
- Human gametes (sperm and egg cells) are haploid cells, which means that they have 1 of each type of chromosome
 - Sperm and egg cells have 23 chromosomes in all
- Autosomes: Chromosomes that do not determine gender

- Sex chromosomes: Chromosomes that determine gender
 - Girls are XX, Boys are XY
- Karyotype: ordered picture of an organism's chromosomes
 - Healthy individuals have 2 of each type of chromosome
 - Individuals with Down Syndrome have three #21 chromosomes

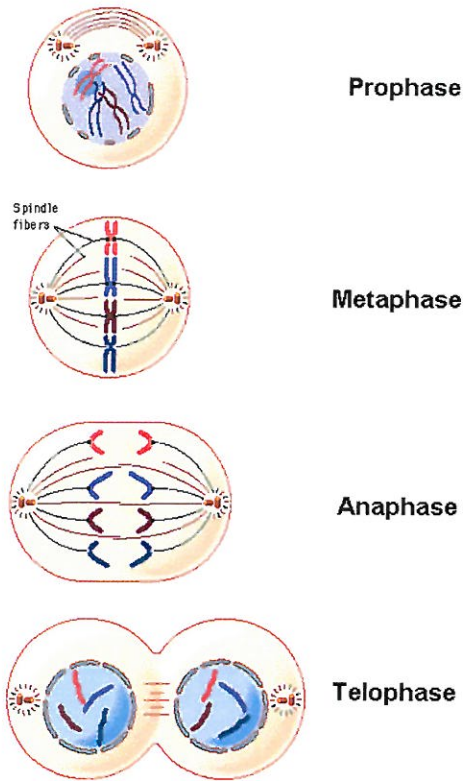


Cell Cycle

- The cell cycle is the phases in the life of a cell



- M phase: Mitosis (cell division) occurs
 - G1 phase: Cell grows
 - S phase: DNA synthesis (chromosomes are copied)
 - G2 phase: Cell grows
 - M phase begins again
- Chromosomes must be copied before mitosis so that new cells receive the same chromosomes found in the old cells



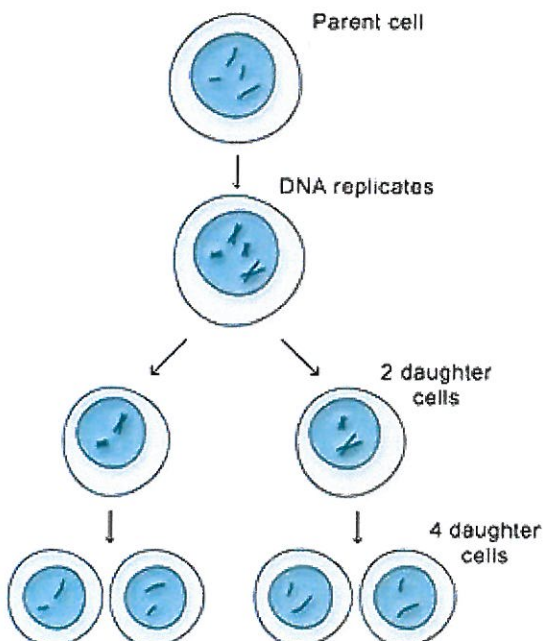
Mitosis

- Division of a cell into 2 identical cells
- Before mitosis: Chromosomes have copied themselves
 - Sister chromatids: original chromosome and its exact copy are attached to each other
- Phases of mitosis
 - o 1. Prophase: Nuclear membrane falls apart and spindle fibers start to form
 - o 2. Metaphase: Sister chromatids line up along the middle of the spindle fibers
 - o 3. Anaphase: Sister chromatids separate and move to opposite ends of the cell
 - o 4. Telophase: Spindle fibers break down and new nuclear membrane forms around each set of chromosomes
 - Cytokinesis occurs when the cytoplasm actually divides, forming two new cells

Genetics

Meiosis

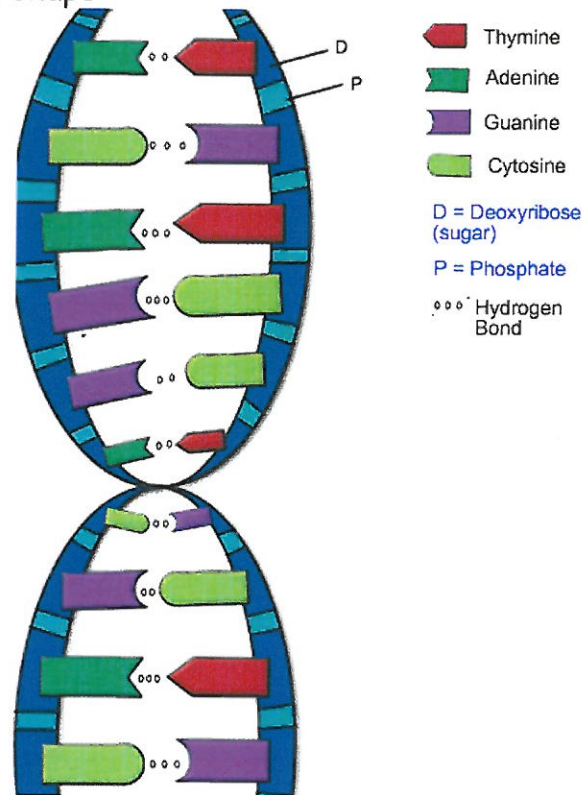
- Cell division that produces gametes (sex cells), such as sperm and egg cells
- Fertilization: Process of an egg and a sperm cell combining to produce a zygote
 - o Zygote: Baby that is only 1 cell big
 - o Egg cell (23 chromosomes) + sperm cell (23 chromosomes) = baby (46 chromosomes)
- Steps in meiosis



- o 1. Before meiosis:
 - 2 chromosomes of the same type come together to make a chromosome pair
 - Each chromosome doubles
 - This gives 4 chromosomes stuck together
- o 2. Meiosis I: Chromosome pairs separate into two new cells
- o 3. Meiosis II: Each chromosome separates from its copy into 4 new cells
- In meiosis, one cell becomes four cells but in mitosis, one cell becomes two cells

DNA

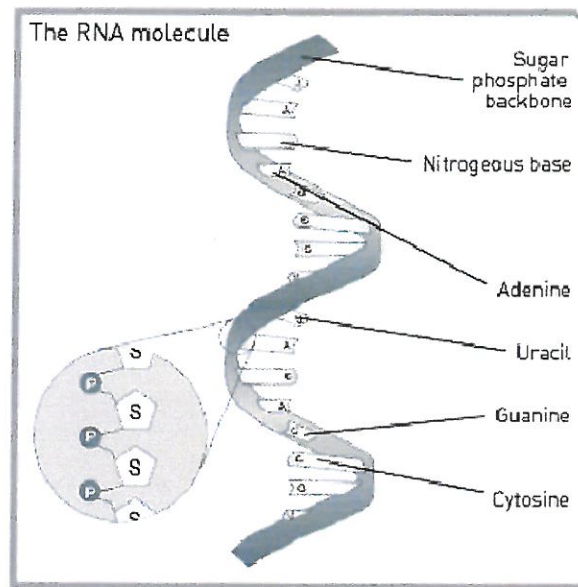
- Deoxyribonucleic acid
- Makes up the chromosomes in the nucleus and never leaves the nucleus
- A chromosome is a chain of different genes
- DNA has a double helix shape



- Has four types of bases: adenine (A), guanine (G), thymine (T), cytosine (C)
- A binds T and G binds C
- DNA is complementary, which means that the bases on one strand match up to the bases on the other strand
 - o For example: Strand 1: ATG CCT GAC
Strand 2: TAC GGA CTG
- Semi conservative replication is the process by which DNA copies itself and each new piece of DNA is made up of 1 old strand and 1 new strand

RNA

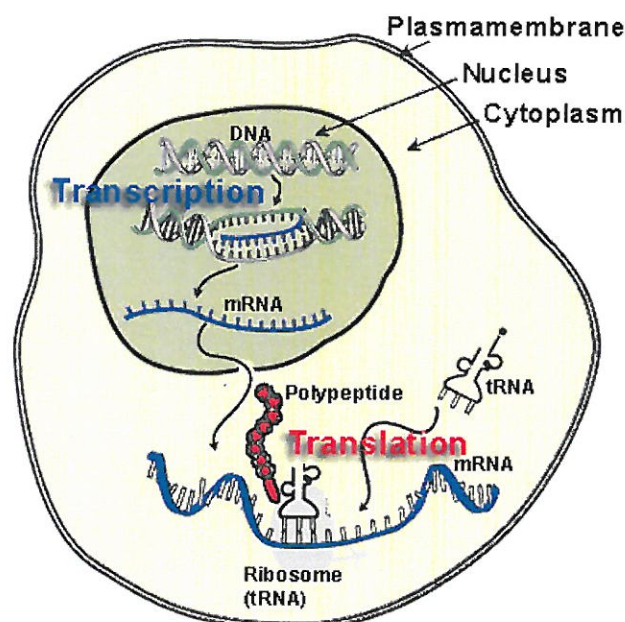
- Ribonucleic acid
- RNA is a copy of DNA that goes out into the cytoplasm to tell the cell what to do in order to stay alive



- RNA is single stranded and has uracil (U) rather than thymine (T)
 - U binds A and G binds C
 - If the DNA is ATG CCA AAG
Then the RNA will be UAC GGU UUC

Using DNA to make protein

- 1. Transcription: DNA in the nucleus is used to make messenger RNA (mRNA)
 - DNA has all the directions the cell needs to live
- 2. RNA moves out into the cytoplasm
 - RNA carries the directions to other parts of the cell
- 3. Translation: The RNA attaches to a ribosome and directs the production of a protein
 - Proteins do all the work in the cell
 - Every 3 bases in RNA is called a codon and codes for 1 amino acid



Mutations

- A mutation is a change in a gene or chromosome
- If the mutation happens in a body cell, it only affects the organism that carries it
- If the mutation happens in a sex cell, it can be passed on to offspring
- Mutations can be
 - harmful if they reduce an organism's chances for reproduction or survival
 - helpful if they improve an organism's chances for survival
 - neutral if they do not produce an obvious changes in an organism
 - lethal if they result in the immediate death of an organism
- Mutations can occur spontaneously or be caused by a mutagen, which is a factor in the environment like UV and chemicals

Mendelian Genetics

- Gregor Mendel is an Austrian monk credited with beginning the study of genetics
- Genetics is the study of heredity
- Humans have 2 genes for every trait
 - Alleles: Different forms of a single trait, like blue and brown are two eye color alleles
- Dominant gene: "Stronger" of 2 genes and shows up in the organism
 - Represented by a capital letter
 - B is the dominant gene for brown eyes
- Recessive gene: "Weaker" of 2 genes and only shows up when there is no dominant gene present
 - Represented by a lowercase letter
 - b is the recessive gene for blue eyes
- Homozygous (purebred): When 2 genes are alike for a trait
 - BB is homozygous for brown eyes, bb is homozygous for blue eyes
- Heterozygous (hybrid): When 2 genes are different for a trait
 - Bb is heterozygous
- Mendel's law of segregation states that the 2 genes we have for each trait get separated from one another when we make egg and sperm cells
- Mendel's law of independent assortment states that the gene for one trait is inherited independently of the genes for other traits
 - Only true when the genes are on different chromosomes

Punnett Squares

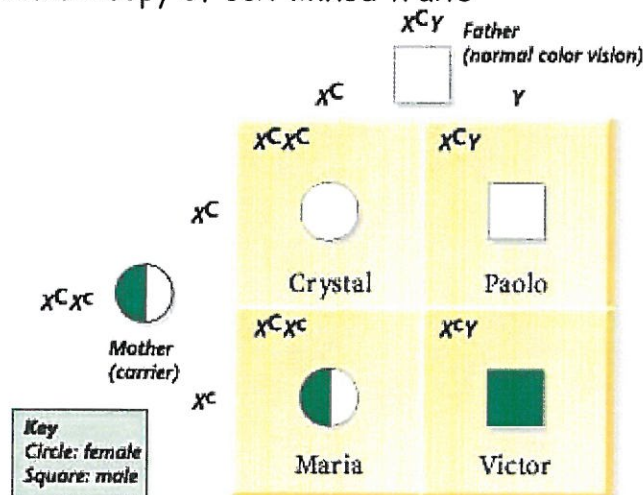
- Punnett squares are charts that are used to show the possible gene combinations in a cross between 2 organisms
 - * Let's say that B is the dominant gene for brown eyes and b is the recessive gene for blue eyes*
- Genotype: The genes of an organism (Bb)
- Phenotype: The physical appearance of an organism (Brown eyes)

Parents		Offspring genotype	
Bb x bb		50% Bb 50% bb	
	B b	Offspring phenotype	
b	Bb bb	50% Brown eyes 50% blue eyes	
b	Bb bb		

Parents		Offspring genotype	
Bb x Bb		25% BB 50% Bb 25% bb	
	B b	Offspring phenotype	
B	BB Bb	75% Brown eyes 25% blue eyes	
b	Bb bb		

Human Genetics

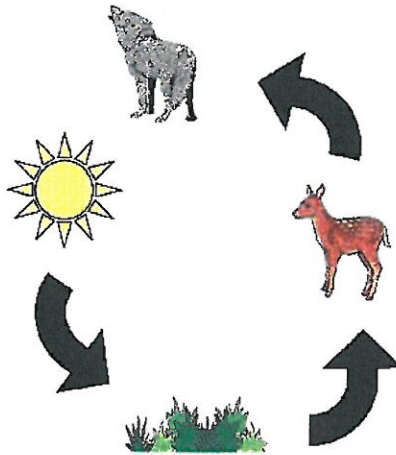
- Multiple alleles are three or more alleles that exist for a single gene
 - For example, A, B, and O are the multiple alleles for blood type
 - The possible blood types are A, B, AB, and O
 - You can be A+ or A-, B+ or B-, AB+ or AB-, O+ or O- depending on whether your blood cells have a special Rh protein
- Codominance occurs when 2 dominant genes are expressed and both genes are seen in the organism
 - AB blood is codominant, a cat with black and white spots is codominant
- Incomplete dominance occurs when 2 dominant genes are expressed and blended together in the organism
 - If the red flower color gene (R) is mixed with the white flower color gene (W) then the offspring will be pink (RW)
- A polygenic trait is a trait that is controlled by more than one pair of genes, like skin color
- A sex-linked trait is a trait that is found on the X chromosome, such as colorblindness
 - Females are XX so have 2 copies of sex-linked traits
 - Males are XY so have 1 copy of sex-linked traits



Ecology

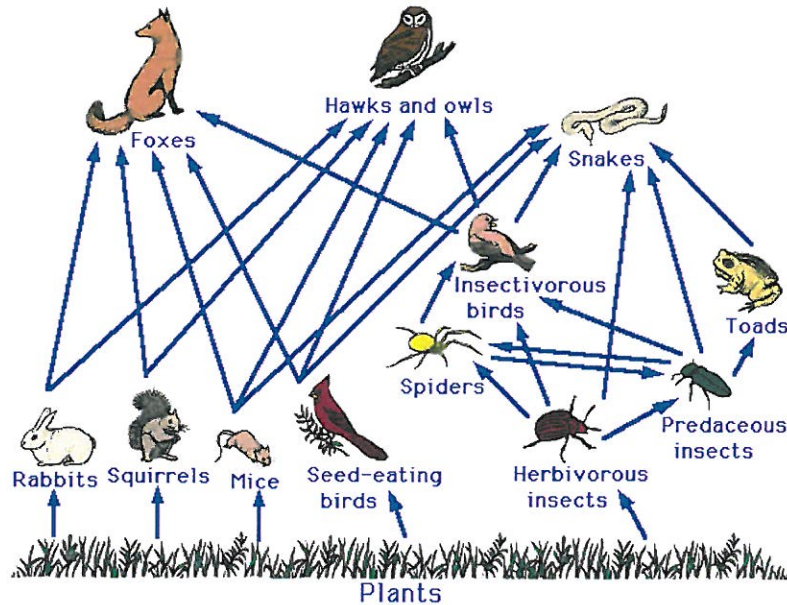
Ecology

- Ecology is the study of how organisms fit into their environment
- A community is the organisms that live in a particular environment
- A habitat is the physical location of a community
- An ecosystem is a collection of organisms and their physical environment
- The diversity of an ecosystem is a measure of the number of species living there
- There are different feeding groups of organisms
 - Autotrophs: Organisms that make their own food, like plants and some bacteria
 - Heterotrophs: Organisms that cannot make their own food, like
 - Herbivores: Eat plants
 - Carnivores: Eat meat
 - Omnivores: Eat plants and meat
- There are different factors in an ecosystem
 - Abiotic factors are nonliving things
 - Biotic factors are living things, such as
 - Producers: Organisms that take in energy from their surroundings to make their own food
 - Consumers: Organisms that eat other organisms for energy
 - Decomposers: Special type of consumer that eats waste products and dead organisms for energy
- There are different trophic levels in a food chain
 - A trophic level is a feeding level in an ecosystem
 - A food chain is a lineup of organisms that shows who eats who



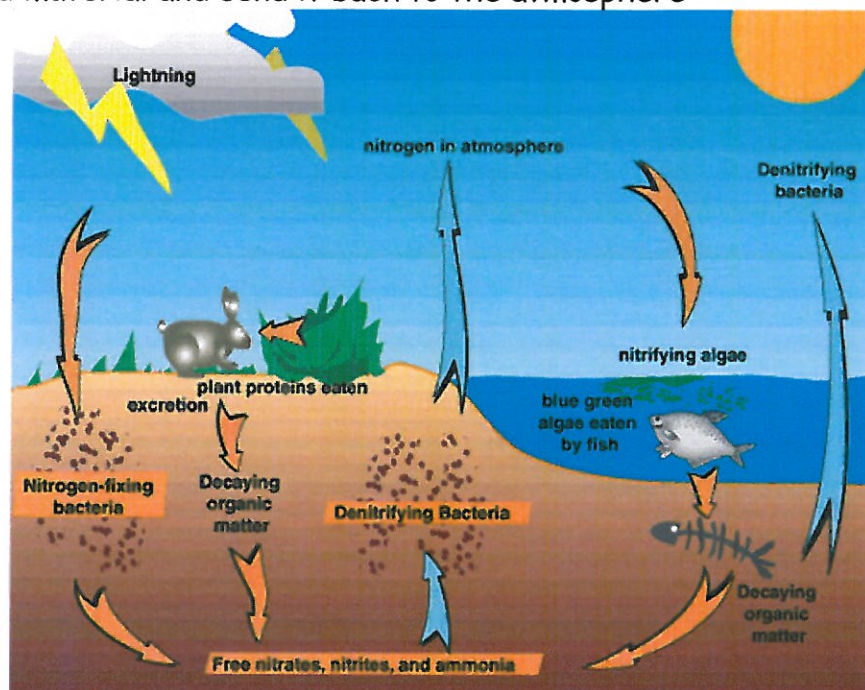
- 1st trophic level is usually a producer
- 2nd trophic level is a primary consumer
- 3rd trophic level is a secondary consumer
- 4th trophic level is a tertiary consumer
- and so on
- Last trophic level is a decomposer
- Every time an organism eats, it obtains energy from its food

- o So energy is transferred from the 1st to the 2nd to the 3rd trophic level and so on (but some of this energy does get lost along the way)
- o Energy pyramid: Picture showing how much energy is transferred to the different trophic levels in a food chain
- A food web is a network of connected food chains



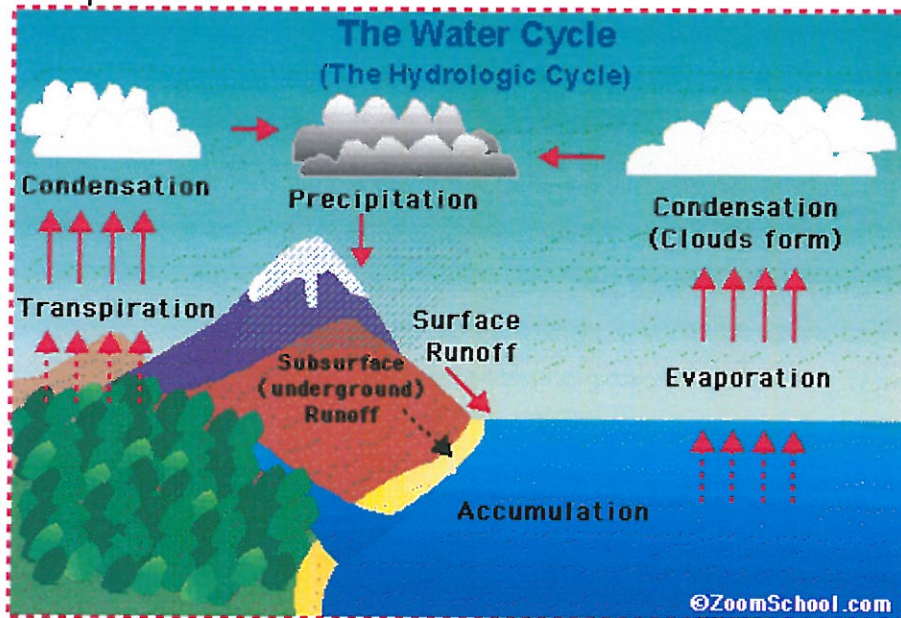
Cycles of Matter

- Water, nitrogen, carbon, and oxygen are recycled in the environment through cycles
- The nitrogen cycle
 - o Nitrogen in the atmosphere is taken in by bacteria that live in plant roots
 - o The nitrogen is passed onto the plants and any animals that eat the plants
 - o Once the plant or animal has died, decomposers (bacteria) again take up the nitrogen in the dead material and send it back to the atmosphere



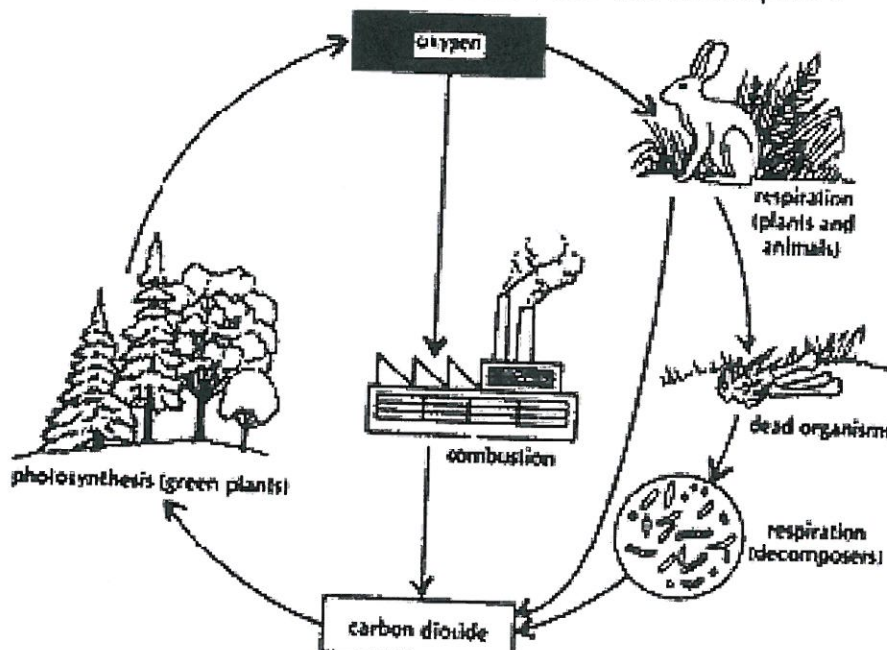
The water cycle

- o Precipitation, such as rain and snow, fall to the earth
- o The water either
 - seeps into the ground for plants to use and the plants give off excess water back to the atmosphere through transpiration
 - or runs off the land to lower-lying bodies of water where it evaporates back into the atmosphere



- **The oxygen-carbon cycle**

- o Carbon dioxide from the atmosphere is taken in by plants who use it during photosynthesis and release oxygen back into the atmosphere
- o Oxygen in the atmosphere is taken in by animals and plants who use it during respiration and release carbon dioxide back into the atmosphere



Interaction in an environment

- Each organism has a niche, or role, to play in its environment
- Competition is a struggle between organisms for resources, such as food, water, shelter
- Predators are organisms that catch, kill, and eat other organisms called prey
- Symbiosis is a close relationship between 2 organisms in which one organism lives near, on, or even inside another organisms and in which at least one organism benefits
 - o There are three types of symbiosis
 - o 1. Commensalism is when one of the 2 organisms benefits from the symbiosis
 - o 2. Mutualism is when both organisms benefit from the symbiosis
 - o 3. Parasitism is when one organism benefits (parasite) and the other organism is harmed (host) from the symbiosis
 - The parasite feeds on the host while it is still alive, weakening but not killing it
- An adaptation is a change in the behavior or physical characteristics of a species that make it better suited to its environment
- Populations of organisms increase and decrease due to overpopulation of a competitor or predator, disease, lack of food or water or shelter, and extreme weather
- Ecosystems are constantly changing due to changing populations of organisms, changing weather, natural disasters, and human activity
- Every time a change occurs, the balance of the ecosystem has to be readjusted

The Theory of Evolution

Evolution

- Evolution is a change in a species over time
- The theory of evolution was stated by Charles Darwin and is based on natural selection
- Natural selection states that organisms with traits well suited to an environment are more likely to survive and produce more offspring than organisms without these favorable traits
- Biodiversity: Organisms become very different from each other as they evolve and become better suited to their environments
- The theory of evolution is supported by evidence that includes
 - o Adaptations: structures and behaviors that organisms have evolved in order to survive better in their environments
 - o The fossil record which is information about all known fossils
 - o Comparative anatomy which is when the bodies of different organisms are compared to see if they are related
 - Homologous structures are body structures on different organisms that are similar
 - Vestigial structures are body structures that may have served a purpose in ancient ancestors but no longer are functional in current organisms
 - o The fact that all vertebrate embryos look very similar as they develop before birth
 - o The fact that the DNA of closely related organisms looks very similar

Types of Natural Selection

- Stabilizing selection: favors average individuals in a population
- Directional selection: favors one of the extreme variations of a trait
- Disruptive selection: favors individuals with either extreme of a trait

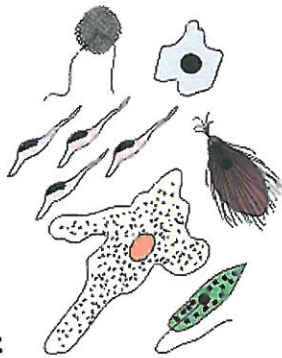
Speciation

- Speciation is the evolution of a new species that occurs when members of similar populations no longer breed with each other to produce fertile offspring
- Occurs when a group of organisms have a reduced gene pool and/or can no longer breed with members of their original population
 - Gene pool: all the alleles of a gene present in the population
 - Any change in the gene pool will cause evolution to happen
- There are several reasons why similar populations no longer breed, creating new species
 1. Geographic isolation: when a physical barrier (lava from volcanic eruptions, sea level changes, etc.) divides a population
 - Makes the gene pool smaller and each new smaller population adapts to its own environment, creating new species
 2. reproductive isolation: when organisms no longer breed with each other to produce fertile offspring because
 - the genes of the populations becomes too different and fertilization cannot occur

Taxonomy

- Taxonomy is the science of classifying living things
- Organisms are organized into 7 different levels of taxonomy (King Philip came over for good spaghetti)

○ 1. Kingdom - most broad	○ 5. Family
○ 2. Phylum	○ 6. Genus
○ 3. Class	○ 7. Species - most specific
○ 4. Order	
- Closely related organisms have more levels of taxonomy in common than unrelated organisms
- There are six kingdoms of living things (Archie eats pretty fantastic apple pies)
 - 1. Archaeobacteria: bacteria that live in extreme environments
 - 2. Eubacteria: common bacteria
 - 3. Protista: Single-celled organisms



Pictures of protists:

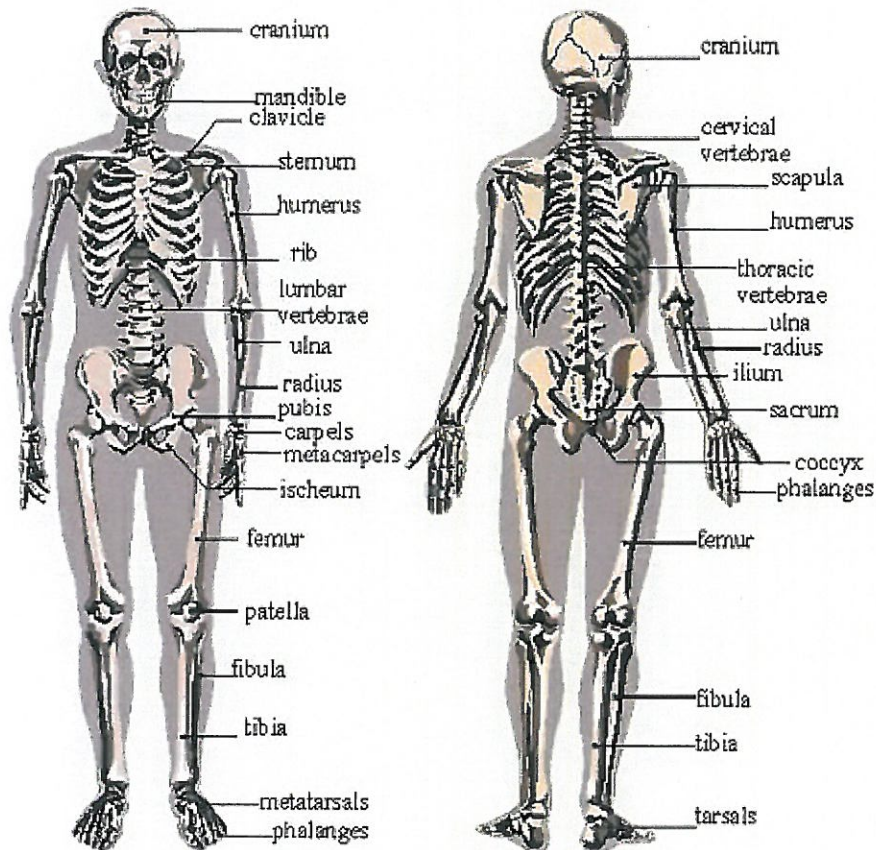
- o 4. Fungi: Mushrooms, yeasts, molds
 - o 5. Animalia: animals
 - o 6. Plantae: plants
- Every organism has a unique two-word scientific name that is written in Latin
 - o The first word is the genus, the second word is the species (Humans are *Homo sapiens*)
 - Some scientists prefer to organize organisms into domains rather than kingdoms
 - o There are three domains (Archie eats eels)
 - o 1. Archaea: Bacteria that live in extreme environments
 - o 2. Eubacteria: Common bacteria
 - o 3. Eukarya: Organisms whose DNA is in a nucleus

Anatomy and Physiology

Skeletal System

◆ Functions

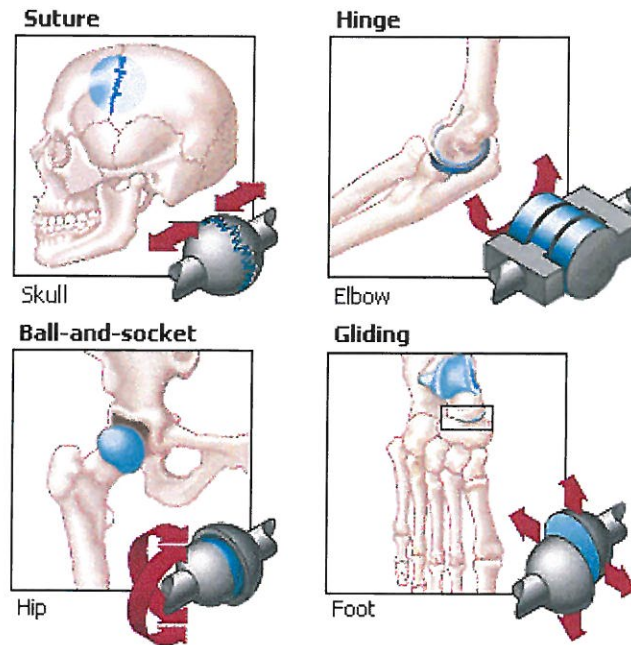
- Provides a framework for the tissues of your body
- Protects your internal organs
- Provides attachment points for muscles
- Stores minerals
- Produces blood cells



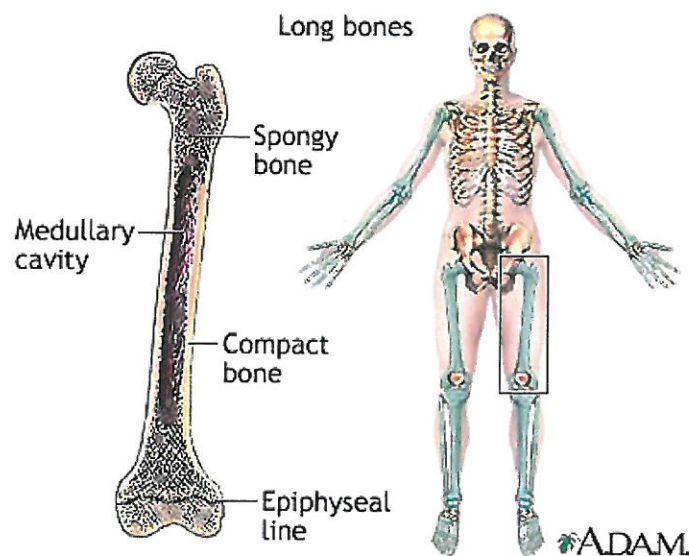
◆ Made up of

- Axial skeleton: skull, vertebral column, sternum, ribs
- Appendicular skeleton: arms, legs, shoulders, pelvis
- ◆ Ligaments: tough band of connective tissue that attaches one bone to another bone
- ◆ Tendons: thick bands of connective tissue that attach muscles to bones

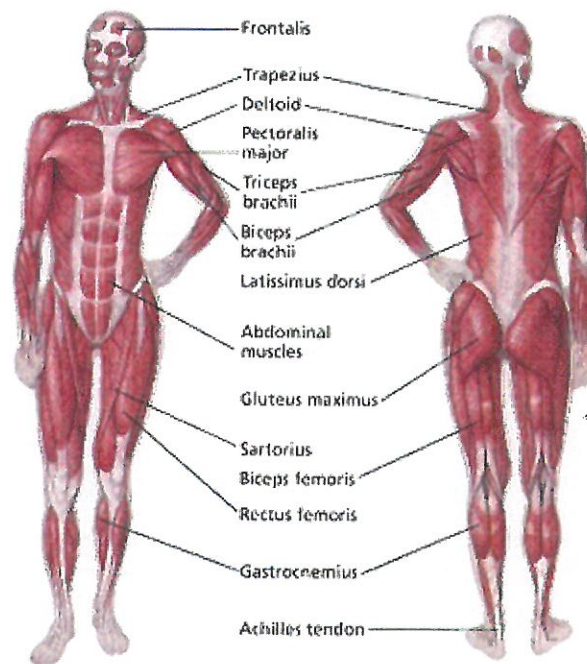
- ◆ Joints: where two or more bones meet
 - Ball and socket joint: allows movement in all directions
 - Pivot joint: allows bones to twist around each other
 - Hinge joint: allows back and forth movement
 - Gliding joint: allows bones to slide past each other



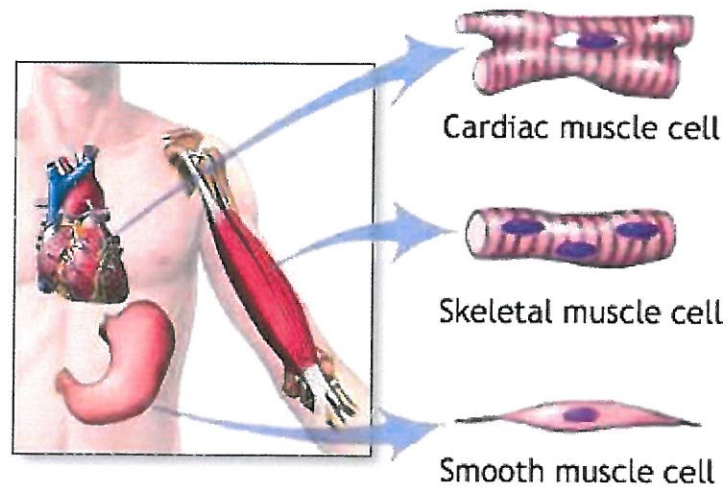
- ◆ 2 types of bone tissue
 - Compact bone: hard and found on the outside of bones
 - Spongy bone: soft with holes and is found on the inside of bones



Muscular System

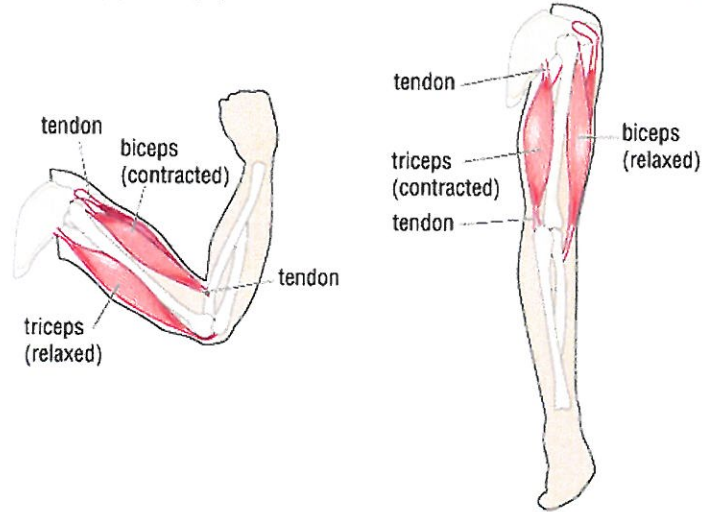


- ◆ Muscles can be
 - Voluntary: under conscious control
 - Involuntary: not under conscious control
- ◆ Three types of muscles

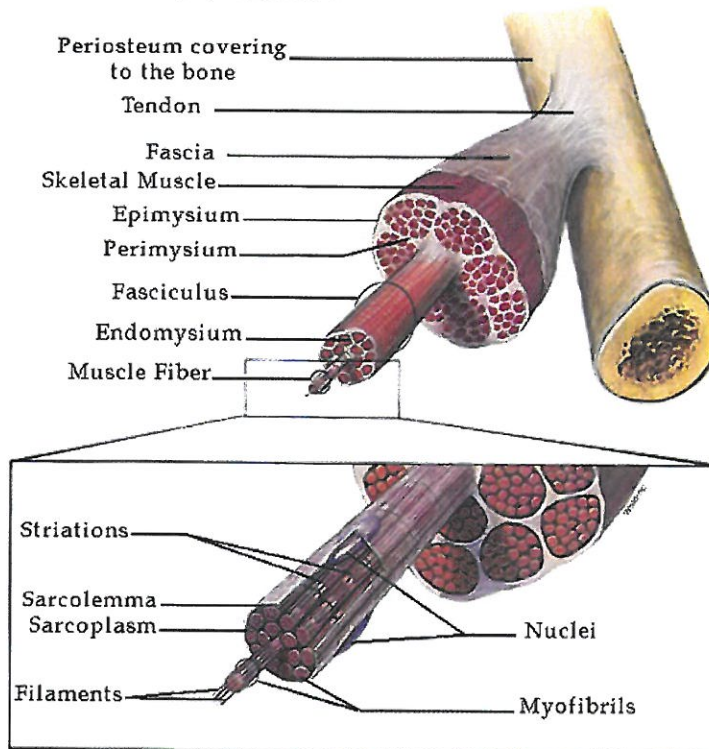


- Smooth muscle: squeezes and exerts pressure on the space inside a tube or organ to move material through it (involuntary)
- Cardiac muscle: make up the heart (involuntary)
- Skeletal muscle: attaches to and moves bones (voluntary)

- ◆ Skeletal muscles work in opposing pairs (one muscle contracts while the other relaxes)



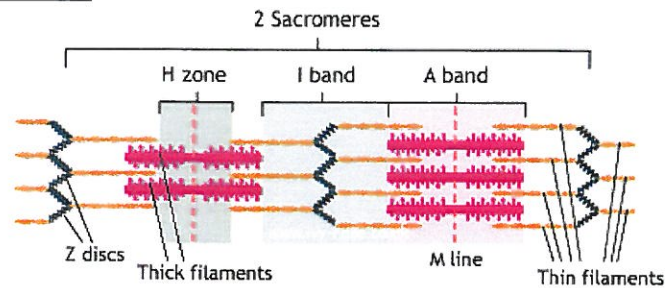
- ◆ Skeletal muscles are made of the following pieces
 - Skeletal muscle is made of bundles of muscle fibers
 - Muscle fibers are made of myofibrils
 - Myofibrils are made of filaments



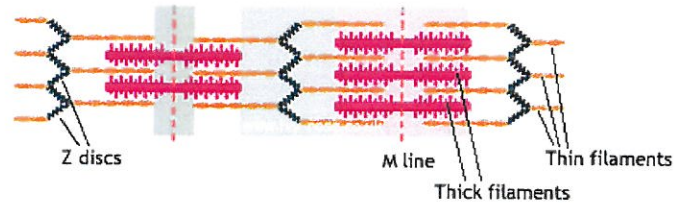
- Myofibrils are divided into sarcomeres
- Sarcomeres are made of myosin and actin proteins

- ◆ Sliding filament theory: actin filaments in sarcomeres slide toward one another, shortening the sarcomeres in a fiber, causing the muscle to contract

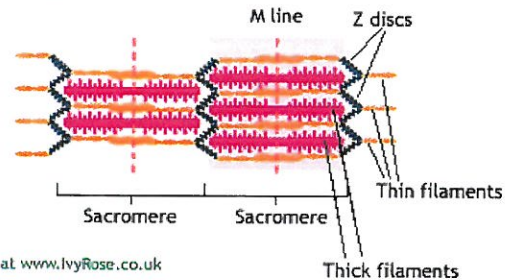
Relaxed Muscle :



Partially Contracted Muscle :



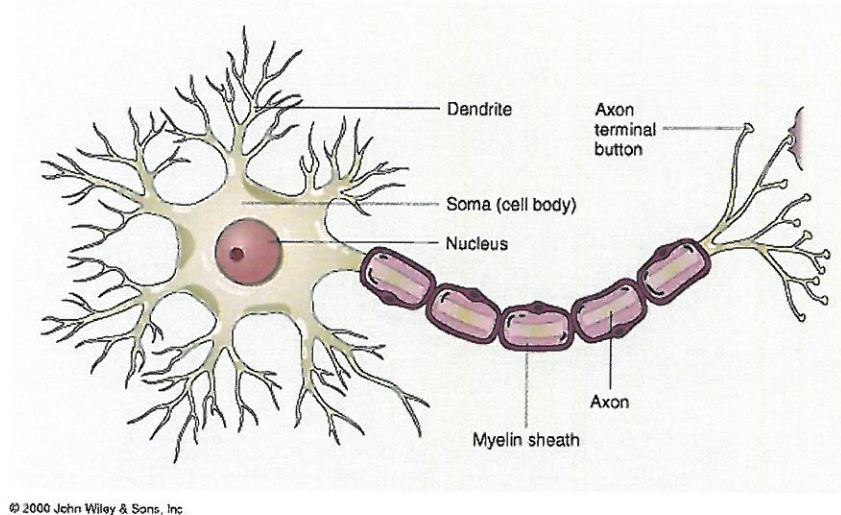
Fully Contracted Muscle :



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Nervous System

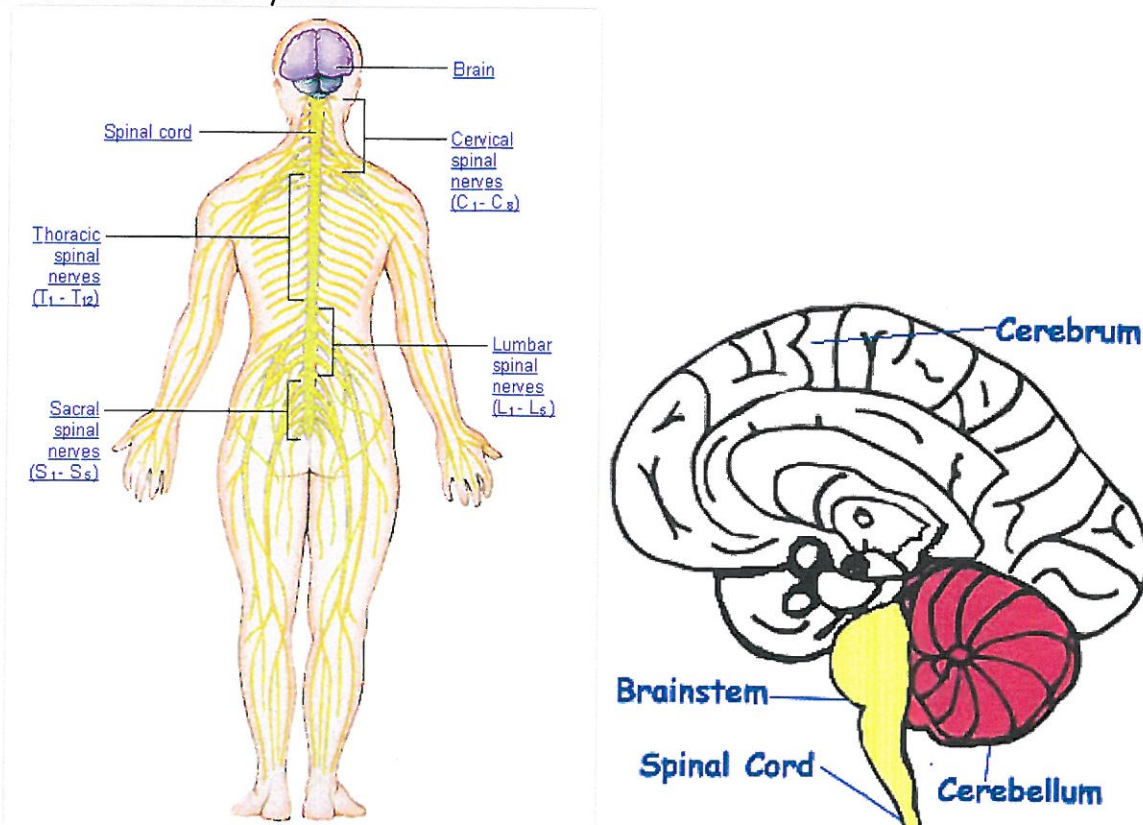
- ◆ Function: allows the body to respond to internal and external stimuli
- ◆ Neuron: cell that conducts impulses through the nervous system
 - Made up of a cell body, dendrites (receives impulses), and an axon (carries impulses away from the cell toward other cells)



♦ 3 types of neurons:

- Sensory neurons carry impulses from the body to the spinal cord and brain
- Interneurons are found within the brain and spinal cord
- Motor neurons carry the response impulses away from the brain and spinal cord to a muscle or gland

♦ Parts of the nervous system

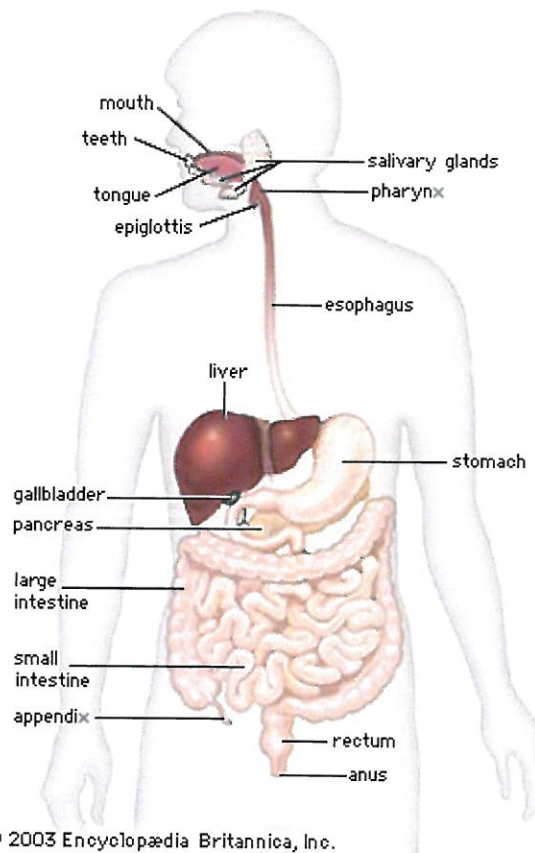


- Central Nervous System: brain and spinal cord
 - Brain: made up of the cerebrum, cerebellum and brain stem
- Peripheral Nervous System: all the nerves in the rest of your body

- Made up of the somatic and autonomic nervous system
 - Somatic nervous system: voluntary (you decide whether you want to move body parts controlled by this system, like your skeletal muscles)
 - Autonomic nervous system: involuntary (the impulses that travel through this system are not under your control, they automatically happen, like muscles that help you breath)
 - Autonomic nervous system is made up of the sympathetic system (controls internal functions during stress) and the parasympathetic system (controls internal functions during rest)
- ♦ Control of the body is done by the nervous system and the endocrine system (release hormones into the bloodstream to control bodily functions)
- ♦ Negative feedback control: hormones, or their effects, are fed back to inhibit, or stop, the original signal
 - Once homeostasis is reached, the signal is stopped and the hormone is no longer released

Digestive System

- ♦ Function: to break apart the food you eat into smaller parts so that it can be used as energy for your body



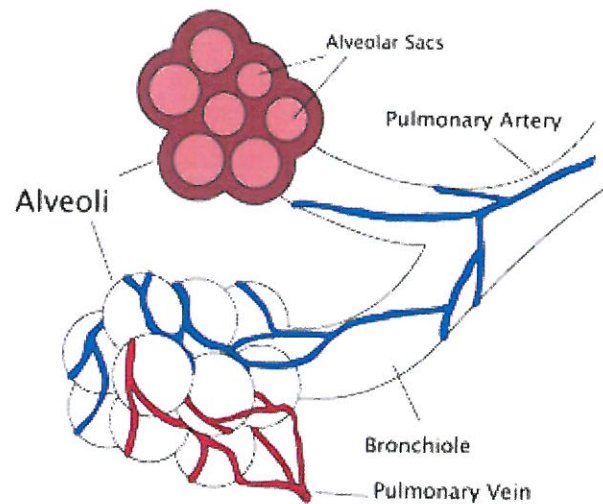
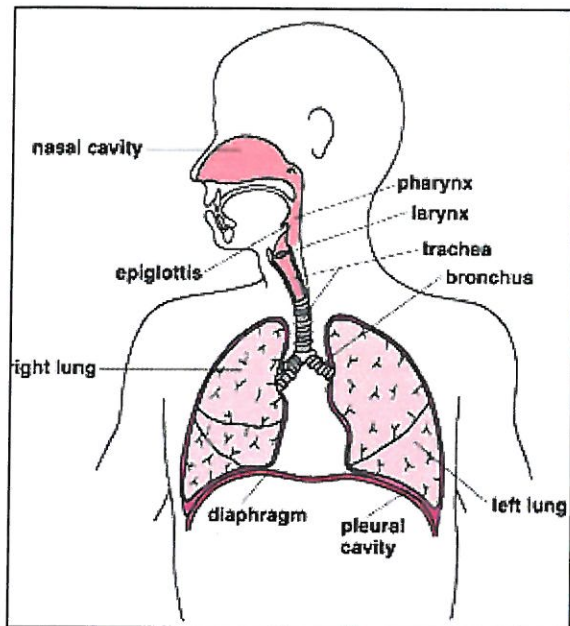
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- ♦ Digestion (The path food takes when you eat)
 - Mouth: mechanical (teeth) and chemical (saliva) digestion

- ♦ Saliva contains the enzyme amylase that begins the chemical breakdown of starch
- Esophagus: muscular tube that connects your mouth to your stomach
- Stomach: Physical and chemical digestion
 - ♦ Stomach contains hydrochloric acid that lowers the pH of the stomach so that the enzyme pepsin can chemically break down protein
- Small intestine: mechanical digestion completed; chemical digestion of proteins, carbohydrates, and fats completed; digested nutrients enter the bloodstream through the villi in the small intestine
 - ♦ Pancreas secretes enzymes to the small intestine to chemically break down fats, proteins, and starch
 - ♦ Liver produces bile (that is stored in the gall bladder) which is secreted into the small intestine to chemically break down fats
 - ♦ Starches are digested to monosaccharides; fats are digested to fatty acids; proteins are digested to amino acids

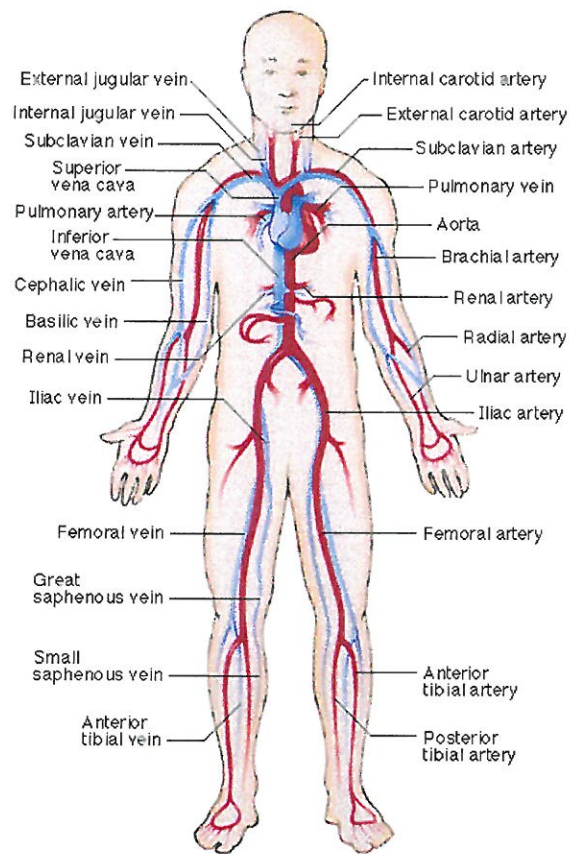
Respiratory System

- ♦ Functions:
 - Breathing
 - respiration (the process of gas exchange)
- ♦ The path air takes during respiration
 - Taking air into your body through your nose or mouth
 - Air flows into the pharynx (throat) and moves through the larynx
 - Air travels down the trachea (windpipe) to the lungs
 - In the lungs, each bronchus branches into bronchioles which branch into alveoli covered in capillaries
 - In the alveoli covered with capillaries, oxygen and carbon dioxide are exchanged by diffusion between the air and the blood
 - Once oxygen from the air diffuses into the blood vessels surrounding the alveoli, it is pumped by the heart to the body cells, where it is used for cellular respiration
 - Carbon dioxide from the body diffuses from the blood into the air spaces in the alveoli
 - During exhaling, this carbon dioxide is removed from the body

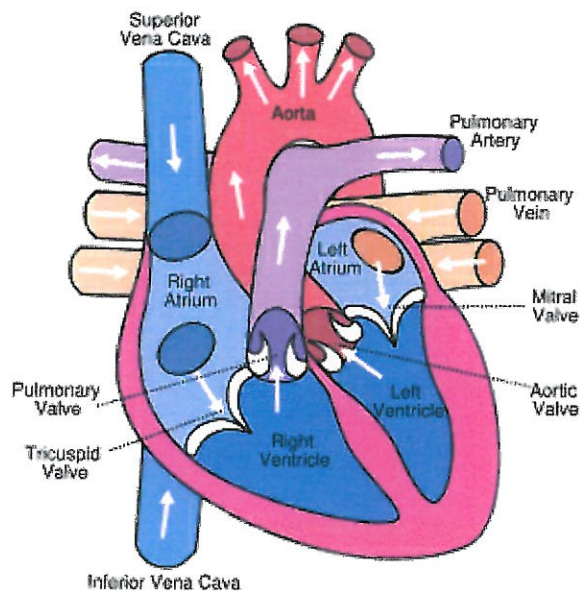


Circulatory System

- ♦ Blood is composed of
 - Red blood cells: transport oxygen to parts of the body using the hemoglobin protein
 - White blood cells: defend the body against disease
 - Platelets: needed for blood clotting
 - Plasma: the liquid portion of the blood
- ♦ Blood types: A, B, AB, O
 - Determined by antigens (proteins) on the surface of red blood cells
- ♦ Three types of blood vessels
 - Arteries: carry blood away from the heart; large
 - Veins: carry blood toward the heart; large
 - Capillaries: connect arteries to veins; very small

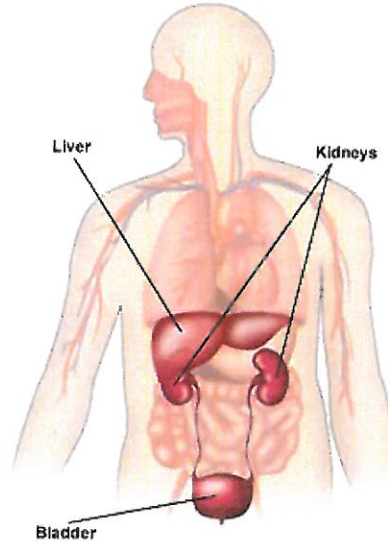


- ◆ Heart: muscle needed to pump blood to all parts of the body
 - Two upper chambers: left and right atria (atrium is singular)
 - Two lower chambers: left and right ventricles
 - Blood enters the heart through the atria and leaves the heart through the ventricles



- ◆ How blood travels through the heart
 - Right atrium: receives oxygen-poor blood from the head and body
 - Left atrium: receives oxygen-rich blood from the lungs

- The two atria fill with blood and then contract, pushing the blood into the ventricles
- Right ventricle: pushes the oxygen-poor blood out of the heart toward the lungs
- Left ventricle: pushes the oxygen-rich blood out of the heart toward the rest of the body
- The two ventricles fill with blood from the atria, then contract at the same time, pushing blood out of the heart
- Valves in the heart prevent blood from flowing in the wrong direction
- ◆ Kidneys: filter the blood to remove nitrogenous wastes from it, thus maintaining homeostasis of body fluids
 - The waste fluid is urine and is excreted from the body
 - Bladder: makes urea (main substance in urine)
 - Liver: filters harmful substances from the blood(ex.Alcohol)



A Review of Biology: Cells and Their Processes

Name: _____ Date: _____ Block: _____

A Review of Biology: Cells and Their Processes

Directions: Use your Big Picture review sheet to answer the following questions in complete sentences.

1. Explain the difference between organic and inorganic compounds.
2. List the four types of organic compounds and describe the function of each.
3. Explain the difference between a eukaryotic cell and a prokaryotic cell.
4. List 5 organelles found in an animal cell and describe the function of each.
5. Which 2 organelles are found in plant cells but not animal cells? Describe the function of these 2 organelles.
6. Describe 2 differences between bacteria and animal cells.
7. What is a phospholipids bilayer?
8. Explain the major difference between active and passive transport.

9. What is the difference between diffusion and osmosis?

10. a. What is photosynthesis?

b. What is the chemical equation for photosynthesis?

11. a. What is cellular respiration?

b. Name and describe the two types of cellular respiration.

c. What is the chemical equation for aerobic respiration?

12. a. What are chromosomes?

b. How many types of chromosomes do humans have?

c. How many chromosomes in all do humans have?

d. From whom do we get these chromosomes?

NBHS Evening Extension - Trimester III - Biology – Mr. Francis

13. What are diploid cells? Give an example of a diploid cell in the human body.

14. What are haploid cells? Give an example of a haploid cell in the human body.

15. Explain the difference between autosomes and sex chromosomes.

16. What are the four phases of the cell cycle and what happens in each phase?

17. What is mitosis?

18. List the four phases of mitosis and describe the events in each phase.