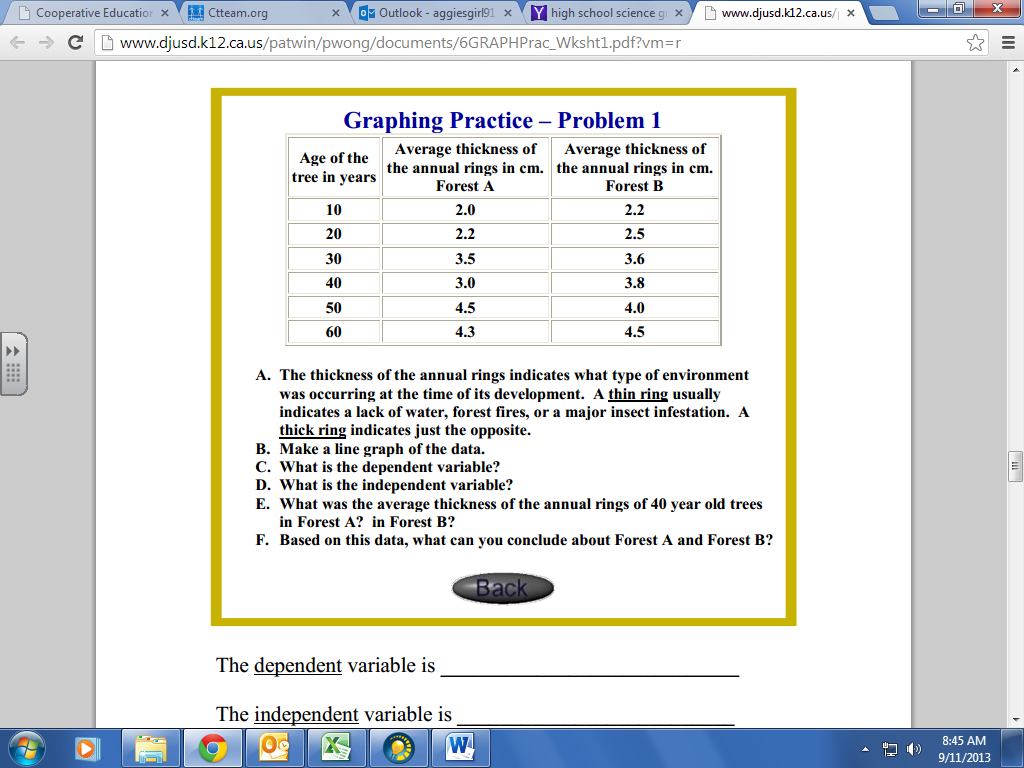
**Biology 21: Midterm Study Guide 2015-2016**

##### Introduction to Biology

* List and Define the characteristics of life

|  |  |
| --- | --- |
| Characteristic | Example |
| Made of cells | unicellular or multi-cellular |
| Reproduction | asexual or sexual |
| Growth and development | born →change →die |
| Metabolism | require energy |
| Respond to stimuli | Bending to light, sweating in hot temperature |
| Homeostasis | constant body temperature, pH, water volume |
| Evolution | change over time to an organism  due to natural selection.  Ex.-Big ears to generate more heat loss in desert. |



* Use the scientific method to design and analyze and experiment.
* Use and define the following: controlled experiment, independent variable, dependent variable, control group, variables held constant, validity
* Read graphs and create a graph with a title, plotted points and properly labeled axes.

Problem 1

C. Dependent variable = average thickness of annual rings

D. Independent variable = age of three in years

E. Forest A = 3.0 cm Forest B = 3.8 cm

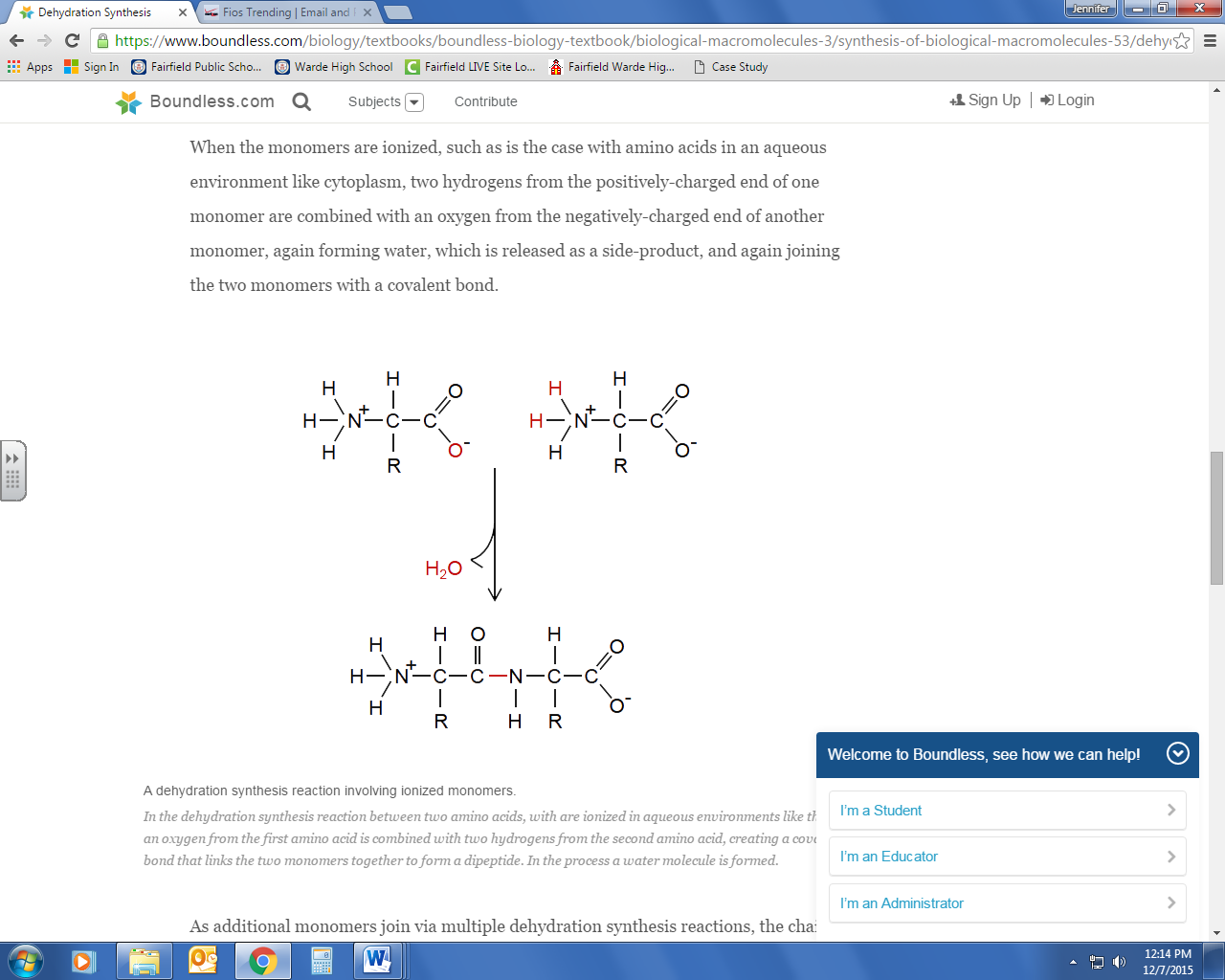
F= Both forests received similar amounts of rains due to average thickness of annual rings being close.

###### Biochemistry

* Identify why all organic compounds all contain carbon

State the structure and function of the four major types of organic compounds by completing the table:

|  |  |  |  |
| --- | --- | --- | --- |
| Macromolecule | Monomer | Polymer | Function |
| Carbohydrates  Bread, pasta | Monosaccharide  Ex glucose | Polysaccaharides  Ex.  Plants:  starch- energy  cellulose –structure/cellwall  Animals:  glycogen-stores glucose in liver/muscles | Quick energy source |
| Proteins  Eggs, meat | Amino acid | Polypeptide- “protein”  Ex.  hemoglobin  cellulase = enzyme | -structure  -transport  -enzymes  -defensive |
| Lipids  Oils, fats | Fatty acids | Phospholipids  Triglycerides | Structure-cell membrane  -energy |
| Nucleic Acids | Nucleotide | DNA  RNA | Hereditary Materials |



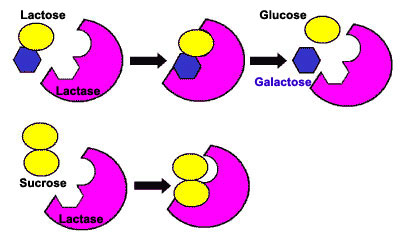
* Describe the creation of polymers and monomers by dehydration synthesis and hydrolysis.
  + Label the reaction and describe what is happening.

Dehydration synthesis. Water is removed and 2 amino acids are being joined together.

* + What is the monomer? What is the polymer?

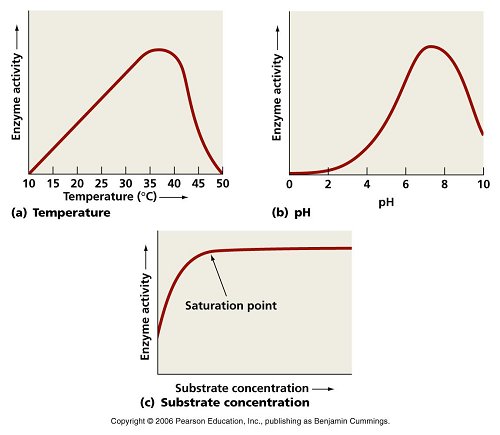
Monomer = amino acid Polymer = protein(dipeptide)

* Describe enzyme specificity.



* Describe the structure and function of enzymes. Explain how enzymes do their function.
* - substrate binds to active site of enzyme – enzyme is unchanged and reused.
* - most enzymes have –ase endings. Ex. Cellulase, sucrase, pectinase

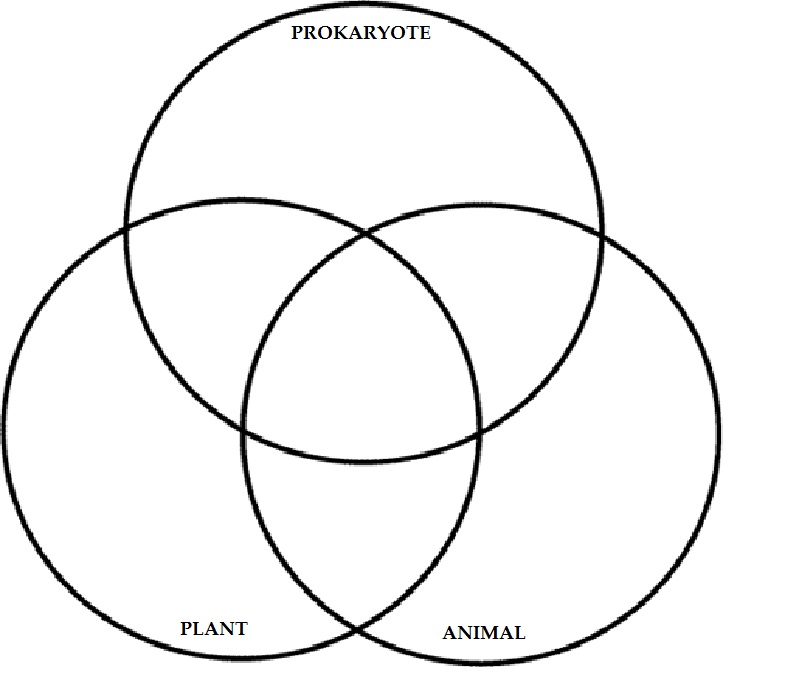
Lower activation energy = faster reactions

Describe how factors affecting enzyme function (temperature and pH) Can denature enzymes (destroy structure) = lose function

###### Cell Structure and Function

* Apply the Cell Theory
* Identify the difference between the cell structures in prokaryotes vs. eukaryote cells

1. Prokaryotic cell no nucleus, no membrane –bound organelles ex. bacteria
2. Eukaryotic cell have nucleus, have organelles ex. Plant, animal, fungus, protist

* Compare and contrast the cell structure in plant vs. animal cells
* Describe the structure and function of the cell membrane, nucleus and other organelles (ribosome, vacuoles [food, water, contractile], lysosomes, Golgi body, mitochondria, chloroplast, cell wall)

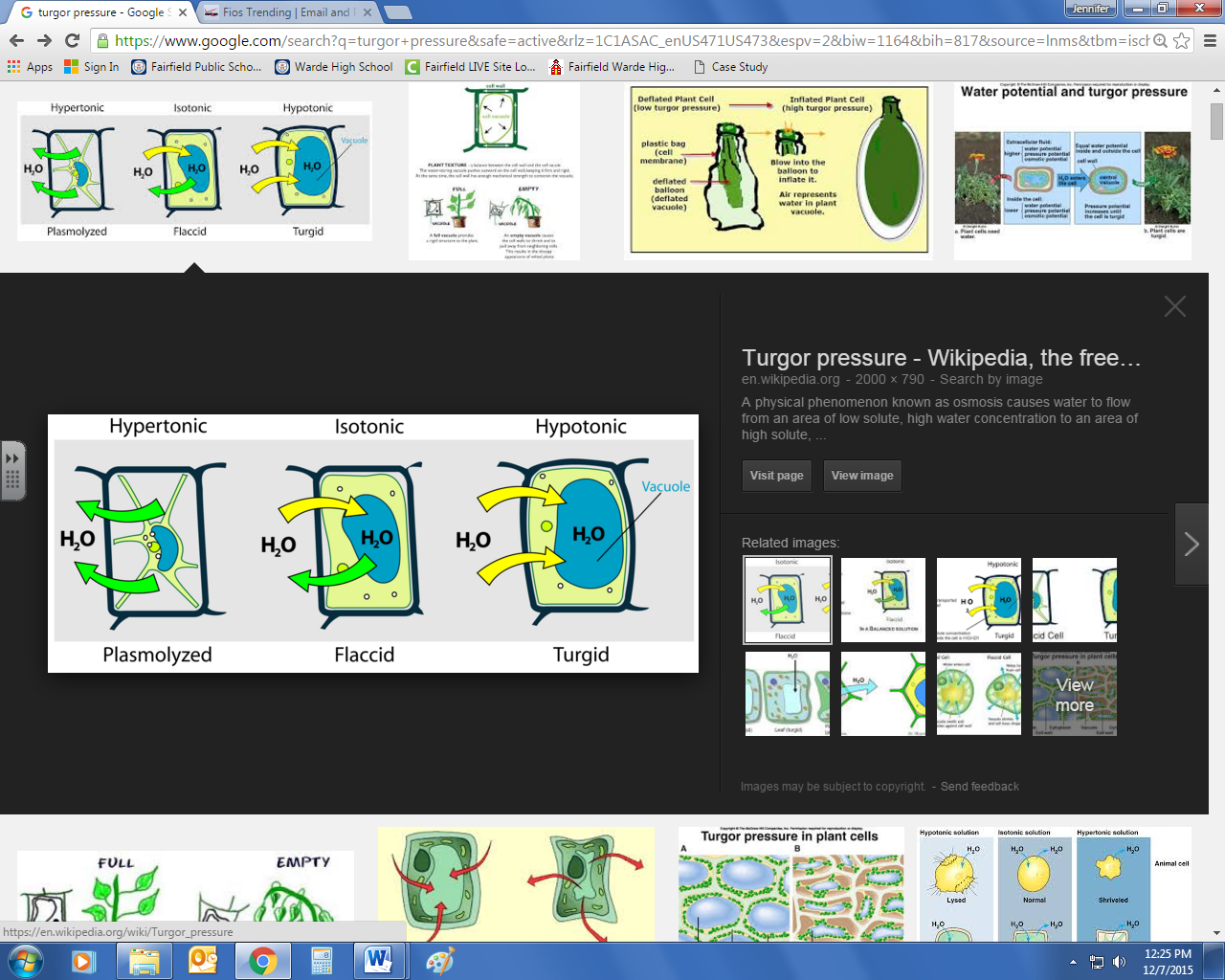
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| STRUCTURE | FUNCTION | PROKARYOTIC | ANIMAL | PLANT |
| Cell membrane | Controls what enters or leaves the cell | X | X | X |
| Mitochondria | Cell respiration  -makes energy(ATP) |  | X | X |
| Ribosome | Protein factory | X | X | X |
| Nucleus | Contains DNA |  | X | X |
| DNA | Hereditary material | X | X | X |
| Chloroplast | Photosynthesis |  |  | X |
| Cell wall | Cell structure/support | X |  | X |
| Endoplasmic reticulum | Transport |  | X | X |
| Golgi | Packaging molecules |  | X | X |

* Describe how the various organelles work together to complete the functions of the cells.

Ribosomes create proteins→ golgi modifies→ER transports around or out of cell.

* Identify molecules that can pass through a membrane passively and actively.

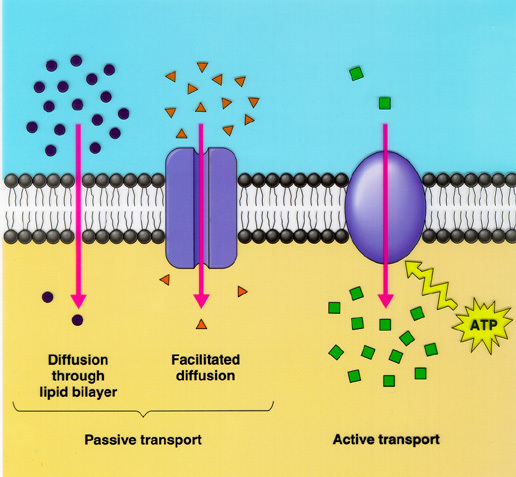
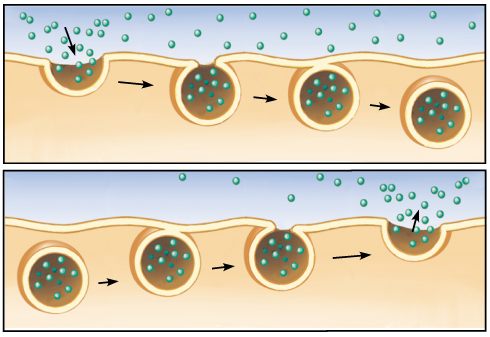
See below



* Describe how osmosis will affect a plant and animal cell differently. (turgor pressure vs. cytolysis)

Cell wall in plants prevents cytolysis. The cell expands created turgor pressure.

In animal cells the cell membrane ruptures causing cytolysis.

* Describe the process of endocytosis and exocytosis, including the organelles and how they are used.

**Endocytosis** includes **pinocytosis**, in which the vesicle contains solutes or fluids.

And **phagocytosis**, in which the vesicle contains large particles or cells.

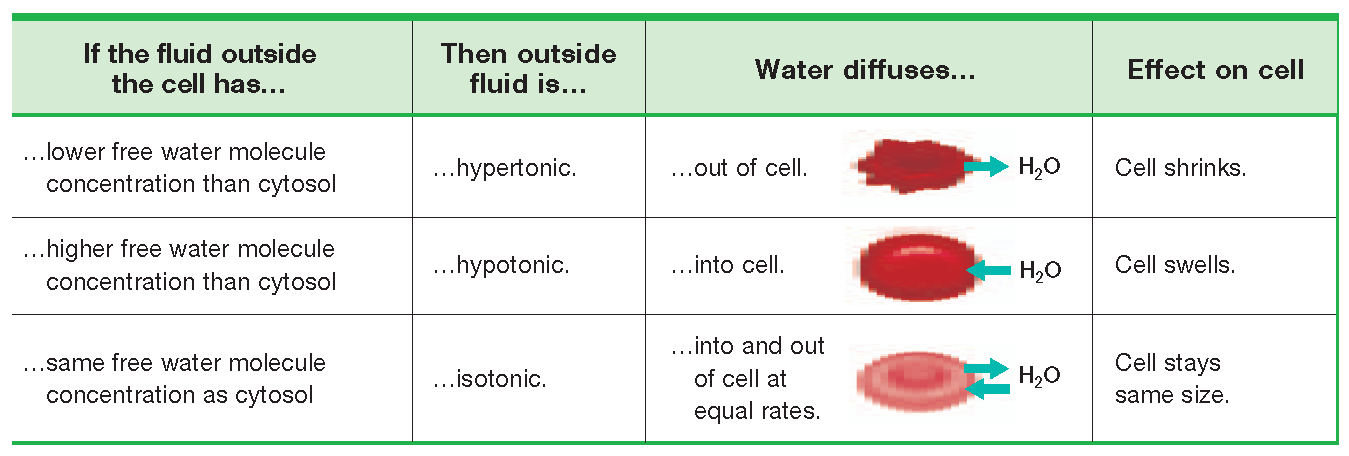
In **exocytosis**, vesicles made by the cell fuse with the cell membrane, releasing their contents into the external environment

* Describe the role of proteins in the cell membrane.

Proteins move materials in and out of cells. See chart below:

* Compare and contrast passive transport vs. active transport (concentration gradient, hypertonic, hypotonic, isotonic, ion pumps)

|  |  |  |
| --- | --- | --- |
| **Type of Transport** | **Definition** | **Examples of Molecules Transported** |
| **Osmosis – PT** | **Diffusion of water from a high to low concentration** | **H2O** |
| **Diffusion - PT** | **Movement of molecules from a high to low concentration** | **O2 and CO2** |
| **Facilitated Diffusion - PT** | **Movement of molecules from a high to low concentration through membrane channel proteins** | **Glucose**  **Amino acids** |
| **Ion Pumps - AT** | **Movement of molecules for a low to high concentration- requires ATP** | **Na+**  **K+**  **H+** |
| **Exocytosis - AT** | **Movement of large amounts of material out of the cell** | **Wastes, hormones** |
| **Endocytosis – AT** | **Movement of large amounts of material into the cell** | **Food, bacteria** |



###### Cell Energetics (Cellular Respiration and Photosynthesis)

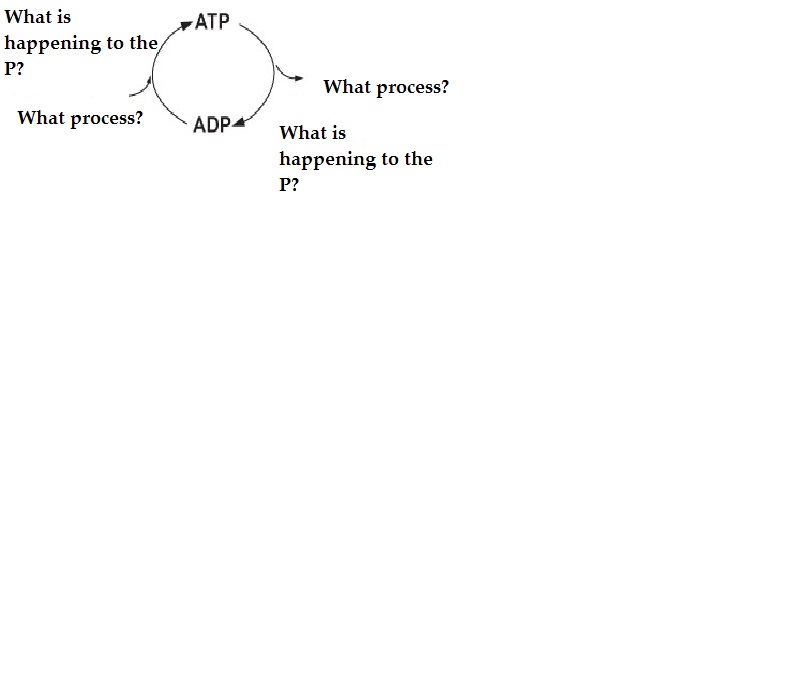
* Describe the complementary roles of photosynthesis in producers and cellular respiration in all living things
* Compare and contrast autotrophs and heterotrophs.
* Plants and other autotrophs use carbon dioxide in the air to make glucose and release oxygen as products through the process of photosynthesis. They make their own food.
* The glucose and oxygen are used by both autotrophs and heterotrophs to perform cellular respiration and produce carbon dioxide and energy as products.

Heterotrophs cannot make their own food and rely on other organisms as a food source.

* Identify the location and summarize each of the following processes: glycolysis, aerobic and anaerobic energy pathways (including fermentation)
* Identify the end products of fermentation, aerobic respiration and photosynthesis

|  |  |  |
| --- | --- | --- |
| Process | Location | Summary |
| Glycolysis | Cytoplasm | Breaks glucose down into pyruvic acid. Produces NADH and ATP |
| Aerobic pathway | Pro: Cytoplasm  Euk: Mitochondria | Uses O2 to break down pyruvic acid into CO2, ATP and water |
| Anaerobic pathway | Cytoplasm | Regenerates NAD+ to keep glycolysis going |

* Describe the ADP and ATP cycles.



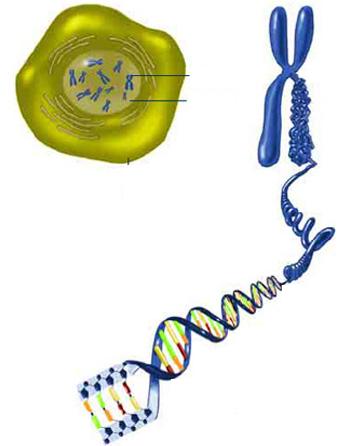
ATP gets broken down by hydrolysis to create ADP and phosphate plus energy.

* Describe how humans are affected by a lack of oxygen.

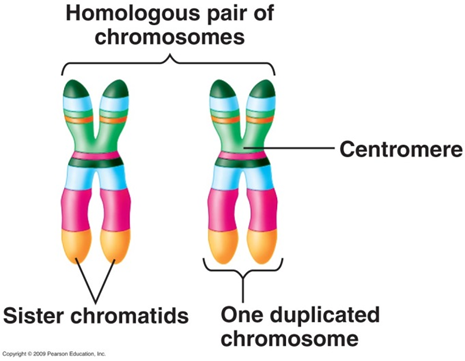
Without oxygen the body reverts short term to lactic acid fermentation. This creates lactic acid in the body and causes body cramps.

* Compare and contrast the production of ATP through aerobic vs. anaerobic pathways

Aerobic pathway = 34-36 ATP per glucose molecule. Anaerobic pathway = 2 ATP per glucose molecule

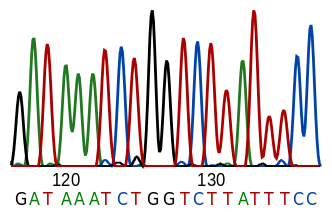


###### DNA, RNA, and Protein Synthesis

* Describe the relationship between nucleotides, genes, chromosomes and DNA.
* Identify the structure of a chromosome and the importance of replicated strands and homologous chromosomes.
* Describe how adenine, guanine, cytosine, thymine and uracil are complementary. DNA RNA

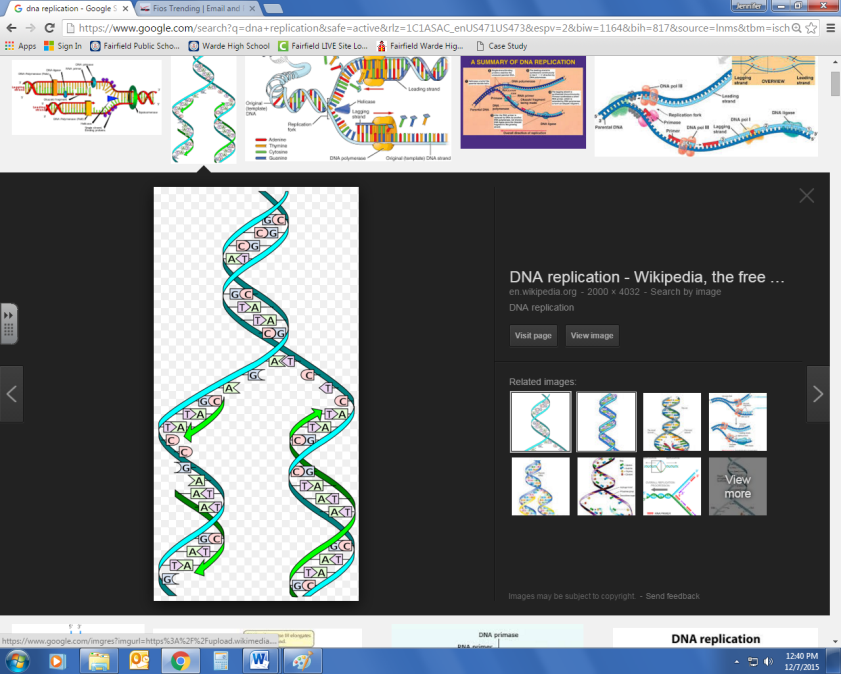
A-T A-U

C-G C-G

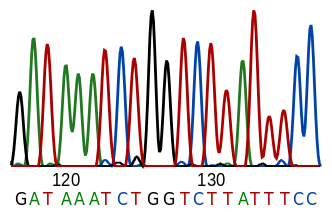


* Compare and contrast the structure and function of DNA and RNA (mRNA and tRNA)

|  |  |
| --- | --- |
| DNA | RNA |
| Double stranded | Single stranded |
| Nitrogen bases- GATC | Nitrogen bases - GAUC |
| Sugar – deoxyribose | Sugar - ribose |

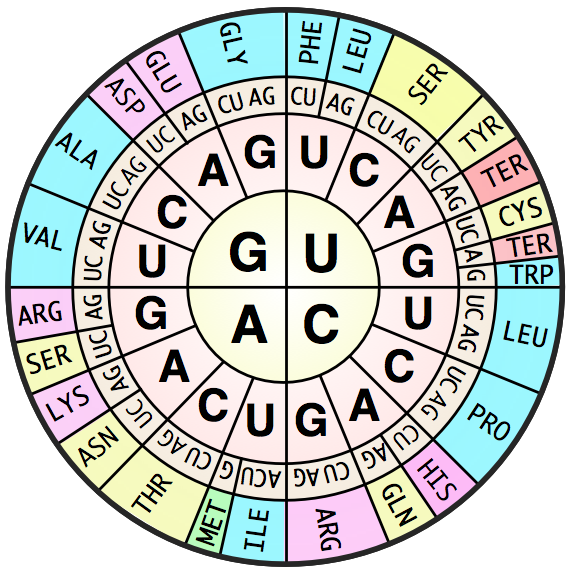


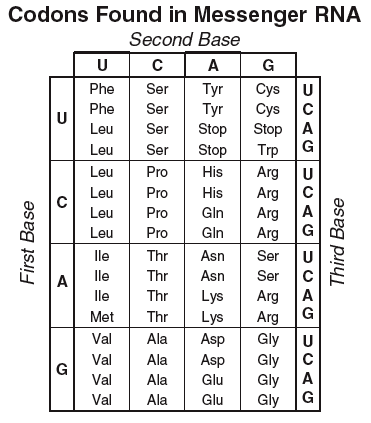
* Describe the process of DNA replication
* DNA unwinds with the help of helicase at replication forks and a copy is made of both strands. Two new molecules of DNA are made each with one original strand and one new strand by DNA polymerase. Both DNA molecules are identical. Semi-conservative replication.
* Define and describe transcription (DNA to mRNA)
* mRNA copies a portion of the DNA strand(gene) and takes the copy to the ribosomes
* Define and describe translation (mRNA to protein)
* The mRNA strand is decoded at the ribosomes. tRNA brings the correct AA’s over to the ribosomes and the polypeptide(protein) is created.
* Translate and transcribe a nucleotide sequence.

DNA =

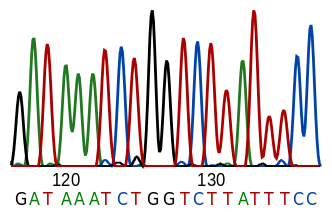
mRNA = CUA UUU AGA CCA GAA UAA AGG

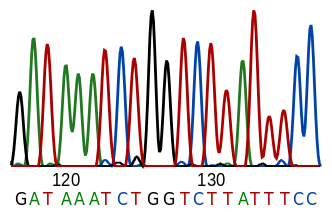
Use the codon chart to determine the amino acid sequence of a gene

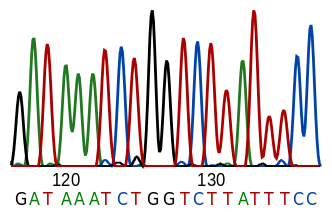




* Identify DNA mutations (deletion, substitution, frame-shift)







* Read and analyze a karyotype (male or female? Is it “normal?” What is wrong?) Male = XY

Trisomy 18 – extra 18th chromosome.

