

Biology One Handbook

2015-2016

Unit 1

- Section 1.1 - Scientific Thinking
- Section 1.2 - Characteristics of Life and Diversity of Life
 - North Carolina Essential Standard **(NCES)** Bio.2.1 Analyze the interdependence of living organisms within their environments.

Unit 2

- Section 2.1 – Biochemistry
 - **(NCES)** Bio.4.1 Understand how biological molecules are essential to the survival of living organisms.

Unit 3

- Section 3.1 - Cell Structure
 - **(NCES)** Bio.1.1 Understand the relationship between the structures and functions of cells and their organelles.
- Section 3.2 - Cell Transport
 - **(NCES)** Bio.1.2 Analyze the cell as a living system.

Unit 4

- Section 4.1 - Cell Energy
 - **(NCES)** Bio.4.2 Analyze the relationships between biochemical processes and energy use in the cell.

Unit 5

- Section 5.1 - DNA Structure and Replication
 - **(NCES)** Bio.3.1 Explain how traits are determined by the structure and function of DNA.
- Section 5.2 - Protein Synthesis
 - **(NCES)** Bio.3.1 Explain how traits are determined by the structure and function of DNA.
 - **(NCES)** Bio.1.1 Understand the relationship between the structures and functions of cells and their organelles.
 - **(NCES)** Bio.3.3 Understand the application of DNA technology.

Unit 6

- Section 6.1 - Cell Reproduction
 - **(NCES)** Bio.1.2.2 – Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis
 - **(NCES)** Bio.3.2 Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits.

Unit 7

- Section 3.3 - Genetics
 - **(NCES)** Bio.3.2 Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits.
- Section 3.4 - DNA Technology and its Application to Human Heredity
 - **(NCES)** Bio.3.2 Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits.

Unit 8

- Section 4.1 - Natural Selection
 - **(NCES)** Bio.3.4 Explain the theory of evolution by natural selection as a mechanism for how species change over time.
- Section 4.2 - Disease Agents and Natural Selection
 - **(NCES)** Bio.3.4 Explain the theory of evolution by natural selection as a mechanism for how species change over time.
- Section 4.3 - Classification and Speciation
 - **(NCES)** Bio.3.5 Analyze how classification systems are developed upon speciation.

Unit 9

- Section 5.1 - Diversity of Life
 - **(NCES)** Bio.2.1 Analyze the interdependence of living organisms within their environments.
- Section 5.2 - Plant Diversity
 - **(NCES)** Bio.2.1 Analyze the interdependence of living organisms within their environments.
 - **(NCES)** Bio.3.5 Analyze how classification systems are developed upon speciation.
- Section 5.3 - Animal Diversity
 - **(NCES)** Bio.2.1 Analyze the interdependence of living organisms within their environments.
 - **(NCES)** Bio.3.5 Analyze how classification systems are developed upon speciation.
- Section 5.4 - Animal Behavior
 - **(NCES)** Bio.2.1 Analyze the interdependence of living organisms within their environments.
 - **(NCES)** Bio.1.2 Analyze the cell as a living system.

Unit 10

- Section 6.1 - Ecology
 - **(NCES)** Bio.1.2 Analyze the cell as a living system.
 - **(NCES)** Bio.4.2 Analyze the relationships between biochemical processes and energy use in the cell.
- Section 6.2 - Human Impact on the Environment
 - **(NCES)** Bio.4.2 Analyze the relationships between biochemical processes and energy use in the cell.
 - **(NCES)** Bio.2.2 Understand the impact of human activities on the environment (one generation affects the next)

**This is the work of many tireless scientists and educators who believe
that science is about exploring and education is about inspiring.
Assembled by: Diana Luong and Joanna Schimizzi**

Unit One – Scientific Thinking and Connections in Biology

1.1- What is Science?

- Science is NOT just a collection of facts, concepts and useful ideas, but _____

- Reliable knowledge is knowledge that has a

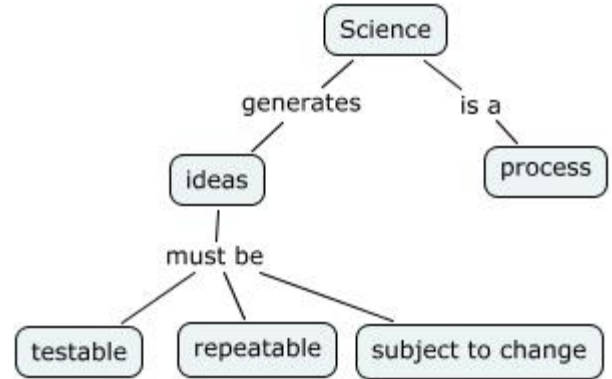


Figure 1.1a

<http://skat.ihmc.us/rid-1M92XK1NB-PLMNTV-21CB/Science.cmap?rid-1M92XK1NB-PLMNTV>

- There are three critical components to reliable scientific/critical thinking.
 - The use of _____ – evidence you can experience (see, hear, etc) and that can be _____, versus circumstantial evidence, testimonial evidence and authoritarian evidence
 - The practice of logical reasoning – requires careful analysis of evidence before:
 - _____ reasoning – _____ based on evidence
 - _____ reasoning – _____ on conclusions
 - _____ – constant questioning of the source and reliability of your beliefs and conclusions, _____
_____ (Schafersman, 1997).

- The Scientific Method collects data using the critical analysis traits that scientists

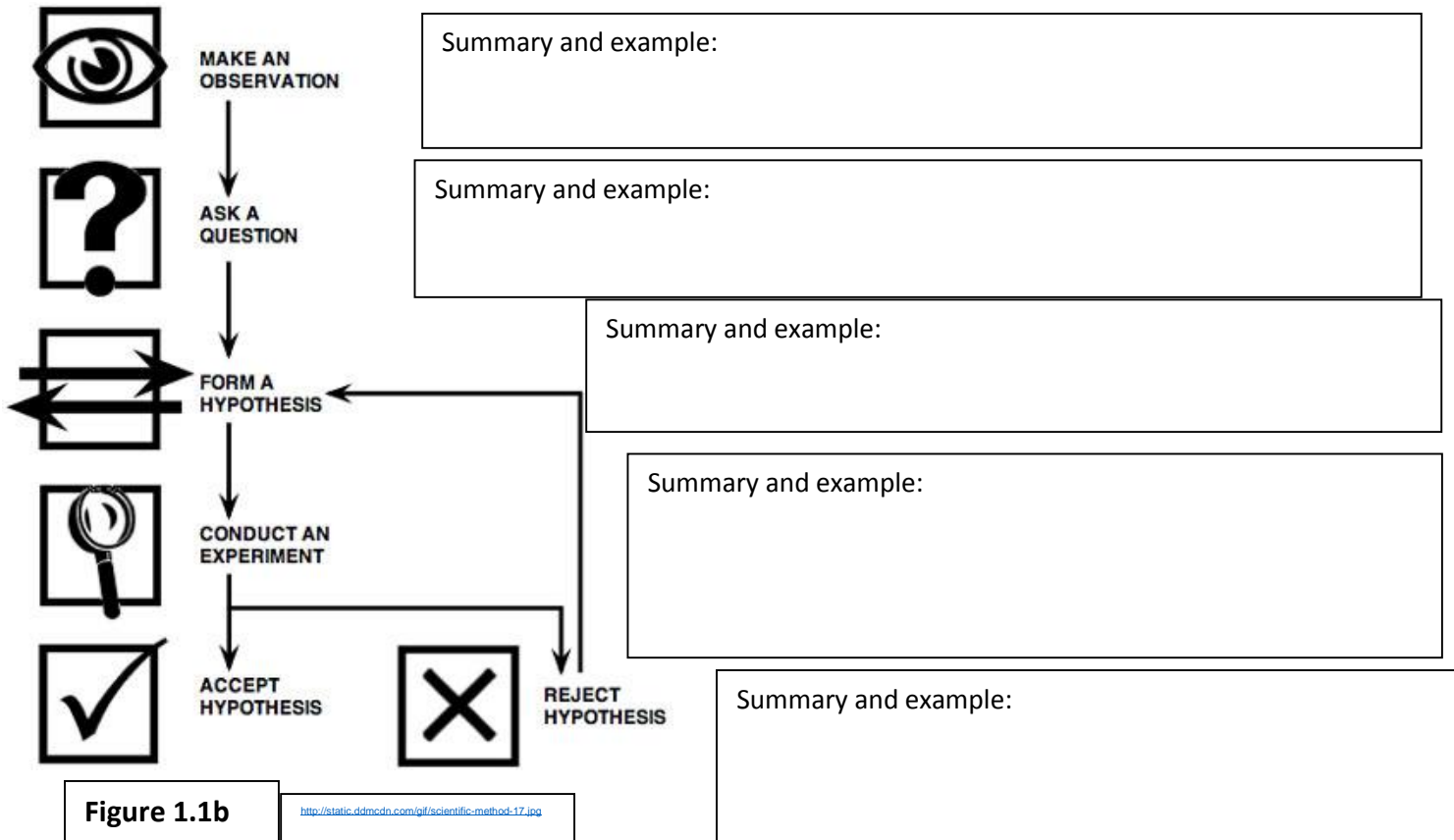


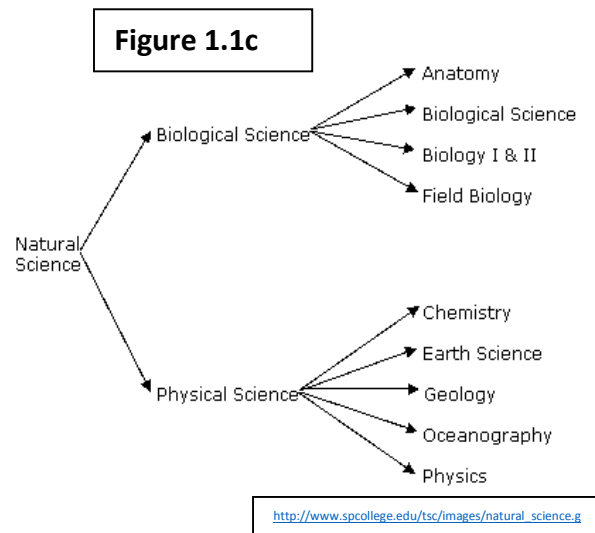
Figure 1.1b

<http://static.dnrcdn.com/gf/scientific-method-17.jpg>

What Does Biology Study?

- Science is divided into disciplines that examine different components of the natural world.

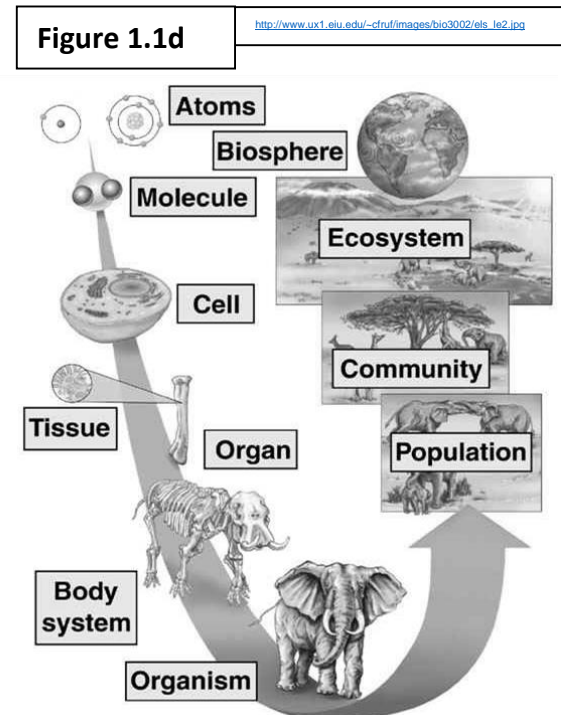
- _____
- _____
- Some organisms are _____ and consist of tissues, organs and organ systems.
- In order to understand cells, we need to know what they are made of, **EVERYTHING**, living or non-living is made of _____.
- The smallest unit of matter is _____. Multiple atoms are held together by _____ to form both small and large _____.
- The matter in the universe is arranged in repeating units that give each set of matter unique characteristics.



Levels of Organization

All matter is composed of atoms of elements. Important elements to life include _____. The essential elements are abbreviated as _____.

- These elements bond together by sharing electrons to form molecules.
 - Molecules can be grouped as _____. The most important inorganic molecule is water.
 - All life is carbon-based and there are _____
 - _____
 - _____



Summary:

1.2- STERNGRR the 8 functions of living things

- Living organisms share many characteristics such as having enzymes. These characteristics can be described in many ways, but one method is to list _____

_____.
 - _____; organisms **build body structures** like hair and nails
 - _____; organisms **move things within their body**, like using blood
 - _____; organisms **get rid of** solid, liquid and gas **waste**
 - _____; organisms **control** their body temperature
 - _____; organisms either **make or consume food**
 - _____; multicellular organisms **get bigger and change in a variety of ways**
 - _____; organisms all need to **break down carbs to get energy** in the form of ATP, often using oxygen
 - _____; organisms **make offspring**, either asexually or sexually
-
- Together ALL these **STERNGRR** reactions and internal processes make up every organism's metabolism. Every living thing will perform all 8 processes. Organisms also regulate their internal conditions in a process known as homeostasis.

Summary:

1.3 - The Six Kingdoms Overview - Living organisms share many

characteristics, but they come in many different forms. Organisms can be grouped or classified into 6 main kingdoms based on their similarities and differences.

- _____ - a kingdom of _____ organism known as _____ (have no nucleus). These are the main bacteria you hear of like Staph, Strep and Salmonella that commonly come in contact with you.
- _____ – (aka extremophiles) are a kingdom of simple _____ unicellular organisms that live in _____ environments. They are even found living in the Dead Sea!
- _____ – a kingdom of complex _____ cells with a nucleus, but some are unicellular, some are _____. These include algae and brain-eating amoebas! These unicellular organisms often have many **adaptations** such as eyespots, cilia and flagella to help them survive.
- _____ - a kingdom of _____, multicellular organisms that are _____ (make their own food). They are divided into 4 main groups within this kingdom.
- _____ - kingdom of eukaryotic organisms that _____ extracellularly. These include mushrooms, molds and yeasts.
- _____ – a kingdom of _____ organisms that _____
- Some don't fit... _____!!! These organisms don't have cells and don't perform any of the life functions on their own. In order to survive, _____

Unit 2 – Biochemistry – The Four Organic Macromolecules

- Macromolecules (_____) are made of _____ (aka subunits). Your body needs these molecules to perform functions. Your source of these is the food you eat. It is possible to use chemistry to perform _____ to see if these macromolecules are found in a sample.

A. Carbohydrates

- Carbohydrates are made of atoms of _____ arranged into a polygon monomer called _____.

- Examples of small carbs are _____. These are sources of _____ for your cells.

- Examples of large carbs are _____. These are longer energy sources because they are bigger polymers.

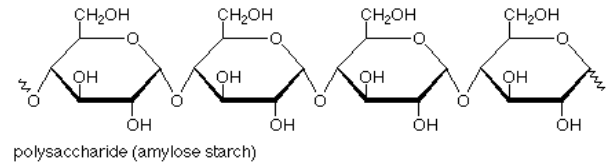
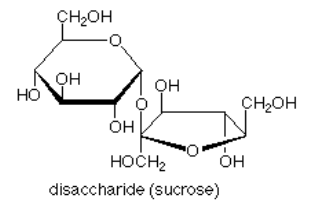
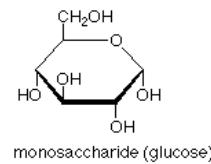
- Plants have a special carb called _____. This big carb provides _____.

- _____ is a chemical that indicates if _____ is present by turning from _____ when boiled.

- _____ indicates if _____ is present by turning from yellow/orange to blue/black.

Figure 2.1a

http://2.bp.blogspot.com/_2he3LXb0OwE/TKgF1RkDICI/AAAAAAAAAAU/OsuVazr5q9s1600/11eb24.pdf



Summary:

B. Lipids

- Lipids are made of atoms of _____ arranged into a monomer called a _____. Lipids have long tails called fatty acids. These can be saturated or unsaturated.
 - _____ fatty acids form kinks and are _____ at room temperature like plant oils.
 - _____ fatty acids form NO kinks and are _____ at room temperature like animal fats.
- Lipids are important sources of _____. They are also stored by animals and be used as _____.
- The most important type of lipid is a _____. Phospholipids have a unique shape that _____ around the outside of every cell !!!
- The indicator test for lipids is a _____. The lipids get absorbed and leave a transparent spot.

Figure 2.1b

http://4.bp.blogspot.com/_5be_mvplNnRA/T385cRz6vZj/AAAAAA

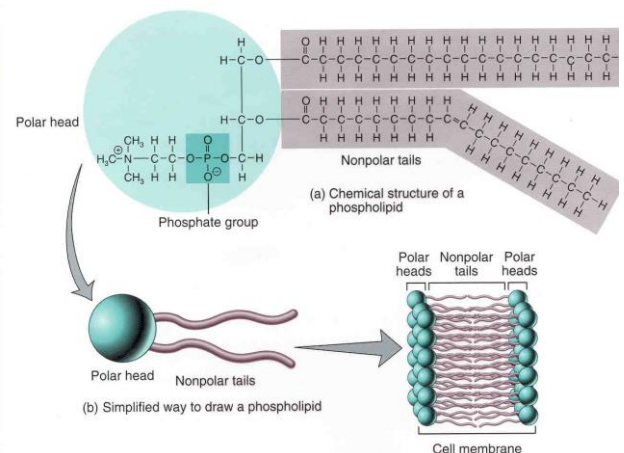
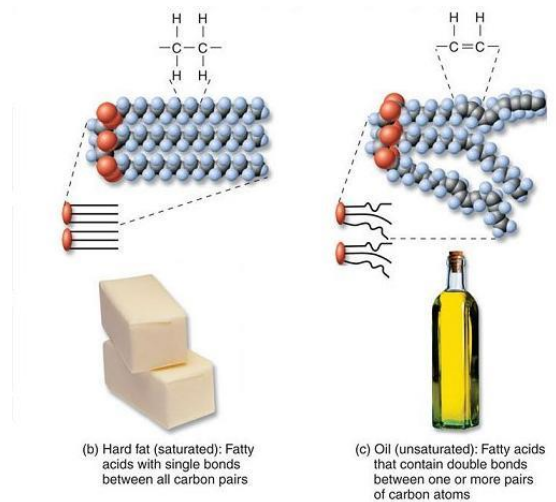


Figure 2.1c

http://homepage.smc.edu/wissmann_paul/anatomy2textbook/phospholipid

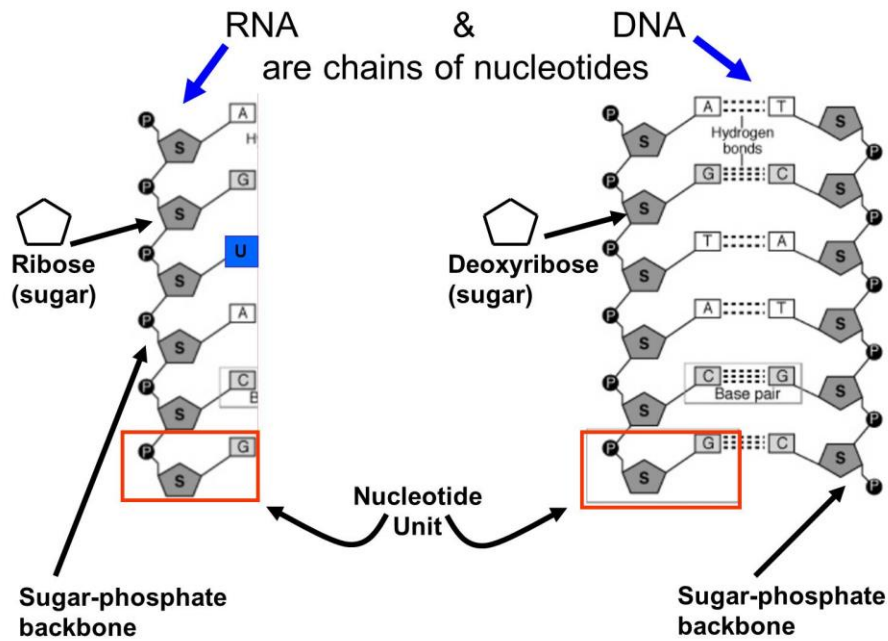
Summary:

C. Nucleic Acids

- Nucleic acids are made of atoms of _____ arranged into a 3- part monomer called a _____. Nucleotides come in five different types and information is stored based on their sequence/order.

Figure 2.1d

http://sphweb.bumc.bu.edu/oth/MPH-Modules/PH/PH709_BasicCellBiology/RNA_DN



- _____ (DNA) is a _____ of nucleotides that carries _____ for cells to make their needed molecules like proteins.
- Ribonucleic acid (_____) is a single strand of nucleotides that performs different jobs to help DNA _____.

Summary:

D. Proteins

- Proteins are made of atoms of _____ arranged into a monomer called an _____. Amino acids come in 20 different types and MUST go in the right order to form the right shaped protein. FORM fits FUNCTION.

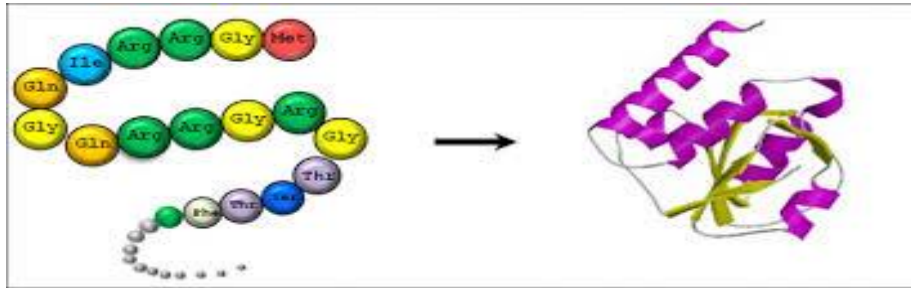


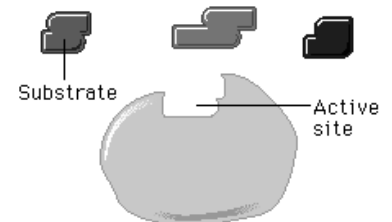
Figure 2.1e

<https://www.ebi.ac.uk/training/online/sites/ebi.ac.uk.training.online/files/user/8>

- A protein's shape is important to the job it performs.** There are 6 important jobs.
 - _____ – builds parts like hair, nails, muscle
 - _____ – between cells and animals like the hormone insulin
 - _____ – prevent illness like antibodies
 - _____ – absorbs light like melanin and chlorophyll
 - _____ – molecules like hemoglobin in your blood
 - _____ – speed up chemical reactions like catalase that breaks down hydrogen peroxide

Figure 2.1f

http://leavingbio.net/ENZYMES_files/image009.gif



- _____ is an indicator of proteins it turns from _____
- These four macromolecules are found in EVERY living thing on Earth. Cells make and break down these molecules as part of the cell's regulation and **homeostasis** needed for survival.

Summary:

E. Enzymes

- Enzymes are a group of _____ that allow organisms to regulate internal conditions by speeding up chemical reactions.

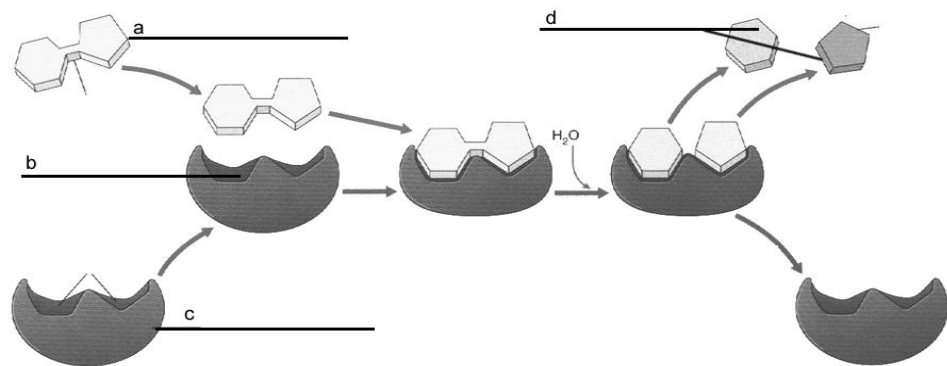
- Enzymes _____ and have 4 unique properties:

- Enzymes _____ (synthesis/digestions) by bringing substrates together in an optimum (BEST) orientation, thus _____ which is needed to start the reaction.

Since enzymes are usually proteins, they are called _____.

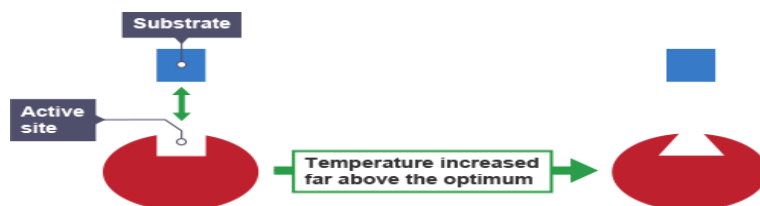
- Enzymes have a _____ that fits with only certain substrates.
- Enzymes are unchanged during the reaction, so they are _____.

Figure 2.1g
http://www.biology.com/er.com/resources/enzyme_labelme.gif



- Enzymes work at their optimum rate in only some conditions. Changes in _____ can _____ the enzyme or change its shape. _____.

Figure 2.1h
<http://a.files.bbci.co.uk/bam/live/content/zn9r87h/laree>



- The reaction rate of enzymes is highest in the optimum conditions of each unique organism (thermal vent bacteria, penguins, cacti). _____

_____ can cause the enzymes to denature which _____.

Organisms and their cells have mechanisms to help minimize changes in temperature, pH and salinity (to maintain homeostasis).

- _____
- pH is a scale to measure if a solution is an acid or a base. The value of 7 is _____; below 7 are called _____; above 7 are called _____.
- Buffers can respond to changes in pH to help maintain homeostasis to prevent enzymes from becoming denatured.

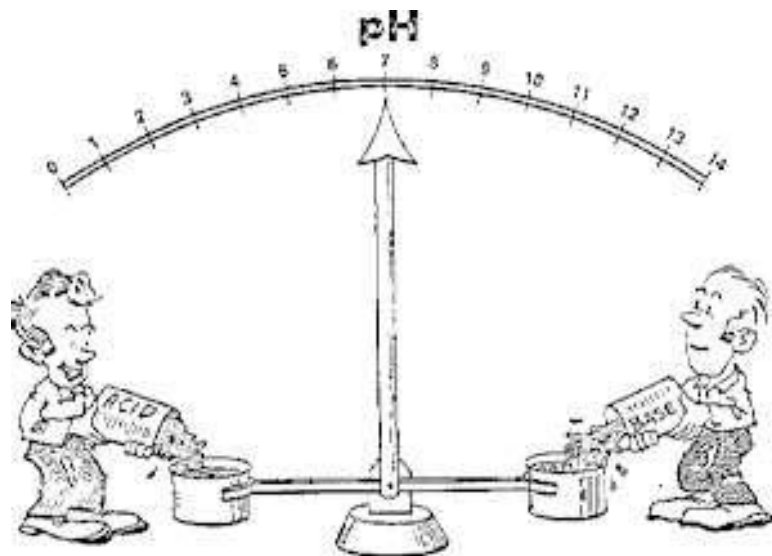


Figure 2.1j

<http://sconline.stonechild.edu/course/view.php?id=278&week=10>

Summary:

Unit 3 Cell Structure and Transport

3.1 Cell Structure and Function

- Macromolecules such as PCLN are organized to form the structures that create cells. Cells are the _____.

Important scientists who discovered cells:

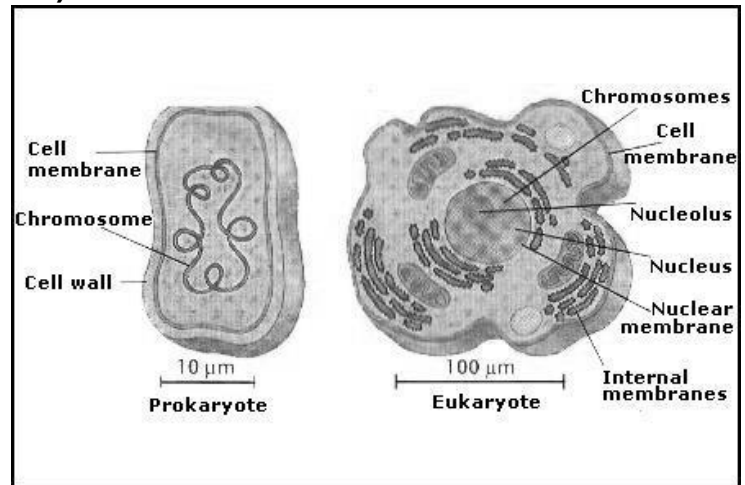
- Robert Hooke – _____, looked at cork (dead cells) and gave individual units the name “cells”
- Anton von Leeuwenhoek – _____, looked at scrapings from his cheek and saw live cells

Figure 3.1a

<http://www.tutorvista.com/content/biology/biology/>

ALL Cells have 4 Structures (organelles):

1. _____ -
is a phospholipid bilayer that separates the inside of the cell from the outside.
2. _____ - the
inside filling of the cell mostly H₂O.
3. DNA – _____ -
_____ Organized into chromosomes that are circular in prokaryotes and linear in eukaryotes.
4. _____ – an organelle where the _____



Types of cells:

- _____: “pro” means _____ and “kary” means _____. They do NOT have a central place to store DNA. The _____ - _____. These cells have only the four main structures to build a cell and are able to perform all STERNGRR life functions.
- Eukaryotic: “eu” means _____ and “kary” means _____. These cells have a membrane that surrounds all the DNA in the cell. The cells have all four main structures as well _____.

Summary:

Cell Organelles - cellular parts that have unique structures and unique functions.

There are four that all cells share (see prior page) and up to nine others that are found in _____.

Figure 3.1b

- **Prokaryotic cell organelles** - in addition to the four common organelles, prokaryotes also have:

<http://www.fridayharborholistichealth.com/2012/06/how-we-must-learn-from-bacteria/>

1. _____ - smaller _____ that can be traded between bacteria
2. _____ - protein structure outside the cell membrane to help protect the cell

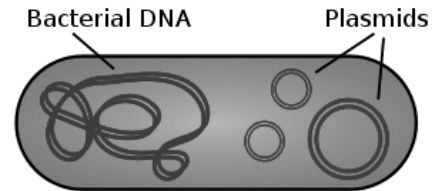


Figure 3.1c

<http://www.nkelloe.com/aphiology.htm>

- **Eukaryotic cell organelles** - in addition to the four common organelles, eukaryotic cells also have the following six organelles:

1. _____ - the region inside of eukaryotic cells where DNA is contained by a membrane
2. _____ - membrane containing _____ to breakdown waste and cell structures
3. _____ (endoplasmic reticulum) - membrane to change proteins, detoxify alcohol and communication
4. _____ Body/Complex - membrane to package proteins for release from a cell
5. _____ - a membrane that creates a _____ for food, water, or waste.
6. _____ - a series of folded membranes where carbs are broken down for energy during respiration.

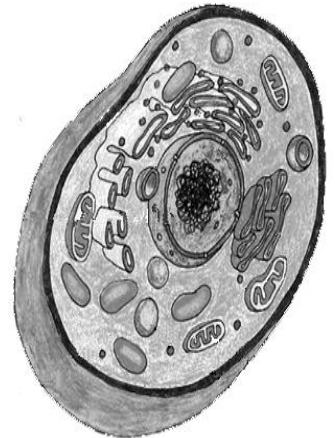
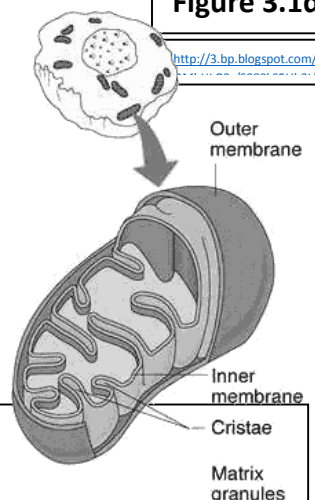


Figure 3.1d

<http://3.bp.blogspot.com/nZq...>

- **Organelles interact with each other to carry out cell functions:**

Example: DNA in the nucleus codes for _____
 _____ These proteins can then be used as _____



Summary:

Figure 3.1e

<http://micro.magnet.fsu.edu/cells/>

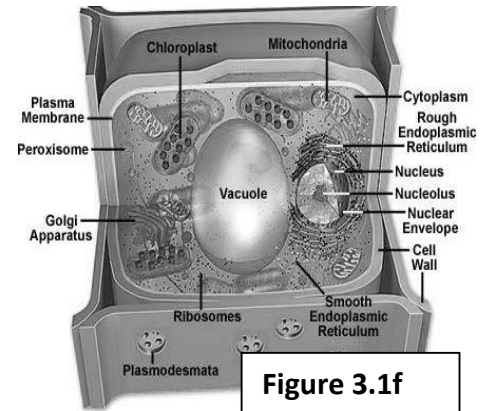


Figure 3.1f

<http://www.artisaid.com/2013/04/14/condict-what-are-and-what-they-are->

• **Organelles found ONLY in PLANT Cells**

1. _____ - large carbohydrate that creates extra support around the exterior of the cell membrane of plants.
2. _____ (plants) – organelle that contains the _____ and has many stacks of membranes to create food during _____.

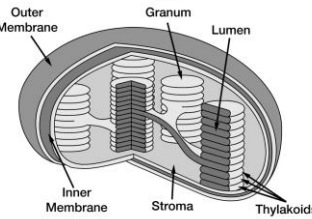
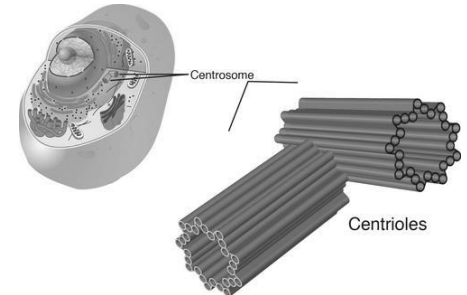


Figure 3.1g

<http://www.huzzle.com/articles/centriole>

• **Organelles found ONLY in ANIMAL cells**

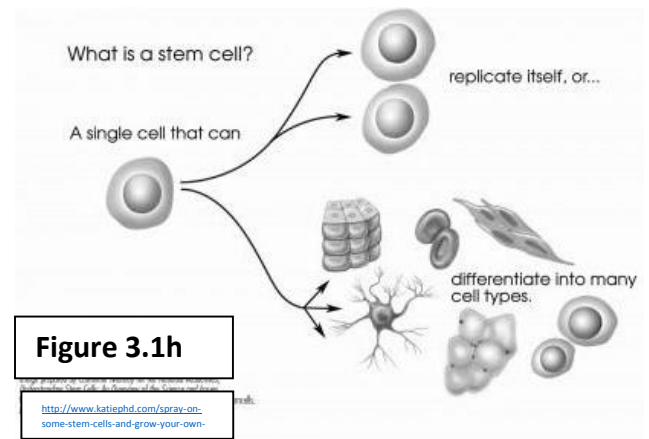
1. _____ – protein that helps animal cells divide during mitosis.



Summary:

Cell specialization creates different cells within an organism.

- A multicellular organism begins its life as an embryo with many _____ and no other job than to grow.
- The different cells of multicellular organisms have the same DNA, but _____. This allows cells to be _____.
- Cells are specialized which means their _____. Cells throughout the organism have different shapes and perform different jobs.
- _____ are undifferentiated cells that can be found in a developing embryos or in small reserves in the body of adults.



• **Examples of differentiated/specialized cells are:**

- Red blood cells are specialized with the protein _____ to help carry oxygen.
- _____ because they need a lot of energy.
- Sperm cells have a tail called a _____ to swim toward the egg,
- Some plants have _____, they are long thin tubes to carry water.
- Nerve cells called _____ are long and thin and have extensions _____ to send messages.

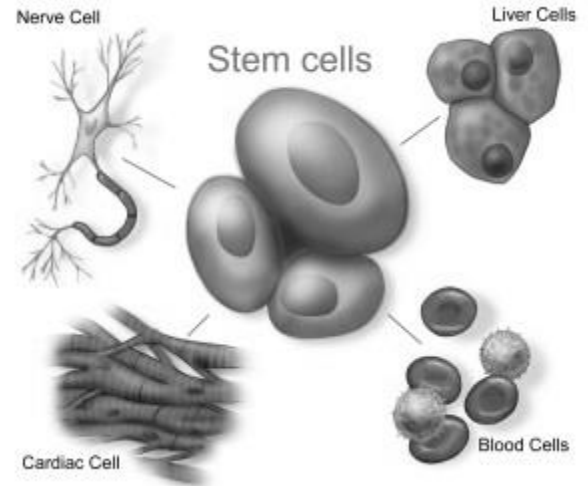


Figure 3.1i

<http://www.apple.com/oss/apps/app-store.html>

• **Differentiated cells require cells to collaborate and communicate**

1. _____: Cells that touch or have a very small distance can use _____. _____ . Animal nerve cells use both electricity and chemical signals to control body responses.

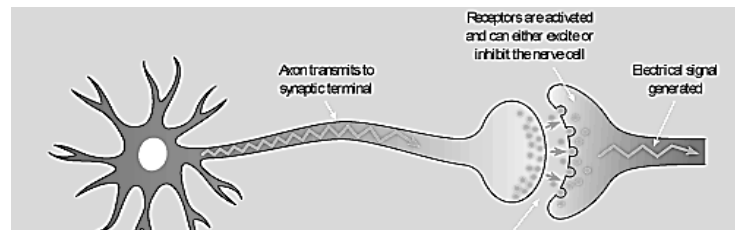
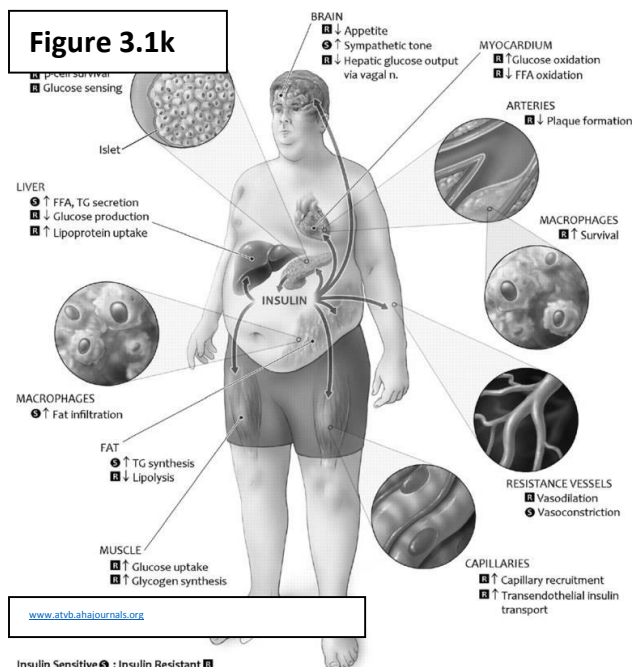


Figure 3.1j

http://www.rch.org.au/neurology/patient_information/antiepileptic_m

2. _____ - communication across long distances requires _____

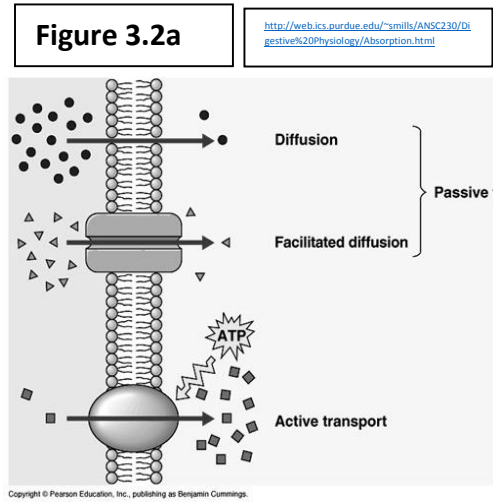


like insulin. This hormone is released by the pancreas and has effects throughout the mammalian body.

Summary:

3.2 Cell Homeostasis

- Cells are the basic unit of life therefore they must perform the life functions of _____.
 - **Cell Transport:** -- _____
_____.
- Any substance passing into or out of cells must pass through the cell membrane.

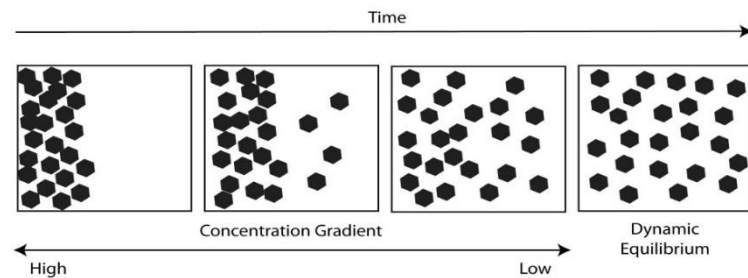


- **Cell Membrane:** The barrier that surrounds ALL cells is _____.
- _____ molecules cross the membrane easily between the lipids (O_2 / CO_2).
- _____ molecules require _____ to cross the membrane.
- Some proteins are channels that allow molecules to passively transport. Other proteins are pumps that require active energy.

Figure 3.2b

- **Passive Transport** - requires _____ because molecules are spreading out from a high concentration to a low concentration without barriers. The two main types are diffusion and osmosis.

1. **Diffusion:** the spreading out of molecules from a _____.



- It is possible because molecules are always randomly moving and colliding.
 - No energy required because molecules are moving _____.
- _____ . A concentration gradient is the difference between two concentrations.

- Diffusion in cells mainly involves the exchange of gases. In animal cells, oxygen is normally diffuses INTO the cell and carbon dioxide is normally diffusing out.
- When the molecules are spread throughout the space evenly, this is called _____.

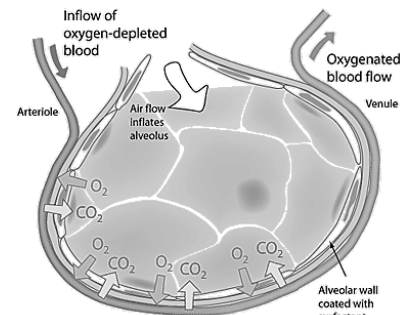


Figure 3.2c

<http://hyperphysics.phy-astr.gsu.edu/hbase/kinetic/henry.html>

2. **Osmosis:** the diffusion of _____

_____ .

- Osmosis is _____ transport- **NO** energy is used.
- Cells must balance their water content. Changing conditions means cells can be in different solutions and must respond.
 - Pure/distilled water = 100% water
 - Saltwater = contains solutes
 - _____ are molecules such as salt or sugar.

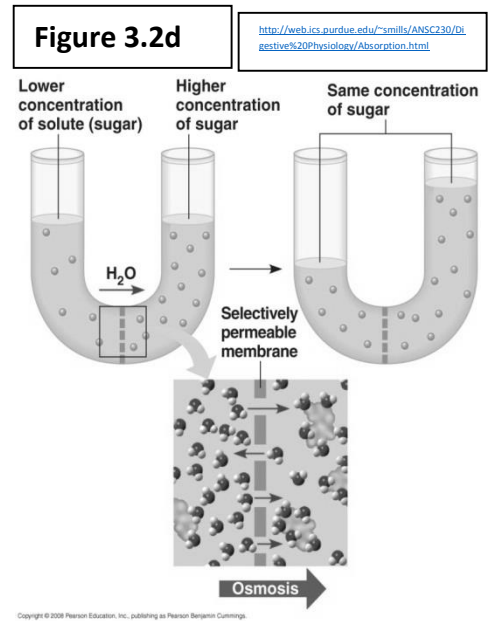


Figure 3.2e

<http://www.ri.net/schools/Narragansett/NHS/PerEwebaage/osmosis.html>

To determine how a cell will react you must:

1. **First-** Calculate how much solute is dissolved in the water on either side of the cell.
2. **Second-** Find the side with the **most water** and **least** amount of solute. **Water** will diffuse from high to low.

Real-life EXAMPLES of osmosis:

- Plant roots use osmosis to take in water they need for photosynthesis.
- If you pour salt on a slug, water diffuses out of the slug and causes it to shrink
- Vegetables in the grocery store are sprayed with water to keep them crisp

Factors that affect cell transport include:

1. _____ (aka :
concentration gradient)
2. Amount of energy (_____)

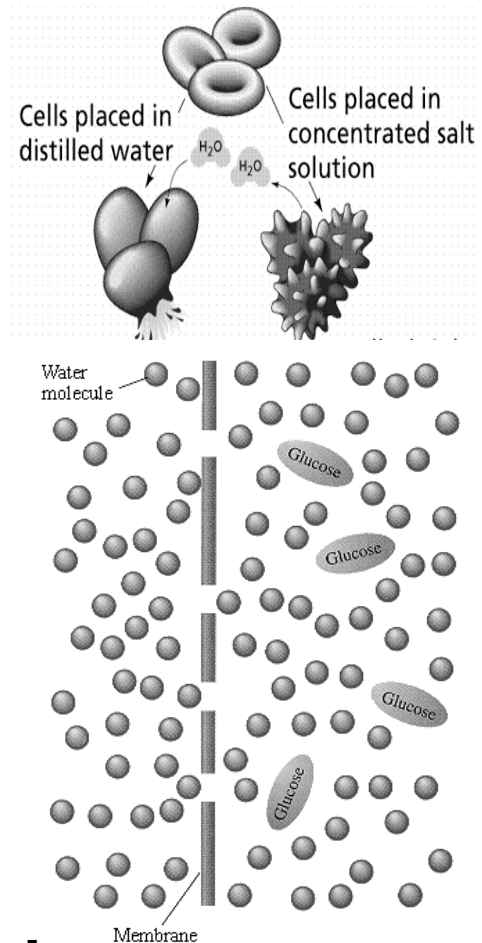


Figure 3.2f

<http://web.nmsu.edu/~snsm/classes/chem116/notes/solutions.html>

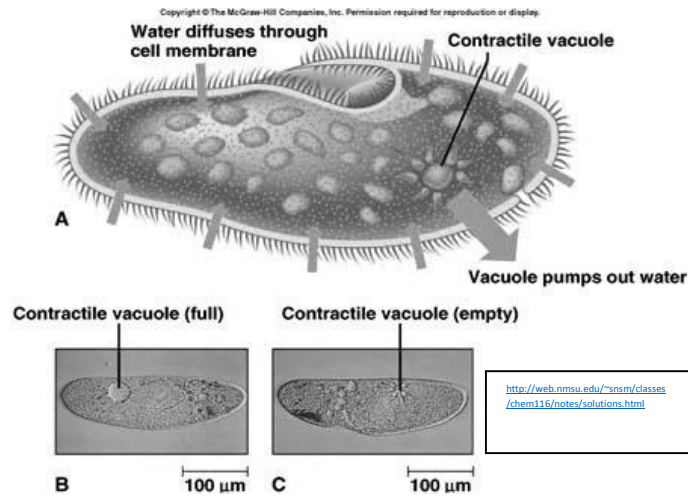
Summary:

Figure 3.2g

Cell Adaptations for survival in a FRESHWATER environment:

- A cell that lives in freshwater, like the protist called paramecium, is surrounded by HIGH concentration of water. This means water is constantly moving INTO their cells which could burst their cell membrane.
- The ADAPTATION they have is called a

_____.



Cell Adaptations for survival in a SALTWATER environment:

- An organism that lives in a saltwater environment, like a starfish, is always in a LOW concentration of water and is constantly losing water.
- _____, organisms bring in salt water and pump out excess salt.

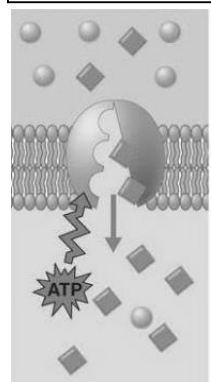
Active Transport: The movement of _____ or the movement of molecules _____.

Both _____ in the form of ATP.

Examples:

- Contractile vacuoles pump water out.
- Sodium-Potassium Pump – 3 sodium pumped out and 2 potassium pumped inside to create electrical impulse for nerve cells.
- _____ (cell-eating), pinocytosis (cell drinking)

Figure 3.2h



<http://alenaimp.blogspot.com/2012/03/diffusi-on-active-transport-and-osmosis.html>

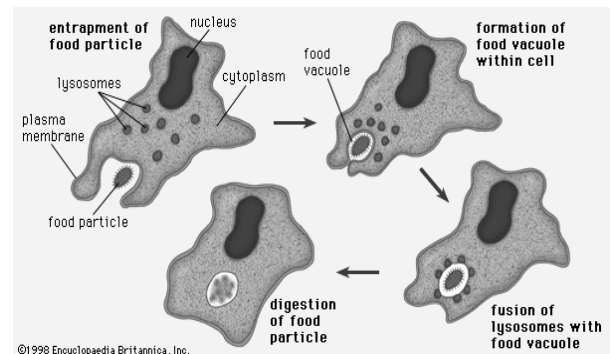
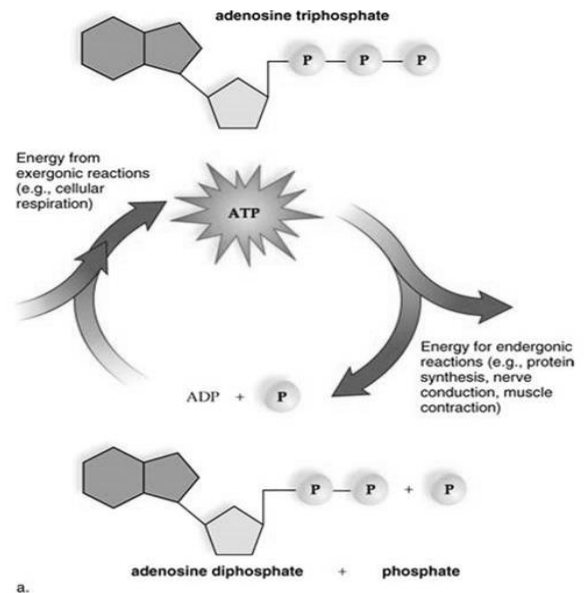


Figure 3.2i

<http://jaoil.blogspot.com/2011/04/cell-membrane.html>

Figure 4.1a

<http://www.biologycorner.com/APbiology/intro/%28notes%29ch6-metabolics.html>



Unit 4 – Energy Transfer

Maintaining homeostasis requires energy.

- _____
(adenosine tri-phosphate).
- **ATP** holds small amounts of energy between 3 phosphates – _____
_____ that can be used by the cell to do work.
 - Product = ADP + Phosphate
- ATP is recyclable, it can be broken and rebuilt.

How do living cells make ATP?

- **Cellular Respiration:** _____

 - In eukaryotic cells - a series of many reactions occurs in the _____ to produce the desired product ATP.

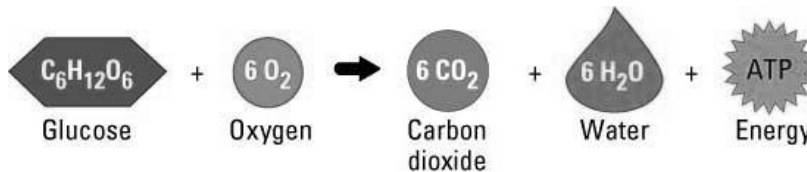


Figure 4.1c

<https://confluence.crbs.ucsd.edu/display/C>

- Water and carbon dioxide must be released as waste.
- **Aerobic Respiration:** _____ to break down sugars, _____, but produces _____.
- **Anaerobic Respiration (FERMENTATION):** uses _____, can be _____ but produces _____.
 - **Alcoholic fermentation:** _____
It produces ATP, CO_2 , H_2O and alcohol.
 - **Lactic Acid fermentation:** _____ makes CO_2 , H_2O and ATP, but also lactic acid, which can cause sore muscles.

Figure 4.1b

<http://micro.magnet.fsu.edu/cells/mitoch/>

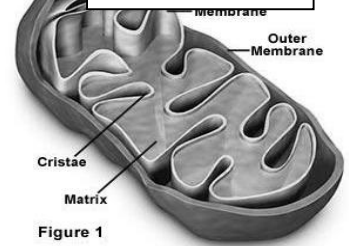


Figure 1

How is energy transferred to ATP?

- Energy comes in many forms.

There are other forms of energy such as kinetic energy (temperature), potential energy and gravitational energy.

- Autotrophs _____ can build their food.

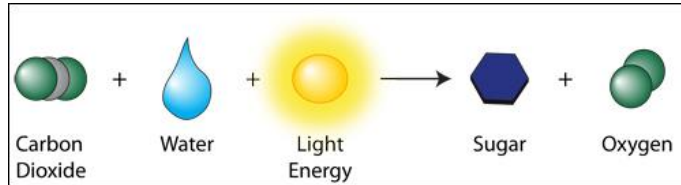
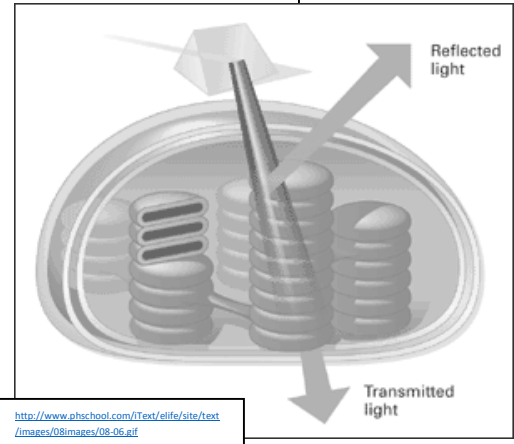


Figure 4.1d

<http://cmmarine.weebly.com/waterweed-simulation.html>

- Plants have a pigment to _____
Chlorophyll can absorb almost all types of light _____

Figure 4.1e



- _____ Oxygen must be released as waste.

- _____ There are stacks of membranes to absorb light.

- Factors that affect the rate of photosynthesis include:
 - Amount of reactants – _____

 - Temperature – Too high of temperatures can

- Photosynthesis and respiration both transfer energy.
 - Photosynthesis transfers _____

 - Respiration transfers _____

- Photosynthesis and respiration both cycle matter.
 - _____

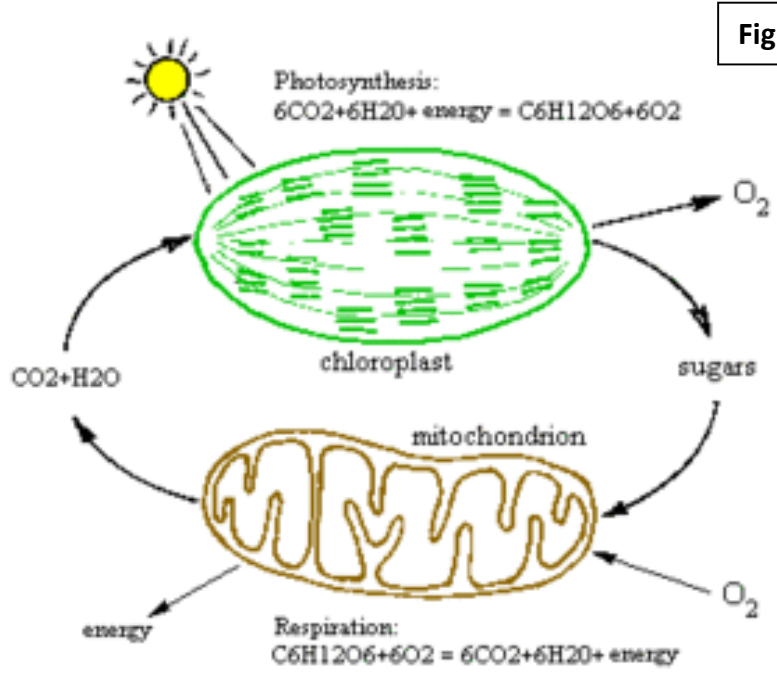


Figure 4.1f

<https://alain.wiki/farlington.k12.mi.us/Unit-3-Photosynthesis-and-Cellular-Respiration>

Summary:

Unit 5 DNA and Genetics

5.1 DNA structure and Replication

Discovery of DNA structure

- _____ was the first to take a clear “picture” of DNA using _____.
- _____ received credit _____ by using the picture taken by Franklin.



Figure 5.1a

<http://3278as3udzze1hdK0f2>

DNA- the Blueprint of Life

- DNA stands for _____.
- DNA is the blueprint for life. Every living thing uses DNA as a _____.
- Ex: DNA contains the instructions for making the proteins (called pigments) which give your eyes color.
- DNA is packaged into _____ (strands of DNA wrapped around proteins and coiled tightly)
- Chromosomes are found _____.
- _____ cells have chromosome _____ in the cytoplasm.

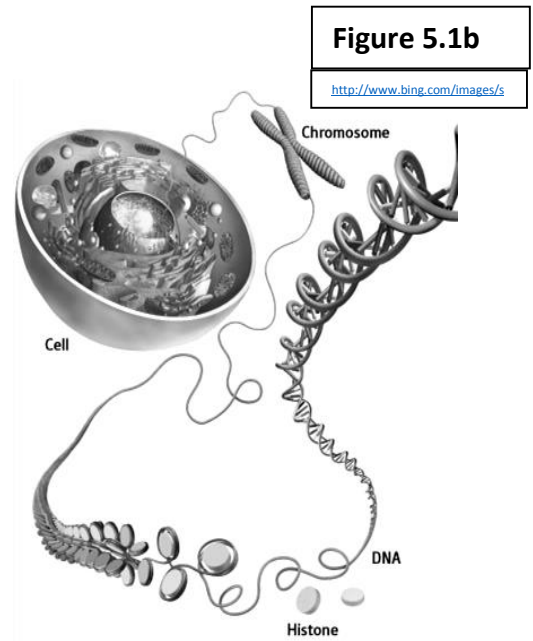


Figure 5.1b

<http://www.bing.com/images/s>

Figure 5.1c

<http://www.dnacenter.com/imag>

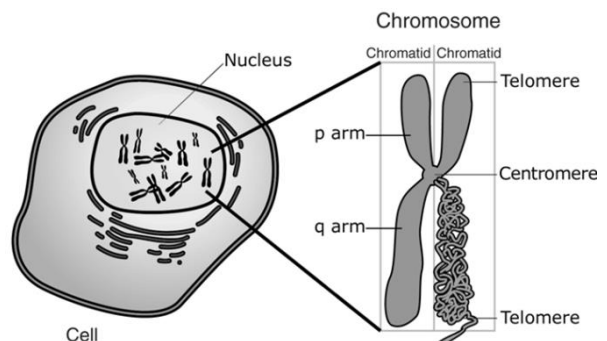
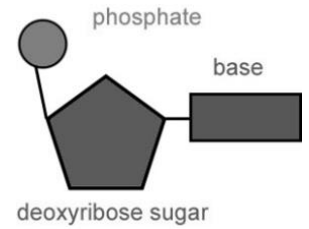


Figure 5.1d

<https://encrypted->

Structure of the DNA molecule

- DNA is composed of two strands that are twisted together into a _____ . A double helix is also called a twisted ladder.
- The building blocks of DNA are called _____ .

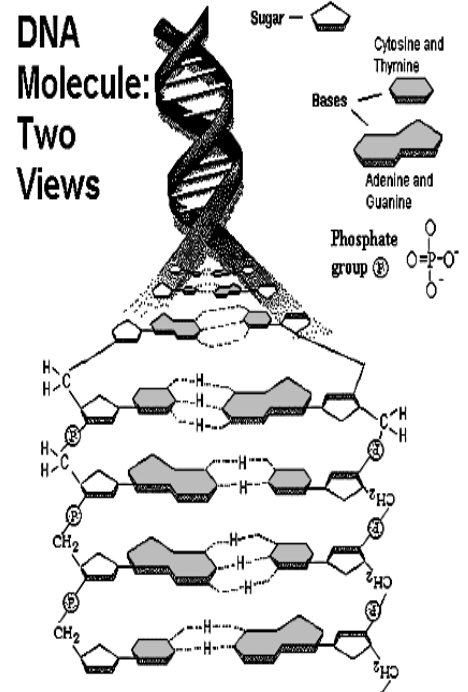


A nucleotide consists of three parts:

1. A _____ (named deoxyribose).
2. A _____
3. A _____ . There are four possible nitrogen bases in a DNA molecule:
 - Adenine (A) _____ (T)
 - _____ (G) Cytosine (C)

- The nucleotides are arranged into 2 stands that are held together by _____ between the nitrogen bases.
- The sides of the ladder are made of _____ . The rungs of the ladder are the _____ .
- _____ of DNA results in the nitrogen bases *a/ways* pairing up _____

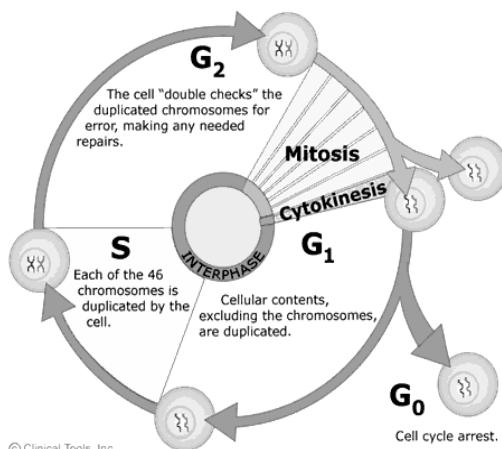
Figure 5.1e



DNA Replication *If I started as one cell, how did all of my cells get a copy of DNA?*

Figure 5.1f

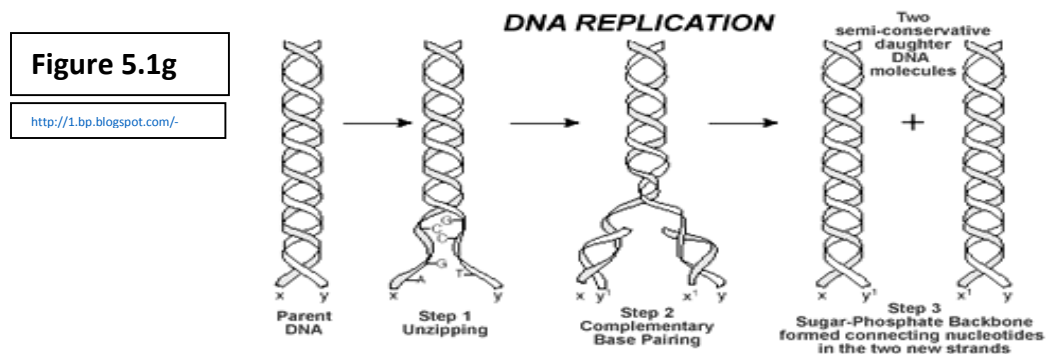
<https://encrypted-thn1.getstatic.com/images/2nsth04N>



- Because DNA is so important, when a cell divides, it _____ to its daughter cells so they can function.
- Therefore, DNA is copied (replicated) _____ , (specifically the "S"-phase), immediately before the cell begins mitosis.

Process of DNA Replication (4 steps)

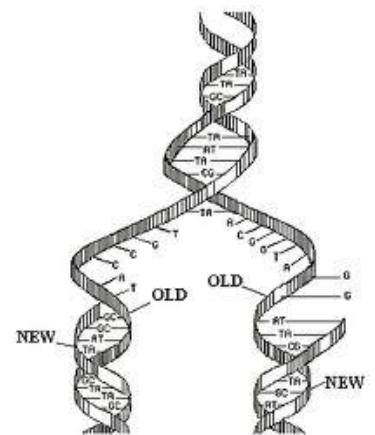
1. An _____ between the paired nitrogen bases. This allows DNA to “_____” as the two strands move apart.
2. The newly _____ with extra nucleotides present in the nucleus. This process is catalyzed by another enzyme.
3. Enzymes then _____ along the newly constructed side of the DNA ladder by _____.
4. The DNA is _____ for any errors.



Result of DNA replication

- _____
 Each “daughter” DNA molecule is composed of _____
 _____ (semi-conservative).
- Each copy of DNA is packaged as a _____ on a doubled chromosome.
- After mitosis _____
 _____. This happens when the doubled chromosome is split.

Figure 5.1h



<https://encrypted->

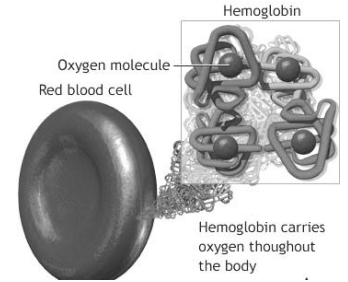
Summary:

5.2 Protein Synthesis

Figure 5.2a

Importance of Protein Synthesis

- Every _____ is controlled by one or more _____.
- Each cell must _____
_____ of that cell.
 - Ex: Only blood cells need to produce the protein hemoglobin.



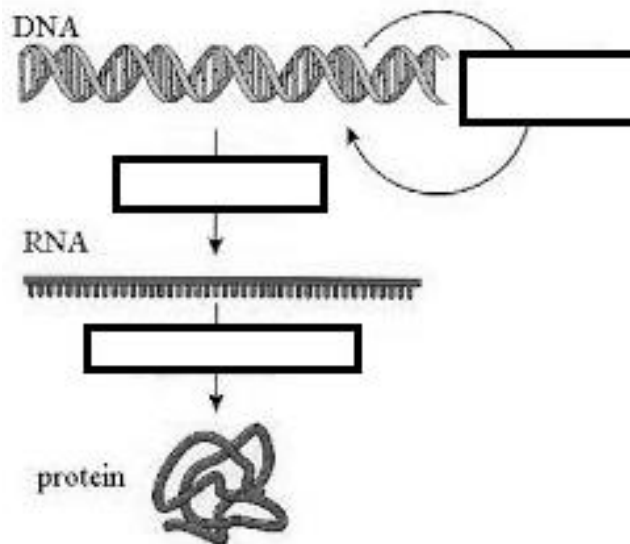
<http://www.masimo.es>

DNA Controls the Production of Proteins.

- _____ is used as the blueprint for making a protein.
- _____
○ Ex: DNA sequence of insulin → CCA-TAG-CAC-GTT-ACA-ACG-TGA
- The cell knows what protein to make based on the sequence. Therefore the _____
_____!

The Central Dogma- describes the sequence in which information is passed to determine your traits (those that are controlled by proteins).

Figure 5.2b



<https://encrypted->

Figure 5.2c

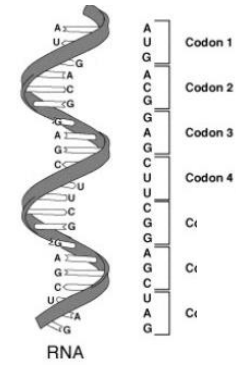
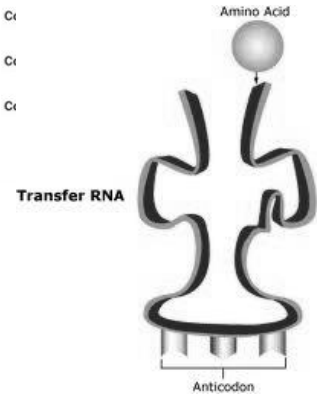


Figure 5.2d



Protein Synthesis Requires RNA

- There are 3 types: _____
_____.
- RNA is made up of a single strand of nucleotides. The nucleotides consist of: sugar (_____), phosphate, a nitrogen base.
 - In RNA _____.
 - Thus: A pairs with U and G pairs with C
- A _____ is every three bases in a sequence of mRNA.
- An _____ is three bases on tRNA.

<https://upload.wikimedi>

<http://science.halleyhosting>

Process of protein synthesis (two steps)

1. Transcription

- Occurs in the _____. The _____.
- _____ (it is far too big) to go the ribosomes where proteins are made.

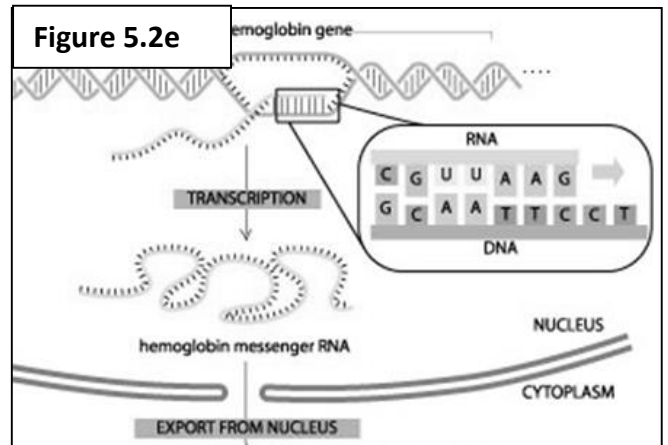


Figure 5.2e

<http://www.conradscience>

Steps:

1. Enzymes _____ (a gene). _____.
 2. mRNA nucleotides _____ and base pair. (A-U and C-G)
 3. mRNA is completed and _____.
 4. _____ the nucleus thru a pore in the nuclear membrane.
- The **protein is not yet synthesized!** The code has been transcribed and needs to be translated!

Summary: Transcribe this DNA sequence into mRNA. **TAC-GTG-CTG-TCT-CCT-ATC**

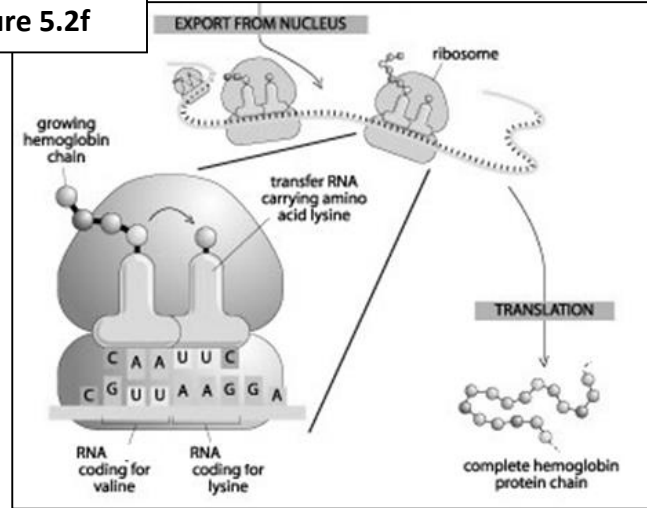
2. Translation

- Occurs in the _____ . Use mRNA to _____ .
- The ribosome holds mRNA in place and helps _____ together to make a protein.

Steps:

- The mRNA enters the _____ .
(A “start” codon begins the process)
- Then tRNA (transfer RNA) _____
_____ to the ribosome
- tRNA's _____
_____ on the mRNA.
- Each new tRNA transfers its amino acid to the previous one to _____ .
- When the “stop” codon is reached the mRNA and _____ .

Figure 5.2f



<http://www.conradscien>

- The amino acid chain “folds” into a special shape and the protein is complete.
- A **mRNA codon chart** has been created to find an amino acid sequence.

Figure 5.2g

First Letter	Second Letter				Third Letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	(start) methionine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G

<http://waynesword.palomar.edu/images/codon1.g>

Summary: Use the mRNA sequence that you transcribed on the previous page and **now translate** it using the **Codon Chart** and find the amino acid sequence.

Gene Regulation

- All of an organism's cells have the same DNA _____
- _____ is the process which _____
- Different types of cells _____

- Ex: Muscle cells, skin cells, and nerve cells have very different functions but the same DNA. It depends on which genes are "turned on".

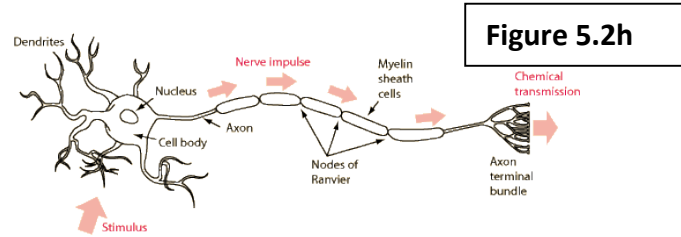


Figure 5.2h

<http://hvnerhvsics.nhv->

Mutations

- Occurs due to a _____
- Results: _____
- Two types of gene mutations:

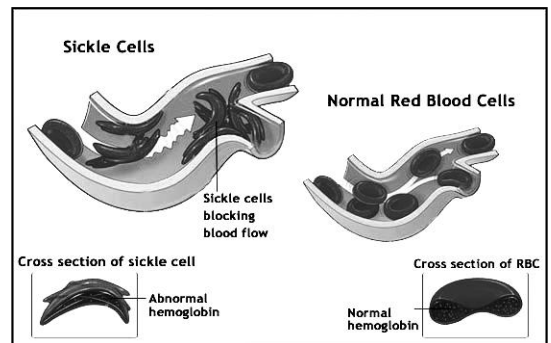
Figure 5.2i

1. _____ occur when a single base is replaced with a different base. May result in the _____ within the protein

Ex. Sickle Cell Anemia, $GAT-TAC-A \rightarrow GAG-TAC-A$

2. _____ occur when a _____ within the sequence. The earlier in the gene sequence the base is added or deleted; the _____.

Ex. Huntington's Disease is caused by the insertion of several bases. $GAT-TAC-ATT \rightarrow GAT-TAA-CAT-T$



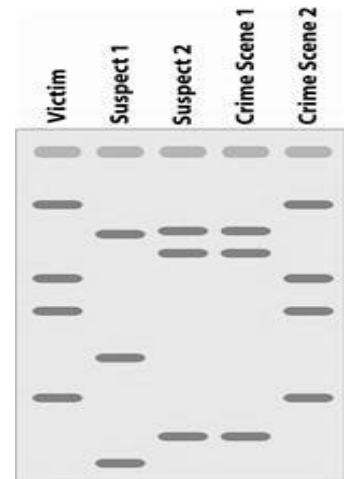
Summary:

Figure 5.3a

<http://dna->

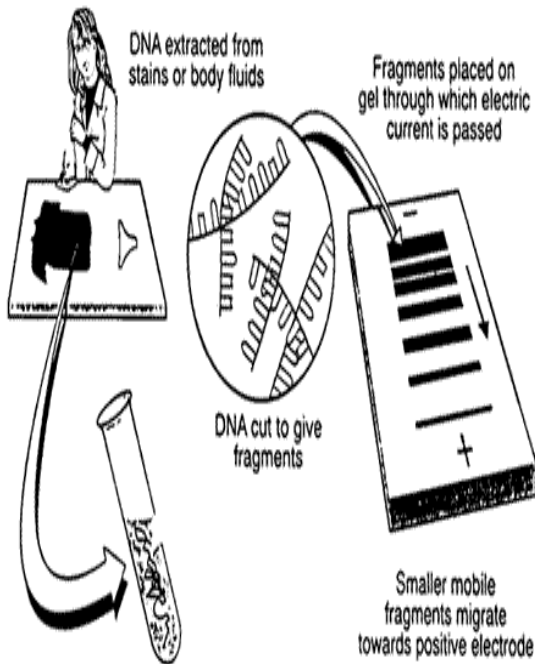
DNA Fingerprint

- DNA fingerprint- _____.
- Unique to every individual, unless you have an identical twin.
- Uses for DNA Fingerprinting:
 - Violent Crimes – determines source of DNA left at a crime scene.
 - Paternity - _____



- _____-tool used to create a DNA fingerprint, it separates pieces of DNA based on size (# of base pairs).

Figure 5.3b



Steps in creating a DNA Fingerprint:

Step 1: _____).

▪ Restriction enzyme: _____

▪ Cleave: _____

Step 2: DNA fragments are loaded into wells on a gel

Step 3: Bands are created as _____ DNA fragments through the gel.

Small pieces move further than larger pieces.

Step 4: Compare to other DNA samples/fingerprints.

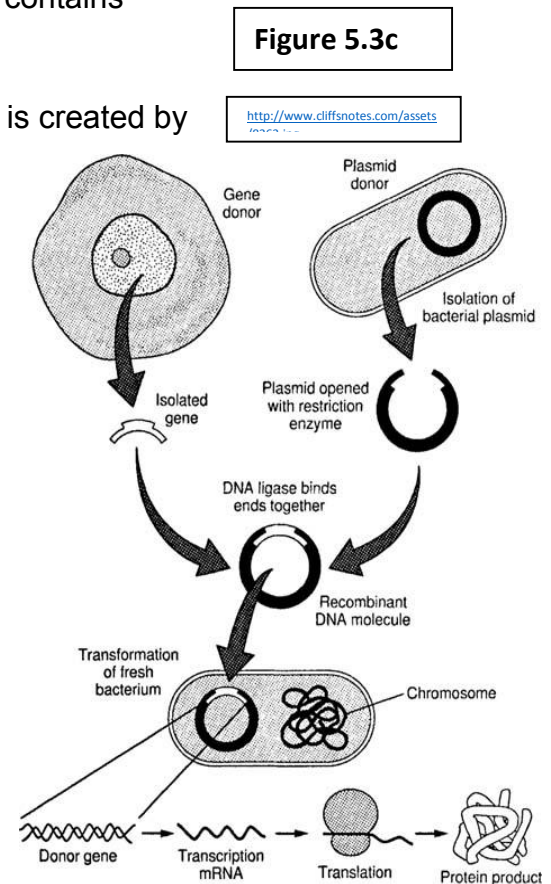
<http://www.biologycorner.co>

Genetic Engineering

- Genetic Engineering: Modifying DNA or creating _____.
- _____: an organism which contains foreign DNA from another species.
- _____: form of artificial DNA that is created by combining two different sources of DNA.

Steps to creating a Transgenic organism:

- Step 1: Restriction enzyme is used to _____.
- Step 2: The same restriction enzyme is used to cleave the vector.
 - _____: The structure used to carry the foreign DNA, plasmids are commonly used.
 - _____: Circular DNA found in bacteria
- Step 3: Foreign DNA and Vector spliced together
 - Splice: _____
- Step 4: The recombinant DNA is inserted into the host (bacteria cell). Then the host cell will copy and produce the protein.



**

**

Bioethical Concerns for Genetic Engineering

- Should we produce artificial proteins? Could lead to allergic reactions
- Stem cell research
- Environmental problems from creating transgenic organisms:
 - _____
 - _____
 - Destruction of beneficial insects like bees by pesticides

Summary:

Human Genome Project

- The Human Genome Project: is a collaborative effort among scientists worldwide to _____ . Allowing them to detect gene variations on the chromosomes which may indicate a disorder.
- _____ .

Prevention/Treatment

- _____: can help parents determine the chances of passing a harmful genetic trait to their child.
- Genetic diseases cannot be cured but treated:
 - Pain medication: to relieve symptoms.
 - Occupational Therapy: _____

 - Blood Transfusions: Sickle-cell/ Hemophiliacs may require this.
 - Gene Therapy: _____

 - Ex. Treating cystic fibrosis and hemophilia

Summary:

Unit 6 - Cell Reproduction

Reproduction is necessary for organisms to have offspring but also for organisms to grow. Reproduction can occur sexually or asexually.

Asexual: has ___ source of parent ____, produces identical _____

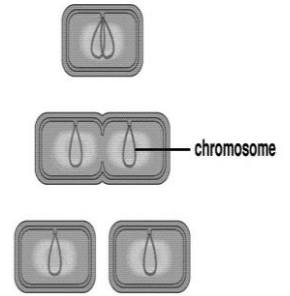
- Advantages: does not require a partner, so it is _____.
- Disadvantages: _____ (more likely to face extinction).

Types of asexual reproduction

- Binary fission- cell divides into 2 _____
- _____ - miniature version of parent is released
- _____ - produces spores
- _____ – the plant uses small stems to grow new plants
- Regeneration- _____
 - Cell division of eukaryotes has a special mechanism known as mitosis.

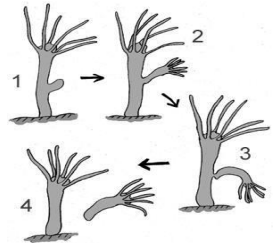
Figure 6.1a

Binary fission



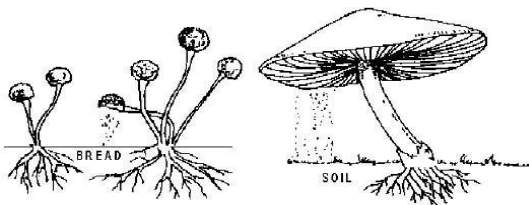
<http://andyannie.pbworks.com/w/page/5454436/Repro>

Figure 6.1b



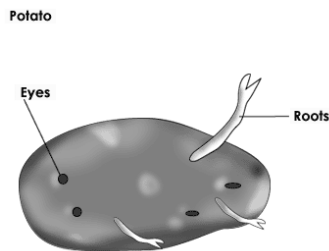
<http://saburchill.com/ans02/chapters/chap051.html>

Figure 6.1c



<http://www.tutorvista.com/content/biology/biology->

Figure 6.1d



ng.sparknotes.com/figures/9/9f79f1dbce762884bf644e4ac8450061/pot

Figure 6.1e

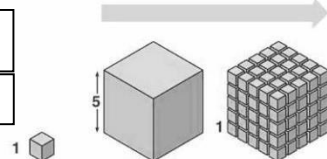


<http://users.rcn.com/kimball.ma.ultranet/BiologyPages>

Summary:

Figure 6.1f

<http://theshrimjournal.com/2m-201210>



Total surface area (height × width × number of sides × number of boxes)	6	150	750
Total volume (height × width × length × number of boxes)	1	125	125
Surface-to-volume ratio (surface area / volume)	6	1.2	6

Reasons for Cell Division

1. Maintain a workable volume to surface area ratio—
_____ increases faster than _____ in cells.

A larger surface area to volume ratio is preferable.

2. _____ - multi-cellular organisms are not composed of bigger cells, but many more small cells

3. _____ – if cells are damaged, surrounding cells can copy themselves.

Eukaryotic cells are complex and require a regulated cycle for division.

Figure 6.1g

• **Interphase:** Longest part of the cell cycle; includes Gap1 in which the cell carries out normal life functions

▪ If a cell receives a signal to divide the cell prepares in the _____ so that two copies can be divided into the two new cells.

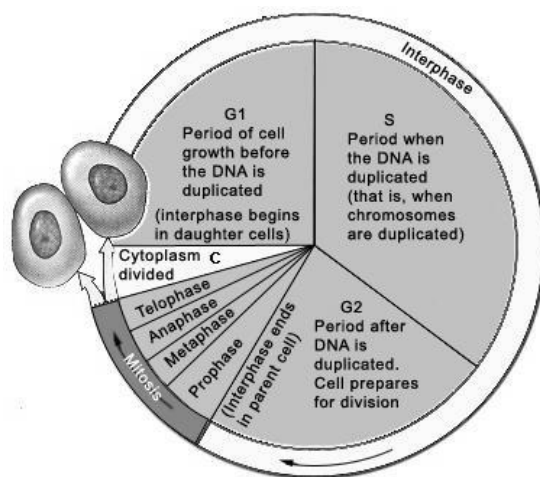
▪ DNA is normally in a relaxed form called _____.

▪ After receiving a signal, the chromatin coils into _____ and is copied.

▪ The two copies are identical and are called _____.

▪ During mitosis, they will be separated so that _____.

▪ Next the cell grows to prepare for cell division during a stage called _____.



<http://www.tutorvista.com/content/biology/biology-11/cell-cycle.html>

Figure 6.1h

<http://home.comcast.net/~ctupold96/notes%20pages/c>

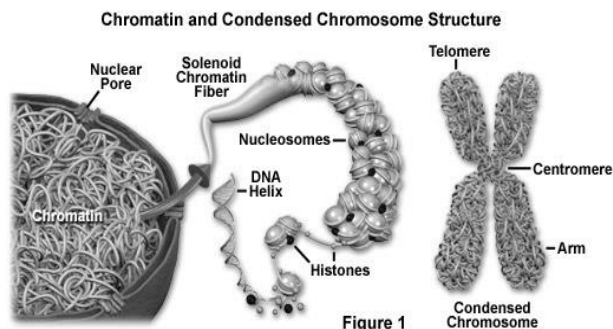
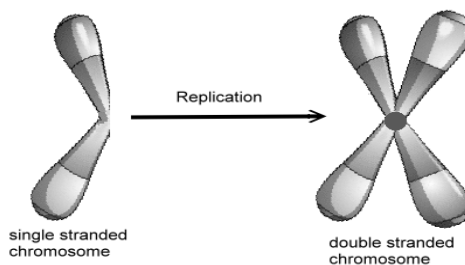


Figure 1

Figure 6.1i

encrypted:

<http://img2.nstatic.com/images?nstr=ANr9GcTatxs7oaZ8HTOKJ7cL3>

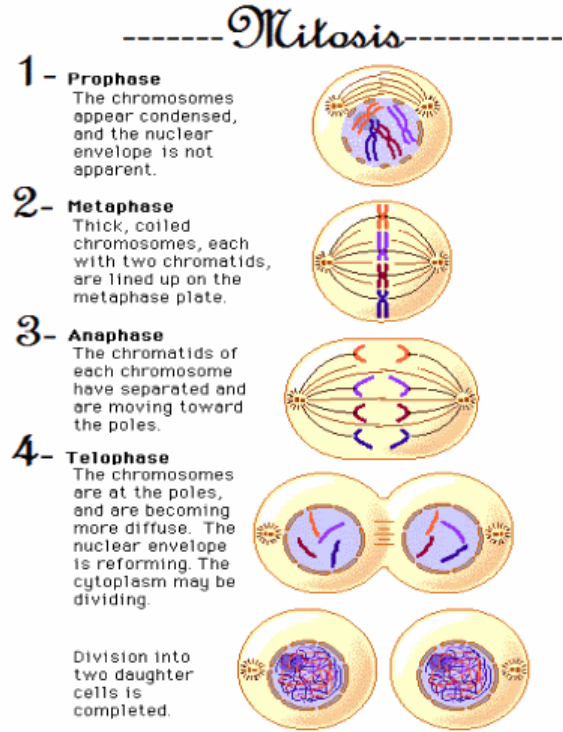


Summary:

Figure 6.1j

Mitosis is the division of the nucleus.

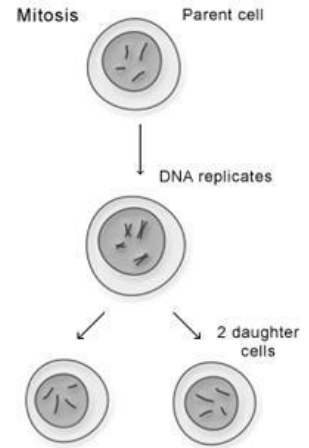
- There are 4 stages:
 1. Prophase: Copied _____
_____ and is visible.
 2. Metaphase: spindle fibers move doubled
chromosomes to the _____ of the cell.
 3. Anaphase: the two _____
_____ to each side of the cell.
 4. Telophase: the now single chromosomes are
surrounded by a nuclear membranes.



<https://biologywawakwawak.files.wordpress.com/2011/1/>

- After mitosis the _____ and two daughter cells are made.
 - Plant cells- have a _____ that is produced and will become cell wall.
 - Animal cells- divide by forming a cleavage furrow.
- Results: _____ that are diploid (2n). (Each cell has two of each chromosome- one from mother and one from father)
 - The diploid number for human cells is 46 chromosomes.

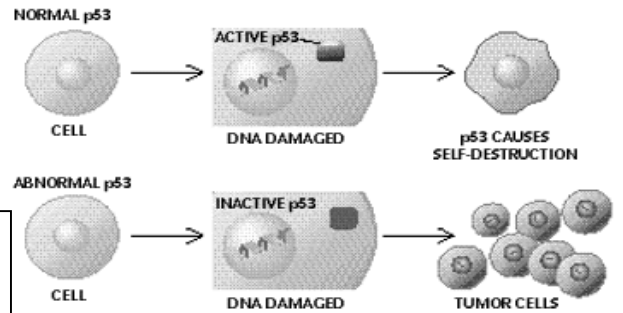
Figure 6.1k



U.S. National Library of Medicine
<http://ghr.nlm.nih.gov/handbook/illustrations/mitosis>

Problems with Mitosis

- Cancer: _____
It can occur when the genes controlling cell division are mutated or damaged.



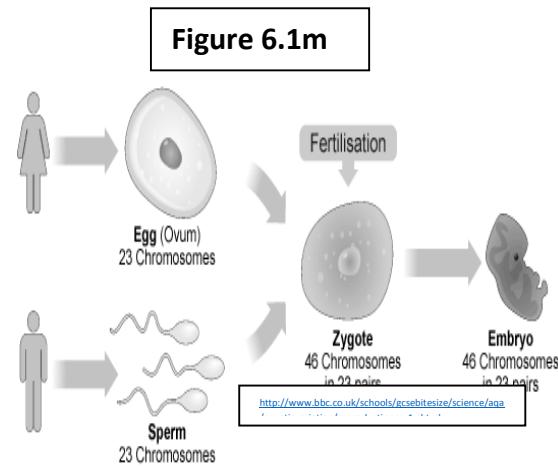
Summary:

Figure 6.1L

<http://scientopia.org/blogs/thisscientificlife/2007/01/25/>

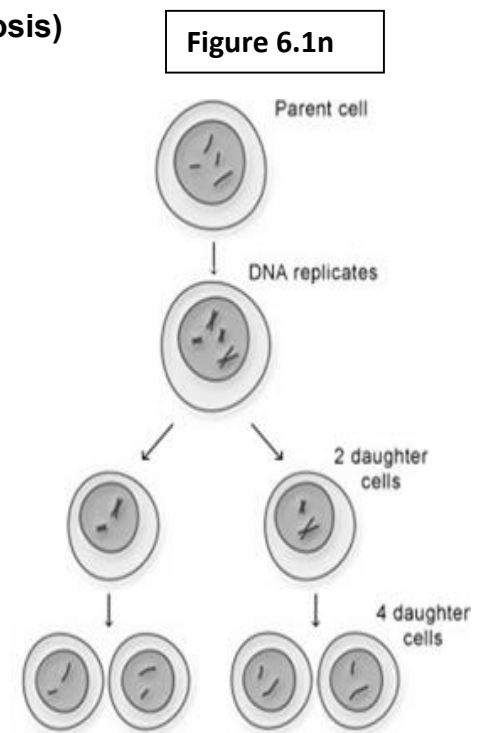
Sexual Reproduction requires Meiosis and Fertilization.

- Sexual: has _____ sources of genetic material, each parent contributes 1/2 of the _____.
- _____: sperm and egg
- Advantages: _____
- Disadvantages: requires a mate, longer process, and can get undesirable variations.



Meiosis: Requires 2 Divisions. (Phases the same as Mitosis)

- Meiosis I (1st division): begins with a diploid (2n) cell. 46 chromosomes.
 - Reduces the chromosome number.
 - Result: _____
_____. 23 chromosomes.
 - The chromosomes are still doubled.
- Meiosis II (2nd division): continues with both haploid cells.
 - Reduces the genetic material by separating doubled chromosomes.
 - Result: _____
These cells are GAMETES (sex cells- egg/sperm)



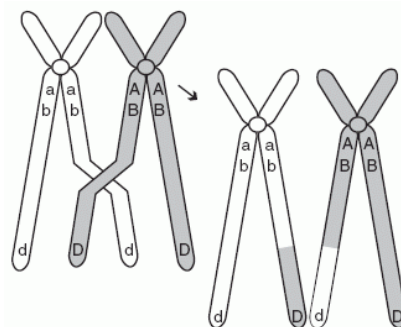
Meiosis allows for Genetic Variation as a result of:

- Crossing Over: _____
_____.
- Random Assortment: _____
_____.
- Random Fertilization: _____
_____.

<http://br.nlm.nih.gov/handbook/illustrations/mitosis>

Figure 6.1o

<http://wp.stockton.edu/efb1/2013/04/21/predicting->

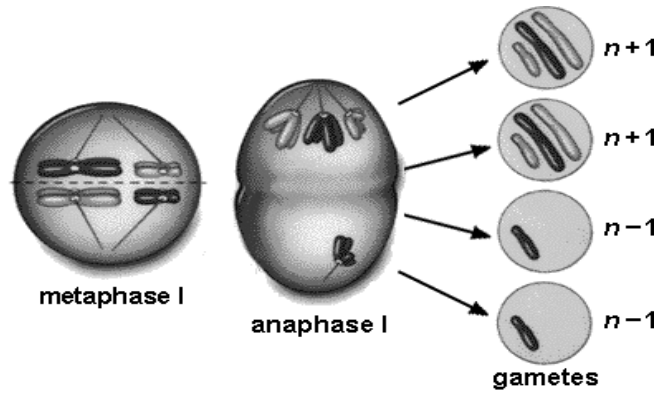


- **Problems with Meiosis:**

- Mutations: _____ during replication can produce variation that is good or bad.
- Nondisjunction: _____
 - Ex. Down syndrome : trisomy 21

Figure 6.1p

<http://www.stockton.edu/efb1/2013/04/21/predicting>

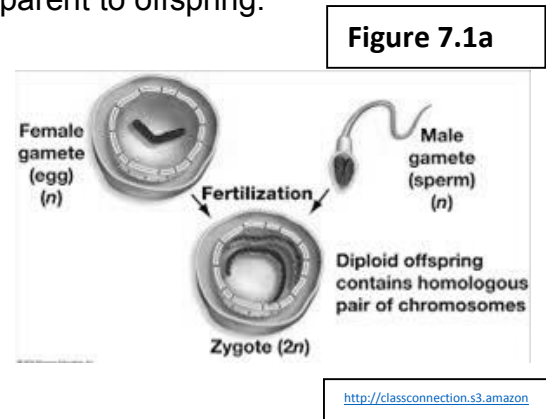


Summary:

Unit 7 Heredity the study of how genes are passed from parent to offspring.

The Father of Genetics:

- _____ is known as the Father of Genetics. He studied _____, because they were easy to observe and reproduce.
- Knowing that the male part of the plant produced _____, and that the female part produced the _____, he was able to _____.
- This is called _____.



Inheritance of chromosomes from parent to offspring:

- Egg (mom) + sperm (dad) → zygote (earliest stage of development)
- (_____) → (_____) → (_____)

- Chromosomes exist in pairs, one from sperm and one from egg. Known as _____.

(Ex: Humans have 46 chromosomes, or 23 pairs)

- Within the chromosome there is a section of DNA that contains the info to make proteins called a _____.

- _____.
- A **trait** is any physical or physiological characteristics.

○ Ex: _____

- We will all receive the same type of genes but we can get _____ called an _____.

▪ Ex: Gene: thumb type. Alleles: Hitchhikers thumb or straight thumb.

○ Alleles are represented by letters. A _____ allele is written with a capital. A _____ allele is written with a lowercase.

▪ Ex: Hitchhikers thumb (A) or straight thumb (a).

- * _____ *

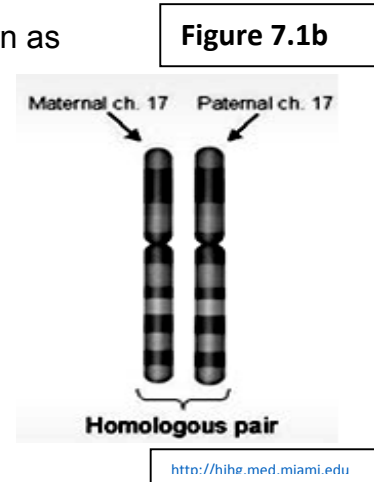
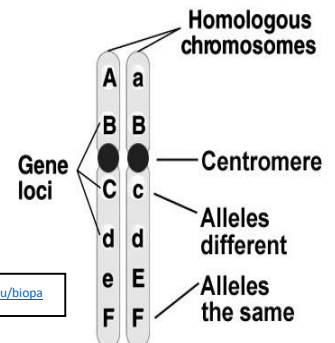
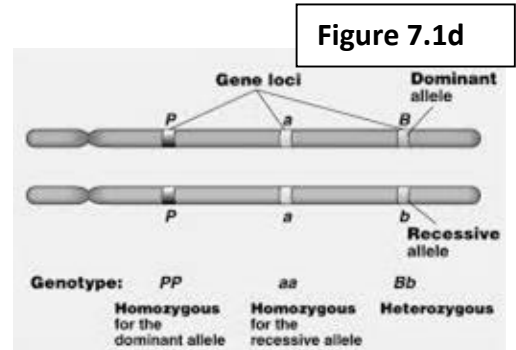


Figure 7.1c



Genotypes and Phenotypes

- _____ describes the 2 alleles you received from mom and dad.
 - _____ means you received identical copies (aka _____)
 - AA – _____
 - aa - _____
 - Heterozygous means you got one dominant and one recessive (hybrid); Aa.
- 2 people can have the same appearance but have different genes: _____.
- _____ describes how the alleles are portrayed or look physically.



<https://encrypted-tbn0.gstatic.com/images?q=tbn:A>

Mendel's Three Principles

1. _____ - dominant alleles can mask/ hide recessive alleles

Genotypes:	Phenotypes:
Homozygous dominant:(AA)	Dominant trait is expressed
	Dominant trait is expressed
Homozygous recessive:(aa)	

2. Principle of Segregation: *during meiosis* _____
_____. We get half of our genes from each parent.

3. Principle of Independent Assortment: _____
_____.

Summary:

Figure 7.1e

<http://passel.unl.edu/image/siteima>

Genetic Probability

- _____ - are used to predict the outcome of fertilization between the gametes.
 - The sides of the Punnett square are labeled with the genotype from each parent (sperm and egg).
- _____ - Cross- involves only 1 trait.
- _____ - Cross- involves 2 traits.

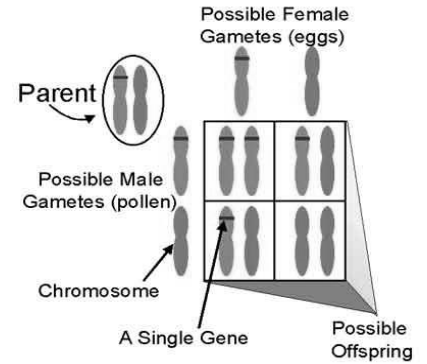
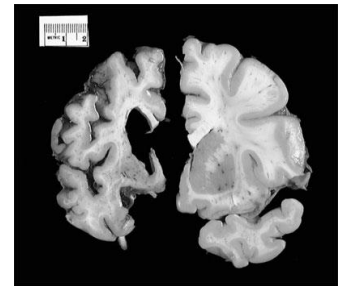


Figure 7.1f

Mendelian Genetics- In the heterozygous genotype the dominant allele can mask the recessive allele, which results in the dominant trait being expressed.



<http://aota.medgen.ucsf.edu/hdrottenw/A>

- Ex: Huntington's disease breaks down the nervous system. It is a dominant trait. If a heterozygous woman marries a man without Huntington's what is the chance their kids will have the disease? _____%
- What is the _____(compare the result of the genes)?
- What is the _____(compare the genetic combinations)?

Summary:

Five Types Non-Mendelian Inheritance

- These traits are NOT just dominant or recessive, therefore they do not follow the principles of Mendelian genetics.

1. _____: Both alleles are equally dominant and will be expressed (in heterozygote).

- Phenotype: _____
- Genotype: _____
- Ex: _____ is a codominant disorder. This means that you will have normal disk shaped cells (N), and sickle shaped cells (S).

- 3 Possibilities:

Genotype	Phenotype
N N	Normal cells only
N S	
S S	Sickle cells only

- * _____ *

2. _____ - neither allele is completely dominant to mask the other.

- Phenotype: the heterozygote results in a _____.
- Genotype _____ (') symbol.
- Ex: In Snapdragon flowers this happens in the genes for color.
- R= red, R'= white. So...

Genotype	Phenotype
R R	Red
R R'	
R' R'	White

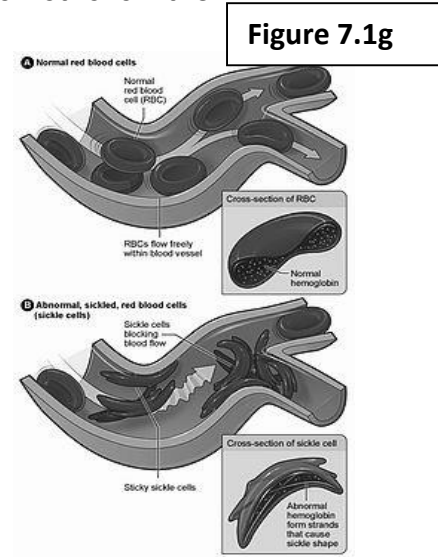


Figure 7.1g

<http://upload.wikimedia.or>

Figure 7.1h

<http://www.gaia3d.co.uk/wp->



Summary:

3. _____: more than two alleles exist for a trait. Ex: Blood Types.

- Four Blood Types: _____

Genotype	Phenotype
	A
I^A I^B	
I^B I^B or I^B i	B
	O

4. _____: trait found on the X-sex chromosome. Hemophilia and Color blindness are both recessive, sex-linked disorders.

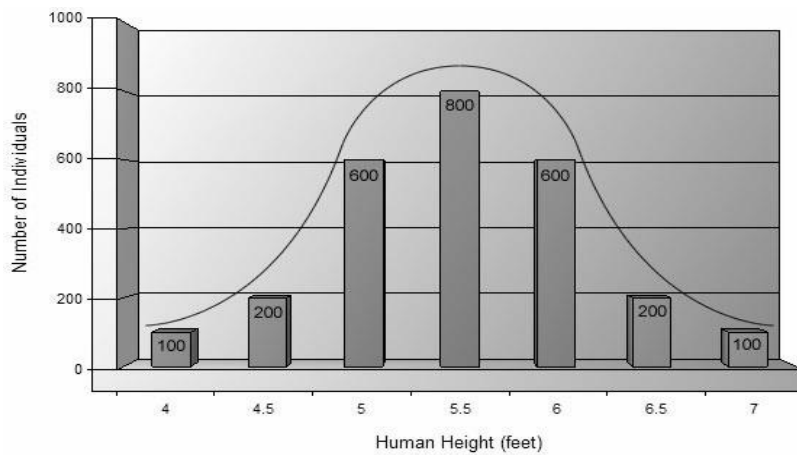
- Phenotype:
 - Female – less likely but can express a sex-linked trait
 - Male – _____

Female - XX		Male- XY	
Genotype	Phenotype	Genotype	Phenotype
$X^A X^A$	UNaffected	$X^A Y$	UNaffected
$X^A X^a$	_____		
$X^a X^a$	Affected	$X^a Y$	_____

5. _____ - Traits that depend on many genes and create a _____
_____.

- NO PUNNETT SQUARE can be used.
- Instead these traits can be graphed using a bell-shaped curve. There is a wide range of differences.
- Ex: _____

Figure 7.1i



<https://encrypted.tumblr.com/post/146293464988/evolution-of-human-height>

Summary:

7.2 Genetic Disorders- result from an _____, which results in the wrongful production of a necessary protein.

1. _____ - found on chromosome 4, causes the brain to break down, loss of muscle coordination, and symptoms often appear in your 40's.
 - Pattern of Inheritance: Autosomal Dominant
2. _____ - a point mutation leads to misshapen red blood cells, causing poor circulation and pain.
 - Pattern of Inheritance: Autosomal Codominant (both versions of trait are equally dominant)
 - Heterozygous individuals are resistant to _____
 - Primarily in African-Americans
3. _____ - body produces excess mucus that affects the lungs and digestive tract.
 - Pattern of Inheritance: Autosomal Recessive
 - _____
4. _____ - breaks down central nervous system leading to premature death (die before 2).
 - Pattern of Inheritance: Autosomal Recessive
 - Found in Jewish and Pennsylvania Dutch populations.
5. _____ (phenylketonuria)- Can't break down the amino acid phenylalanine (in milk)
 - Can build up in brain and lead to decreased mental function
 - Pattern of Inheritance: Autosomal Recessive
 - _____
6. _____ - blood does not clot normally
 - Pattern of Inheritance: Recessive sex-linked disorder
 - _____. Carriers are females only.
7. _____ – Red/green color blindness is passed on the chromosome #23.
 - Pattern of Inheritance: Recessive sex-linked disorder
 - Mainly affects males. Carriers are females only.

Summary:

Studying Human Genetics and Biotechnology

Problems Studying Human Genetics

- Humans have long life spans, produce a small number of offspring and have a long gestational period. This makes studying human heredity very difficult.
- It is ethically irresponsible to conduct testcrosses on humans.
 - _____: method to determine the genotype for a dominant phenotype (AA or Aa?), always use homozygous recessive to compare with the unknown.

Techniques Used to Study Human Genetics

- _____ - determine how often a trait appears in a small randomly selected group, then apply to the entire population.
- _____: graphical record of the inheritance of a single trait over several generations.
 - Determined based on family/historical documents, interviews, photographs, and medical records.

Figure 7.2a
<http://standback.pbworks.c>

Pedigrees- a chart used in genetics to analyze the inheritance of traits.

- Shapes represent individuals in pedigrees, connecting lines represent relationships.
- Questions to consider when analyzing pedigrees:

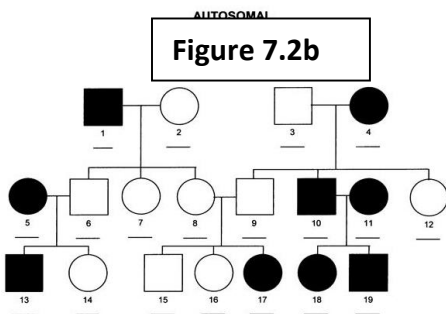
Key	
○	Female
□	Male
○ □	Unaffected individual
● ■	Affected individual

A. Dominant or recessive?

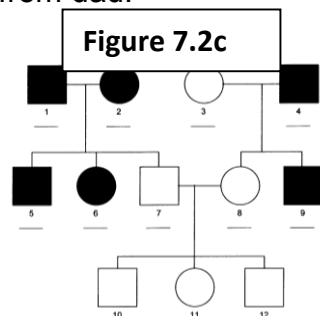
1) Are there any children who have trait but both parents don't? _____

B. If recessive; autosome or sex-linked? (autosome are chromosome pairs #1-22)

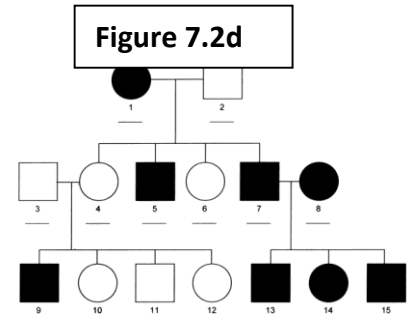
- 1) Daughter has, did her dad? _____
- 2) Mom has, does every son have the trait? _____
- 3) If sex-linked, can a son inherit trait from dad? NO, the son only receives "Y" chromosome from dad.



<https://migr.org/Library/AutosomalDominant.gif>



<https://migr.org/Library/X-linkedRecessive.gif>



<https://migr.org/Library/AutosomalRecessive.gif>

Summary:

Chromosomal Disorders

- _____.
- Usually caused by a *mistake in MEIOSIS* called nondisjunction.
- _____ is when chromosomes fail to separate properly.

This mistake leads to _____ - an incorrect (extra or missing) number of chromosomes in a fertilized zygote.

- Examples are:

1. _____ - is caused by an extra chromosome #21 (trisomy 21). Causes mental retardation, heart defects, and an enlarged tongue.

2. Klinefelter's Syndrome- _____.

- Male but develops female secondary sex characteristics, and usually sterile.

Figure 7.2e <https://embryology.med.u>

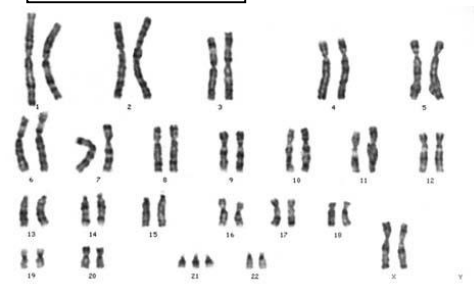


Figure 7.2i

<http://www.hhmi.org/sites/default>

- Use testosterone therapy to treat.

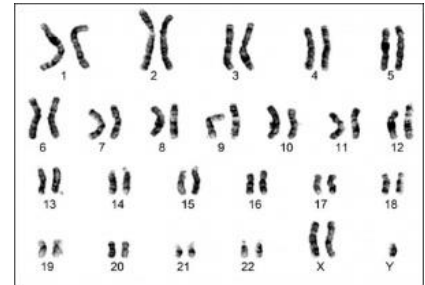
Figure 7.2f

<http://www.cleveland>



Figure 7.2g

<http://php.med.unsw.edu>



3. Turner's Syndrome- _____.

- Female with underdeveloped gonads, infertile

Figure 7.2h

Detection of Disorders

- Sonograms: use of sound waves to produce a picture of a fetus
 - Used to evaluate baby's growth and development
- Blood tests: used to screen for proteins
 - Alpha-Feto protein test (AFP)- Levels determine if baby is at risk for Down's, Turner's , or Spina Bifida.
- Amniocentesis: Removes amniotic fluid with fetal cells which can be cultured and produce a karyotype.

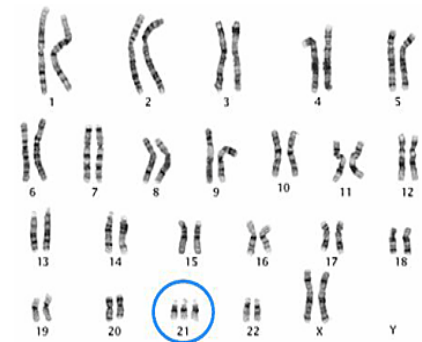
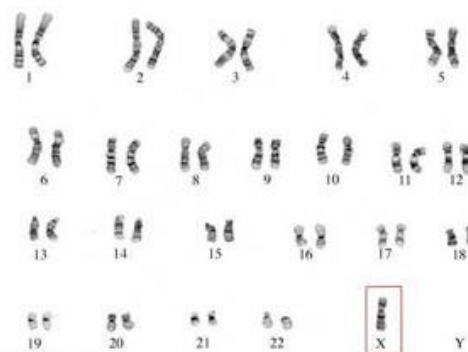


Figure 7.2j

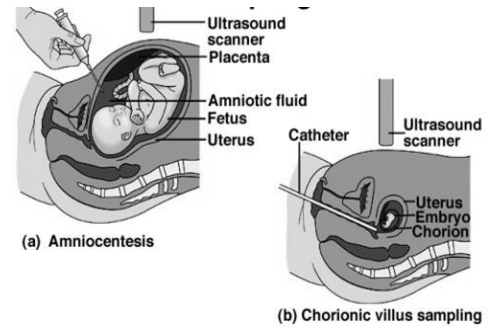


<http://genetics.thetech.org/sites/d>

- _____: a picture of the chromosomes placed in order from #1-23. Can identify: Down's Syndrome, Klinefelters, and Turners.

<http://www.mamasonbedrest.com/wp>

- Chorionic Villi Sampling: removes tissue from the placenta for karyotyping. This can be done earlier in pregnancy and is more risky.



Nature vs. Nurture:

- Nature is heredity (your DNA). Nurture is your environment.
- Scientist debate: _____ ?
- Example: We use _____ to study the effect of the environment on genes.

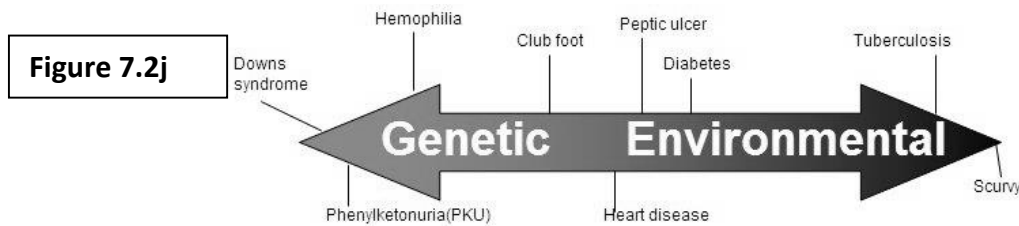


Figure 7.2j

http://1.bp.blogspot.com/_bWGD0U27_Q/TIBYVELmVRI/AAAAAAAAA

- _____: can stop the progression of PKU, and limit the risk for genetic predispositions such as diabetes, heart disease, and certain cancers.
- Environmental Toxins: _____

Summary:

UNIT 8: CHANGE OVER TIME

8.1 EVOLUTION

ORIGIN OF LIFE

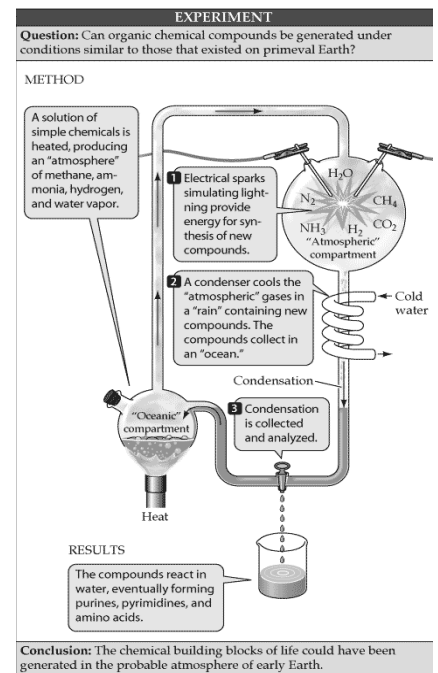
- Abiogenesis: _____

- Early Atmosphere- Consisted of gases like carbon monoxide, nitrogen, and carbon dioxide. _____!

- _____:
Developed theory that inorganic molecules could become organic molecules due to early conditions of earth- carbon monoxide, carbon dioxide and nitrogen.

- Miller and Urey:

Figure 8.1a



<http://www.halfhollowhills.k12.ny>

- Biogenesis: Life must come from life.
 - Redi and Pasteur: Both scientist Disproved that ABIOGENESIS occurs now, with rotting meat and S-shaped flask experiment. Life comes from living things (even microscopic), not from the air itself.

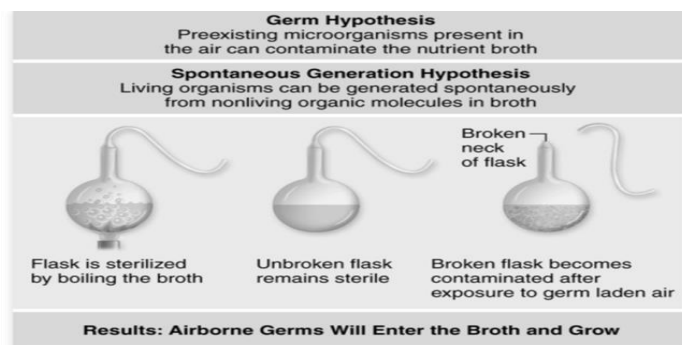


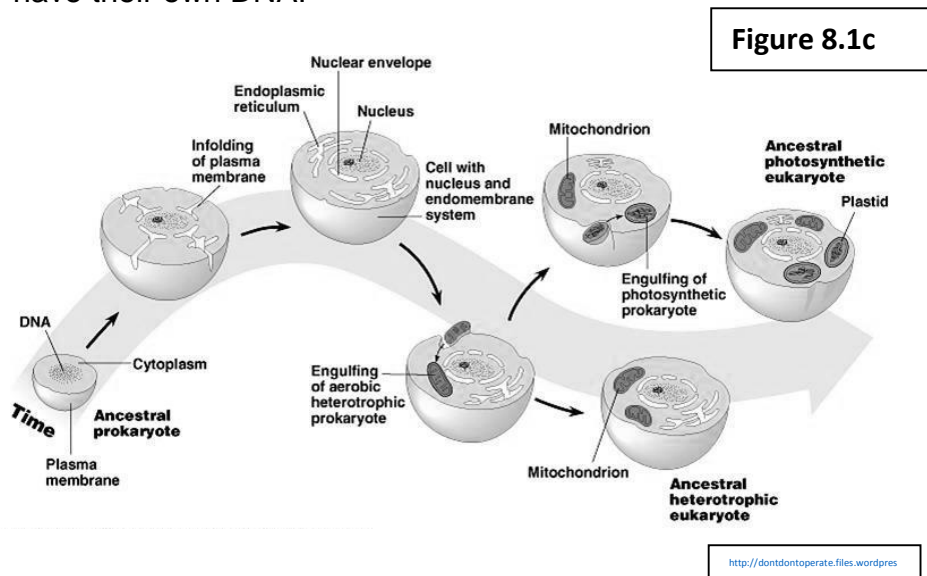
Figure 8.1b

<https://lbi.arkstate.edu/Biology/340101/MS100/>

EVOLUTION OF CELLS- mutations produced new varieties of cells that co-exist.

- **Heterotroph Hypothesis-** the first cells lacked complexity and could NOT make their own food.
 - **First type of cell:** Prokaryotic, Anaerobic due to lack of oxygen in atmosphere and _____
 - **Second type of cell:** _____
 - **Third type of cell:** _____

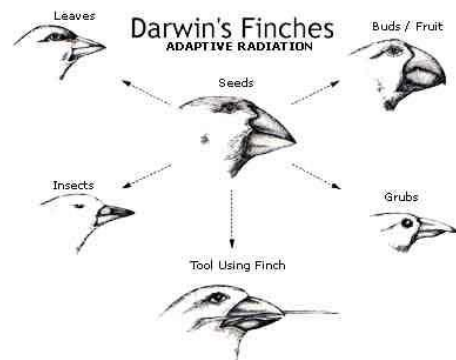
- **Endosymbiont Theory-** _____
 - _____ prokaryotes became _____
 - _____ prokaryotes became _____
 - EVIDENCE→ chloroplasts and mitochondria are the only organelles that have their own DNA!



SUMMARY:

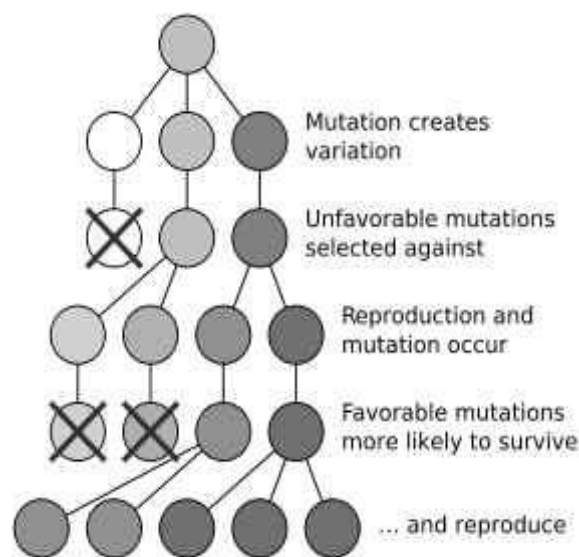
55

Figure 8.1d



<http://www.khanacademy.com>

Figure 8.1e



<http://unlcar.wikimedia.org/>

THEORY OF EVOLUTION

- Charles Darwin: Naturalist; credited with theory of evolution; sailed on the *Beagle* in 1831

- Natural Selection: _____

 _____.
- This can lead to a new species (speciation).

• Natural Selection- a process

- 1) Variation: _____

2) **Overproduction:** more members of the population exist than the carrying capacity can support

3) **Competition:** favors the best suited phenotype at that particular time.

- 4) **Survival of best adapted:** _____

• **Adaptations:** inherited trait that helps organism survive in environment

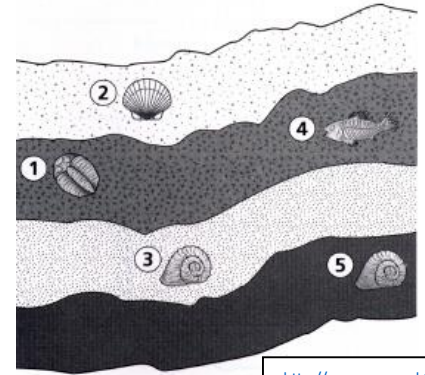
- Structural: any physical form or part
 - Example- _____
 - Mimicry = similarity of one species to another which protects one or both
 - Examples: King and Coral Snake, Stick bug
- Behavioral: any genetically-controlled action
 - Example- _____
- Physiological: any internal body process
 - Example- _____

Figure 8.1f

EVIDENCE FOR EVOLUTION

- **Fossils:** any evidence of life that once existed on earth (bones, footprints, etc); Find patterns of evolution over time.

- _____ - Order of appearance in sedimentary rock
- _____ - Use the natural decay of isotopes in organism



<http://www.eag.rcs.k12.tn>

Figure 8.1g

<http://www.biorewind>

Species	Sequence of Amino Acids in the Same Part of the Hemoglobin Molecules
Human	Lys-Glu-His-Iso
Horse	Arg-Lys-His-Lys
Gorilla	Lys-Glu-His-Lys

- **Biochemical Similarities:**

- _____

- The more similar → more closely related

- **Anatomical Structures:**

- Homologous: _____
- Analogous: _____

- Example Human arm vs Whale flipper

Figure 8.1h

<http://www.edhsgreen>

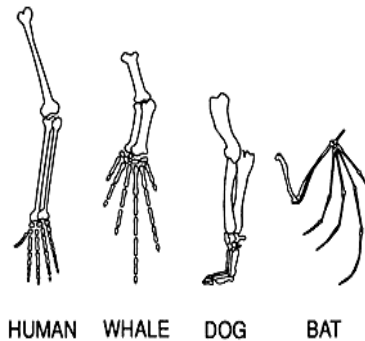
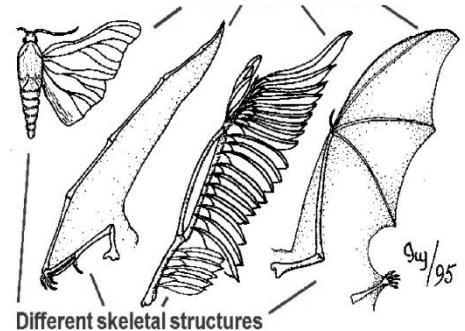


Figure 8.1i

<http://bioidiac.bio.uot>



- Vestigial: structure serves no purpose in organism, may be “left over” of previous ancestor.
 - Example – _____

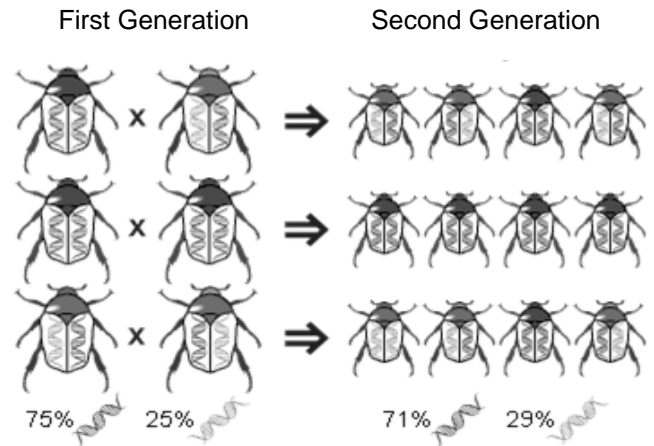
SUMMARY:

Figure 8.1j

MECHANISMS FOR EVOLUTION

1. _____

- Population is the smallest unit of evolution
- Different versions of acquired traits are present in a population and can be selected thus changing the population



2. Changes in Gene Pool:

1. Mutations: _____ <http://evolution.berkeley>

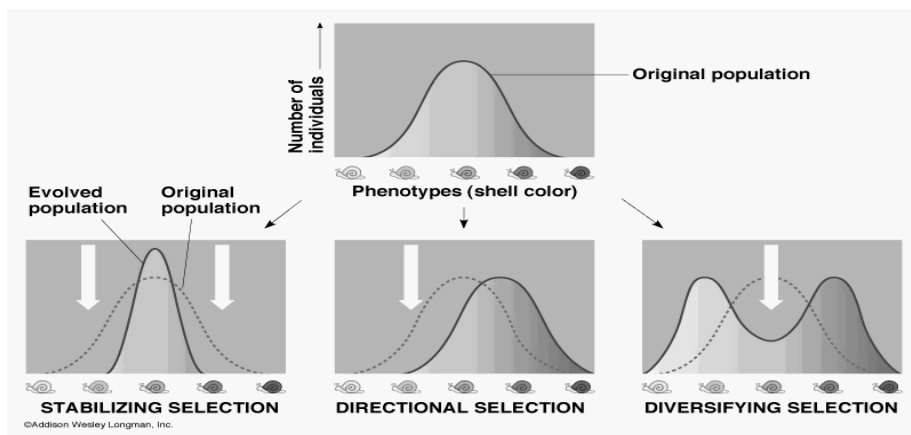
Does the change affects the phenotype?

2. Environmental changes: (types/patterns of natural selection)

- _____ – conditions are most favorable for BOTH of the two extremes of the phenotype.
- _____ – conditions are most favorable for the average version of the phenotype.
- _____ -- conditions are most favorable for ONE of the two extremes of the phenotype.

Figure 8.1k

<http://leacy.nwensham.k>



3. Speciation – development of a new species.

- Geographic Isolation – _____
 _____ → _____

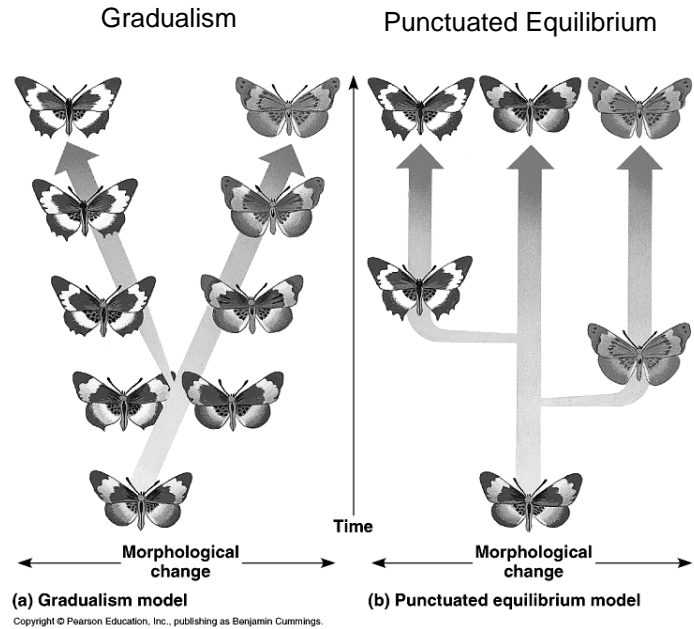
TIMEFRAME FOR EVOLUTION

Timeframes: Describe how quickly the new species may have formed based on the fossil record.

- Gradualism - _____

- Punctuated Equilibrium – _____

Figure 8.1L



<http://www.tokresource.o>

SUMMARY:

8.2 DISEASE AGENTS AND NATURAL SELECTION

Disease can act as a selecting force where the organism with the best adapted phenotype survives.

A) Pathogen: _____

Examples: Virus, Bacteria, Protists (algae & protozoa), and Fungi (yeast)

- Pathogens trigger an Immune Response

▪ _____

- Two Types of Immunity

1. Passive Immunity:

- Antibodies are passed from mother to child through the placenta and breast milk

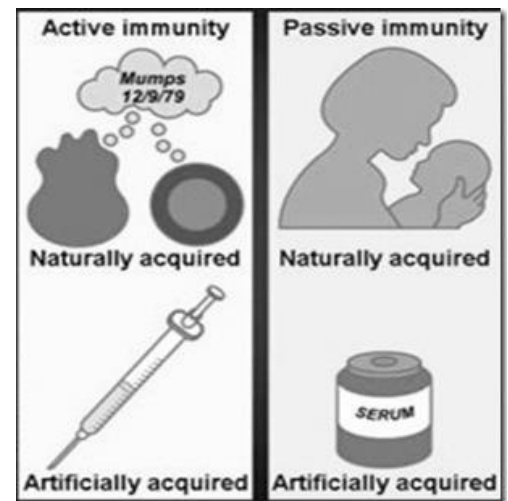
▪ _____

2. Active Immunity:

▪ _____

- Vaccines – weakened or dead virus is injected and triggers production of antibodies

Figure 8.2a



B) AIDS and Natural Selection

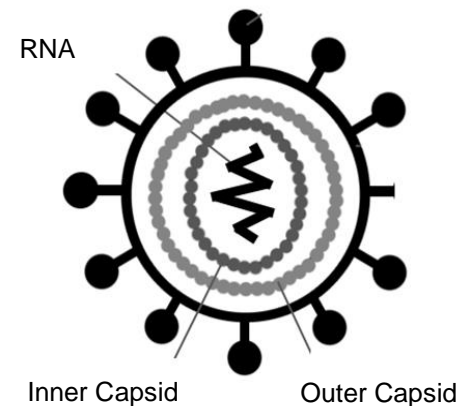
- AIDS (Acquired Immune Deficiency Syndrome) is contracted through HIV (Human Immunodeficiency Virus)

▪ Virus: _____

▪ Structure: _____

- Attacks the T-cells (first antibodies produced)

Figure 8.2b



<http://scienceaid.co.uk/biology/micro>

- 10% of European population is immune to HIV
 - Life-saving random mutation(CCR5-delta 32 mutation)selected for by the devastating black plague epidemics that swept over Europe beginning in the 14th century
 - _____

 - Antivirals are used to treat AIDS and other viruses
 - Functions of Antivirals
 - _____
 - _____
 - _____
- Viruses mutate at a blinding pace causing antiviral drugs to be ineffective.
 - Viruses like HIV will _____. Which helps the virus avoid the drug, reproduce and _____. AND virus population becomes resistant.
 - This is why HIV patients are on the AIDS “Cocktail”
 - Typically 3 different antivirals make-up the cocktail to account for the quick mutation

C. EVOLUTION TODAY

- _____:
- Bacteria can be killed by antibiotics that target its cell wall. Overuse of antibiotics is a selection force, and leaves behind resistant bacteria.
 - Example: MRSA (Methicillin Resistant *Staphylococcus aureus*)
- _____:
- RESISTANCE – describes how well the organism can survive exposure to a chemical. If an insect is resistant to pesticide, the pesticide does NOT kill the insect.
 - Example: Bedbugs

SUMMARY:

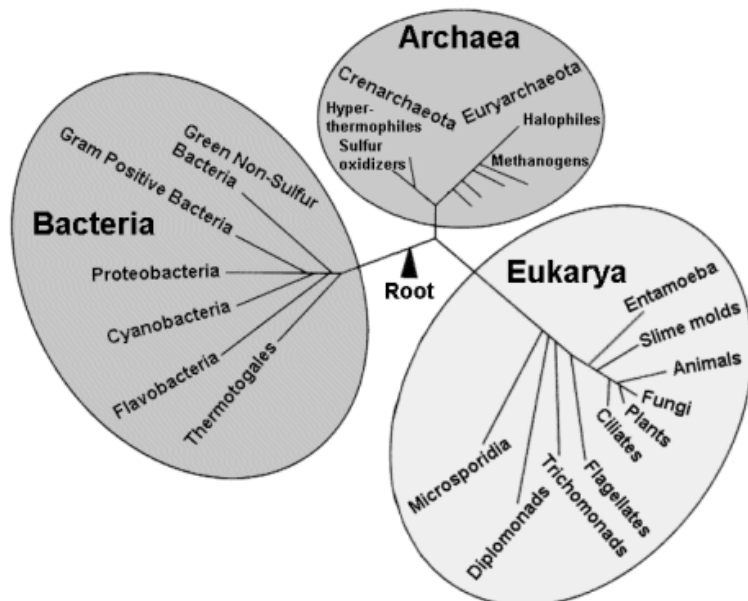
8.3 CLASSIFICATION AND SPECIATION

Given the diversity of life, how do we give names to organisms?

- **First Classification System**
 - Devised by Aristotle
 - Two basic groups: _____
- **Modern Classification System**
 - Devised by Carl Linnaeus (1707-1778)
 - Created a system called **Binomial Nomenclature**
 - _____
 - The genus and specie names are written with specific rules
 - Italicize= *Homo sapiens*
 - Underline = Homo sapiens
 - *Homo* is the genus, *sapiens* is the species
 - Biological Taxonomy
 - **TAXONOMY-**_____
 - Domain is the highest taxonomic rank of organisms
 - Domain system consists of three domains:
 - _____
 - _____
 - _____

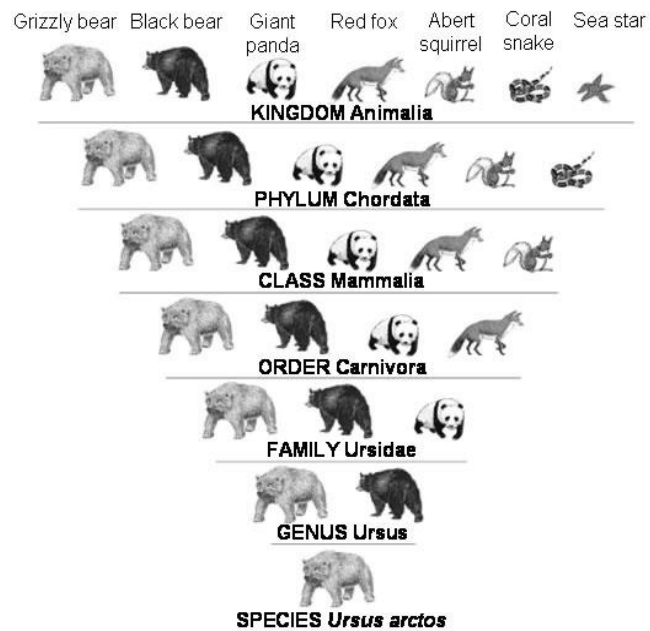
Figure 8.3a

<http://blogs.scienti>



- Seven levels of TAXA were created
 - Kingdom
 - Most General (only 6 Kingdoms)
 - Phylum
 - Class
 - Order
 - Family
 - Genus
 - Species
 - Most Specific (~2 million identified)
- **“King Philip Came Over For Green Soup”**

Figure 8.3b



- _____ of these seven taxa, thus the specie would contain only one type of organism.

<http://facinatingamazingani>

- Specie is defined as a _____

SUMMARY:

• **Basis for Classification**

▪ Linnaeus Classification

▪ Morphology: Shared physical characteristics

- Example: Animals – Type of Heart (2 chambers vs 4 chambers) and Blood, live birth vs egg, antennae, wings, etc.
- Example: Plants – Number of Stamens (male parts), number of styles (female parts)

▪ Modern Classification

▪ _____: gram staining bacteria, or comparing DNA and amino acid sequences

▪ _____: common fetal development

▪ _____: describes the evolutionary relationships between organisms.

- Example: Homologous/Analogous structures used to determine relationships
- Phylogenetic Trees _____

- Each node on the tree represents the inferred most recent common ancestor and the edge lengths may be interpreted as time estimates.

- _____ – specific type of phylogenetic tree which emphasize the order in which derived characteristics arise from a phylogenetic tree

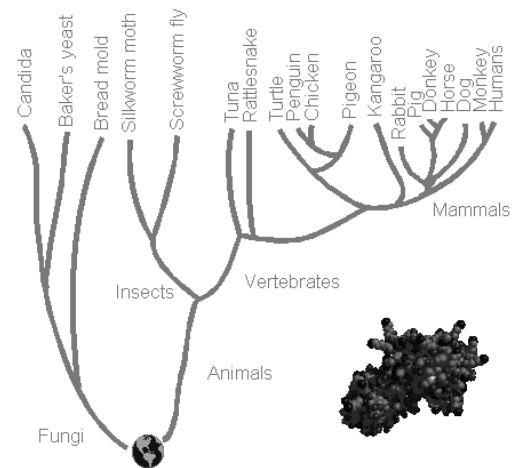
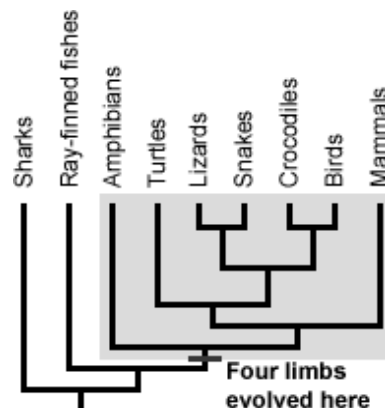


Figure 8.3d

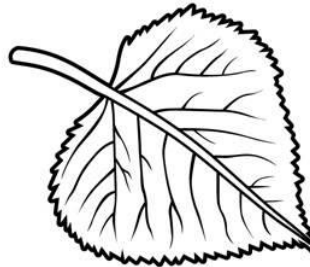
<http://evolution.berkeley.edu>



- Tools used in Classification
 - Phylogenetic Tree/Cladogram
 - Dichotomous Key- _____

Figure 8.3e

Characteristic	Direction
1a. The leaf is divided into leaflets.	<i>Carya</i> (pecan)
1b. The leaf is not divided into leaflets.	Go to step 2
2a. Veins branch from a single point on the leaf.	Go to step 3
2b. Veins branch from a main vein in the middle of the leaf.	Go to step 4
3a. The leaf is heart-shaped.	<i>Cercis</i> (redbud)
3b. The leaf is star-shaped.	<i>Liquidambar</i> (sweetgum)
4a. The leaf has a jagged edge.	<i>Betula</i> (birch)
4b. The leaf has a smooth edge.	<i>Magnolia</i> (magnolia)



<https://sample.stemscopes.c>

SUMMARY:

Unit Nine – Unity and Diversity of Life

9.1 How are living things similar and different?

- All living organisms evolved from an original set of cells, so they share 8 common characteristics.

- _____
- _____
- _____
- _____

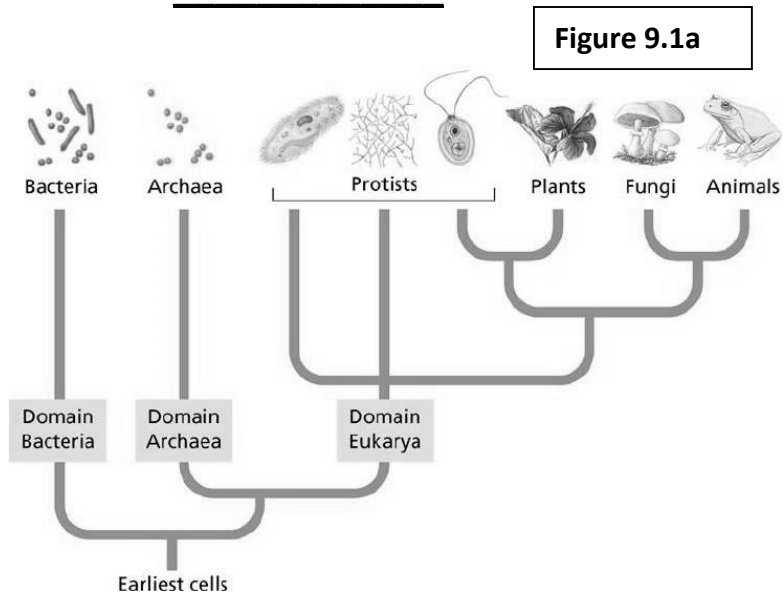
- _____
- _____
- _____
- _____

- Living organisms do have differences, so they are classified based on the physical and evolutionary similarities into 3 domains.

- Domain _____ – Contains one kingdom of eubacteria.

- Domain _____ – Contains one kingdom of archaebacterial.

- Domain _____ – Contains four diverse kingdoms of eukaryotic cells.



<http://reflow.scribd.com/860H5uphc6/sot/imaees/imaee-6.1oe>

The Six Kingdoms- are based on similarities/differences in cell structure and metabolism.

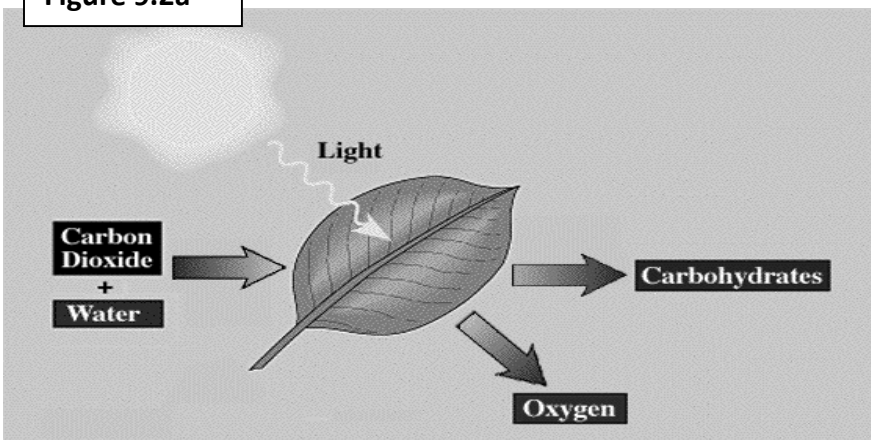
Kingdom	Number of cells, basic type	Cell features	Metabolism	Unique features
	Prokaryotic, unicellular	Cell wall	Some make food, some consume	
	Prokaryotic, unicellular	Cell wall	Some make food, some consume	
	Eukaryotic, uni or multicellular		Some make food, some consume	Plant-like, animal-like or fungi-like
			Make food =	Producers in the food web
	Eukaryotic, uni or multicellular	Complex Organelles, Cell Wall	Extracellular digestion, consume food	
	Eukaryotic, multicellular		Consume food =	Consumers

Summary:

9.2 How do organisms perform life functions in different ways?

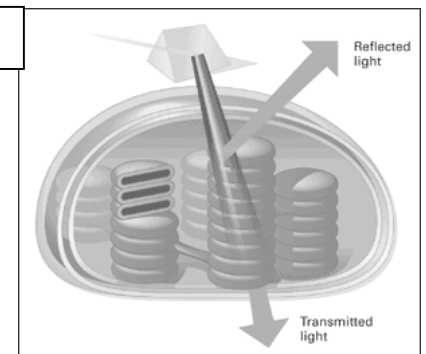
- _____ organisms organized into three main organs. The _____ have their own structure and functions, but the cells must communicate for the whole plant to maintain homeostasis.
- Plants differentiate their cells for different types of **SYNTHESIS**.
 - _____
 - The chloroplast is found in plant cells that receive light. Enzymes speed up the reactions of _____ as waste.
 - Factors that influence the reaction rate are temperature and light intensity.
 - To make food, the photosynthesis equation is _____
_____ This is almost exactly the opposite of how ALL living things break food down during respiration.

Figure 9.2a



<http://www.phschool.com/Text/e/life/site/text/fmasec/08imaec/08>

Figure 9.2b

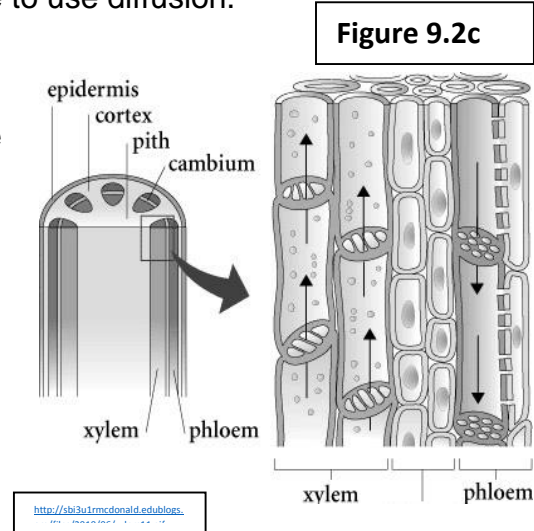


<http://www.phschool.com/Text/e/life/site/text/fmasec/08imaec/08>

- Some plants are vascular plants and have differentiated cells that **TRANSPORT** within the plant body. Non-vascular plants, like moss, have to use diffusion.

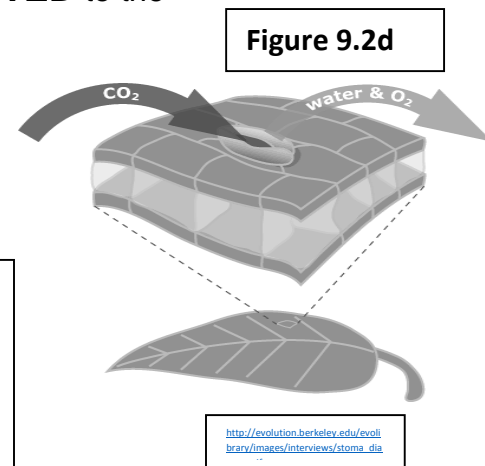
- _____ . Seen as the veins in a leaf, they travel down the stem and into the roots.

- _____ from the roots to the rest of the plant
 - _____ from the leaves to the rest of the plant



- The oxygen produced is a waste product that must be **EXCRETED** to the environment.

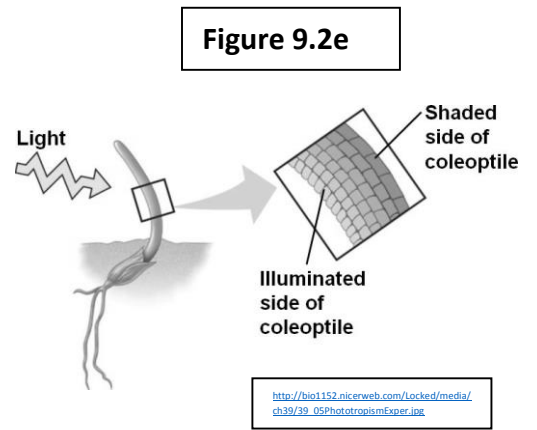
- Plants use guard cells to form openings called _____ .
_____ .
Water will also escape.



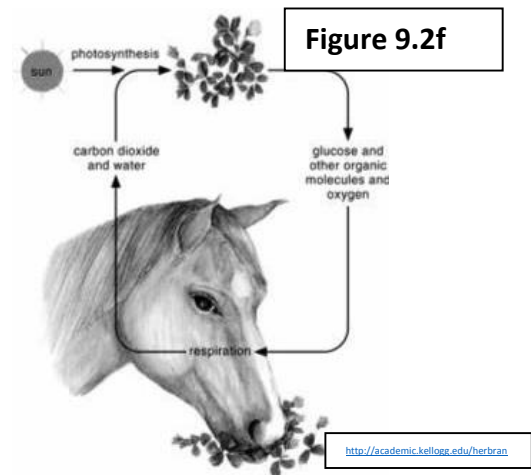
Summary:

- Plants use hormones to **REGULATE** their growth and response to the environment.
 - Plants make three specifically shaped hormones to control growth.
 - _____ is a gas that ripens fruit.
 - _____ increase the rate of cell division.
 - _____ elongates the cells so they can grow in response to stimuli.

- Growth in response to light is called _____
- Growth in response to gravity is _____
- Growth in response to touch is _____

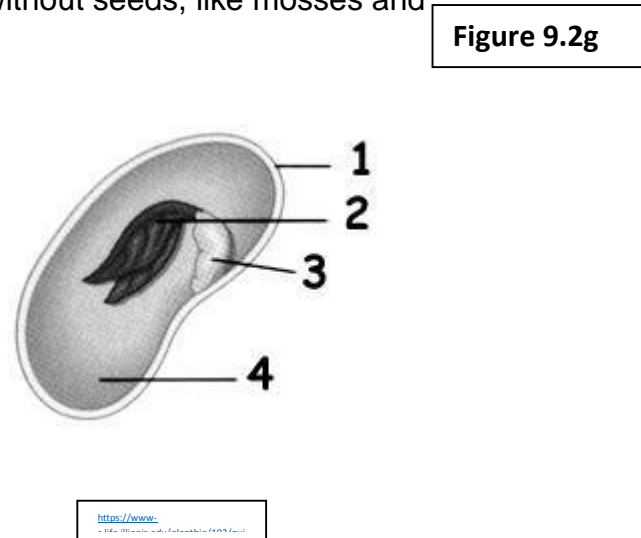


- Plants' **NUTRITION** is provided by themselves through photosynthesis.
- _____
- _____



- Most plants begin their lives as seeds. The embryo is dormant until conditions are optimum, and then the juvenile plant will begin to **GROW** and **DEVELOP** into a mature plant with roots, stems and leaves. Plants without seeds, like mosses and ferns, have to use spores, which can dry out.

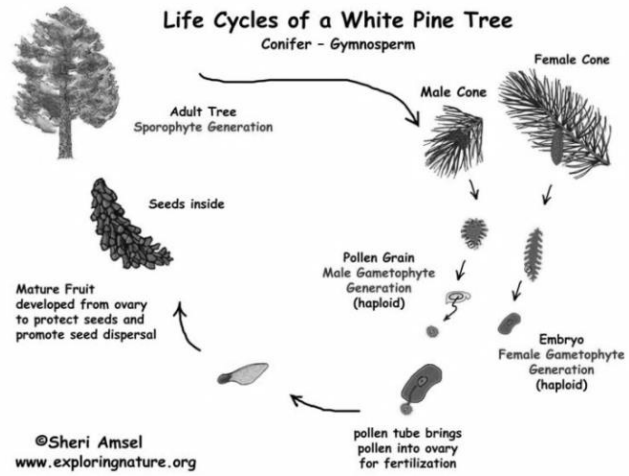
- Seeds have four main parts that are _____
- _____



Summary:

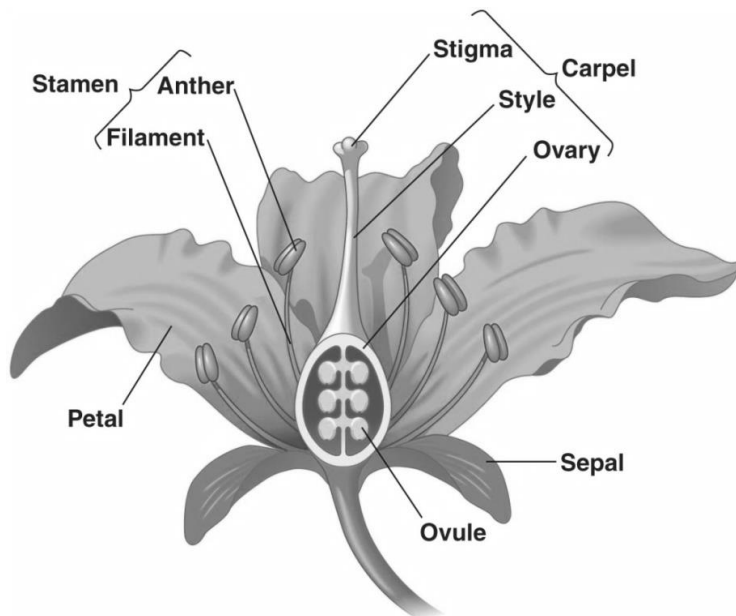
- Plants mostly **REPRODUCE** sexually. This requires both production of sperm and egg and their union (_____). Some plants have special adaptations to help with this process.
 - A group of plants called _____ make eggs in a _____, pollen (sperm) in another. After the wind helps with pollination the fertilized egg/seed is stored in a cone. Wind and animals are used to _____.

Figure 9.2h



- Different plants called _____ make sperm and egg on different parts of a flower. These _____ to spread the pollen. The fertilized egg/seed is stored in the flesh of the _____ (a fruit). Animals help disperse the seeds.

Figure 9.2i



<http://2.bp.blogspot.com/-1VASrR0Q-0k/1anZCY6z2n/AAAAAAAAAM/64BEukA>

- All of the plants' actions require energy in the form of ATP, which is produced during **RESPIRATION**.

- _____

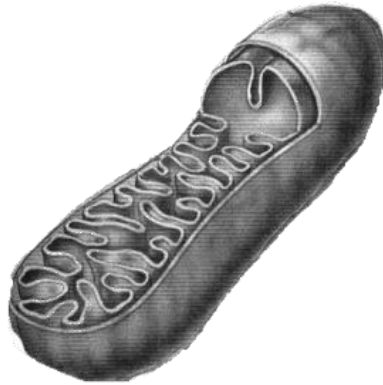
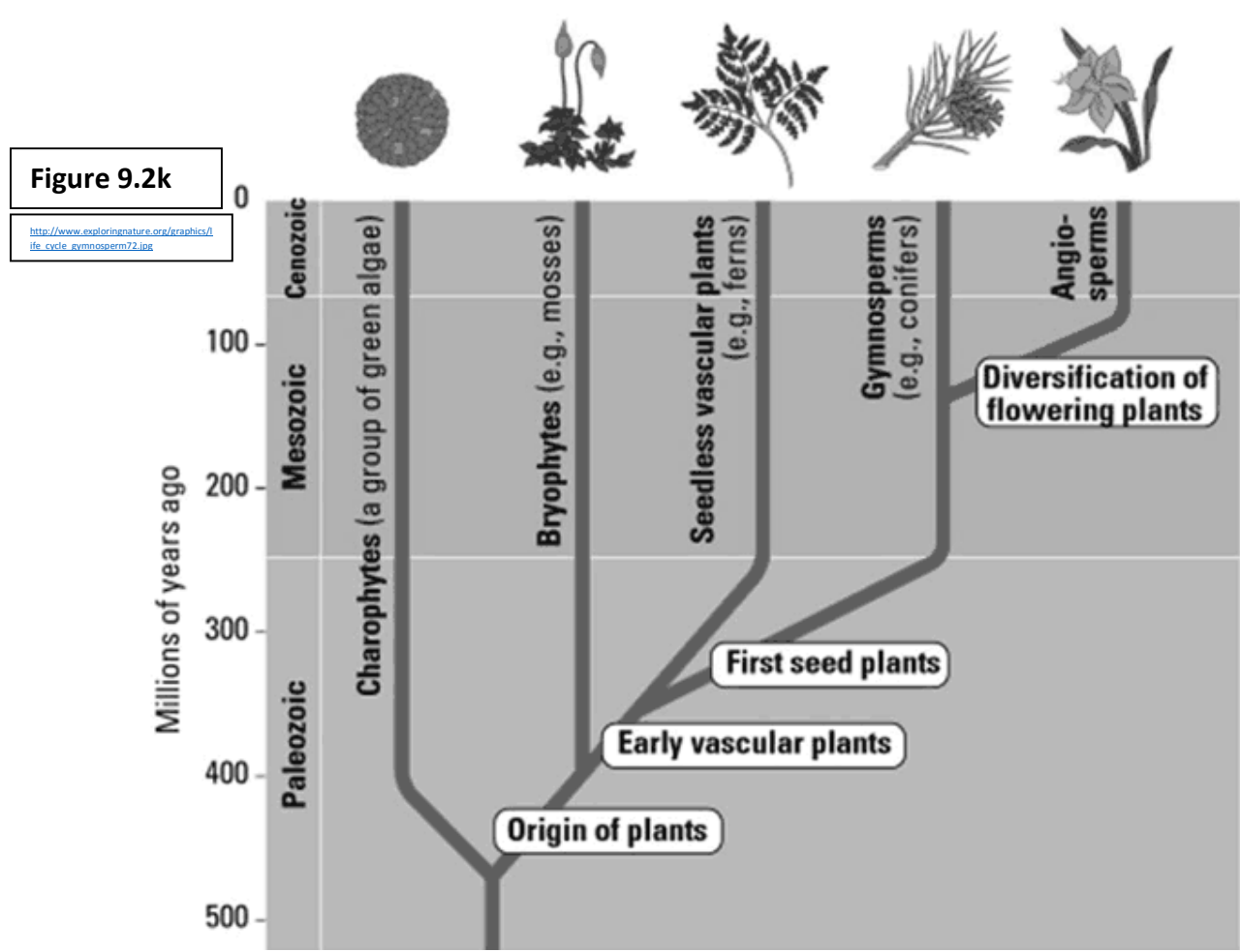


Figure 9.2j

<http://shawmst.org/biology/files/2010/08/mitochondria17.gif>

Summary:

- According to their similarities and differences, plants have been classified into four main groups. These groups represent _____
_____.
- The plants with the _____ which have many survival and reproductive structures. This includes _____
_____.



Summary:

73

9.3 What structures do plants and animals have that are similar in function?

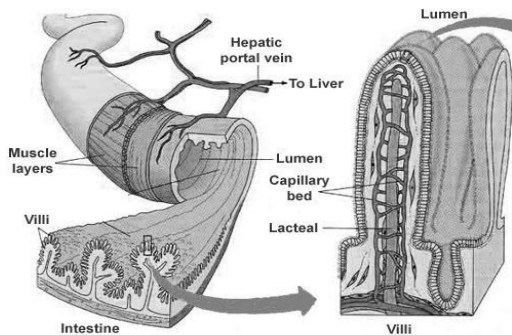
- Animals are also multi-cellular organisms, but they usually have many organs which work to make organ systems. These systems are interdependent on each other in order to maintain homeostasis for the animal. _____

- Nutrition, Respiration, Transport and Excretion** are body systems that are very interconnected within animals.

- Animals usually have mouthparts to help them obtain food. Some animals have teeth, while others swallow whole and perform digestion mostly in the stomach.

Figure 9.3a

<http://kristindockter.wikispaces.com>

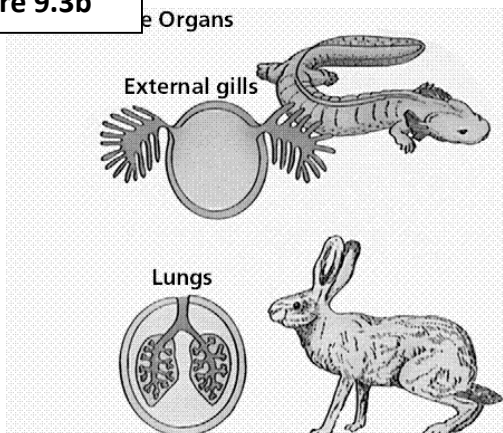


- Digested food must be prepared for transport through the body, _____

- Digested food may be used for energy sources, so animals need to obtain oxygen

for RESPIRATION.

Figure 9.3b



- Some animals use simple diffusion, but large animals have organs to help obtain oxygen and get rid of carbon dioxide.

Aquatic organisms use _____
 _____ to remove oxygen from the water.

Land organisms have lungs which contain

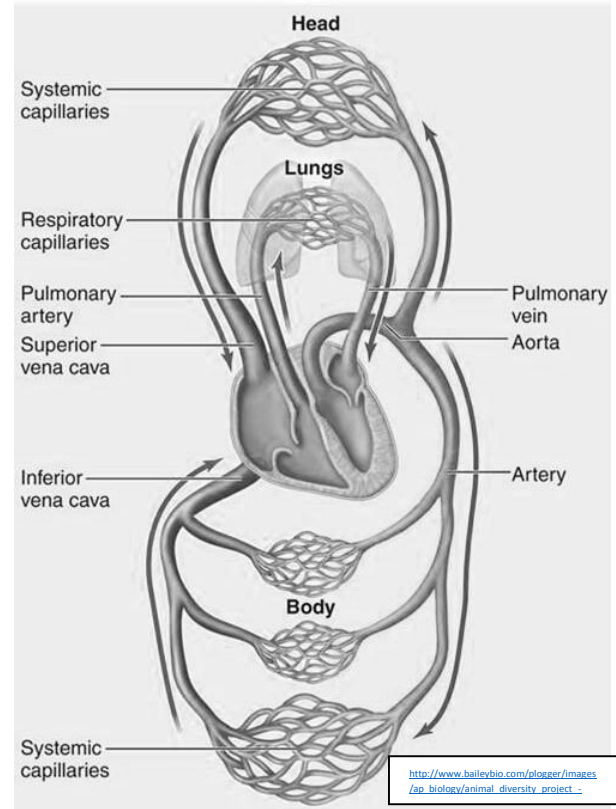
<http://www.emc.maricopa.edu/faculty/farabee/biobk/gasexch1.pt>

Figure 9.3c

- To deliver nutrients and oxygen to the cells, most animals have a _____ to help with **TRANSPORT**.

- The heart is a muscle that pumps to force blood to transport through the body. Animals with lungs have chambered/divided hearts to

- When being pumped, some organisms like insects have open circulatory systems where the blood moves around the body freely. Other organisms including worms, amphibians and _____ which contain the blood until it is delivered to the cells.

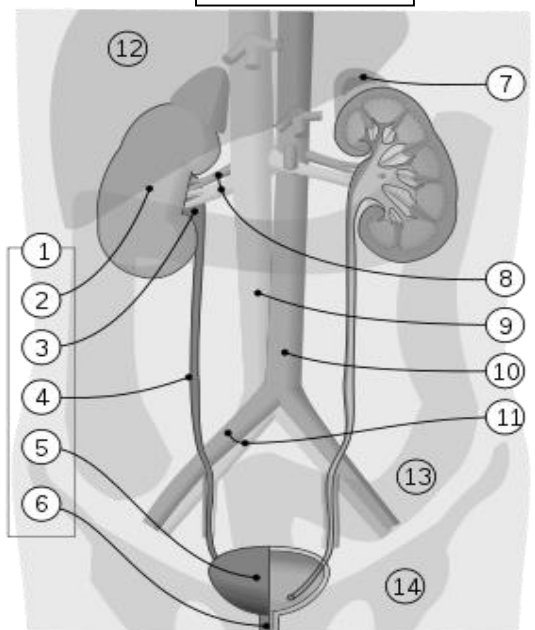


http://www.bailevbio.com/blogger/images/1a_biology/animal_diversity_project_

Figure 9.3d

- As the blood circulates, it picks up waste which must be removed through **EXCRETION**.

- Animals have unique adaptations that filter waste out of the blood. _____



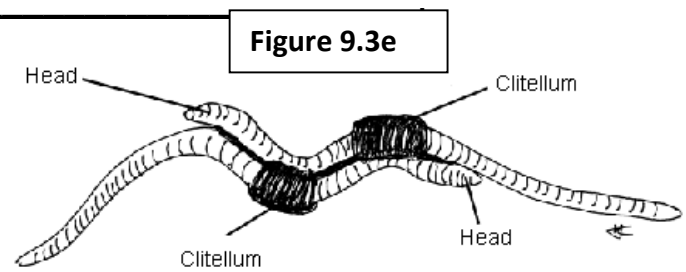
http://upload.wikimedia.org/wikipedia/commons/thumb/3/30/Urinary_system.svg/3

- Structures called _____ are the smallest unit and are seen in earthworms.
- Insects are very unique because their _____
_____.
- Amphibians and mammals have collections of nephridia called _____ that can efficiently balance water so they can live on land.

Summary:

- **Reproduction and Growth and Development** are processes that are tied in multicellular organisms.

- All animals _____
- They use meiosis to make sperm and egg, which then must combine during fertilization.
- Some organisms, like earthworms, are _____. They make sperm and egg on the same body, but must still exchange gametes with another organism.

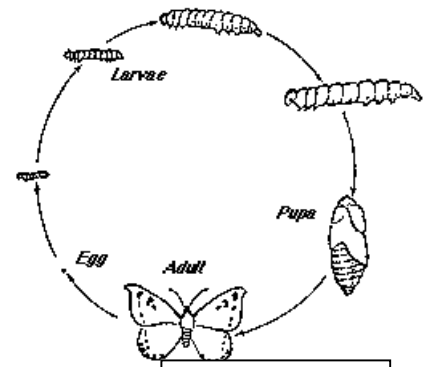


- _____ . This allows them to release the gametes even without finding a particular mate.
- _____ . This requires finding a mate, but the fertilized egg (embryo) is more protected.

<http://www.naturewatch.ca/enrich/wormwatch/about/i>

- The _____ changes into an organism during GROWTH and DEVELOPMENT.
 - Some organisms like fish and insects produce many offspring in hopes that some will survive to maturity.
 - Many land organisms provide protection for the embryo. Some like reptiles and birds lay eggs while others protect the embryo internally in the _____ like mammals.

Figure 9.3f



<http://www.extension.org/sites/default/files/w/2/24/Ch12Commsta.gif>

- As the organisms grow, their bodies experience changes.
 - Organisms like insects and amphibians go through a whole body change called a _____

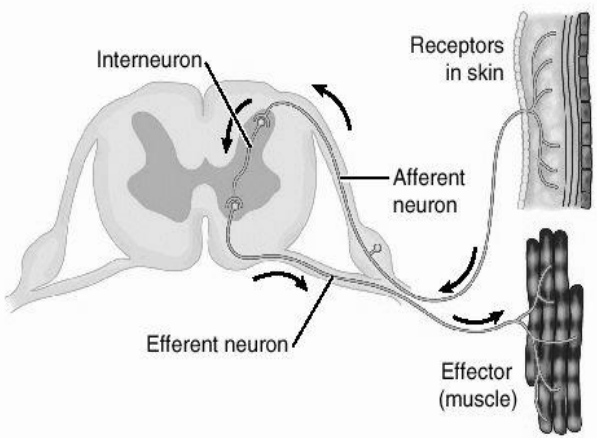
- Other organisms develop internally and only develop to prepare for sexual reproduction.

Summary:

- Regulation** of the mature body is achieved through the **synthesis** and use of hormones to send signals to other cells in order to maintain homeostasis.

- _____ in the environment and the internal body.

Figure 9.3g



<http://images.tutorvista.com/content/feed/u1406/reflex%20arc.jpg>

- Many animals are able to _____ to perceive changes in their environment.
- The senses then use _____

_____ which is the regulatory center of the animal.

- The brain can then control movement patterns

(_____) or

can control internal responses (_____

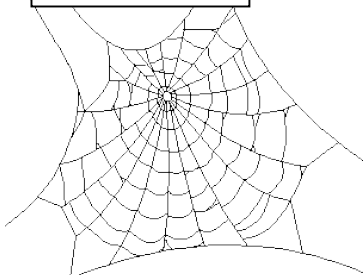
_____).

Summary:

9.4 How do animals use behavior as adaptations to help with survival?

- Animals that can sense their environment and respond are capable of behaviors. The stimulus is a change in the environment that causes a response in the animal.
- _____ . These behaviors are sometimes also called instincts. They can be seen at birth such as babies begging for food or suckling to get milk.
 - _____ and include chemotaxis and phototaxis.
 - Behaviors may be in response to other organisms. Courtship behaviors include _____. Defending your territory occurs among many organisms and can include aggressive actions such as fighting fish.
 - Some behaviors occur in rhythms in response to changes in the temperature or seasons. This includes migration, hibernation and estivation.

Figure 9.4a



<http://zwickwardlistdotcom.files.wordpress.com/2011/06/spiderweb.gif>

Figure 9.4b



http://1.bp.blogspot.com/_AgC15wGedA/S9HvuoqzDl/AAAAAAAAAAM/7yHvPE41K

Figure 9.4c



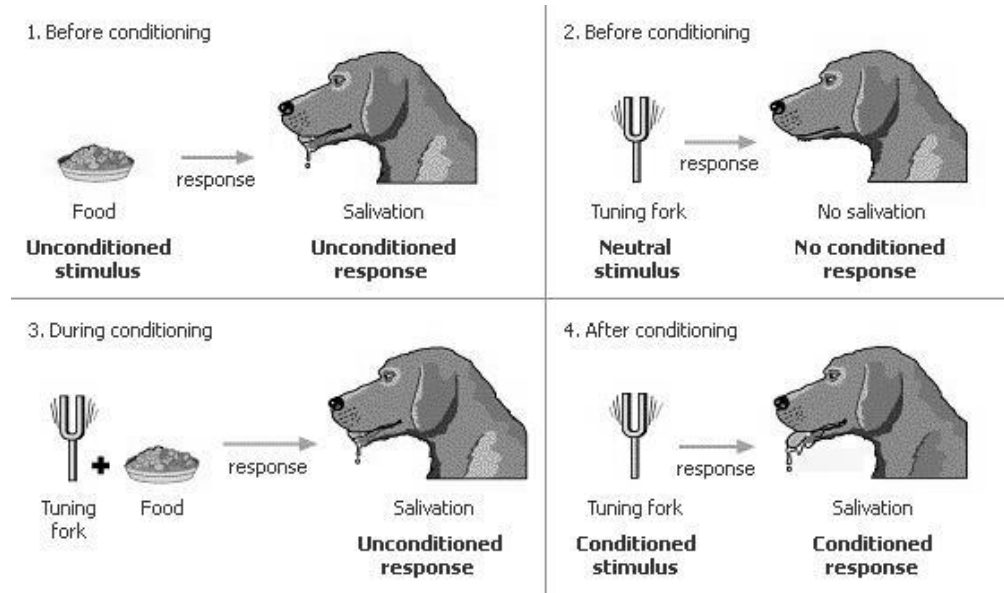
http://4.bp.blogspot.com/_asokfV3tR8/7bIn2yScreI/AAAAAAAAAg/d

Summary:

- _____.
- _____ if there is no reward or punishment. This shows that learning requires motivation.
- _____ is also known as operant conditioning.
This is where an animal _____.
- _____. The famous example is with Pavlov training his dogs to associate a bell with food coming. The dogs eventually salivated at the sound of the bell, signaling _____.

Figure 9.4d

<http://www.experiment-resources.com/images/classical>



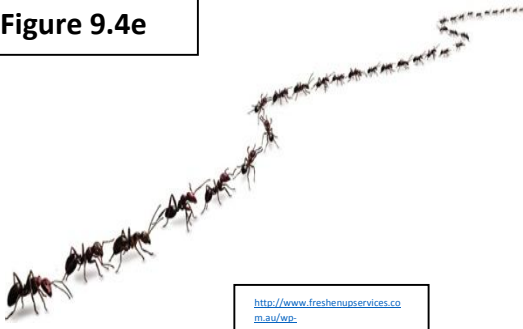
Summary:

79

- Most behaviors are a combination of innate and learned. _____
_____.

- _____ is the first step to learning the behaviors of your specie.
The urge to follow/copy an organism is innate, but the animal must learn who the correct “role model” is.
- _____
_____.

Figure 9.4e



<http://www.freshnupservices.com.au/wp>

- Animals communicate by using sight, sound and even chemical. _____

_____.

- The honeybee _____ is an example of insects communicating with each other. Forager bees are able to use the dance to communicate distance and direction by using vibrations and chemicals.

Summary:

UNIT 10: INTERDEPENDENCE OF LIVING ORGANISMS WITHIN THEIR ENVIRONMENT

10.1 ECOLOGY

LEVELS OF THE BIOSPHERE

- **Biosphere:** Area on earth where life exists
- **Biome:** Areas of similar climate and vegetation
- **Ecosystem:** _____

Figure 10.1a

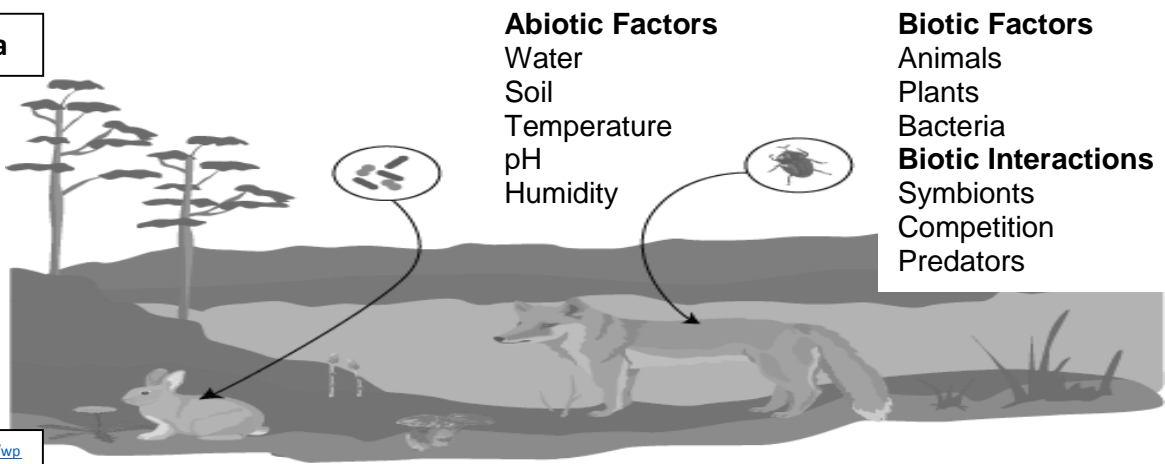
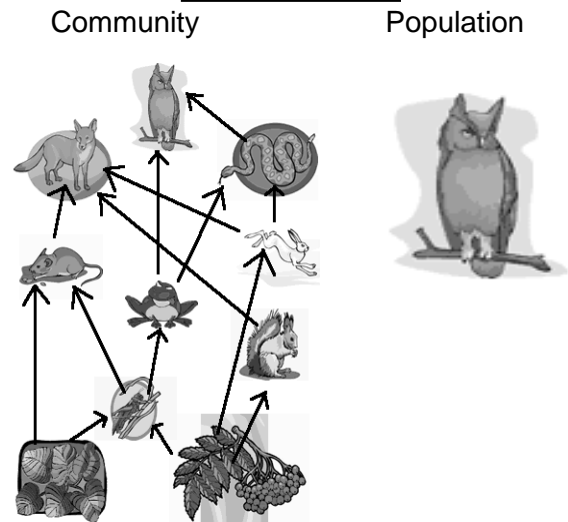


Figure 10.1b



- **Community:** _____
- **Population:** _____
- **Niche:** _____
 - _____
 - _____

SUMMARY:

<http://www.biolnevcerner.com/r>

Figure 10.1c

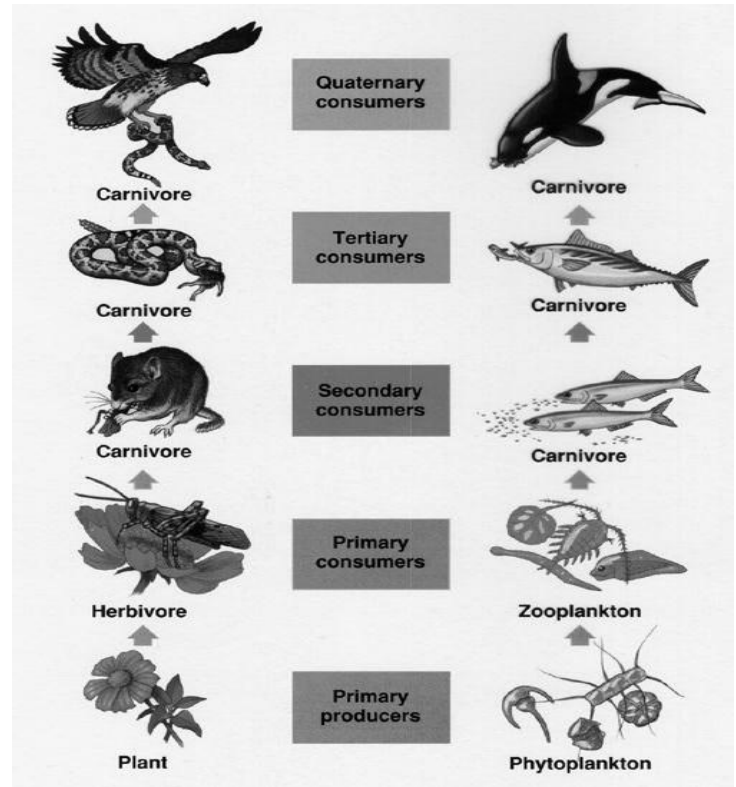
TROPHIC LEVELS = LEVELS OF FEEDING

- Producers: _____

- Consumers: Must take in food
 - Primary Consumer
 - Herbivores: _____

- Secondary and Tertiary:
- Carnivore (eats animals)
- Omnivores: _____

- Decomposers: _____



<http://belizesharks.org/wp-content/uploads/2012/02/trophiclevels.jpg>

ECOLOGICAL EFFICIENCY

- 10% rule: _____

Ecological Pyramids

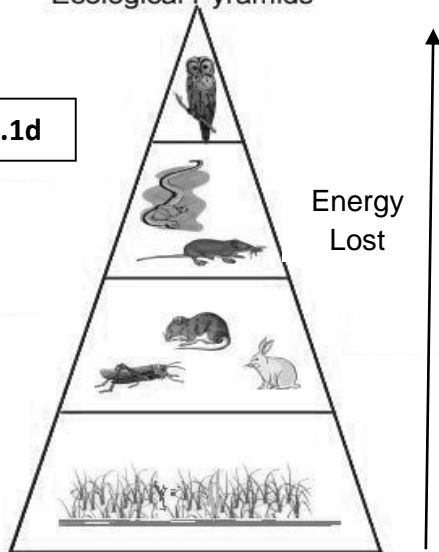


Figure 10.1d

<http://www.eelsinc.org/id64.html>

- The ultimate source of energy is the sun. Energy that comes into the atmosphere is known as “radiant” energy.
- Plants then use this energy and convert it into chemical energy that consumers use.
- Energy can then be lost as heat energy

SUMMARY:

BIOGEOCHEMICAL CYCLES

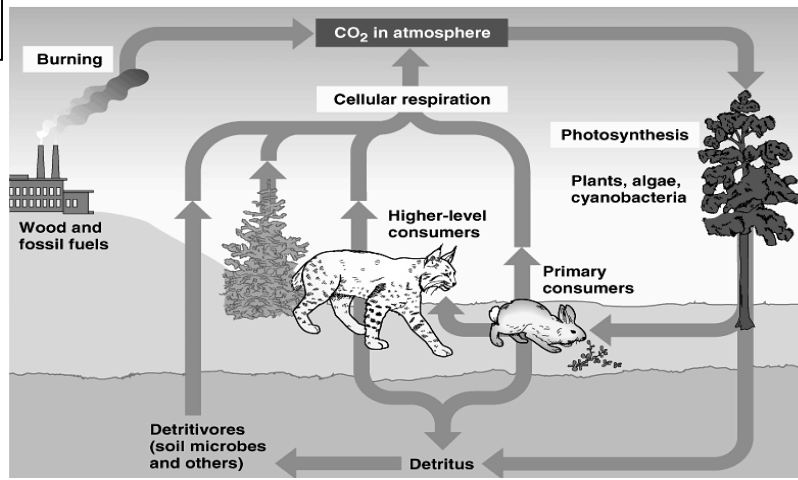
- **Water Cycle**

- Enters through precipitation or infiltration
- Exits through _____

- **Carbon Cycle**

- _____
- Humans influence by burning fossil fuels

Figure 10.1e



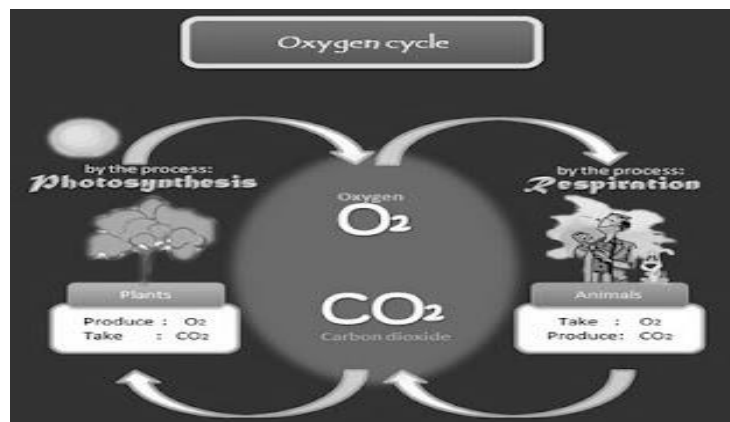
<http://mrewert.pbworks.com/f/1>

- **Oxygen Cycle**

- _____
- Led to development of Ozone layer and today's atmosphere
- _____

Figure 10.1f

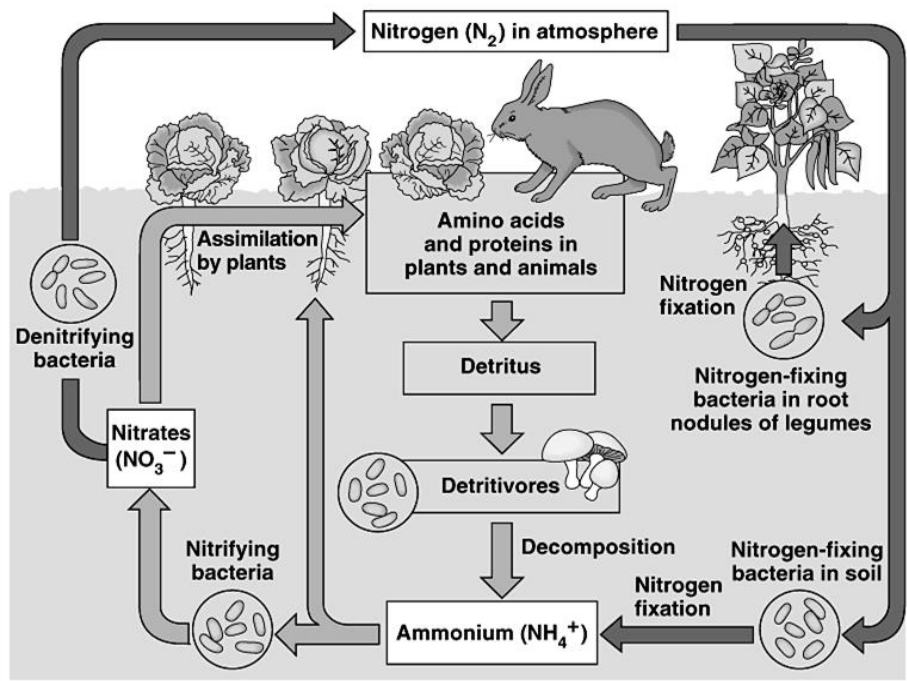
<http://1.bp.blogspot.com/>



- **Nitrogen Cycle**

- _____ are responsible for converting nitrogen gas to usable forms
- Importance of Nitrogen cycle:
 - Nitrogen fixing bacteria-_____
 - Nitrogen is essential for-_____

Figure 10.1g



<http://bioh.wikispaces.com/file/>

SUMMARY:

BIOTIC RELATIONSHIPS: association between organisms within an ecosystem which are interdependent

- **Competition:** _____
- **Predator/Prey:** _____ feeds upon another organism, _____ is organism being feed upon
- **Symbiosis:** Living together in a permanent relationship
 - Mutualism: _____
 - Commensalism: _____
 - _____
 - Parasitism: _____

POPULATION GROWTH

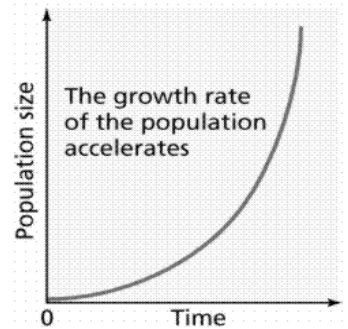
- As organisms reproduce and populations increase, resources limit growth and populations are in dynamic equilibrium.

- **Population Growth Curves**

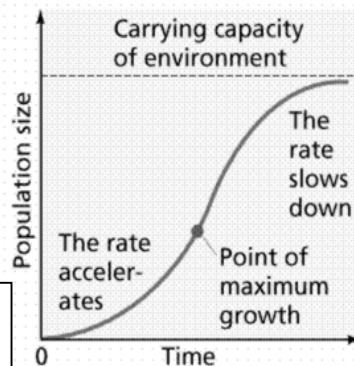
- J-curve: Period of “exponential” growth
- S-curve: _____
- _____
- _____
- Carrying Capacity:
 - _____
- Limiting factor: _____
 - Ex: _____
- **Disease**
 - AIDS, influenza, Dutch Elm disease, Pfiesteria

Figure 10.1h

(a) Exponential (un-restricted) growth



(b) Logistic (restricted) growth



<http://www.emc.maricopa.edu/faculty/f>

SUMMARY:

10.2 HUMAN POPULATION GROWTH

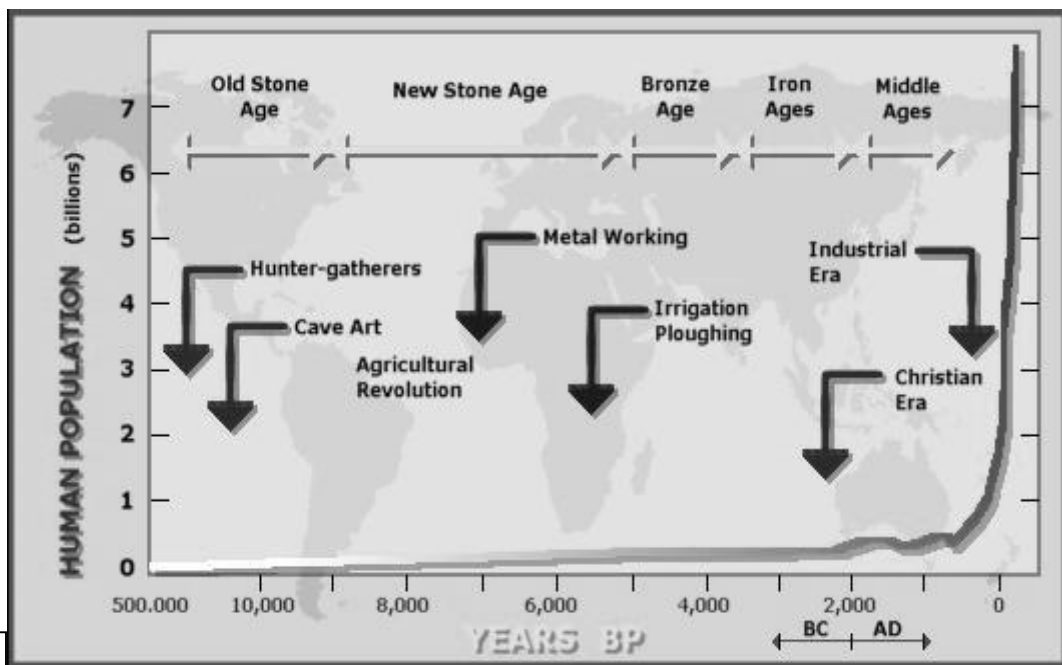
Too many people = environmental problems!

What caused human population growth?

- Causes:
 - Agricultural Revolution- _____
 - Industrial Revolution- _____
 - _____
 - Urbanization – _____

Human population Growth: J curve

Figure 10.2a



<http://www.globalchange.umich.edu/>

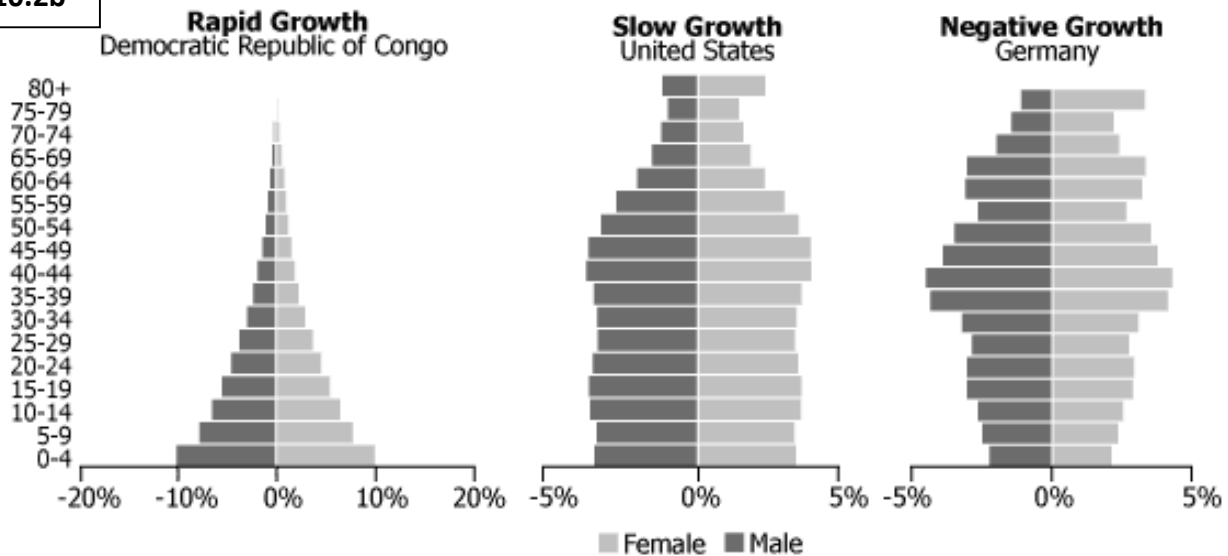
- Effects of Human Population Growth
 - Overcrowding
 - Increase in pollution- _____
 - _____
 - Decrease of Natural Resources: _____
 - Increase land use
- Solutions:
 - Zero Population Growth: _____
 - _____

- Conservation: _____
 - Reduce: _____
 - Reuse: _____
 - Recycle: _____
- Sustainability – _____

What's in a Histogram? - Ages, percent of males and females in the population

What can a histogram reveal? - An increasing, stable or decreasing population

Figure 10.2b



www.elements-srm.com.au/what-is-climate-change-

SUMMARY:

GLOBAL WARMING: Unnatural warming of the Earth

• Cause: _____

- CO₂ comes from burning fossil fuels
- CH₄ from landfills and cow farts!

• Effect: It's like the earth has a fever!

Global warming and the greenhouse effect

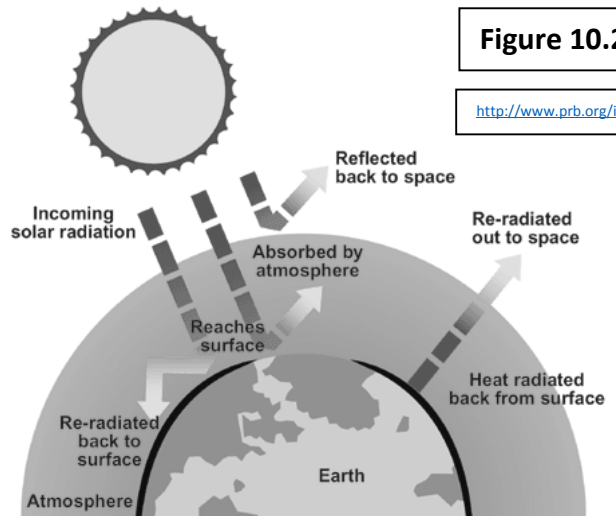


Figure 10.2c

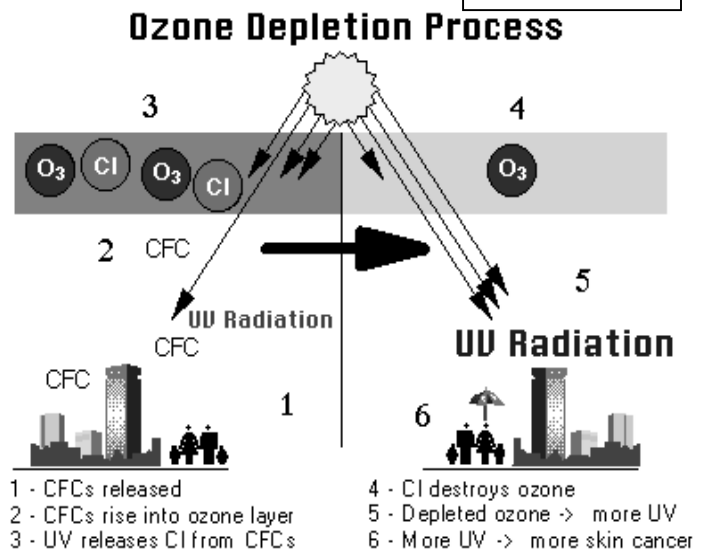
<http://www.prb.org/image>

OZONE DEPLETION: HAS NOTHING TO DO WITH GLOBAL WARMING!

• Cause:

• Effects:

Figure 10.2d



www.epa.gov/ozone/science/process.html

SUMMARY:

ACID RAIN

- Cause: emissions (_____ from cars and factories react with oxygen and water)
- Effects: _____

WATER QUALITY

- Cause: _____

- Effect: Disease, habitat destruction

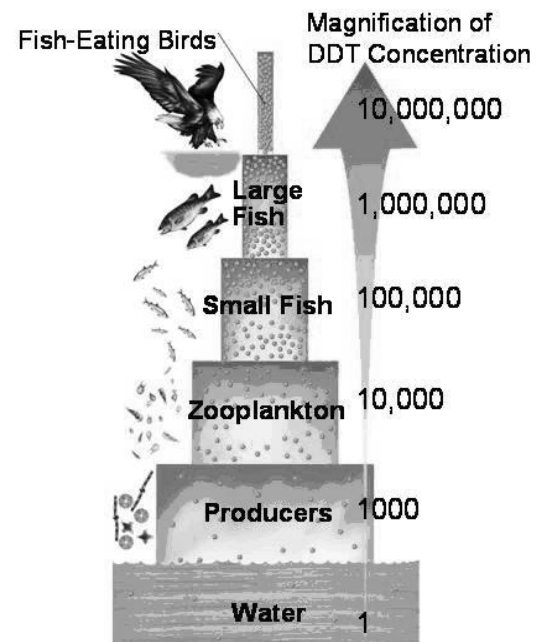
BIODIVERSITY LOSS/ HABITAT DESTRUCTION

- Causes:
 - Deforestation: cutting down forests for wood, and farming
 - Draining/filling wetlands
 - Bioaccumulation:
 - Greatest accumulation in _____

 - Biomagnification
Magnified greatest in _____

- Endangerment/extinction: Endangered species are at risk of becoming extinct. Extinction refers to the loss of a particular species.

Figure 10.2e



www.currentscienceevent.org

SUMMARY: