Biology EOC Review (Saturday 1/12/13)

Bio.1.1.1 Summarize the structure and function of organelles in eukaryotic and ways that these organelles interact with each other to perform the function of the cell.
Bio.1.1.2 Compare prokaryotic and eukaryotic cells in terms of their general structures and degree of complexity.

All living things are made of _____. Whether they are simple or complex, all cells contain**:**

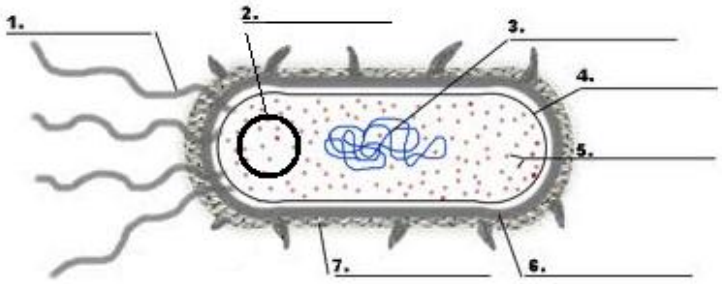
_____, _____, _____, _____

Term	Definition
	Simple cells which do not have their DNA in a nucleus; Also do not have membrane bound organelles.
	More complex cells which protect DNA inside a **nucleus**; Also have specialized structures called **membrane bound organelles**.

Complete table below about the basic cell types (Animal, Plant & Bacteria):

Prokaryotic or Eukaryotic? _____

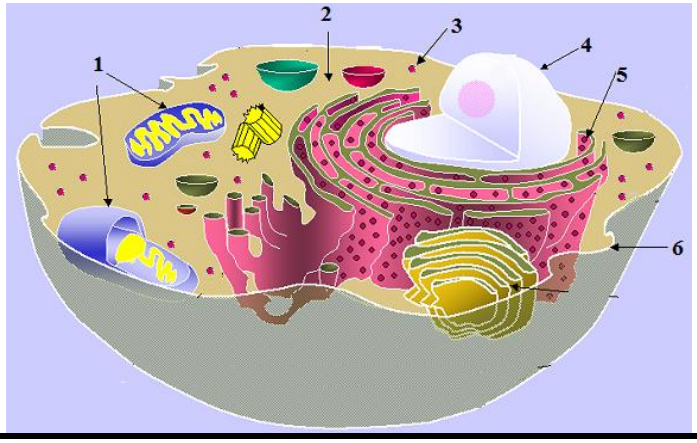
Cell Type _____



1. _____
2. **Plasmid (circular DNA)** _____
3. **Unwound DNA** _____
4. _____
5. **Ribosomes** _____
6. _____
7. **Capsule** _____

Prokaryotic or Eukaryotic? _____

Cell Type _____



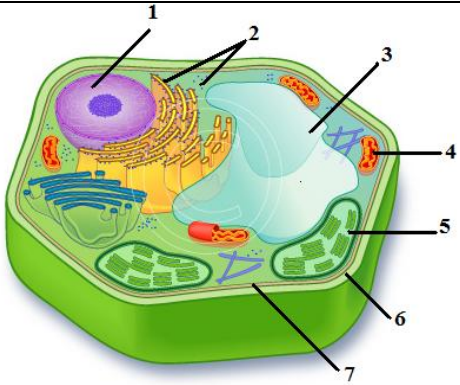
1. _____
2. **Cytoplasm** _____
3. _____
4. _____
5. **Rough ER** _____
6. _____

Key parts that are NOT found in this cell:

1. _____
2. _____

Prokaryotic or Eukaryotic? _____

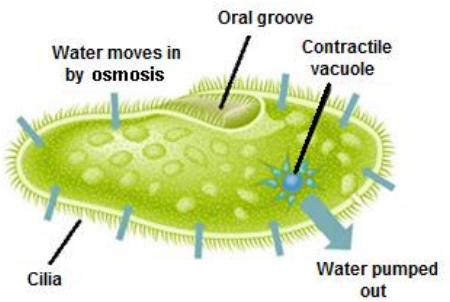
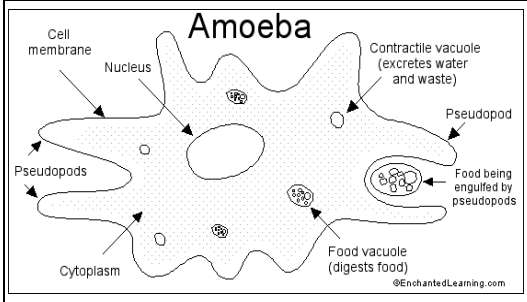
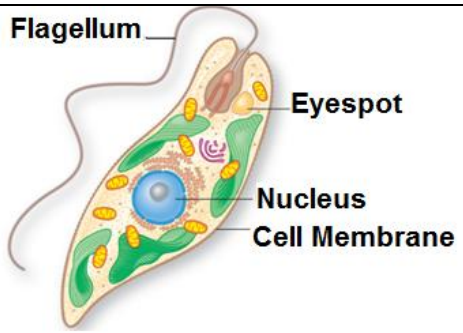
Cell Type _____



1. _____
2. **Ribosomes** _____
3. _____
4. _____
5. _____
6. _____
7. **Cell Membrane** _____

Identify the correct part of the cell:	Function – the purpose of this structure in a cell
1.	Stores the DNA in eukaryotic cells; Sometimes called the **control center** of the cell.
2.	Controls what enters and leaves the cell; it is ***selectively permeable***.
3.	Provides support & structure to plant, fungi & bacteria cells; found outside cell membrane
4.	Site of **cell respiration** in eukaryotic cells… Produces **ATP** or usable cell energy.
5.	Stores water & dissolved material; in plants it is usually the largest organelle.
6.	Uses **sunlight**, **carbon dioxide** (CO_2) and **water** (H_20) to make **glucose** ($C_6H_{12}O_6$) and **Oxygen** (O_2)
7.	Smallest organelle found in all cells; **makes protein;** gets instructions from DNA;

Bio.1.2.1 Explain how homeostasis is maintained in the cell and within an organism in various environments (temp. & pH).
Bio.1.2.3 Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms).

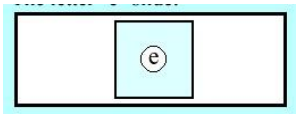
Examples of Protists	Structure	Adaptive advantage
		**Opening to bring larger material into a cell**
		Small hair-like projections on the outside of a cell; sweeps food towards the oral groove
		Pumps water out of the cell to prevent cell lysis (breaking open due to osmosis)
		**"Fake Foot" – Used to surround food item and bring it into the cell. Can also be used for movement.**
		Specialized storage food can be broken down by enzymes (inside the cell)
		**Senses light… beneficial for PHOTOTAXIS** **(movement towards light)**
		Long whip-like tails used for movement (swimming)

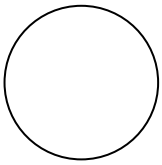
Viewing organisms: Microscopes are use to **magnify** images and to see more **detail.** The type of microscope used will determine your ability to do this.

- **How do you calculate total magnification when using a compound light microscope?**

  Total Magnification = _____

- **Draw what you would see in the field of view if looking at the slide of the letter 'e' on the compound light microscope.**





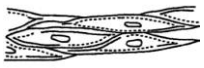
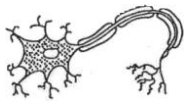
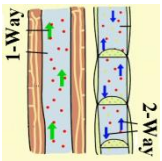
- **When viewing bacteria cells or ribosomes in a cell, why would it be beneficial to have an Electron Microscope?**

  _____

Bio.1.1.3 Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms.

Match each cell shown below with their possible function:

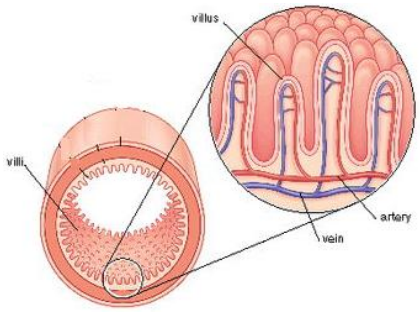
A cell's _____(shape) is directly related to its _____(what it does)

1. ____ My job is to carry genetic info to an egg for sexual reproduction.	2. ____ I allow for gas exchange by delivering O_2 and collect CO_2.	3. ____ I am a single celled organism; I live in pond water.	4. ____ I help send messages between your brain and the rest of your body.	5. ____ I allow water and food to move throughout vascular plants.	6. ____ I assist with movement by contracting & relaxing with other cells like me.
A. 	B. 	C. 	D. 	E. 	F. 
I am a…	*I am a…*	*I am a…*	*I am a…*	*I am a…*	*I am..*

If **cells B**, **C** and **D** came from the same person, the DNA in each of them would be _____. The cells are _____ for specific jobs. Therefore each one of these cells utilizes different parts of the instructions found in the DNA at different times.

Another example of how structure relates to function: **Folds** in organs and organelles increase _____ _____. This increases the structure's ability to do its job.

Ex: _____ and the villi in the _____



List the levels of organization of life, starting with the basic unit of life:

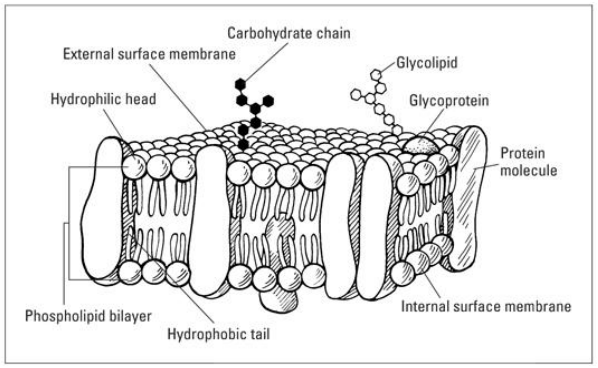
All living things are made up of _____ … many may group together to form→ _____ → _____ → _____ _____ →_____ (multicellular)

Bio.1.2.1 Explain how homeostasis is maintained in the cell and within an organism in various environments.

_____ or maintaining balance in a living cell is essential for life. Examples of conditions in humans in which homeostasis in ***not*** maintained included:

- Diabetics often suffer from Hyperglycemia … _____ blood sugar & Hypoglycemia… _____ blood sugar
- When you are exercising, movement of your muscles creates lots of heat. How does your body respond to help maintain homeostasis? _____
  _____

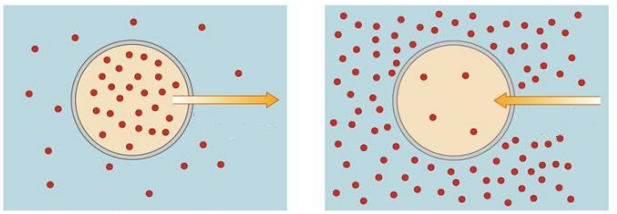
The _____ is the barrier that separates all cells from their surroundings. Its job is to control what may enter and leave the cell.



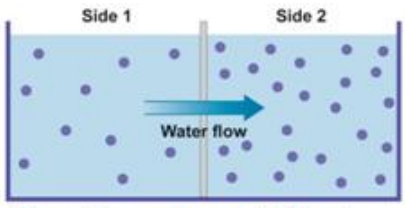
- _____ - are channels for large or charged material to move in/out of the cell.
- _____ - ID tags found on the outer surface of a cell (i.e. ABO blood type antigens)

_____ **Transport** – movement of material across the cell or plasma membrane without the use of energy (molecules move due a concentration difference… a gradient). **High to Low concentration.**

- **The goal of passive transport is to have the concentration be _____ inside & outside of a cell.**



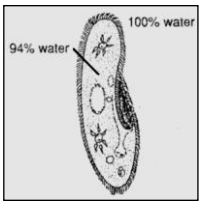
Diffusion (Facilitated Diffusion) = Solute moves from a high to a low concentration



Osmosis = movement of water

_____ **Transport** – movement of material across the cell or plasma membrane using energy (**ATP**). Energy may be needed for several reasons:

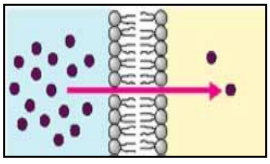
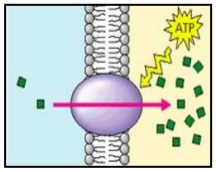
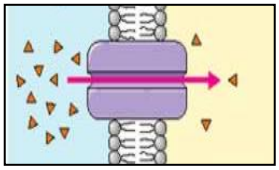
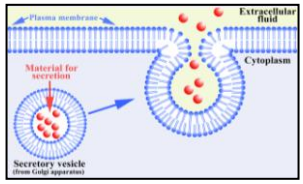
- Material must be **pushed** against the gradient (through a protein). **From low to high concentration**.
- Large quantities are being **pushed** in or out of the cell

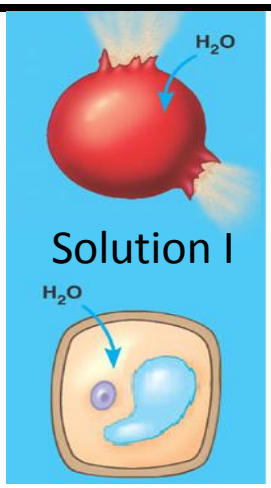
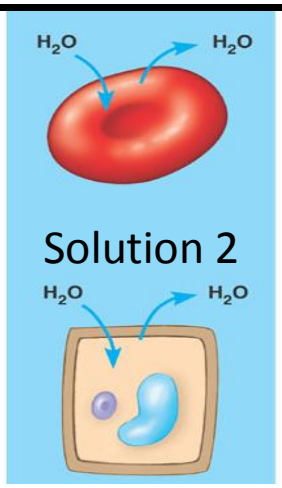
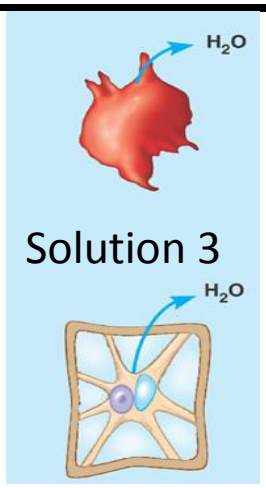
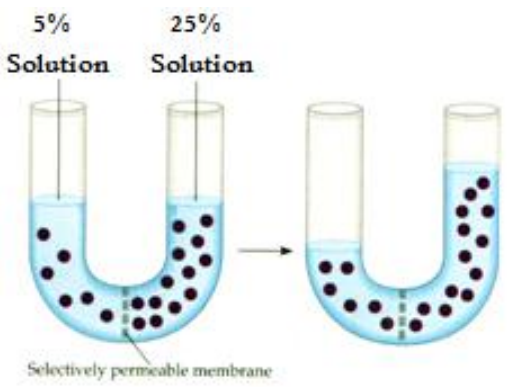


In a living cell, passive and active transport are constantly responding to environmental changes:

- **Water moves in to the paramecium due to _____ (passive transport).**
- **The cell will then pump (active transport) water out with a _____.**

Identify the processes occurring in each picture below:

Movement of material across the cell membrane:				
What process is moving the material?				
Is this **PASSIVE** or **ACTIVE** transport?				

An animal cell and a plant cell are placed in 3 different solutions below.			Refer to the change with the U-tube
			
Describe what's happened to the cells.	Describe what's happened to the cells.	Describe what's happened to the cells.	Explain what has happened in this picture.
Describe the type of solution it was placed in?	Describe the type of solution it was placed in?	Describe the type of solution it was placed in?	

- Why do plant and animal cells respond differently being placed in distilled water?

_____

What is the optimum (ideal) type of solution for animal cells? _____

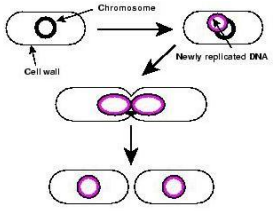
What is the optimum (ideal) solution for plant cells? _____

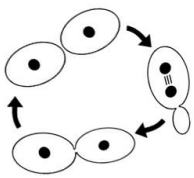
Bio.1.2.2 Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis.
Bio.3.2.1 Explain the role of meiosis in sexual reproduction and genetic variation.

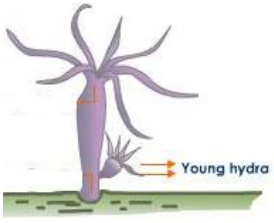
Reproduction – producing more cells/organisms (Sexually or Asexually)

- **Asexual Reproduction –** the production of a new cell through the division of a previously existing cell.
  - Grow and replacement of worn out cells
  - Daughter cells are **genetically identical** to the parent cell (**clones**)

What types of asexual reproduction is shown in each picture?



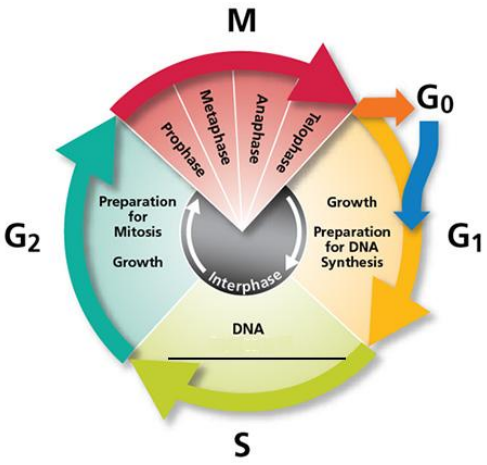


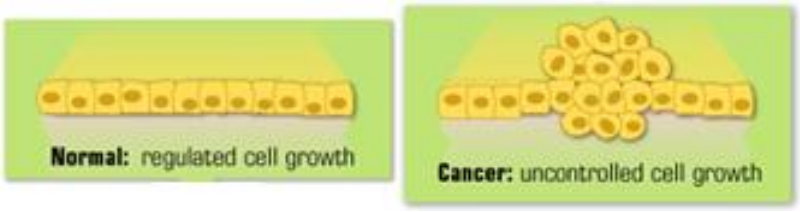


_____ _____

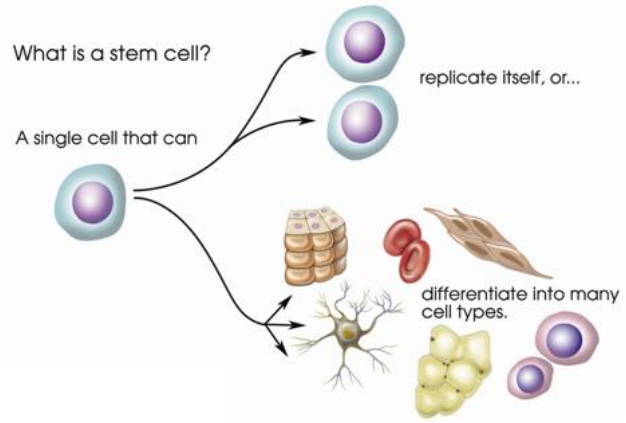
Cell Cycle (Mitosis)

- Mitosis makes almost all the cells of your body (somatic cells).
  - Only cells **not** made by mitosis are _____.
- When cells are not actively dividing – they enter G_0, a resting state.
- _____ is the result of a mutation in which the cells fail to enter into G_0, or don't stop dividing.



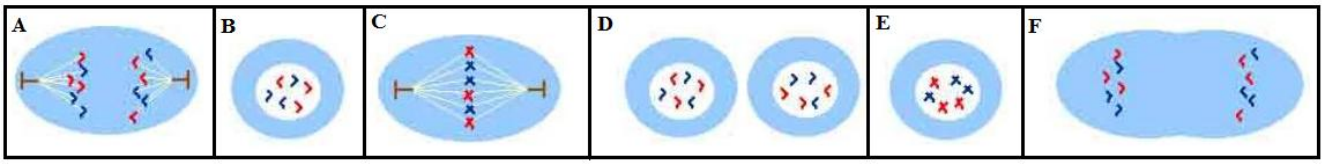


_____ cells are **unspecialized** cells that continually reproduce themselves and have, under appropriate conditions, the ability to **differentiate** into one or more types of specialized cells.



- **Embryonic** cells which have not yet differentiated into various cell types are called embryonic stem cells.
- Stem cells found in organisms, for instance in bone marrow, are called **adult stem cells**.

Place the following pictures in the correct order that shows the phases of Mitosis:



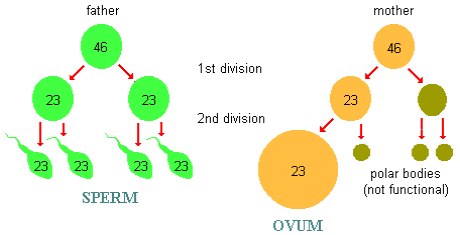
_____ → _____ → _____ → _____ → _____ → _____

(parent cell) (daughter cells)

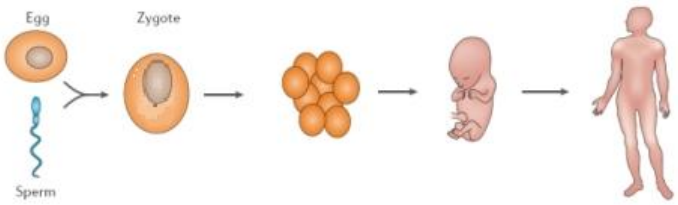
Interphase → _____ →_____ →_____ →_____ **→Cytokinesis**

Meiosis makes _____ (egg or sperm); these are ***haploid*** (1N) cells… they carry **half** the info needed to make a new organism. Provides a huge source of **GENETIC VARIATION due to two reasons:**

- Independent assortment of chromosomes
- Crossing Over



Sexual Reproduction – the union of two gametes to create an offspring with new combinations of traits



- **Fertilization** is the process of the two haploid cells (gametes) joining together to create a diploid (2N) cell.
- Benefit – **increases genetic** _____ (the cells produced are different from the parent cell) This increases the chance of survival for the species .

	Description	MITOSIS	MEIOSIS
1	Where in the body does this process occur?		
2	Involved in Sexual or Asexual Reproduction?		
3	Does the process limit or increases genetic variation?		
4	How many cells are produced at the end?		
5	Describe a human cell made by the process (include chromosome #)		

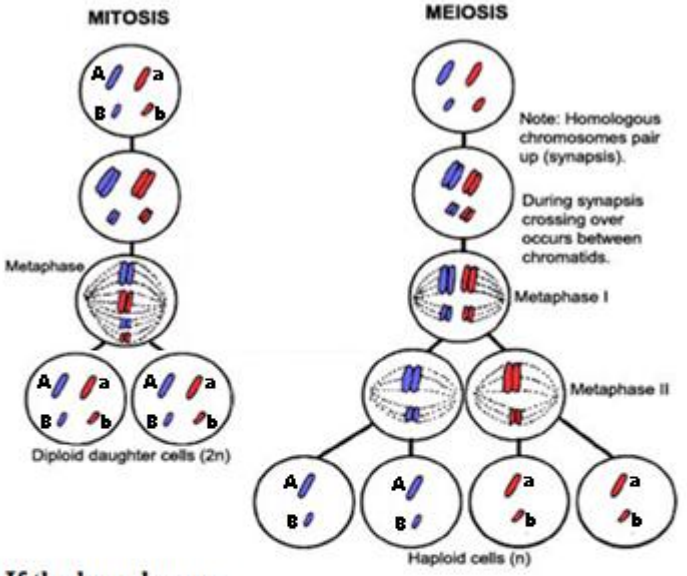
Which diagram most correctly represents meiosis? _____

(1) 2n → 2n

(3) 2n → n

(2) 2n → 2n, 2n

(4) 2n → n, n



Which diagram illustrates fertilization that would most likely lead to the development of a normal human male? __

A. X + X

B. X + XY

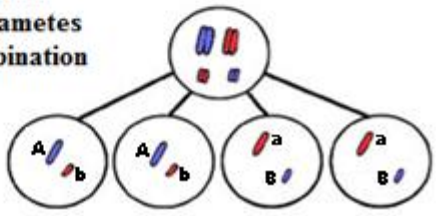
C. XX + X

D. X + Y

If the homologous chromosomes line up in a different order, the gametes have a different combination of chromosomes.

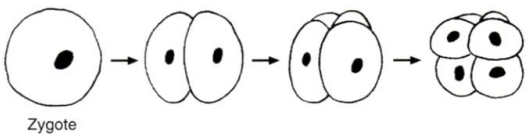
This is called INDEPENDENT ASSORTMENT

or



The diagram to the right represents the early stages development of a human embryo. Which process in the diagram is represented by the arrows as it changes from a one cell to many cells? ____

A. meiosis
B. fertilization
C. mitosis
D. evolution



Bio.3.1.1 Explain the double-stranded, complementary nature of DNA as related to its function in the cell.

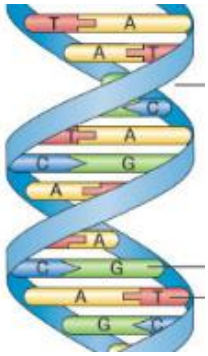
Bio.4.1.2 Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms.

The instructions for making living things are written in two types of nucleic acids called _____ & _____

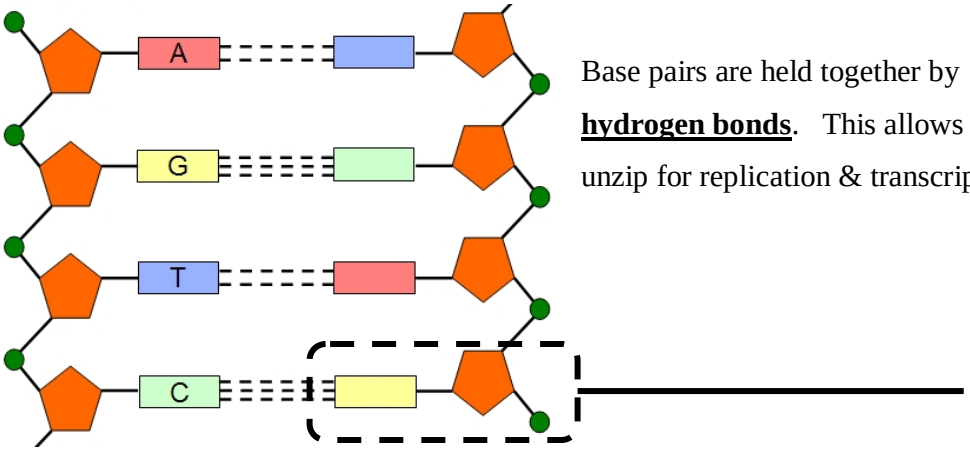
- Both are made up of many monomers or building blocks called _____
  - Every DNA & RNA nucleotide has 3 parts: **a sugar, a phosphate group and a nitrogenous base**.

Characteristic	DNA	RNA
Name of sugar in a nucleotide		
Bases found in nucleotides		
Forms	**Always a double stranded molecule.**	**3 Types (_____)**
Relative Size		

The shape of DNA is called a _____ or "twisted ladder".



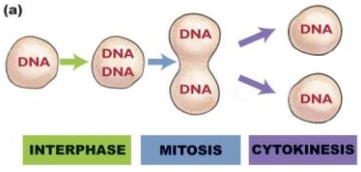
- The sides (or backbones) are made up of alternating **sugar-phosphate** groups
- Each step or "rung" of the ladder is made up of a pair of nitrogenous bases:
- Two strands in a DNA molecule are _____ so if you know the sequence of one strand, you can figure out the other. **(Label the DNA molecule on the left).**

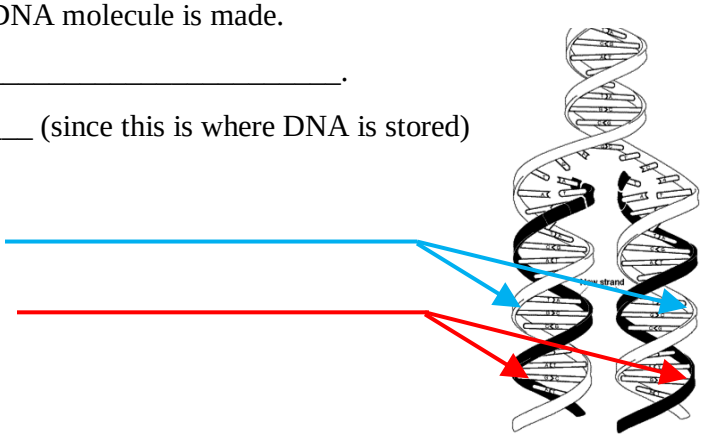


Base pairs are held together by _____ **<u>hydrogen bonds</u>**. This allows the two strands of DNA to unzip for replication & transcription.

Replication – The process in which an **<u>identical</u>** copy of a DNA molecule is made.

- Must occur before a cell can _____.
- In eukaryotic cells, it occurs in the _____ (since this is where DNA is stored)
- Each original strand is used as a template to build a new strand (this is called **semi-conservative replication**)





<u>Protein</u> <u>Synthesis</u> = a two step process used by cells to make proteins (Transcription & Translation)

The sequence of nucleotides (G C A T) in DNA codes for proteins. This is the key to cell function and life.

- Cells respond to their environments by producing different types and amounts of protein.
- Proteins can be **structural** (forming a part of the cell) or **functional** (hormones, enzymes, or chemicals involved in cell chemistry).
- Proteins are made at the _____, the smallest organelle found in <u>all</u> cells.
- Proteins are made by joining many _____ _____ together. The amino acids are linked together by a _____ bond (this is why proteins are also called **<u>polypeptides</u>**).
- Once the polypeptide is made, it must be _____ to form a 3-dimensional protein.

	Protein Synthesis	
	Transcription	**Translation**
What is made?		
Which nucleic acid(s) is/are involved?		
Where does it occur?		

DNA ⟶ RNA ⟶ Protein ⟶ Phenotype

What amino acids would be coded for by the following DNA?

DNA	T A C G C T A A G A C T
_____	
Amino Acids	

A	Lysine	Arginine	Isoleucine	Threonine	A
	Lysine	Arginine	Methionine	Threonine	G
	Asparagine	Serine	Isoleucine	Threonine	U
	Asparagine	Serine	Isoleucine	Threonine	C
G	Glutamic acid	Glycine	Valine	Alanine	A
	Glutamic acid	Glycine	Valine	Alanine	G
	Aspartic acid	Glycine	Valine	Alanine	U
	Aspartic acid	Glycine	Valine	Alanine	C
U	Stop codon	Stop codon	Leucine	Serine	A
	Stop codon	Tryptophan	Leucine	Serine	G
	Tyrosine	Cysteine	Phenylalanine	Serine	U
	Tyrosine	Cysteine	Phenylalanine	Serine	C
C	Glutamine	Arginine	Leucine	Proline	A
	Glutamine	Arginine	Leucine	Proline	G
	Histidine	Arginine	Leucine	Proline	U
	Histidine	Arginine	Leucine	Proline	C
	A	G	U	C	

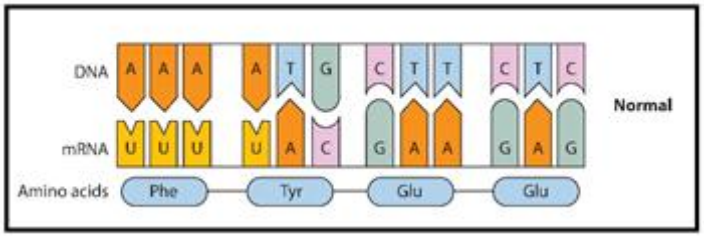
Which DNA mutation below is most likely to cause the largest change to a protein?

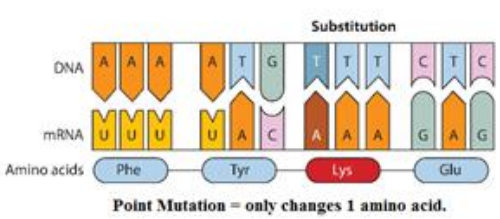
A. **<u>G</u>**CT TCA CCA TAT (Changing the G to C)

B. GCT TCA CCA T**<u>A</u>**T (Deleting the A)

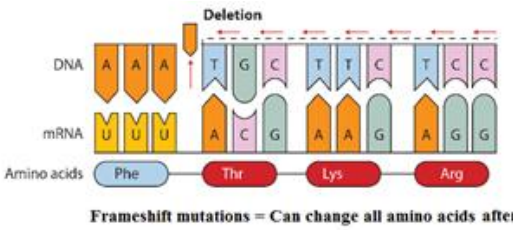
C. GCT TCA CCA TAT (Inserting a C)

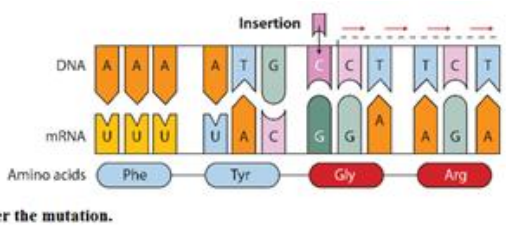
D. GCT TCA CCA **<u>T</u>**AT (Changing the T to a G)





Point Mutation = only changes 1 amino acid.





Frameshift mutations = Can change all amino acids after the mutation.

What would be a likely cause of a mutation in a skin cell? _____.

If a mutation occurs in a skin cell, which of the following statements would be true?

A. All of the cells in the body would contain the same mutation.
B. All of the skin cells would end up with the same mutation.
C. Only cells made from the mutated skin cell would contain the mutation.
D. The reproductive cells would contain the mutation.

Bio.3.2.2 Predict offspring ratios based on a variety of inheritance patterns (including dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits).

Complete the Punnett square below for a cross between a **heterozygous black** & a **white** guinea pig.
In guinea pigs: Black allele = (B); white allele = (b)

	_____	_____
_____	genotype _____ phenotype _____	genotype _____ phenotype _____
_____	genotype _____ phenotype _____	genotype _____ phenotype _____

__/4 = BB
__/4 = Bb
__/4 = bb
___:___:___

__/4 = Black
__/4 = white
___:___

Two tabby cats mate produce a litter of 10 kittens: 5 tabby & 5 solid kittens.

A. What is the most likely genotypes of the parents **(use the letters TT, Tt or tt)**?

B. If they were to have an 11th kitten, how likely is it to be a solid color (give a %).

In snapdragons, **incomplete dominance** can be seen in flower color: red = (RR), pink = (Rr), white = (rr)

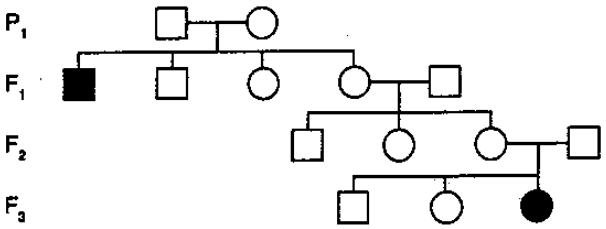
Cross two PINK snapdragons. What would be the genotypes of the parent plants? _____ X _____

What percent of their offspring are expected to be red? _____ (circle them)

In birds, the allele for blue feathers **codominant** to the allele for yellow feathers. If a bird with blue feathers is mated with a bird with yellow feathers, what are the possible phenotypes of their offspring?

Autosomal Recessive Disorders:

- Disorders such as ***Tay-Sachs*** are recessive. T = normal t = Tay-sachs



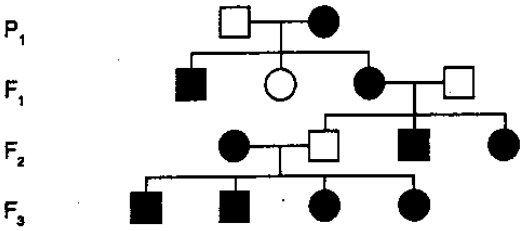
⇨ **In the F_3 generation, there is an affected daughter (she has the disease). What is her genotype? ____**

⇨ **What must be the genotpe of her parents?**

Mom = _____ Dad = _____

Patterns of Dominant Disorders:

- Some diseases such as ***Huntington's*** are caused by autosomal dominant alleles. H = Huntington's h = normal

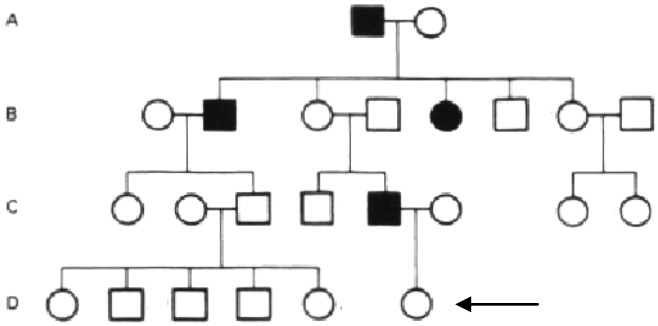


- **What is the genotype of the parents in the P_1 generation?**

  Mom = _____ Dad = _____

- **If a parent has Huntington's gene, what is the chance that they will pass it on to each child? _____**
- **Can a dominant disorder skip a generation? _____**

Below is an example of a sex-linked pedigree that shows the inheritance of hemophilia.



⇨ **What is the genotype of the last female in the fourth generation? _____**

⇨ **The oldest son in the second generation has hemophilia. Did he inherit this disease from his father or his mother? Explain.**

⇨ **How do sex-linked pedigrees often look different from a pedigree for an autosomal trait?**

In humans, hemophilia is a sex-linked recessive trait located on the X chromosome. Normal blood is dominant (X^H) to hemophilia (X^h).

- **Cross a female that is a carrier for hemophilia with a male that has normal blood clotting.**

Parents genotypes: _____ X _____

A. What percentage of this couple's **offspring** do we expect to have hemophilia?

B. What percentage of this couple's **sons** do we expect to have hemophilia?

C. If this couple could choose the gender of their child, which do you think they would pick? Explain.

Complete the table below about the ABO Blood Groups

Phenotype / Blood Type	Genotype (s)	Phenotype / Blood Type	Genotype (s)
Type A	$I^A I^A$ or _____	Type B	_____ or $I^B i$
Type AB		Type O	

If a man has **Type AB** blood and his wife has **Type O** blood, what is the chance that their child will have type AB blood? Use the Punnett square below to show the possible blood types of their children

	_____	_____
_____		
_____		

_____ % of their children are expected to be Type A

_____ % of their children are expected to be Type B

_____ % of their children are expected to be Type AB

_____ % of their children are expected to be Type O

<u>Polygenic</u> <u>traits</u> are often easy to identify since they have a wide variety of phenotypes**.**

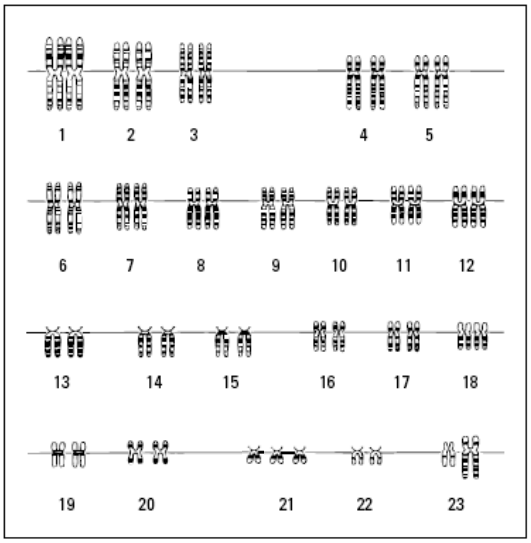
Human examples include: _____

_____

Each of the following are genetic conditions whose expression is affected by environmental conditions:

- Lung/mouth cancer – _____ use
- Skin cancer – vitamin D, folic acid and _____ exposure
- Diabetes – _____ and <u>exercise/weight.</u>
- PKU – _____ phenylalanine (an amino acid found in many foods)
- Heart disease – diet and _____

Use the karyotypes below to answer the following questions?



- **Is this for a boy or a girl? _____**

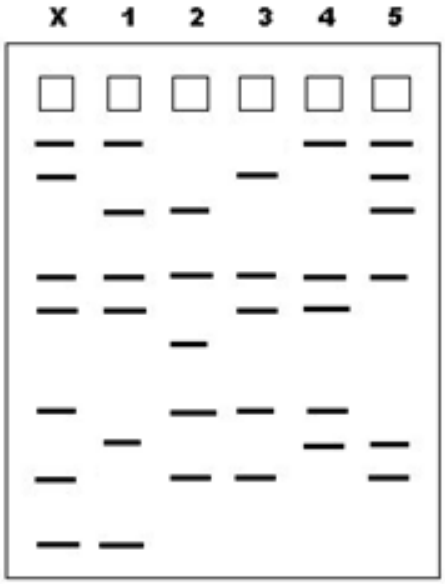
This patient does not have a normal number of chromosomes. Circle the mistake in their karyotype.

- **When an egg or sperm has too many or too few chromosomes, it is the result of _____ (when pairs of chromosomes fail to separate during meiosis).**
- **Explain why this is more likely to occur in the mother (rather than the father). _____**

  _____

  _____

Bio.3.3.1 Interpret how DNA is used for comparison and identification of organisms.



Before DNA can be loaded into a gel to make a DNA fingerprint, what must be done to the DNA so that it makes the different bands? It must be

_____with a _____ _____

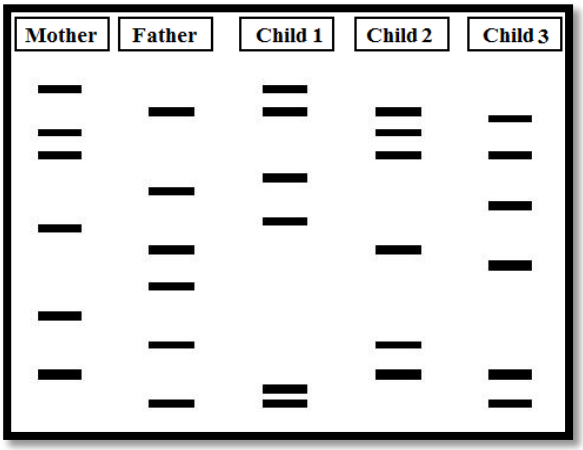
What causes the fragments of DNA to move through the gel?

_____

_____

Which species (1-5) is most closely related to the common ancestor (X)?

_____ Why? _____



Which children are the offspring of both parents? _____

Which child has the <u>largest</u> fragment of DNA in their DNA fingerprint?

_____

Bio.3.3.2 Summarize how transgenic organisms are engineered to benefit society.

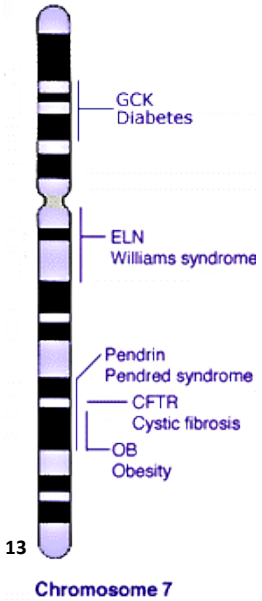
Bio.3.3.3 Evaluate some of the ethical issues surrounding the use of DNA technology (including cloning, genetically modified organisms, stem cell research, and Human Genome Project).

The _____ was an attempt by scientists to read & record the order of the 3 billion bases (Gs, Cs, As & Ts) in a human cell.

- Once done, the goal was to identify the location & sequence of genetic disorders.

Applications of the Human Genome Project:

- Individuals that carry genes for genetic conditions may be candidates for _____ _____ - in which a working copy of a gene is inserted into the cells of an individual with a genetic disorder. Examples include:
  - Severe Combined Immunodeficiency (SCID)
  - Cystic Fibrosis



Genetically Modified Organisms (GMOs) contain DNA that has been altered. Examples:

- Agriculture _____
- Pharmaceuticals to _____
- Industry to **create bacteria that can produce plastic while taking in CO_2 rather than releasing it.**

- A **Transgenic Organism** is a GMO that contains DNA from _____
  - Examples include: _____
- Place the steps of bacterial transformation in the correct order (Number them from 1-5):

_____ - Put the plasmid with recombinant DNA back into the bacteria.

_____ - Identify the gene to be inserted into the bacteria.

_____ - Isolate the product made by the transformed bacteria.

_____ - The transformed bacteria reproduce, making clones that also carry the recombinant DNA.

_____ - Insert the desired gene into the bacteria plasmid.

Place a ✓ next to each statement that is a positive outcome of DNA Technology

____ Curing Parkinson's or Alzheimer's using stem cells (not done yet).
____ Reactions to treatments aren't always known.
____ Finding cheaper ways to make medicine.
____ Being able to insert a working gene into a person's cells.
____ Violates moral and ethical beliefs of some individuals.
____ Large amounts of money are spent on research that may not produce any benefit.
____ Finding better ways to clean up the environment.
____ Creating plants that produce their own pesticides.

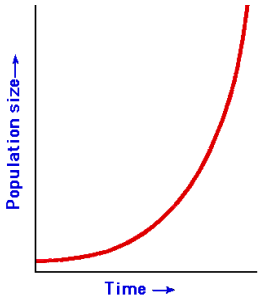
Bio.3.4.1 Explain how fossil, biochemical, and anatomical evidence support the theory of evolution.
Bio.3.4.2 Explain how natural selection influences the changes in species over time.
Bio.3.4.3 Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection.

Evolution means the _____ of a species over time. Two key ideas of the theory of evolution state:

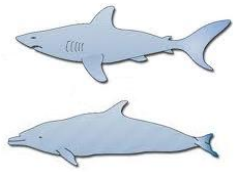
- Newer forms appearing in the fossil record are actually modified descendents of older species. And all species are descendants from one or a few original types of life… Darwin called this ***Descent with Modification***.

- The _____ determines which traits are favorable and it limits the growth of populations. It increases the rate of death or decreases the rate of reproduction, (or both)… ***Modification by Natural Selection***.

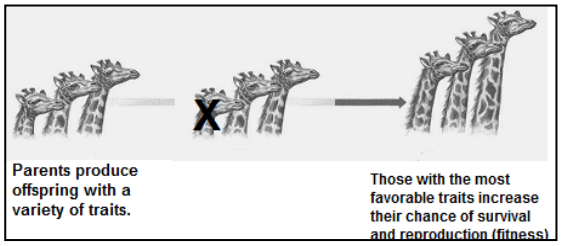
Driving forces for Natural Selection:



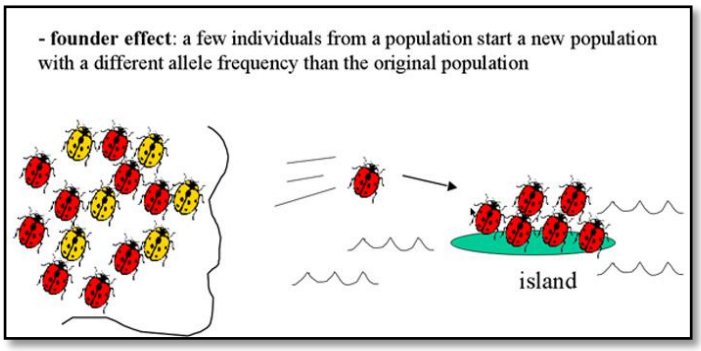
- Species have the potential to increase in numbers _____.
- Populations contain _____ _____ due to mutations and genetic recombination (sexual reproduction).
- There is a _____ supply of resources required for life… this increases _____, especially between members of the same species with the same needs.
- Changing _____ select for specific genetic phenotypes. This is evident when we look at unrelated organisms that live in similar environments. Overtime similar body designs tend to be favored (Example: Shark & Dolphin):



- Those organisms with favorable adaptations survive, reproduce and pass on their alleles… this is what Darwin called ***Survival of the _____.***



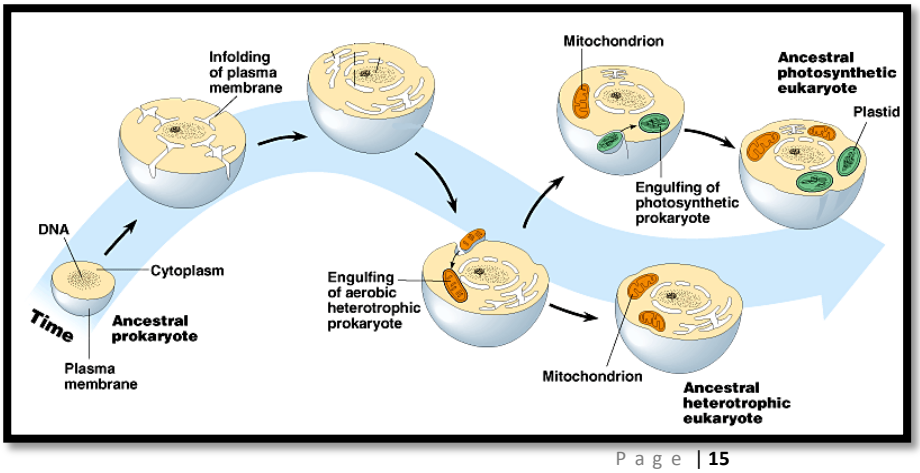
- Changes in an environment can lead to changes in which alleles are favored over time.
- **Geographic Isolation** is an important force that my speed up the process of _____ (forming a new species)



Things tend to start off _____ and become more _____ over time. Read each pair of characteristics listed below and circle the one that is thought to have appeared first on earth:

- **Prokaryotic vs. Eukaryotic**
- **Autotrophs vs. Heterotrophs**
- **Aerobic vs. Anaerobic**
- **Multicellular vs. Unicellular**

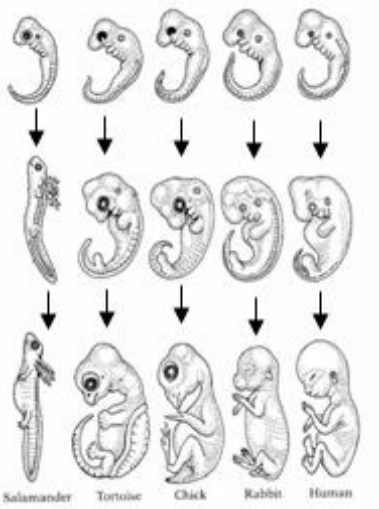
The Endosymbiotic theory addresses the origin of the first _____ cells.

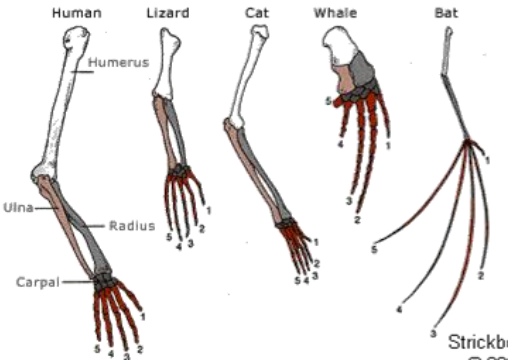


Evidence for Evolution:

The best evidence that supports the theory of evolution is the comparison of _____ and _____ (or sequence of amino acids).

- The more closely related two species are, the _____ number of differences will be found in these macromolecules.



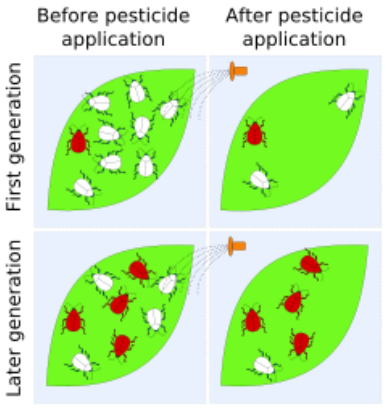


Common Ancestry can be seen by:

- Comparing the development of embryos (directions are written in their _____)
- Comparing bone structure in related species. Selection favors various designs in different environments.

Examples of how we can see a species change over time (adapting to their environment) include:

- Bacteria resistance to _____ and insects that develop resistance to pesticides.
- In order for this to occur, there must be _____ variation present in the population. Those with a mutation that makes them more resistant survive and reproduce to pass the resistance on to their offspring.



Bio.3.5.1 Explain the historical development and changing nature of classification systems.
Bio.3.5.2 Analyze the classification of organisms according to their evolutionary relationships

The system of classifying organisms was developed by Carolos Linnaeus (1700's). This same system is still used today, however it has been modified based upon newly discovered information about evolutionary relationships.

- All organisms were classified into groups or taxa based upon their characteristics (from Largest to smallest):
  - _____ (biggest taxa)
  - _____
  - _____
  - _____
  - _____
  - _____
  - _____
  - _____(smallest, most specific taxa)

- Originally there were 2 kingdoms (_____ & _____). More kingdoms added as knowledge of the diversity of organisms increased.
- Linnaeus gave a ***scientific name*** for each living organism. Every scientific name is made up the (_____ + _____)

If two organisms are in the same **order**, they must also be in the same: _____

What is the genus of an organism with the scientific name *Passer domesticus*? _____

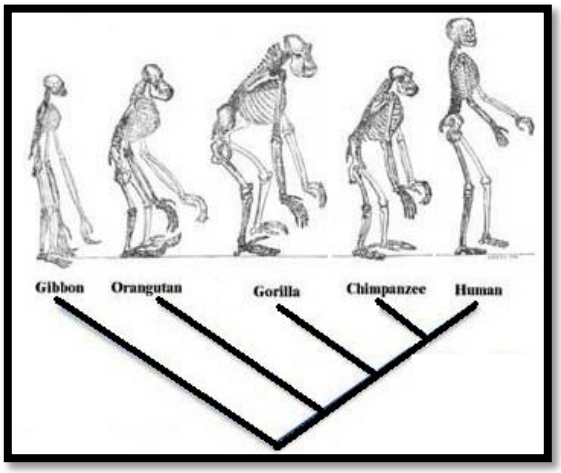
Classification of Living Things (Domain & Kingdom System)

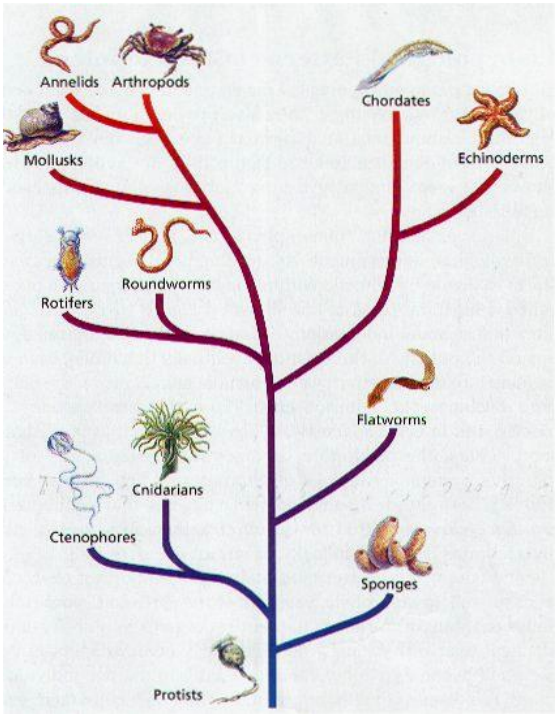
Domain	Archaea	Bacteria	Eukarya			
Kingdom	**Archaebacteria**	**Eubacteria**				
Examples	Bacteria that live in harsh environments	Bacteria that live in/on you, strep and E. coli	Paramecium, Amoeba and Euglena	mushrooms, mold &yeast	Moss, Fern, Pine tree, Flowering Plant	Sponge, Worm, Insect, Reptile, Fish, Human
Cell Type (Prokaryote or Eukaryote)						
unicellular or multicellular	Unicellular		Mostly unicellular	Mostly Multicellular	Multicellular	Multicellular
Cell Wall (absent or present)	Present		Present in some	Present	Present	Absent
If there is a **Cell Wall**, what is it made of	Various Carbohydrates	Peptidoglycan	Various Carbohydrates			**No cell wall**
Nutrition (Autotroph or Heterotroph)	Both (some are autotrophs & others are heterotrophs)		Both			
VIRUSES ARE NOT CLASSIFIED AS A LIVING THING AND THEREFORE THEY DO NOT BELONG IN ANY OF THE ABOVE KINGDOMS!						

Recent changes in the classification system are based mainly on information that was gained through studying:

- Evolutionary relationships, macromolecules (such as DNA & biochemical analysis), embryology & morphology

Cladograms & **Phylogenetic trees** such as the one seen below are used to show evolutionary relationships between organisms.





- Which is the most ***primitive*** primate seen in the diagram on the left? _____
- Which animal is more closely related to the arthropod – the roundworm or the chordate? _____
- According to the diagram on the right, what is the common ancestor shared by all animals? _____

Use the dichotomous key below to complete the following questions:

This salamander usually measures about 19 cm long as an adult.

1. Identify the common name of this salamander. _____
2. What is its scientific name? _____
3. Is a **newt** normally larger or smaller than 17cm? _____
4. Which salamander in the chart is the red backed salamander most closely related to? _____

Classification Key to Salamanders

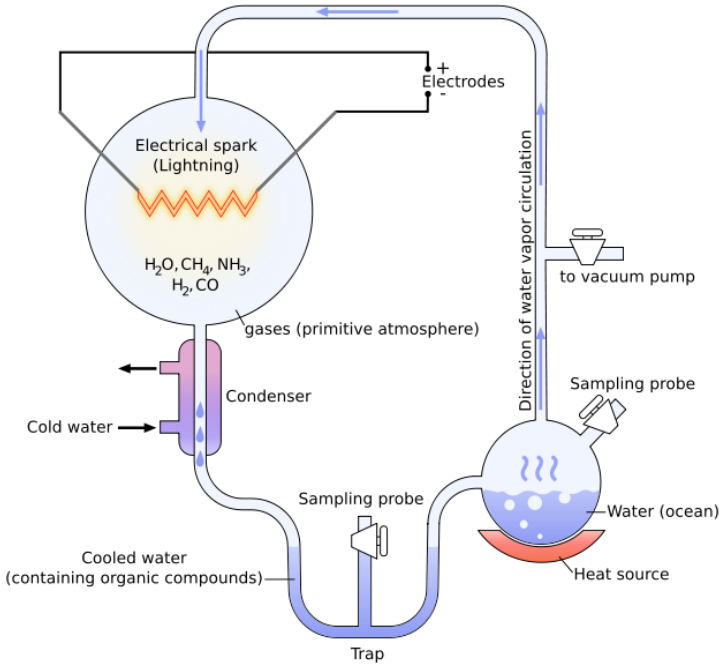
1.	a. Hind limbs (legs) absent ..... *Siren intermedia*, **siren**
	b. Hind limbs (legs) present ..... Go to 2
2.	a. External gills present in adults (appear as frilly extensions between the head and the forelimbs) .....*Necturus maculosus*, **mud puppy**
	b. External gills absent in adults ..... Go to 3
3.	a. Large size (over 17 cm long) ..... Go to 4
	b. Small size (under 17 cm long) ..... Go to 5
4.	a. Body background black, large white spots irregular in size & shape completely covering body & tail ..... *Ambystoma tigrinum*, **tiger salamander**
	b. Body background black, small round white spots in a row along each side from eye to tip of tail..... *Ambystoma maculatum*, **spotted salamander**
5.	a. Body background black with white spots ..... Go to 6
	b. Body background light color with dark spots and/or lines on body ..... Go to7
6.	a. Small white spots on a black background in a row along each side from head to tip of tail..... *Ambystoma jeffersonianum*, **Jefferson salamander**
	b. Small white spots scattered throughout a black background from head to tip of tail ..... *Plethodon glutinosus*, **slimy salamander**
7.	a. Large irregular black spots on a light background extending from head to tip of tail ..... *Ambystoma opacum*, **marbled salamander**
	b. No large irregular black spots on a light background .....Go to 8
8.	a. Round spots scattered along back and sides of body, tail flattened like a tadpole .....*Triturus viridenscens*, **newt**
	b. Without round spots and tail not flattened like a tadpole ..... Go to 9
9	a. Two dark lines bordering a broad light mid-dorsal stripe with a narrow dark line extending from head to …*Eurycea bislineata*, **two-lined salamander**
	b. Without two dark lines running the length of the body .....Go to 10
10.	a. A light stripe running the length of the body, bordered by dark pigment on the sides..... *Plethodon cinereus*, **red-backed salamander**
	b. A light stripe extending the length of the body, a marked constriction at the base of the tail ..... *Hemidactylium scutatum*, **four-toed salamander**

Bio.4.1.1 Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms.

How did the building blocks of life first form?

- Miller & Urey's experiment used simple inorganic gases (H_2O, CH_4, NH_3, and H_2) sealed inside a sterile glass tubes and flasks connected in a loop.
  - One flask was half-full of liquid water which was heated (evaporation)
  - Another flask fired sparks between the electrodes to simulate lightning
  - The water was cooled again so it could condense and trickle back into the first flask.
- Within a day, the mixture had changed color.
- At the end of 2 weeks, 15% of the carbon was in the form of organic compounds such as:

_____ _____ & _____.

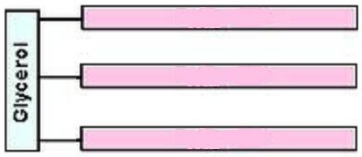


Bio.4.1.1 Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms.

Organic Compound	*What it's made of* *(subunits or monomers)*	Primary Purpose	Important examples* (see list below the table)	Test(s) used to identify if its present
Carbohydrates		1. Main energy source in cells • Simple carbohydrate • Complex carbohydrates 2. Provides structure & support (i.e. cell walls & exoskeletons)		
Lipids		1. Makes biological membranes 2. Long-term energy storage. 3. Insulation & waterproofing.		
Proteins		1. Transports material into/out of the cell (ex: protein channel or pump) 2. Components of cells & tissues (i.e. muscle, hair, tendons) 3. Speeds up the rate of a reaction (it happens using less energy)		
Nucleic Acids		1. Controls heredity information 2. Contains instructions for making proteins		

*Examples to know include **starch, insulin, phospholipids, glycogen, DNA, glucose, enzymes, steroids, cellulose, hemoglobin, fats** & **RNA**

Identify the type of organic compound pictured below:



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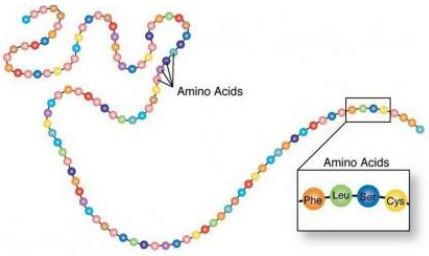
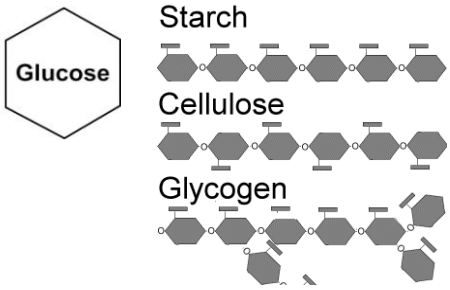
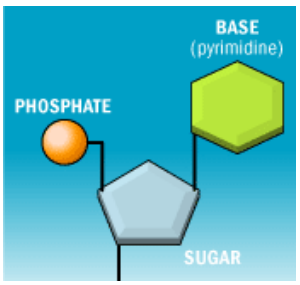


_____



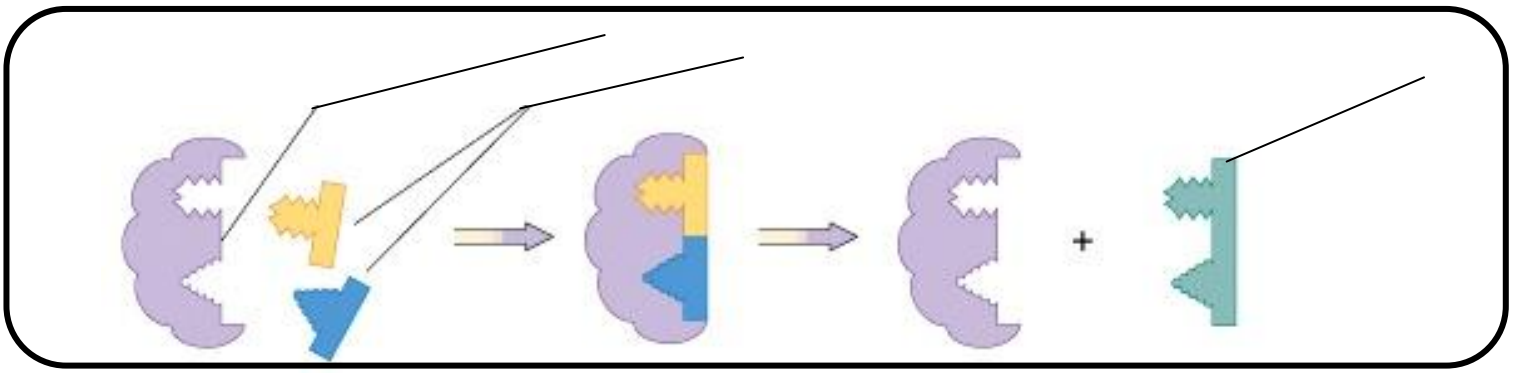
_____

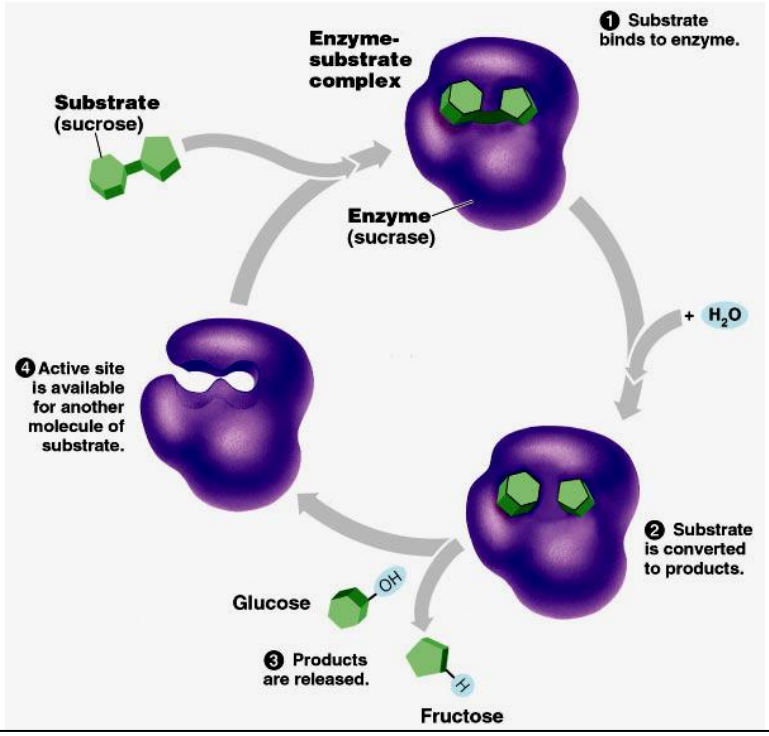


_____

Bio.4.1.3 Explain how enzymes act as catalysts for biological reactions.

Label the parts of the enzymatic reaction shown below:





Use the information seen in the diagram on the right to answer the following questions:

1. What is the enzyme's job in this reaction? _____

   _____

2. What are the **reactants** in the above reaction ? _____

3. What are the **products** of the above reaction? _____

4. Does the enzyme get used up in this reaction? Explain. _____

   _____

5. Identify two characteristics about the environment that might cause the enzyme to **denature** or stop working?

   _____ & _____

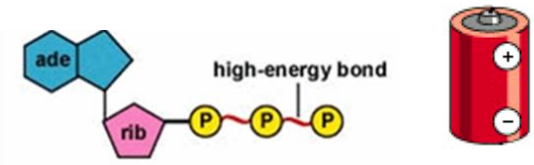
6. To work efficiently, enzymes rely on the presence of _____ so that changes in pH are minimized.

7. Could this same enzyme be used to break down a protein into its amino acid monomers? _____

   _____

Bio.4.2.1 Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.

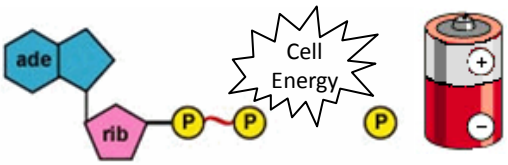
ATP (**A**denosine **t**riphos**p**hate) is the _____storing molecule used by cells to move, work & survive.



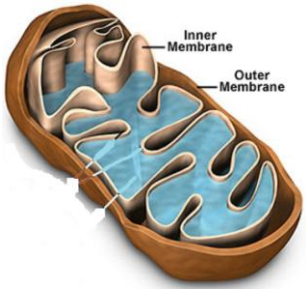
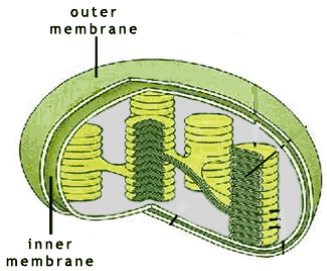
- ATP like a **fully charged** battery just waiting to provide energy.

- To **release** energy from ATP one phosphate must be _____.

  ATP then becomes _____ (Adenosine ____phosphate)



To make more ATP a _____ must be added back on to a molecule of _____

	Cellular Respiration	Photosynthesis
Function	Takes energy in glucose and stores it in ATP	Using energy from the sun to produce glucose (a sugar)
Location in the Cell	 _____(organelle)	 _____(organelle)
In what kinds of organisms?		

	Cellular Respiration	Photosynthesis
Reactants (What is needed to begin the process)		
Products (What is made by the process)		

Identify the gases produced by each setup:

Aquatic Plant **Yeast**

Aerobic vs Anaerobic Cellular Respiration:

Cellular Respiration = How the cell makes ATP (usable energy)

1 GLUCOSE + Oxygen → Produces ____ ATP

without Oxgyen

Alcoholic Fermentation **Lactic Acid Fermentation**

Produces ____ ATP **Produces ____ ATP**

In order to make ATP **aerobic** respiration requires _____ **(anaerobic** does not).

- **When yeast ferment sugar without oxygen they produce _____ & _____**
- **Without oxygen your muscles produce lactic acid, this causes your muscles to _____.**

If your muscle cells are able to produce ATP through aerobic & anaerobic respiration, which process would best for them to use? _____ Why? _____

_____