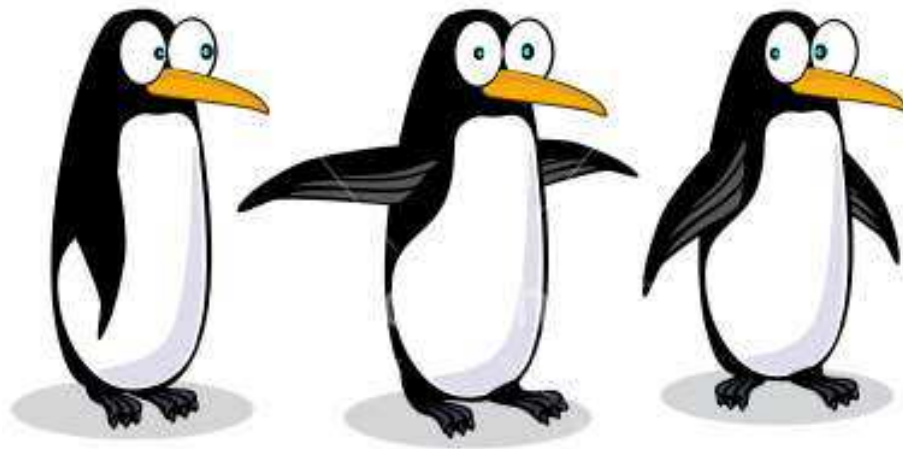


MCAS Review Packet

~~2010~~ 2015



Strands

1. Chemistry of Life, Organic Compounds
2. Cell Biology, Cell Transport, Photosynthesis & Cell Respiration, Cell Division
3. DNA & Protein Synthesis, Mendelian Genetics, Inheritance Patterns
4. Anatomy & Physiology (not included)
5. Evolution by Natural Selection, Biodiversity, Classification
6. Ecology, Population Biology, Cycles

MCAS Review: Standard 1.1

1. The Chemistry of Life

Broad Concept: Chemical elements form organic molecules that interact to perform the basic functions of life.

1.1 Recognize that biological organisms are composed primarily of very few elements. The six most common are C, H, O, N, P, S.

Vocabulary:

organic compound: _____

What elements do these symbols represent?

C - _____

H - _____

N - _____

O - _____

P - _____

S - _____

The 4 major categories of organic molecules found in living things are:	Which of the above atoms are found in these types of organic molecules:

1.2 Describe the basic molecular structures and primary functions of the four major categories of organic molecules (carbohydrates, lipids, proteins, and nucleic acids).

Vocabulary:

• macromolecule: _____

• amino acid: _____

• polypeptide: _____


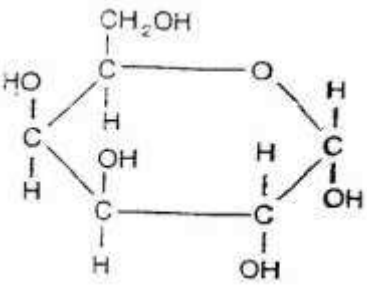
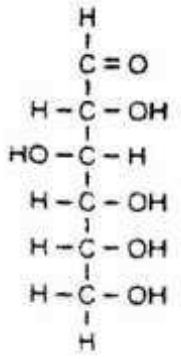
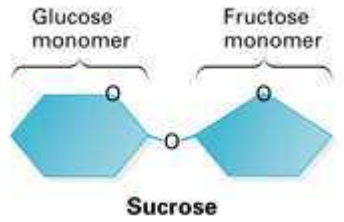
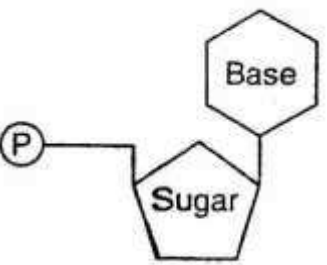
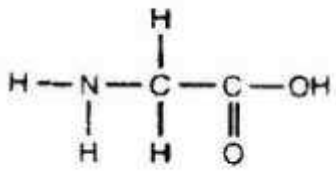
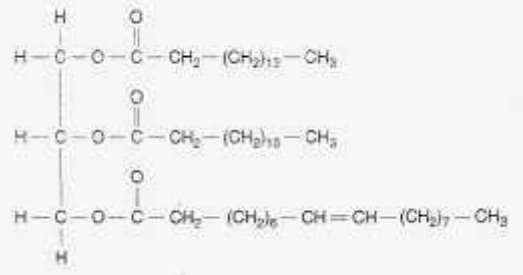
• monosaccharide: _____

- polysaccharides: _____
- nucleotide: _____
- fatty acid: _____

Identify the major function(s) of the following organic compounds;

4 Organic Compounds Found in Living Things	Function
Carbohydrates	
Lipids	
Proteins	
Nucleic Acids	

Identify the following molecules (as one of the four major categories):

 <p>_____</p>	 <p>_____</p>	 <p>_____</p>	 <p>_____</p>
 <p>_____</p>	 <p>_____</p>	 <p>_____</p>	

1.3 Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, which have an effect on enzymes.

Vocabulary:

catalyst: _____

enzyme: _____

activation energy: _____

substrate: _____

product: _____

active site: _____

Name 5 factors which can control the rate of enzyme activity:

(1) _____

(2) _____

(3) _____

(4) _____

(5) _____

2. Cell Biology

Broad Concept: Cells have specific structures and functions that make them distinctive. Processes in a cell can be classified broadly as growth, maintenance, and reproduction.

2.1 Relate cell parts/organelles (plasma membrane, nuclear envelope, nucleus, nucleolus, cytoplasm, mitochondrion, endoplasmic reticulum, Golgi apparatus, lysosome, ribosome, vacuole, cell wall, chloroplast, cytoskeleton, centriole, cilium, flagellum, pseudopod) to their functions. Explain the role of cell membranes as a highly selective barrier (diffusion, osmosis, facilitated diffusion, and active transport).

Vocabulary:

- organelle: _____
- flagellum (a): _____
- cilium (a): _____
- pseudopod: _____

Name two cell structures found in animal cells but not in plant cells.

(1) _____ (2) _____

Name two structures that could be found in plant cells but not in animal cells.

(1) _____ (2) _____

Which of the above is found in all plant cells? _____

Describe the difference in the vacuoles found in plant and animal cells.

State the function of the following cell parts:

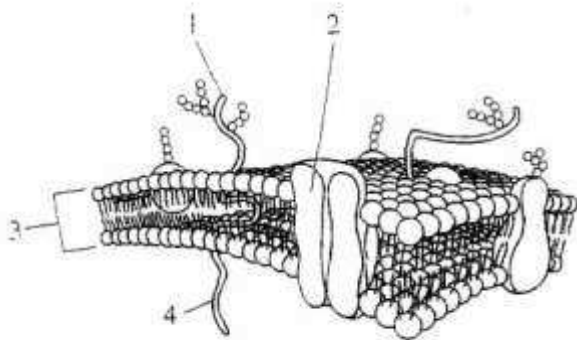
Cell Part	Function
plasma membrane	
nuclear envelope	
nucleus	
nucleolus	
cytoplasm	
mitochondrion(a)	
endoplasmic reticulum	
Golgi apparatus	
lysosome	
ribosome	
vacuole	
cell wall	
chloroplast	
cytoskeleton	
centrioles	

MCAS Review: Standard 2.1 (Part 2 - Cell Membrane and Transport)

Vocabulary:

- selectively permeable: _____
- diffusion: _____
- osmosis: _____
- facilitated diffusion: _____
- active transport: _____

Structure of Cell Membrane:



Identify the parts of the membrane labeled:

- #2: _____

 #3: _____

Materials can pass across a cell membrane by simple diffusion, facilitated diffusion or active transport. Compare and contrast these three processes by completing the following table:

Process	Direction of Particle Movement	Energy Requirement	Part of Membrane Through Which Particle Passes
Active Transport			
Facilitated Diffusion			
Simple Diffusion			

2.2 Compare and contrast, at the cellular level, prokaryotes and eukaryotes (general structures and degrees of complexity).

Vocabulary:

- prokaryote: _____
- eukaryote: _____

Complete the following table comparing and contrasting prokaryotes and eukaryotes:

	Prokaryote	Eukaryote
Does it have a nucleus?		
Where is the DNA?		
Does it have membrane bound organelles?		
Where is the ETC for ATP production?		
Does it have ribosomes?		
What's its size?		
What some examples?		

2.4 Identify the reactants, products, and basic purposes of photosynthesis and cellular respiration. Explain the interrelated nature of photosynthesis and cellular respiration in the cells of photosynthetic organisms.

Vocabulary:

- reactant: _____
- product: _____
- cellular respiration: _____
- photosynthesis: _____

Write the general equation for **photosynthesis**.

What are the reactants in photosynthesis? _____

What are the products? _____

What is the source of energy for photosynthesis? _____

What is the role of chlorophyll in photosynthesis? _____

What kind of organisms carry on photosynthesis? _____

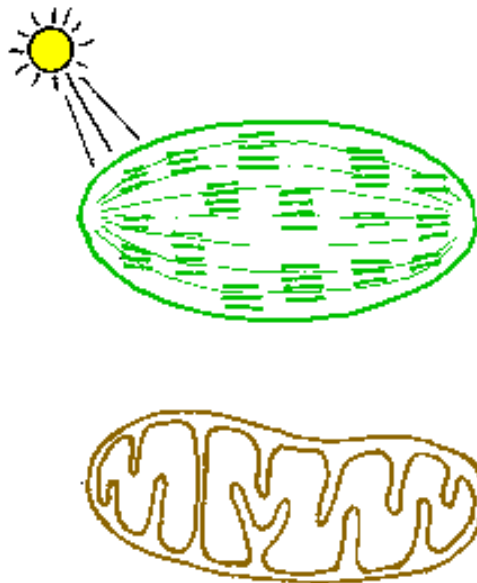
Write the general equation for **cellular respiration**.

What are the reactants in cellular respiration? _____

What are the products? _____

What kind of organisms carry on cellular respiration? _____

Label this simple diagram to illustrate how carbon dioxide, water, glucose, and oxygen are used in the process of photosynthesis and cellular respiration in a plant.



2.5 Explain the important role that ATP serves in metabolism.

Vocabulary:

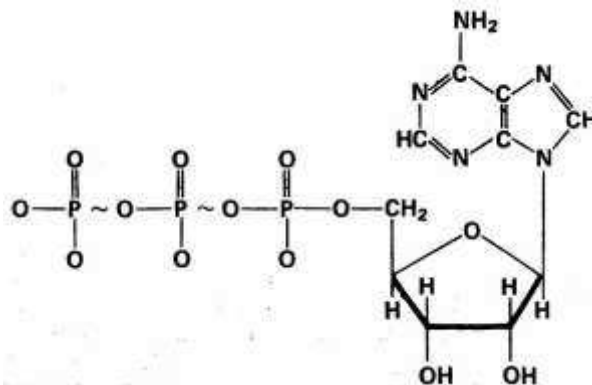
- metabolism: _____
- chemical energy: _____
- ATP: _____

What is the main source of the energy that all organisms use? _____

What process in the cell converts the chemical energy stored in food into chemical energy stored in the form of ATP? _____

What must producers do to light energy before they can build CO_2 into $\text{C}_6\text{H}_{12}\text{O}_6$ during the Calvin Cycle? _____

The diagram below shows the structure of ATP. Answer questions a through d.



- (a) Circle the high energy bonds.

- (b) Label the ribose, adenine, and phosphate groups.

- (c) How is energy released from this molecule? _____

- (d) How is ATP made? _____

2.6 Describe the cell cycle and the process of mitosis. Explain the role of mitosis in the formation of new cells, and its importance in maintaining chromosome number during asexual reproduction.

Vocabulary:

- reproduction: _____
- asexual reproduction: _____
- mitosis: _____
- cytokinesis: _____
- interphase: _____
- chromatin: _____
- chromosome: _____
- sister chromatids: _____
- centromere: _____
- spindle: _____

Complete the chart telling what happens during the various phases of the cell cycle:

Phase of Cell Cycle	What happens?
G₁ phase	
S phase	
G₂ phase	
mitosis	
cytokinesis	

Name the **TWO** reasons why a cell might undergo mitosis.

(1) _____

(2) _____

2.7 Describe how the process of meiosis results in the formation of haploid cells. Explain the importance of this process in sexual reproduction, and how gametes form diploid zygotes in the process of fertilization.

4.6 Recognize that the sexual reproductive system allows organisms to produce offspring that receive half of their genetic information from their mother and half from their father, and that sexually produced offspring resemble, but are not identical to, either of their parents.

Meiosis: _____

Haploid: _____

Diploid: _____

Crossing over: _____

Genetic variation: _____

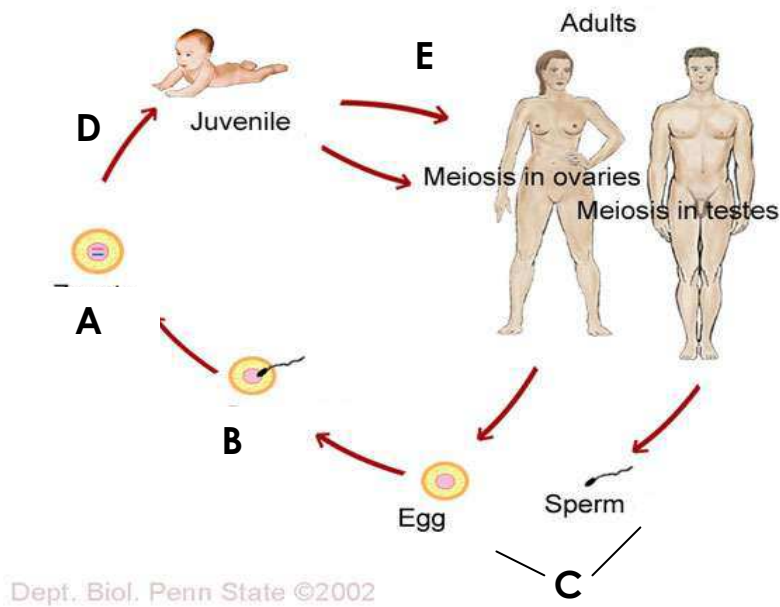
Gamete: _____

Fertilization: _____

Zygote: _____

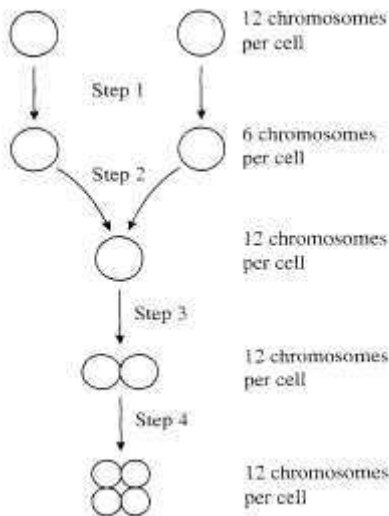


This is a diploid cell. Draw the results after this cell has COMPLETED **meiosis**.



The diagram above represents the life cycle of a human. Use it to answer the following questions.

1. The letter **A** represents the union of a sperm and an egg cell. What is this first cell of a human called? _____
2. What process is represented by **B**? _____
3. **C** is pointing to the sperm and egg. What is the other name for these cells? _____
4. **D** and **E** both represent what process? _____
5. According to the diagram, what process makes sperm and egg? _____



Use the diagram to the left to answer the following questions.

Which of the labeled steps in the diagram represents the formation of a zygote? _____

Which step(s) represent meiosis? _____

Which step(s) represent mitosis? _____

What does each parent contribute to the zygote? _____

Why do offspring resemble, but are not identical to either of their parents? _____

Why may crossing over result in an increase in genetic variation? _____

2.8 Compare and contrast a virus and a cell in terms of genetic material and reproduction.

	Cell	Virus
Genetic material		
Method of reproduction		

Vocabulary:

_____ - term used to describe the bursting of a cell

_____ - name given to the protein coat that surrounds the genetic material of a virus

Briefly describe the two reproductive cycles of a virus.

lytic - _____

lysogenic - _____

Describe the general structure of a virus. _____

Why aren't viruses considered to be living things? _____

3. Genetics

Broad Concept: Genes allow for the storage and transmission of genetic information. They are a set of instructions encoded in the nucleotide sequence of each organism. Genes code for the specific sequences of amino acids that comprise the proteins that are characteristic of that organism.

3.1 Describe the basic structure (double helix, sugar/phosphate backbone, linked by complementary nucleotide pairs) of DNA, and describe its function in genetic inheritance.

DNA: _____

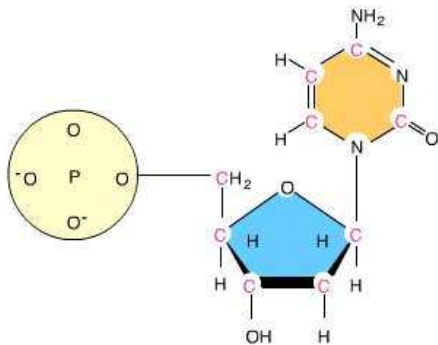
nucleotide: _____

sugar-phosphate backbone: _____

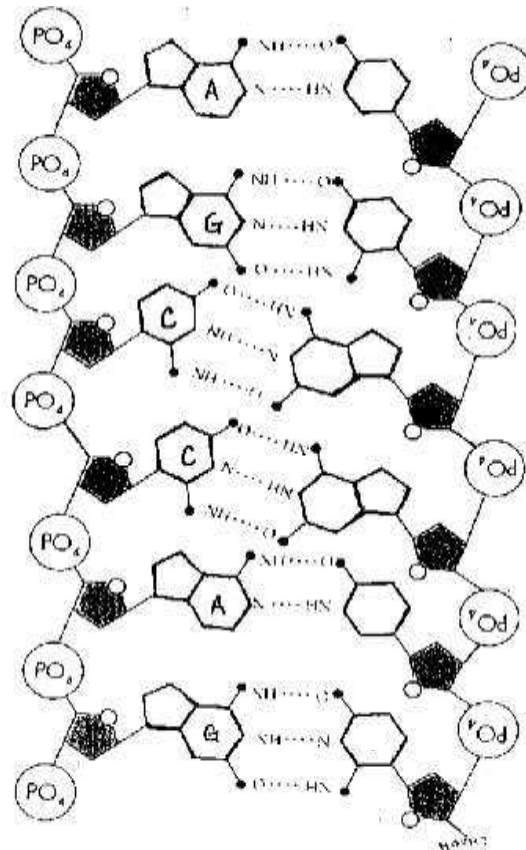
double helix: _____

gene: _____

Label the three parts of the nucleotide.



Complete the following molecule of DNA by filling in the correct base pairs. Circle and label a hydrogen bond.



3.2 Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic code. Explain the basic processes of transcription and translation, and how they result in the expression of genes. Distinguish among the end products of replication, transcription, and translation.

3.3 Explain how mutations in the DNA sequence of a gene may or may not result in phenotypic change in an organism. Explain how mutations in gametes may result in phenotypic changes in offspring.

replication: _____

transcription: _____

translation: _____

Process	Nucleic Acids Involved	End Products
replication		
transcription		
translation		

Why would a cell need to replicate its DNA? _____

What are two functions of proteins? _____

Below is the DNA base sequence for the normal protein for normal hemoglobin and the mutated base sequence for sickle cell hemoglobin. As the result of this mutation, the red blood cells that are formed are sickle-shaped which may cause blockage in the capillaries. Using the codon chart, answer the questions that follow.

Codons Found in Messenger RNA
Second Base

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

Normal: GGG CTT CTT TTT

Sickle: GGG CAT CTT TTT

1. Transcribe and translate both the normal and sickle cell DNA.

2. If the DNA base sequence was mutated and read GGA CTT CTT TTT instead,

would this result in sickle cell hemoglobin? Explain. _____

3. Does a mutation in DNA **always** result in a phenotypic change? Explain your answer using the evidence you have gathered from this problem. _____

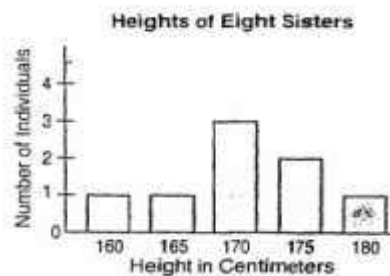
- 3.4 Distinguish among observed inheritance patterns caused by several types of genetic traits (dominant, recessive, codominant, sex-linked, polygenic, incomplete dominance, multiple alleles).
- 3.6 Use a Punnett square to determine the probabilities for genotype and phenotype combinations in monohybrid crosses.

Vocabulary:

- _____ - different forms of a gene that control a specific characteristic
- _____ - what the organism physically looks like
- _____ - what the 2 alleles are that control a specific characteristic
- _____ - in the genotype, the 2 alleles are different
- _____ - in the genotype, the 2 alleles are the same
- _____ - in the heterozygote, the allele that shows itself
- _____ - in the heterozygote, the allele that is not allowed to show itself when a dominant allele is present
- _____ - type of dominance where one allele is dominant and the other is recessive
- _____ - type of dominance where in the heterozygote neither allele shows itself, physically the organism looks somewhere in between
- _____ - the type of dominance where in the heterozygote both alleles are seen
- _____ - alleles for a particular characteristic are located on the X chromosomes
- _____ - characteristic is controlled by more than one gene
- _____ - characteristic is controlled by more than 2 alleles

Look around you. What characteristics of your peers show a wide variety of phenotypes?

- These are controlled by more than 1 gene with 2 alleles controlling each gene. They are referred to as _____ traits or characteristics. If you were to graph all the different physical possibilities, there would be many and if arranged from least to most it would resemble a **bell curve**.



Identify the inheritance pattern in the following scenarios.

a. A cross between a purebred animal with red hairs and a purebred animal with white hairs produces an animal that has both red hairs and white hairs. What type of inheritance pattern is involved? _____

b. In a cross between individuals of a species of tropical fish, all of the male offspring have long tail fins, and none of the females possess the trait. Mating two of the F₁ fish fails to produce females with the trait. What type of inheritance pattern is involved? _____

c. Suppose you mate a black rooster with a white hen. The feathers of all the offspring are grey and white. What is the inheritance pattern being expressed? _____

d. An ecologist observes that a population of plants in a meadow has flowers that may be red, yellow, white, pink, or purple. Hypothesize what the inheritance pattern might be. Explain.

Complete Punnett squares for the following crosses.

a. In chimpanzees, straight fingers are dominant to bent fingers. Cross a heterozygous straight fingered chimpanzee with x bent fingered chimpanzee. List the percentages of all possible genotypes and phenotypes of their offspring.

b. In humans, tongue rolling is a dominant trait; those with the recessive condition cannot roll their tongues. Bob can roll his tongue, but his mother could not. He is married to Sally, who cannot roll her tongue. List the percentages of all possible genotypes and phenotypes of their offspring.

c. In snapdragons, flower color is controlled by incomplete dominance. The two alleles are red (R) and white (W). The heterozygous genotype is expressed as pink. A pink-flowered plant is crossed with a white-flowered plant. List the percentages of all possible genotypes and phenotypes of their offspring.

3.5 Describe how Mendel's laws of segregation and independent assortment can be observed through patterns of inheritance (e.g., dihybrid crosses).

Vocabulary:

Law of Segregation: _____

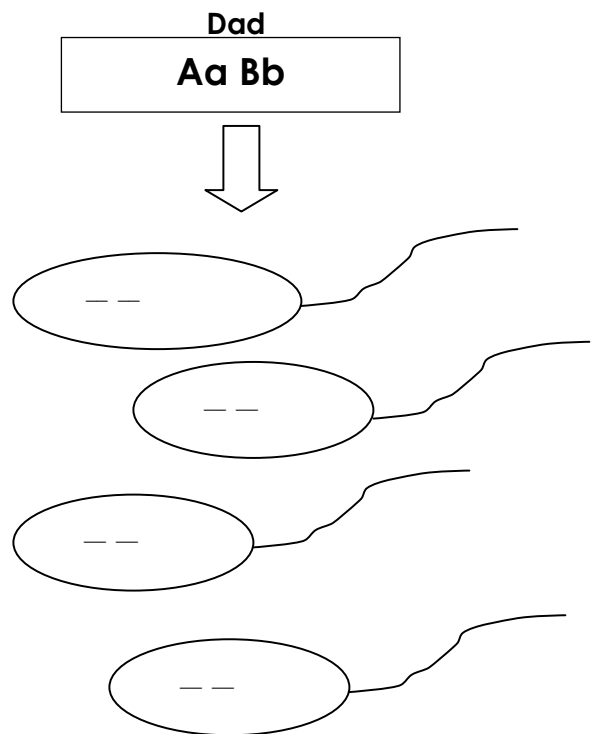
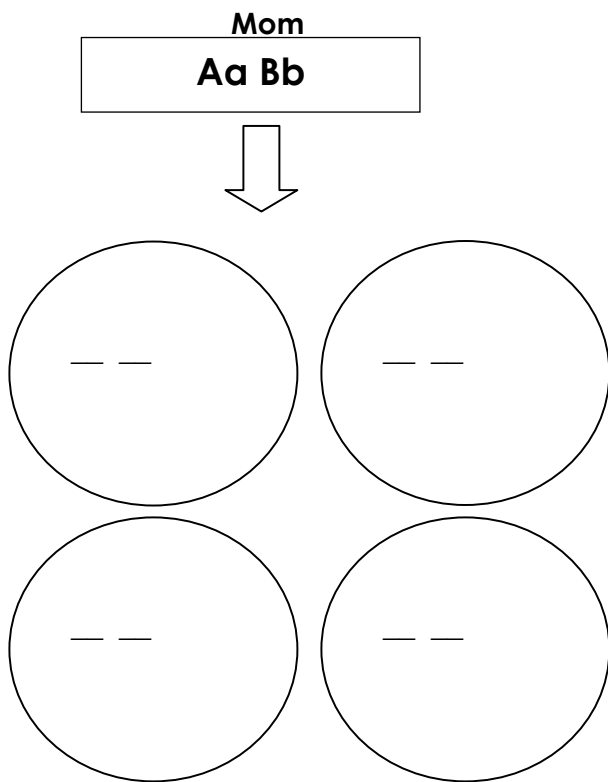
Law of Independent Assortment: _____

dihybrid: _____

two-factor cross: _____

gamete: _____

Gamete Allele Combinations



Below is a Punnett square of a two-factor cross. Use the Punnett square to answer the questions that follow.

A woman with the genotype PpRr is crossed with a man with the genotype PPRr.

	PR	Pr	pR	pr
PR	PPRR	PPRr	PpRR	PpRr
Pr	PPRr	PPrr	PpRr	Pprr
pR	PpRR	PpRr	ppRR	ppRr
pr	PpRr	Pprr	ppRr	pprr

P = puffy lips
p = thin lips

R = red lips
r = purple lips

1. What is the genotype of the mom? _____
2. What is the phenotype of the father? _____
3. What ratio of the offspring will be PPRR? _____
4. What ratio of the offspring will have puffy, red lips? _____
5. What ratio of the offspring will be heterozygous for both traits? _____
6. Which of the four traits will not show up in any of the offspring? _____

5. Evolution and Biodiversity

Broad Concepts: Evolution is the result of genetic changes that occur in constantly changing environments. Over many generations, changes in the genetic make-up of populations may affect biodiversity through speciation and extinction.

5.1 Explain how evolution is demonstrated by evidence from the fossil record, comparative anatomy, genetics, molecular biology, and examples of natural selection.

Vocabulary:

evolution: _____

biodiversity: _____

natural selection: _____

adaptation: _____

natural variation: _____

survival of the fittest: _____

fossil: _____

homologous structure: _____

geographic distribution: _____

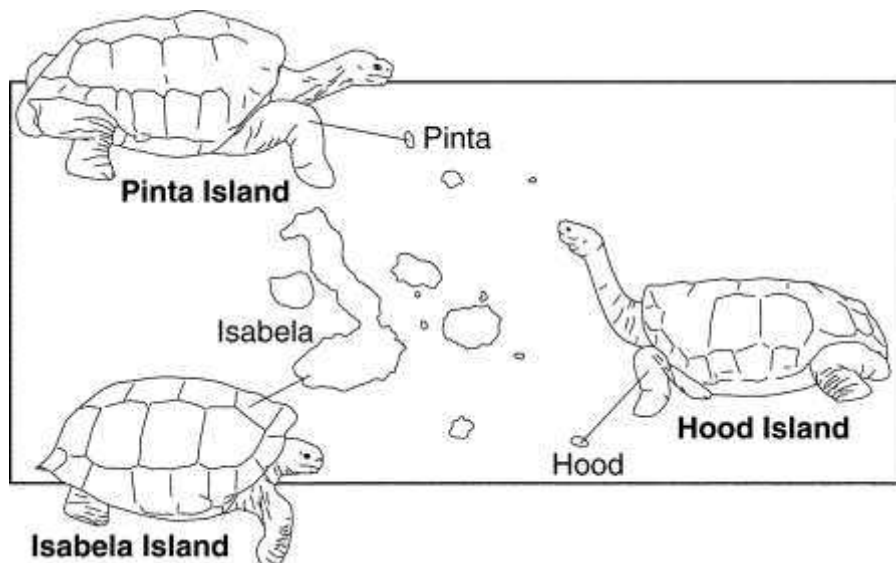
What are the three sources of natural variations?

1. _____
2. _____
3. _____

Complete the following table on the evidence of evolution.

Evidence	How does this show evidence of evolution?	What is an example of this evidence?

Answer the following:

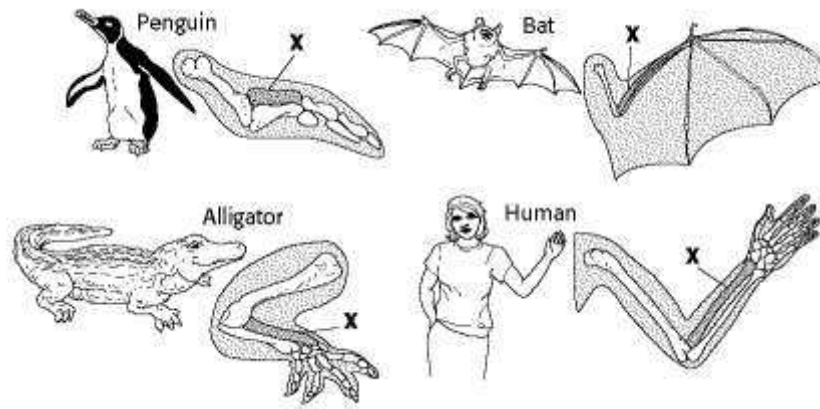


Pictured on the previous page are different species of turtles found on different islands of the Galapagos. How do they show evidence of evolution by natural selection?

Cytochrome c is a protein that is involved in cellular respiration in all eukaryotic organisms. Human cytochrome c contains 104 amino acids. The following table compares human cytochrome c with cytochrome c from a number of other organisms.

Organism	Number of cytochrome c amino acids that differ from human cytochrome c amino acids
Chickens	18
Chimpanzees	0
Dogs	13
Rattlesnakes	20
Rhesus monkeys	1
Yeasts	56

Based on the chart above, which organism is most closely related to humans? Which is the least closely related to humans? How does this show evidence for evolution? _____



Pictured above are the upper limbs and forelimbs of various species. How do they provide evidence for evolution? _____

5.2 Describe species as reproductively distinct groups of organisms. Recognize that species are further classified into a hierarchical taxonomic system (kingdom, phylum, class, order, family, genus, species) based on morphological, behavioral, and molecular similarities. Describe the role that geographic isolation can play in speciation.

Vocabulary:

taxonomy: _____

Linnaean classification: _____

cladogram: _____

phylogenetic tree: _____

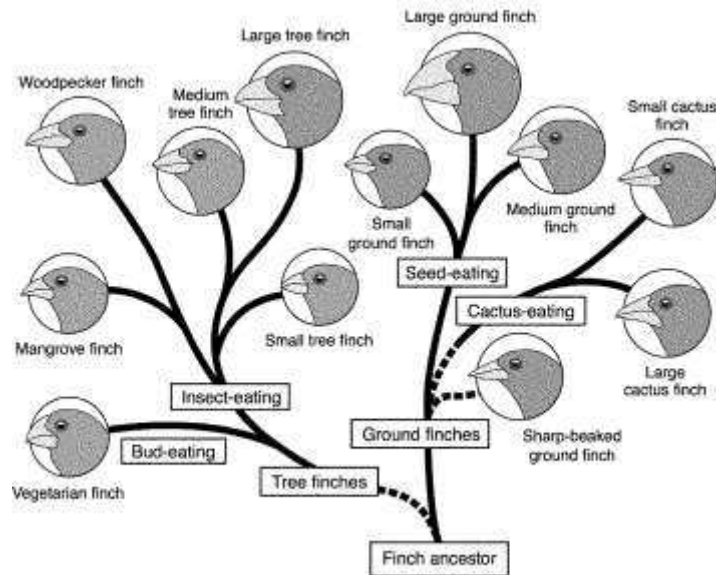
reproductive isolation: _____

geographic isolation: _____

speciation: _____

extinction: _____

common ancestry: _____



One Proposed Family Tree for Darwin's Finches

Pictured above are the different finches found on the islands of the Galapagos. Explain what speciation means using examples from above. How did the island geography possibly contribute to the evolution of these species? _____

Classification of Four Organisms

	Corn	Whale Shark	Humpback Whale	Spider Monkey
Kingdom	Plantae	Animalia	Animalia	Animalia
Phylum	Anthophyta	Chordata	Chordata	Chordata
Class	Monocotyledones	Chondrichthyes	Mammalia	Mammalia
Order	Commelinales	Squaliformes	Cetacea	Primates
Family	Poaceae	Rhincodontidae	Balaenopteridae	Atelidae
Genus	Zea	Rhincodon	Megaptera	Ateles
Species	<i>Zea mays</i>	<i>Rhincodon typus</i>	<i>Megaptera novaeangilae</i>	<i>Ateles paniscus</i>

Use the chart above to answer the following questions.

Which two organisms are most closely related to each other? How do you know? Explain.

If you wanted to add a column for the protist species *Amoeba proteus*, what taxonomic category, if any, would it have in common with the other organisms in the chart?

Consider the following statement: "Size and shape are NOT reliable indicators of how closely different organisms are related." What information in the figure above supports this statement?

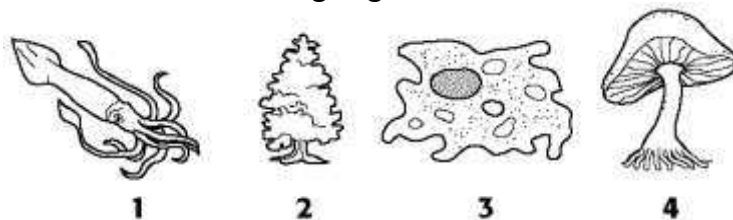
2.3 Use cellular evidence (e.g., cell structure, cell number, cell reproduction) and modes of nutrition to describe the six kingdoms (Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, Animalia).

Complete the chart below.

Classification of Living Things

DOMAIN	Bacteria	Archaea				
KINGDOM		Archaeobacteria	Protista	Fungi	Plantae	Animalia
CELL TYPE	Prokaryote					Eukaryote
CELL STRUCTURES		Cell walls without peptidoglycan	Cell walls of cellulose in some; some have chloroplasts	Cell walls of chitin		
NUMBER OF CELLS			Most unicellular; some colonial; some multicellular	Most multicellular; some unicellular		
MODE OF NUTRITION		Autotroph or heterotroph	Autotroph or heterotroph			
EXAMPLES		Methanogens, halophiles	<i>Amoeba</i> , <i>Paramecium</i> , slime molds, giant kelp			

Identify the Kingdom of each of the following organisms:



1. _____

2. _____

3. _____

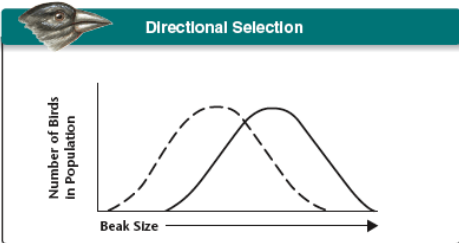
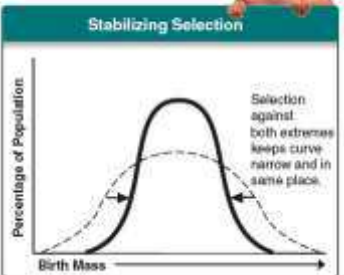
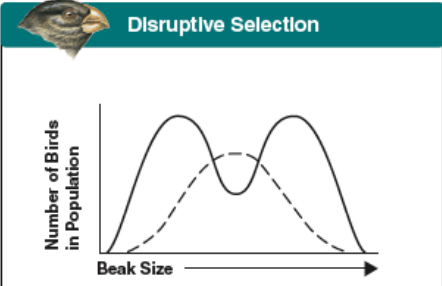
4. _____

5.3 Explain how evolution through natural selection can result in changes in biodiversity through the increase or decrease of genetic diversity within a population.

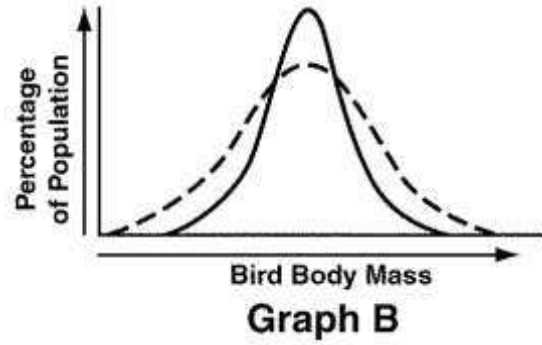
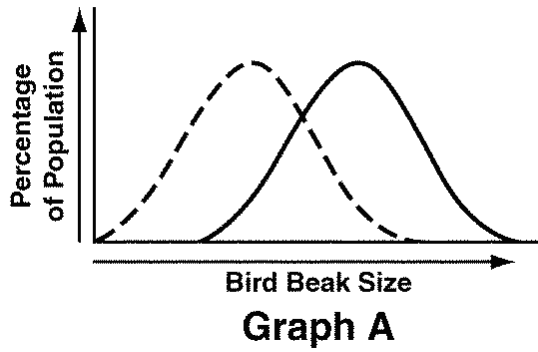
Name three ways in which natural selection can disrupt the distribution of phenotypes among individuals within a species.

1. _____
2. _____
3. _____

The following graphs represent the three types of selection that can occur as a result of natural selection. Briefly describe which members of these populations are being favored and the results.

 <p>Directional Selection</p> <p>Number of Birds in Population</p> <p>Beak Size</p> <p>The graph shows a dashed bell curve representing the initial population distribution of beak sizes. A solid bell curve, shifted to the right, represents the population after directional selection, indicating that birds with larger beak sizes are favored.</p>	 <p>Stabilizing Selection</p> <p>Percentage of Population</p> <p>Birth Mass</p> <p>Selection against both extremes keeps curve narrow and in same place.</p> <p>The graph shows a dashed bell curve representing the initial population distribution of birth masses. A solid bell curve, narrower and centered at the same place as the dashed curve, represents the population after stabilizing selection, indicating that individuals with average birth mass are favored.</p>	 <p>Disruptive Selection</p> <p>Number of Birds in Population</p> <p>Beak Size</p> <p>The graph shows a dashed bell curve representing the initial population distribution of beak sizes. A solid curve with two peaks at the extremes and a dip in the middle represents the population after disruptive selection, indicating that birds with either very small or very large beak sizes are favored.</p>

To what can disruptive selection possibly lead? _____



---	Original distribution of phenotypes
—	Distribution of phenotypes after natural selection

The graphs above show changes in the phenotypes of a bird population over time.

Look at Graph A. What change occurred in the beak size of the population? Provide one possible explanation why this may have occurred. _____

Look at Graph B. What change occurred in the bird body mass of the population? Provide one possible explanation why this may have occurred. _____

MCAS Review: Standard 6.1

6. Ecology

Broad Concept: Ecology is the interaction among organisms and between organisms and their environment.

6.1 Explain how birth, death, immigration, and emigration influence population size.

population: _____

population density: _____

immigration: _____

emigration: _____

limiting factor: _____

carrying capacity: _____

Name two factors that **increase** population growth.

(1) _____ (2) _____

Name two factors that **decrease** population growth.

(1) _____ (2) _____

6.2 Analyze changes in population size and biodiversity (speciation and extinction) that result from the following: natural causes, changes in climate, human activity, and the introduction of invasive, non-native species.

Vocabulary:

biodiversity: _____

speciation: _____

extinct: _____

natural selection: _____

introduced species: _____

ozone: _____

Questions:

How is poaching, or illegal hunting, a threat to biodiversity?

How are introduced species a threat to biodiversity?

Discuss biodiversity as a natural resource.

6.3 Use a food web to identify and distinguish producers, consumers, and decomposers, and explain the transfer of energy through trophic levels. Describe how relationships among organisms (predation, parasitism, competition, commensalism, and mutualism) add to the complexity of biological communities.

Vocabulary:

community: _____

food chain: _____

food web: _____

producer: _____

consumer: _____

primary consumer: _____

secondary consumer: _____

tertiary consumer: _____

decomposer: _____

trophic level: _____

ecological pyramid: _____

predation: _____

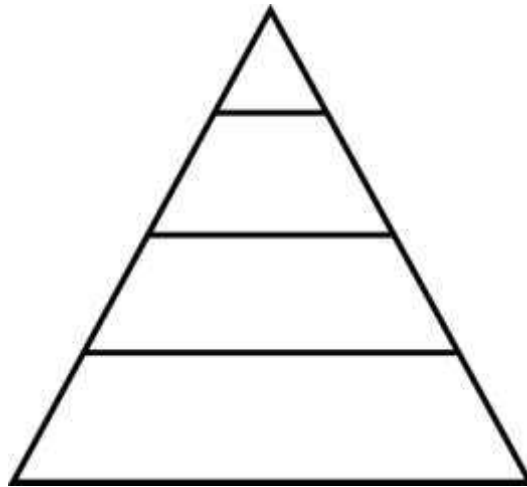
parasitism: _____

competition: _____

commensalism: _____

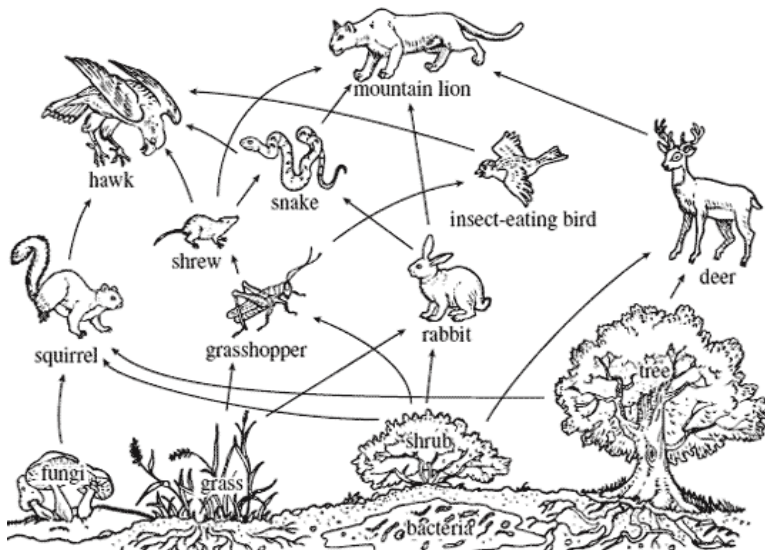
mutualism: _____

Label the following energy pyramid with 4 trophic levels. At each level name the type of organism that exists there and the amount of energy available at each level for the organisms at the next level.



Explain why there is less energy available at higher trophic levels than at the lower levels.

Food Web of a Forest Ecosystem



Use the food web on the previous page to identify all organisms in the following categories:

producers: _____

primary consumers: _____

secondary consumers: _____

higher order consumers: _____

decomposers: _____

What is the original source of the energy for this entire food web? _____

Feeding Relationships in a Salt Marsh Ecosystem

<p>Mouse Eats: Grasshoppers Snails Plants</p>	<p>Rat Eats: Sparrows Grasshoppers Snails Plants</p>	<p>Owl Eats: Rats Sparrows Ducks Sandpipers</p>	<p>Fish Eats: Crustaceans Plants Algae</p>	<p>Salt water algae: Energy Source: Sunlight</p>
<p>Hawk Eats: Shrews Mice Rats</p>	<p>Duck Eats: Crustaceans Plants Algae Grasshoppers Snails</p>	<p>Sandpiper Eats: Crustaceans Algae</p>	<p>Heron Eats: Fish</p>	<p>Salt marsh plants Energy Source: Sunlight</p>
<p>Sparrow Eats: Crustaceans Plants Grasshoppers Snails</p>	<p>Shrew Eats: Grasshoppers Snails Mice</p>	<p>Small Crustacean Eats: Algae</p>	<p>Grasshopper Eats: Plants</p>	<p>Snail Eats: Plants Algae</p>

The table above provides details of the feeding relationships in a salt marsh ecosystem. On a separate sheet of paper or on the back of this sheet, construct a food web that displays all of these relationships.

Which organism is the highest order consumer in this food web? _____

6.4 Explain how water, carbon, and nitrogen cycle between abiotic resources and organic matter in an ecosystem and how oxygen cycles through photosynthesis and respiration.

Vocabulary:

ecosystem: _____

biosphere: _____

nitrogen fixing bacteria: _____

denitrifying bacteria: _____

transpiration: _____

evaporation: _____

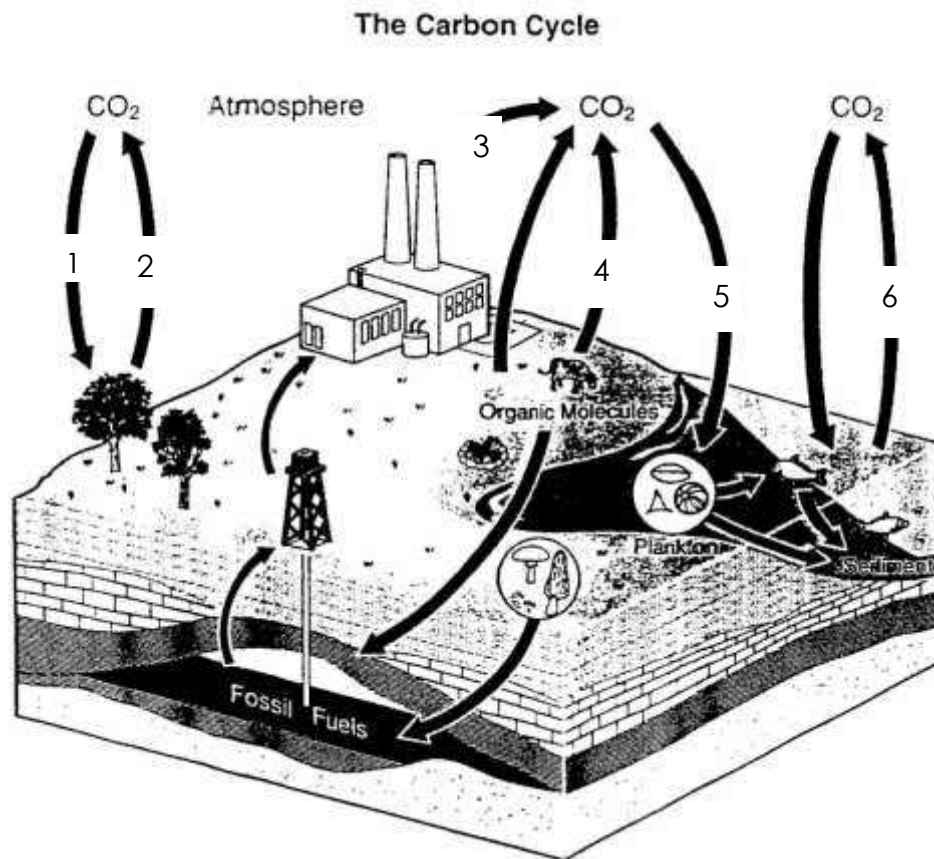
condensation: _____

runoff: _____

combustion: _____

greenhouse effect: _____

Carbon Cycle: Identify the process taking place at each of the numbered arrows. Some answers may be the same.



- (1) _____ (2) _____
 (3) _____ (4) _____
 (5) _____ (6) _____

What is the primary source of carbon in our atmosphere? _____

What is the only process that removes carbon from the environment and incorporates it into living organisms? _____

What does this process turn carbon dioxide into? _____

What three processes in the above diagram returns carbon to the environment?

- (1) _____ (2) _____ (3) _____

What fourth process puts carbon dioxide into our atmosphere? _____

How is carbon dioxide related to the greenhouse effect?

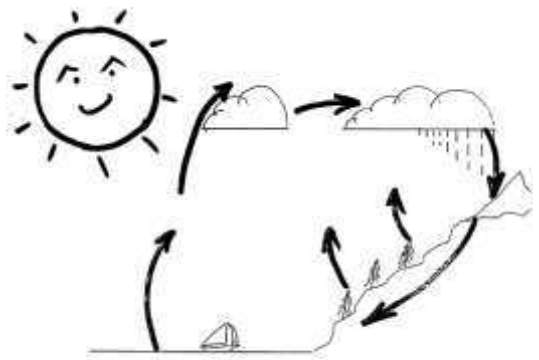
Nitrogen Cycle

What is the primary source of nitrogen in our environment? _____

Plants cannot use this form of nitrogen. What organism changes this form of nitrogen into a form that plants can use? _____

What organic compounds do plants need nitrogen to make? _____

Label the diagram of the water cycle below.



Which of these three cycles (carbon, nitrogen or water) **can** occur in the absence of living organisms? _____