Biology Keystone Review

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The Chemical Basis for Life - Objectives

- Description of the properties of water.
- Description of different organic molecules: Lipids, Carbohydrates, DNA, and Protein
- Different enzyme functions.

The Chemical Basis for Life - Essential Questions

Why is carbon essential to the construction of organic compounds?

Describe the difference between an element and a compound.

What are the properties of Water?

Why is Water important for living things?

The Chemical Basis for Life - Summary

Water is the most important molecules found in living things. The reactions that take place in the cells involved substances dissolved in water. All life on Earth is also carbon based because it forms the compounds that make up cell cells and organisms. Nucleic acids and proteins play active roles in the structure and function of cells. Proteins play a lot of roles in the cell. Enzymes are one of the functions that can happen in proteins. Without enzymes, the important chemical reactions would not occur at the rate that is required for life.

Organic Molecules:Lipids and Carbohydrates Key Terms

Organic Compounds- Contain carbon atoms bonded to hydrogen atoms.

Macromolecules- Large, complex molecules made of chains of smaller molecules.

Carbohydrates- A macromolecule made of hydrogen, carbon, and oxygen, that cells use for energy.

Monomers- Smaller building building block molecules that combine through chemical reactions to form large polymers.

Organic Molecules:DNA and Proteins Key Terms

Nucleic Acid- A macromolecule that carries genetic information.

DNA is deoxyribonucleic acid and **RNA** is ribonucleic acid.

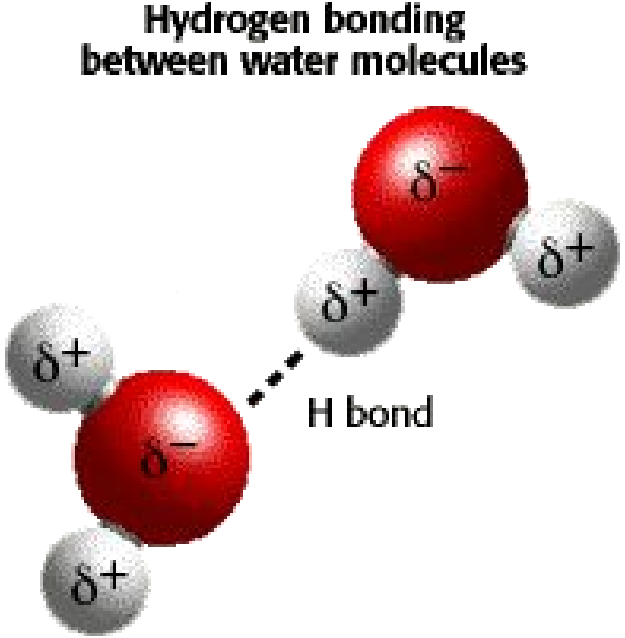
Proteins- Macromolecules that perform structural and regulatory functions for cells.

Enzymes Key Terms

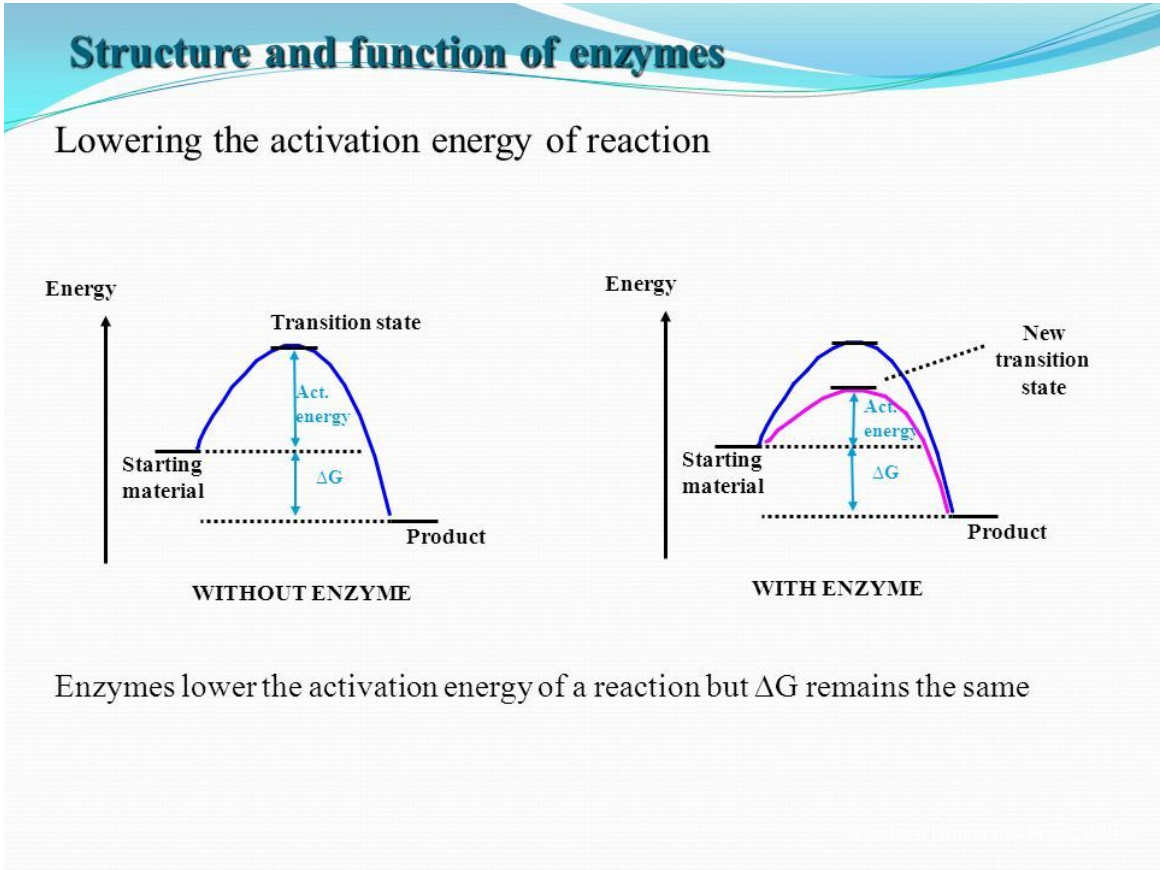
Enzymes- Protein catalysts.

Catalysts- Substances that speed up chemical reactions , without being changed or used up.

The Molecular Structure of Water



Enzymes and Activation Energy



Enzymes work by lowering the activation energy of a chemical reaction. With a lower activation energy, the reactants can be changed to products at a much faster rate.

Practice Questions - The Chemical Basis for Life

1. Which of the following is **not** created as a result of dehydration synthesis?

A. Cellulose
B. Disaccharide
C. Glucose
D. Water

2. Which does **not** describe a function of proteins?

A. They encode genetic information.
B. They allow muscle cells to contract.
C. They help to carry out chemical reactions.
D. They make up structures that support the cell.

Answer Key - The Chemical Basis for Life

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Objectives- Cell Growth

- Describe the cell cycle
- Compare mitosis and meiosis
- Describe how DNA replication conserves genetic material
- Explain the relationship between DNA, genes, alleles, and chromosomes, and tell about their role in inheritance.

Cell Growth- Essential Questions

Why is the cell cycle important?

What would happen if a cell didn’t DNA replicate properly?

Where do you think moles come from?

Cell Growth and Reproduction- Summary

To understand the growth of cells and how the reproduce you have to be familiar with the cell cycle because that is the process in which this happens. The cell cycle is broken into stages interphase (the longest) then mitosis and cytokinesis. Interphase has 3 phase G1, S, and G2. Mitosis also has phases prophase, metaphase, anaphase, and telophase. Cytokinesis is the actual splitting of the cell. For the cell to be able to split the DNA had to replicate or make an exact copy of itself, forming 2 chromosomes which attach to a centromere forming sister chromatids.

Cell Growth and Reproduction- Key Terms

Cell Cycle- describes the stages of a single cell's life.

Chromatids- a chromosome attached to a centromere

Sister Chromatids- 2 identical chromosomes attached to a centromere

Chromosomes- genetic information in the form of genes

Centromere- the region where chromosomes attach

Centrioles- involved in spindle fiber development

Semiconservative- each new double strand consist one old strand and one new

DNA Replication- Key Terms

Gametes- cells used in sexual reproduction

Allele- different versions of the same thing (think of them as flavors)

Crossing-over (only in meiosis)- exchange of genetic material between homologous chromosomes

Gene- a segment of a DNA molecule that gives the instructions for making a protein.

Genotype- the combination of alleles in a person's cells

Phenotype- observable characteristics

Inheritance Summary

When you are born you have half of your mom’s chromosomes and half of your dad’s in total you have 46 of 23 pairs. Each chromosome has long molecules of DNA. The DNA contains genes. Groups of the same genes but different versions or alleles give instructions for making different version of proteins. All of the DNA gets replicated and split into new cells so you can grow and repair broken skin after a cut. Since you have half of your DNA from both of your parents you are likely to look like them and your body might react as theirs do that’s why some disease are genetic because their in your genes.

Cell Growth and Reproduction

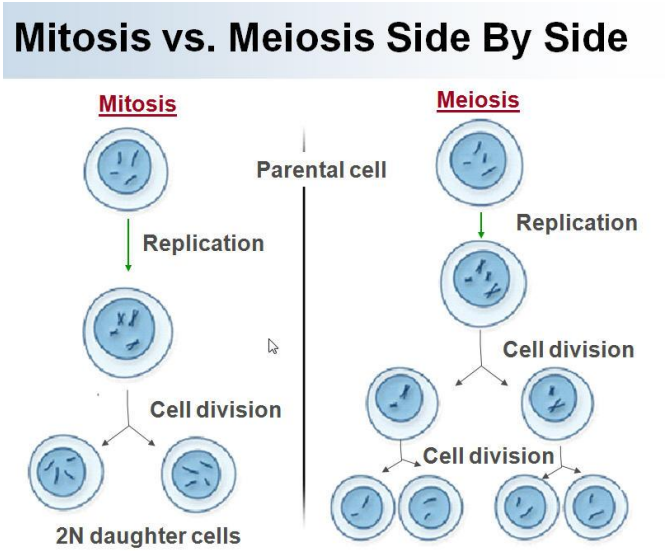
The Cell Cycle

- **Interphase (stage of the cell cycle)**- cells grows and prepares for cell division in 3 phases the growing takes place in the G1 phase, the DNA replicates (the production of an exact copy of genetic material in a chromosome in S phase and prepares to divide in the G2
- **Mitosis** (stage of the cell cycle)- Nuclear division that produces most cells of the body has 4 phases. *Prophase* -where the nuclear membrane starts to break down and centrioles begin to move toward the poles of the cell, *metaphase-* spindles attach from the centrioles to the chromatids as the lineup in the center, *anaphase-* where the chromatids to the opposite poles, and *telophase-* new nuclear membranes form around the separated chromosomes.
- **Cytokinesis**- the process which the cytoplasm, organelles, and plasma membrane of a cell divide to form 2 daughter cells

Mitosis and Meiosis

Mitosis creates 2 daughter cells from 1 parent cell with the same genetic material as the parent cell.

While meiosis creates four new cells with half of the genetic material as the parent cell. Meiosis goes through 2 rounds of cell division.



Cell Cycle Chart

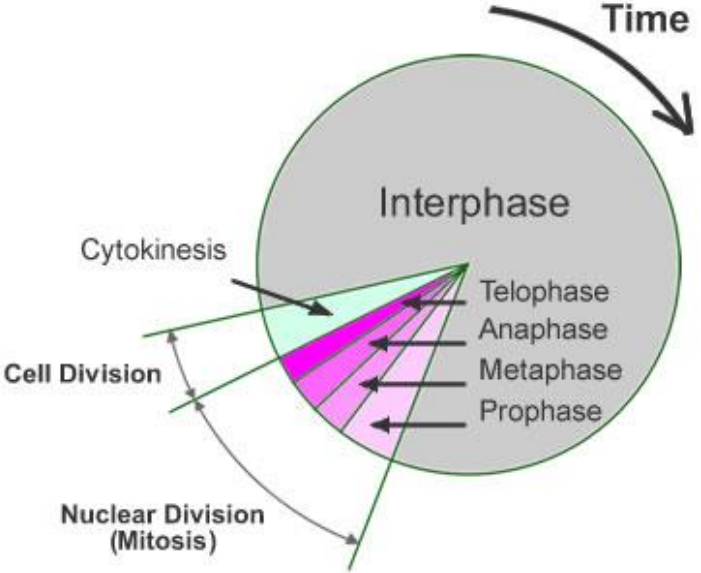
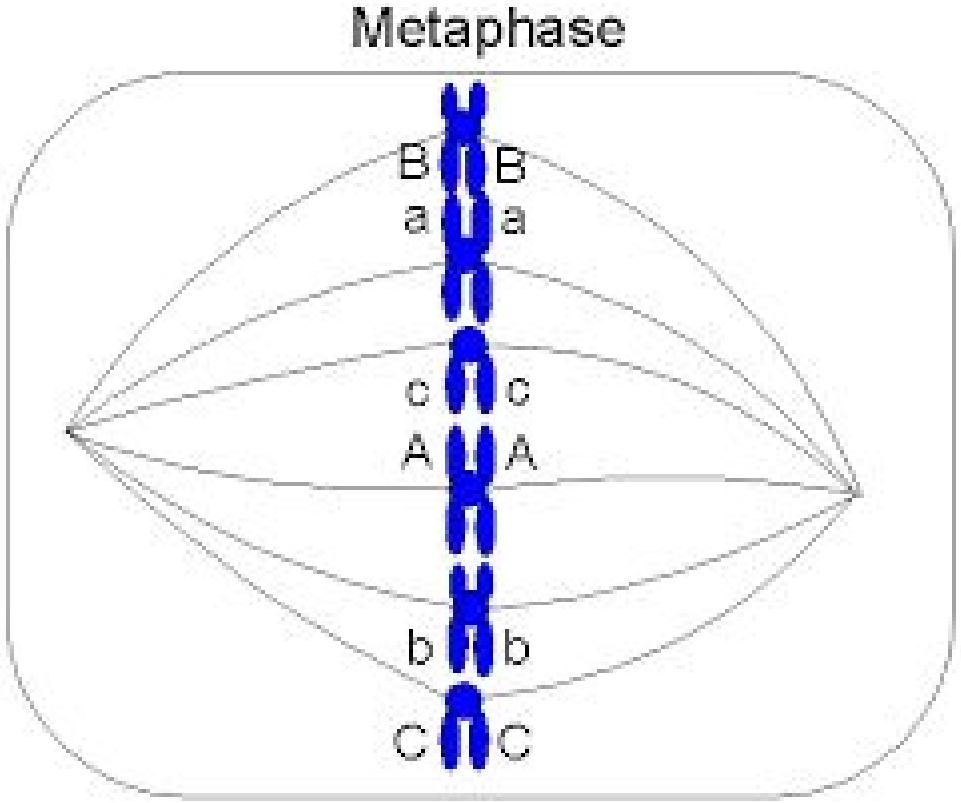


Diagram by IvyRose, 2007.



Practice Questions- Cell Growth and Reproduction

1. DNA replication makes cells semiconservative meaning every new double strand consist of…

A. One new strand and one old
B. 2 new strands
C. 2 old strands

2. DNA molecules coil in what phase of mitosis?

A. Prophase
B. Metaphase
C. Anaphase

3. What is DNA Replication?

4. Humans have…

A. 23 chromosomes
B. 46 chromosomes
C. 2 chromosomes

5. How many cells would an organism (male) have after going through the meiosis process 4 times?

Answer Key- Cell and Growth Reproduction

1. **One new strand and one old** because the DNA is replicated and each cell takes 1 of each
2. **Prophase** because during this phase chromosomes coil up and form the familiar X- shape
3. **DNA Replication is** the process in which a cell copies its genetic material in a chromosome.
4. **46 chromosomes** because we have 23 pairs of 2 which equals 46
5. The organism would have 256 news cells since each meiosis process creates 4 new cells after 4 times 64 cells make 4 new cells leaving 256 new cells

Ecology- Objectives

- Describe the levels of ecological organization Ex: organism, population, community, ecosystem, biome, and biosphere
- Describe characteristic biotic and abiotic components of aquatic and terrestrial ecosystems
- Describe the energy flow through an ecosystem Ex: food chains, food webs, energy pyramids
- Describe biotic interactions in an ecosystem Ex: competition, predation, symbiosis
- Describe how matter cycles through an ecosystem Ex: water cycle, carbon cycle, oxygen cycle, and nitrogen cycle
- Describe how ecosystems change in response to natural and human disturbances Ex: climate changes, introduction of nonnative species, pollution, fires
- Describe the effects of limiting factors on population dynamics and potential species extinction.

Ecology- Essential question

Do you know your surroundings?

Are you in a food chain? If so at what trophic level?

Do humans play any part in ecological systems like the water system?

ECOLOGY : KEY TERMS

Organism : an individual plant, animal, or single-celled life form

Population : a community of animals, plants, or humans

Community : interacting group of various species in a common location

Ecosystem : biological community of interacting organisms

Biome : a naturally occurring community of flora and fauna

Biosphere : regions of the surface, atmosphere, and hydrosphere

Biotic : relating to or resulting from living things

Abiotic : physical rather than biological

Competition : occurs when organisms seek the same limited resources

Food Chains : the flow of energy from one organism to another

Food Webs : system of interlocking and interdependent food chains

Energy Pyramids : graphical model of energy flow in a community

Predation : the preying of one animal on others

Symbiosis : interaction between two different organisms

Symbiotic relationship : individuals of different species living closely together

Water Cycle : the process of water circulating between the earth's oceans, atmosphere, and land

Carbon Cycle : the process of carbon compounds being interconverted

Oxygen Cycle : biogeochemical cycle of oxygen

Nitrogen Cycle : the process of nitrogen and its compounds being interconverted

Climates Changes : change in global or regional climate patterns

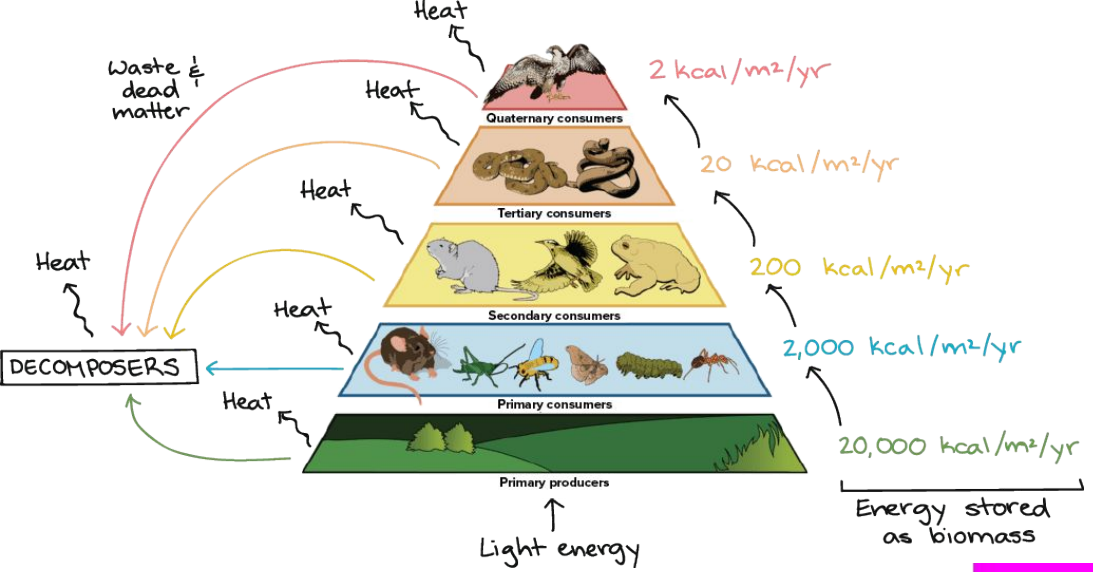
Non-native species : A species that doesn’t originate from the place it’s invading

Pollution : introduction of harmful effects to an environment

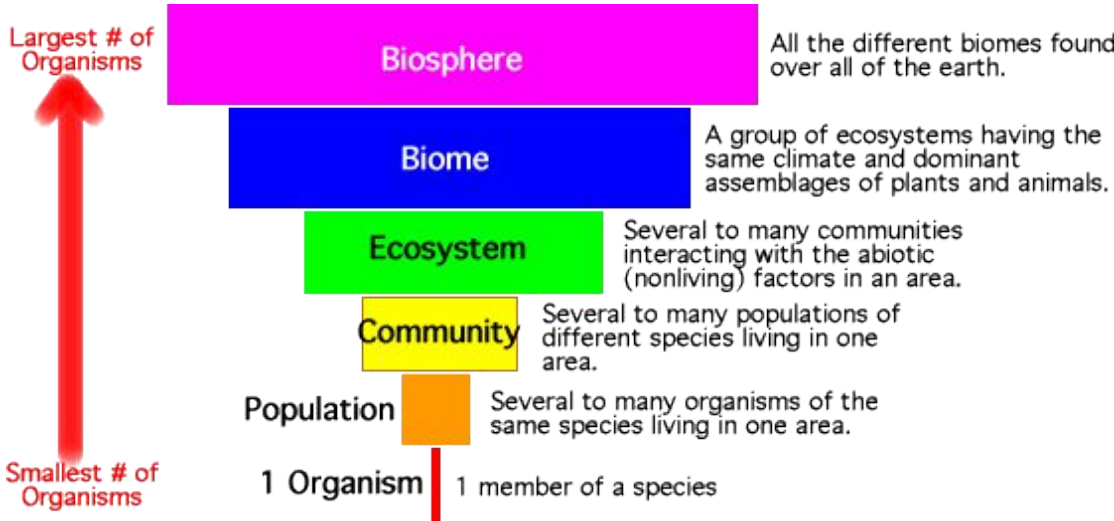
ECOLOGY : SUMMARY

Ecology is the relationship between organisms and their surroundings. Organisms of the same species make a population and multiple population make a community of biotic or living organisms. When combined with the nonliving organisms it makes an ecosystem. Similar ecosystems make up biomes Earth's biomes can be split into 2 major groups terrestrial (land) and aquatic (water). Terrestrial biomes include abiotic characteristics such as temperature, latitude longitude, and soil types. As well as biotic characteristics such as animals, grass, and trees. While aquatic biomes include abiotic and biotic characteristics too such as aquatic communities with fish, kelp, and microscopic organisms along with abiotic features including salinity and sunlight. All the biomes make the world's biosphere. With in each community energy has a way of flowing through the ecosystem all of the abiotic and biotic characteristics play a parts in the passing of energy. For example a food chain is the energy that flows from one organism to another. A stream in Pennsylvania includes the source at the beginning of every food chain sunlight. A producer in the case algae absorbs the sunlight to be eaten by a primary or first consumer a tadpole who is eaten by a secondary consumer the crayfish who is eaten by a tertiary or third consumer the brook trout. Interrelationships between multiple food chains showing the every role of each organism. Some organisms get their energy from decomposing other organisms or decomposers. Each of these organisms occupy different trophic levels or position in a food chain/web. The flow of energy through the trophic levels is represented by an energy pyramid.

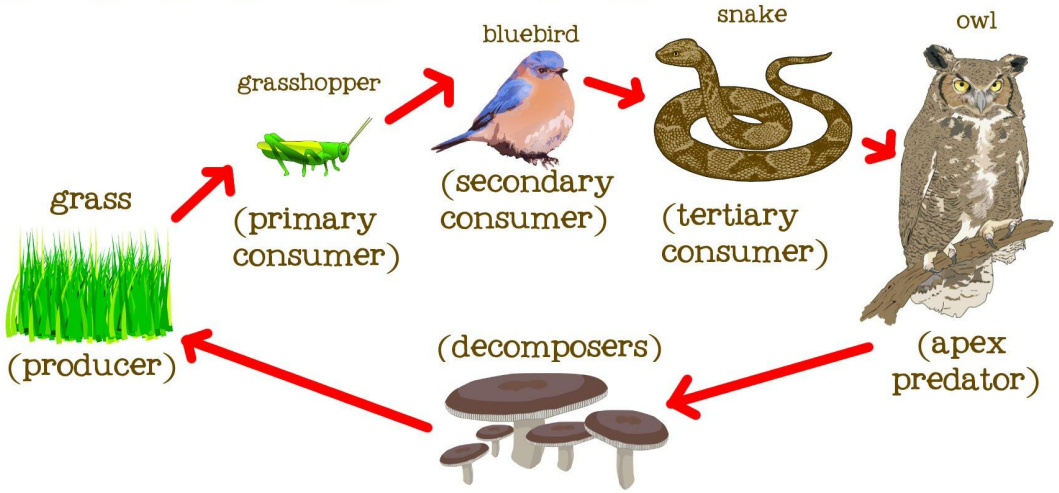
Energy Pyramid



Biosphere chart



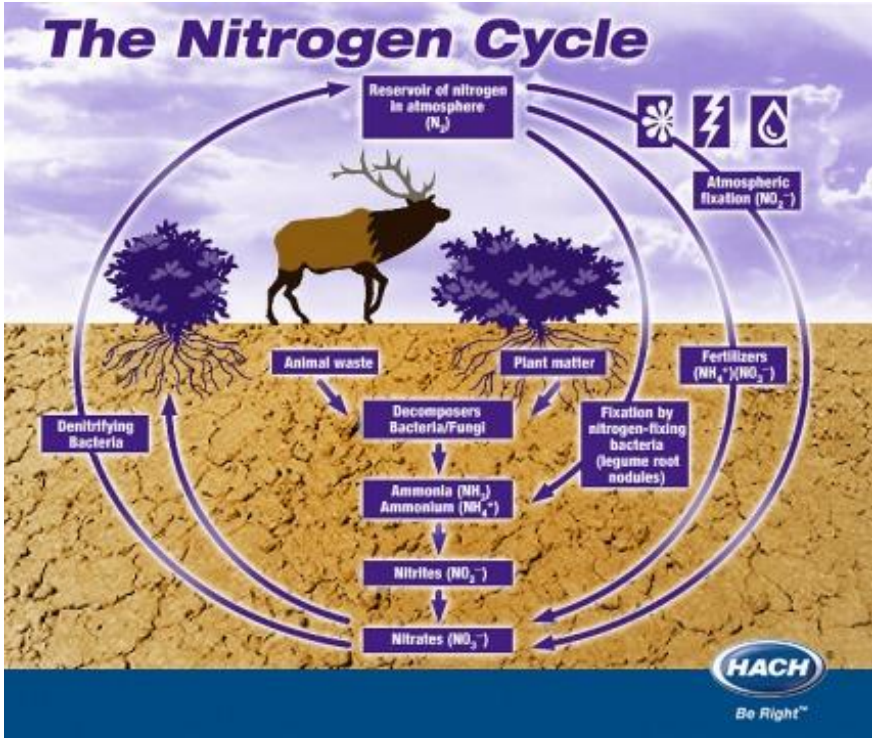
Food Chains

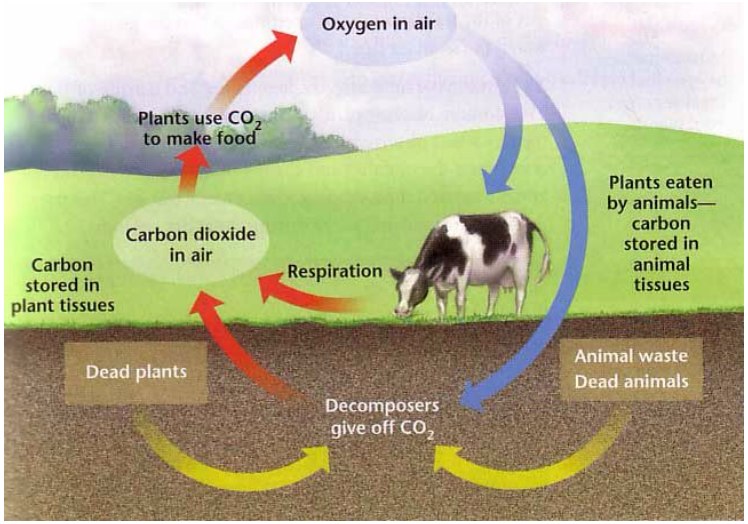

grass
(producer)
grasshopper
(primary consumer)
bluebird
(secondary consumer)
snake
(tertiary consumer)
owl
(apex predator)
(decomposers)

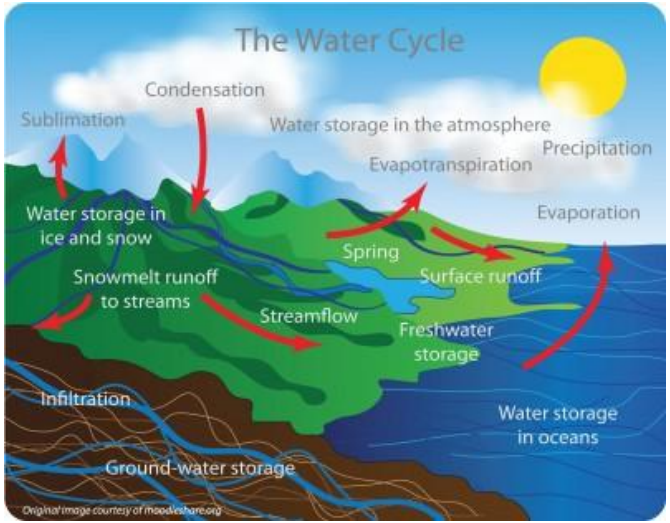

Chesapeake Bay Waterbird Food Web
Tertiary Consumers:
Secondary Consumers:
Primary Consumers:
Herbivores:
Primary Producers:

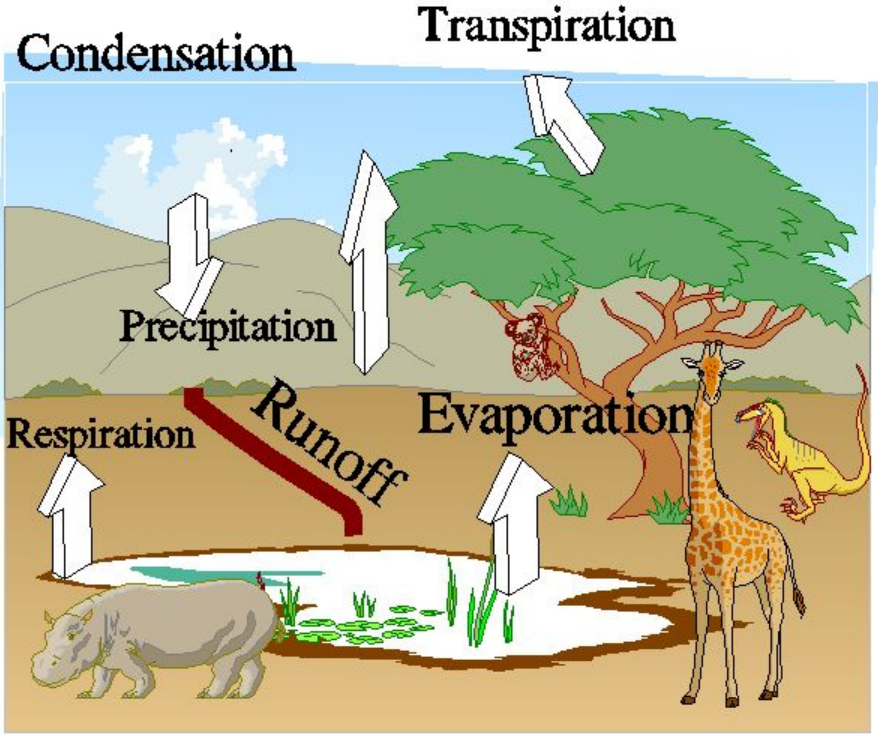
Organisms have ecological relation like competition, predation, and symbiotic. There are 3 types of symbiotic relationships mutualism where both species benefit, commensalism where one species benefits but the other isn't harmed and also doesn't benefit, and parasitism where one species benefits and the other is slightly harmed. As well as biotic organism abiotic characteristics have cycles too including the water, carbon, oxygen, and nitrogen cycles. The cycles of carbon dioxide and oxygen include each other in familiar processes cellular respiration and photosynthesis. The water cycle is the most familiar with evaporation, condensation, precipitation, transpiration evaporation from plant leaves, runoff liquid water that goes over land into bodies of water, and groundwater. The carbon cycle is separate, during this cycle organic carbon in the form of fats and proteins is converted to carbon dioxide through respiration and reversed by photosynthesis. The nitrogen cycle is the system of nitrogen flowing through the atmosphere, living things, and the soil. The ecosystem is affected by all types of things like climate changes, introduction of nonnative species, pollution, fires. The ecosystem responds to these natural/human disturbances with things like succession. Succession occurs after a disturbance leaves almost nothing. For instance a wildfire burns everything above ground but the roots underground are still their and able to eventually regrow the forest. The dynamics of the population depends on the births and deaths, along with the individuals leaving and coming to the population. Primary succession occurs on land that hasn't previously supported life and secondary succession occurs on land that has.

INTERACTION	TYPE OF SYMBIOSIS	EXAMPLE
Benefits / Benefits	**Mutualism** Species A benefits Species B benefits	Sea anemone / Clown fish
Benefits / Unaffected	**Commensalism** Species A benefits Species B unaffected	Whale / Barnacle
Benefits / Harmed	**Parasitism** Species A benefits Species B harmed	Dog / Tick









The Water Cycle

Practice Questions- Ecology

1. What would happen if the source of energy (the sun) was to disappear?
2. Is water an abiotic or biotic characteristic?

A. Biotic
B. Abiotic

3. Which form of succession would occur after a tsunami that wiped out a forest?

A. Primary
B. Secondary

4. What would happen if water was the only thing missing from the water cycle?

5. A dog has a tick in its ear what type of symbiotic relationship is this?

A. Mutualism
B. Commensalism
C. Parasitism

Answer Key- Ecology

1. **If the sun were to disappear** every system that is will cease to exist. All food chain will eventually stop and because every trophic level will run out of food the only thing that can eat will be decomposers. Also it would be completely dark.
2. **Abiotic** because water is not alive (Tip if something isn't alive such as objects or air they are abiotic)
3. **Secondary** because life was supported previously in that area (secondary succession means life used to be their and is growing back)
4. **If water went missin**g everywhere where water is would become dry and eventually dry out because of the sun animals, and plants would dehydrate and die.
5. **Parasitism** because the tick benefits but the dog doesn't and is harmed.

Objective : Genetics

- Study the key terms
- Read over the summary
- Answer the multiple choice questions (provide explanations for each answer)
- Refer to the visuals and charts if needed

Summary : Genetics

Inside every cell are instructions for the production of proteins that determine how the cells will function. Genotypes are the genetic makeup of any organisms. The genotypes are a combination of alleles. Alleles can be either dominant or recessive. Dominant traits are more common than recessive traits. The appearance of these traits is called phenotypes. Dominant traits are represented in capital letters (AA) and recessive traits are represented in lowercase letters (aa). When genotypes share matching alleles this is called homozygous. When genotypes are not matching they are heterozygous. Recessive traits are only shown when the genotypes are homozygous, otherwise the dominant genes will takeover the appearance. Genes can also determine your physical appearance and traits. The genes themselves are long strings of DNA. Chromosomes carry these, hereditary genes. Humans have 22 pairs of chromosomes and a single pair of sex chromosomes. Each chromosome pair is inherited by a mother and father. A complete set of genes is called a genome. Genomes can contain up to 25,000 genes. DNA is the genetic instructions for creating an organism.

Key Terms : Genetics

Genetics : study of heredity

Heredity : parents passing on genes to offspring

Gene : segment of DNA that controls an organism's traits

Dominant : allele that masks the recessive if both are present ; the uppercase letter

Heterozygous : different alleles

Homozygous : same alleles

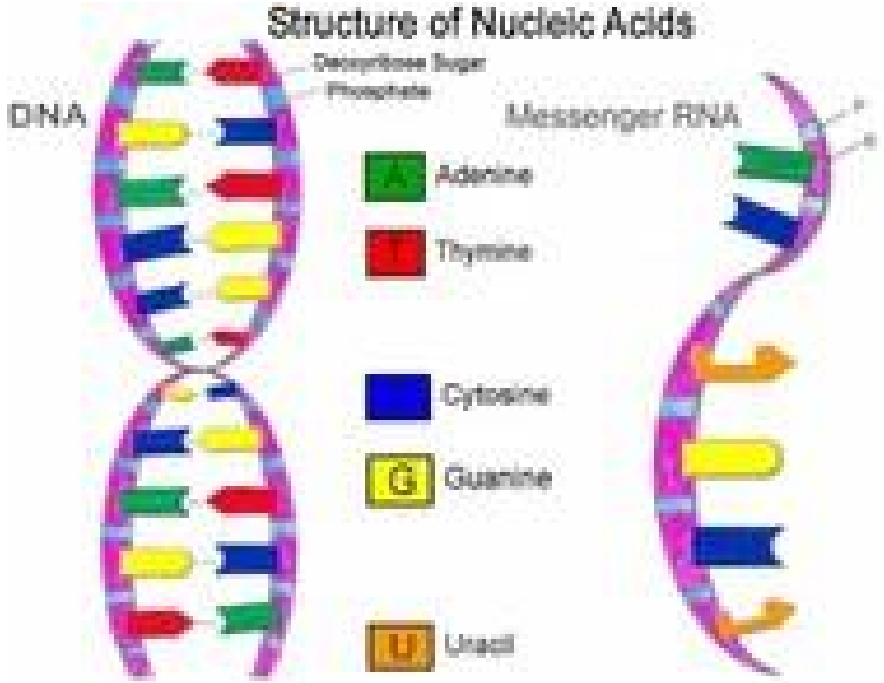
Recessive : allele that is masked by the dominant ; only physically apparent in homozygous organism ; lowercase

Allele : forms of a gene

Trait : genetically determined characteristic

Genotype : complete set of an organism's genes

Phenotype : physical appearance



F.O.I.L.	Directions	Genotype	Gametes
F	First, you multiply the **first** letters of each trait with each other.	PpGg →	PG
O	Next, multiply the **outside** letters of each trait with each other.	PpGg →	Pg
I	Third, multiply the **inside** letters of each trait together.	PpGg →	pG
L	Fourth, multiply the **last** letters of each trait together.	PpGg →	pg

Multiple Choice Questions : Genetics

When do recessive traits appear physically on the organism?

a. when the organism is homozygous
b. when the organism is heterozygous
c. they appear randomly
d. they don’t appear at all

When do dominant traits appear physically on the organism

a. when the organism is homozygous
b. when the organism is heterozygous
c. the traits will appear whether they are homozygous or heterozygous
d. they don’t appear at all

Multiple Choice Questions : Genetics

Recessive traits are represented as ___

a. lowercase letters
b. uppercase letters
c. numbers
d. hieroglyphics

Open Ended Questions : Genetics

1. Explain how recessive and dominant traits relate to genotype and phenotype?

_____

2. How does the parents traits play a part on the offspring’s physical appearance?

_____

Answer Key : Genetics

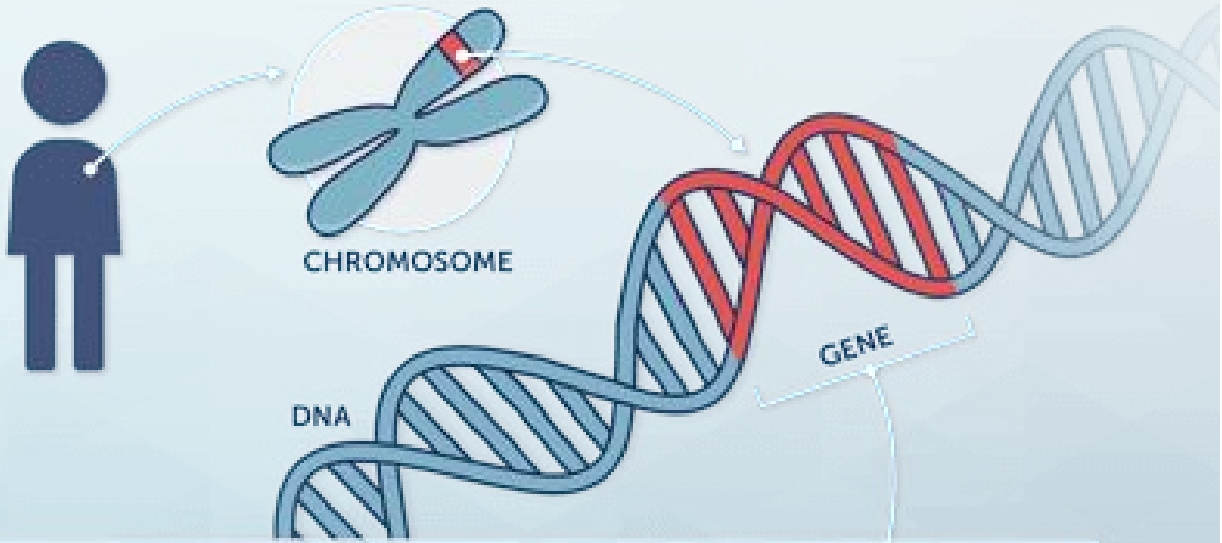
MULTIPLE CHOICE QUESTIONS :

1. **A (When the organism is homozygous because if not the recessive trait would be masked over by the dominant trait)**
2. **C (**
3. **A**

OPEN ENDED QUESTIONS :

1. …
2. ...

WHAT IS A GENE?



A **gene** is made up of **DNA**. It carries instructions to make proteins.

The **proteins** have specific jobs that help your body work normally.

PROTEIN