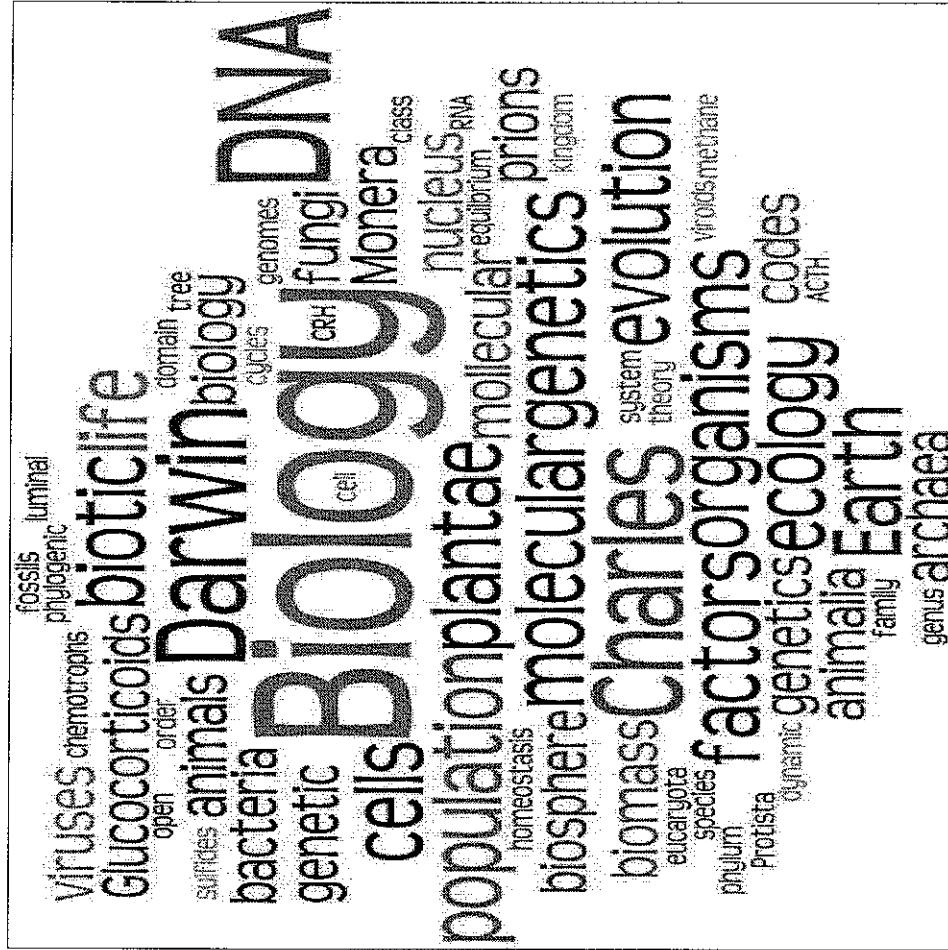


Biology EOC Prep

This booklet was produced by the following boss, brainy, brilliant, and brave Biology Teachers at Glacier Peak High School....
Tami Caraballo, Kerensa Moon, Brian Hill, Jean Ingersoll, Alisa Myers, Nick Prasad, and edited by Chris Scott



Here is a booklet of a lota but not all ya need to know for the EOC ... If you want to get an idea of allllll the stuff you are responsible for, you can always go to

<http://www.k12.wa.us/Science/TestSpecs/HSBiologyTestandItemSpec.pdf>

and there you will find a plethora of knowledge and guidance and fun stuff to see....don't be overwhelmed, we'll work through it together and if you work really hard, you may just make us look goooooooooooood!

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Not included in the booklet is evolution and genetics (since they are so fresh on your mind). Please review these as part of your studying process.

- What is the most probable cause of the algae growing in the lake near farmer A's farm?
 A. Corn
 B. Nitrogen Fertilizer
 C. All the rain
 D. Warm weather
- Why does Farmer A use a nitrogen fertilizer?
 A. It's a limiting factor for plant growth
 B. Plants need Nitrogen to make certain amino acids
 C. It kills all the bugs that infect corn
 D. It produces a smaller crop
 E. A & C
 F. A & B
 G. C & D
- Why would increased nitrogen cause the algae to grow?
 A. Nitrogen runoff stirs up the nutrients on the lake bottom
 B. It's a limiting factor for algae growth
 C. It provides excess nutrients for algae
- What would cause the fish to die?
 A. They eat the algae, which kills them.
 B. Lower levels of oxygen due to algae bloom
 C. Nitrogen is EXTREMELY toxic to fish (kills them instantly)
- Why did the algae not increase in the lake near farmer B?
- If fossil fuels contain nitrogen what happens to the nitrogen oxide gas (NO) that is produced when they are burned?
- As human populations increase, more food is needed. To meet the increasing demand crops are grown using fertilizer to increase their yield. What happens to the excess fertilizer?
- What would happen to the coastal marine fisheries when nitrogen fertilizer follows the rivers to the ocean?
- Farmers raise cattle, hogs and chickens in large numbers. Their waste contains large amounts of nitrogen. What takes place when that waste enters a water system such as a creek, lake or river?

Elements & Macromolecules in Organisms

The reduction of nitrates back into nitrogen gas (N_2), completing the nitrogen cycle. This process is performed by bacterial species in anaerobic conditions

- A. Ammonification
- B. Anammox Reaction
- C. Denitrification
- D. Nitrification
- E. Nitrogen Fixation

The conversion of ammonium to nitrate is performed primarily by soil-living bacteria and other nitrifying bacteria. The oxidation of ammonium (NH_4^+) is performed by bacteria which converts ammonia to nitrites (NO_2^-).

- A. Ammonification
- B. Anammox Reaction
- C. Denitrification
- D. Nitrification
- E. Nitrogen Fixation

When a plant or animal dies, or an animal expels waste, the initial form of nitrogen is organic. Bacteria, or fungi in some cases, convert the organic nitrogen within the remains back into ammonium (NH_4^+), a process called ??????? or mineralization

- A. Ammonification
- B. Anammox Reaction
- C. Denitrification
- D. Nitrification
- E. Nitrogen Fixation

Nitrogen, Farms, Fish, Bears, and Salmon

Farmer A has a large farm on which he grows corn. Through his farm flows a small creek which empties into a lake. This farmer sprays nitrogen fertilizer on his crops several times a year. Due to the weather patterns where he lives it often rains within several days of the application of the fertilizer. The lake near him has been a major recreation area with clear water and good fishing. Recently, clear water has become brownish green with mats of algae floating on the surface by late summer, resulting in fish kills. In the fall and winter there are many dead fish floating on the surface of the lake and drifting to shore. Recreation at the lake is coming to a halt because of the murky water and the dead fish.

Farmer B has a similar large farm in which he grows corn one year and soybeans the next. Through his farm also flows a small creek, which empties into a similar lake. This farmer does not spray any nitrogen fertilizer on his crops. He knows that soybeans have bacteria on their roots which take the atmospheric oxygen and convert it into a form of nitrogen that the plants can use. The rainfall is similar to Farmer A's area. The lake near him is and remains a major recreation area. The water is clear and there is good fishing. There is no algae floating in the late summer and there are no fish kills.

Draw a line to match the monomer on the left to the macromolecule on the right.

- A. Fatty acids and glycerol
- B. Monosaccharide
- C. Nucleotide
- D. Amino acid

- A. protein
- B. lipid
- C. nucleic acid
- D. carbohydrate

Draw a line to match the monomer on the left to the macromolecule on the right.

- A. DNA
- B. Enzyme
- C. Triglyceride
- D. Polysaccharide

- A. protein
- B. lipid
- C. nucleic acid
- D. carbohydrate

Draw a line to match the monomer on the left to the polymer on the right.

- A. DNA
- B. Enzyme
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Draw a line to match the monomer on the left to the polymer on the right.

- A. DNA
- B. Enzyme
- C. Triglyceride
- D. Polysaccharide

- A. protein
- B. lipid
- C. nucleic acid
- D. carbohydrate

Draw a line to match the monomer on the left to the macromolecule on the right.

- A. Cholesterol
- B. Enzyme
- C. RNA
- D. Cellulose

- A. protein
- B. lipid
- C. nucleic acid
- D. carbohydrate

Most common elements in living things are carbon, hydrogen, nitrogen, and oxygen. These four elements constitute about 95% of your body weight.

Each small organic molecule can be a unit of a large organic molecule called a **macromolecule**. There are four classes of macromolecules (polysaccharides or carbohydrates, triglycerides or lipids, polypeptides or proteins, and nucleic acids such as DNA & RNA). Carbohydrates and lipids are made of only carbon, hydrogen, and oxygen (CHO). Proteins are made of carbon, hydrogen, oxygen, and nitrogen ($CHON$). Nucleic acids such as DNA and RNA contain carbon, hydrogen, oxygen, nitrogen, and phosphorus ($CHONP$).

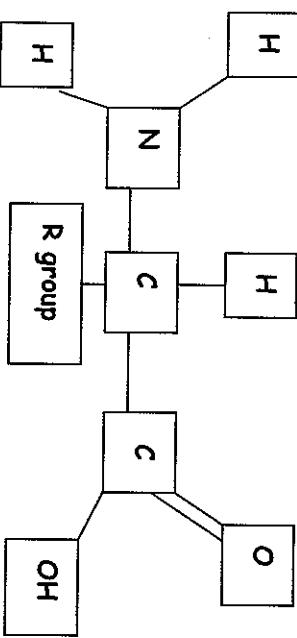
Answer the following questions based on the nitrogen story above: CIRCLE YOUR ANSWER for #1-4).

Proteins

Proteins are made of subunits called **amino acids** and are used to build cells and do much of the work inside organisms. They also act as **enzymes** helping to control metabolic reactions in organisms. Amino acids contain two **functional groups**, the **carboxyl group** (-COOH) and the **amino group** (-NH₂). Circle the amino acid group and the carboxyl group.

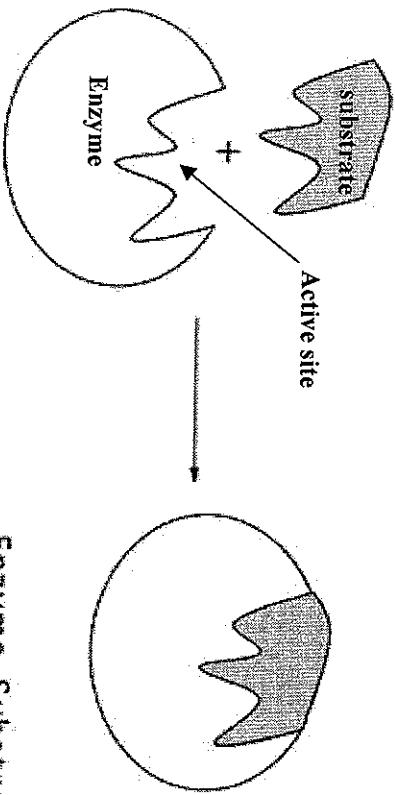
Color code the amino acid on this worksheet: C = carbon -black, H = hydrogen-yellow, N = nitrogen-blue, and O = oxygen-red.

Basic Structure of Amino acid



Enzymes are protein molecules that act as **biological catalysts**. Cells contain thousands of different enzymes to control the functions of the cell. Enzymes must physically fit a specific **substrate(s)** to work properly. The place where a substrate fits an enzyme to be catalyzed is called the **active site**. Excess heat, a change in pH from neutral, etc. change the shape of enzymes and their active sites so the enzyme is unable to work.

Color the enzyme purple, the substrate yellow. Also **color** the active site red.



Enzyme + Substrate

Enzyme- Substrate Complex

Nitrogen Cycle

The atmosphere is the largest reservoir of nitrogen on Earth. It consists of 78 percent nitrogen gas. The nitrogen cycle moves nitrogen through abiotic and biotic components of ecosystems.

Absorption of Nitrogen
Plants and other producers use nitrogen to synthesize nitrogen-containing organic compounds, including chlorophyll, proteins, and nucleic acids. Consumers also make use of the nitrogen in these compounds. Plants absorb nitrogen from the soil through their root hairs. However, they cannot absorb nitrogen gas directly. They can absorb nitrogen only in the form of nitrogen-containing ions, such as nitrate ions.

Nitrogen Fixation
The process of converting nitrogen gas to nitrate ions that plants can absorb is called nitrogen fixation. It is carried out mainly by nitrogen-fixing bacteria. Some nitrogen-fixing bacteria live in soil. Others live in the root nodules of legumes such as peas and beans. In aquatic ecosystems, some cyanobacteria are nitrogen fixing.

Ammonification and Nitrification

After being used by organisms, nitrogen is released back into the environment. When decomposers break down organic remains and wastes, they release nitrogen in the form of ammonium ions. This is called ammonification. Certain soil bacteria, called nitrifying bacteria, convert ammonium ions to nitrites. Other nitrifying bacteria convert the nitrites to nitrates, which plants can absorb. The process of converting ammonium ions to nitrites or nitrates is called nitrification.

Denitrification and the Anammox Reaction

Still other bacteria, called denitrifying bacteria, convert some of the nitrates in soil back into nitrogen gas in a process called denitrification. It is the opposite of nitrogen fixation. Denitrification returns nitrogen gas back to the atmosphere, where it can continue the nitrogen cycle. In the ocean, an anammox reaction returns nitrogen to the atmosphere. The reaction involves certain bacteria, and it converts ammonium and nitrite ions to nitrogen gas.

Multiple Choice:

_____ What is the only form of nitrogen that plants can absorb?

- A. Nitrogen Gas
- B. Nitrate Ions

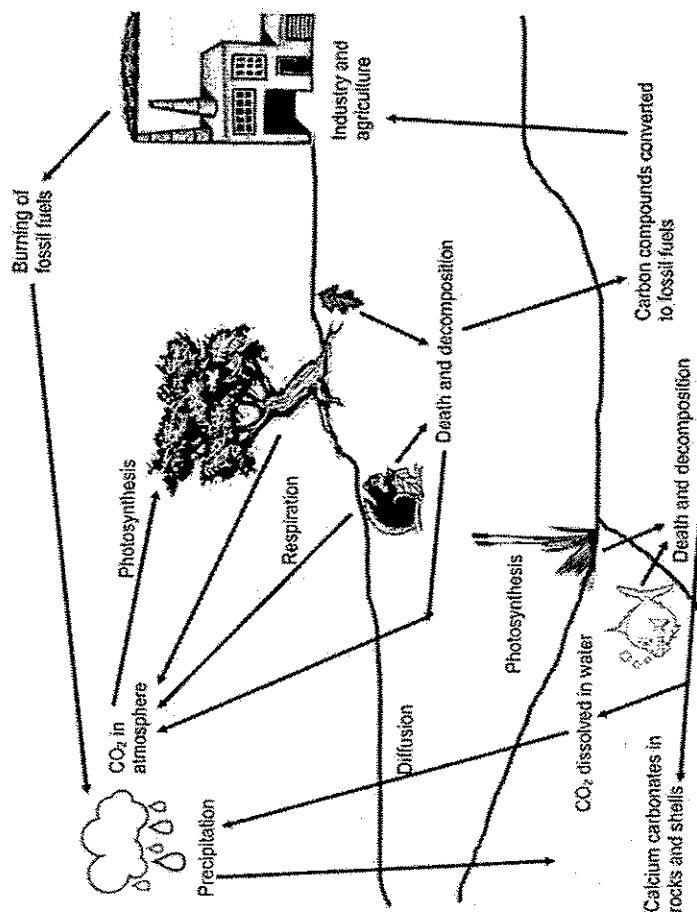
_____ What do nitrogen-fixing bacteria do, and where do they live?

- A. Nitrogen Fixation , soil
- B. Nitrogen Fixation, soil and roots
- C. Ammonification, soil
- D. Denitrification, soil and roots

_____ What major role do decomposers play in the nitrogen cycle?

- A. Return nitrogen back into the environment
- B. Convert nitrogen gas into ions
- C. Convert nitrogen gas into a protein

Look at the Carbon Cycle below and answer the questions-USE THE PICTURE!



What is the process by which plants convert carbon dioxide into energy-rich carbon compounds?

Explain what happens over millions of years to the carbon compounds in organisms that die and decompose.

What processes above release carbon dioxide into the atmosphere?

Identify two major reservoirs of carbon dioxide on Earth.

What are the forms in which carbon is found in the oceans?

How do plants and animals help to maintain a balance of carbon dioxide in the atmosphere?

Atmospheric carbon dioxide might produce a “greenhouse effect” by trapping heat near the Earth’s surface. What human activities might tend to increase the greenhouse effect?

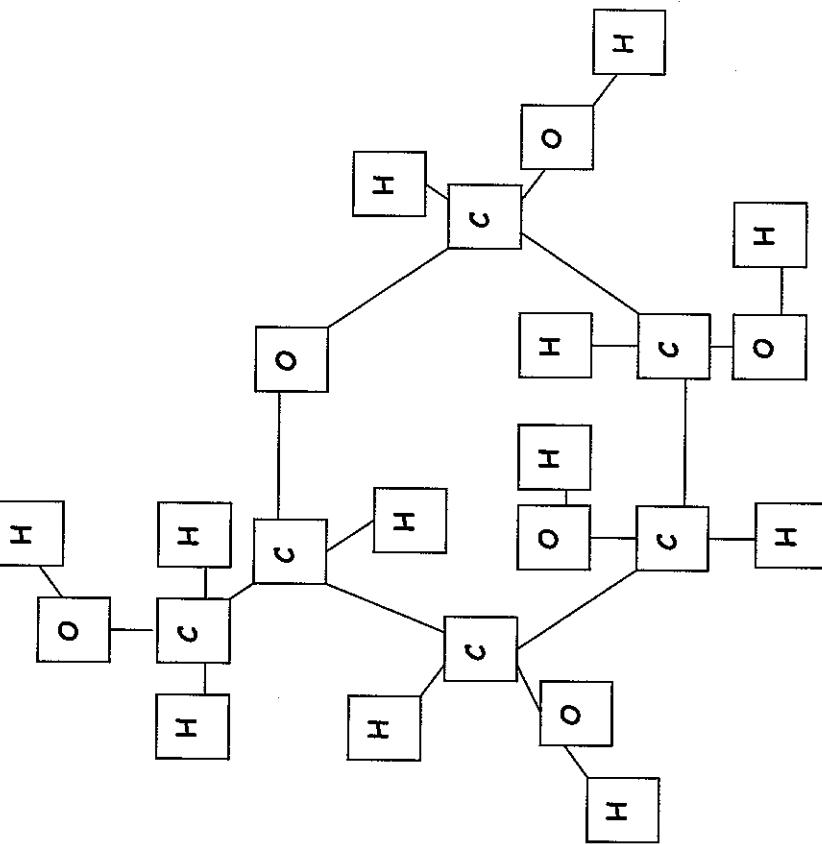
Carbohydrates

Carbohydrates are used by the body for energy and structural support in cell walls of plants and exoskeletons of insects and crustaceans. They are made of smaller subunits called monosaccharides. Monosaccharides have carbon, hydrogen, and oxygen in a 1:2:1 ratio. Monosaccharides or simple sugars include glucose, galactose, and fructose. Although their chemical formulas are the same, they have different structural formulas. These simple sugars combine to make disaccharides (double sugars like sucrose) and polysaccharides (long chains like cellulose, chitin, and glycogen).

Color code the glucose molecule on this worksheet. C = carbon -black, H = hydrogen-yellow, N = nitrogen-blue, and O = oxygen-red.

Glucose Molecule

Use the diagram of glucose to tell how many carbons, hydrogens, and oxygens are in a single molecule. #C _____ #H _____ #O _____

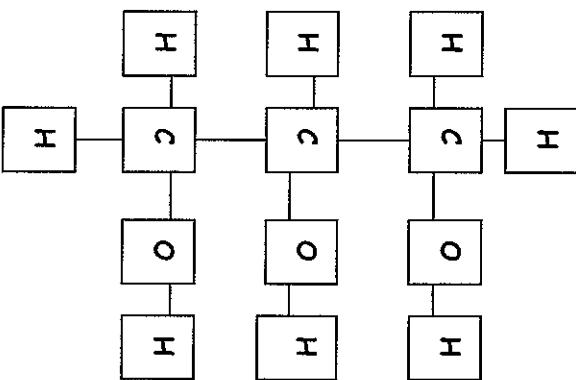


Lipids

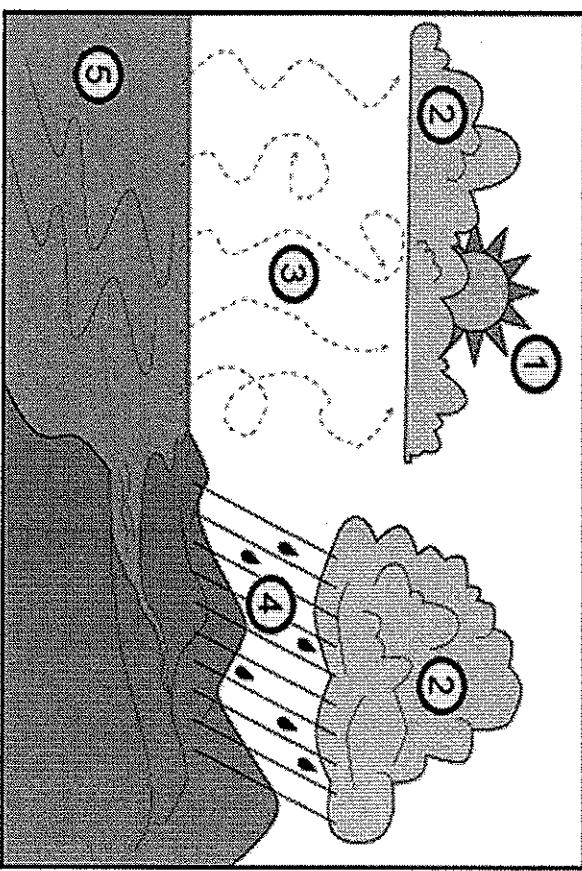
Lipids are large, **nonpolar** (won't dissolve in water) molecules. **Phospholipids** make up cell membranes. Lipids also serve as waxy coverings (cuticle) on plants, **pigments** (chlorophyll), and **steroids**. Lipids have **more carbon and hydrogen atoms** than oxygen atoms. Fats are made of a **glycerol** (alcohol) and three fatty acid chains. This subunit is called a **triglyceride**.

Color the glycerol molecule using: **C** = carbon - black, **H** = hydrogen-yellow, and **O** = oxygen-red.

Glycerol Molecule



LABEL THE WATER CYCLE BELOW



WORD BANK	
Condensation	1. _____
Evaporation	2. _____
Precipitation	3. _____
Original source of Energy	4. _____
Groundwater/Runoff/Water table	5. _____

Multiple Choice:

_____ Water that infiltrates the ground is called

- A. runoff.
- B. groundwater.
- C. reservoir water.
- D. discharge water.

_____ How does water come from the atmosphere to the Earth?

- A. Condensation
- B. Evaporation
- C. Precipitation

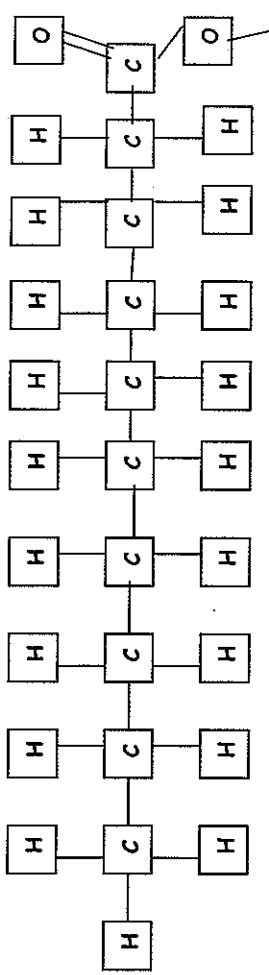
_____ How does water leave the earth and return to the atmosphere?

- A. Condensation
- B. Evaporation
- C. Precipitation

CIRCLE AND LABEL the carboxyl groups in the 2 fatty acids on this worksheet. Color the fatty acid chains the same colors for carbon, hydrogen, and oxygen as you did before.

CIRCLE THE CORRECT ANSWER:

Saturated Fatty Acid



Energy (increases, decreases, stays the same) as you move through a food chain.

A (Food web, Food Chain, Food Pyramid) shows one possible pathway for energy.

Producers are organisms that (makes their own food, obtain energy from non-living matter, or obtain food from other organisms).

Consumers are organisms that (makes their own food, obtain energy from non-living matter, or obtain food from other organisms).

Decomposers are organisms that (makes their own food, obtain energy from non-living matter, or obtain food from other organisms)

Review Ecology Part IV: CYCLES

Multiple Choice

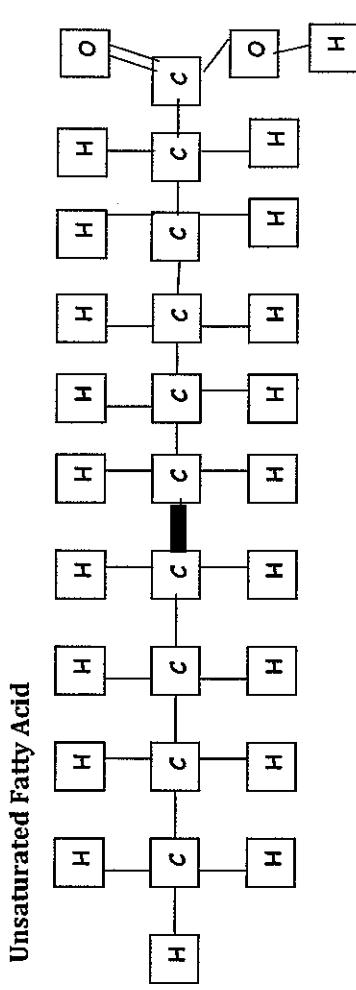
- _____ A circuit or pathway by which a chemical element moves through both living and non-living components of an ecosystem, including the Earth as a whole.
- Biogeochemical cycle
 - Carbon cycle
 - Nitrogen cycle
 - Water Cycle

_____ Describes the transformations of carbon and carbon-containing compounds in nature.

- Biogeochemical cycle
- Carbon cycle
- Nitrogen cycle
- Water Cycle

_____ Describes the transformations of nitrogen and nitrogen-containing compounds in nature.

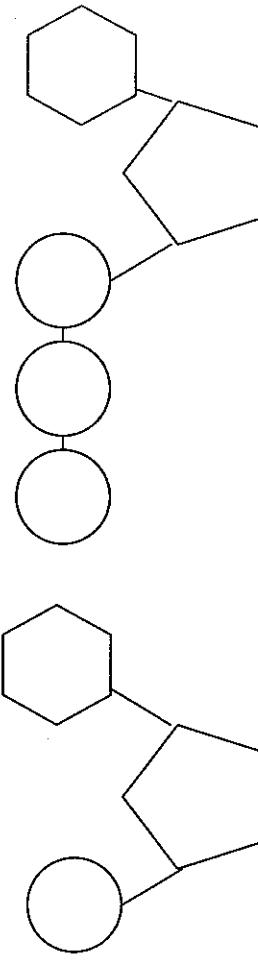
- Biogeochemical cycle
- Carbon cycle
- Nitrogen cycle
- Water Cycle



Nucleic Acids

Nucleic acids carry the genetic information in a cell. **DNA** or **deoxyribose nucleic acid** contains all the instructions for making every protein needed by a living thing. RNA copies and transfers this genetic information so that proteins can be made. The subunits that make up nucleic acids are called **nucleotides**.

COLOR AND LABEL the parts of a nucleotide --- sugar (5-sided)-green, phosphate group (round)-yellow, and nitrogen base (6-sided)-blue. ATP used for cellular energy is a high energy nucleotide with three phosphate groups. **Color code the ATP and LABEL THE PHOSPHATES.**



nucleotide

ATP

DNA

The nucleus is a small spherical, dense body in a cell. It is often called the "control center" because it controls all the activities of the cell including cell reproduction, and heredity. Chromosomes are microscopic, threadlike strands composed of the chemical DNA (short for deoxyribonucleic acid). In simple terms, DNA controls the production of proteins within the cell. Think of proteins as the building blocks for an organism, proteins make up your skin, your hair, parts of individual cells. How you look is largely determined by the proteins that are made. The proteins that are made is determined by the sequence of DNA in the nucleus.

Chromosomes are composed of genes, which is a segment of DNA that codes for a particular protein which in turn codes for a trait. Hence you hear it commonly referred to as the gene for baldness or the gene for blue eyes. Meanwhile, DNA is the chemical that genes and chromosomes are made of. DNA is called a nucleic acid because it was first found in the nucleus. We now know that DNA is also found in organelles, the mitochondria and chloroplasts, though it is the DNA in the nucleus that actually controls the cell's workings.

In 1953, James Watson and Francis Crick established the structure of DNA. The shape of DNA is a double helix which is like a twisted ladder. The sides of the ladder are made of alternating sugar and phosphate molecules. The sugar is deoxyribose. Color all the phosphates red (one is labeled with a "P"). Color all the deoxyriboses light blue (one is labeled with a "D".) Note, the nitrogenous bases attach to the sugar = "D".

The rungs of the ladder are pairs of 4 types of nitrogen bases. The bases are known by their coded letters A, G, T, C. These bases always bond in a certain way. Adenine will only bond to thymine. Guanine will only bond with cytosine. This is known as the "Base-Pair Rule". The bases can occur in any order along a strand of DNA.

- Color Thymines (T) orange 
- Color Cytosines (C) yellow
- Color Guanines (G) purple 
- Color Adenines (A) green 

Messenger RNA

So, now, we know the nucleus controls the cell's activities through the chemical DNA, but how? It is the sequence of bases that determine which protein is to be made and determines which proteins are made and the proteins determine which activities will be performed. And that is how the nucleus is the control center of the cell. The only problem is that the DNA is too big to go through the nuclear pores. So a chemical is used to read the DNA in the nucleus. That chemical is messenger RNA. The messenger RNA (mRNA) is small enough to go through the nuclear pores. It takes the "message" of the DNA to the ribosomes and "tells them" what proteins are to be made. Recall that proteins are the body's building blocks. Imagine that the code taken to the ribosomes is telling the ribosome what is needed - like a recipe.

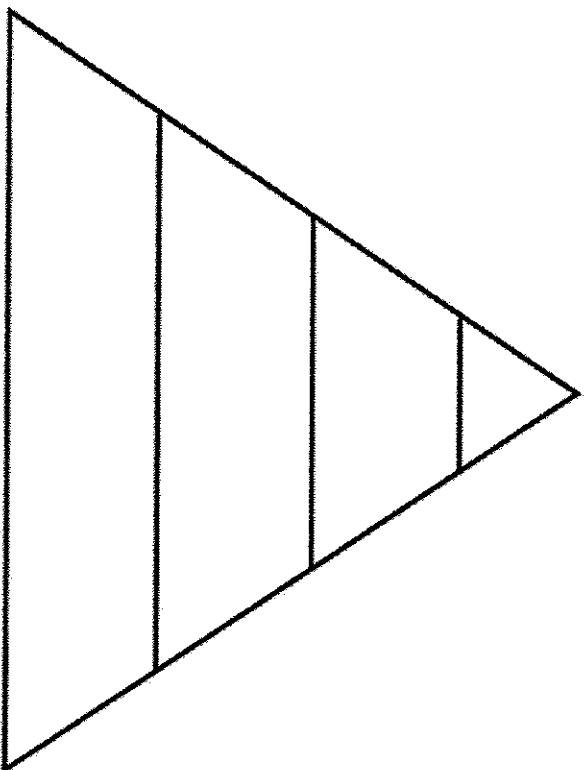
Messenger RNA is similar to DNA, except that it is a single strand, and it has no thymine. Instead of thymine, mRNA contains the base Uracil. In addition to that difference, mRNA has the sugar ribose instead of deoxyribose. RNA stands for Ribonucleic Acid. Color the mRNA as you did the DNA, except:

Color the ribose (R) a DARKER BLUE, and the uracil brown. 

The Lion King

For the following questions, use the characters from the movie Lion King to correctly form relationships, fill in charts, or answer questions #1-7.

1. Name a producer from the movie:
2. Name an herbivore:
3. Name a carnivore:
4. Identify two decomposers:
5. Put the following characters into a trophic pyramid.
Label the pyramid with the appropriate levels.
(Timon, Simba, Zazu, Scar, Rafiki, Pumba, Hyenas, Gazelles, elephants, rhinos, Nala, zebras, grass, trees, grubs, Mufasa).

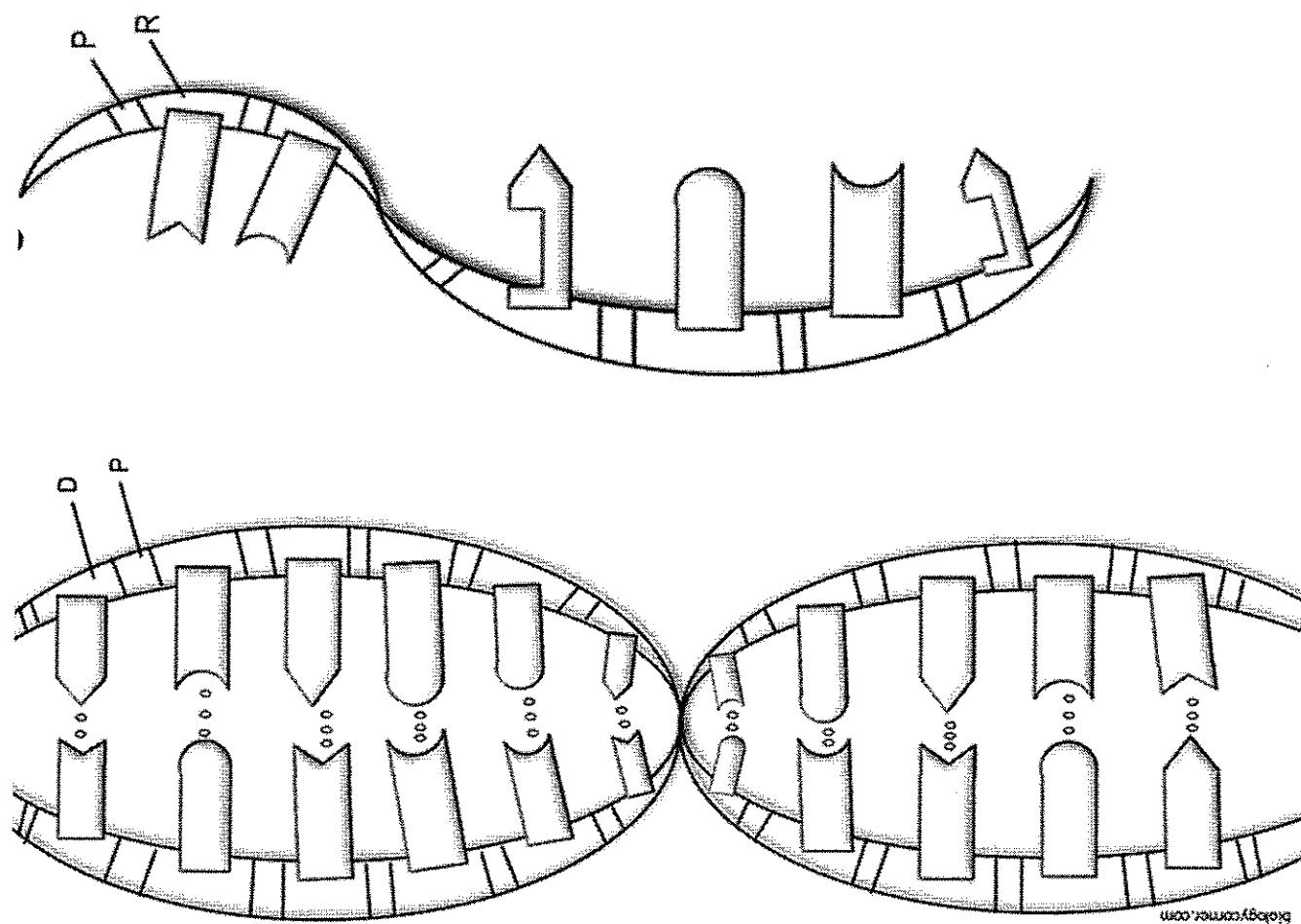


6. Give two examples of predator/prey relationships from the movie.
7. The grass has 1000 units of energy.
How much units of energy does Simba have?
Pumbaa?

Analysis of the graph

1. It took 1649 years for the world population to double, going from .25 billion people to .50 billion people. How long did it take for the population to double once again? _____
2. How long did it take for the population to double a second time? _____
3. Based the graph/data, in what year will the population reach 8 billion? _____
4. Based the graph/data, how many years will it take for the population of 2004 to double? _____
5. What would be some *population density independent limiting factors* that affect the population growth?
6. What would be some *population density dependent limiting factors* that affect the population growth?
7. The *concept of sustainable development* supports adoption of policies that enable people to obtain the resources they need today without limiting the ability of future *generations* to meet their own needs. What would need to be some sustainability policies for the human population?

DNA - The Double Helix



Review Ecology Part III: Recycling Matter & Energy

- _____ A food web is best described as a diagram of
- A. feeding relationships in an ecosystem.
 - B. energy flow among producers.
 - C. Calories available to primary consumers.

- _____ The broadest level of an energy pyramid consists of
- A. producers.
 - B. decomposers.
 - C. scavengers.
 - D. saprotrophs

- _____ Which trophic level of an ecosystem has the least biomass?
- A. tertiary consumers
 - B. secondary consumers
 - C. primary consumers

Below is a diagram of the different nucleotides. Color the diagram as follows:

P = Phosphates - red

D = Deoxyribose (sugar) - light blue

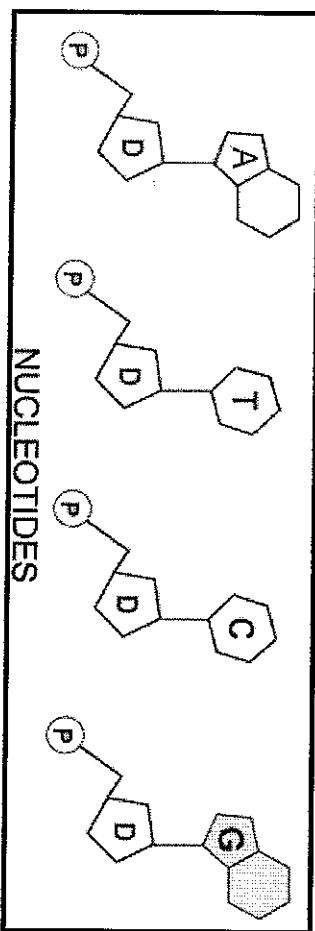
A = Adenine - green

T = Thymine - orange

C = Cytosine - yellow

G = Guanine - purple

Bond between the Deoxyribose and nitrogenous base = Hydrogen bond - black



Comparing DNA Replication and Transcription

DNA replication is the process by which a cell copies its DNA. During replication both strands of the double helix are used as templates to make complementary, or matching strands of DNA. DNA transcription is the process by which a single strand of DNA is used as a template to generate a strand of mRNA.

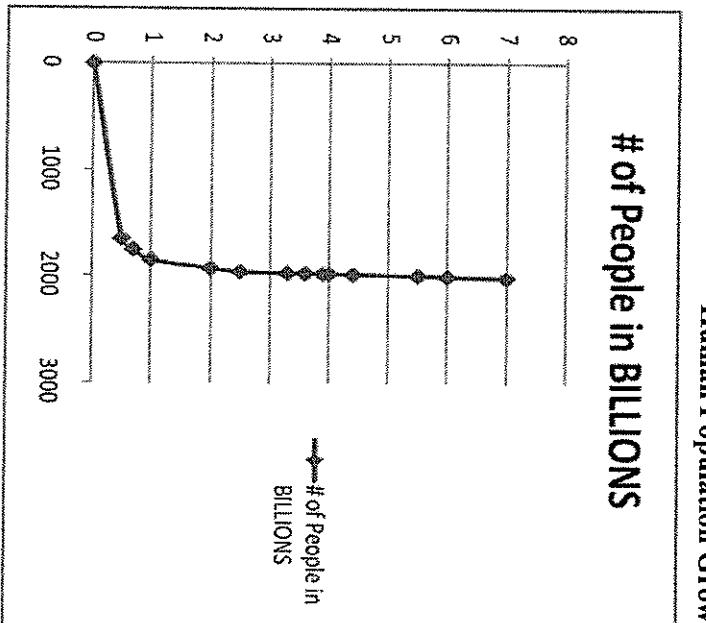
Fill in the missing information. One row has been completed for you.

Template DNA	Complementary DNA	Messenger RNA (mRNA)
T T A C G	A A T G C	U U A C G
	G G C G G	
		A C G U A G C
A G A C T C		C U G G C U A C

- The graph shows a ??? growth curve.
- A. Exponential
B. Linear
C. Logistic
- The carrying capacity for rabbits is?
- A. 5
B. 20
C. 40
D. 60

During which month were the rabbits in exponential growth?

- A. May to June
B. May to August
C. August to September
D. May to September



_____ Abiotic components of the environment include

- A. air temperature.
- B. other species.
- C. producers.
- D. all of the above.

_____ The niche of a plant includes all of the following except its

- A. role as a producer.
- B. need for sunlight.
- C. use of soil nutrients.
- D. genetic makeup.

_____ Aspects of a species' habitat include

- A. the average rainfall it receives.
- B. the amount of sunlight it gets.
- C. the range of temperatures it experiences.
- D. all of above.

_____ If two species occupied the same niche in the same area, they would

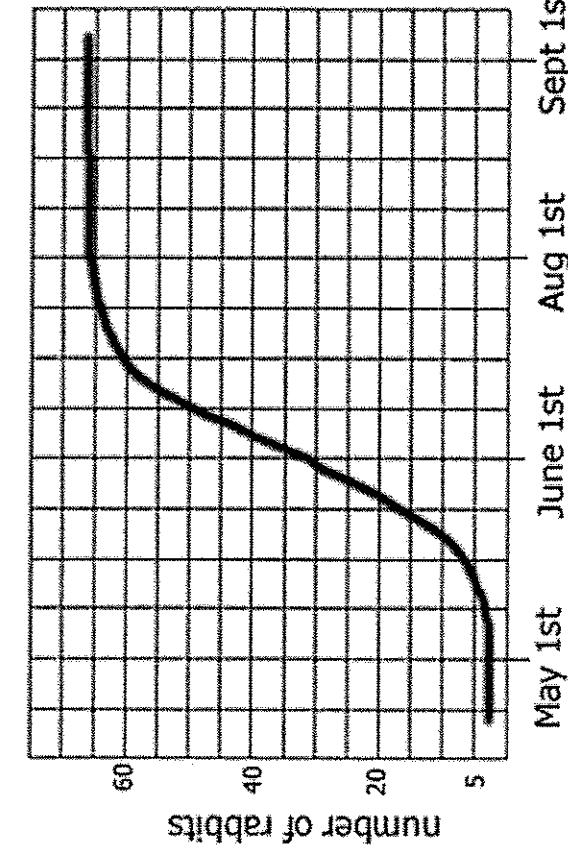
- A. outcompete species in other niches.
- B. move to a different habitat.
- C. be in competition with each other.
- D. both go extinct.

DNA / RNA Vocabulary Review

- 1. _____ DNA
- 2. _____ mRNA
- 3. _____ tRNA
- 4. _____ rRNA
- 5. _____ Hydrogen bond
- 6. _____ Adenine
- 7. _____ Uracil
- 8. _____ Amino acid
- 9. _____ Central dogma
- 10. _____ Transcription
- 11. _____ Translation
- 12. _____ Replication
- 13. _____ Codon
- 14. _____ Anti-codon
- 15. _____ Nucleotide

Review Ecology Part II: Interpreting Ecological Graphs & Data

Graph 1: Rabbits Over Time



- A. Building blocks of proteins
- B. 3 consecutive nucleotides on mRNA that code for a specific amino acid
- C. process of making a copy of DNA
- D. Nitrogenous base of DNA
- E. DNA is transcribed into RNA that complements mRNA codon
- F. Nitrogenous base of RNA
- G. Form of RNA that is transcribed from DNA
- H. Monomer of DNA composed of a phosphate, 5 carbon sugar, and nitrogenous base
- I. Type of bond that holds DNA's double helix together
- J. Process in which mRNA is made using DNA
- K. Form of RNA that attaches amino acids to protein chains in the ribosome
- L. Type of RNA that makes up a major part of the ribosome
- M. Process in which cells use information on mRNA to make proteins
- N. Nucleic acid that stores and transmits genetic information
- O. DNA → RNA → Amino Acid → Protein → Trait

Transcription & Translation

Using your awesome knowledge and the reading above complete the matching using the word list.

WORD LIST

RNA, Ribonucleic Acid is very similar to DNA. RNA normally exists as a single strand (and not the double stranded double helix of DNA). It contains the same bases, adenine, guanine and cytosine. However, there is no thymine found in RNA, instead there is a similar compound called uracil.

Transcription is the process by which RNA is made from DNA. It occurs in the nucleus. Label the box with the X in it near the nucleus with the word TRANSCRIPTION and proceed to color the bases according to the key below

Thymine = orange 

Adenine = dark green 

Guanine = purple 

Cytosine = yellow 

Uracil = brown 

Color the strand of DNA dark blue (D) and the strand of RNA light blue (R). Color the nucleic membrane (E) black.

Translation

Translation occurs in the cytoplasm, specifically on the ribosomes. The mRNA made in the nucleus travels out to the ribosome to carry the "message" of the DNA. Here at the ribosome, that message will be translated into an amino acid sequence. Color the ribosome light green (Y) and note how the RNA strand threads through the ribosome like a tape measure and the amino acids are assembled. The RNA strand in the translation area should also be colored light blue, as it was colored in the nucleus.

Label the box with the X in the translation area with the word TRANSLATION. Important to the process of translation is another type of RNA called Transfer RNA (F) which function to carry the amino acids to the site of protein synthesis on the ribosome. Color the tRNA red.

A tRNA has two important areas. The anticodon, which matches the codon on the RNA strand. Remember that codons are sets of three bases that code for a single amino acid. Make sure you color the bases of the anticodon the same color as the bases on your DNA and RNA strand - they are the same molecules!

At the top of the tRNA is the amino acids. There are twenty amino acids that can combine together to form proteins of all kinds, these are the proteins that are used in life processes. When you digest your food for instance, you are using enzymes that were originally proteins that were assembled from amino acids. Each tRNA has a different amino acid which link together like box cars on a train. Color all the amino acids (M) polka dotted.

Multiple Choice:

- _____ What happens to matter in ecosystems?
- It gets used up
 - It gets used up and more matter is created
 - It gets recycled (matter cannot be created nor destroyed)
 - It changes form
 - B & C
 - C & D
 - None of the above

TRANSCRIPTION AND TRANSLATION

Ecosystem

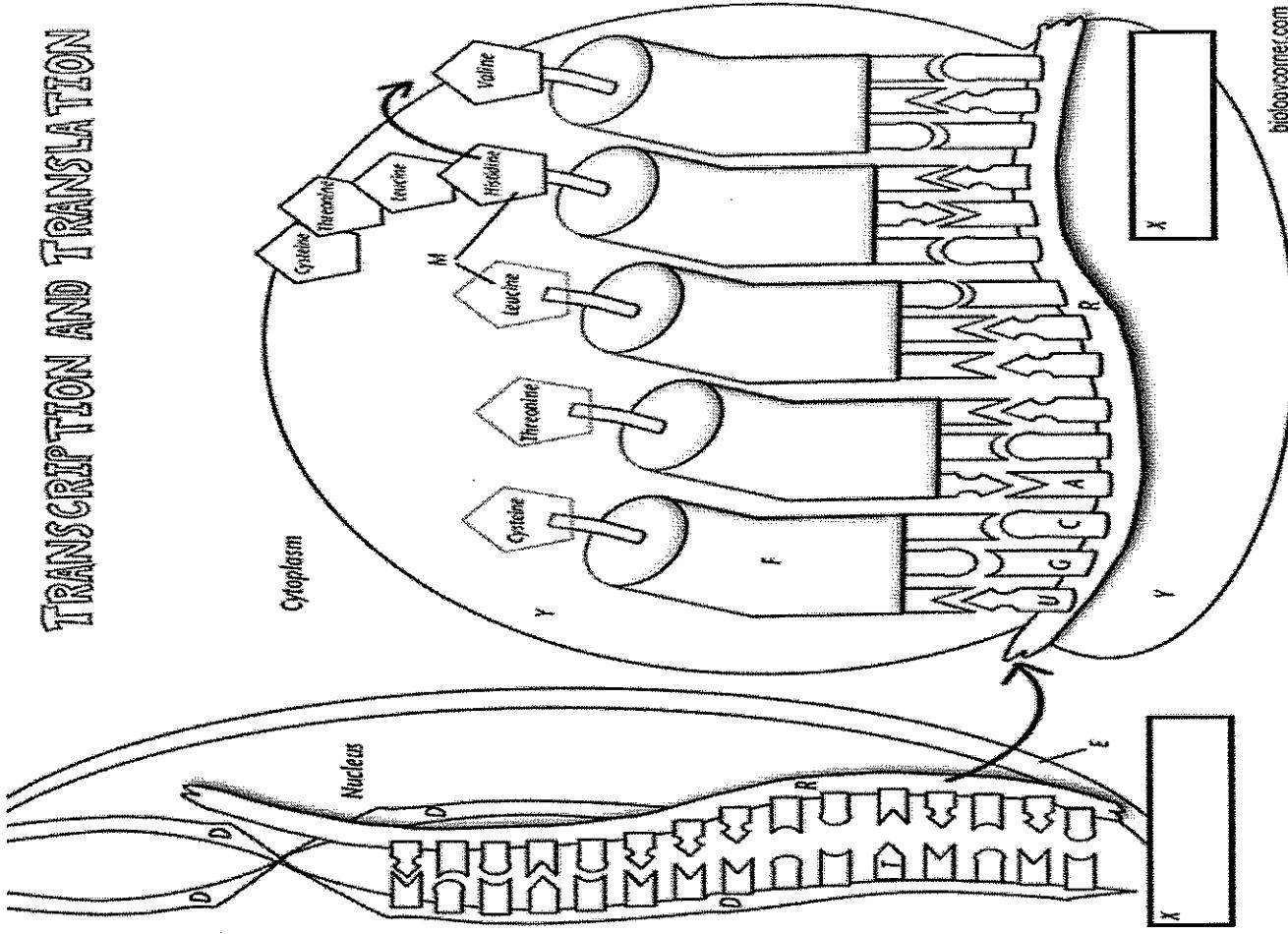
An ecosystem is a natural unit consisting of all the living organisms in an area functioning together with all the nonliving physical factors of the environment. The concept of an ecosystem can apply to units of different sizes. For example, a large body of fresh water could be considered an ecosystem, and so could a small piece of dead wood. Both contain a community of species that interact with one another and with the abiotic components of their environment. Like most natural systems, ecosystems are not closed, at least not in terms of energy. Ecosystems depend on continuous inputs of energy from outside the system. Most ecosystems obtain energy from sunlight. Some obtain energy from chemical compounds. In contrast to energy, matter is recycled in ecosystems. Elements such as carbon and nitrogen, which are needed by living organisms, are used over and over again.

Niche

One of the most important ideas associated with ecosystems is the niche concept. A niche refers to the role of a species in its ecosystem. It includes all the ways species' members interact with the abiotic and biotic components of the ecosystem. Two important aspects of a species' niche include the food it eats and how it obtains the food.

Habitat

Another aspect of a species' niche is its habitat. A species' habitat is the physical environment to which it has become adapted and in which it can survive. A habitat is generally described in terms of abiotic factors, such as the average amount of sunlight received each day, the range of annual temperatures, and average yearly rainfall. These and other factors in a habitat determine many of the traits of the organisms that can survive there. Consider a habitat with very low temperatures. Mammals that live in the habitat must have insulation to help them stay warm. Otherwise, their body temperature will drop to a level that is too low for survival. Species that live in these habitats have evolved fur, blubber, and other traits that provide insulation in order for them to survive in the cold. Human destruction of habitats is the major factor causing other species to decrease and become endangered or go extinct. Small habitats can support only small populations of organisms. Small populations are more susceptible to being wiped out by catastrophic events from which a large population could bounce back.



Amino Acid Wheel

Plan a controlled experiment to answer the question below. You may use any materials and equipment in your procedure. Be sure your procedure includes:

• logical steps to do the experiment

- two controlled (kept the same) variables
 - one manipulated (independent) variable
 - one responding (dependent) variable
 - how often measurements

Question: What is the effect of the temperature of potato juice on the time for bubbling to stop after hydrogen peroxide is added?

Procedure:

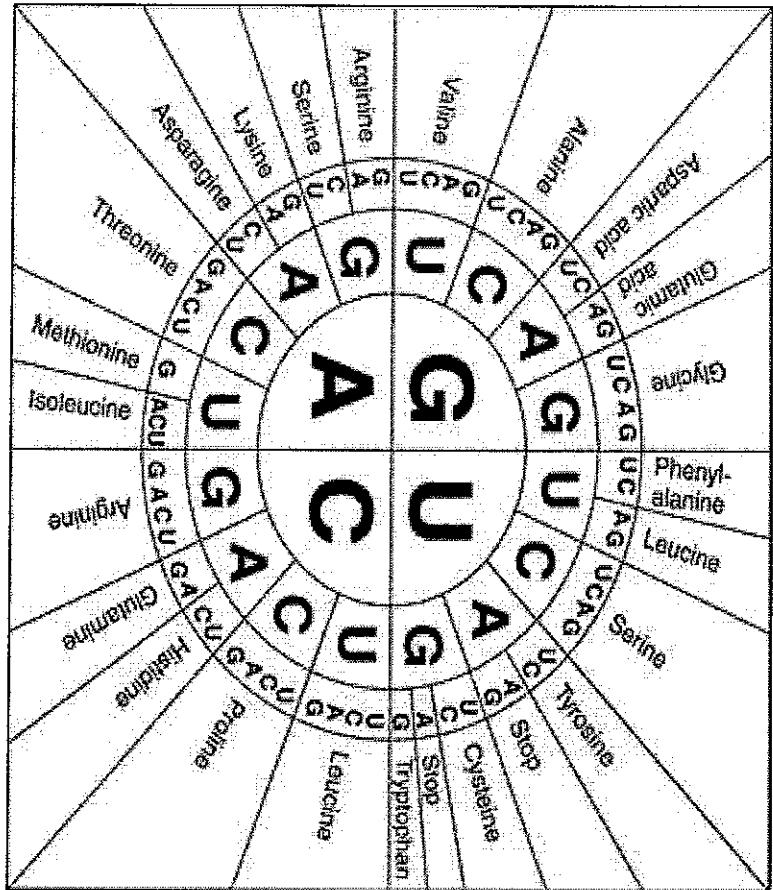
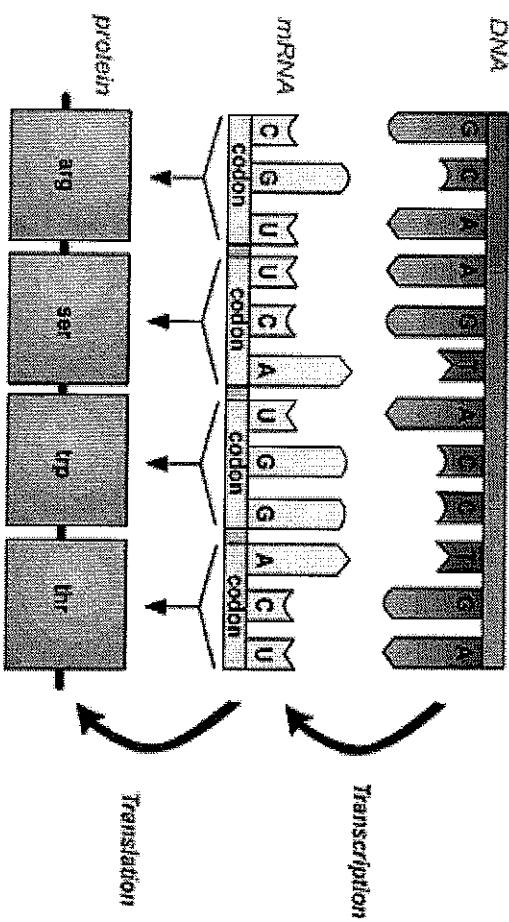


Diagram of Protein Synthesis



Write a conclusion for this controlled experiment.

In your conclusion, be sure to:

- Answer the experimental question.
- Include **supporting** data from the Acidity of Potato Juice vs. Volume of Foam table.
- Explain how these data **support** your conclusion.
- Provide a **scientific** explanation for the trend in the data.

Question:

What is the effect of the acidity of potato juice on the volume of foam produced when hydrogen peroxide is added to potato juice?

1. Complete the table below in order to compare the DNA for the *Normal Hemoglobin Gene* vs. the *Sickle Cell Hemoglobin Gene*.

Normal Hemoglobin Gene	CAC GTA GAC TGA GGA CTC				
Transcription	Codon 1	Codon 2	Codon 3	Codon 4	Codon 5
mRNA					
Translation	Amino acid 1	Amino acid 2	Amino acid 3	Amino acid 4	Amino acid 5

Sickle Cell Hemoglobin Gene	CAC GTA GAC TGA GGA CAC				
Transcription	Codon 1	Codon 2	Codon 3	Codon 4	Codon 5
mRNA					
Translation	Amino acid 1	Amino acid 2	Amino acid 3	Amino acid 4	Amino acid 5

What is the difference in the amino acid sequence of the hemoglobin molecules synthesized by translating the sickle cell vs. the normal hemoglobin?

Below is information regarding the differences between the normal and sickle cell hemoglobin alleles which result in different proteins.

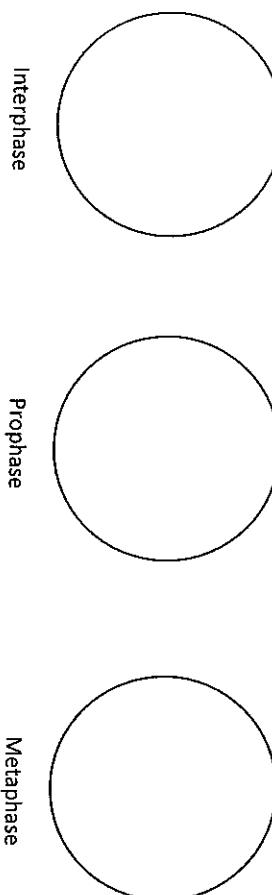
- The *Normal Hemoglobin Gene* has a codon 6 of TCT.
- The *Sickle Cell Hemoglobin Gene* has a codon 6 of TAC.

Mitosis & Meiosis

Cell Cycle: are the processes, stages and duration for which cells replicate and grow.
Match the stages with their description.

- _____ Interphase a. Chromosomes are pulled to opposite poles
- _____ Prophase b. Nuclear membrane forms around chromosomes at each pole
- _____ Metaphase c. Chromosomes duplicate and spindle fibers occur and centrioles move to opposite poles
- _____ Anaphase d. Cytoplasm and other organelles are separated (not considered a part of mitosis)
- _____ Telophase e. Growth phase for cell. Majority of cells life is in this cycle. (not considered a part of mitosis)
- _____ Cytokinesis f. Duplicated chromosomes are lined up in the middle of the cell

Interphase and Mitosis: please use 3 homologous chromosomes and draw the phases of the cell cycle below:



Data:

Acidity of Potatoe Juice (pH)	Volume of Foam (milliliters)			
	Trial 1	Trial 2	Trial 3	Trial 4
6	22	25	25	24
7	32	38	36	35
8	41	42	42	42
9	32	29	30	30

How could Mike and Kelsey be more certain the results of their experiment are reliable?

- o A. Test the reaction with other acidities of potato juice.
- o B. Repeat the experiment the same way.
- o C. Increase the volume of potato juice.
- o D. Use a different type of plant juice.

What did Mike & Kelsey do to make the results of their experiment valid?

- o A. Recorded the volume of foam in milliliters.
- o B. Calculated the average volume of foam for each acidity.
- o C. Measured the volume of foam at each acidity three times.
- o D. Waited three minutes before measuring the volume of foam.

The end product of Mitosis is the formation of two new identical daughter cells for the body (also known as somatic cells). Each cell has the same number of chromosomes and is diploid (2n).

EOC Short Answer Writing Prompt (when)

Foaming Spuds

Directions: Use the following information to answer the following questions.

Mike and Kelsey were studying how hydrogen peroxide (H_2O_2) in cells breaks down to form water and oxygen. When this reaction happens, bubbles of oxygen gas are released, producing foam. This reaction is described as follows:



A protein named *catalase*, found in all cells including potatoes, increases the rate of this reaction. Mike and Kelsey used potato juice as the source of *catalase* to do the following controlled experiment.

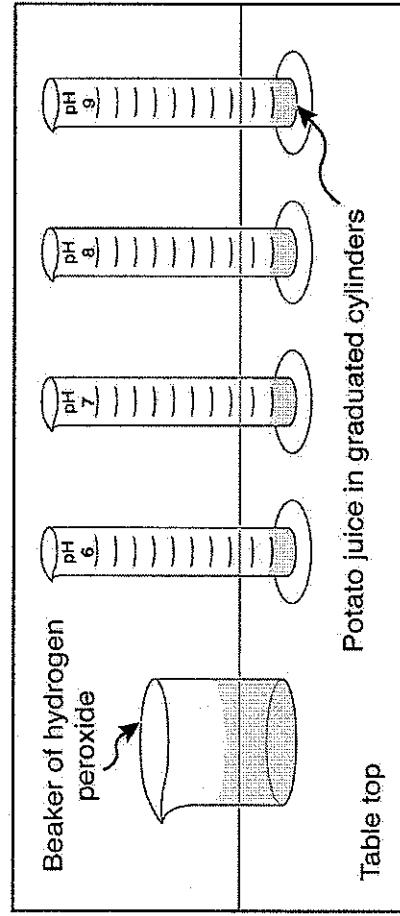
Question: What is the effect of the acidity of potato juice on the volume of foam produced when hydrogen peroxide is added to potato juice?

Prediction: As the acidity of potato juice decreases (higher pH), the volume of foam will increase.

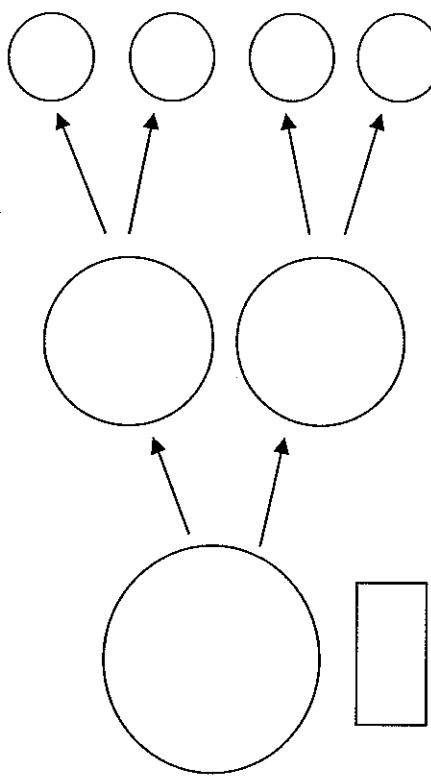
Materials:

- graduated cylinders labeled pH 6, pH 7, pH 8, and pH 9
- potato juice from the same potato, divided and adjusted to four acidities: pH 6, pH 7, pH 8, and pH 9
- hydrogen peroxide (H_2O_2)
- beaker, stopwatch, stirring rods, thermometer

Investigation Setup



Meiosis: is the process of cell division where the cell separates chromosomes twice. It is also called reduction division. Cells go from being diploid ($2n$) to haploid (n). The end result is 4 haploid gametes (also known as sex cells)



Males = 4 sperm
Females = 1 egg + 3 polar bodies

In the boxes / cells above, place the following terms correctly

- Meiosis I
- Meiosis II
- Which cell is $2n$
- Which cells are $1n$

Meiosis is important for genetic variation. Explain how crossing over adds to genetic variation.

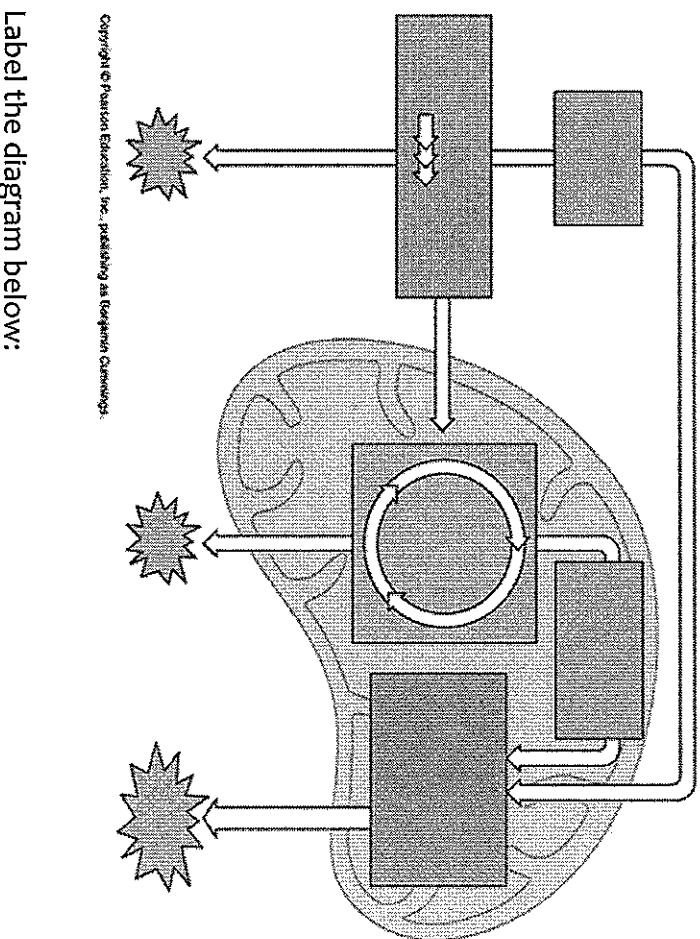
Compare Mitosis and Meiosis by filling in the following chart:

End Product	Mitosis	Meiosis
1n or 2n		
Genetically identical?		
Number of cells		
Crossing over occur?		

Mitosis / Meiosis / Genetics Vocabulary

- | | |
|--------------------|-----------------------------|
| _____ Dominant | _____ Incomplete Dominance |
| _____ Recessive | _____ Codominance |
| _____ Allele | _____ Sex-Linked Traits |
| _____ Gene | _____ Polygenic Traits |
| _____ Heterozygous | _____ Multiple Alleles |
| _____ Genotype | _____ Diploid |
| _____ Phenotype | _____ Haploid |
| _____ Tetrad | _____ Homologous Chromosome |
| _____ Somatic | _____ Sister Chromatid |
- A. 2 different alleles for a particular trait
- B. Situation in which one allele is not completely dominant over another; pink flower
- C. Characteristics of a gene; different form of a gene
- D. 2 copies/sets of each chromosome ($n=$ number of sets of chromosomes)
- E. Non-sex cell; 46 chromosomes
- F. Traits controlled by more than one gene
- G. Sequence of DNA that codes for a protein; determines trait
- H. Chromosomes that have a corresponding chromosomes; 1 from mom, 1 from dad
- I. Genetic makeup of an organism; uses letters
- J. 2 identical copies of a single chromosome; connected by a centromere
- K. Prominent allele for a trait; uses capital letter(s)
- L. Genes with more than 2 alleles
- M. Egg & sperm; mature reproductive cell; 23 chromosomes
- N. Physical characteristic of an organism; what is seen
- O. 1 copy/set of each chromosome; ($n=$ number of sets of chromosomes)
- P. Non-prominent allele for a trait; uses lower case letter(s)
- Q. Situation in which both alleles of a gene contribute to the phenotype
- R. Structure containing 4 chromatids that form during meiosis
- S. Traits located on the X chromosome; color blindness
- T. Same type of alleles; 2 identical alleles for a particular trait

Label the diagram below:



19. Write the equation for cellular respiration, including the formula and name (i.e. $C_6H_{12}O_6$ = glucose), and label the products, reactants, inputs, outputs.

Positive and Negative Feedback

This is the official way to cover this right before the test but here are the standards needed
 Feedback is a process in which changing one quantity changes a second quantity, and the change in the second quantity in turn changes the first.

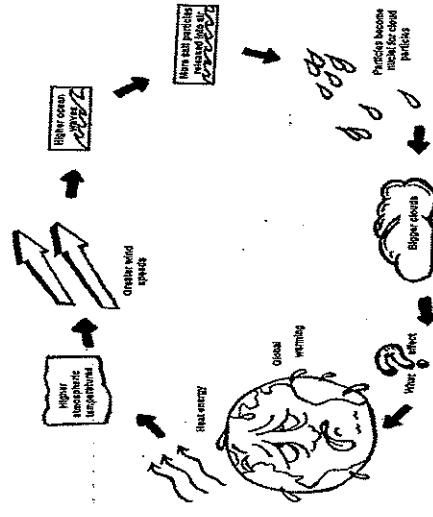
Definitions:

Positive Feedback: A process in which the effects of a disturbance on a system include an increase in the magnitude of the perturbation. That is, *A produces more of B which in turn produces more of A.*

Negative Feedback: A process in which the effects of a disturbance on a system include a decrease or maintenance of the original system.

Examples:

Analyzing a Feedback Mechanism



Positive Feedback:

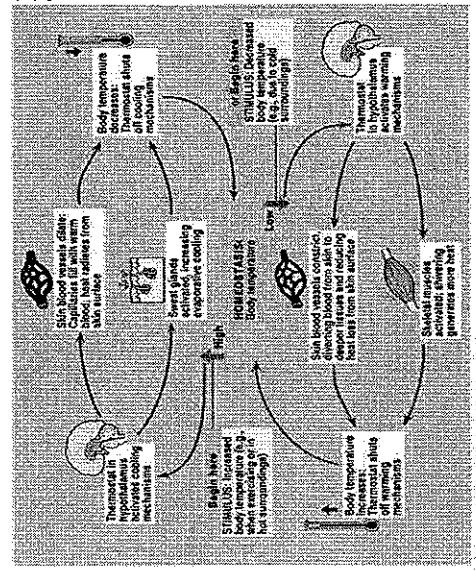
Feedback is important in the study of global warming because it may amplify or diminish the effect of a particular process. The global warming feedback is indicated by higher temperatures causes polar ice caps to melt. Reflective surface of energy is reduced. More heat energy is absorbed and global temperature increases.

- Draw a picture representing the process of cellular respiration.

20. Write the equation for photosynthesis, including the formula and name (i.e. $C_6H_{12}O_6$ – glucose), and label the products, reactants, inputs, outputs.

- Draw a picture representing the process of photosynthesis.

21. What is the difference between ATP and ADP (i.e. energy stored or released).

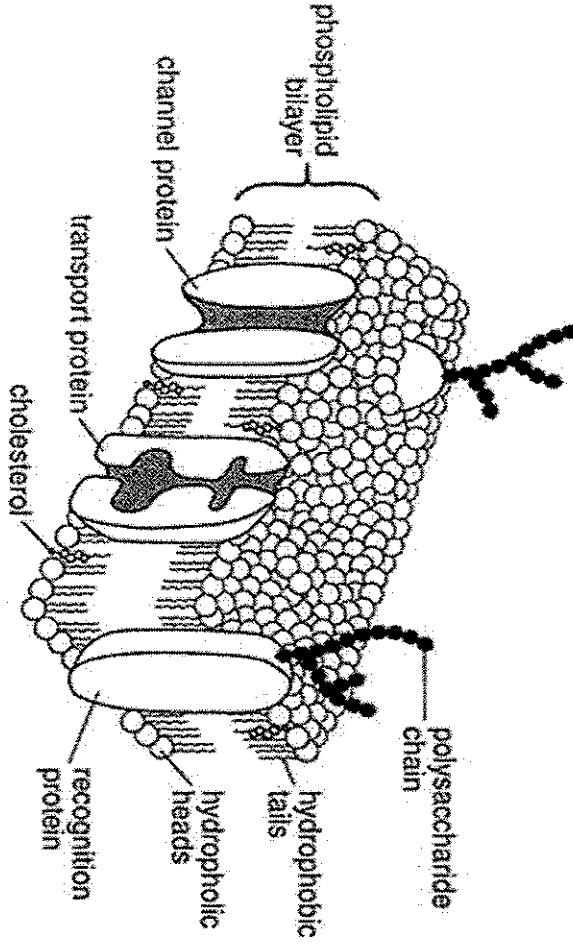


Negative Feedback:
 The body's homeostatically controlled systems are maintained by negative feedback mechanisms, sometimes called negative feedback loops. In negative feedback, any change or deviation from the normal range of function is opposed, or resisted. The change or deviation in the controlled value initiates responses that bring the function of the organ or structure back to within the normal range.

Cell Membrane

Coloring:

Phospholipid bilayer:	
Hydrophobic heads	orange
Hydrophobic tails	brown
Channel protein	blue
Transport protein	purple
Cholesterol	yellow
Polysaccharide chain	green
Recognition protein	green



Cell Processes: Photosynthesis & Cellular Respiration

Vocab: Match the term with the correct definition

- | | |
|--|--------------------------|
| 1. _____ Aerobic | 10. _____ Mitochondria |
| 2. _____ Anaerobic | 11. _____ Krebs Cycle |
| 3. _____ ATP | 12. _____ Photosynthesis |
| 4. _____ Calorie | 13. _____ Energy |
| 5. _____ Chloroplast | 14. _____ Glucose |
| 6. _____ Carbon dioxide (CO ₂) | 15. _____ Glycolysis |
| 7. _____ Cellular respiration | 16. _____ Light energy |
| 8. _____ Chlorophyll | 17. _____ Input |
| 9. _____ Electron transport chain | 18. _____ Output |

- A. The process in which the energy of sunlight is used to convert water and carbon dioxide into oxygen and high energy sugars
- B. With oxygen
- C. Found in the cytoplasm of most cells and produces enzymes for the metabolic conversion of food to energy
- D. Without oxygen
- E. Green pigment in plants that aid in photosynthesis
- F. A molecule composed of carbon and oxygen; a product of respiration and a reactant in photosynthesis
- G. A 6 carbon monosaccharide produced in plants by photosynthesis; formula C₆H₁₂O₆
- H. 1st step in cellular respiration
- I. Measure of energy required to raise 1 gram of water 1° Celsius
- J. Chemical energy used by organisms; adenosine triphosphate
- K. Organelle used in the process of photosynthesis
- L. 2nd step in cellular respiration
- M. Reactant; heat energy from the sun
- N. Process that releases energy by breaking down food molecules in the presence of oxygen
- O. Light, heat, electricity; ability or power to work
- P. Product; energy for cellular work
- Q. 3rd step in cellular respiration
- R. Plants and other types of organisms use this type of energy from the sun to produce food

(Pg 172)
1) What is the difference between prokaryotes and eukaryotes?

Prokaryotes: _____

Eukaryotes: _____

(Pg 184)
2) What does the lipid bilayer give cell membranes?

Cell Processes: Osmosis & Diffusion

Define the following:

Diffusion:

Osmosis:

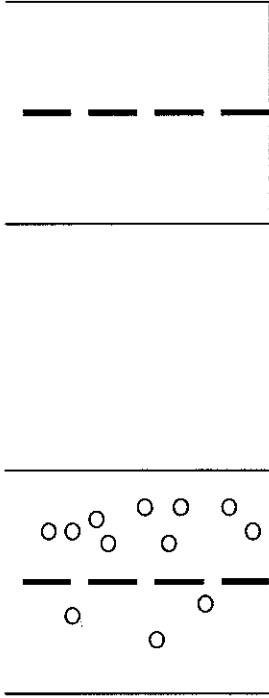
Facilitated Diffusion:

Active Transport:

Fill in the chart below:

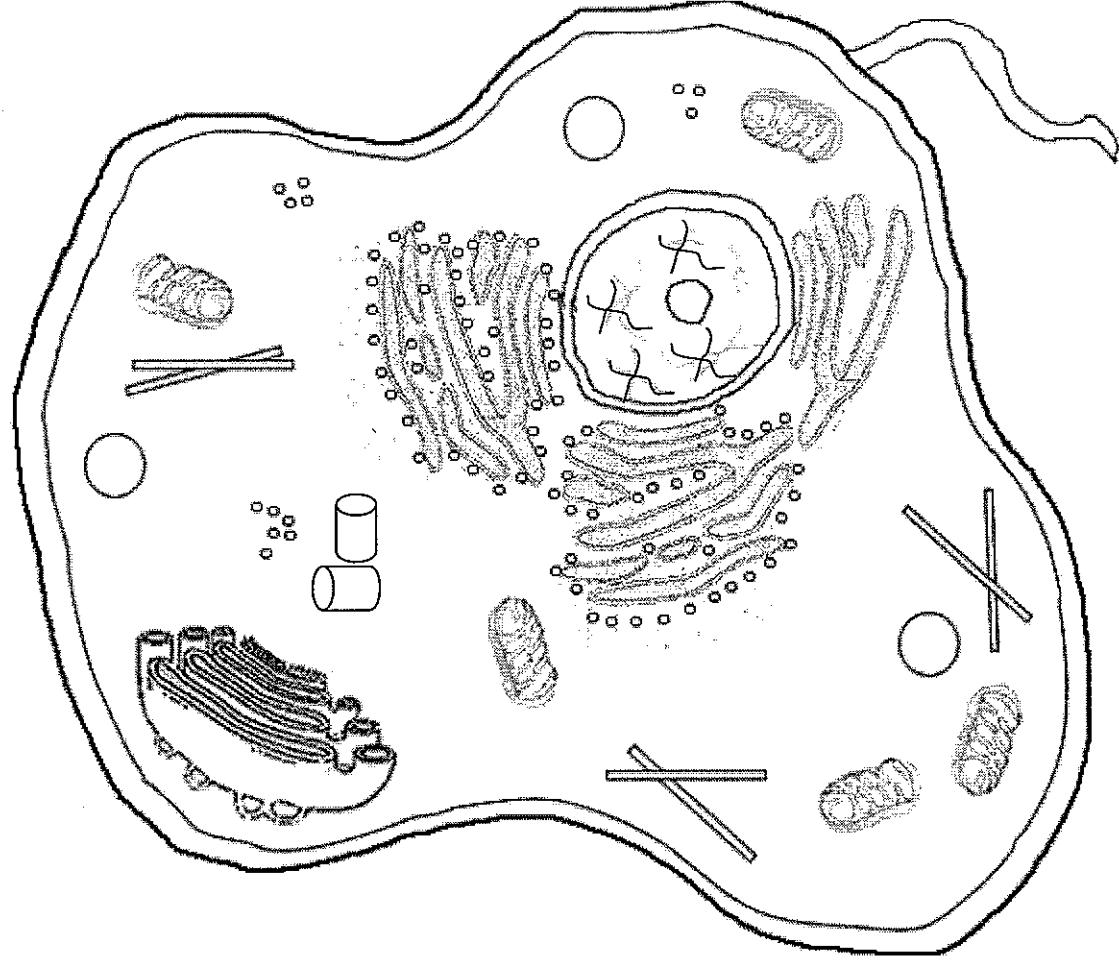
Mechanism	Energy Required? or No Energy Required?
Diffusion	
Facilitated diffusion	
Osmosis	
Active transport	

Consider the solution in the drawing below with the two sides divided by a semi-permeable membrane. In the blank drawing on the right, show how the solution would look like once it reached equilibrium:



Animal Cell
Color each part of the cell its designated color:

- Cell membrane – light brown
- Nuclear membrane – dark brown
- Golgi apparatus – light blue
- Rough endoplasmic reticulum – dark blue
- Smooth endoplasmic reticulum – orange
- Flagella – dark green polka-dots
- Microtubules – dark green
- Centrioles – black polka-dots
- Nucleolus – black striped
- Ribosome – red
- Mitochondria – yellow
- Lysosome – purple striped
- Cytoplasm – white
- Chromosomes – multi colored

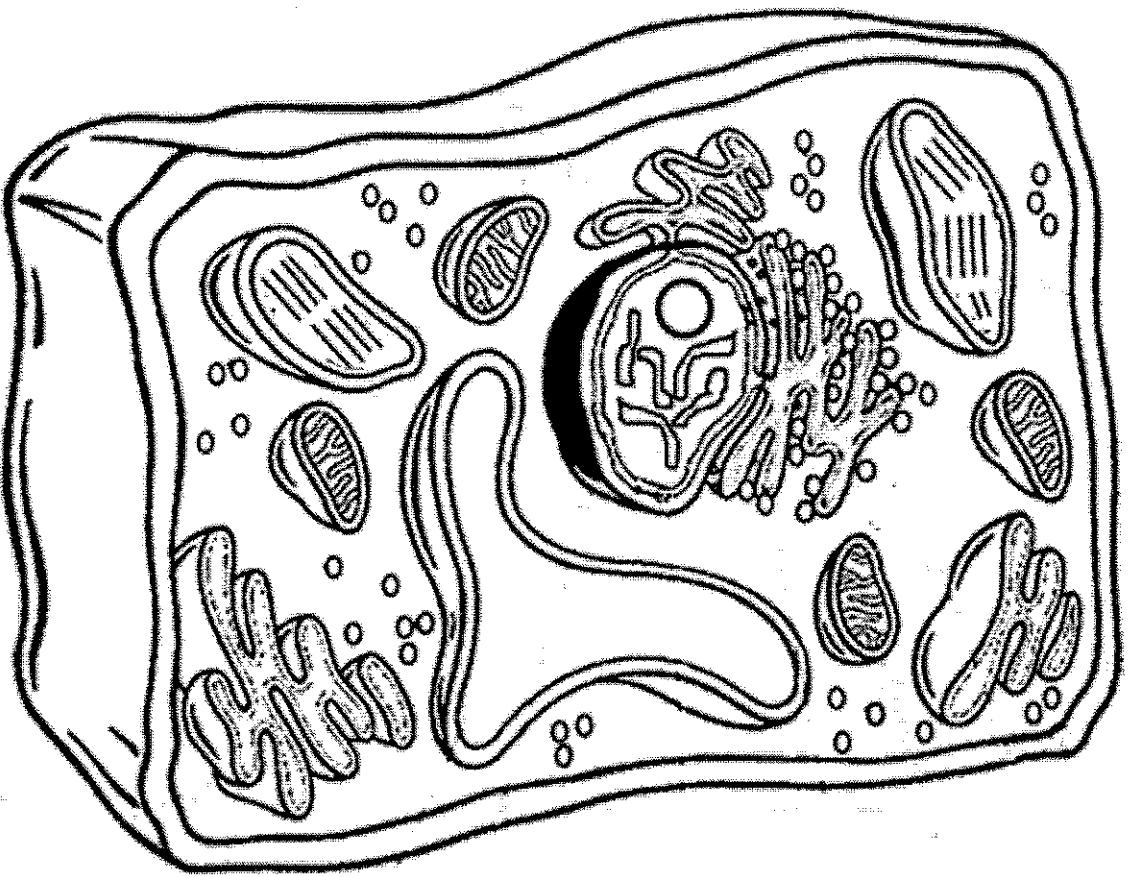


Use the same colors as you did for the animal cell color and add:

Cell wall — purple
Vacuole — black

Plant Cell:

Use Pgs 170-184 to complete the matching:



- A. Use the energy from sunlight to make energy rich foods molecules in plants
- B. Whip-like structure used for movement
- C. Attach carbohydrates and proteins to lipids
- D. Solution that suspends the organelles of the cell
- E. Double layered membrane with pores; surrounds nucleus
- F. Contain spindle fibers which guide chromosomes during division
- G. Ribosomes stud its surface; proteins are chemically modified
- H. Filled with enzymes; takes out the trash
- I. Store water, salts, proteins and carbohydrates
- J. Assembly of ribosomes begin here; dense region in the nucleus
- K. Thin flexible barrier around the cell; lipid bilayer
- L. Helps the cell maintain its shape; microtubules, microfilaments
- M. Contains a collection of enzymes; synthesis of lipids
- N. Make proteins
- O. Supports and protects the cell; not found in animal cells
- P. Threadlike structures that contain genetic material
- Q. Use energy from food to make high energy compounds