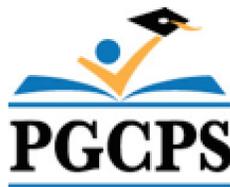
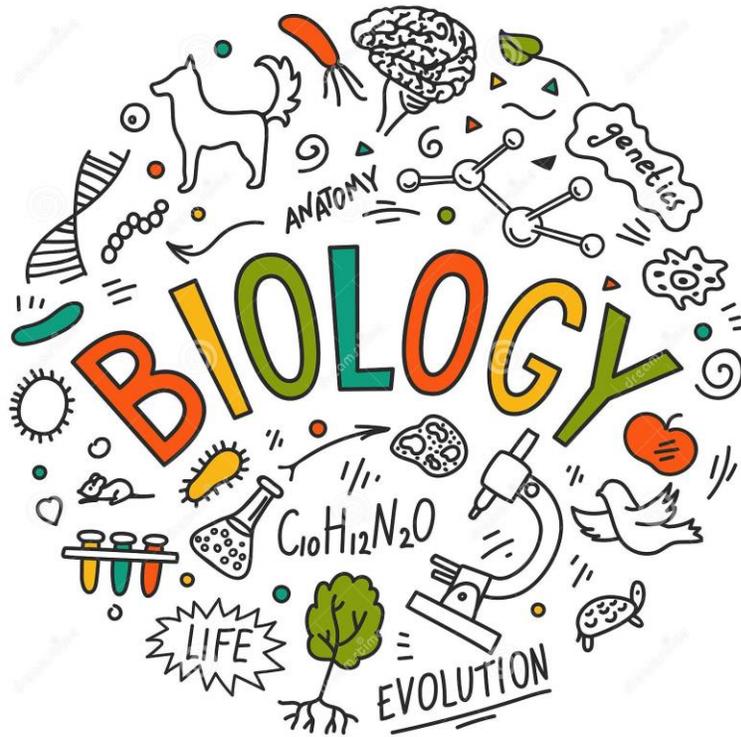


Summer Enrichment Packet for Rising Biology Students



PRINCE GEORGE'S COUNTY PUBLIC SCHOOLS
Division of Academics
Department of Curriculum and Instruction

Note to Students:

You've learned so much in school this year! It is important that you continue to engage in science content and practices over the summer to help prepare you for a rigorous biology course next school year. In this packet, you will find weekly activities for the Summer Break.

Student Directions: The calendars provided are snapshots of the activities and assignments. Some of the assignments are to be completed entirely in your science journal, while for other assignments there are detailed information and directions provided on subsequent pages in this packet. Use the calendars to pace out the tasks. As a suggestion, you may wish to check off each assignment as it is completed. You should begin working on the activities the following Monday after school closes.

Science Journal: You will need your Evidence Notebook to record brief constructed responses, extended responses, exploration ideas, flowcharts, and diagrams, etc. If you do not have your Evidence Notebook, then you will need to create a science journal to record your information.

- Create a science journal by stapling several pieces of paper together or use a notebook or binder with paper.

- Each journal entry should:
 - Have the title of the activity.
 - Have a clear and complete answer (to each question) that explains your thinking.
 - Be neat and organized.

June Activities

June Activities			
Week One Thinking Like A Scientist	Days 1 and 2 <input type="checkbox"/> Claim, Evidence, and Reasoning (C-E-R)	Day 3 <input type="checkbox"/> Controls and Variables	Days 4 and 5 <input type="checkbox"/> Experimental Design
Week Two Science and Engineering Practices	Days 1 and 2 <input type="checkbox"/> Analyzing Data	Days 3 and 4 <input type="checkbox"/> Scientific Processes: Causal Questions	Day 5 <input type="checkbox"/> Scientific Inquiry

July Activities

Week Three Cell Structure and Function (Part I)	Days 1 and 2 <input type="checkbox"/> Plant and Animal Cells	Day 3 <input type="checkbox"/> Looking Inside Cells: Identifying Organelles	Days 4 and 5 <input type="checkbox"/> In your science journal, draw and label a plant cell and an animal cell. <input type="checkbox"/> Create a graphic organizer to compare/contrast plant and animal cells
Week Four Cell Structure and Function (Part II)	Days 1 and 2 <input type="checkbox"/> Modeling Cell Structures	Days 3 and 4 <input type="checkbox"/> Organ and Tissue Transplants: Thinking About Autografts	Day 5 <input type="checkbox"/> Read and annotate the article, <i>Are They Plants or Animals?</i> <input type="checkbox"/> Write a summary of the article in your science journal.
Week Five Photosynthesis and Respiration	Day 1 <input type="checkbox"/> Photosynthesis <input type="checkbox"/> Energy	Days 2 and 3 <input type="checkbox"/> Respiration	Days 4 and 5 <input type="checkbox"/> In your science journal, compare/contrast photosynthesis and respiration. Use a graphic organizer to record your information.
Week Six Cell Processes and Energy (Part I)	Days 1 and 2 <input type="checkbox"/> The Cell Cycle and Mitosis	Days 3 and 4 <input type="checkbox"/> * <i>Mitosis Tutorial</i> https://tinyurl.com/tutorial-mitosis	Day 5 <input type="checkbox"/> Read and annotate the article, <i>Getting to Know: Meiosis.</i> <input type="checkbox"/> Write a summary of the article in your science journal.

August Activities

Week Seven Cell Processes (Part II)	Days 1 and 2 <input type="checkbox"/> Describe and diagram the process of meiosis. Complete Part I of the ** <i>Meiosis Virtual Lab.</i> <input type="checkbox"/> https://tinyurl.com/Meiosis-Virtual-Lab	Days 3 and 4 <input type="checkbox"/> Complete Parts 2-4 ** <i>Meiosis Virtual Lab.</i> https://tinyurl.com/Meiosis-Virtual-Lab	Day 5 <input type="checkbox"/> In your science journal, draw a three-way Venn Diagram to compare/contrast mitosis and meiosis
Week Eight Energy in Ecosystems	Days 1 and 2 <input type="checkbox"/> Food Chains and Food Webs	Day 3 <input type="checkbox"/> Trophic Levels	Days 4 and 5 <input type="checkbox"/> Energy Pyramid

References/Links:

*Mitosis Tutorial (Week Six) – <https://tinyurl.com/tutorial-mitosis>

**Meiosis Virtual Lab (Week Seven) – <https://tinyurl.com/Meiosis-Virtual-Lab>

Week 1 – Focus: Thinking Like A Scientist

Claims, Evidence, and Reasoning (C-E-R)

Claim: a statement about the solution to a problem – what you think you know

Evidence: scientific data to support your claim – measurable

Reasoning: justification of how your evidence supports your claim (using scientific principles)

Directions: Find the Claim, Evidence, and Reasoning in the following paragraphs: Underline the Claim; Circle the Evidence; and put a box around the Reasoning.

1. A common type of asexual reproduction found in nature is called Mitosis. Mitosis requires less energy than sexual reproduction does. Mitosis can occur in seconds and does not require a mate to reproduce. Sexual reproduction requires two compatible parents. It also requires time to produce the egg and sperm cells and then for fertilization to occur. Energy is required to find a compatible mate, produce sex cells, and for fertilization.

Therefore, Mitosis requires less energy than sexual reproduction does.

2. Cold air weighs more than hot air. When I filled a 9-centimeter diameter balloon with cold air, it weighed 1 gram and when I weighed the same size balloon with hot air, it weighed 0.5 grams. When molecules are cooled, they move closer together and when they are heated up, they move farther apart. Because of this more molecules can fit into a balloon when the air going in is cold than when the air going in is warm.

Directions: Identify your own Claim, Evidence, and Reasoning in items below.

3. Brianna wanted to compare the densities of two different solids of the same size 6cm³ (same volume) to see which one was denser. Solid A had a mass of 2 grams and Solid B had a mass of 0.5 grams. (Density = Mass/volume)

Claim:

Evidence:

Reasoning:

4. Sammy wants to see if plants really do grow better in sunlight. He uses 3 plants of the same type and size in 3 locations. Plant A is placed on Mrs. Shaw's countertop in the center of the room; Plant B is placed inside the cabinet; and Plant C was placed near windowsill. After 5 days, Sammy measures the growth of each plant and documents it in the table to the right.

	Height on Day 1	Height on Day 5
Plant A	12 cm	14 cm
Plant B	12 cm	13 cm
Plant C	12 cm	16 cm

Claim:

Evidence:

Reasoning:

C-E-R: Identifying Liquids

Directions: Use the data table below to complete the C-E-R template in your science journal.

	Density	Color	Mass	Melting Point
Liquid 1	0.93 g/cm ³	No color	38 g	-98 °C
Liquid 2	0.79 g/cm ³	No color	38 g	26 °C
Liquid 3	13.6 g/cm ³	Silver	21 g	-39 °C
Liquid 4	0.93 g/cm ³	No color	16 g	-98 °C

Question: Are any of the liquids in the table the same substance?

C

(Claim)

Write a statement that responds to the question.

E

(Evidence)

Provide at least three pieces of scientific data to support your claim. Your evidence should be appropriate (relevant) and sufficient enough to convince someone that your claim is correct. This can be bullet points instead of sentences.

R

(Reasoning)

Use scientific principles and knowledge that you have about the topic to explain why your evidence (data) supports your claim. (paragraph form)

Controls and Variables

Directions: Read the description for each experiment and answer the following questions in your science journal.

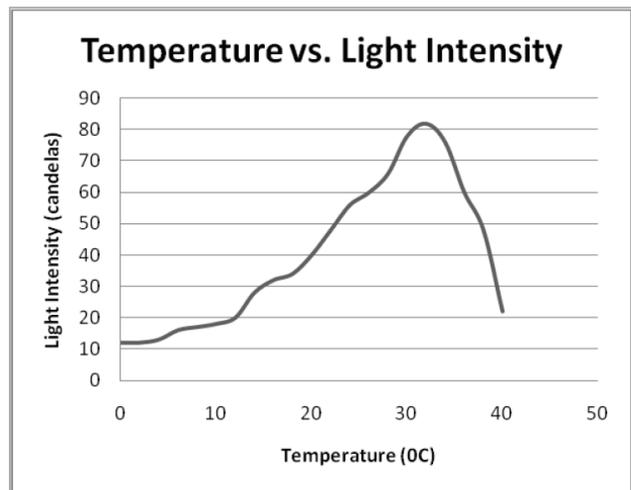
1. Prince Burgers and Fries

Prince Burgers and Fries restaurant has created a new sauce that allegedly will reduce the production of body gas associated with eating its gourmet burgers. The manager at the restaurant, Sheila E., recruits 100 customers with a history of gas problems. She has 50 of them (Group A) eat gourmet burgers with the new sauce. The other 50 (Group B) eat gourmet burgers with sauce that looks just like new sauce but is really just a mixture of mayonnaise and food coloring. Both groups were told that they were getting the sauce that would reduce gas production. Two hours after eating the gourmet burgers, 30 customers in Group A reported having fewer gas problems and 8 customers in Group B reported having fewer gas problems.

- A. Which people are in the control group?
- B. What is the independent variable?
- C. What is the dependent variable?
- D. What should the restaurant's conclusion be?

2. Use the graph on the right to answer the following questions.

- A. What is the independent variable?
- B. What is the dependent variable?



3. Use the chart on the right to answer the following questions.

- A. What is the independent variable?
- B. What is the dependent variable?

Mouse Number	Food	Week 1 Mass Gain	Week 2 Mass Gain	Week 3 Mass Gain
1	Rice	6 g	8 g	14 g
2	Grain	5 g	4 g	9 g
3	Corn	8 g	4 g	12 g
4	Mixture	12 g	8 g	20 g

Experimental Design

Directions: Read the description for each experiment and use your knowledge of scientific processes to respond to the following questions or scenarios in your science journal.

1. Flower Power

Mendel loves to garden and wants to grow lots of white flowers for his friend Daisy. He bought a special Flower Power fertilizer to see if it will help plants produce more flowers. He plants two plants of the same size in separate containers with the same amount of potting soil. He places one plant in a sunny window and waters it every day with fertilized water. He places the other plant on a shelf in a closet and waters it with plain water every other day.

- A. What (if anything) did Mendel do wrong in this experiment? Explain your answer.
- B. What should Mendel do to test the effectiveness of Flower Power fertilizer? Write an experiment.

2. Brainiacs

Marie believed that she could improve her brainpower by eating Super Cranium Snacks. In order to test this hypothesis, she recruited several friends to help her with an experiment. They each ate one snack with every meal daily for three weeks. Each of them took a test before they started eating the snacks, as well as after three weeks.

Participant	Test Results	
	Before Eating Super Cranium Snacks	After Eating Super Cranium Snacks for Three Weeks
Marie	64%	80%
Charles	78%	78%
Rachel	82%	84%
Jonathan	72%	70%

Based on the data provided in the table above, do the Super Cranium Snacks work? Explain your answer.

3. Microwave Miracle

Godfrey believes that fish that eat food exposed to microwaves will become smarter and would be able to swim through a maze faster. He decides to perform an experiment by placing fish food in a microwave for 20 seconds. He has the fish swim through a maze and records the time it takes for each one to make it to the end. He feeds the special food to 10 fish and gives regular food to 10 others. After 1 week, he has the fish swim through the maze again and records the times for each.

- A. What was Godfrey's hypothesis?
- B. Which fish are in the control group?
- C. What is the independent variable?
- D. What is the dependent variable?
- E. Look at the results in the charts. What should Godfrey's conclusion be?

Special Food Group (Time in minutes/seconds)			Regular Food Group (Time in minutes/seconds)		
Fish	Before	After	Fish	Before	After
1	1:06	1:00	1	1:09	1:08
2	1:54	1:20	2	1:45	1:30
3	2:04	1:57	3	2:00	2:05
4	2:15	2:20	4	1:30	1:23
5	1:27	1:20	5	1:28	1:24
6	1:45	1:40	6	2:09	2:00
7	1:00	1:15	7	1:25	1:19
8	1:28	1:26	8	1:00	1:15
9	1:09	1:00	9	2:04	1:57
10	2:00	1:43	10	1:34	1:30

4. Bubble Time

Galen loves bubble gum and would like to be able to blow bigger bubbles than anyone else in the county. To prepare for the PGCPs Big Bubble Contest, he bought four different brands of bubble gum and needs your help to find the brand that creates the biggest bubbles.

Write an experiment to test the bubble power of the bubble gum brands and help Galen win the contest.

Week 2 – Focus: Science and Engineering Practices

Analyzing Data

Directions: Please record your responses to the questions below in your science journal.

1. Mouse Experiment

An experiment studies the effects of an experimental drug on the number of offspring a mother mouse has. 10 female mice are given the drug and then impregnated. The number of mice in their litters is compared to the litters of mice that did not take the drug. Based on the data, what would you conclude about the drug, did it work?

	Number of Babies in Litter									
	Group A (drug)	5	6	4	8	5	2	7	13	12
Group B (control)	4	4	6	6	5	6	4	7	5	3

2. Cow Growth Rates

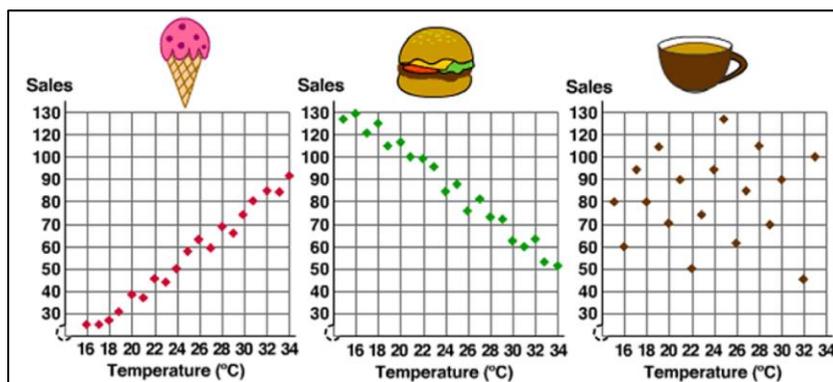
A type of feed claims to boost the growth rate of cows. The feed is tested on two twin newborn cows. Bessie receives the experimental feed, and Bertha receives regular corn feed. Their weights are recorded below.

Month	April	May	June	July	Aug
Bessie	100 lbs	210 lbs	260 lbs	320 lbs	400 lbs
Bertha	100 lbs	250 lbs	290 lbs	340 lbs	400 lbs



- Graph the data; use a dotted line for Bessie and a straight line for Bertha. Make sure you label the X-axis and Y-axis.
- Both cows ended at the same weight, but did the experimental feed change the way they gained weight at all? Describe your conclusions about the experimental feed and explain why it is important that the experiment used twin cows?

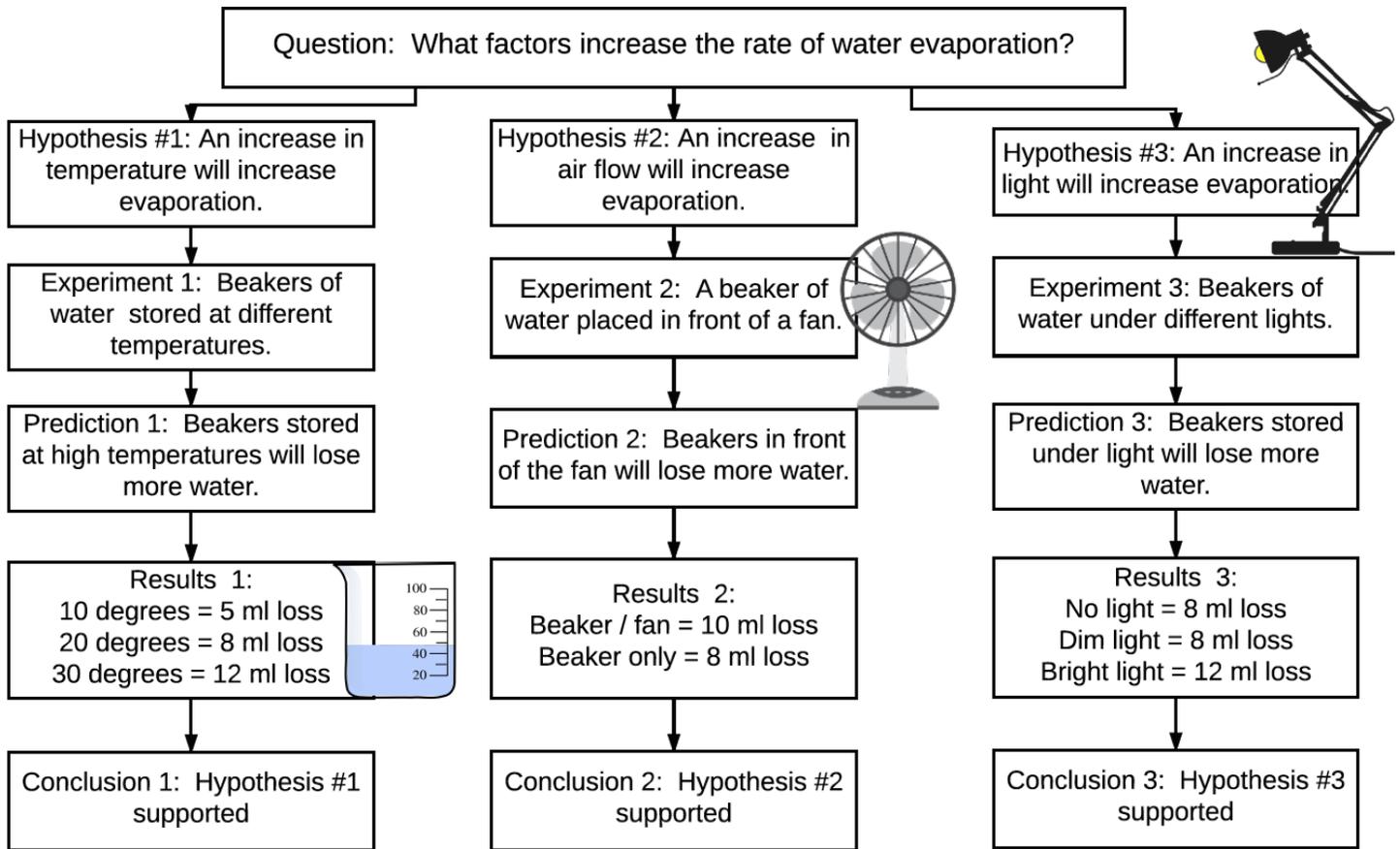
3. Food Sales (Scatterplot)



- A positive correlation occurs when one set of values increases, so does the other set of values. Which food shows a positive correlation between sales and temperature? Which shows no correlation?
- How could a park manager use this type of information?

Scientific Processes: How Can A Causal Question Be Answered?

Directions: Examine the flow chart below that considers a question about water evaporation. Multiple hypotheses are tested and conclusions are drawn from the given results of the experiments. In your science journal, answer the questions regarding the experiments.



1. What are the independent and dependent variables in each of the experiments?
2. What information should be added to the diagram to give the reader a better understanding of how these experiments were conducted?
3. What items should have been CONTROLLED in the experiments?
4. How much confidence would you have in the conclusion of experiment 3 if you found out that the temperature was not controlled? Explain your reasoning.
5. Create your own flow chart to answer a causal question.

Scientific Inquiry in Medicine

By Frank W. Jackson, MD

Science has been a latecomer in the world's history. Up until the 20th century, there was no precise testing of any treatment. If the patient didn't die and did recover, there was acceptance that whatever treatment was given must have worked. Most of what was done for the patient was not helpful, but not harmful either. At times, however, it was dangerous. For instance, our founding father, George Washington, was bled in 1799 when he had pneumonia, undoubtedly hastening his death. In the 1800s things hadn't really changed very much. One main reason was that there were so few good treatments for any medical condition. Even as late as the 1950s, the effective medications were few: the heart medicine digitalis, aspirin, sulfa and another new antibiotic called penicillin, a few toxic diuretics, some hormones, Maalox for indigestion and herbs. Even though there was little to offer (we didn't really know it at the time), patients still came to see physicians and patients did get better.

So what is [Scientific Inquiry]—on which all modern medicine and science are based?

Simply put, it means that a treatment or a hypothesis is subjected to rigorous testing to see if the treatment works or if the hypothesis is true. For example, a scientist hypothesizes that a drug will be effective in treating a certain disease. The fact that the scientist wants to believe it does not make it so. Testing must be done. Sometimes, it doesn't work or it actually makes the patient worse. [The research process allows the scientific community to accumulate information to verify scientific information.] Still, it is the best system we have. All scientists, not just doctors, use this technique in one form or another.

The federal Food and Drug Administration (FDA) uses these scientific guidelines to approve new treatments. So whenever someone or some published article mentions a great treatment for some disease, we need to question the data. Testimonials by individuals don't really mean much. They can sound great but, from a scientific viewpoint, they are almost meaningless. In fact, they may actually be damaging, as there may be a serious underlying problem such as cancer, which is not discovered early.

The FDA does an enormous amount of [regulation]. To the extent possible, they assure us that the food we eat is safe. They brought us the new food labels that provide a great deal of valuable information for the consumer on calories, fat, sodium and other nutrients. They regulate medical devices. We would never buy a heart valve from Best Buy and ask a physician to insert it just because a friend said it was great. Likewise, the FDA regulates the pharmaceutical drug industry [by creating a clear process for science to go through a systematic screening. This screening ensures that devices, drugs, and medical best practices are safe and lives up to their claims.] The public benefits by being assured that the prescription medicines they take and the medical devices used on them have undergone rigorous scientific testing.

Directions: Respond to the following questions in your science journal.

1. According to the author, what are characteristics of scientific inquiry in medicine?
2. Why is rigorous scientific testing required?
3. What do you think would happen if medicine didn't have rigorous scientific testing?
4. What is the FDA and what are some of its responsibilities?
5. Explain what it means to 'regulate' something?
6. Do you think it's a good idea to use scientific processes in medicine? Why or why not?

Week 3 – Focus: Cell Structure and Function (Part I)

Plant and Animal Cells

One of the main differences between plants and animals is usually obvious. Plants are green! But the evidence for this is so tiny you need a microscope to really see it. If you look at a plant cell under a microscope you can see that it has tiny green granules in sacs. These granules are green because they contain the pigment chlorophyll. This pigment absorbs energy from sunlight. This energy is used in an organelle called a chloroplast to make food for the plant. Animal cells do not have chloroplasts or cell walls. Can you think of why this might be? Well, animals cannot make their own food. This is reflected in the fact that they do not have chloroplasts in their cells. Also, animal cells do not have a cell wall because animals do not take on the rigid structures that plants do. Animals have other ways of keeping their shape; some animals have bones. Other animals such as insects have a hard, shell-like covering called an exoskeleton that gives them shape.

Overall, plants and animals have many organelles in common. Both plant and animal cells have organelles to help control, organize, and maintain the cell. These are functions that are mainly done by the cell nucleus, endoplasmic reticulum, cell membrane, cytoplasm, and mitochondria. So even though plants and animals are very different organisms, they have some very similar structures within their cells.

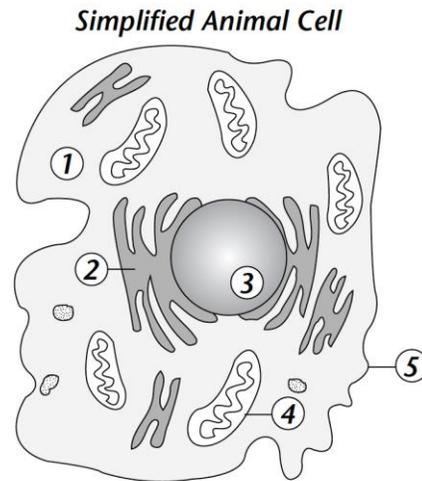
Directions: In your science journal, complete the chart below adding the function and an illustration of each organelle.

Organelle	Function	Illustration
mitochondria		
cell nucleus		
endoplasmic reticulum		
Golgi apparatus		
cell membrane		
cytoplasm		
vacuole		
chloroplast		
cell wall		

Looking Inside Cells

Understanding Main Ideas – Identify each of the cell structures in the figure.

1. _____
2. _____
3. _____
4. _____
5. _____



Building Vocabulary

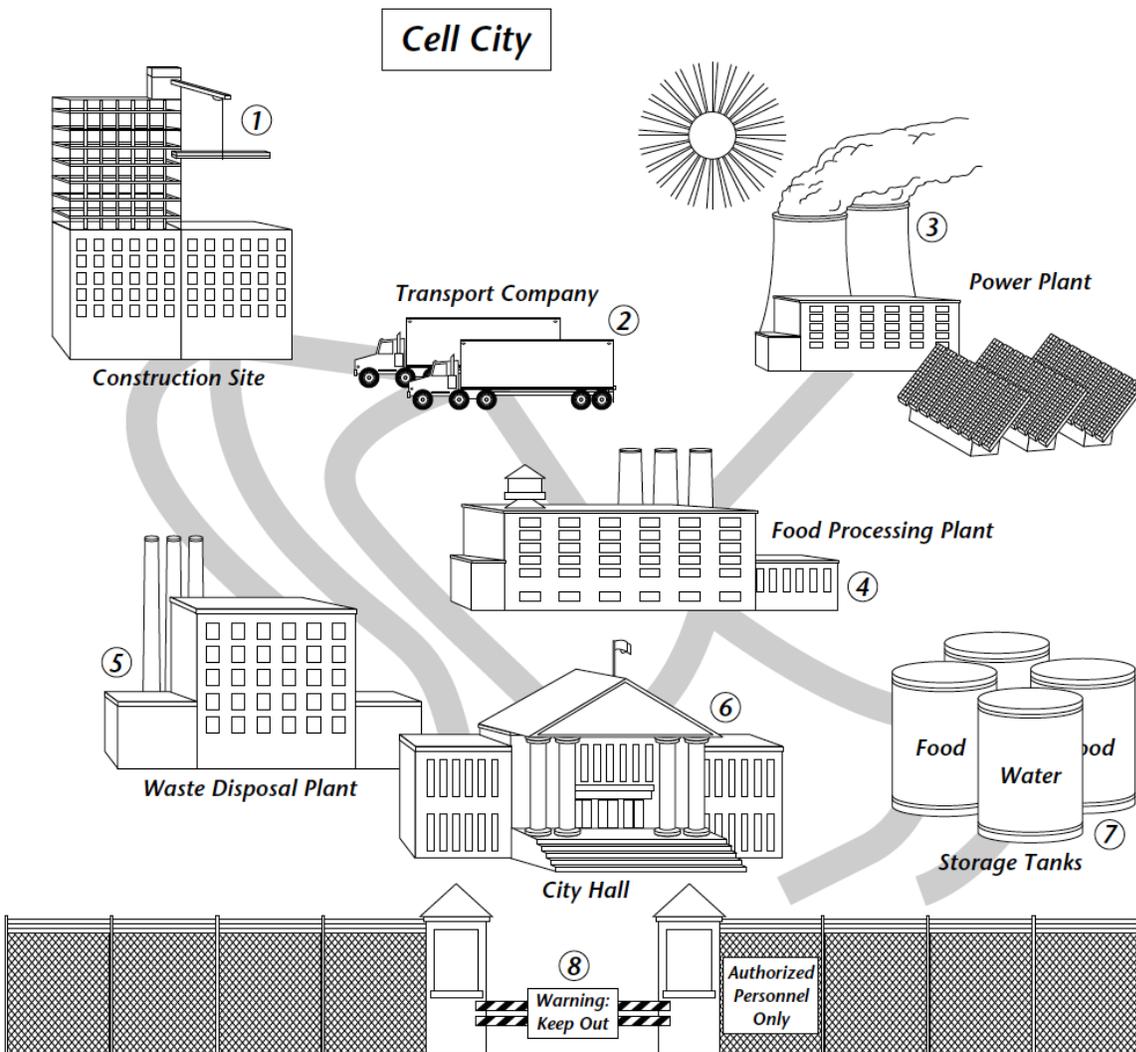
Fill in the blank to complete each statement.

6. _____ are tiny cell structures that carry out specific functions within the cell.
7. The rigid layer of nonliving material that surrounds the cells of plants and other organisms is called the _____.
8. In cells without cell walls, the _____ forms the outside boundary that separates the cell from its environment.
9. The _____ is a large, oval structure that directs all of the cell's activities.
10. The region between the cell membrane and the nucleus is called the _____.
11. _____ produce most of the energy the cell needs to carry out its functions.
12. A maze of passageways called the _____ carries proteins and other materials from one part of the cell to another.

Week 4 – Focus: Cell Structure and Function (Part II)

Modeling Cell Structures

The figure below shows a city that is a model for a cell. Study the figure, and use it to respond to the items that follow.



1. In your journal, state the function performed by each numbered structure in the figure.
2. Now name a cell structure that performs each of these same functions.
3. Does "Cell City" represent a plant cell or an animal cell? Explain your answer.

Organ and Tissue Transplants

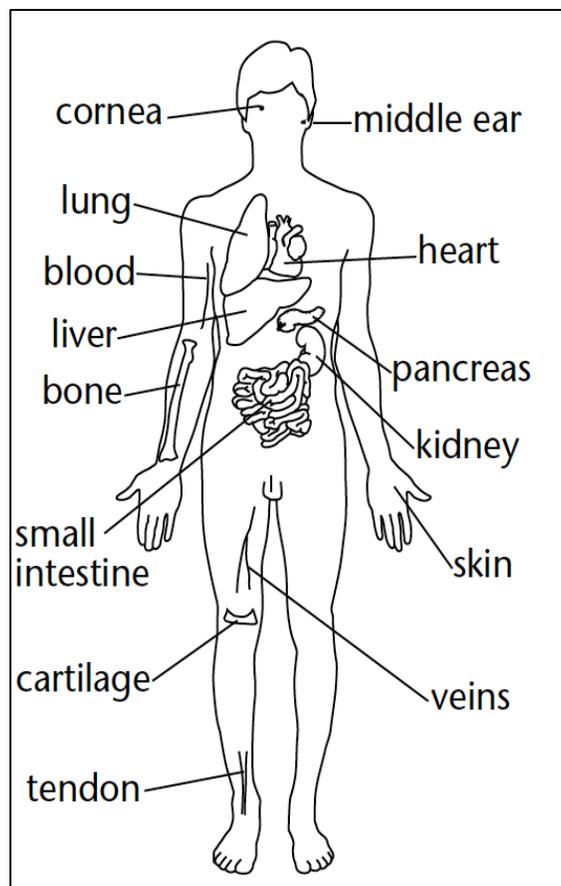
When a doctor performs a transplant operation, he or she replaces a diseased or damaged organ or tissue. Sometimes a tissue is moved from one place to another on the same person. This procedure is called an *autograft*. (*Auto-* means “self,” and *-graft* means “transplant.”) A burn victim may have an autograft in which a section of his or her healthy skin is transplanted to cover the burn.

Sometimes a person receives an organ or tissue from another person. This is called an *allograft*. (*Allo-* means “different.”) An example of an allograft is the transplantation of a kidney from the body of one person into that of another person. One problem with allografts is *rejection*. Rejection occurs when the patient’s body recognizes the transplanted organ or tissues as foreign, similar to the way in which a mother cat recognizes a kitten from another litter as not belonging to her. Rejection is a serious problem because the body begins to attack the transplanted organ or tissue. One way of preventing rejection is by giving the patient certain drugs.

Transplants are performed to save a patient’s life or to correct a serious medical condition. For example, a person with severe liver disease might need a new liver in order to survive. Transplanting a part of the eye called the cornea can help some blind people to see. The illustration shows some of the many organs and tissues that doctors can transplant.

Answer the following questions in your Science Journal.

1. Autografts are never rejected. Why do you think this is true?
2. Why do you think doctors try to use autografts rather than allografts on burn patients?
3. A patient’s body is less likely to reject an allograft if it comes from a close relative. Why do you think this is true?
4. Do you think doctors would have more difficulty transplanting an organ system than transplanting an organ? Think of an example to explain your answer.



Are They Plants or Animals?

www.discoveryeducation.com

Some scientists believe about 2 million different species of plants, animals, and other organisms live on Earth. Other scientists believe the number of species on Earth may be greater than 5 million! New species are constantly being discovered. When a new organism is discovered, biologists try to identify it. Is it a plant, an animal, or some other type of creature? What kind of environment does the organism live in? What kind of conditions help it survive?

Telling the difference between plants and animals may seem simple. Some organisms are more difficult to categorize than others, however. For example, coral do not move. Their bodies are shaped like some plants, and most types of coral must live in sunlight. But coral are animals! Scientists determined this fact by examining coral very closely. They studied the bodies of different species of coral and learned that coral function more like animals than like plants.

Scientists determined that coral are animals by studying coral cells. Cells are the tiny building blocks that make up all living things. Some cells are very simple. Bacteria cells, for example, have only a few parts. We call organisms with these simple types of cells prokaryotic organisms.

Most cells are more complicated. They contain a nucleus and other parts that help the cells obtain energy, reproduce, and carry out other functions. We call organisms made of these complex cells eukaryotic organisms. All plants, animals, algae, and fungi are eukaryotic organisms.

Even though both contain a nucleus, plant cells are very different than animal cells. Animal cells are surrounded by a membrane that allows water and nutrients to pass in and out of the cell. This membrane is similar to a net. The membrane is not stiff or solid, but it can still hold all the cell parts together.

A membrane also surrounds plants cells. However, plant cells also have a sturdy wall around their exterior. This wall around plant cells contains many gaps that allow water and nutrients to pass into and out of the cell. But even with these gaps, cell walls are very strong. Remember that plants do not have skeletons to hold them upright. Instead, plants are held upright by their cell walls.

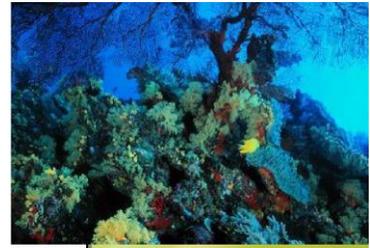
Can you guess what kind of cells scientists discovered in coral? Scientists found cells without walls! This discovery meant that coral were not plants.

Like plants, however, most coral grow best where they receive lots of sunlight. Plants are autotrophic, which means they make their own food. Special parts of a plant's cells use energy from the sun to make food for the plant. Coral cells, however, do not contain these special parts. Coral are heterotrophic; they cannot make their own food.

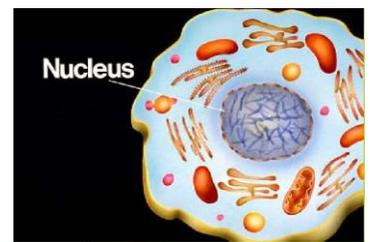
So why do most coral need sunlight? The reason is algae. For most coral, algae are the main source of food. Algae are autotrophic, so they depend on sunlight to survive. Because the coral depend on the algae, most coral grow in shallow water penetrated by sunlight.

Scientists have determined that coral behave like animals in other ways as well. Like most sea animals, coral reproduce by producing egg and sperm cells that join and begin growing. New coral larvae swim to a sunny, shallow area where they can find food. Then the larvae attach to a hard surface and begin forming their skeletons around the surface. Usually at night, the coral reach their tentacles out to pull food into their mouths.

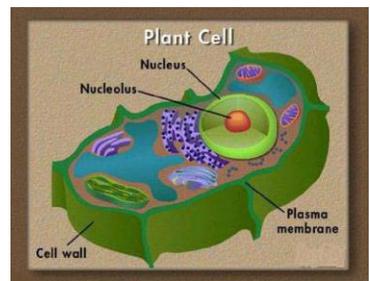
Scientists continue to study coral to learn what factors in their environments help these animals thrive. In the same way, scientists study newly discovered organisms, hoping to learn more about Earth and the creatures that inhabit it.



Coral live in warm, shallow waters of the ocean.



Most eukaryotic cells contain a **nucleus** that directs their growth and reproduction.

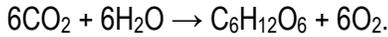


Plant cells contain a cell wall.

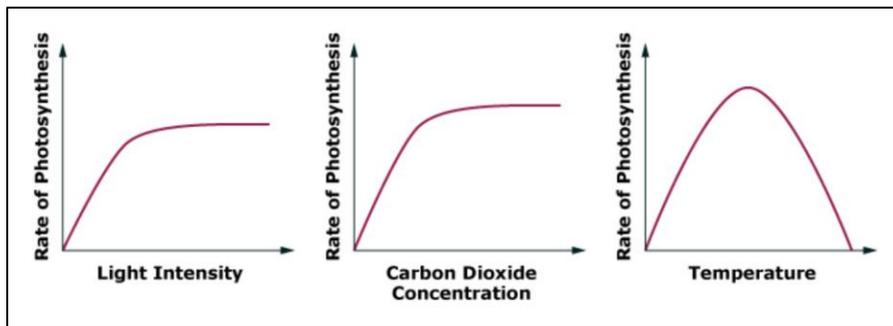
Week 5 – Focus: Photosynthesis and Respiration

Part A

Photosynthesis is a series of complex chemical reactions. These changes involve the making or breaking of molecules to create new substances. A plant takes in carbon dioxide from the air and water from the soil and turns these into a sugar called glucose, releasing oxygen as a byproduct. A plant uses light energy to power these reactions. The equation that follows represents a simplified version of what occurs during photosynthesis:



The graphs below show the effects of different factors on the rate of photosynthesis. Choose the correct word or phrase from each set of parentheses to complete the statements about the data. Write the completed paragraphs in your science journal.



As light intensity and carbon dioxide concentration increase, the rate of photosynthesis initially (increases, decreases, stays the same). This is because light energy and (carbon dioxide, oxygen, chlorophyll) are inputs for the photosynthesis process. Eventually, increasing the light intensity or carbon dioxide concentration (causes no further increase in the, causes a decrease in the, stops the) rate of photosynthesis. This is because the processes involved in photosynthesis are working as efficiently as they can.

As temperature increases, the rate of photosynthesis initially (increases, decreases, stays the same). Eventually, photosynthesis reaches its maximum rate. The temperature increases and causes the rate of photosynthesis to (increase, decrease, stay the same). This is because the processes involved in photosynthesis work best at a particular temperature.

Part B

Photosynthesis plays an important role in maintaining life in most ecosystems on Earth because it has an impact on how organisms obtain their energy. In your science journal, write a claim that supports the idea that photosynthesis helps sustain life on Earth, and support that claim with at least one piece of evidence. Use the rubric below to assist you with your response.

Scale	2	1	0
Criteria			
Makes Claim about Photosynthesis and Supports Claim with Evidence	This response includes both a claim about photosynthesis and its importance, and supports the claim with one piece of factual evidence.	This response either lacks both a claim and a piece of evidence, or contains a faulty claim or irrelevant/faulty evidence.	This response lacks the required components for partial credit.

Respiration

Directions: Fill in the blanks in the table below. Then answer the questions that follow in the spaces provided.

Raw Materials	Products
1.	3.
2.	4.
	5.

6. Where in the cell does the first stage of respiration take place?
7. Where in the cell does the second stage of respiration take place?
8. How does fermentation differ from respiration?
9. Which type of fermentation occurs in yeast?
10. Which type of fermentation sometimes occurs in human muscle cells?

History of Fermentation

People have known about and used fermentation for thousands of years. But it has been only in the past two hundred years that scientists have come to understand this important process. In 1854, the French chemist Louis Pasteur determined that fermentation is caused by yeast. His work was influenced by the earlier work of Theodor Schwann, the German scientist who helped develop the cell theory. Around 1840, Schwann concluded that fermentation is the result of processes that occur in living things. In 1907, a German chemist named Eduard Buchner received the Nobel Prize for showing that enzymes in yeast cells cause fermentation. About two decades later, two other scientists determined exactly how enzymes cause fermentation. Their names are Arthur Harden and Hans Euler-Chelpin, and they won the Nobel Prize for their work in 1929. By the 1940s, technology was developed to use fermentation to produce antibiotics.

is a very useful process. Today it is used to produce industrial chemicals, medicines such as antibiotics, and alcoholic beverages, as well as to make bread rise and to preserve many types of food. Some of these uses have been known for thousands of years. For example, the Chinese used fermented soybean curd to treat skin infections 3,000 years ago, and they started using fermented tea to treat a variety of illnesses as early as 220 B.C. The use of fermentation to make bread rise and to produce alcoholic beverages is as old as the development of agriculture itself, which most scholars date to about 8000 B.C.

Answer following questions/statements in your science journal.

1. Use the information provided in the passage above to make a timeline of the history of fermentation.
2. What contribution did Louis Pasteur make to the understanding of the process of fermentation?
3. What are two of the oldest uses of fermentation?
4. How is fermentation used in medicine today?

Week 6 – Focus: Cell Processes and Energy (Part I)

The Cell Cycle

Directions: Read and annotate the text.

Interphase is the first stage of the cell cycle. Interphase takes place before the cell divides. In the first part of interphase, the cell grows to its full size. The cell also makes all the cell structures and organelles that it needs. In the second part of interphase, the cell makes an exact copy of its DNA molecule in a process called replication. At the end of DNA replication, the cell has two identical sets of DNA, or genetic material. At the end of interphase, the cell makes the structures it will need to divide.

The second stage of the cell cycle is mitosis. Mitosis is the second stage of the cell cycle. Mitosis is the stage when the cell's nucleus divides into two new nuclei. The threadlike DNA shortens and thickens to form chromosomes. Each chromosome is made up of two rods held together. The two rods are made of DNA that is an exact copy of each other. During mitosis, the two chromosome rods separate from each other and move to opposite sides of the cell. At the end of mitosis, a new nucleus forms around each group of chromosomes, creating two new nuclei. Each new nucleus has one copy of DNA.

Cytokinesis is the final stage in the cell cycle. In cytokinesis, the cytoplasm divides. The organelles are divided up between the two new cells. When cytokinesis is over, two new cells, called daughter cells, have formed. Each daughter cell has the same number of chromosomes as the original parent cell. At the end of cytokinesis, each new cell enters interphase. The cell cycle begins again.

Mitosis

Directions: Answer the following questions in your science journal. You can review the steps of mitosis using the online activity located at <https://tinyurl.com/mitosis-review>.

- Which stage does each of the following occur?
 - Chromatin condenses into chromosomes
 - Chromosomes align in center of cell.
 - Nuclear envelope breaks down.
 - Cell is cleaved into two new daughter cells.
 - Daughter chromosomes arrive at the poles.
 - Chromatids are pulled apart

- Onion Root Tip- Online Activity at <https://tinyurl.com/onion-root>

Read the introduction and then click the “next” button. You will have 36 cells to classify. When you’re finished, record your data in the chart below. Round to whole numbers.

	Interphase	Prophase	Metaphase	Anaphase	Telophase	Total
Number of Cells						
Percent of Cells (Calculate: number of cells divided by total cells x 100)						

Weeks 6/7 – Focus: Cell Processes and Energy (Part II)

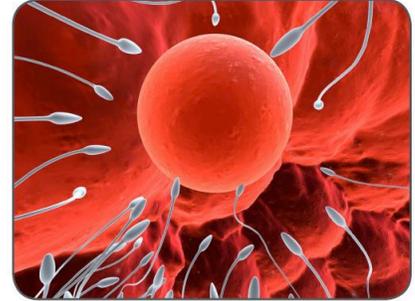
Meiosis

www.discoveryeducation.com

Directions: Read and annotate the text. Summarize the article in your science journal.

Getting to Know: Meiosis

Think about this: your parents each have a complete set of chromosomes. So do you. You inherited genetic material from your father and from your mother. Since this is the case, why don't you have twice as much genetic material as your parents? The answer to this question has to do with the process of meiosis. Meiosis is needed to produce the egg and sperm cell that combine to produce a fertilized egg. This process ensures that egg and sperm cells each have half the number of chromosomes as other cells in the body.



Eggs and sperm are the result of meiosis.

Why is meiosis important?

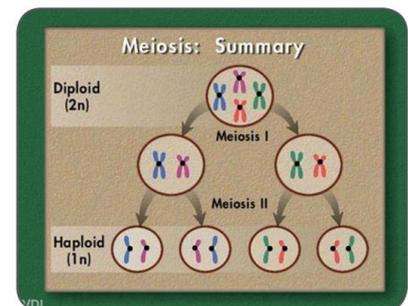
Without meiosis, eggs and sperm could not be made. For example, in humans, adult cells have 46 chromosomes. They are diploid. If two adult cells combined, the new cell would have too many chromosomes. Meiosis is the way that cells divide to reduce the number of chromosomes by half. In humans, meiosis results in cells with 23 chromosomes. These cells form eggs in the female and sperm in the male. When the egg and sperm combine, they form a new cell with 46 chromosomes. Meiosis ensures that all future generations are diploid.

What is the point of meiosis?

Without meiosis, cells could only reproduce asexually. The advantage of meiosis is that it combines the DNA from two individuals. The new combination might express traits or characteristics that were absent in either parent. This is why children are always slightly different from either parent. Meiosis increases genetic diversity in a population. Genetic diversity is important because if the environment changes, a diversity of traits enables adaptation.

What happens during the process of meiosis?

Meiosis takes place in cells in the ovaries in females and in the testicles in males. It involves a complex series of steps. The first step is Meiosis 1, which halves the number of chromosomes. Remember that in a 46-chromosome cell, 23 chromosomes each have a duplicate. One duplicate was from the mother and the other from the father. Before meiosis, the cell's DNA replicates. The result is two exact copies of each of the 23 duplicate chromosomes. The copies are called homologs. In mitosis, the cell at this point divides in two, resulting in two cells identical to the parent. However, during Meiosis 1, the cell does not divide right away. First each of the homologs pairs up and swaps DNA randomly. This chromosomal crossing over, or recombination, is a major reason why offspring are genetically distinct from their parents.



Meiosis involves two cell divisions. After each division, the number of chromosomes is halved.

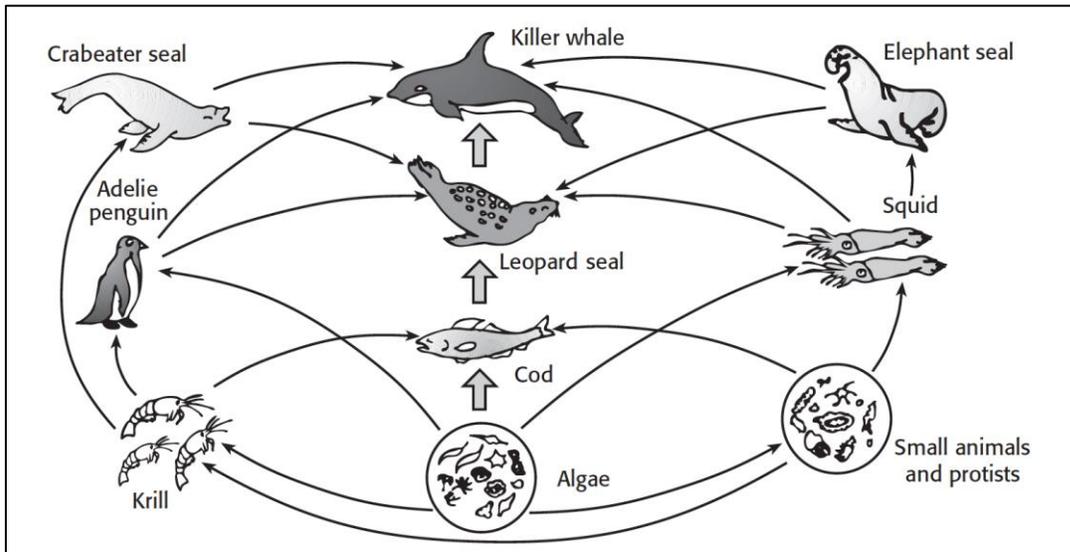
How does a cell halve the number of chromosomes?

After recombination, the chromosomes separate and attach to protein scaffolding inside the cell. The scaffolding then pulls the chromosomes apart. The two resulting cells each contain 23 pairs of chromosomes. During Meiosis 2, these two cells undergo another division. Each pair of chromosomes is separated. The four new cells that result each have only one of the original 23 pairs. The new cell is called a gamete. Because the gamete has only half the number of chromosomes of the diploid cell, it is called haploid.

Week 8 – Energy in Ecosystems

Food Chains and Food Webs

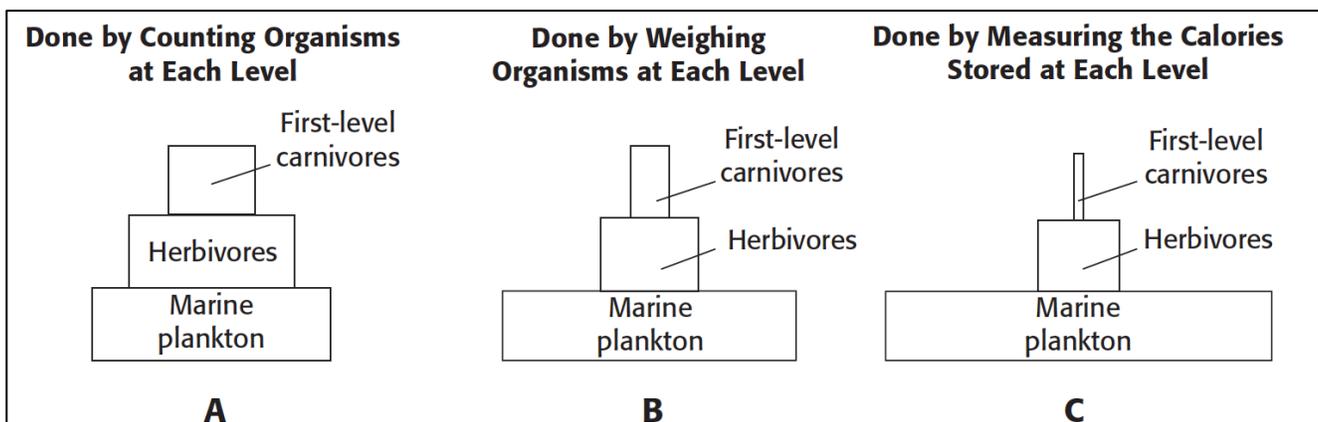
Directions: Use the figure below, which shows the food web of an aquatic ecosystem, to complete the questions/statements below (1-3)



1. In the food web above, there are eight food chains that include krill. In your science journal, identify all of the organisms in the order in which they occur in four of these eight food chains.
2. List all the organisms that eat squid.
3. How many producers are in the food web? Name them.

Trophic Levels

Directions: Use the figures below, which show trophic levels in an ecosystem, to complete items 4–6.



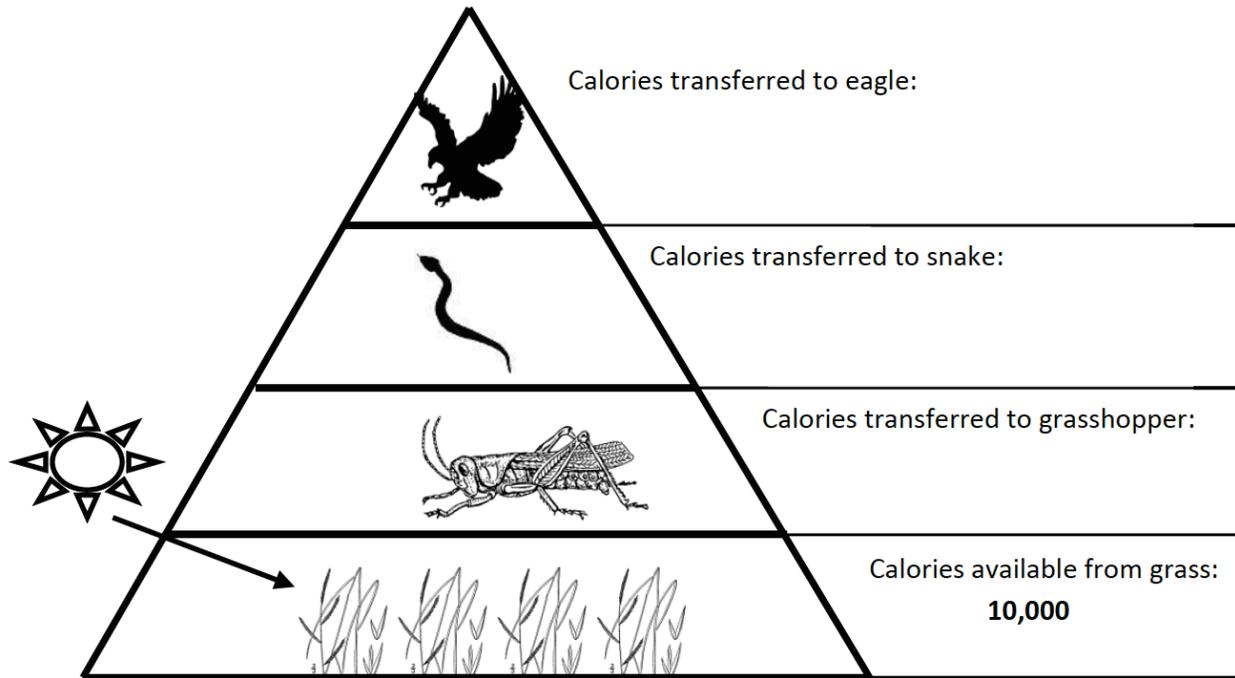
Study the three pyramids above. In the space provided, identify which pyramid is the most accurate indicator of each item below by writing the correct letter (A–C) in the space provided.

- ___ 4. number of individual organisms ___ 5. measurement of productivity ___ 6. measurement of biomass

Energy Pyramid

The amount of available energy at each trophic (feeding) level decreases as it moves through an ecosystem. As little as 10 percent of the energy at any level is transferred up to the next level.

In the energy pyramid below, calculate the amount of energy that is passed up from one trophic level to the next, assuming only 10% of the energy from the previous level is available for the next level.



Answer the following questions in your science journal.

1. Assume that the grasshopper in the food pyramid above must eat half its body weight in grass each day. If an average-size grasshopper weighs 2 grams, and 1 blade of grass weighs 0.1grams (one tenth of a gram), how many blades of grass does the grasshopper need to eat each day?
2. Assume a snake must eat 5 grasshoppers per day, while an eagle must eat 2 snakes per day. Use this information along with your answer from Question #1 to calculate how many blades of grass are needed to keep an eagle alive for a day?
3. How many blades of grass are needed to support a family of four eagles for a week?
4. If only 10% of the energy from one trophic level passes up to the next level, what happens to the 90% energy that is not passed on?
5. Do you think a pyramid is a good shape to represent how matter and energy transfer in an ecosystem? Why or why not?