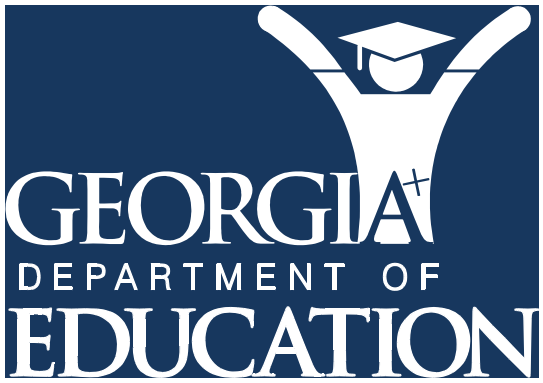


Exam Preparation for Science and Social Studies Program

ExPreSS

June 14 through June 25
2010
TEACHER
Week Two

Georgia High School Graduation Test
Science Content

Cells and Heredity

- Evaluates the nature of the relationships between structures and function in living cells by explaining the roles of cell organelles and by analyzing the function of the four major macromolecules.
- Evaluates how biological traits are passed on to successive generations by comparing and contrasting the roles of DNA and RNA.
- Analyze the role of DNA in storing and transmitting cellular information.
- Explains Mendel's laws and the role of meiosis in reproductive variability.
- Investigates the use of DNA technology in forensics, medicine, and agriculture.
- Derives the relationship between single-celled and multi-celled organisms by analyzing the complexity and organization of organisms in their ability for obtaining, transforming, transporting, releasing, and eliminating the matter and energy used to sustain the organisms.

Ecology

- Describes the interdependence of all organisms on one another and evaluates the relationships among organisms, populations, communities, ecosystems, and biomes.
- Analyzes the flow of matter and energy through ecosystems as components of a food chain or food web.

Structure and Properties of Matter

- Analyzes the structure of the atom in terms of proton, electron, and neutron locations as well as atomic mass, atomic number, atoms with different numbers of neutrons and different numbers of protons.
- Explains properties of solutions.

Energy Transformations

- Distinguishes the characteristics and components of radioactivity and explains the process of half-life as related to radioactive decay.
- Analyzes the atomic/molecular motion of solids, liquids, gases and plasmas.
- Identifies and explains energy transformation within a system.
- Investigates and describes molecular motion as it relates to thermal energy changes in conduction, convection, and radiation.

Forces, Waves, and Electricity

- Analyzes relationships between force, mass, and motion by applying the calculations of velocity and acceleration.
- Evaluates the application of Newton's three laws in everyday situations related to inertia explaining falling objects as related to gravitational force.
- Applies mass and weight to appropriate situations.
- Applies the calculations of work and mechanical advantage to complex systems.
- Analyzes the properties of waves by explaining the transfer of light, heat, and sound energy through the application of wave theory.
- Explains the properties of electricity and magnetism by applying and relating these to electromagnets and simple motors.

Instructional Calendar at a Glance

Day	Content
Monday June 14	**Domain: Cells and Heredity** • Students describe the structures of cells and the structure and function of their components. • Students examine the similarities and differences between prokaryotic and eukaryotic cells.
	Domain: Structure and Properties of Matter • Students describe atoms, understanding the structure of an atom. • Students identify the symbol, atomic number, and atomic mass of the first 20 elements on the periodic table.
Tuesday June 15	**Domain: Cells and Heredity** • Students explain the process of inheritance of genetic traits. ❖ Students differentiate between DNA and RNA, recognizing the role of each in heredity.
	Domain: Structure and Properties of Matter • Students apply the properties of solutions, analyzing solutions in terms of solutes and solvents.
Wednesday June 16	**Domain: Cells and Heredity** • Students analyze the similarities and differences between organisms of different kingdoms.
	Domain: Energy Transformations • Students understand radioactivity. • Students examine the phases of matter and the related atomic and molecular motion.
Thursday June17	**Domain: Cells and Heredity** • Students explain the process of inheritance of genetic traits. ❖ Students demonstrate understanding of Mendel's Laws in genetic inheritance and variability. • Students discuss the use of DNA technology in the fields of medicine and agriculture.
	Domain: Energy Transformations • Students investigate and describe molecular motion as it relates to thermal energy changes in conduction, convection, and radiation. • Students analyze energy transformations and the flow of energy in systems.
Friday June 18	**Domain: Cells and Heredity** • Students differentiate how organisms from different kingdoms obtain, transform, and transport, energy and/or material. • Students understand the relationships between single-celled and multi-celled organisms, on a broad, conceptual level.
	Progress Assessment

Day	Content
Monday June 21	**Domain: Ecology** • Students evaluate relationships between organisms, populations, communities, ecosystems, and biomes.
	Domain: Forces, Waves, and Electricity ▪ Analyzes relationships between force, mass, and motion by applying the calculations of velocity and acceleration.
Tuesday June 22	**Domain: Ecology** • Students describe the flow of matter and energy through an ecosystem by organizing the components of food chains and webs.
	Domain: Forces, Waves, and Electricity ▪ Students evaluate the application of Newton's three laws in everyday situations related to inertia explaining falling objects as related to gravitational force. ❖ Applies the calculations of work and mechanical advantage to complex systems.
Wednesday June 23	**Domain: Cells and Heredity** • Students differentiate the functions of the macromolecules. • Students describe the structures of cells and the structure and function of their components.
	Domain: Forces, Waves, and Electricity • Students describe the properties of waves.
Thursday June 24	**Domain: Ecology** • Students use diagrams to interpret the interactions of organisms within food chains and webs. • Students determining the role of different organisms in food chains and webs.
	Domain: Forces, Waves, and Electricity • Students understand the properties of electricity and magnetism.
Friday June 25	**Biology Key Concepts - Review**
	Physical Science Key Concepts -Review
	Administration of the Georgia High School Graduation Test

Monday, June 21		
Objective **Domain: Ecology** • Students evaluate relationships between organisms, populations, communities, ecosystems, and biomes		
Time	**Activity/Task**	**Assessment**
15 min	*Opening/Pre-Assessment Activity-Organization Levels* The teacher begins the lesson with an activity on organization levels using cards that the students organize (see Relationship Cards in Monday's June 21 materials section). Put students in pairs. Give each pair a baggie of cards. Tell students to organize the cards in some way and be able to explain how they are organized. After all groups have completed the task, number each student in each pair a 1 or a 2. 2s stay seated and 1s visit three other tables to review and discuss. **No one makes any changes!!** 1's return to their seats and 2's visit three other groups to review and discuss. Everyone returns to their seats *Teacher note: Use the suggested Organization Guiding Questions to direct the discussion (see Organization Guiding Questions handout in Monday's June 23, materials section). After each question is discussed, ask the students to write their own answer to the question. Place the large Organization Signs somewhere in the classroom where students can see them and keep them there until Thursday.*	Participation in the discussion. Completion of the Suggested Guiding Questions handout
15 min	*Word Splash Activity* Now that the students have reviewed the levels of organization, the teacher will review other key terms related to ecological relationships through the use of a word splash. The teacher will write terms on the board and students will respond on paper by completing the Ecological Relationships Graphic Organizer (see word splash activity in Monday's June 21, materials section).	Completion of the Ecological Relationships graphic organizer
25 min	*Relationships video clips* Students will watch three video segments from United Streaming on relationships of populations. • Relationships between populations: Competition • Relationships between populations: Predator-Prey • Relationships between populations: Symbiotic As they watch they will complete an interactive note-taking chart (see Relationships Between Populations handout in Monday's June 21 materials section). At the conclusion of the video segments the teacher will go over the note-taking chart with the students to make sure they have the correct information. The students will use this chart for the next part of the lesson.	Students completing notes

Monday, June 21 (continuation)		
Time	**Activity/Task**	**Assessment**
20 min	*Paired Activity- Ecosystem Relationships Manipulative Cards* Using their notes from the previous activity as a reference, students will match the relationship description in each picture to the type of relationship described and lay the cards next to each other. (See Ecosystems Relationships Cards in the Monday's June 21 materials section). The teacher will circulate among the students and will ask questions about their work to determine level of understanding. After students have completed their work the teacher should summarize with students the importance the relationships within the ecosystem.	Students matching cards correctly
20 min	*Review Questions 9* Provide students with a set of questions (see Review Questions 9 handout in the Monday's June 21, materials section) about the organisms, populations, communities, ecosystems, and biomes. Give them 15 minutes to answer the questions individually. Conduct a group discussion of the answers to the questions. Ask students to correct their answers if necessary providing an explanation for the correction. The explanation must state the original reason the student chose the wrong answer and what makes the answer choice correct.	Student questionnaire
15 min	*Closing* Students will answer the following question and will submit it to the teacher: • Which relationship do you think is the most beneficial for populations in an ecosystem and why?	Student responses to question

Monday, June 21 (continuation)		
Objective **Domain: Forces, Waves, and Electricity** • Analyzes relationships between force, mass, and motion by applying the calculations of velocity and acceleration.		
Time	**Activity/Task**	**Assessment**
20 min	*Pre-Assessment* As the students walk in, provide them with the Pre-assessment – Force, Mass, and Acceleration handout (see Pre-assessment-Force, Mass, and Acceleration in Monday's, June 21 materials section) and ask them to answer all the questions. Tell the students that it is important to write their ideas but not be concerned about whether their idea is right or wrong. After about 10 minutes, ask the students to stop writing and proceed to have a group discussion on each question.	Completion of the pre-assessment handout
15 min	*Force, Mass, and Acceleration* Put students in small groups and provide each group with markers and a large sheet of paper. Instruct each group to copy the Concept Maps for force, mass, and acceleration from their respective handouts (see Concept Map for: Force, Mass and Acceleration in Monday's June 21 materials section) and complete them on their large sheet of paper. Each group should post their concept maps on a wall in the classroom. Students should perform a gallery walk and review other group's posters. During the walk students will note additional ideas presented by other groups in their notebooks. Once the gallery walk is complete, the student should modify or expand their concept maps on their handouts for force, mass and acceleration.	Completion of the concept maps
40 min	*Velocity and Acceleration* Follow the instructions for the laboratory Students in Motion (see Student in Motion laboratory in Monday's June 21 materials section)	Lab report
20 min	*Lab Reflection* Hand the students the post-assessment handout (see Post-Assessment handout in Monday's June 21 materials section) and ask them to answer all the questions the best that they can. After about 10 or so minutes, ask the students to stop working and discuss each question. Instruct the students to correct their answers if necessary.	

Monday, June 21 (continuation)		
Time	**Activity/Task**	**Assessment**
20 min	*Review Questions 10* Provide students with a set of questions (see Review Questions 10 handout in Monday's June 21, materials section) about force, mass, and motion. Give them 15 minutes to answer the questions individually. Conduct a group discussion of the answers to the questions. Ask students to correct their answers if necessary providing an explanation for the correction. The explanation must state the original reason the student chose the wrong answer and what makes the answer choice correct.	Student responses to question

Monday's June 21
Materials Section

Relationship Cards

ORGANISM

POPULATION

COMMUNITY

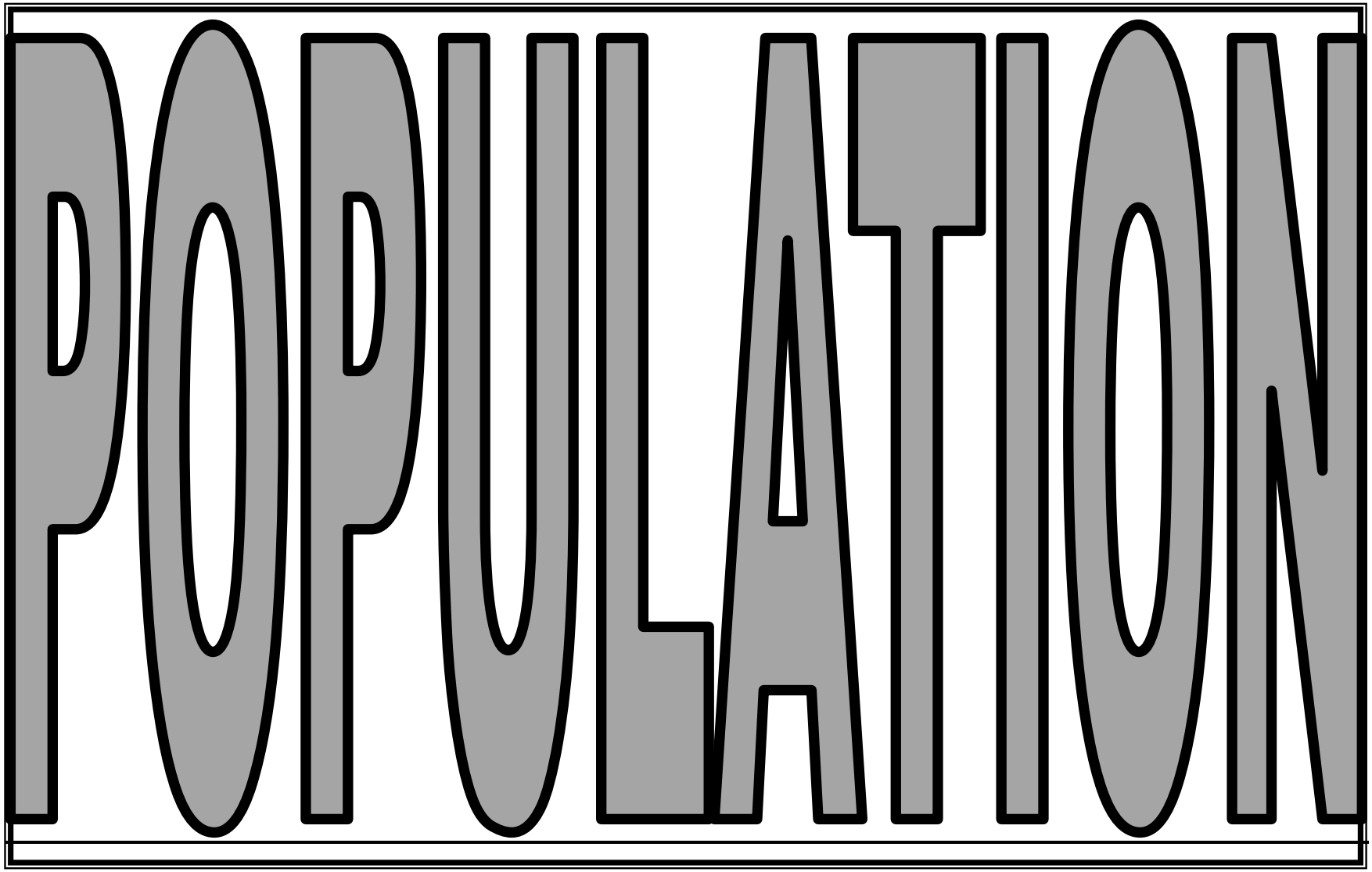
ECOSYSTEM

BIOME

Organization Guiding Questions	
What similarities did groups have in the arrangement of their cards?	
What differences did groups have in the arrangement of their cards?	
What criteria are used by scientist to organize organisms?	
What is the correct organization level?	

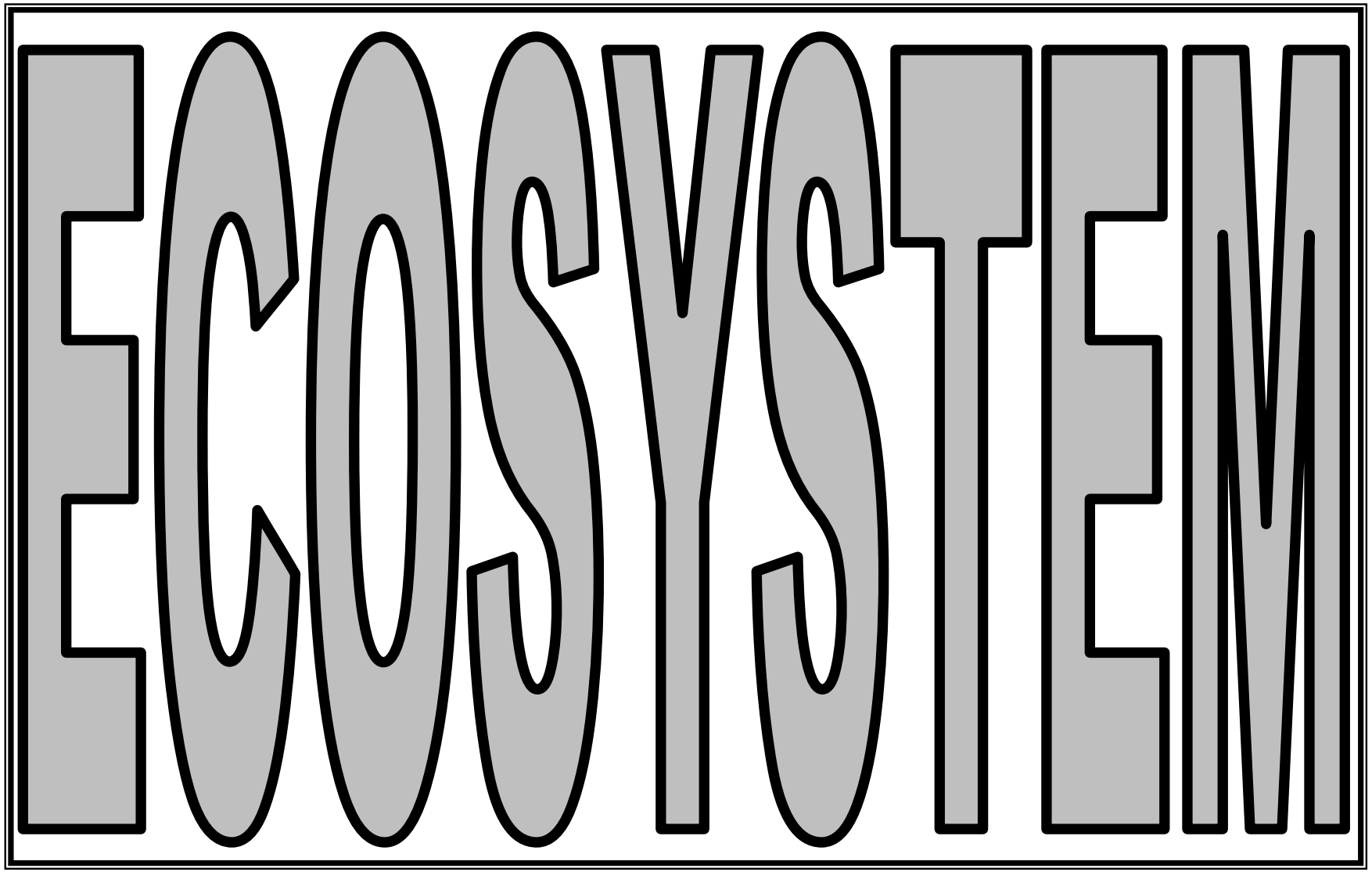
Organization Sign

Organization Sign



Organization Sign

Organization Sign



Organization Sign

Ecological Relationships graphic organizer

Concept	What I know	What I learn
Predation		
Predator		
Prey		
Symbiosis		
Parasitism		
Commensalism		
Mutualism		

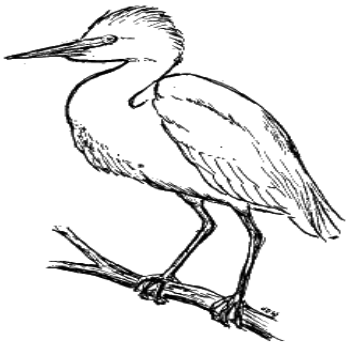
Relationships Between Populations Videos	
When do we say that two species compete with each other?	
What happens when two species fill the same role in an ecosystem?	
What is an example of competition between two species?	
When do we say that an organism is a predator?	
When do we say that an organism is a prey?	
What is an example of a predator-prey relationship? Identify the co-evolutionary traits developed by both the prey and predator.	

Relationships Between Populations Videos	
Describe three examples of how prey protect themselves against predators.	
What is a symbiotic relationship?	
What are the three types of symbiotic relationships? Provide the definition and give one examples of each type of symbiotic relationship	

Ecosystem Relationships Manipulative Cards

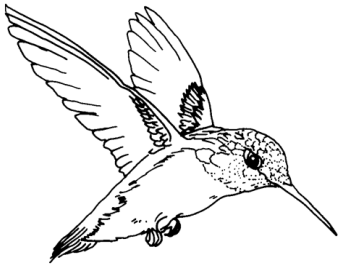
Mutualism	Commensalism	Parasitism	Predation
Mutualism	Commensalism	Parasitism	Predation
Mutualism	Commensalism	Parasitism	Predation
Mutualism	Commensalism	Parasitism	Predation

Ecosystem Relationships Manipulative Cards

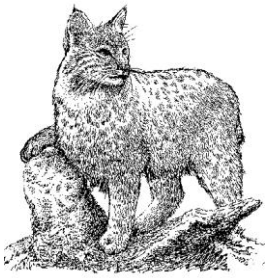


The Cattle Egret (***Bubulcus ibis***) forages in pastures and fields among livestock such as cattle and horses, feeding on the insects stirred up by the movement of the grazing animals. The egrets benefit from the arrangement, but the livestock, generally, do not.

The cuckoo bird attacks another bird's nest and removes the bird's eggs. She then lays her eggs in the attacked nest and lets the unsuspecting bird raise the cuckoo's young.

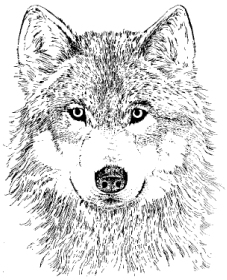


Hummingbirds pollinate plants



This lynx loves to catch and eat rabbits.

Butterflies pollinate plants

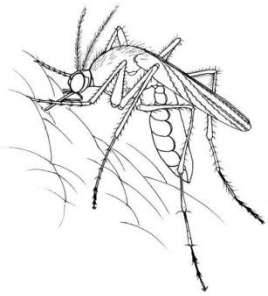


The wolf preys on smaller mammals.

Ecosystem Relationships Manipulative Cards

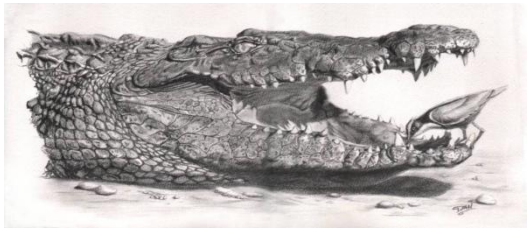
Barnacles attach to rocks, ships, shells, whales, and just about anywhere else they can gain a foothold. In the example, the two barnacles are attached to the shell of a scallop. The barnacle gains a place to live and, presumably, the scallop is not harmed by the presence of the barnacles.

The fungus species attaches the lichen structure to the log, rock, or brick wall it lives on and absorbs nutrients from the environment. In addition, the fungus forms a protective envelope for the algae preventing the algae from drying out. The algae in its turn use the nutrients absorbed by the fungus and the carbon dioxide produced to photosynthesize. The sugars and oxygens produced by the algae are, in turn, used for food by the fungi.



Mosquitoes spread the disease malaria.

Clownfish live in the stinging tentacles of sea anemone. They are coated in mucous, which protects them from the anemone's stinging nematocysts.



The drawing shows the Nile crocodile opening its mouth to permit the Egyptian plover to feed on any leeches attached to its gums. The small bird gets to eat and the croc gets its teeth cleaned.

Review Questions 9
Relationships

1. A group of similar ecosystems that share the same climax community is called a

   A. Population
   B. Community
   C. Trophic level
   D. Biome

2. The role an organism plays in an ecosystem is called it's

   A. Habitat
   B. Niche
   C. Trophic level
   D. Biome

3. The abiotic factor in this list is

   A. Bacteria
   B. Fungi
   C. Water
   D. Human

4. The biome that is the most biologically diverse is

   A. tropical rain forest
   B. Temperate forest
   C. Desert
   D. Grassland

5. The biome that is dominated by cone bearing trees, and is populated by moose, showshoe hare, and lynx, and has long winters is

   A. Tundra
   B. Taiga
   C. temperate forest
   D. Chaparral

6. An intense forest fire burns an entire forest to the ground. Soon wild flowers, grasses, and weeds begin to repopulate the area. This is

   A. primary succession
   B. secondary succession
   C. tertiary succession
   D. climax succession

7. An example of a population would be

   A. neighborhood cats and dogs
   B. all the rocks in your yard
   C. all the largemouth bass in a fish pond
   D. all the species of trees in the school nature area

8. Major ecosystems that occur over wide areas of land are called

   A. Communities
   B. Habitats
   C. Biomes
   D. food chains

9. A relationship between a producer and consumer is best illustrated by

   A. a snake eating a bird
   B. a fox eating a mouse
   C. a lion eating a zebra
   D. a zebra eating grass

10. A tick feeding on a human is an example of

    A. Parasitism
    B. Mutualism
    C. Competition

D. Predation

11. An organism's niche includes

    A. what it eats
    B. where it eats
    C. when it eats
    D. all of the above

12. An ecologist who studies how several species in an area interact among each other and with the abiotic parts of the environment is interested in the biological organization level called

    A. Organism
    B. Population
    C. Community
    D. Ecosystem

13. The relationship between plants and the bees that pollinate them is an example of

    A. Commensalisms
    B. Competition
    C. Mutualism
    D. Parasitism

14. Symbiosis involving a fungi and algae is seen in which of the following?

    A. Moss
    B. lichen
    C. mildew
    D. bread mold

15. In the study of ecology, what is a population?

    A. all plants and animals in a liven place
    B. all the living and nonliving things in an environment
    C. all the organisms of one particular species in a given place
    D. different plants interacting with each other in a given place

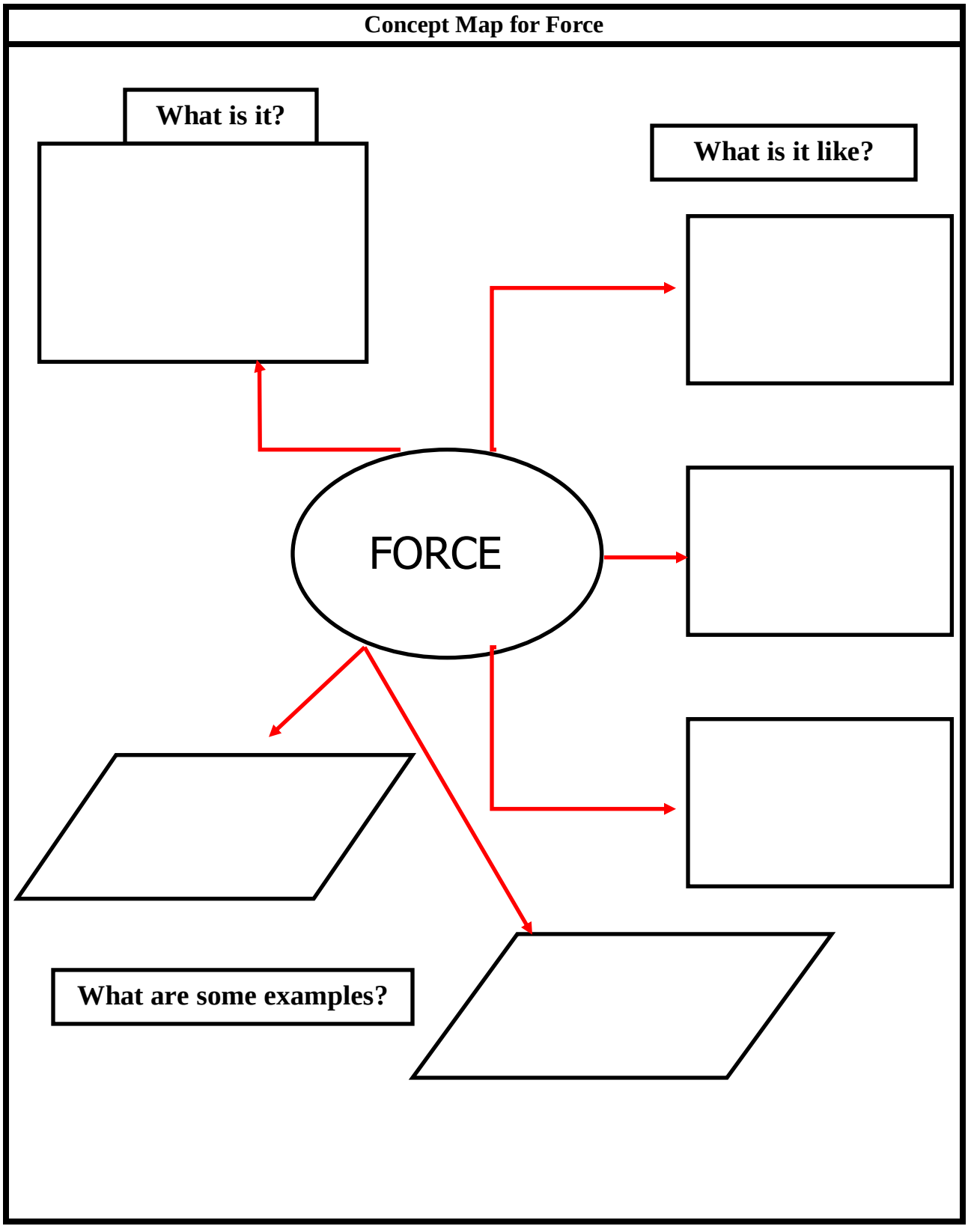
16. Which of the following is an abiotic factor in an ocean ecosystem?

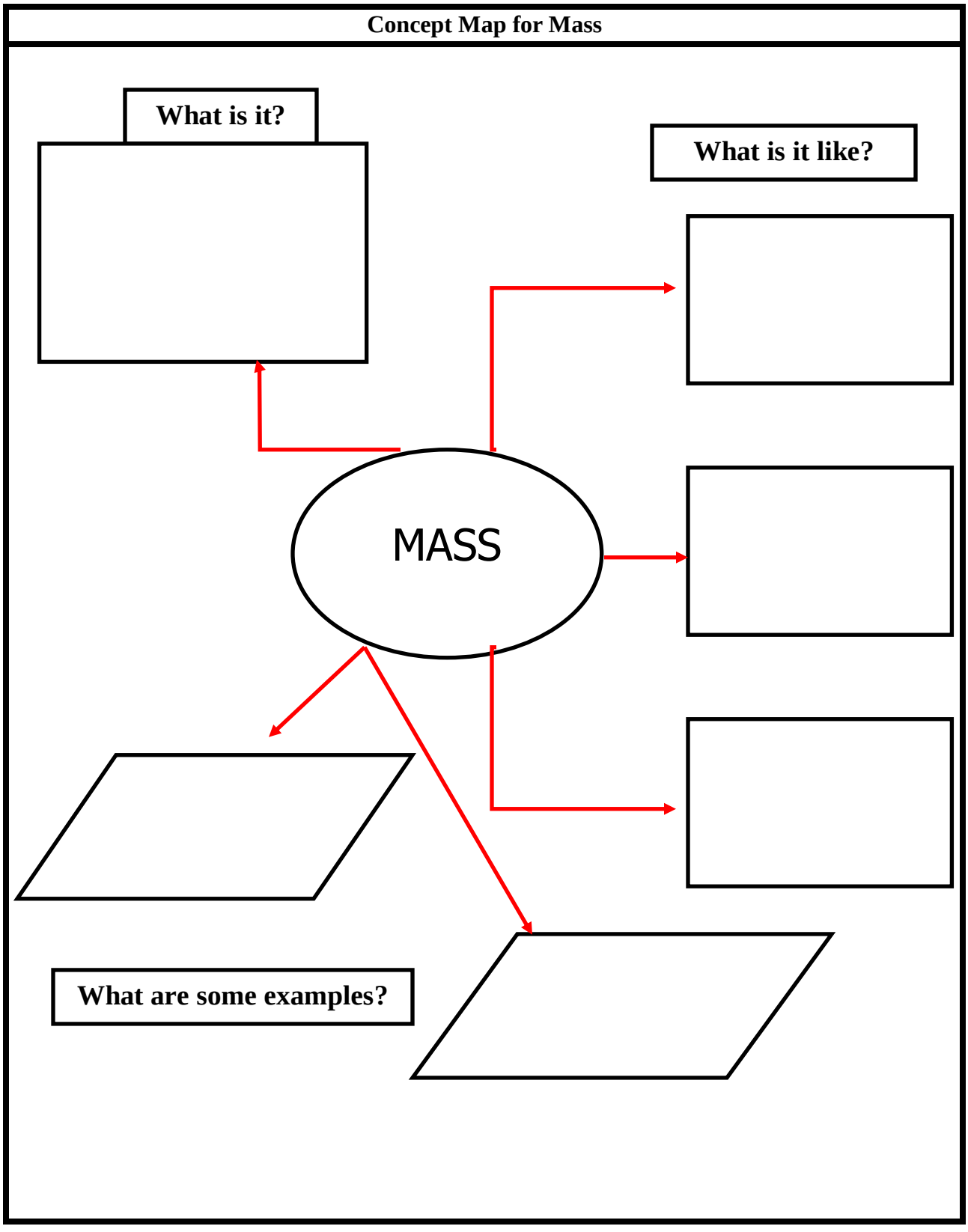
    A. Coral
    B. Whale
    C. water
    D. shrimp

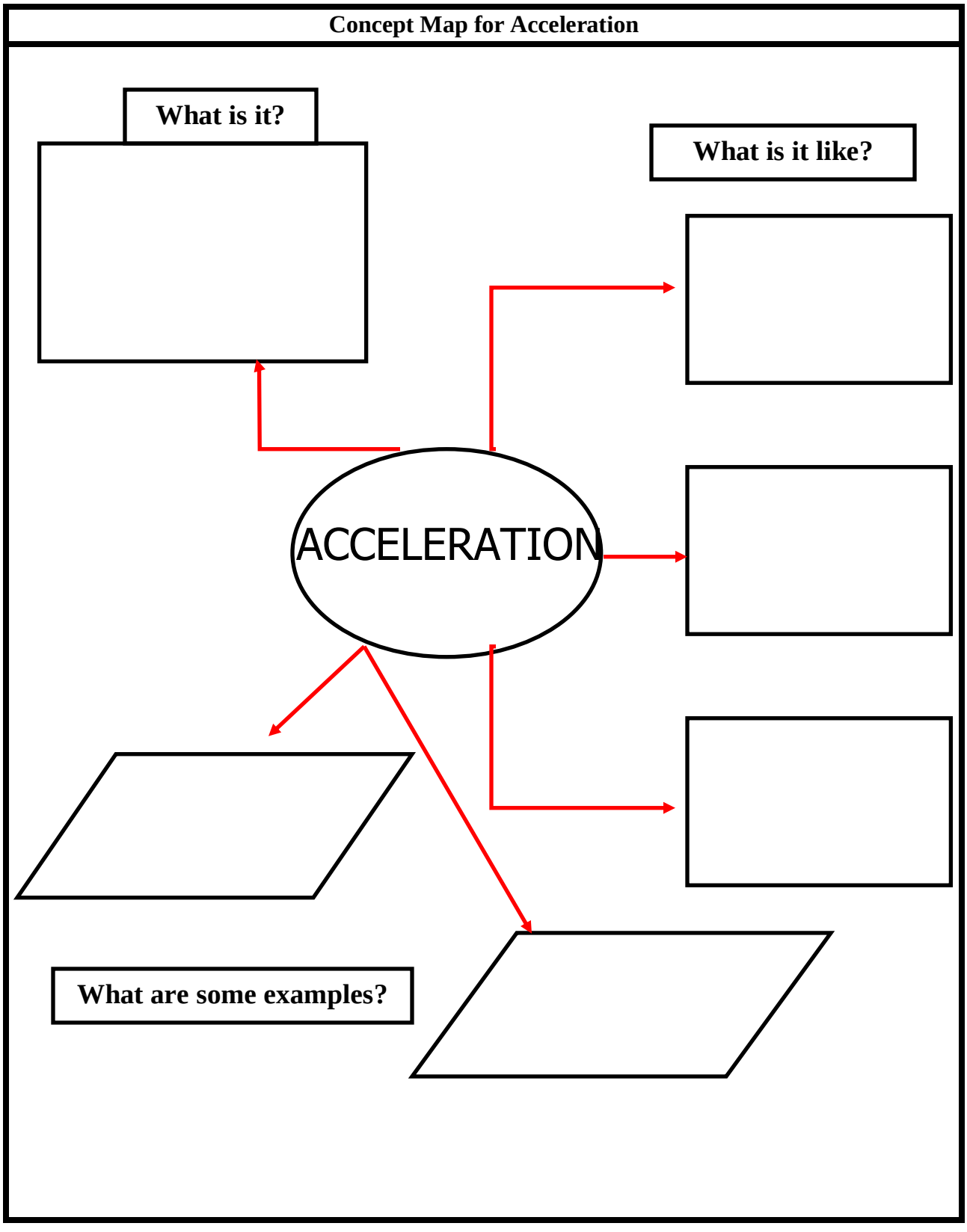
15. Which of the following best describes a biome?

    A. areas of like climate and ecology
    B. primary productivity per square kilometer
    C. all of the living organisms in an ecosystem
    D. areas that include the entire range of an organism

Pre-Assessment –Force, Mass, Acceleration	
Name:	Date:
Instructions: This assessment is designed to guide the lessons that we are going to study in this unit. Please answer all the questions the best that you can.	
1. A mass resting on a table is attached to a compressed spring. Describe all the forces acting on the mass while in contact with the spring and after the mass has been push away from the spring.	
2. Why do objects start or stop moving?	
3. There are two objects: one with small mass but large volume and one with large mass but small volume. Explain which object will have a greater acceleration if each object is pushed by the same force.	
4. How does friction affect the motion of objects?	
5. Describe the motion of a spaceship propelled forward by a constant force F for 20 minutes. The force suddenly stops after 20 minutes. Describe the motion of the spaceship after the force F stops.	
6. How are weight and mass related?	


Concept Map for Force
What is it?
What is it like?
FORCE
What are some examples?


Concept Map for Mass
What is it?
What is it like?
MASS
What are some examples?


Concept Map for Acceleration
What is it?
What is it like?
ACCELERATION
What are some examples?

Students in Motion: A Graphical Representation

Theory:

Drawing graphs is a very useful means of presenting information and making it easily understood. A further advantage of using graphs is that changes and patterns can be quickly recognized. The motion of an object is regularly represented with graphs. Graphs provide information about what is being represented on each axis. The type of curve and its slope provide additional information about the relationship between those two variables.

This laboratory will provide us with an understanding on how to draw and read graphs of position vs. time, velocity vs. time, and acceleration vs. time. Information about the motion of an object can also be obtained from the slope of the line in the graph. The slope of the line obtained when the position of an object is plotted against time represents the velocity with which the object is moving. The shape of the line when position of an object is plotted against time gives us information about the velocity of the object. In the case of a velocity vs. time graph, the slope of the line obtained when plotting the velocity of an object against time represents its acceleration. The shape of the line when velocity of an object is plotted against time gives us information about the acceleration of an object.

It is important to remember that motion is a change in position of an object measured by distance and time. Velocity tells the speed and direction of motion, whereas speed tells us the rate at which an object moves. Finally, the acceleration of an object tells us the rate at which the velocity, speed and/or direction, changes. The slope of a line gives us information about the magnitude of the rate of change, the steeper the slope the higher the rate of change and vice versa.

Research Question: How does the shape of the graph representing the relationship between displacement vs. time, velocity vs. time, and acceleration vs. time offer information about the motion of an object?

Materials:	
Graph paper	Timers
Calculator	Meter Sticks or Trundle Wheels
Clipboards	Computers (not essential)

Procedure:

1. Organize the students such that there are enough timers to have two times for each data point (see Figure 1). Make sure that all the students have a copy of the data sheet form (see the data collection section of this laboratory) and a clipboard.
2. Measure 100 meters (if possible conduct this activity on the schools track) and place two students with timers every 10 meters.
3. Some students volunteers need to perform one of the following activities (each activity needs a volunteer):
    a. Walking at a uniform pace
    b. Walking faster and faster
    c. Running at a constant rate
    d. Sprinting
    e. Oscillating (moving back and forth). In this case the student should start in the middle (the 50 meter mark) and move back and forth. It is not necessary for the student to reach the starting and finishing line every time.
    f. A combination of some or all of the previous motions.

Procedure (continuation):

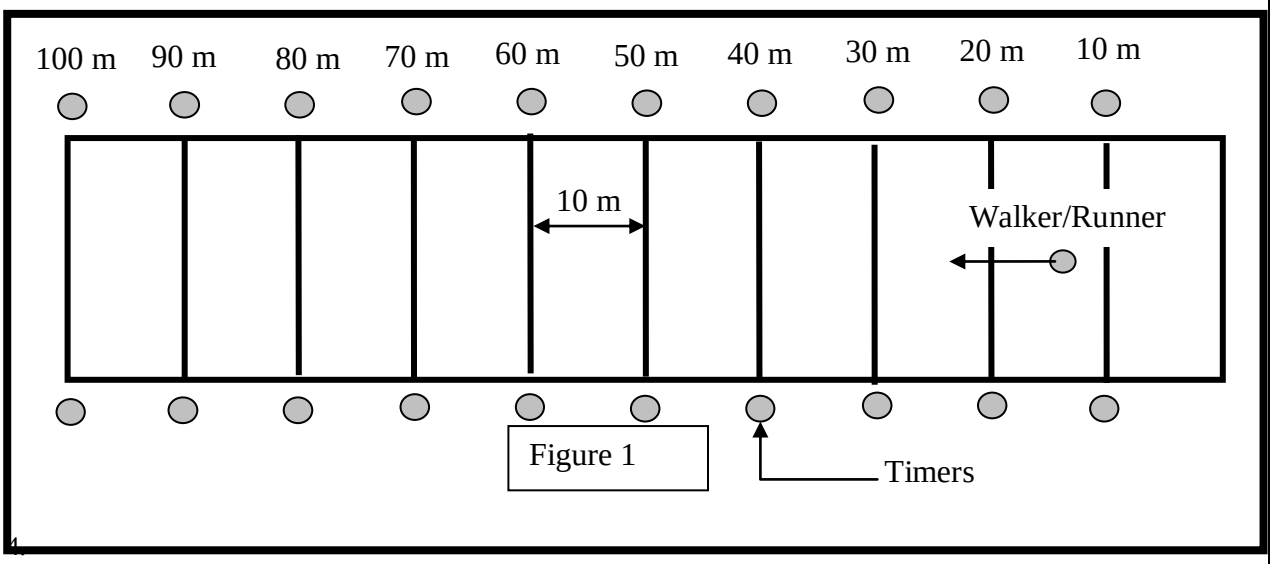


Figure 1

4. The timers need to agree in a signal that all timers can see, and use it to indicate when all the timers will to start their timers.
5. The first student will walk from the starting line (0 meters) to the finish line (100 meters) at a constant pace. As the student passes in front of each pair of timers, the timers should stop their timer and record the time.
6. Repeat this process for each type of motion described on step 3.
7. Students need to share their information. In general the two times for each distance will be very close. If not they are not close, use personal judgment to either accept one or the other, take an average or disregard both times. (Note: I have found that the best way to do this is to have everybody back in the classroom and fill out a blank data sheet placed on an overhead projector or, if available, filling a spreadsheet and then printing enough copies for the whole class).

Data Collection:

(See following pages)

Data Calculations

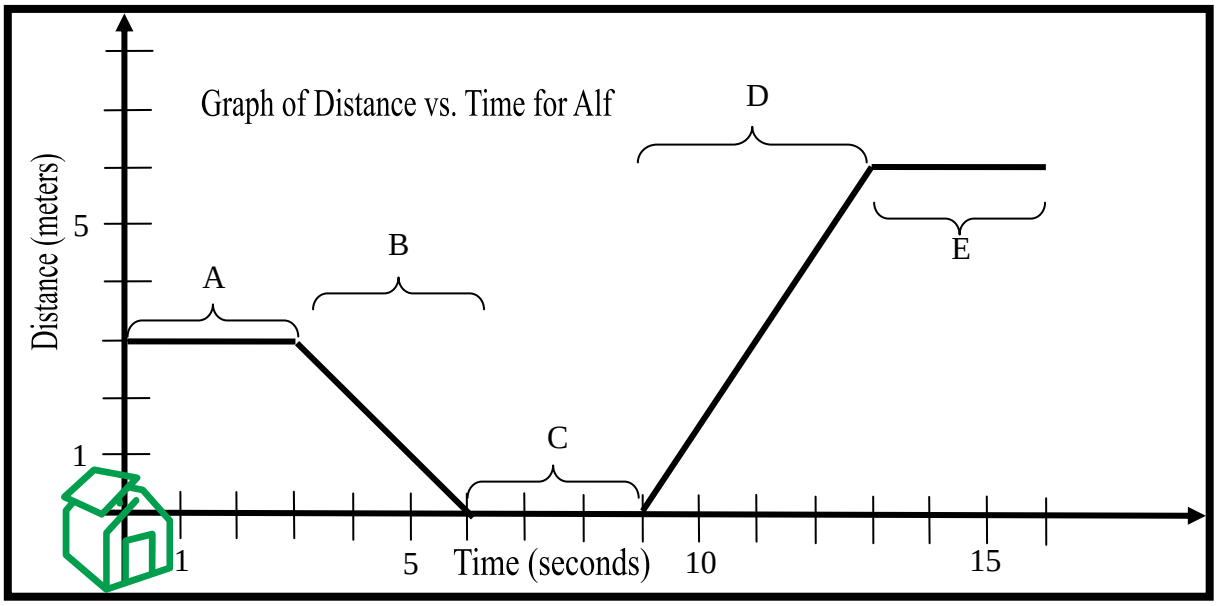
1. Draw a distance vs. time graph for each type of motion studied on this lab. Use a separate sheet of graph paper for each one.
2. Select two of the types of motion and calculate the velocity of the walking/running student on each 10 meter interval. Record answers on the Velocity Data Sheet. Calculate the average speed for each interval using the expression

$$\langle v \rangle = \frac{v_f + v_i}{2} = \frac{d}{t}$$

Where v_f is the final velocity, v_i is the initial velocity, d is the distance travel (10 meters in our case), t is the time that it took for the student to cover the distance d, and $\langle v \rangle$ is the average speed.

Analysis

1. Identify regions that represent one of the two types of motion analyzed in part two of the calculations on each distance vs. time graphs (See example below).



A → Alf was standing still at 3 m from his house for 3 seconds.
B → Alf was moving for 3 seconds with constant speed towards his house.
C → Alf was standing still next to his house for 3 second.
D → Alf was moving away from his house for 4 seconds with constant speed.
E → Alf was standing still for 3 seconds at 6 m from his house.

2. As done for part 1, identify, on each of the velocity vs. time graphs, the particular type of acceleration/deceleration (uniform acceleration, not uniform acceleration) taking place.

Timing Data Sheet																				
	10 m		20 m		30 m		40 m		50 m		60 m		70 m		80 m		90 m		100 m	
Walking at a constant rate																				
Walking faster and faster																				
Running at a constant rate																				
Sprinting																				
Oscillating																				

Timing Data Sheet (Averages)										
	10 m	20 m	30 m	40 m	50 m	60 m	70 m	80 m	90 m	100 m
Walking at a constant rate										
Walking faster and faster										
Running at a constant rate										
Sprinting										
Oscillating										

Average Velocity Data Sheet										
	10 m	20 m	30 m	40 m	50 m	60 m	70 m	80 m	90 m	100 m
Walking at a constant rate										
Walking faster and faster										
Running at a constant rate										
Sprinting										
Oscillating										

Post-Assessment

Name:	Date:

Instructions: Please answer all the questions the best that you can. Your grade for this assessment is based on the quality of your answers (explanations and thinking) not correctness.

1. Explain the difference between the concepts of speed and velocity. Give an example of a situation in which you would use each one.

2. Explain what is meant by saying that a car is accelerating. What is meant by saying that a car is decelerating?

3. Explain if the following statement is true or false, "if the velocity of an object is zero, its acceleration must be zero"

4. Explain if the following statement is true or false, "heavier objects fall faster than lighter objects"

Post-Assessment (continuation)

5. An object moves with constant velocity of 10 m/s for 20 seconds, it then accelerates at a rate of $2 m/s^2$ for 10 seconds and then moves with constant velocity of 50 m/s for 20 seconds. Sketch a graph for the motion of this object.

Review Questions 10
Force, Mass, Velocity and Acceleration

1. How much force is needed to accelerate a 500.0-kg car at a rate of 4.000 m/s/s?

   A. 125.0 N
   B. 2,000. N
   C. 250.0 N
   D. 4,000. N

2. Two equal forces act at the same time on the same stationary object but in opposite directions. Which statement describes the object's motion?

   A. It remains stationary.
   B. It accelerates.
   C. It moves at a constant speed.
   D. It decelerates.

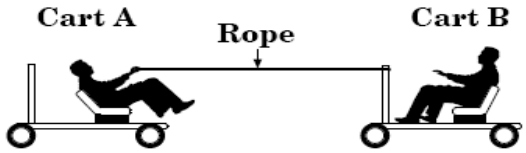
3. A 100-N force causes an object to accelerate at 2 m/s/s. What is the mass of the object?

   A. 0.02 kg
   B. 102 kg
   C. 50 kg
   D. 200 kg

4. A chair exerts a force of 20 N on a floor. What is the force that the floor exerts on the chair?

   A. 10 N
   B. 21 N
   C. 20 N
   D. 40 N

5. Carts A and B have the same mass. Both students have a mass of 80 kg.



   If the student in cart A pulls the rope, what will result?

   A. Cart A will move toward a stationary Cart B.
   B. Cart B will move toward a stationary Cart A.
   C. Both carts will move toward each other.
   D. Cart B will move faster than Cart A.

6. A student in a boat decided to go for a swim. He dove off the back of the boat, as shown in the diagram. The boat moved in the direction shown by the arrow.

   Which statement ***best*** explains why the boat moved in the direction shown?

   A. A body in motion tends to remain in motion.
   B. The acceleration of a body is directly proportional to the force applied.
   C. For every action there is an equal and opposite reaction.
   D. Friction on the bottom of the boat was reduced because of the lake water.

7. A car's velocity changes from 0 m/s to 40 m/s in 5 seconds. What is the average acceleration of the car?

   A. 5 m/s/s
   B. 35 m/s/s
   C. 8 m/s/s
   D. 200 m/s/s

8. A rocket sled accelerates from 10 m/sec to 60 m/sec in 2 seconds. What is the acceleration of the sled?

   A. 10 m/sec^2
   B. 25 m/sec^2
   C. 40 m/sec^2
   D. 20 m/sec^2

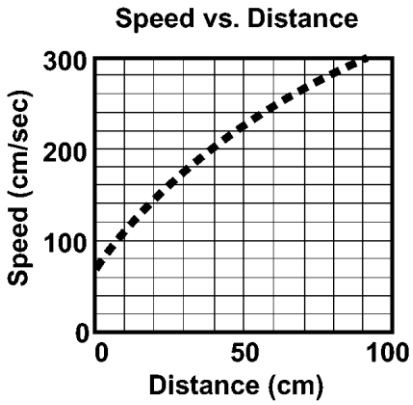
9. John Force, a drag racer, starts from a stopped position he reaches a speed of 140 m/sec in 7 seconds. What is his acceleration?

   A. 147 m/sec^2
   B. 200 m/sec^2
   C. 0.5 m/sec^2
   D. 20 m/sec^2

10. A rocket can fly into space because

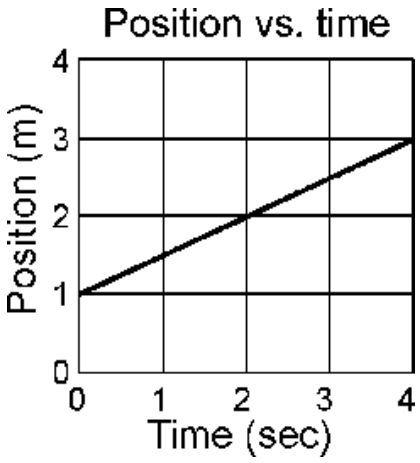
   A. when it is launched, the hot exhaust gases hit the ground and push the rocket forward.
   B. the rocket pushes the exhaust gases backward, and there is an equal and opposite reaction pushing the rocket forward.
   C. when the gases are burning up, the mass of the rocket decreases, changing the amount of gravity on the rocket.
   D. the launch pad pushes the rocket forward like a slingshot.

11. Use the graph to predict the speed of the car when the car is at 60 cm.



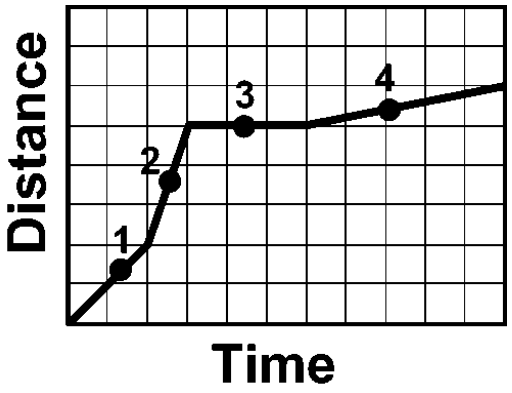
   A. 220 cm/sec
   B. 230 cm/sec
   C. 240 cm/sec
   D. 250 cm/sec

12. Calculate the speed of the object from the position vs. time graph shown below.



   A. 0.5 m/sec
   B. 0.75 m/sec
   C. 2 m/sec
   D. 3 m/sec

13. At which of the following points on the graph is the speed the greatest?



A. Point 1
B. Point 2
C. Point 3
D. Point 4

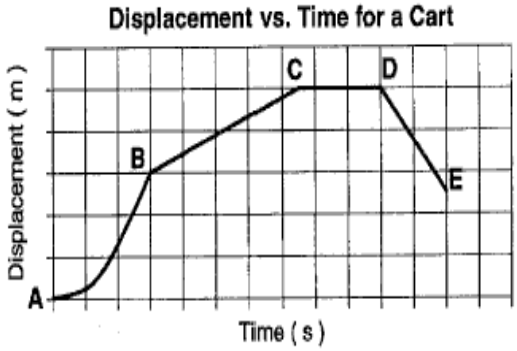
14. Compared to your weight and mass on Earth, if you were on the moon

A. your weight and mass would be less
B. your weight would be less but your mass would remain the same
C. your weight would remain the same, but your mass would be less
D. your weight would increase, but your mass would remain the same

15. A car passed a truck on the road. The car accelerates from 20 meters/second to 24 meters/second in 2 seconds. What was the car's acceleration?

A. 2 meters/second/second
B. 4 meters/second/second
C. 12 meters/second/second
D. 22 meters/second/second

16. The displacement-time graph below represents the motion of a cart along a straight line. During which interval is the cart NOT moving at constant speed?



A. AB
B. BC
C. CD
D. DE

17. A vehicle travels a distance of 160 km in 5 hours. The average speed is

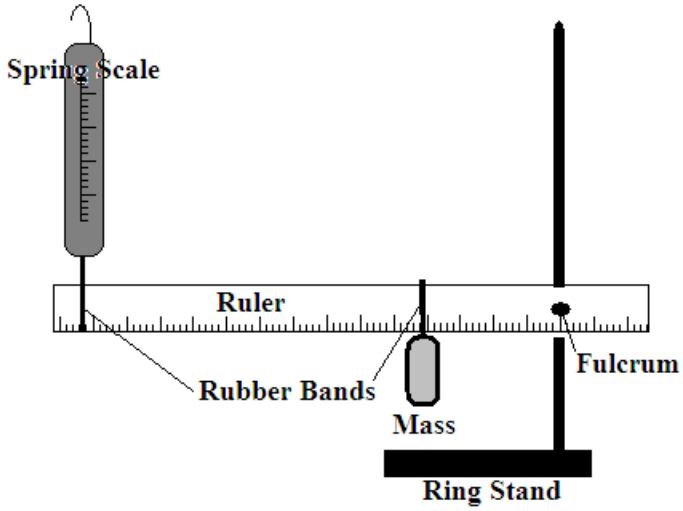
A. 32 km/hr
B. 40 km/hr
C. 80 km/hr
D. 165 km/hr

Tuesday, June 22		
Objective: **Domain: Ecology** • Students describe the flow of matter and energy through an ecosystem by organizing the components of food chains and webs.		
Time	**Activity/Task**	**Assessment**
10 min	*Warm-up* As the students enter the classroom ask the students to write an answer to the *essential question*: **"How is the flow (pathway) of energy different from the flow (pathway) of matter in an ecosystem?"** Once the majority of students have finished writing conduct a short classroom discussion on possible answers to the question.	Essential question answer. Participation in the discussion.
15 min	*Activating strategy:* The purpose of this activity is: 1. to get students thinking about the connections of matter and energy in food and how matter and energy pass through the ecosystem, including human consumers, and 2. to informally pre-assess students' current level of understanding of the flow of energy and matter in an ecosystem Ask students to work in pairs to complete the table (see Activating Strategy Table in the Tuesday's June 16 materials section) based on what they think about energy and matter in food. This pre-assessment will be the basis for discussion and will be referred to as the lesson progresses. Ask volunteers to share their answers and tell the class where the matter goes and where the energy goes. *Teacher note: If possible, display some common food items: Meat Potato Oil & Fat, DNA/RNA (tell students: all living things have DNA). Otherwise, use the pictures provided. (See Activating Strategy Pictures in Tuesday's June 22 materials section).*	Students complete table
15 min	*Introduce the Cyclic Nature of Matter vs. the One Way Path of Energy* Students will watch the video The Flow of Energy through Ecosystems from UnitedStreaming and complete the Flow of Energy video reflection handout (See Flow of Energy video reflection handout in Tuesday's June 22 materials section). Review with the students the answers to the video reflection questions and after finishing with them ask them to put them aside for a moment. Watch the video Recycling of Matter from UnitedStreaming and complete the Recycling of Matter video reflection handout (See Recycling of Matter video reflection handout in Tuesday's June 22 materials section).	Completion of the Flow of Energy and Recycling of Matter reflection handouts.

Tuesday, June 22 (continuation)		
Time	**Activity/Task**	**Assessment**
20 min	*Language of Ecology and Energy Pyramid Task* Form groups of three or four and provide each group with markers, the Frayer Diagrams (see Frayer Diagrams in handout in the Tuesday's June 22 materials section), and a large sheet of paper. Each group should post their Frayer Diagrams on a wall in the classroom. Students should perform a gallery walk and review other group's posters. During the walk students will note additional ideas presented by other groups in their notebooks. Once the gallery walk is complete, the student should modify or expand their own Frayer Diagrams on their handouts for producers, primary consumers, secondary and tertiary consumers.	Completion of their own Frayer Diagrams
15 min	*Energy Pyramid Manipulative* Give out the energy pyramid manipulatives to pairs of students. Ask students to construct a pyramid beginning by using the organism that they have the most of as the base. After the pyramids are constructed, ask students to observe the pattern, and answer the questions related to the energy pyramid. (See the Energy Pyramid Manipulatives in the Tuesday's June 22 materials section). See board illustration below**:** 	Students complete the energy pyramid graphic organizer and related practice questions.

Tuesday, June 22 (continuation)		
Time	**Activity/Task**	**Assessment**
15 min	*Interactions Among Organisms* Have pairs of students create analogies for the ecological relationships of predation, commensalism, parasitism, and mutualism using the Pac-Man and smiley face manipulatives. Tell students that they should arrange the "smiley faces" into examples of each of the five types of species interactions. The students need to check their product with the instructor, and then organize the pictures of real organisms below the faces to demonstrate real world examples of each relationship. Have the students come up with real life examples to match with each. (See the Ecological Relationships Manipulatives in Tuesday's June 22 materials section).	Students' real life examples of different ecological relationships.
30 min	*Matter cycles* Divide students into groups of four. Assign each group one of the matter cycles. Each group will watch the Unitedstreaming video that that pertains to their cycle. (The Carbon Cycle - Recycling Matter, The Cycle Series - The Carbon Cycle, The Cycle Series - The Nitrogen Cycle and The Cycle Series - The Oxygen Story) They will then carry out a jigsaw to share this information with others. There should be at least one person for each cycle in the new groups. They then "teach' their new group what they learned about their cycle and complete the Jigsaw graphic organizer (see jigsaw activity in the Tuesday's June 22 materials section). Teacher notes: Instruct the students that they will have 15 minutes to watch their videos and 15 minutes for jigsaw part of the activity.	Jigsaw graphic organizer.
20 min	*Review Questions 11* Provide students with a set of questions (see Review Questions 11 handout in the Tuesday's June 22, materials section) about the flow of matter and energy through an ecosystem. Give them 15 minutes to answer the questions individually. Conduct a group discussion of the answers to the questions. Ask students to correct their answers if necessary providing an explanation for the correction. The explanation must state the original reason the student chose the wrong answer and what makes the answer choice correct.	Student questionnaire

Tuesday, June 22 (continuation)		
Objective **Domain: Forces Waves & Electricity** • Students evaluate the application of Newton's three laws in everyday situations related to inertia. Explain falling objects as related to gravitational force. ❖ Applies the calculations of work and mechanical advantage to complex systems.		
Time	**Activity/Task**	**Assessment**
10 min	*Essential Question* How can Newton's three laws be demonstrated in everyday life? *Warm-up Questions* As the students walk in provide them with the three warm-up questions (see warm-up questions handout in Tuesday's June 22 materials section) and ask them to answer them as best as they can. After the majority of the students have finished answering the questions ask for volunteers that would like to share their answers. Conclude the activity by asking the students if they remember Newton's laws of motion and to provide examples of these laws from everyday life.	Students' responses to the warm-up questions.
20 min	*Inertia, force and mass Demonstrations* Case 1 Tape a sign to your chest or back with the word "BALANCED FORCE" on it. Take a chair with wheels out into the hallway and ask a student to sit in the chair. Give the sign with the word "INERTIA" on it and ask him/her to tape it to themselves. Ask another student for assistance and give them a sign with the word "UNBALANCED FORCE" on it and have them tape it to his/her chest. Ask that student to gently push the student seating on the chair. Ask all students to write in their observation handout (see Inertia, force, and mass demonstrations handout in Tuesday's June 22 materials section) what they are observing and construct an explanation using the words force, mass, and motion. Case 2 Take the student in the chair and gently push the chair with the student in it with a finger but do not move the student. Again ask the students to write their observation and to provide an explanation by using words like balanced or unbalanced forces.	Completion of their observations and explanations handout.
15 min	*Newton's Three Laws of Motion Video* Watch the video Newton's Three Laws of Motion video and ask the students to complete the Newton's Three Laws of Motion video handout. (See Newton's Three Laws of Motion video handout in Tuesday's June 22 materials section).	Completion of video handout.

Tuesday, June 22 (continuation)		
Time	**Activity/Task**	**Assessment**
30 min	*GPB Lever Lab* Facilitate the lever lab for the students (The first lab in this packet) *Teacher Note: This lab contains TWO parts. Both parts have students using a second class lever (metric ruler) with a known mass (load) attached to the end being lifted by a spring scale (effort).The fulcrum is made by a hole drilled through the ruler and attached to a ring stand with a clamp. See below:*  In part A the spring scale is positioned at the 15 cm mark on the lever. In Part B the spring scale is positioned at the 30 cm mark. This will illustrate changes in mechanical advantage at different distances on the lever.	Student's lab report.
20 min	*Review Questions 12* Provide students with a set of questions (see Review Questions 12 handout in Tuesday's June 22, materials section) about Newton's three laws of motion. Give them 15 minutes to answer the questions individually. Conduct a group discussion of the answers to the questions. Ask students to correct their answers if necessary providing an explanation for the correction. The explanation must state the original reason the student chose the wrong answer and what makes the answer choice correct.	Student questionnaire

Tuesday's June 22
Materials Section

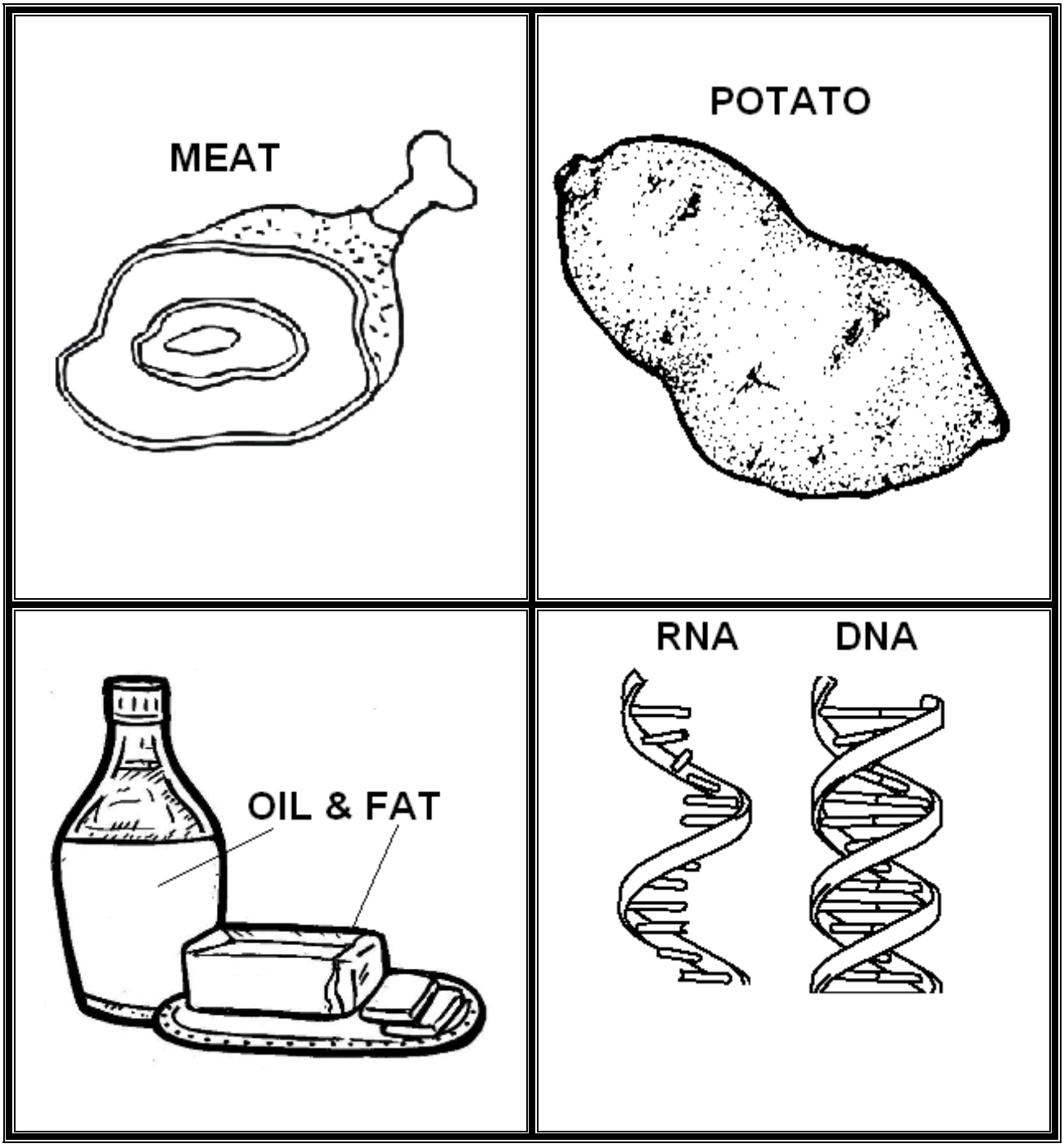
Activating Strategy: Pathway of Energy and Matter
Preassessment

	Fruit	Vegetable	Meat
What kind of matter is this? Does it contain carbohydrates, protein, lipids (fat/oil) and/or nucleic acid?			
Does this food provide energy?			
Where is the energy in this food?			
What happens to the food (matter) when it is eaten?			
What happens to the energy that we get from the food?			

Activating Strategy: Pathway of Energy and Matter
Preassessment (Teacher Notes)

	Fruit	Vegetable	Meat
What kind of matter is this? Does it contain carbohydrates, protein, lipids (fat/oil) and/or nucleic acid?	Name of fruit: Carbohydrate and nucleic acid	Name of vegetable: potato Carbohydrate Nucleic acid	Name of meat: Lipid Protein Nucleic acid
Does this food provide energy?	Yes	Yes	Yes
Where is the energy in this food?	Stored in the chemical bonds	Stored in the chemical bonds	Stored in the chemical bonds
What happens to the food (matter) when it is eaten?	Broken down, stored, built into new molecules	Broken down, stored, built into new molecules	Broken down, stored, built into new molecules
What happens to the energy that we get from the food?	Converted to heat, used for motion	Converted to heat, used for motion	Converted to heat, used for motion

Food Examples for Activating Strategy: the Pathway of Matter and Energy



Flow of Energy Video	
What do plants do with the energy they receive from the Sun?	
What organisms are producers?	
What organisms are consumers?	
What organisms are primary consumers?	
What organisms are secondary consumers?	
How much energy is passed from one level to the next?	
What is the role of decomposers and scavengers?	

Recycling of Matter Video	
Where does the carbon cycle start?	
What is the role of plants in the cycling of matter?	
How is carbon transferred from plants to other organisms?	
How is carbon released back into the atmosphere?	

Energy Pyramid Manipulative

Instructions

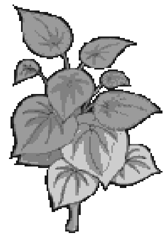
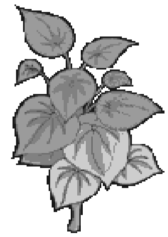
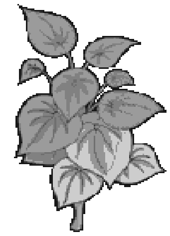
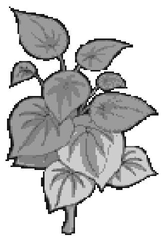
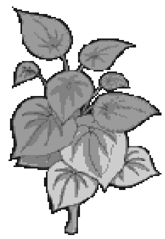
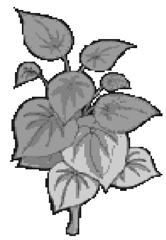
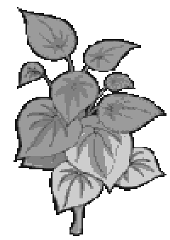
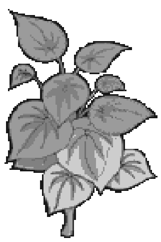
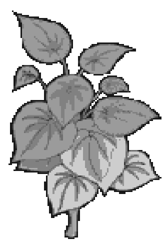
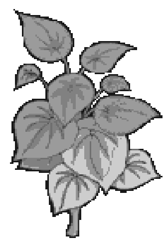
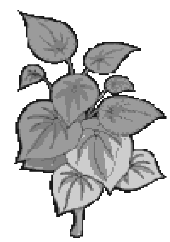
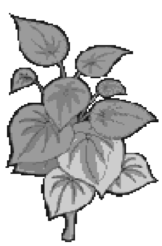
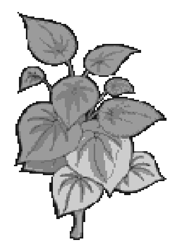
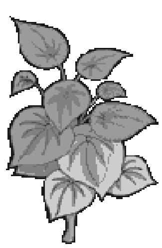
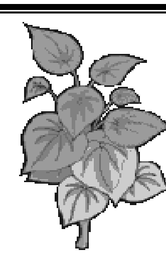
Step 1: Empty the baggie onto a desk and organize the pictures into an energy pyramid using the pieces provided.

Step 2: Place the name of the producers, primary consumers, secondary consumers, tertiary consumers, and quaternary consumers next to the appropriate part of the pyramid. You may also label autotrophs, carnivores, and herbivores.

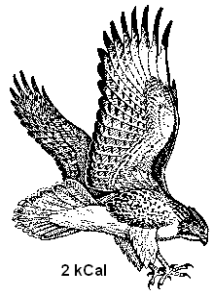
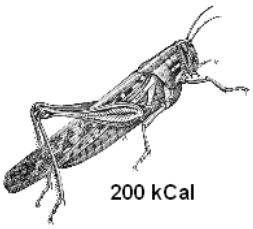
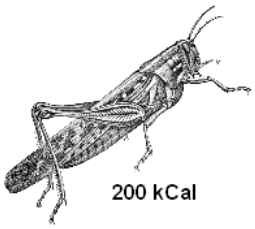
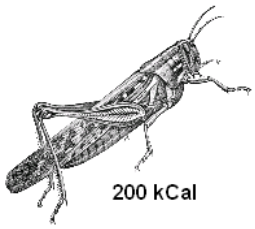
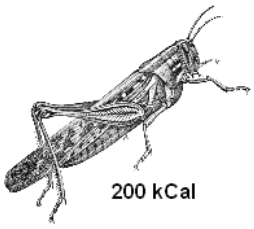
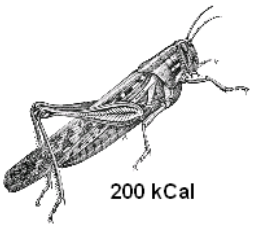
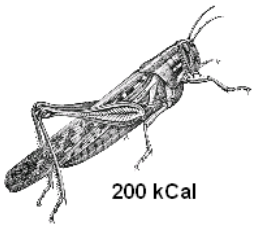
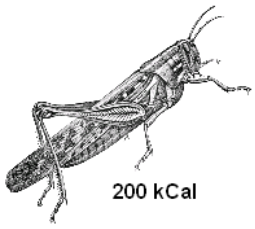
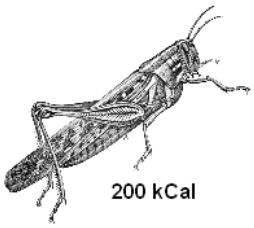
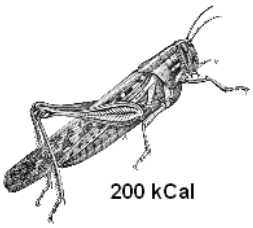
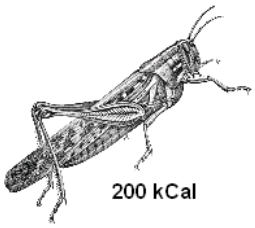
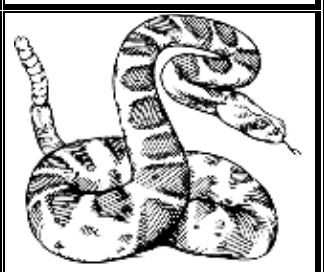
Step 3: Add up all the kCalories available from the producers. Add up all the kCalories available for each trophic level of the other organisms.

Step 4: Determine what percentage is lost as energy moves up the trophic levels. What percentage of energy is actually available from the lower trophic levels to the one immediately above it? What happens to the rest of the energy?

Energy Pyramid Manipulatives

 1000kCal	 1000kCal	 1000kCal	 1000kCal
 1000kCal	 1000kCal	 1000kCal	 1000kCal
 1000kCal	 1000kCal	 1000kCal	 1000kCal
 1000kCal	 1000kCal	 1000kCal	 1000kCal
 1000kCal	 1000kCal	 1000kCal	 1000kCal

Energy Pyramid Manipulatives

 2 kCal	 200 kCal	 200 kCal	 200 kCal
 200 kCal	 200 kCal	 200 kCal	 200 kCal
 200 kCal	 200 kCal	 200 kCal	 10 kCal
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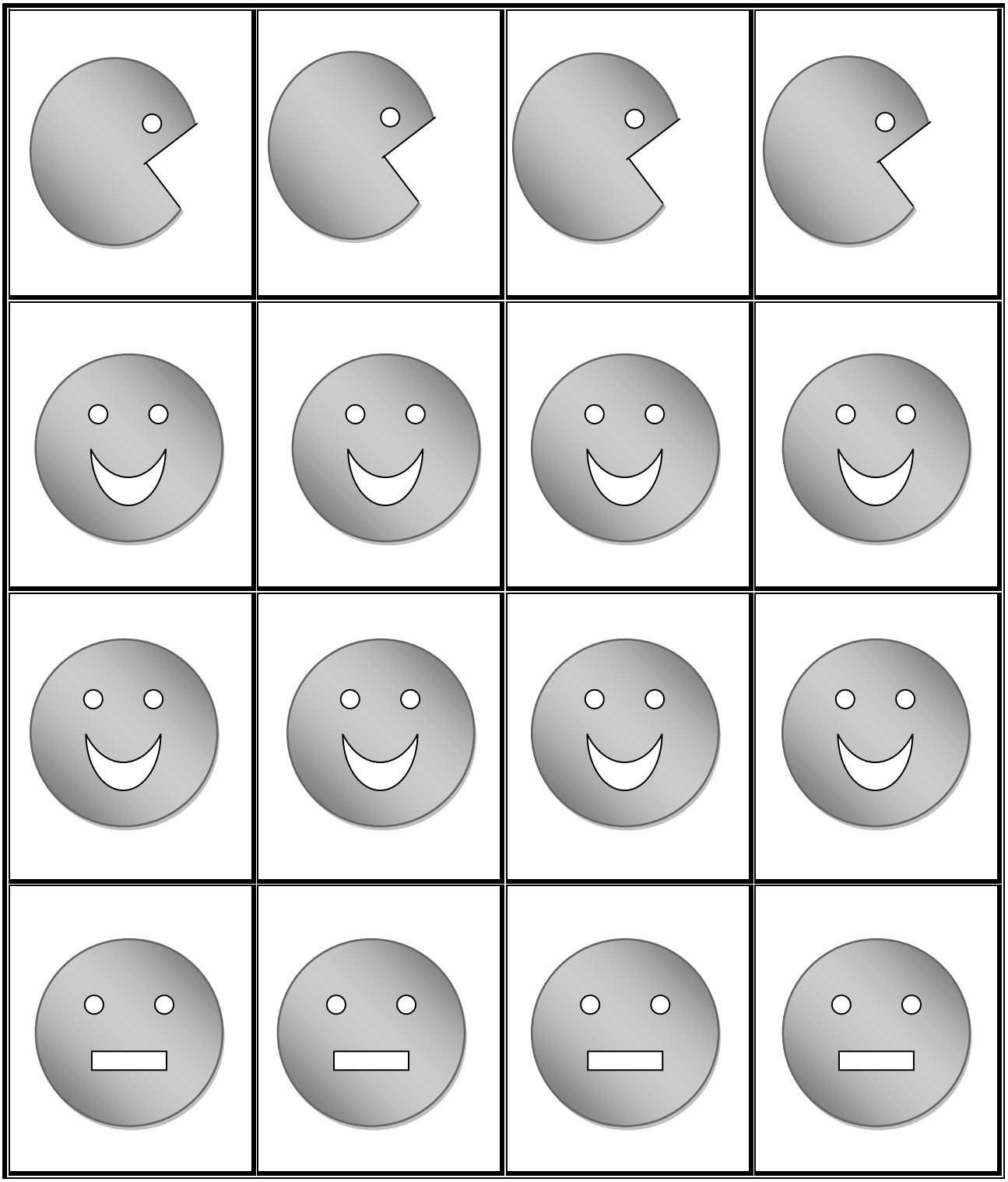
 50 kCal			

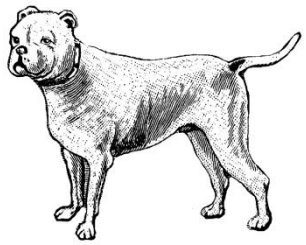
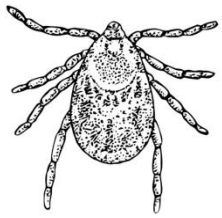
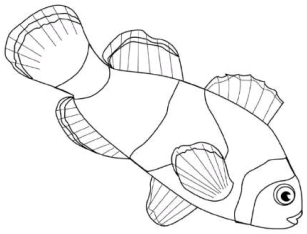
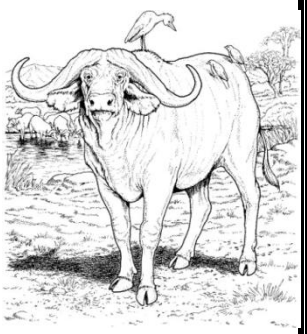
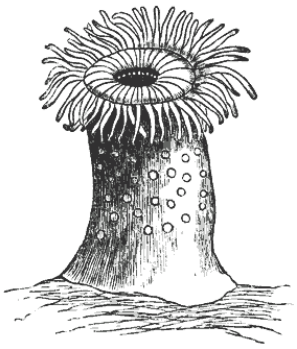
Energy Pyramid Manipulatives

AUTOTROPHS	**HETEROTROPHS**	**HETEROTROPHS**	**PREDATORS**
HETEROTROPHS	**HETEROTROPHS**	**PRODUCERS**	**PREDATORS**
PRIMARY CONSUMERS	**SECONDARY CONSUMERS**	**TERTIARY CONSUMERS**	**PREY**
QUATERNARY CONSUMERS	**CARNIVORES**	**HERBIVORES**	**PREY**
CARNIVORES	**CARNIVORES**	**PREDATORS**	**PREY**

Interactions Among Organisms

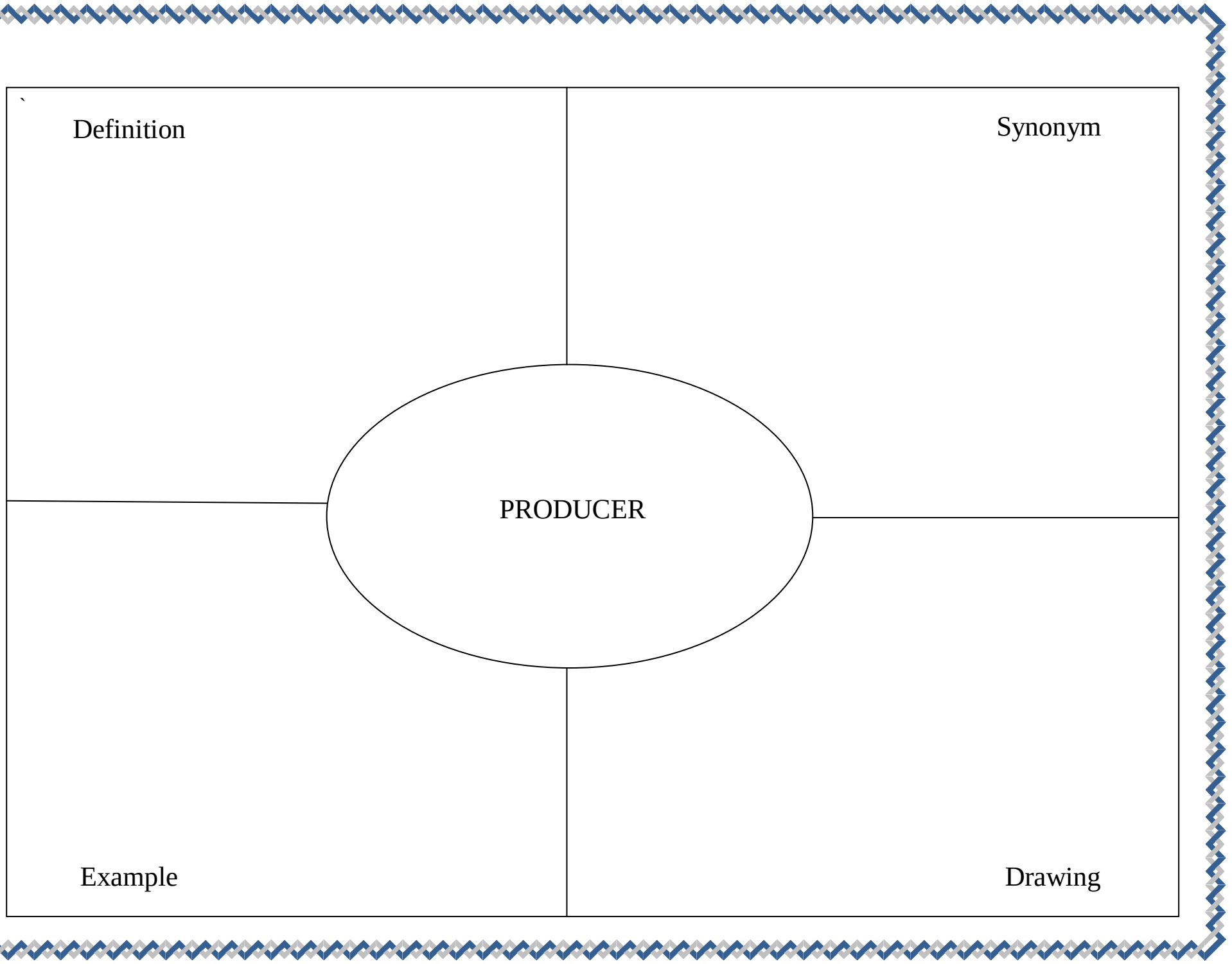


Interactions Among Organisms

			
Dog	**Cattle Egret**	**Tick**	**Clownfish**
			
Bobcat	**Water Buffalo**	**Anemone**	**Squirrel**

Matter Cycle Jigsaw

Name of cycle	Elements and Compounds involved	What changes do these elements and compounds undergo?	Where do we see these cycles occurring?	Why is this cycle important?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Definition
Synonym
PRODUCER
Example
Drawing

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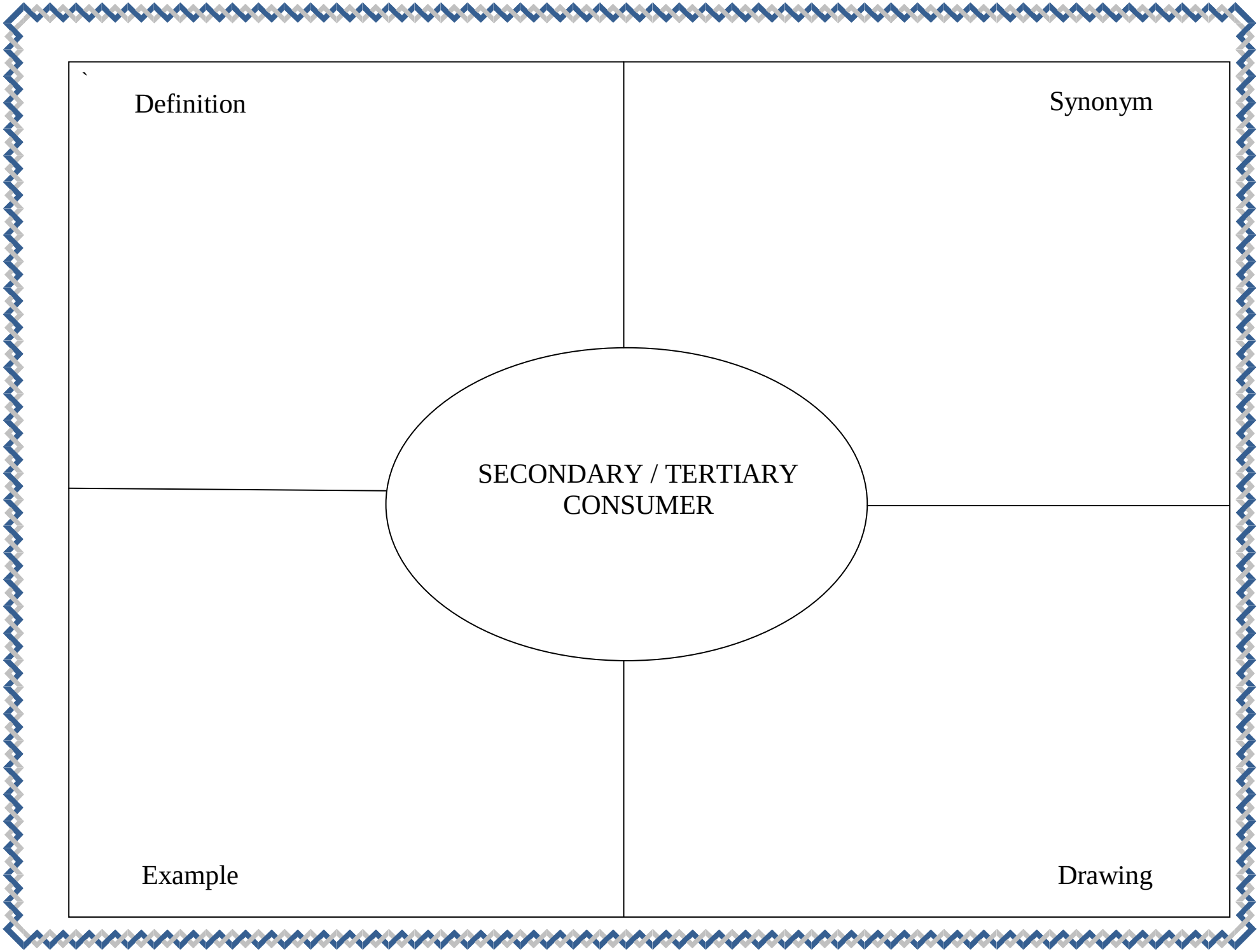
Definition

Synonym

PRIMARY
CONSUMER

Example

Drawing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Definition
Synonym
SECONDARY / TERTIARY CONSUMER
Example
Drawing

Review Questions 11
Flow of Energy and Matter

1. A relationship between a producer and consumer is best illustrated by

   A. a snake eating a bird
   B. a fox eating a mouse
   C. a lion eating a zebra
   D. a zebra eating grass

2. As energy passes through an ecosystem from sunlight to grass to cow

   A. the energy is destroyed
   B. the energy stops at the cow
   C. the amount of energy always increases
   D. the energy is converted into different forms

3. Animals that feed on plants are in the

   A. first trophic level
   B. second trophic level
   C. third trophic level
   D. fourth trophic level

4. A tick feeding on a human is an example of

   A. Parasitism
   B. Mutualism
   C. Competition
   D. Predation

5. When an organism dies, the nitrogen in its body

   A. can never be reused by other living things
   B. is immediately released into the atmosphere
   C. is released by the action of decomposers
   D. none of the above

6. The relationship between plants and the bees that pollinate them is an example of

   A. Commensalisms
   B. Competition
   C. Mutualism
   D. Parasitism

7. Matter moves through ecosystems in cycles such as the carbon, nitrogen, and water cycles. The total amount of matter

   A. remains constant
   B. increases
   C. decreases
   D. cannot be measured

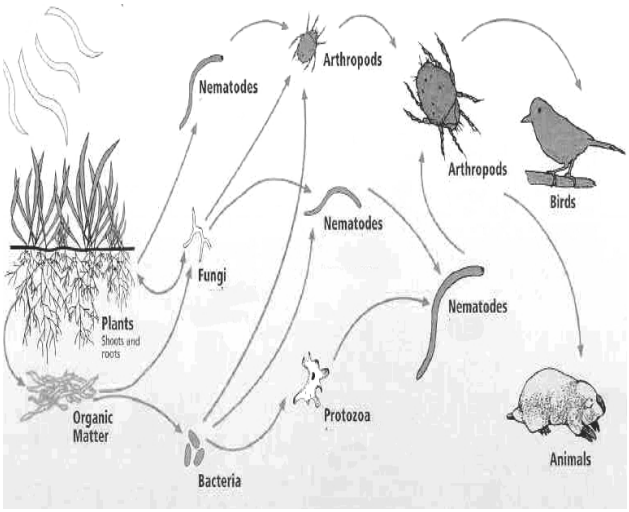
8. Nitrogen-fixing bacteria help cycle nitrogen through ecosystems. How do they do this?

   A. They change nitrogen into forms usable by plants.
   B. They convert water and carbon dioxide into sugar.
   C. They release the chemical energy in nitrogen for respiration.
   D. They convert sunlight into chemical energy stored in nitrogen.

9. Replacing inorganic nutrients in soil is accomplished primarily by the

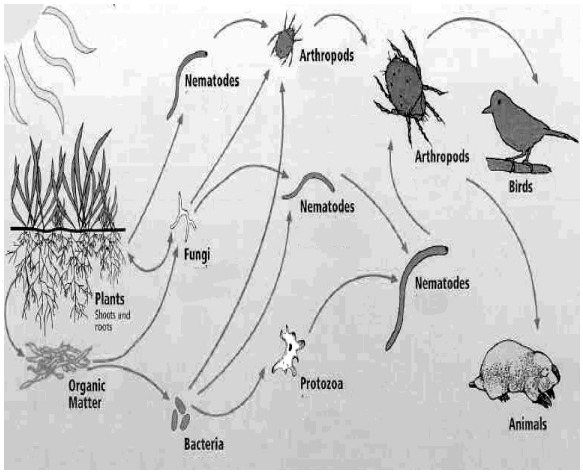
   A. second-order consumers
   B. first-order consumers
   C. decomposers
   D. herbivores

10. In the soil food chain shown, arthropods would be considered _____ with respect to nematodes.



A. primary producers
B. secondary producers
C. primary consumers
D. secondary consumers

11. Which of the organisms in the food chain shown above would have the LEAST amount of overall biomass?



A. Animals
B. Arthropods
C. Bacteria
D. Grass

12. A Columbian tropical rainforest food chain includes the following set of feeding relationships:
Fig leaves -> Leaf cutter ants -> Anteater -> Jaguar.
Approximately how many pounds of ants would be needed to support one 300-pound adult jaguar?

A. 300,000
B. 30,000
C. 3,000
D. 300

13. Which of these organisms contributes the MOST biomass and MOST energy to a food chain?

A. pine trees
B. humans
C. coral reef animals
D. bacteria

14. Arrange the members of a Southwest Georgia food chain in the proper order, from primary producer to secondary consumer.

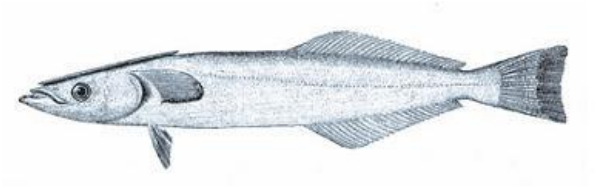
i. Black buzzard
ii. Coyote
iii. Field mouse
iv. Garter snake
v. Grass seeds

A. Grass seeds → garter snake→ field mouse→coyote
B. Grass seeds →garter snake→field mouse→coyote
C. Grass seeds →field mouse→coyote→garter snake
D. Grass seeds →field mouse→coyote→black buzzard

15. In regard to mutualism versus parasitism, what is the relationship between the two involved organisms?

A. Both organisms benefit in mutualism; both organisms are harmed in parasitism.
B. One organism receives a benefit in mutualism; both organisms are harmed in parasitism.
C. Both organisms receive a benefit in mutualism; one organism is harmed and the other helped in parasitism
D. One organism receives a benefit in mutualism; one organism is hurt and the other is harmed in parasitism.

16.



The picture above shows a remora, a species of fish that attaches itself harmlessly to sharks and other large fish with a sucker-like organ on its head.
The remora receives the benefit of a free ride and scraps of food from any meals the large fish eats. While the remora does not hurt the large fish, no one has ever proven that they help the fish either.
This type of relationship is known as

A. mutualism
B. symbiosis
C. co-evolution
D. commensalism

Warm-Up Questions
Why can you move a boulder of Styrofoam with your finger but cannot move a rock the same size with your finger?
What keeps a satellite in orbit around the earth?
Explain how a small child on one end of a seesaw can move an adult on the other end?

Inertia, force and mass Demonstrations	
Case 1	
What did I observe?	**What is a possible explanation?**
Case 2	
What did I observe?	**What is a possible explanation?**

Newton's Three Laws of Motion Video	
What causes any type of motion?	
What does the first law of motion state?	
What is inertia?	
Give two examples of inertia	
How are inertia and mass related?	
What does the second law of motion state?	

Newton's Three Laws of Motion Video	
How are acceleration and the magnitude of a force related?	
What does F = ma means?	
What does the third law of motion state?	

Lever Lab

Objective:
Study the mechanical advantage and work done by simple machines.

Materials:
Ring stand and clamp 30 cm ruler with hole drilled (or paint sticks)
100 g mass Spring scale
Meter stick Rubber bands (2) or string

Procedure
1. Construct a second class lever using the ring stand, clamp, and drilled 30 cm ruler (see Figure 1 below).
2. Measure the resistance force of the 100g mass (remember to convert into Newtons) and record on the data table 1.
3. Use the rubber bands to attach the 100 g mass at the 10cm mark on the meter stick and the spring scale at the 30cm mark.
4. Measure the resistance arm (RA) distance (in meters) and record on the data table.
5. Measure the effort arm (EA) distance and record on the data table 1.
6. Pull up on the spring scale to lift the mass 10cm (0.10 meter) above the table. The 10cm would be the resistance distance. Record it on the data table 1.

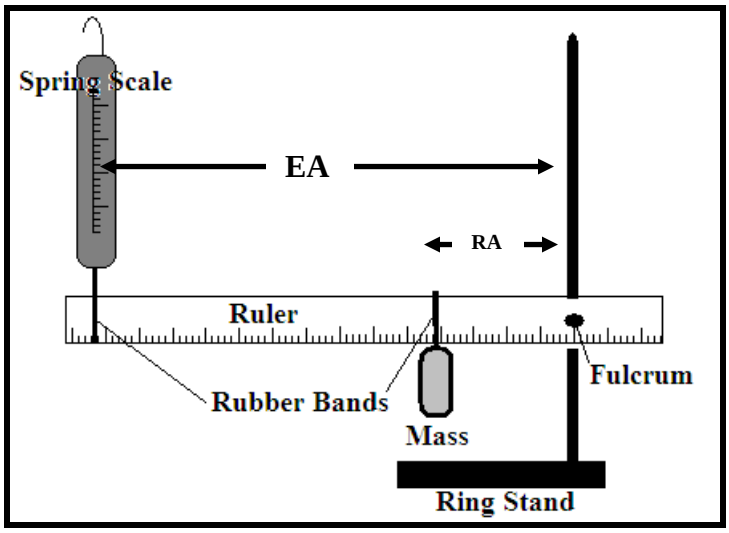


Figure 1

7. Use the spring scale to measure the force needed to lift the mass. This is the effort force (remember to convert into Newtons). Record this measurement on the data table 1.
8. Measure the force (N) required to lift the Effort Arm about 10 cm. Record in table one.

9. Using these measurements calculate for this second class lever the following quantities and record on the data table 2.

a. Ideal mechanical advantage
b. Real mechanical advantage
c. Work input
d. Work output

10. Repeat the above procedure by placing the 10g mass at the 20cm mark this time. Use tables 3 and 4 to record your results and calculations.

Data and Calculations

Weight of mass in Newtons (the resistance force)	
Effort Force in Newtons	
Resistance arm in meters	
Effort distance in meters	

Table 1

Ideal Mechanical Advantage (MA)	**MA = EA / RA**	
Real Mechanical Advantage (MA)	**MA = Fr / Fe**	
Input Work (W_I)	**$W_I = F_e \times d_E$**	
Output Work (W_O)	**$W_O = F_r \times d_R$**	

Table 2

Weight of mass in Newtons (the resistance force)	
Effort Force in Newtons	
Resistance arm in meters	
Effort distance in meters	

Table 3

Ideal Mechanical Advantage (MA)	**MA = EA / RA**	
Real Mechanical Advantage (MA)	**MA = Fr / Fe**	
Input Work (W_I)	**$W_I = F_e \times d_E$**	
Output Work (W_O)	**$W_O = F_r \times d_R$**	

Table 4

Analysis: *Compare the results from the experiments above to answer the following questions.*

1. What was the difference in the mechanical advantage between lifting the load on the levers at the 10 cm mark and the 20 cm mark?
2. Does higher mechanical advantage mean less force is needed to move a load?
3. How much work was needed to move the load in both parts of the experiment? Explain these results.
4. Write a paragraph describing what you have learned about mechanical advantage and the work done by simple machines.

Review Questions 12
Newtons Three Laws of Motion

1. Which **best** describes the function of a lever?

   A. Using a small force at a great distance to move a large object a short distance
   B. Using a small force over a short distance to move a large object over a short distance
   C. Using a large force over a great distance to move a small object over a short distance
   D. Using a large force over a short distance to move a small object over a great distance

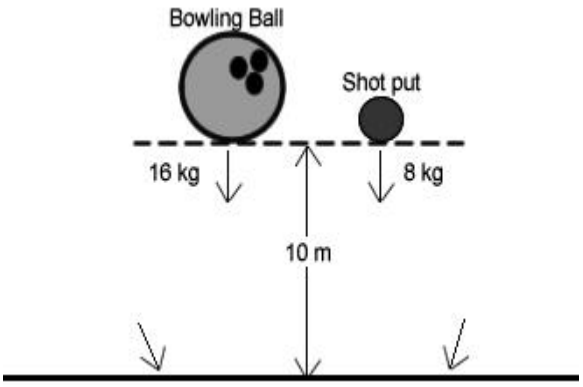
2. Many public buildings now have entrance ramps in addition to entrance stairs. Which principle explains the idea behind entrance ramps?

   A. By increasing the distance, the required force decreases
   B. By increasing the distance, the required force increases
   C. By increasing the force, the required distance decreases
   D. By increasing the force, the required distance increases

3. Which of the following BEST describes why someone may NOT be able to lift a full wheelbarrow by its handles?

   A. The effort force is not great enough to raise the fulcrum
   B. The resistance force is not great enough to raise the fulcrum
   C. The resistance force is not great enough to overcome the effort force
   D. The effort force is not great enough to overcome the resistance force.

4. A 16 kg bowling ball and a 8 kg shot put are held 10 meters above the ground outside an office window. Which of these statements is true?

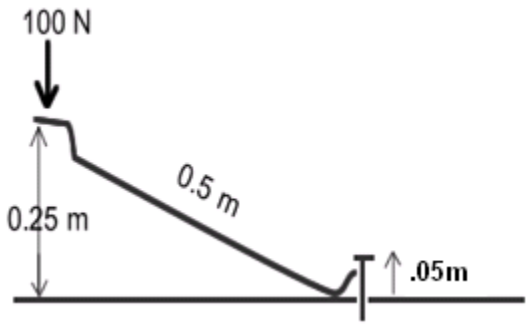


   A. The bowling ball will hit the ground first
   B. The bowling ball will experience twice the velocity
   C. The bowling ball experiences twice as much gravitational force
   D. The bowling ball will accelerate twice as fast

5. Which of these is an example of Newton's First Law, inertia?

   A. Pushing against a brick wall, and the brick wall does not move
   B. Pushing a stationary wheelbarrow, and the wheelbarrow accelerates forward
   C. Pushing a wheelbarrow full of bricks, and the bricks slide back towards the handles
   D. Pushing a wagon to the top of a hill, and the wagon accelerates down the hill without assistance

6. A prybar is a simple machine that acts as a lever, similar to a crowbar. It can do the job of quickly and easily removing nails, boards or other attached items. In the image, a force of 100 N pushes downward over 0.25 m. The imbedded nail is moved vertically upward a distance of 5 cm. The length of the prybar is 0.5 m. Determine the mechanical advantage of the simple machine (prybar) in this example.



A. 0.5
B. 2
C. 5
D. 400

7. What would be the **most** realistic body shape for a science fiction character from a massive planet with strong gravitational attraction?

A. Squat and sturdy
B. Mushroom-shaped
C. Tall and thin-boned
D. Birdlike with strong flight muscles

8. Which of the following situations **best** illustrates the principle of inertia?

A. Steve throws a ball straight up and notices it slowing down
B. Emily asks for a push to get started on a swing
C. Paula decides to sit in an outside seta of a merry-go-round so that she will have a wilder ride.
D. When Dave drops a bowling ball, it does not bounce as high as a basketball dropped from the same height.

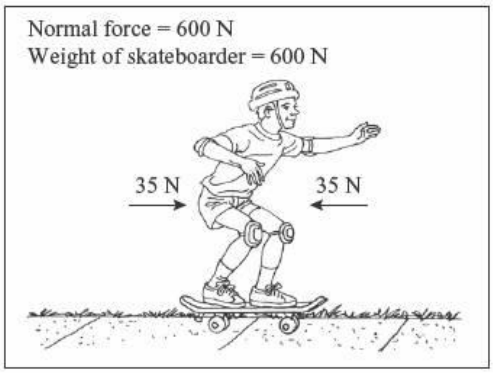
9. Anne-Marie is using a fixed pulley to raise a weight. How does using the pulley change her effort?

A. It reduces the effort needed to raise the weight
B. It changes the direction of the effort but doesn't reduce it
C. It increases the effort needed to raise the weight
D. It both reduces and changes the direction of the effort

10. Slamming on the brakes in a moving car makes a passenger move forward against his or her seat belt because

A. The passenger has the inertia to keep moving forward
B. The passenger is being pushed by the seats of the car
C. The passenger is better able to stop themselves in this manner
D. The passenger has an equal and opposite force supporting their weight

11. The forces acting on a skateboarder moving at a constant velocity along a sidewalk are shown in the figure below.



Which of the following is the net force on the skateboarder?

A. 0 N
B. 70 N
C. 670 N
D. 1270 N

12. Which of these is an example of Newton's Second Law, F=ma?

A. A tug of war where both sides pull equally, and the rope does not move
B. A wide receiver using his hands to stop and catch a football thrown by the quarterback at 20 m/s
C. A car traveling on a straight part of the highway with a cruise control set and a constant velocity of 55 miles/hour
D. A book pushing down on the desk where it is resting.

13. You pull a wagon with your younger sister in it. Which of these would accelerate the rate at which you can pull the wagon?

A. Pull the wagon with less force
B. Pull the wagon with more force
C. Have your sister push down on the wagon
D. Put another of your siblings in the wagon

14. Which of these is true regarding weight but NOT mass?

A. Weight is based on density, mass is not
B. Weight is proportional to volume, mass is not
C. Weight changes based on inertia, mass does not
D. Weight changes depending on distance from the earth, mass does not

15. A rotating water sprinkler has many arms which rapidly shoot water backward out of the ends, in response, the arms of the sprinkler

A. Fall with the water
B. Are lifted as the water falls due to gravity
C. Move forward and, hence, rotate
D. Remain motionless due to inertia

16. Which of these experiences the greatest gravitational force if dropped from an airplane?

A. A 2 pound metal wrench
B. A 15 pound box of food and supplies
C. A 150 pound paratrooper with her parachute still closed

A 1500 pound jeep with an open parachute

17. When a Civil War era cannon is fired, the force of the gas produced by exploding powder propels the cannonball forward at a high speed. According to Newton's Third Law,

    A. The cannon itself moves backward
    B. The cannon itself does not move due to inertia
    C. The cannon itself moves forward as well with the momentum
    D. The cannon itself moves forward with the inertia of the cannonball

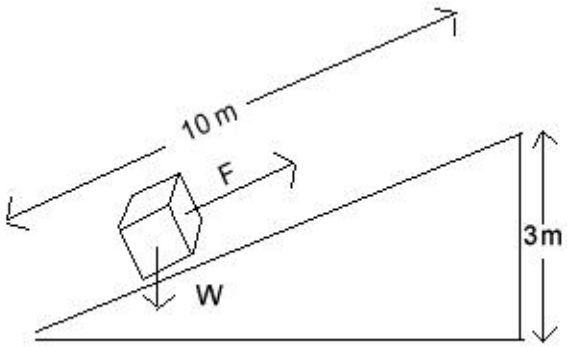
18. You accidentally drop a drinking glass. After the glass left your hand,

    A. The inertia of the earth pulled the glass down
    B. Gravity caused the glass to fall at a constant rate
    C. Gravity caused the glass to fall faster and faster
    D. The equal and opposite forces of gravity and air resistance acted upon it.

19. As the space shuttle lifts off from Cape Canaveral and ascends into the atmosphere, its _____ becomes less.

    A. density
    B. inertia
    C. mass
    D. weight

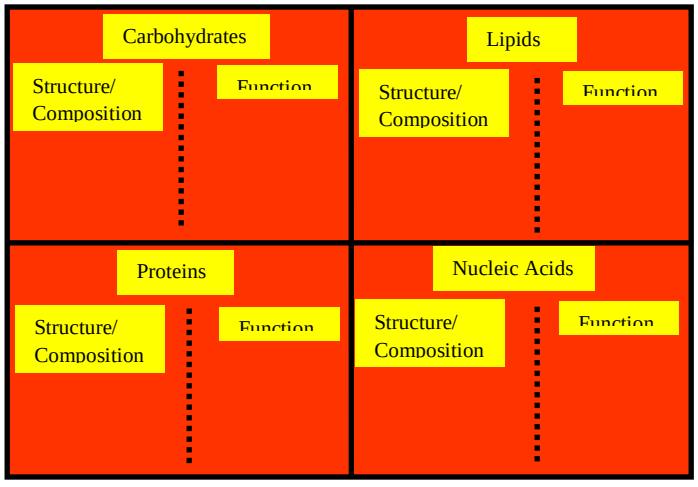
20. In order to raise a box 3 meters (m) to the awaiting bed of a tractor-trailer, you push it up a 10 m ramp. The box is filled with books and weighs 200 Newtons (N). You use a force of 75 N applied parallel to the ramp.



Determine the mechanical advantage of the ramp.

A. 0.3
B. 0.375
C. 2.67
D. 3.33

Wednesday, June 23		
Domain: Cells and Heredity • Students differentiate the functions of macromolecules. • Students describe the structures of cells and the structure and function of their components.		
Time	**Activity/Task**	**Assessment**
10 min	*Warm-up* Ask students to complete the "Exploring What I Know" (see Exploring What I Know handout in Wednesday's, June 23 materials section). Have students post their ideas on chart paper and post it around the room. Instruct the students to do a wall walk and to write in their notebooks any similarities or differences between their answers and those of their classmates. Conclude the activity by facilitating a short discussion about their ideas.	Completion of the Exploring What I Know activity
20 min	*Diffusion Lab* Students set up the Diffusion lab activity for later review (see Diffusion Across a Semi-Permeable Membrane activity in Wednesday's, June 23 materials section). *Teacher Notes: Make sure that you do this first thing in the morning. After the lab has been set, it needs to be left alone for about two hours.*	Proper set up of the lab experiment.
20 min	*Osmosis and Diffusion -Research* Divide the classroom in four groups, two of the groups should prepare a five minute presentation on osmosis and the other two a five minute presentation on diffusion. *Teacher notes: Take the students to the computer lab or the school library to do their research. Pass out the guiding questions for research handout (see Osmosis and Diffusion Guiding Questions in Wednesday's, June 23 materials section). Provide students with large chart paper, markers, or if available, a computer to do a multimedia presentation.*	Group presentations
20 min	*Osmosis and Diffusion -Presentations* Each group will present the results of their work. Students should complete the answers to the Osmosis and Diffusion Guiding Questions handout. (See Osmosis and Diffusion Guiding Questions in Wednesday's, June 23 materials section).	Students' presentations. Guiding Questions completion.

Wednesday, June 23 (continuation)		
Time	**Activity/Task**	**Assessment**
15 min	*Macromolecules' Functions - Information* Divide the students into four groups and assign- each group one of the four macromolecules (carbohydrates, proteins, lipids, and nucleic acids). Ask each group to watch the corresponding Unitedstreaming video on their assigned macromolecule and complete the Macromolecules video information form (see Macromolecules Video Information Form handout in Wednesday's, June 23 materials section). *Teacher Notes: Information for student research on nucleic acids and lipids is included in the materials section. The following videos from Unitedstreaming can be found in the resource DVD provided with this handbook* • *Carbohydrates* • *Proteins*	Completion of Macromolecules information sheets.
20 min	*Macromolecules' functions – Discussion* Form four new groups of students, making sure that there is at least one representative for each type of macromolecule. Ask the students to complete information under each macromolecule on the placemat board. (See the Wednesday's, June 23 materials section for the labels for the placemat).  After you have reviewed the information on the placemat, ask the students to copy it into their notes/notebooks. (See Scaffolded Notes (teacher's page) in Wednesday's, June 23 materials section for a summary of information students should include).	Completion of placemats.

Wednesday, June 23 (continuation)		
Time	**Activity/Task**	**Assessment**
15 min	*Diffusion Lab -Conclusion* Record observations of diffusion activity that was set up at beginning of the day. Students should see evidence of diffusion across baggies (cell membranes).	Lab report observations

Wednesday, June 23 (continuation)		
Domain: Forces, Waves and Electricity • Students describe the properties of waves		
Time	**Activity/Task**	**Assessment**
10 min	*Warm-up* Provide the students with the Waves Anticipation Guide handout (see Waves Anticipation Guide handout in Wednesday's, June 23 materials section) and ask them to fill out the column titled "Before the Lesson" and leave the column titled "After the Lesson" blank for now.	Completion of Anticipation Guide.
20 min	*Mechanical vs. Electromagnetic Waves* Students watch the Unitedstreaming videos on waves and energy and complete the Mechanical and Electromagnetic Waves video information handout (see the Mechanical and Electromagnetic Waves Videos Information handout in Wednesday's, June 23 materials section). *Teacher notes: The students should watch the following Unitedstreaming videos to complete this section* • *Waves and the movement of energy* • *The nature of waves* • *Sound Waves* • *Electromagnetic waves*	Completion of the video information handout
15 min	*Group Discussion* After watching the videos, review each question- by asking different students to share their answers with the group. Form groups of three or four students, provide them with a piece of chart paper and markers and ask them to draw a large transversal and a longitudinal wave. Instruct the students to label all the parts of both waves and to indicate below each one some of its important characteristics.	Participation in the classroom discussion. Illustrations of the different types of waves.

Wednesday, June 23 (continuation)		
Domain: Forces, Waves and Electricity • Explain the transfer of light, heat, and sound energy through the application of wave theory.		
Time	**Activity/Task**	**Assessment**
20 min	*The Electromagnetic Spectrum* Students use the Electromagnetic Spectrum Manipulative and work in small groups. Ask students to identify each region of the electromagnetic spectrum by using the labels and arrows provided to them in the plastic bag. After the students have finished placing the labels where they believe they go, ask the students to watch the UnitedStreaming video The Electromagnetic Spectrum. Have students - modify or correct their original identification of the regions of the electromagnetic spectrum. Conduct a discussion about characteristics and uses of the different types of energy waves in the electromagnetic spectrum. Simultaneously with this discussion ask students to complete the Electromagnetic Spectrum information sheet (See Electromagnetic Spectrum information handout in Wednesday's June 23 materials section).	Correctly identifying the regions of the electromagnetic spectrum
20 min	*Wave Behavior* Ask students to complete the graphic organizers on refraction, reflection, diffraction, and interference (see Concept Map: Wave Phenomena handouts in Wednesday's June 23 materials section). Provide every group with the Wave Behavior Manipulatives (see Wave Behavior Manipulatives in Wednesday's June 23 materials section). Have students match the term, description, and picture of each type of wave phenomena. Facilitate a class discuss about these phenomena. Students should, if necessary, correct/improve their own graphic organizers based on the classroom discussion.	Completion of concept maps Classroom participation Completion of Wave Phenomena Manipulative
20 min	*Review Questions 13* Provide students with a set of questions about mechanical and electromagnetic waves (see Review Questions 13 handout in Wednesday's June 23, materials section). Give them 15 minutes to answer the questions individually. Conduct a group discussion reviewing answers to the Review Questions. Have students correct their responses and provide an explanation of why the answer needed to be corrected.	Student questionnaire

Wednesday's June 23
Materials Section

Exploring What I Know

Instructions:
With your partner, answer the following question as best you can.

You are a member of the coaching staff for the next Olympic track and field team. The chef at your Olympic training facility is asking you for a recommendation for a meal before a competition. Which type of food will you recommend to feed to the athletes so that they will have the energy they will need to run in the events? Why?

Diffusion across a Semi-permeable Membrane
Laboratory

Background information
The cell membrane, in addition to providing protection and support for the cell, also regulates what comes into the cell and what leaves the cell. This movement of material through the cell membrane in either direction is very important. In the cells' normal activities, nutrients are going to need to be supplied, waste materials are going to need to be eliminated and the cell membrane is central to those processes.

Small molecules can move through the cell membrane with little difficulty, passing between the lipid bilayer-construction of the membrane. Larger molecules however need help getting through which comes from proteins embedded in the bilayer membrane.

One of the ways that material can move through a cell membrane is **diffusion.** This is especially true of smaller molecules or dissolved ions which are able to pass between the bilayer-construction of the cell membrane. In diffusion, particles move through the membrane according to concentration; they move from areas of higher concentration to areas of lower concentration. For example, as nutrients are used in the cell, the concentration of nutrients becomes lower in the cell than outside the cell; therefore nutrients move into the cell by diffusion. Wastes, on the other hand, will accumulate inside the cell and be at a higher concentration than outside the cell. Wastes will then move out of the cell. Some particles are too large to pass between the molecules making up the membrane.

In this activity, we will use a sandwich bag to model a cell membrane and we will observe the movement of some materials through the bag. We will use glucose or dextrose as a monosaccharide (small enough to move through the membrane) and cornstarch, a polysaccharide (too large to pass through the membrane). The indicators that we will use will be glucose test strips to detect the presence of glucose and iodine to detect for the presence of the starch. Your teacher will demonstrate what the iodine test looks like when placed in a starch solution and what the glucose test strip will look like when placed in a sugar solution.

Materials:

For each group you will need:
1-250 ml beaker
1-sandwich bag
1-rubber band
Cornstarch
Dextrose or glucose
Water
Iodine solution
Glucose test strips
Scoop or spatula

Procedure: (Part 1)
This part of the procedure should be done on the previous afternoon or first thing in the morning of the day on which the activity will be conducted.

1. Place about 100 ml of water, a scoop of cornstarch in the bag and mix thoroughly. Since we know that starch is present in the baggie, record starch present in the 'before' column of the data table.
2. Place about 150 ml of water in the beaker along with 2 scoops of glucose or dextrose and dissolve. In the 'before' column of the data table, record that sugar is present.
3. To the contents of the beaker, now add a couple of drops of the iodine indicator. Describe the color of the solution in the beaker after adding the iodine. Is it showing the same color that you saw when the demonstration was done with iodine and starch? Is starch present in the beaker? Record in the 'before' column of the data table.
4. Seal up the baggie by twisting/folding/rubber band and submerge it in the beaker, taking care not to allow the contents to overflow.
5. Label and place the beaker aside for use later.

Procedure: (Part 2)
This part of the procedure should be done app. 3 hours after Part 1 is set up to allow for the movement of any material across the bag membranes.

1. Remove the baggie carefully from the beaker and place on some paper towels. Notice any changes in color that occurred compared to the original colors when you set up the activity.
2. Based on the positive starch test, did any starch move out of the bag? Record on the data table in the 'after' column.
3. Based on the positive starch test, what must have moved through the membrane to the inside of the bag to account for the color?
4. Using the glucose test strips, test the contents of the bag. Is glucose present in the bag? Record on the data table in the 'after' column.

Data table

	Before submerging		After submerging	
	Initial color	Substance(s) present	Final color	Substance(s) present
Solution in baggie				
Solution in beaker				

Analysis:
Based on your observations and data answer the following questions:

1. Based on your observations, what substance(s) moved, the iodine, starch, and/or glucose?
2. How did you determine this?
3. The plastic baggie was permeable to which substance?
4. Is the plastic baggie selectively permeable? Explain.
5. Sketch the cup and baggie in the space below. Use arrows to illustrate how diffusion occurred in this lab.

Diffusion and Osmosis Guiding Questions
Instructions: Your research on diffusion or osmosis must answer the following questions
What is osmosis?
What is diffusion?
What is the difference between diffusion and osmosis?
What is passive transport?
What is active transport?
What is the role of mitochondria in the active transport process?

Macromolecules Information: Carbohydrates	
Instructions: Complete the following information sheet for the molecule assigned to your group. Work with your teammates to get the best answer to each question.	
What elements make carbohydrates?	
What is the more important sugar for life? What is its chemical composition?	
What are polymers? What is an example of a polymer found in plants?	
What is the main function of polymers?	

Macromolecules Information: Lipids	
Instructions: Complete the following information sheet for the molecule assigned to your group. Work with your teammates to get the best answer to each question.	
What elements make lipids?	
What is the main function of lipids in living organisms?	
Where are lipids stored?	

Lipids

Lipids are present in all living cells, but the proportion varies from tissue to tissue. They are organic compounds, insoluble in water, but that dissolve readily in other lipids and in organic solvents such as alcohol, chloroform, and ether. Lipids contain carbon, hydrogen, oxygen, and sometimes phosphorus. They are classified according to their solubility and include neutral fats (triglycerides), phospholipids, and steroids.

The triglycerides accumulate in certain areas, such as adipose tissue in humans and in the seeds of plants, where they represent a form of energy storage. The more complex lipids occur closely linked with protein in the membranes of cells and of subcellular particles. More active tissues generally have higher complex lipid content; for example, the brain, liver, kidney, lung, and blood contain the highest concentration of phosphatides in the mammal.

In living organisms lipids serve as the basis of cell membranes and as a form of fuel storage. Often lipids are found conjugated with proteins or carbohydrates, and the resulting substances are known as lipoproteins and lipopolysaccharides. The fat-soluble vitamins can be classified as lipids.

Lipids (fats and oils) have borne the brunt of the blame for the degenerative diseases (heart disease and cancer) that are the major causes of death in the developed world. The negative view of lipids has obscured their essentiality for human health. If a problem exists, it is one of quantity, in general, and specific lipids in particular.

Lipids are important for maintenance of human health and well-being in a number of ways. Probably the most important function of lipids is provision of an efficient energy source. Fat provides 9 calories of energy per gram or 2.25 times as much as either carbohydrate or protein. Carbohydrate is not stored in the body and protein stores are predominantly muscle, whose breakdown entails serious health consequences. Fat is stored as such and can be easily mobilized if needed.

Macromolecules Video Information: Proteins	
Instructions: Complete the following information sheet for the molecule assigned to your group. Work with your teammates to get the best answer to each question.	
What elements make proteins?	
What determines how a protein functions?	
What are some examples of proteins in the human body? What is their function?	
What are enzymes?	

Macromolecules Video Information: Nucleic Acids	
Instructions: Complete the following information sheet for the molecule assigned to your group. Work with your teammates to get the best answer to each question.	
What elements make nucleic acids?	
What is the function of the nucleic acids?	
What are the two classes of nucleic acids? What is their importance for living organisms?	

Nucleic Acids

Nucleic acids are extremely complex molecules that are found in living cells and viruses and constitute the fundamental substances of living things. Their name comes from their initial isolation from the nuclei of living cells, but they also occur elsewhere in cells. Their functions include the transmission of hereditary characteristics from one generation to the next and the triggering and controlling of the manufacture of specific proteins.

The two classes of nucleic acids occurring naturally are DNA, or deoxyribonucleic acid, and RNA, or ribonucleic acid. The backbones of DNA and RNA molecules are generally shaped like helical strands. A typical strand consists of a chain with a great number of links. Each of the links of the chain includes a phosphate group and a particular type of sugar: deoxyribose for DNA and ribose for RNA--a deoxyribose molecule has one less oxygen atom than does ribose. Also, to each of the sugar subunits in the backbone there is connected a smaller molecule, or "side group," which belongs to the class of chemical compounds known as bases. These side-group bases contain nitrogen and, for each type of nucleic acid, only four specific bases are allowed. The combination of the three subunits--sugar, base, and phosphate--is called a "nucleotide."

The sequence of these bases on the strand determines the code of the particular nucleic acid. This code, in turn, signals the cell how to produce a duplicate of itself or the proteins it requires for survival. In all living cells and most viruses, DNA carries the genetic code; in some viruses, known as RNA viruses, or riboviruses, RNA serves as the genetic material. RNA, for its part, plays an important role in the transfer, expression, and replication of the genetic information carried by DNA.

Scaffolded Notes *(teacher page)*

	Structure/Composition	Function
Carbohydrates	Carbon, hydrogen, oxygen atoms – ratio of **1:2:1** Made of monomers (monosaccharides), simple sugars or molecules composed of 2 or more simple sugars	Maintain structure – cellulose Energy – glucose
Lipids	Carbon, hydrogen, oxygen – but more complex than carbohydrates. Composed of C-H bonds, with fewer oxygen atoms than carbohydrates. Nonpolar molecules, therefore *insoluble* in H_2O	Used for long term energy storage, insulation and protective coatings. Lipids are the major component of membranes surrounding all living organisms. ***Waxes*** are long chain fatty acids attached to an alcohol group. Example: cutin – helps plants retain H_2O
Proteins	Carbon, hydrogen, oxygen, nitrogen and sulfur Made of a series of amino acids	***Essential to all life*** Used as enzymes, channel proteins in the cell membrane and used to build muscle Important in muscle contraction, transporting oxygen in blood and the immune system. Also an important component of membrane surrounding cells. Examples are collagen, enzymes, hemoglobin, insulin and antibodies.
Nucleic Acids	Made of nucleotides strung together. Nucleotides are small organic compounds consisting of a 5 carbon sugar, a base containing nitrogen, and a phosphate group. Adenine, cytosine, guanine, thymine or uracil.	Store genetic material and transport genetic material to ribosome to make protein Make up ATP, NAD+, NADP+, DNA and RNA

CARBOHYDRATES

PROTEINS

LIPIDS

NUCLEIC ACIDS

FUNCTION

FUNCTION

FUNCTION

FUNCTION

STRUCTURE/COMPOSITION

STRUCTURE/COMPOSITION

STRUCTURE/COMPOSITION

STRUCTURE/COMPOSITION

Anticipation Guide: Waves

Instructions:

In the column labeled "Before the Lesson", place a check next to any statement with which you agree. After the classroom discussion, compare your opinions with those presented during the lesson.

Before the lesson	After the lesson	Statements
		1. All waves travel at the same speed.
		2. Sound waves travel better in air than in water.
		3. Waves transport energy not matter.
		4. Only mechanical waves must travel through a medium.
		5. An electromagnetic wave in vacuum travels at the speed of light.
		6. Light is one form of an electromagnetic wave.
		7. Frequency and wavelength are the same.
		8. The energy of an electromagnetic wave is associated with its wavelength.
		9. Long wavelength electromagnetic waves (red light) have more energy than short wavelength electromagnetic waves (blue light).
		10. Radio waves are electromagnetic waves.

Mechanical and Electromagnetic Waves Videos	
Provide three examples of forms in which energy is transported by waves.	
What are the two basic types of waves?	
How is energy transported on a transverse wave? Sketch this phenomenon.	
How is energy transported on a longitudinal wave? Sketch this phenomenon.	

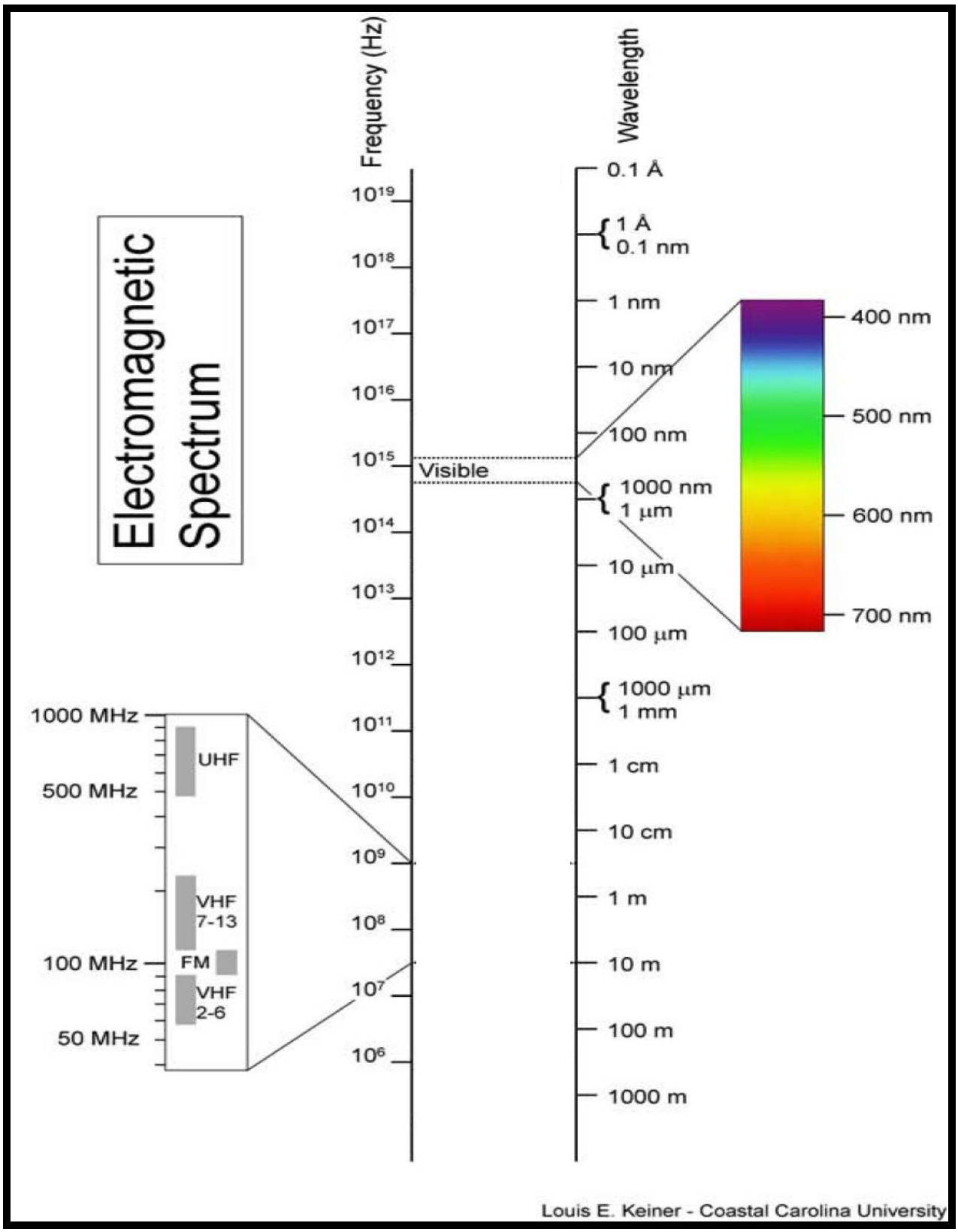
Mechanical and Electromagnetic Waves Videos	
What is frequency?	
What is the Amplitude of a wave?	
What limits the velocity of a wave?	
How are all waves similar?	
What causes sound? How is sound transmitted?	
What is another term for sound wave? Why is this?	

Mechanical and Electromagnetic Waves Videos	
What is necessary for sound waves to propagate? Why?	
What is the relation between pitch and frequency?	
What is the cause of the electromagnetic waves? What type of waves does it generate?	
Through what materials can the different electromagnetic waves travel?	
What is the velocity at which all electromagnetic waves travel?	

Electromagnetic Spectrum Labels

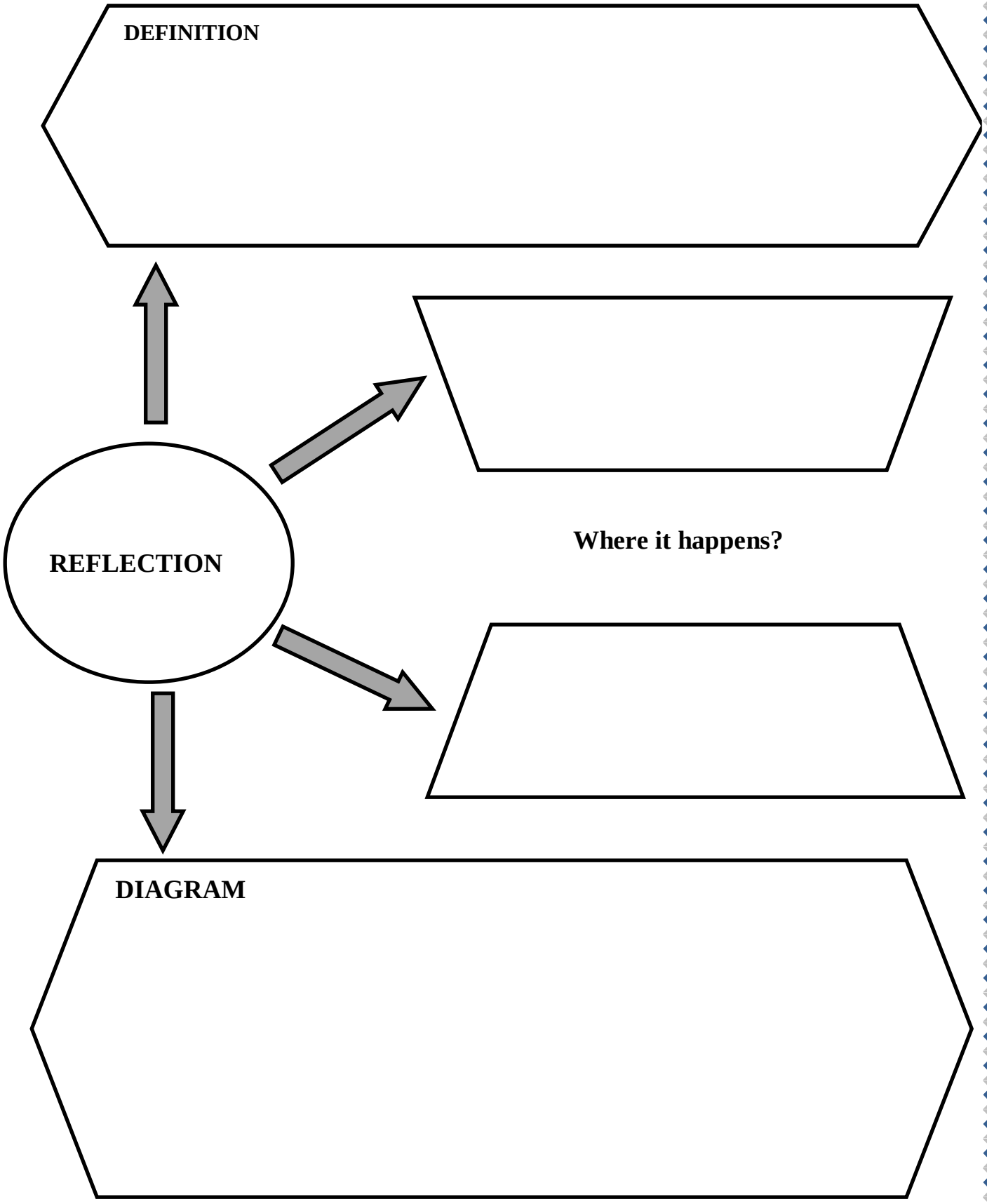
Gamma Rays	X-Rays	Ultraviolet
Microwave	Radio - TV	Infrared
Visible	Red Light	Blue Light
		
		
		

Electromagnetic Spectrum

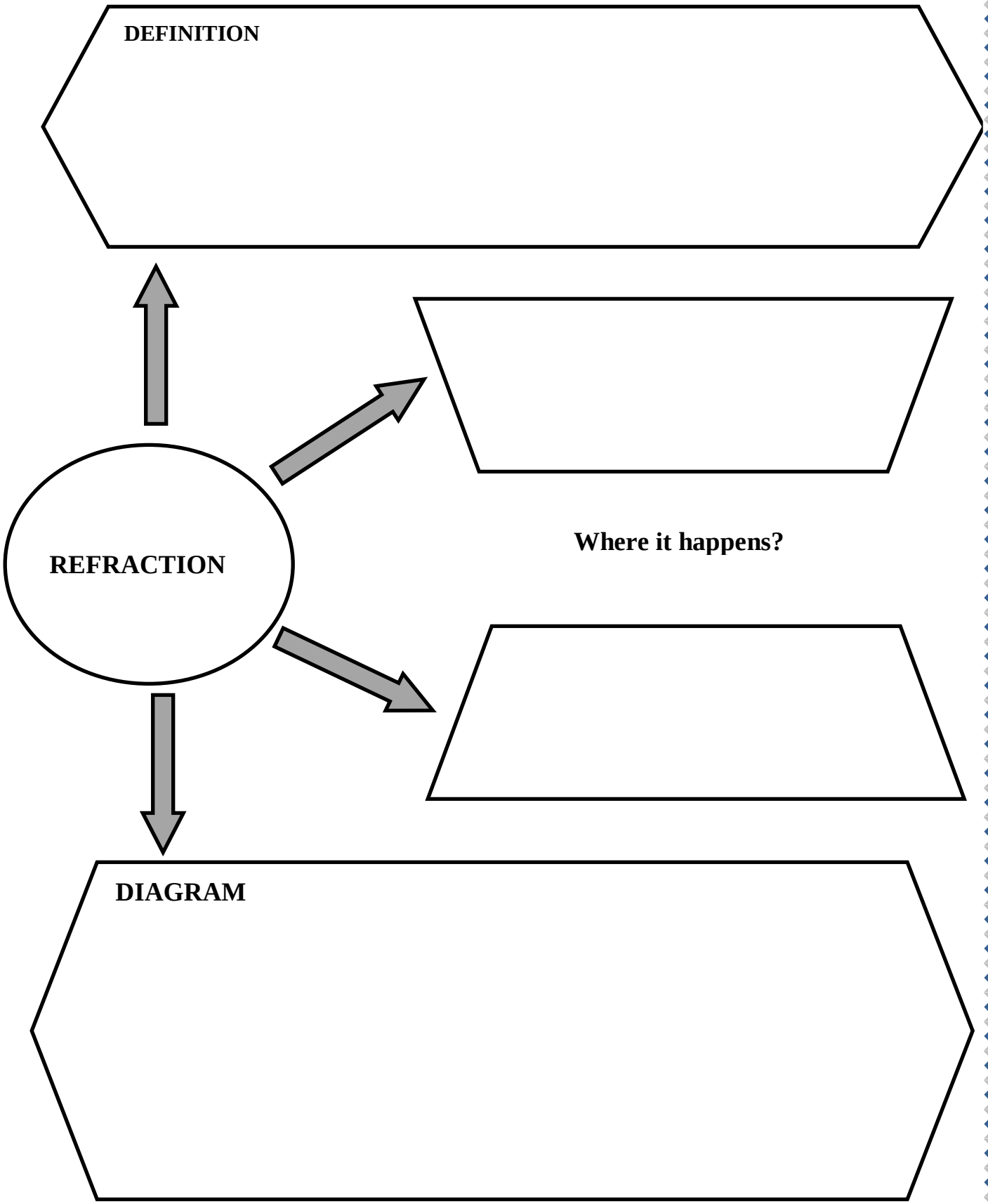


Electromagnetic Spectrum Video	
What characteristic of electromagnetic waves differentiate the various parts of the spectrum?	
What electromagnetic waves have the longer wavelength?	
What are two uses for microwaves?	
How does a microwave oven heat food?	
What are two types of radiation that we cannot see that are given off by the sun?	
Why is it not a good idea to sit out in the sun without a strong sun block?	

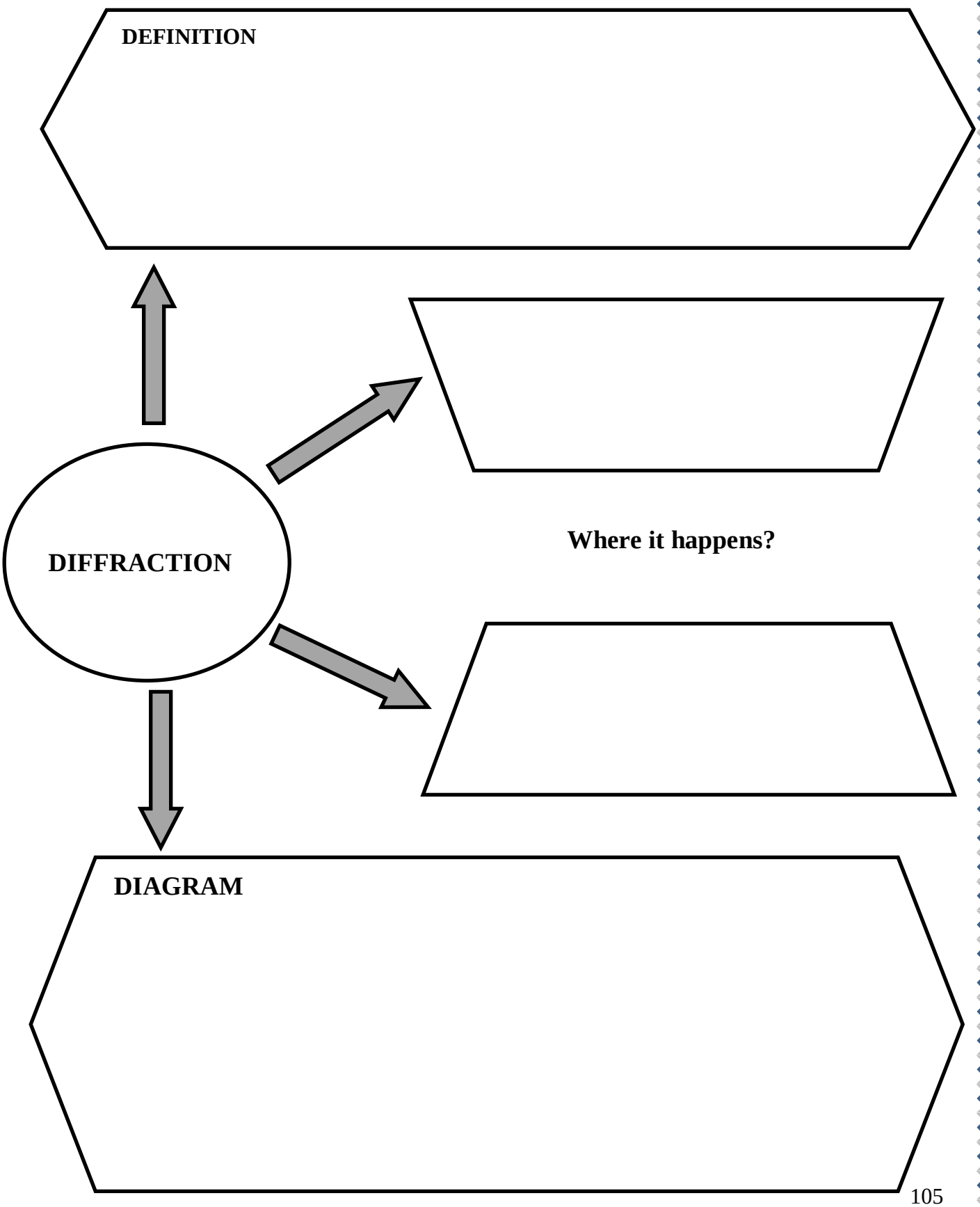
Concept Map: Wave Phenomena



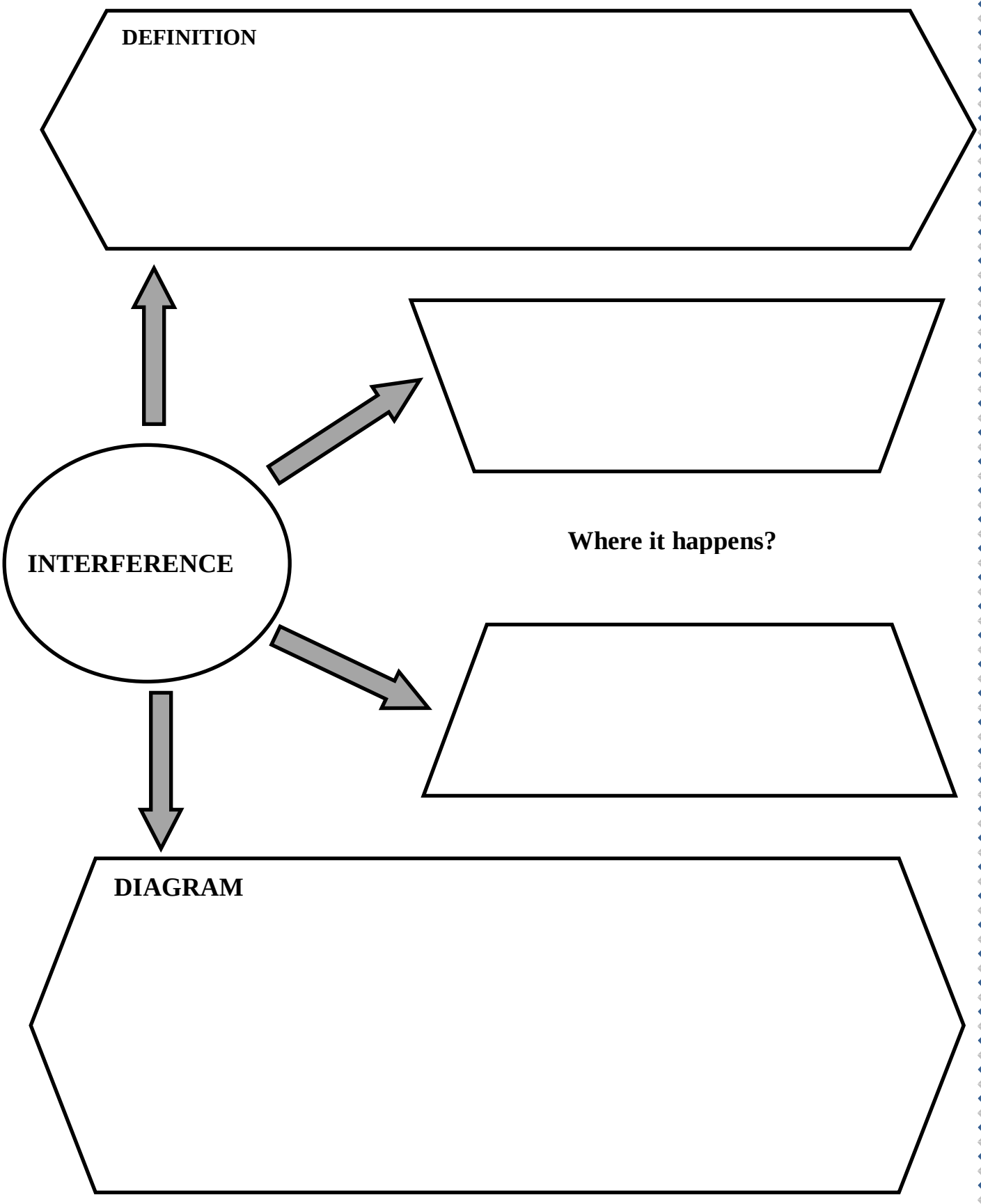
Concept Map: Wave Phenomena



Concept Map: Wave Phenomena



Concept Map: Wave Phenomena



Wave Behavior Manipulative

Bouncing back of waves when they reach another surface

The wave bounces back at the same angle with which it hit the surface

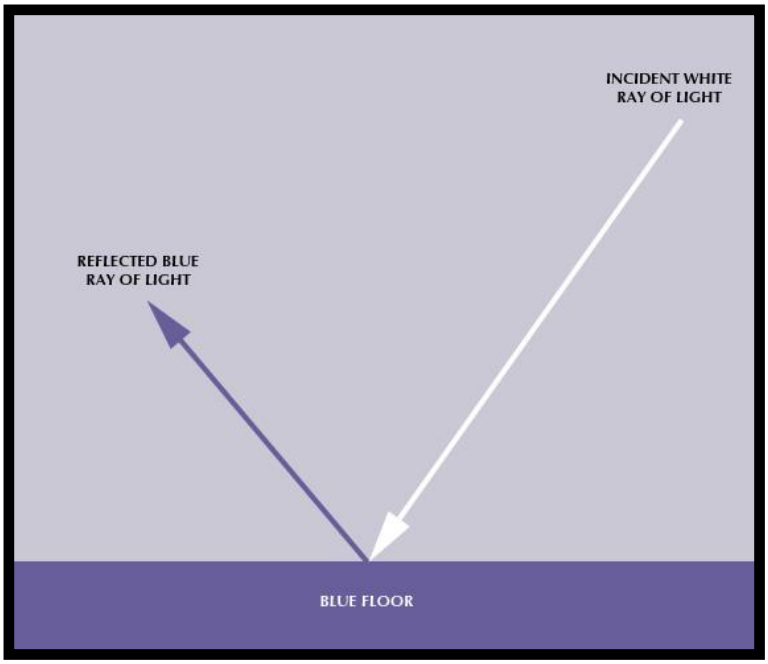
Bending of waves due to a change in speed

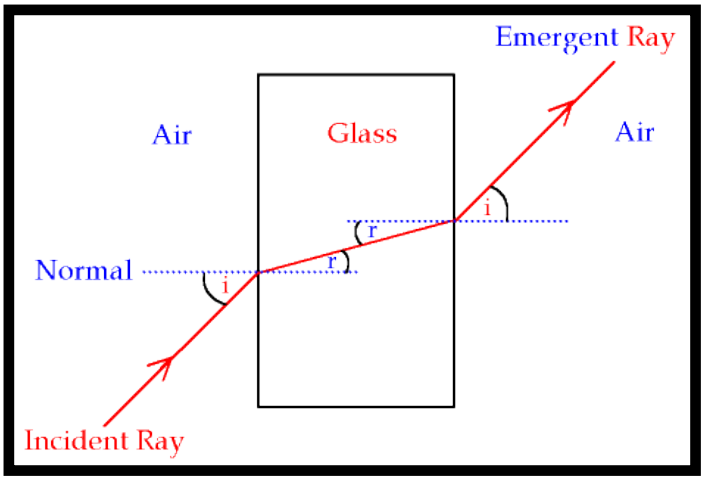
Caused when waves change mediums

Wave Behavior Manipulative

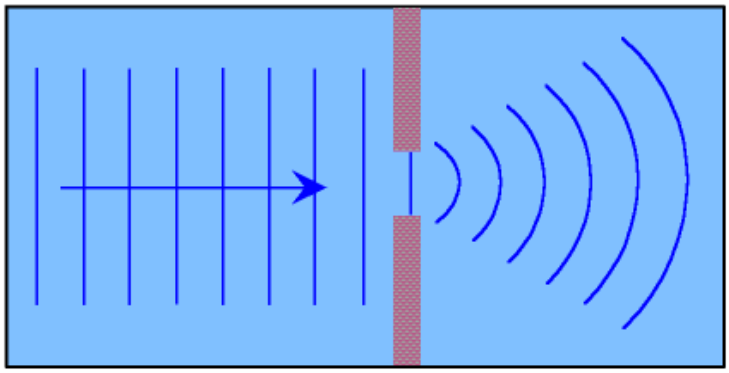
Bending of waves around the edge of an obstacle

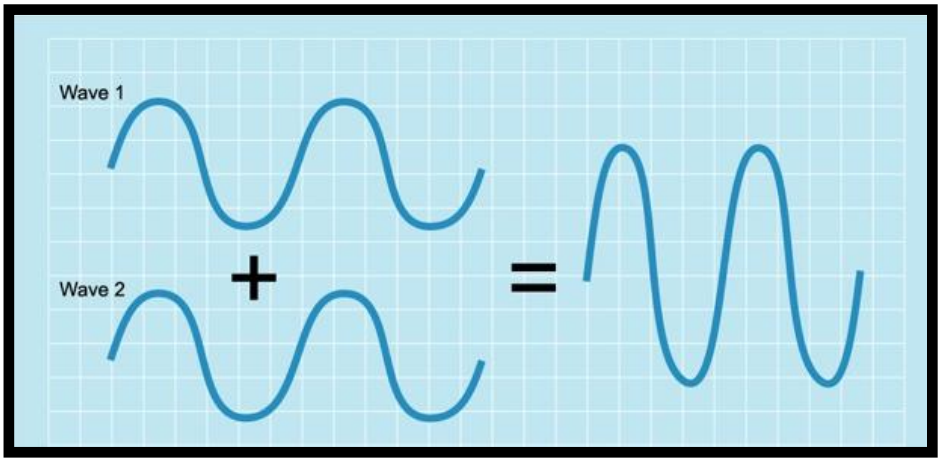
Interaction of waves that occur at the same place at the same time

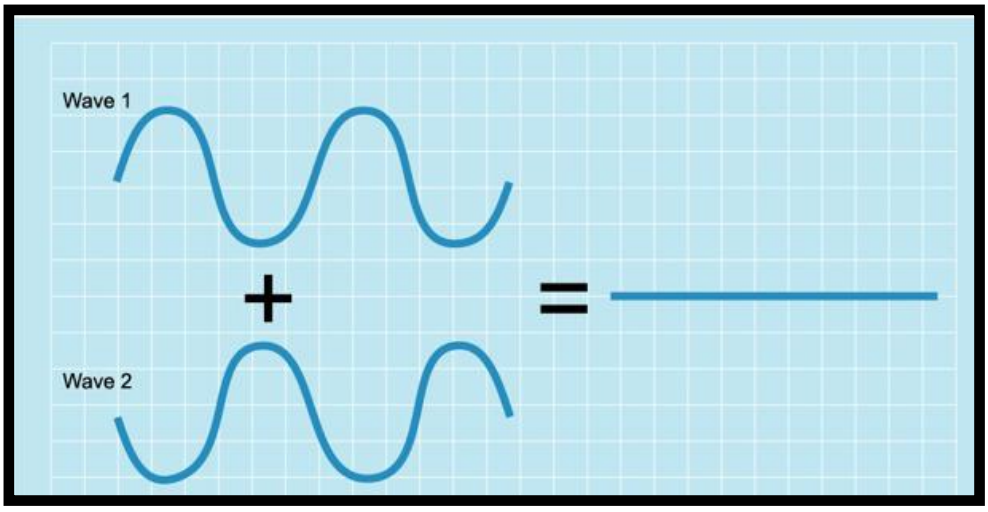




Wave Behavior Manipulative







Review Questions 13
Mechanical and Electromagnetic Waves

1. Which property of waves is illustrated in the example below?
   A black car hood in the July sun becomes very hot.

   A. Refraction
   B. Diffraction
   C. Absorption
   D. Reflection

2. Which is NOT true of a light wave?

   A. it is a disturbance
   B. it transfers energy
   C. it needs a medium in which to travel
   D. it is an electromagnetic wave

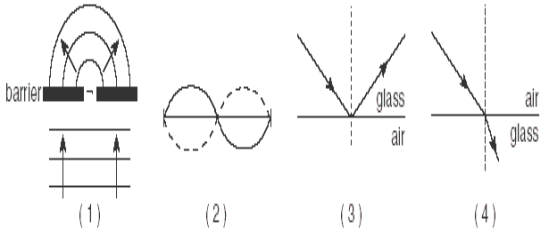
3. A scientist is delivering a lecture about sound. Which statement about sound would NOT be correct?

   A. The speed of sound in a steel rail on a railroad is slower than the speed of sound in the air above it.
   B. sound needs a medium in which to travel
   C. sound travels faster in the hot air of a desert than in the colder air of Antarctica
   D. sound is a mechanical wave

4. Which property of waves is illustrated in the example below?
   Two ocean waves meet and combine to make a bigger wave.

   A. Diffraction
   B. Absorption
   C. Reflection
   D. Interference

5. Which diagram below best represents refraction?



   A. 1
   B. 2
   C. 3
   D. 4

6. For a wave traveling at constant speed, frequency increases as

   A. amplitude decreases
   B. amplitude increases
   C. wavelength decreases
   D. wavelength increases

7. The electromagnetic spectrum is arranged according to

   A. wave speed
   B. wave amplitude
   C. wave medium
   D. wavelength

8. When two sound waves interfere constructively,

   A. the resulting sound is louder than either sound
   B. the resulting sound is softer than either sound
   C. neither sound wave is changed
   D. there is no resulting sound

9. A wave that carries a large amount of energy will always have a

   A. large amplitude
   B. small amplitude
   C. high frequency
   D. short wavelength

10. The color in the electromagnetic spectrum with the most energy would be

    A. red
    B. orange
    C. violet
    D. yellow

11. Electromagnetic waves are different from other types of waves in that they do not

    A. have amplitude
    B. have frequency
    C. transfer energy
    D. need a medium

12. Which of the following waves carries the most energy?

    A. Infrared
    B. Ultraviolet
    C. gamma rays
    D. X – rays

13. Wave A carries more energy than wave B. Wave B has a smaller ____ than wave A.

    A. Frequency
    B. Wavelength
    C. Amplitude
    D. Speed

14. The speed of a sound depends on

    A. its source
    B. the force of its compressions
    C. the number of waves per second
    D. the medium through which it travels

15. Because of their high energy, ____ can be used by radiologists to treat some forms of cancer.

    A. X-rays
    B. gamma rays
    C. microwaves
    D. ultraviolet radiation

16. The energy of light is proportional to

    A. its amplitude
    B. its wavelength
    C. its frequency
    D. the speed of light itself

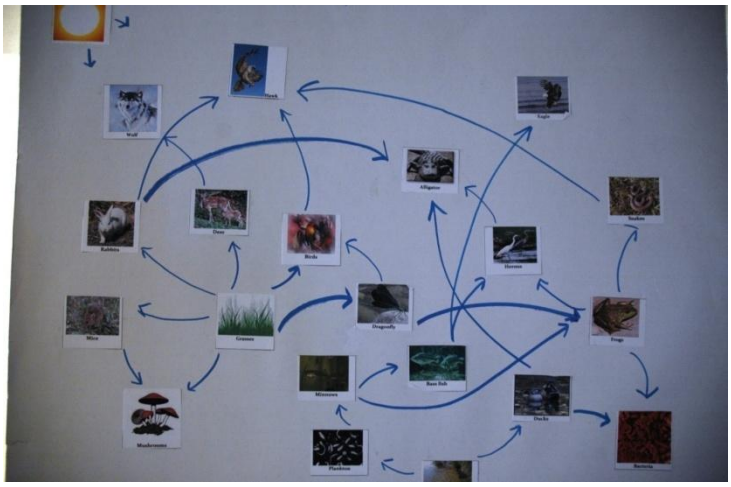
17. Refraction occurs when a wave enters a new medium at an angle because

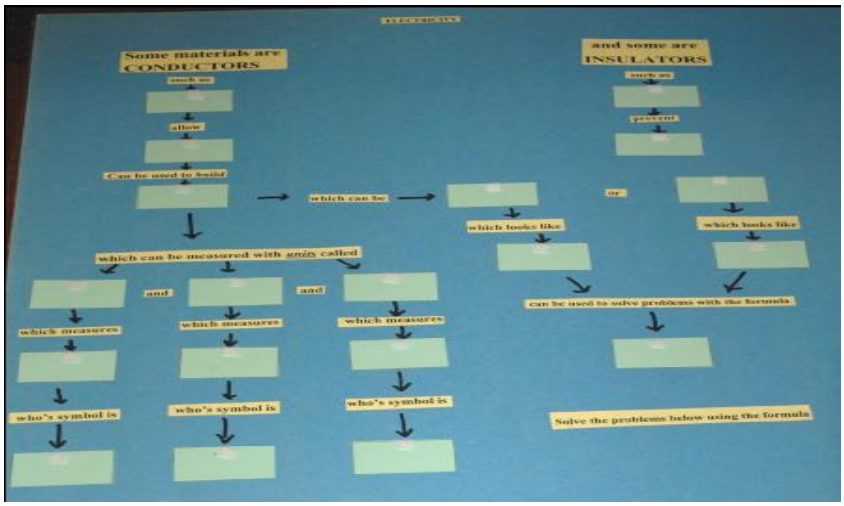
    A. the frequency changes
    B. the amplitude changes
    C. the wave speed changes
    D. none of the above

18. For a given wave, if the frequency doubles, the wavelength _____.

    A. Doubles
    B. stays the same
    C. is halved
    D. quadruples

Thursday, June 24		
Objective **Domain: Ecology** • Students use diagrams to interpret the interactions of organisms within food chains and webs. • Students determine the role of different organisms in food chains and webs.		
Time	**Activity/Task**	**Assessment**
10 min	*Guiding Questions Pre-assessment* Ask students to answer the guiding questions on Interactions of Organisms within food chains and webs. (See Guiding Questions in Thursday's June 24, materials section). *Teacher notes: conduct a short discussion around the questions as a manner to introduce the students to today's lesson.*	Answer guiding questions. Participation in classroom discussion
15 min	*Organisms and their roles within food chains and webs* The teacher shows the Organisms in Their Environment video clip from UnitedStreaming. Students should complete the Organisms in Their Environment video information sheet. (See Organisms in their Environment video information sheet in Thursday's June 24, materials section). *Teacher notes: Students do not need to watch the last two segments of the video; the carbon cycle and the quiz.*	Video information sheet
15 min	*Card Activity* The instructor passes out a set of index cards with roles and pictures. Students in groups of two arrange the roles and pictures as a pre-assessment probe. (See Organisms Matching cards in Thursday's June 24, materials section).	Constructed definitions.
20 min	*Generating a Food Chain* Divide the students in groups of two. Provide each group with a packet of the Food Chain Manipulatives with descriptor role terms, directions, and threat scenarios. (See Food Chain Manipulatives in Thursday's June 24, materials section). Student groups arrange the species into a food chain. Students select threat cards and describe in their notebooks what will happen to organisms in the food chain due to the threat card event.	Notebook reflections.

Thursday, June 24 (continuation)		
Time	**Activity/Task**	**Assessment**
30 min	*Food Web Construction, question generation and discussion* Use the organisms in the baggie to construct a food web (see Organisms Manipulatives in Thursday's June 24, materials section). This is an open ended activity. Students place the organisms on the poster and use a dry erase marker to draw arrows between the organisms, indicating their relationships. Each student group creates a scenario (disruption threat or question and writes it on their whiteboard) other groups circulate and respond to the question created by the group who created the food web.  *Teacher notes: This activity is designed to draw in and review information on ecology presented on Monday and Tuesday, including relationships between organisms, populations, communities, ecosystems, and biomes as well as matter and energy as they move through food chains and food webs. Class discusses the webs, questions and responses.*	Students construct a food web. Students generate and answer questions on interactions and changes in the webs.
20 min	*Review Questions 14* Provide students with a set of questions (see Review Questions 14 handout in Thursday's June 24 materials section) about the interaction of organisms within food chains and webs. Give them 15 minutes to answer the questions individually. Conduct a group discussion of the answers to the questions. Ask students to correct their own answers if necessary providing an explanation for the correction. The explanation must state the original reason the student chose the wrong answer and what makes the answer choice correct.	Student questionnaire

Thursday, June 24 (continuation)		
Objective **Domain: Forces, Waves and Electricity** • Students understand the properties of electricity and magnetism		
Time	**Activity/Task**	**Assessment**
15 min	*Guiding Questions – Electricity and Magnetism Assessment Probe and Task Challenge* Students complete an introductory assessment probe. (See Electricity and Magnetism Assessment Probe in Thursday's June 24, materials section). Teacher and students then discuss responses. The teacher challenges class to make suggestions on how to turn on the light bulb (making a complete circuit) with one battery, ONE wire, and one bulb.	Students complete assessment probe and build a circuit.
30 min	*Series and Parallel Circuit Activity* Follow the instructions given on the Series and Parallel Circuits Activity (see Series and Parallel Circuit Activity in Thursday's June 24, materials section) in groups of three. Ask the students to write a two paragraph conclusion about the things that they learned in their notebooks.	Completion of the activity
20 min	*Electricity Board Activity* Students review concepts in electricity by placing card terms in a concept map (see Electricity Concept Board Activity in Thursday's June 24, materials section). Instruct the students to take the words out of the plastic bag and place them on the correct place in the concept maps. Teacher and student discuss maps completed to clear up any misconceptions before the students tackle the problem set in the next activity. *Teacher notes: The concept maps need to be put together before issuing them to the students (see picture below). Follow the directions at the top of each concept map page.* 	Students complete the Concept Maps

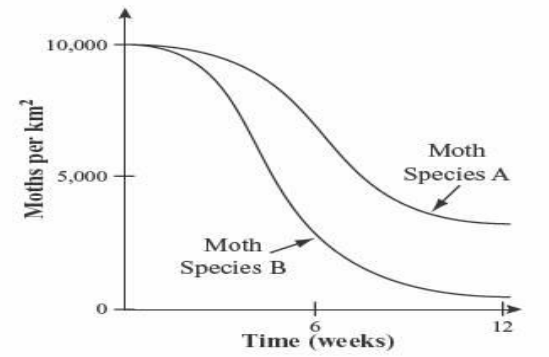
Thursday, June 24 (continuation)		
Time	**Activity/Task**	**Assessment**
20 min	*Electromagnets* Show the UnitedStreaming video Electromagnets. Ask the students to complete the Electromagnet video handout and conduct a group discussion.	Completion of Electromagnets video handout
20 min	*Making an Electromagnet* Group the students in groups of three or four and challenge them to use materials in the lab to design an electromagnet that will pick up paper clips. Students describe how they build their electromagnet and how it works.	Description of experiment results.
20 min	*Review Questions 15* Provide students with a set of questions (see Review Questions 15 handout in Thursday's June 24, materials section) about electricity and magnetism. Give them 15 minutes to answer the questions individually. Conduct a group discussion of the answers to the questions. Ask students to correct their own answers if necessary providing an explanation for the correction. The explanation must state the original reason the student chose the wrong answer and what makes the answer choice correct.	Student questionnaire

Thursday's June 24
Materials Section

Guiding Questions
The role of organisms within food chains and webs

What is an example of ecological succession?

The praying mantis is a predatory insect that often eats moths. The graph below shows the relative numbers of two species of moths over 12 weeks after the introduction of the predatory praying mantis.



What characteristic of this ecosystem is **best** indicated from this graph?

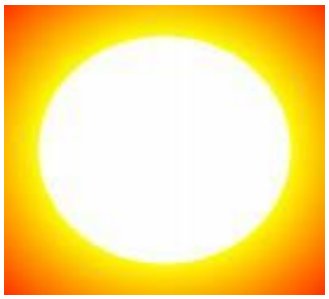
Organisms in their Environment Video Notes	
What are ecosystems?	
What factors help define the characteristics of a particular ecosystem?	
What is a population?	
What is a niche?	
What are species?	
What is a habitat?	
What are food chains?	
What are food webs?	

Organisms in their Environment Video Notes	
What are food producers?	
What are the first order consumers?	
What are the second order consumers?	
What are decomposers?	
What is a pyramid of energy?	
How much energy passes from one level to the next?	

Organisms Matching Cards
Terms

HETROTROPH	AUTOTROPH	PRODUCER
PREY	PREDATOR	CARNIVORE
HERBIVORE	OMNIVORE	Primary (1^{ST} ORDER) CONSUMER
Secondary (2^{ND} ORDER) CONSUMER	3^{RD} ORDER CONSUMER	Top Level Consumer
SUN	SCAVENGER	DECOMPOSER

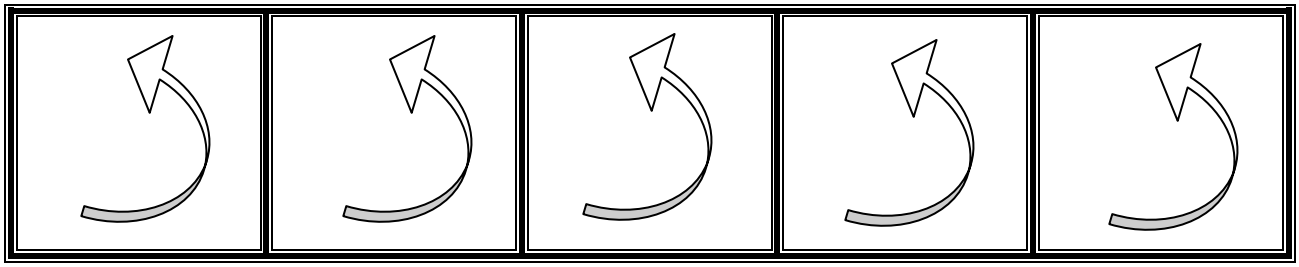
Organisms Matching Cards
Pictures

Food Chain Activity

Instructions:

1. Place the organisms in the correct order of the terrestrial food chain.
2. Lay the proper term beside each organism that defines its role in the food chain.
3. Use the arrows and "gives energy to" signs to indicate the direction of energy flow.
4. Use your threat scenario cards in the lower half of you whiteboard poster. Explain what you think would happen to the food chain after the event on the threat card occurs at the bottom of your white board using the dry erase marker.



Gives energy to	Terrestrial Food Chain			
Gives energy to	Gives energy to	Gives energy to	Gives energy to	Energy Source

Food Chain Manipulatives
(Continuation)

HETEROTROPH	HETEROTROPH	HETEROTROPH
HETROTROPH	AUTOTROPH	PRODUCER
PREY	PREDATOR	CARNIVORE
CARNIVORE	PREDATOR	HERBIVORE
CARNIVORE	OMNIVORE	Primary (1^{ST} ORDER) CONSUMER
Secondary (2^{ND} ORDER) CONSUMER	3^{RD} ORDER CONSUMER	Top Level Carnivore (4^{TH} ORDER) CONSUMER
SUN	PREY	PREDATOR

Food Chain Manipulatives
(Continuation)

	 1000kCal	 2 kCal
 200 kCal	 50 kCal	 10 kCal

Card for students who are not familiar with ecosystems in Georgia or who show confusion as they attempt this activity:

In a sunny field containing a small pond in Georgia, organisms cycle nutrients and pass energy in one direction through a food chain. In this ecosystem, grasshoppers love to eat the leafy plants surrounding the pond but must watch out for hungry frogs. The frogs are the favorite food of the snakes which are careful to hide their movements from the hawks that use them as a primary food source.

Food Chain Manipulatives
(Continuation)

Threat scenarios

A drought kills the plants in the area	**A farmer sprays a pesticide on the plant that is stored in its leaves at a small concentration.**
A drought kills the plants in the area	**A farmer sprays a pesticide on the plant that is stored in its leaves at a small concentration.**
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A drought kills the plants in the area	**A farmer sprays a pesticide on the plant that is stored in its leaves at a small concentration.**

Food Web Manipulatives

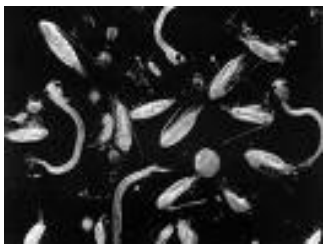
Directions:

1. All of these organisms make up the community of a portion of Georgia's Okefenokee swamp. Use the organisms in your baggie to construct a possible food web for the Okefenokee. Use a dry erase marker to show the movement of matter and energy from one organism to another.
2. Create a question to ask other student groups about your food web. Write that question at the end of your white board. You pose a question about a possible disruption threat or about the relationships between organisms, populations, communities, ecosystems, and biomes you have reviewed earlier in the week. Be creative!!!
3. Once you have completed your web and written the question you are asking about your web and the bottom of your whiteboard, circulate with the other members of your group and respond to the questions created by other groups using the dry erase markers. Make sure to include the names of your group members with the responses you make to the other groups' food webs.

Food Web Manipulatives
(Continuation)

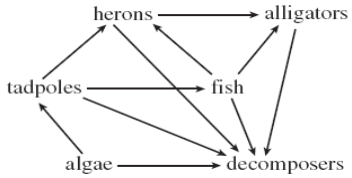
 Sun	 Mushrooms	 Bacteria
 Wolf	 Hawk	 Grasses
 Bird	 Rabbit	 Mice
 Snake	 Frog	 Herons

Food Web Manipulatives
(Continuation)

 **Bass fish**	 **Plankton**	 **Alligator**
 **Ducks**	 **Dragonfly**	 **Eagle**
 **Deer**	 **Algae**	 **Minnows**

Review Questions 14
Organisms' Interactions within Food Chains and Webs

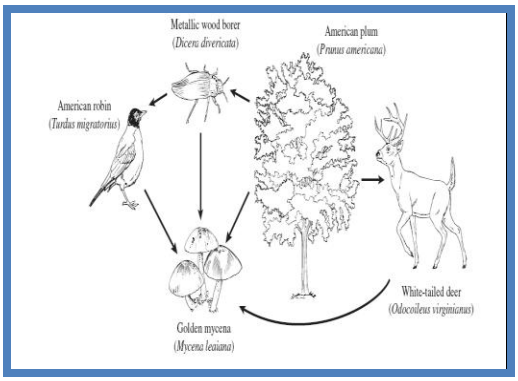
1. The diagram below shows a food web.



Which population would **probably** increase if the tadpole population decreased?

A. herons
B. alligators
C. fish
D. algae

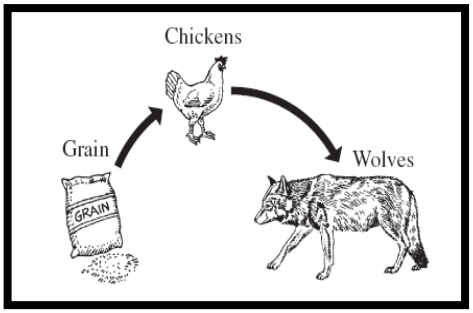
2. A food web is shown below.



Which organism in this food web is a decomposer?

A. American plum
B. Golden mycena
C. Metallic wood borer
D. White-tailed deer

3. The figure below represents the flow of food energy through a system.



In an experiment, chickens were fed grain that contained a chemical marker in its protein. The presence of the marker can be detected in organisms.
Which of the following is the **MOST** reasonable prediction from this experiment?

A. The marker will only be found in the grain.
B. Both chickens and wolves will have the marker.
C. Wolves will have the marker, but chickens will not.
D. The marker will only be found in the animal's wastes.

4. Plants → Aphids → Spiders → Sparrows
In this food chain, the spiders are

A. Hawks
B. Weasels
C. Raccoons
D. Mice

5. Many species of beetles, fungi and bacteria feed exclusively on dead plants and animals in the tropical rainforest biome so that the nutrients are very rapidly recycled in the biome. These organisms would be considered:

   A. Producers
   B. Carnivores
   C. Herbivores
   D. Decomposers

6. Major ecosystems that occur over wide areas of land are called

   A. Communities
   B. Habitats
   C. Biomes
   D. food chains

7. A relationship between a producer and consumer is best illustrated by

   A. a snake eating a bird
   B. a fox eating a mouse
   C. a lion eating a zebra
   D. a zebra eating grass

8. The physical location of an ecosystem in which a given species lives is called a

   A. habitat
   B. tropical level
   C. community
   D. food zone

9. Animals that feed on plants are at least in the

   A. first trophic level
   B. second trophic level
   C. third trophic level
   D. fourth trophic level

10. An organism's niche includes

    A. what it eats
    B. where it eats
    C. when it eats
    D. all of the above

11. An ecosystem consists of

    A. a community of organisms
    B. energy
    C. the soil, water, and weather
    D. all of the above

12. In the study of ecology, what is a population?

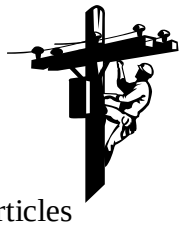
    A. all plants and animals in a given place
    B. all the living and nonliving things in an environment
    C. all the organisms of one particular species in a given place
    D. different plants interacting with each other in a given place

13. Physical and chemical factors may affect an organism's survival. These abiotic factors may include

    A. infectious parasites
    B. autotrophs and chemoautotrophs
    C. pathogens such as fungi and bacteria
    D. available gases such as O_2, CO_2 and N_2

14. Replacing inorganic nutrients in soil is accomplished primarily by the

    A. second-order consumers
    B. first-order consumers
    C. decomposers
    D. herbivores



Electricity and Magnetism Assessment Probe

One of the four fundamental forces, electromagnetic force, operates between charged particles (like protons and electrons) and electromagnetic fields that they create. Like charges repel and unlike charges attract. This basic law of nature results in many phenomena known as "electricity", "magnetism" and "electromagnetism". Listed below are some terms. Check all the ones you think are associated with electricity and magnetism. On right column of the table write a brief explanation outlining how each of the words you checked is associated with things that surround you.

	Current	
	Direct Current	
	Generator	
	Electromagnet	
	Motor	
	Resistance	
	Battery	
	Series circuit	
	Conductor	
	Voltage	

Series and Parallel Circuit Activity

Materials

1 AA battery
5 Christmas tree lights
Wires from the lights cut in different lengths

Directions

1. Construct a series circuit by using three or more tree lights (see figure 1 below).

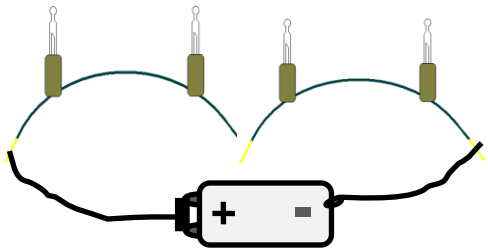


Figure 1

2. Complete the table below with your observations.

OBSERVATIONS	
1	
2	
3	
4	
5	

3. Modify your circuit if necessary to find out the answers to the questions on Table 2.

Inquiry Questions	
Are all the tree lights equally bright?	
What happens when one tree light is removed from the circuit and the remaining stay connected?	
	Why?
What happens if one of the lights burns out?	
	Why?

4. Construct a series circuit by using three or more tree lights (see figure 2 below).

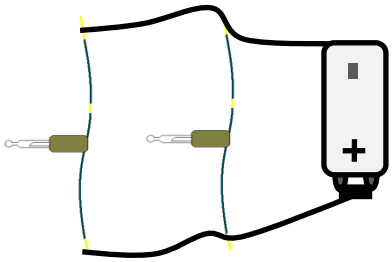


Figure 2

5. Complete the table below with your observations.

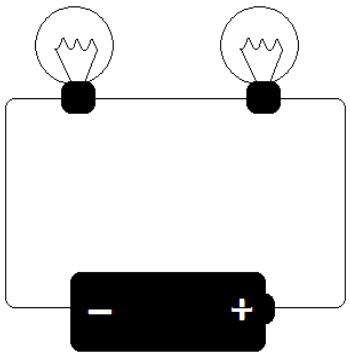
OBSERVATIONS	
1	
2	
3	
4	
5	

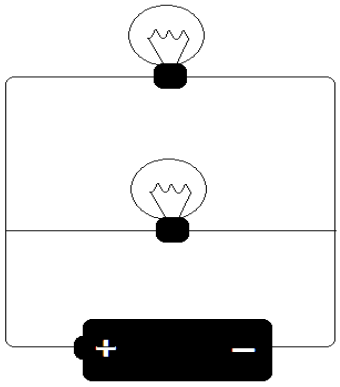
6. Modify your circuit if necessary to find out the answers to the questions on Table 2.

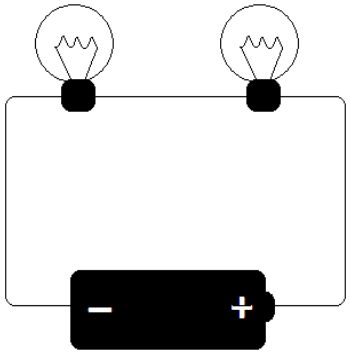
Inquiry Questions	
Are all the tree lights equally bright?	
What happens when one tree light is removed from the circuit and the remaining stay connected?	
	Why?
What happens if one of the lights burns out?	
	Why?

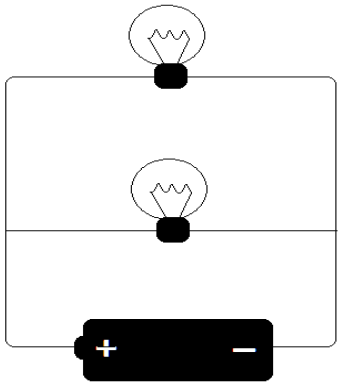
QUESTIONS:

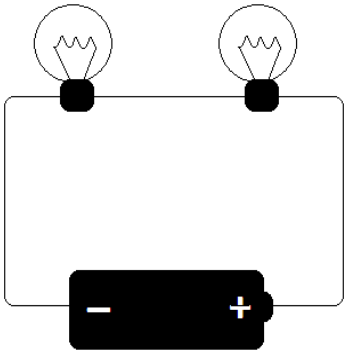
Look at the diagrams of the circuits below. Label each circuit as a series circuit or a parallel circuit. Draw some switches at various places in the circuit and describe what will happen to the flow of current if the switch is opened.

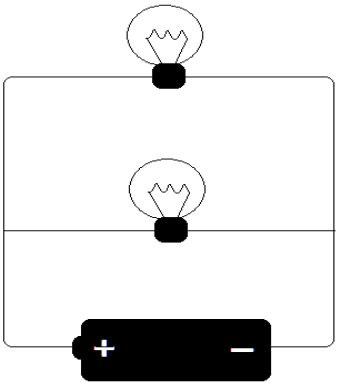




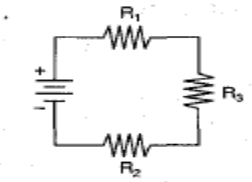
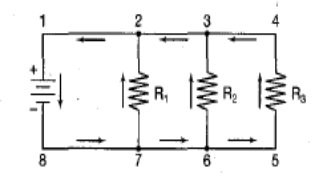




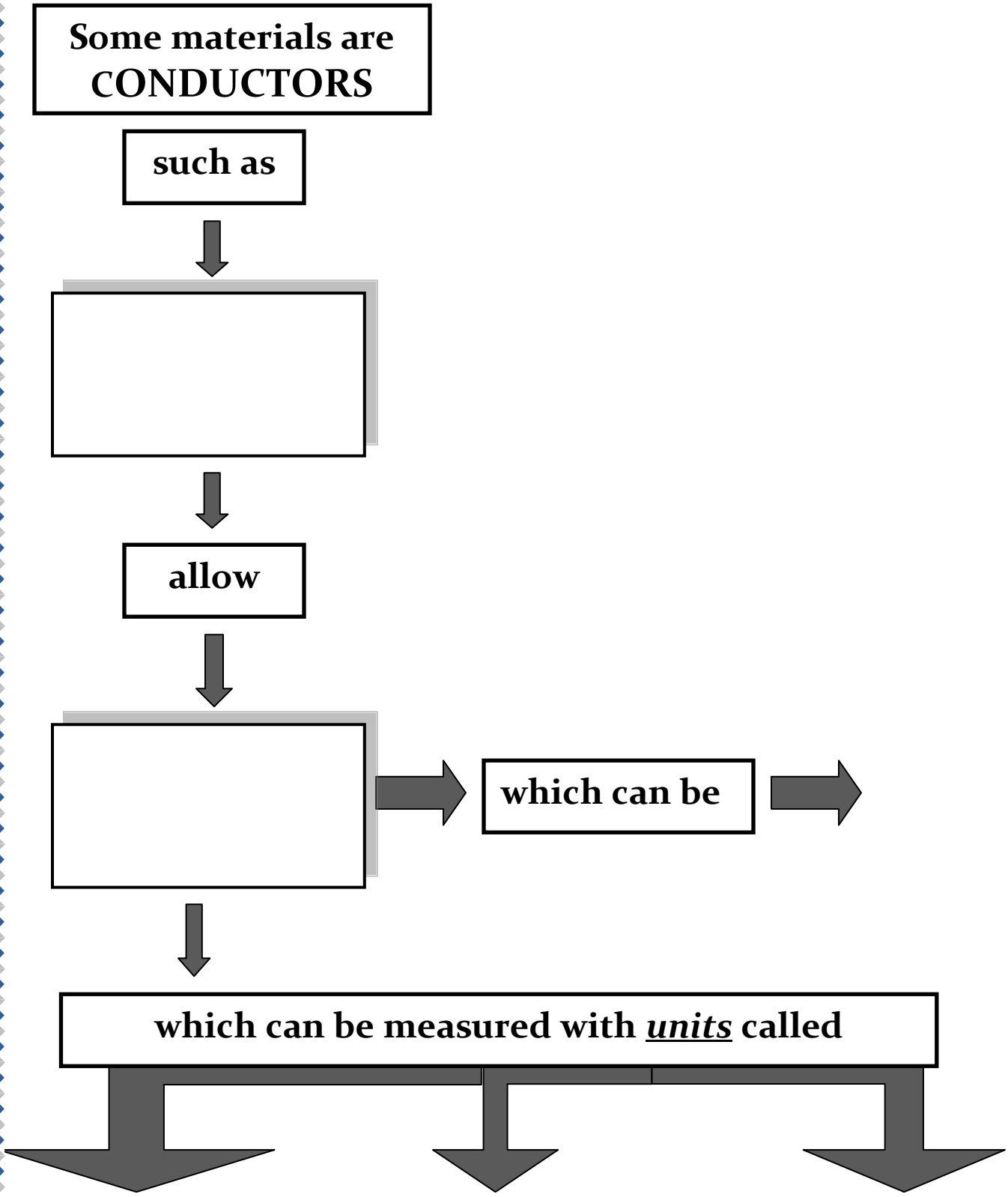




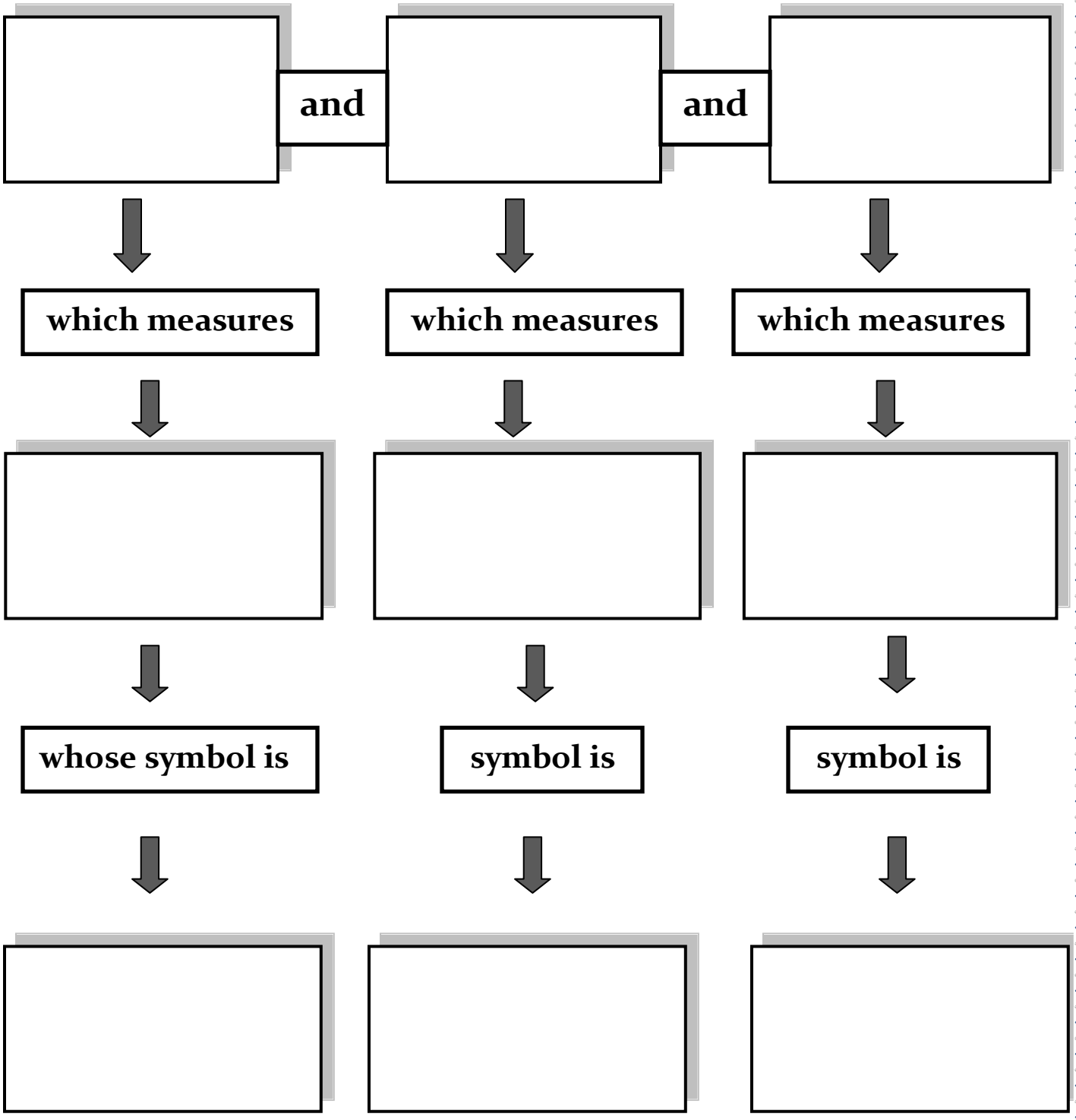
Electricity Concept Board Activity

Flow of charges	**The easy flow of charges**	**Copper & silver**
Plastic and rubber	**Electrical circuits**	**Volts**
Ohms	**Amperes**	**Resistance to current**
Current	**Force of charge through conductors**	**I**
V	**R**	**Series Circuits**
Parallel Circuits	**V=IR**	
		

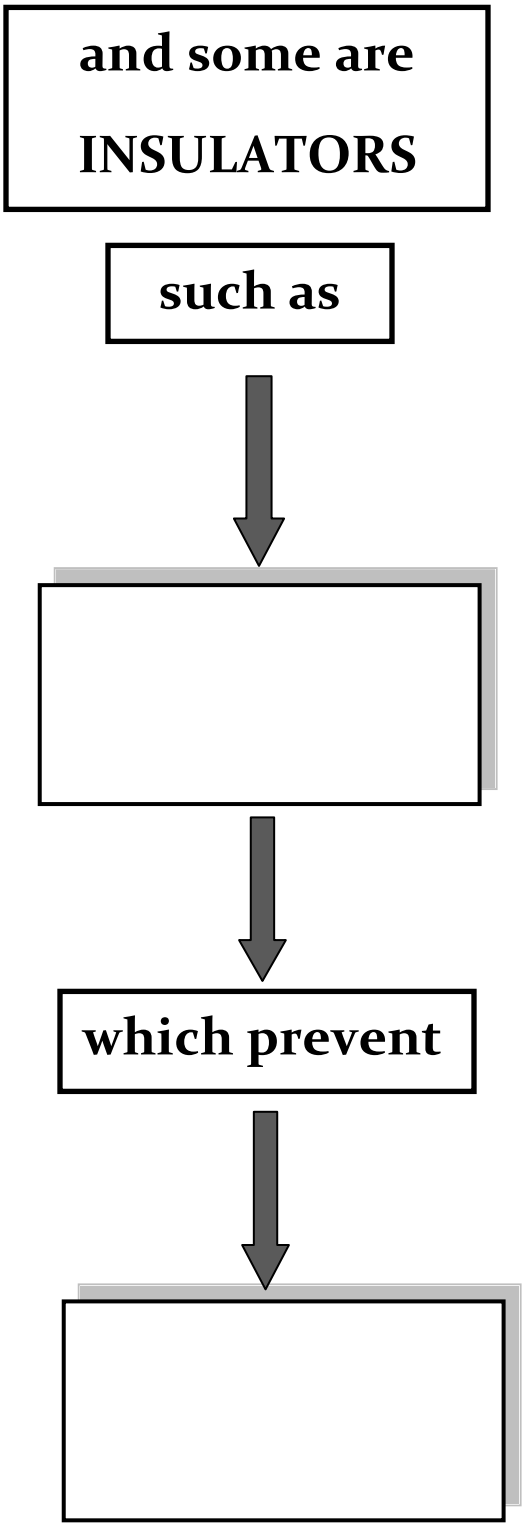
(Top left) **Electricity Concept Board Activity**



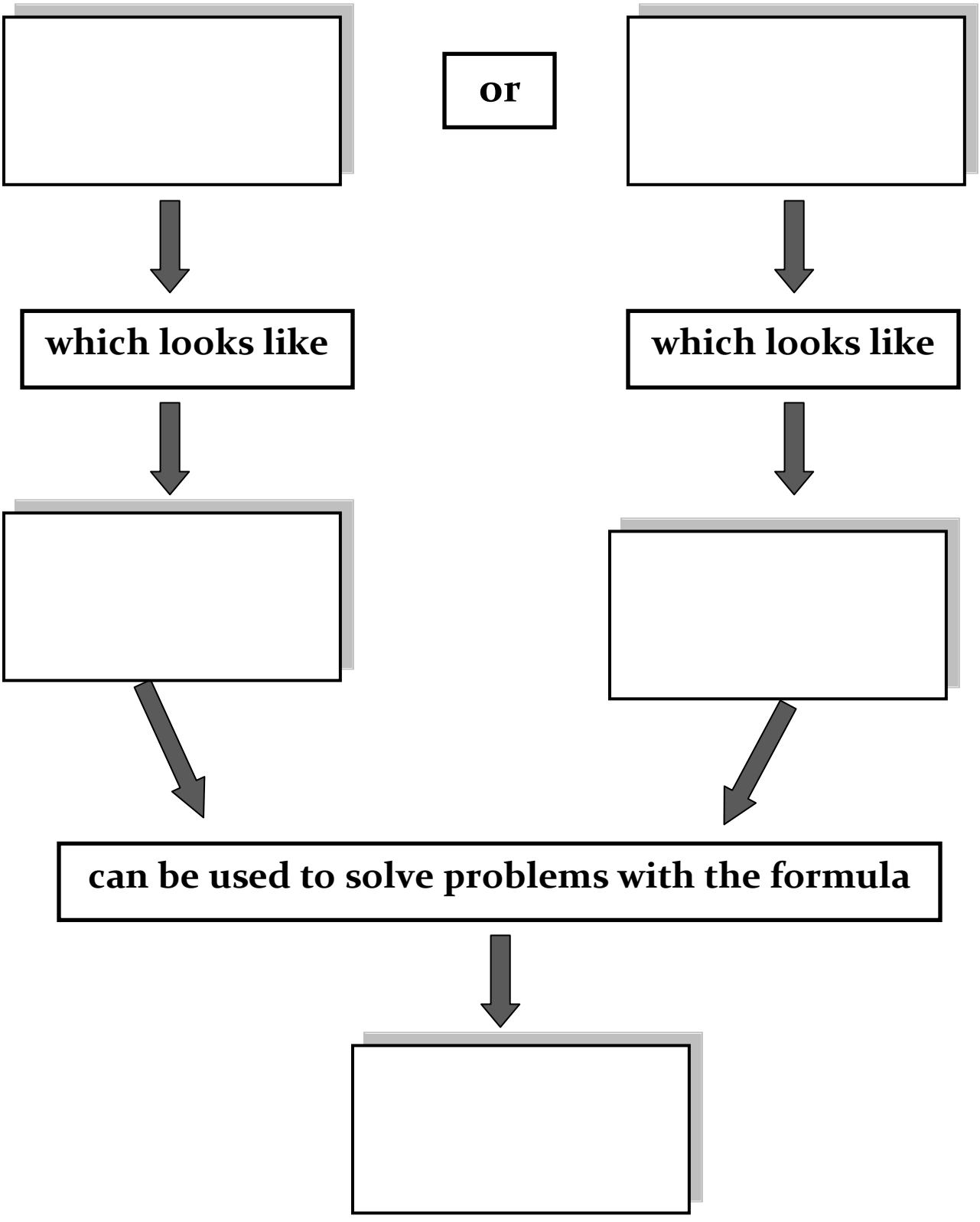
(Bottom Left) **Electricity Concept Board Activity**



(Top right) **Electricity Concept Board Activity**



(Bottom right) **Electricity Concept Board Activity**



(Additional labels) **Electricity Concept Board Activity**

can be used to solve problems with the formula

Electricity

Video Handout Electricity and Magnetism: The Magic of Magnets	
1. How did Oersted discover that electricity and magnetism are related?	
2. What materials does one need in order to make an electromagnet?	
3. Why is an electromagnet considered a “temporary” magnet?	
4. What are some uses for electromagnets?	
5. What are some variables that you could test to determine their effects on the strength of an electromagnet?	

Review Questions 15
Electricity and Magnetism

1. If a circuit has a current equal to 10 amps and a resistance equal to 2 ohms, what is the voltage in the circuit?

   A. 5 volts
   B. 20 volts
   C. 0.2 volts
   D. cannot be determined

2. Which of the following statements about circuits is true?

   A. As you add light bulbs to a parallel circuit, the light bulbs will become less bright as less current flows through each.
   B. If you stop the flow of current in one branch of a parallel circuit, the entire circuit MUST stop carrying electric current.
   C. If you stop the flow of current in one part of a series circuit, no current will flow in any part of the circuit.
   D. All of these statements are true.

3. Electric charges are usually transferred by

   A. electrons
   B. the nucleus
   C. protons
   D. neutrons

4. Appliances connected so that they form a single pathway for electricity to flow are connected in a(n)

   A. a series circuit
   B. a parallel circuit
   C. an open circuit
   D. not enough information

5. If a circuit has a voltage of 60 volts and a resistance of 5 ohms, what is the current flowing through the circuit?

   A. 300 amps
   B. 1/12 amp
   C. 12 amps
   D. 55 amps

6. A dry-cell battery produces
   A. direct current
   B. alternating current
   C. both direct and alternating current
   D. neither a direct current or alternating current

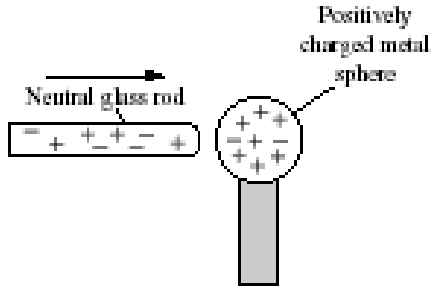
7. If you want holiday lights to operate so that when one bulb burns out and the rest stay lit, you will want to get lights that

   A. are connected in series
   B. are only white
   C. are connected in parallel
   D. have many colors

8. A negatively charged rubber rod was brought near some small pieces of paper. The rod's charges repelled the negative charges in the pieces. Which of the following caused the repulsion of the negative charges?

   A. conduction
   B. gravitation
   C. induction
   D. insulation

9. The figure below shows a neutral glass rod and a positively charged metal sphere.



Which of the following **best** describes the movement of charges as this glass rod touches the sphere?

A. Negative charges move from the sphere to the glass rod.
B. Negative charges move from the glass rod to the sphere.
C. Positive charges move from the sphere to the glass rod.
D. Positive charges move from the glass rod to the sphere.

10. Which of the following is common to all electric motors?

A. battery power
B. magnetic forces
C. hydroelectric power
D. internal combustion engines

11. In which way do permanent magnets and electromagnets differ?

A. Electromagnets have fixed magnetic strength
B. Permanent magnets can only be used in fixed positions
C. Electromagnets can attract other substances besides metals
D. The largest permanent magnets are weaker than the largest electromagnets

12. An electric generator converts

A. solar energy to electric energy
B. thermal energy to electric energy
C. chemical energy to electric energy
D. mechanical energy to electric energy

13. A student's hair stands out when the Van de Graff generator charges them. The reason for this is

A. hair strands are at a high voltage

B. hair is a good conductor
C. the student is in a strong electric field
D. like charges repel

14. Reginald has set up an electromagnet, but it is weak and won't even attract paperclips. How might Reginald make the electromagnet stronger?

A. Increase the current
B. Increase the number of turns
C. Use a soft iron core instead of a nail
D. Decrease the amount of wire used