GEORGIA DEPARTMENT OF EDUCATION

Exam Preparation for Science and Social Studies Program

ExPreSS

June 8 through June 19
2009

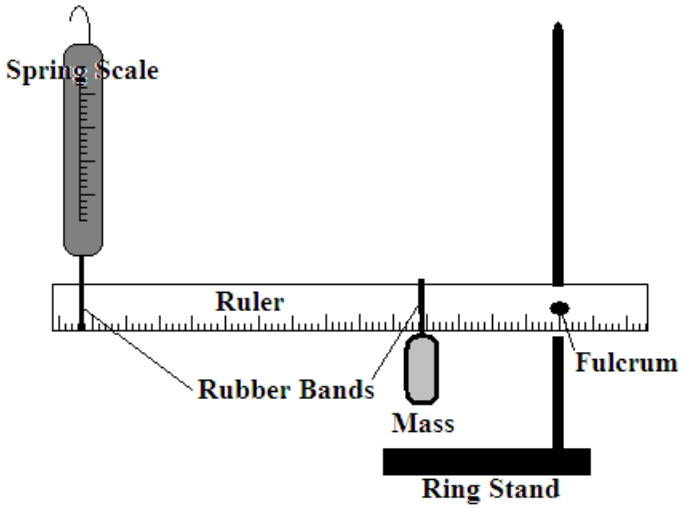
TEACHER

Tuesday, June 16		
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 two or three volunteers to share their answers and tell the class that where the matter goes and where the energy goes. *Teacher note:* If possible, display some common food items (include fruit or vegetable and an example of meat). Otherwise, use the pictures provided. (See Activating Strategy Pictures in the Tuesday's June 16 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 the Tuesday's June 16 materials section). Review with the students the answer 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 the Tuesday's June 16 materials section).	Completion of the Flow of Energy and Recycling of Matter reflection handouts.

Tuesday, June 16 (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 a markers, the Frayer Diagrams (see Frayer Diagrams in handout in the Tuesday's June 16 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 16 materials section). See board illustration below  	Students complete the energy pyramid graphic organizer and related practice questions.

Tuesday, June 16 (continuation)		
Time	**Activity/Task**	**Assessment**
15 min	*Ecological Relationships Manipulatives* 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 the Tuesday's June 16 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. 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 16 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 16, 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 answer to the questions and ask the students to correct their own answer if necessary and to write an explanation of why the answer needed to be corrected. The explanation must state the original reason the student chose the wrong answer and what makes the correct answer correct.	Student questionnaire

Tuesday, June 16 (continuation)		
Objective **Domain: Forces Waves & 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.		
Time	**Activity/Task**	**Assessment**
10 min	*Warm-up Questions* As the students walk in provide them with the two warm-up questions (see warm-up questions handout in the Tuesday's June 16 materials section) and ask them to answer them as best as they can. After the majority of the students have finished answering the question ask for two or three volunteers that would like to share their answer. Conclude the activity by asking the students if they remember Newton's laws of motion.	Students' responses to the essential questions.
20 min	*Inertia, force and mass Demonstrations* Case 1 Tape a sign to your chest 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 observation handout in the Tuesday's June 16 materials section).what they are observing and by constructing an explanation by using the words force, mass, and motion. Case 2 Take the student in the chair and push against the student 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 balance or an unbalance forces.	Completion of their observations and explanations handout.
15 min	*Newton's Three Laws of Motion Video* Watch the vide 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 the Tuesday's June 16 materials section).	Completion of video handout.

Tuesday, June 16 (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 the Tuesday's June 16, materials section) about Newton's three laws of motion. Give them 15 minutes to answer the questions individually. Conduct a group discussion of the answer to the questions and ask the students to correct their own answer if necessary and to write an explanation of why the answer needed to be corrected. The explanation must state the original reason the student chose the wrong answer and what makes the correct answer correct.	Student questionnaire

Tuesday's June 16

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 that 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 the carbon cycle does start?	
What is the role of plants in the cycling of matter?	
How carbon is transfer from plants to other organisms?	
How is carbon release back into the atmosphere?	

Trophic Levels and Energy Pyramid

Instructions

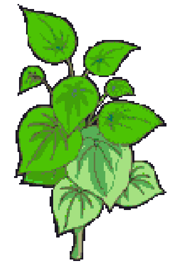
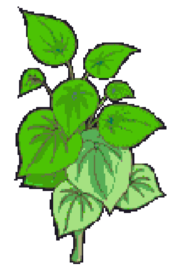
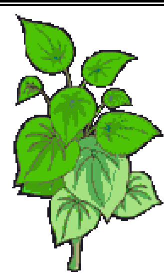
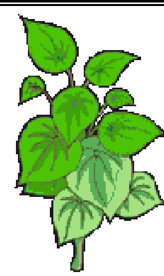
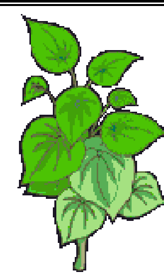
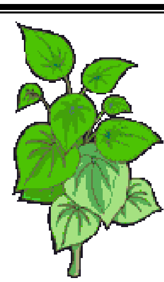
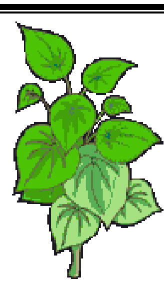
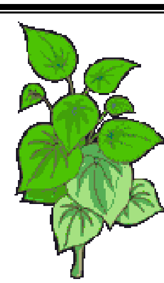
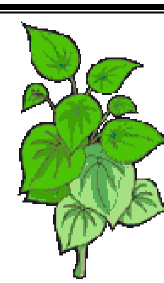
Step 1: Empty the baggie onto a desk and begin to organize the pictures from bottom to top according to those pictures that are most numerous. In other words, the pictures that occur most often should be lined up side-by-side at the bottom and the pictures that occur least often should be lined up side-by-side nearer the top.

Step 2: Place the name of the producers, primary consumers, secondary consumers, tertiary consumers, and quaternary consumers next to the appropriate picture. 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

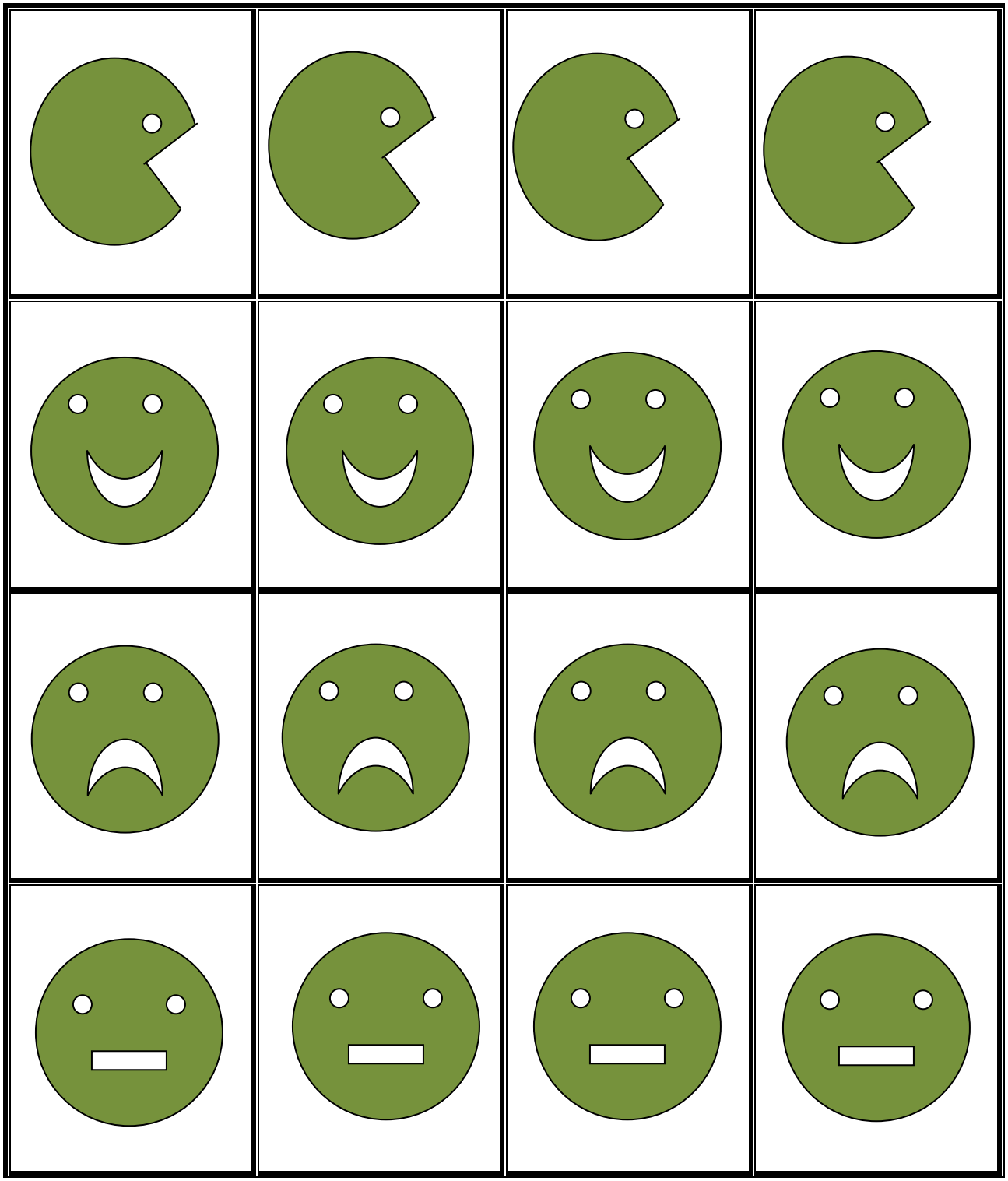
Energy Pyramid Manipulatives

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

Ecological Relationships Manipulatives

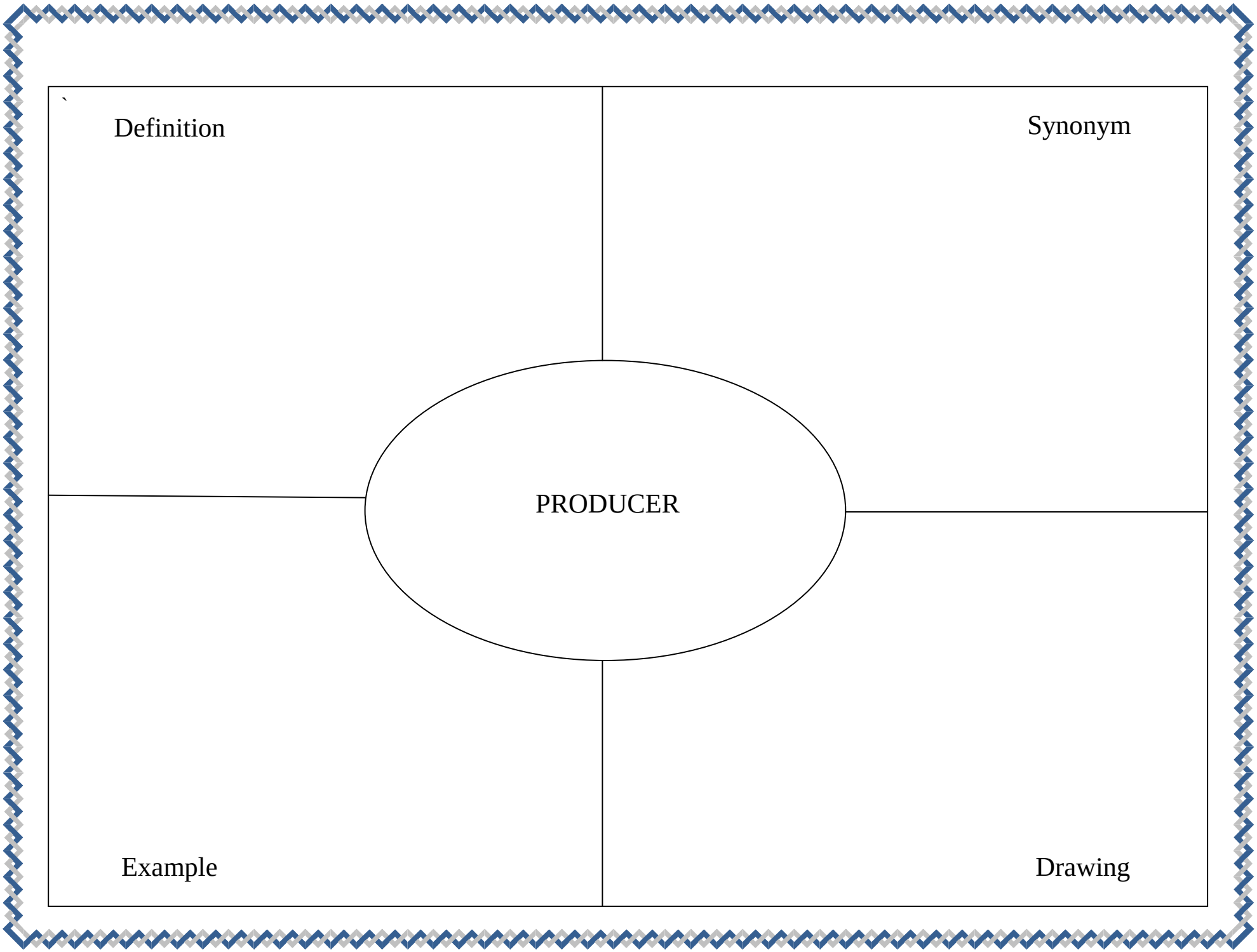


Ecological Relationships Manipulatives

			
Rhino with ticks on back	**Cattle Egret**	**Tick**	**Clownfish**
			
Bobcat	**Water Buffalo**	**Anemone**	**Squirrel**

Matter Cycle Jigsaw

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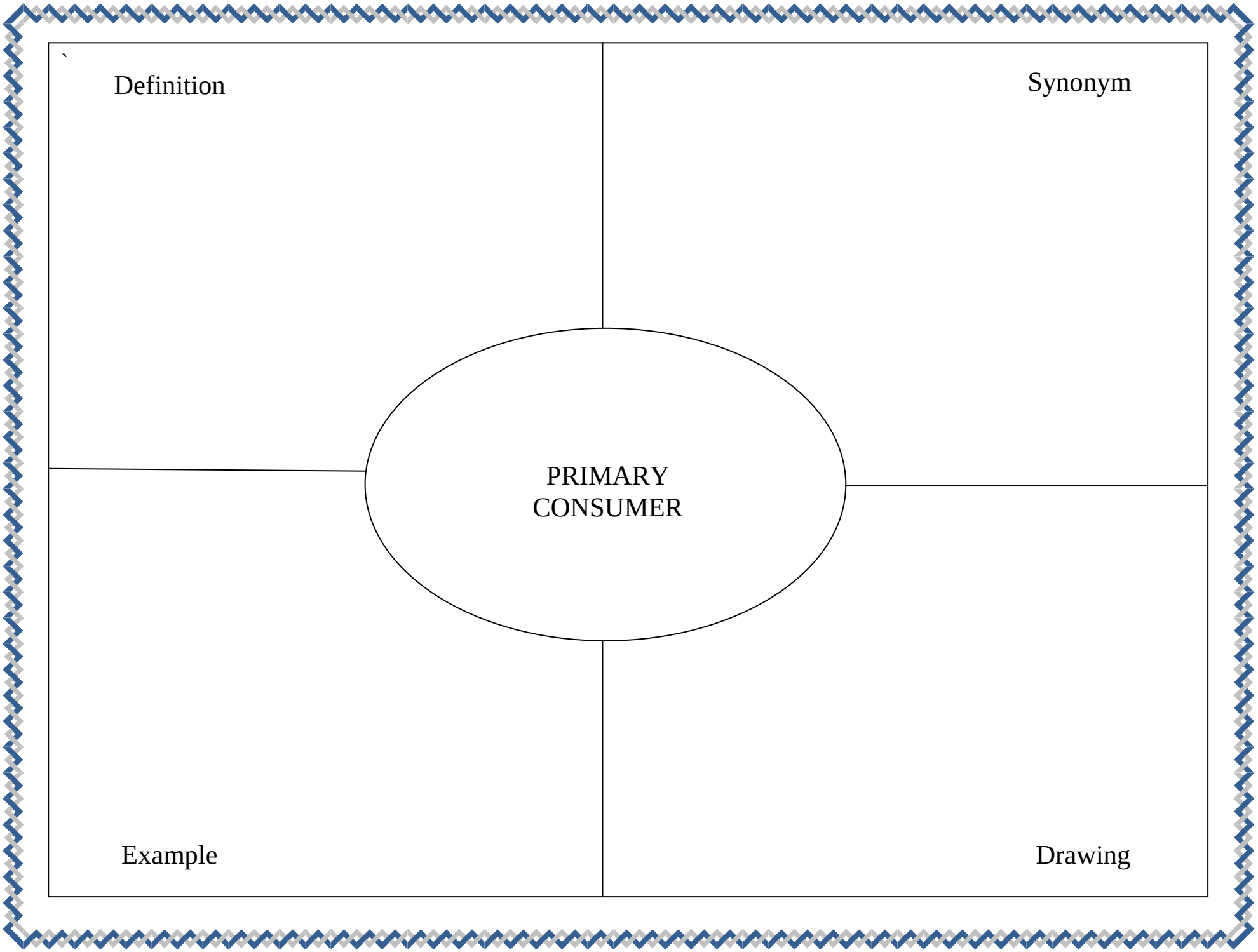
Definition
Synonym
PRODUCER
Example
Drawing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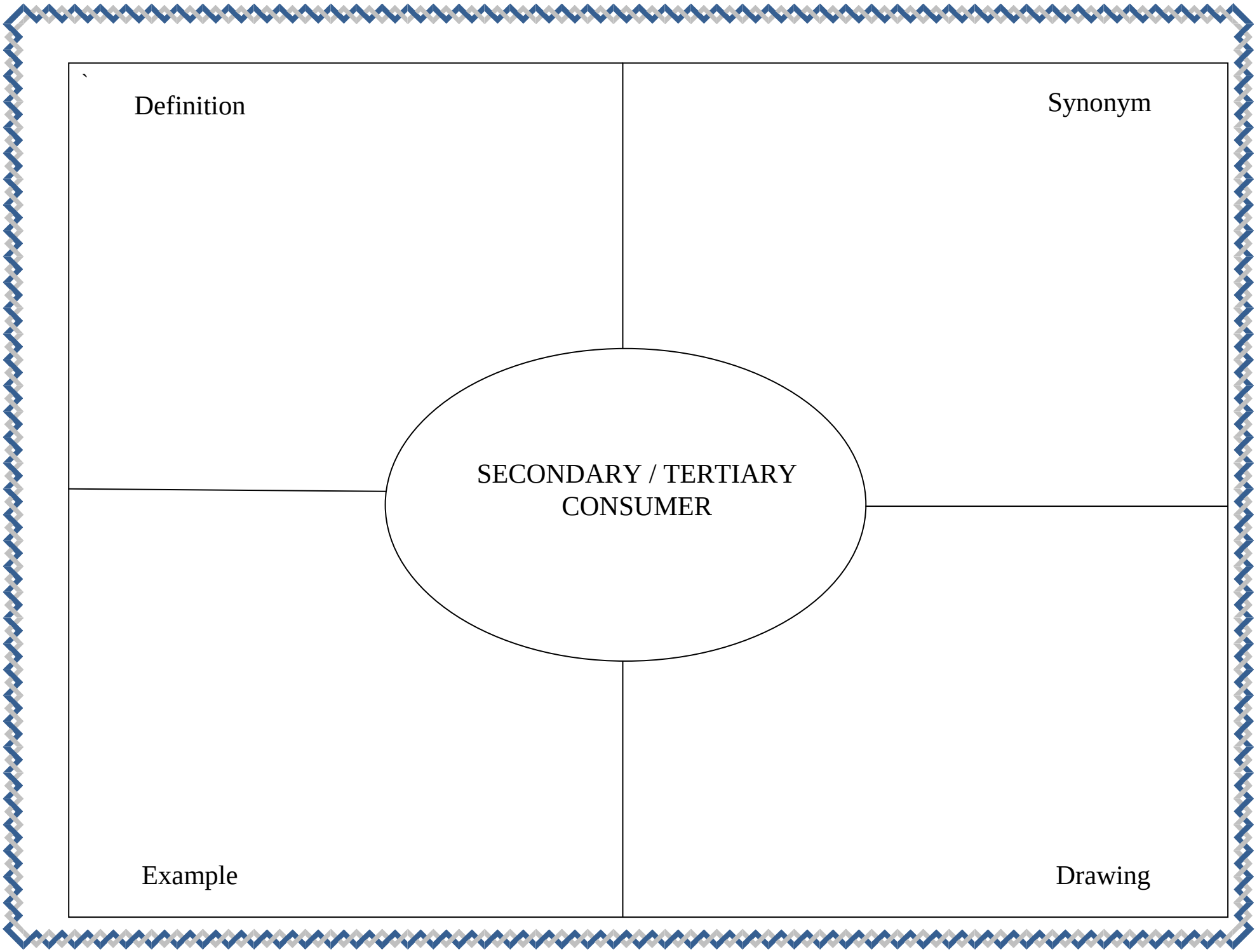
Definition
Synonym
PRIMARY
CONSUMER
Example
Drawing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Definition
Synonym
SECONDARY / TERTIARY CONSUMER
Example
Drawing

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 least 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

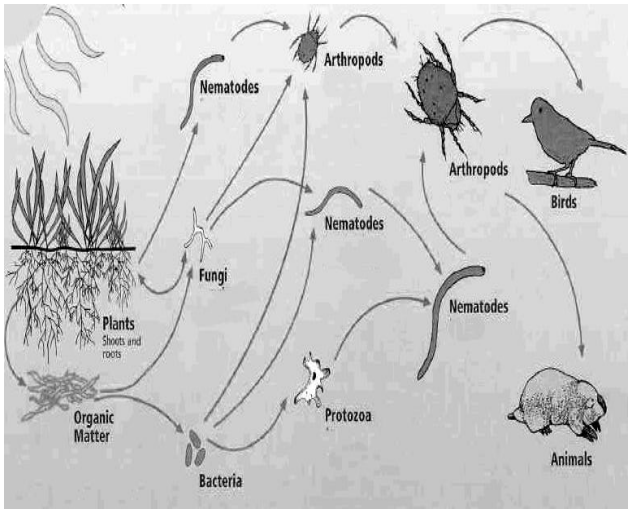
8. Nitrogen-fixing bacteria help cycle nitrogen through ecosystems. How do they do this?

   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

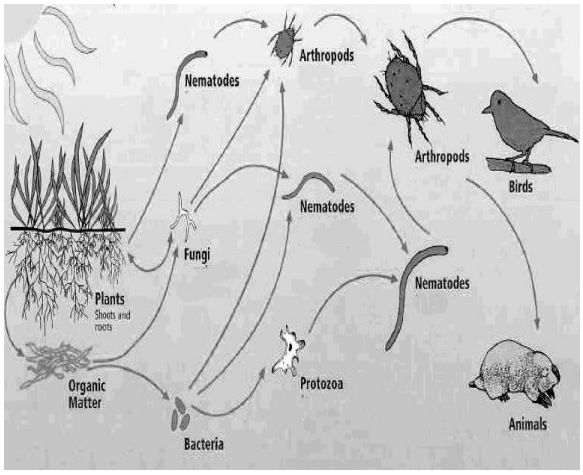
   A. second-order consumers
   B. first-order consumers
   C. decomposers
   D. herbivores

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 Southwestern food chain in the proper order, from primary producer to secondary consumer.

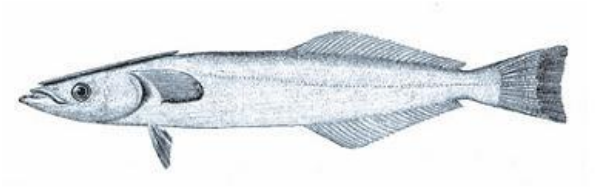
i. Black buzzard
ii. Coyote
iii. Field mouse
iv. Garter snake
v. Grass seeds

A. Grass seeds →field mouse→garter snake→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?
Why a heavy object in one end of a seesaw can be risen by a little child sitting 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 says?	
What is inertia?	
Give two examples of inertia	
How inertia and mass are related?	
What does the second law of motion says?	

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 says?	

Lever Lab

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

Materials:

Ring stand and clamp	Meter stick with hole drilled
500 g mass	Spring scale
Meter stick	Rubber bands (2)

Procedure

1. Construct a second class lever using the ring stand, clamp, and drilled meter stick (see Figure 1 below).
2. Measure the **resistance force** of the 500g mass (remember to convert into Newtons) and record on the data table 1.
3. Use the rubber bands to attach the 500 g mass at the **15cm mark** on the meter stick and the spring scale at the **90cm 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.

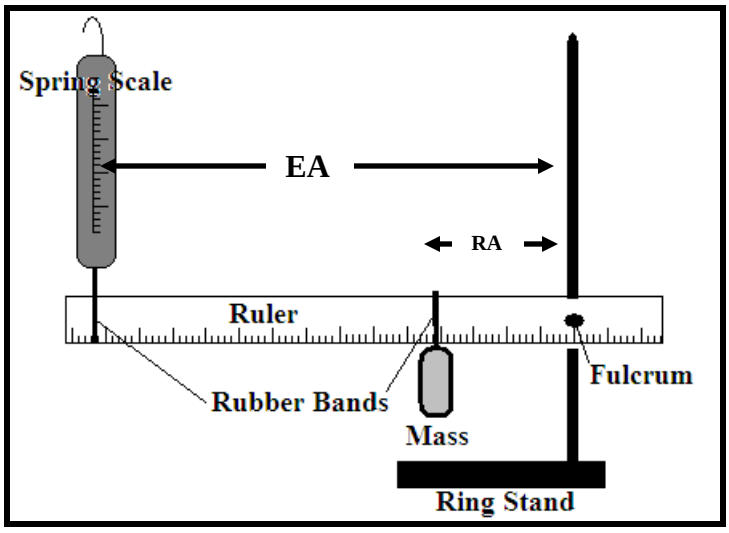


Figure 1

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 how far above the table the spring scale must lift in order to life the mass 10cm. This is the **effort distance**. Measure the distance in meters and record on the data table 1.

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
    e. Efficiency
10. Repeat the above procedure by placing the 500g mass at the 30cm 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)	**$W_O = F_r \times d_R$**	
Efficiency (Eff)	**$Eff = (W_O / W_I) \times 100\%$**	

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)	**$W_I = F_e$ X d_E**	
Output Work (W_O)	**$W_O = F_r$ X d_R**	
Efficiency (Eff)	**Eff = (W_O/ W_I) X 100%**	

Table 4

Analysis

1. What was the difference in the mechanical advantage between lifting the load on the levers at the 15 cm mark and the 30 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?
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

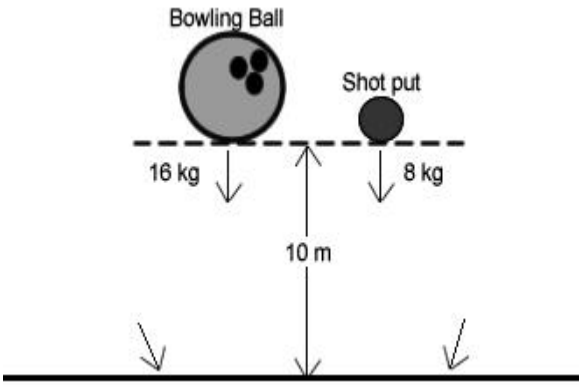
2. Many public buildings now have entrance ramps in addition to entrance stairs. Which principle explains the idea behind entrance ramps?

   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?

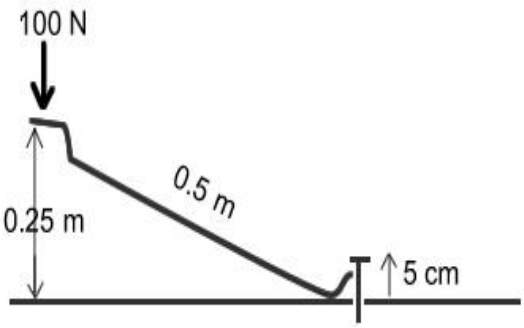


   A. The bowling ball will hit the ground first
   B. The bowling ball will experience twice the velocity
   C. The bowling ball experiences twice as much gravitational force
   D. The bowling ball will accelerate twice as fast

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.

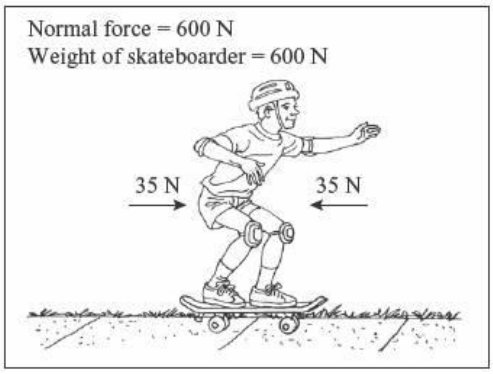
9. Anne-Marie is using a fixed pulley to raise a weight. How does using the pulley change her effort?

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 canon 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

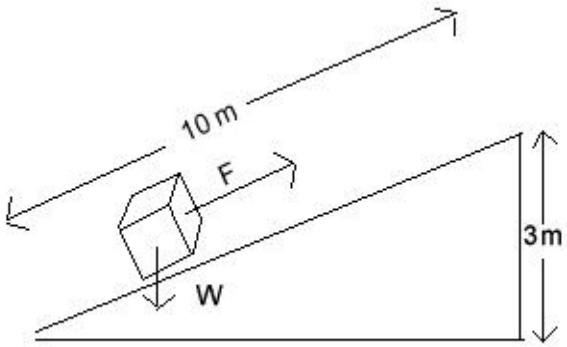
18. You accidentally drop a drinking glass. After the glass left your hand,

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