Name _____

Hour _____

How is energy transferred within a food chain?

Purpose: In this lab, you will model the flow of energy through a food chain by passing a quantity of water along a chain of students.

One of the most important concepts in ecology is the flow of energy through an ecosystem. Energy flow takes place though the food chain and is often thought of as moving from one organism to another organism, or from species to species.

The energy that an organism at one level of a food chain obtains from an organism it has eaten is called **assimilated energy**. Assimilated energy follows these routes:

1. Some of the energy is converted to heat during routine metabolism and various activities (walking, running, etc.)
2. The rest of the energy is used to support growth or is stored until needed. This energy becomes available to a consumer at the next level of the food chain or next trophic level.

Some of the energy is an organism eaten by a consumer does not become available. This energy is referred to as **unassimilated energy**. There are two major forms of unassimilated energy in food chains:

1. Parts of consumed organisms discarded during feeding, such as bones and hides.
2. Undigested food that completely passes through the consumer's digestive tract.

Procedure:

1. Your teacher will divide you up into different numbered groups.
2. Follow your teacher outside to the area where the lab will be completed.
3. An "X" marks were buckets will go; an "O" marks where people go.
4. Each student will have a cup. Yes, it is supposed to have holes!
5. Stand with your cup in your group's row on an "O". **You must be standing on your "O" whenever water is poured into your cup.**

X	X	X	X	X
O	O	O	O	O
X	O	O	O	O
	X	O	O	O
		X	O	O
			X	O
				X

6. When your teacher yells "start" Person one of each group will fill his/her cup with water from the full bucket. **It is up to person one to remember and record how many times he/she draws water from the bucket.**
7. Person one will immediately go to person 2 and pour all of the water into person 2's cup.
8. Person one will go back to the full bucket to refill, and person 2 goes to person 3 and transfers the water. Continue passing water up the chain, the last person in the chain pours the water into the end, empty bucket.
9. When the teacher yells "stop", you may continue passing the water already in your cups, but you may not pick up any more water from the first bucket.
10. Bring your end bucket to the classroom and use a graduated cylinder to measure the volume of water transferred. Record this number on the class table.
11. Measure how much water a full plastic cup holds in milliliters. Record this number. _____ ml

Calculations:

A. With your group calculate the total volume of water person one took from the beginning bucket and enter the volume in the data table. Use the following formula.

Total volume of water (ml) = volume of one cup (ml) X number of times cup was filled

B. Calculate the efficiency of energy transfer for your food chain from the following formula.

$$\text{Percent efficiency} = \frac{\text{Volume of water in end bucket}}{\text{Total volume of water taken from bucket}} \times 100$$

Food chain length	Total volume of water taken from bucket (Calculation A)	Volume in end bucket	Percent efficiency (Calculation B)
1			
2			
3			
4			
5			

Conclusions:

1) What does the water in the big bucket at the beginning represent in an ecosystem?

2) What does the water you receive from another food-chain species represent?

3) What does the spilled water represent?

4) What does the water in the end container represent?

5) In a one-link food chain what process is being modeled? Explain.

6) If you have a longer food chain, are you <u>more</u> or <u>less</u> efficient?

7) Consider all "energy" that was lost to the food chain during the activity. In an actual ecosystem how would this energy be used? Explain.

8) Explain why we should eat more from "the bottom of the food chain" (Plants instead of animals)