



It's Giving Energy

Simulating Energy Flow In Ecosystems

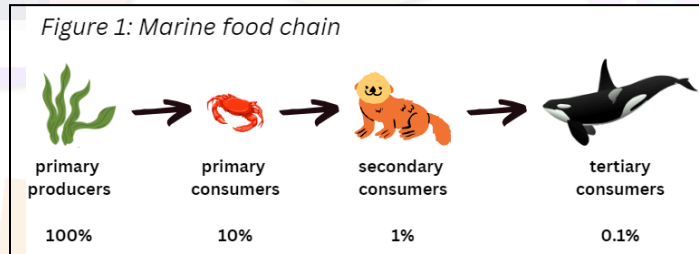
NAME:

DATE:

BLOCK:

INTRODUCTION: Diagrams like food chains, food webs, and ecological pyramids help us understand how energy flows in ecosystems. All food chains, like the one below, start with primary producers. These organisms are autotrophs that get their energy directly from the sun through photosynthesis. The heterotrophs that follow must eat other organisms for energy. Primary consumers eat producers, secondary consumers eat primary consumers, and tertiary consumers, or apex predators, eat secondary consumers.

Each level of a food chain is called a trophic level. Each trophic level receives only 10% of the energy from the level below, with 90% lost as heat. This is called the 10% rule. For example, producers get 100% of their energy from the sun. Primary consumers get 10% of that energy, secondary consumers get 1%, and tertiary consumers get just 0.1%.



In this lab, you will simulate energy flow through an ecosystem to demonstrate the 10% rule.

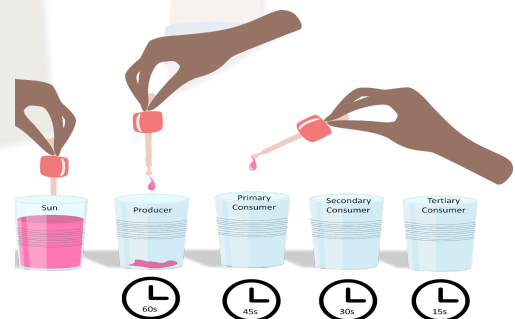
PRE-LAB QUESTIONS:

1. What type of organisms do all food chains start with? _____
2. Where do autotrophs get their energy from? _____
3. How do heterotrophs get their energy? _____
4. What is each level of a food chain called? _____
5. Explain the 10% rule in your own words. _____

MATERIALS RECEIPT:

Food Coloring (1/group)	\$3.00 (4ct)
Plastic Pipettes (1/group)	\$5.00 (50ct)
Water	---
Spoon	---
Clear, Identical Cups (5/group)	---
Timer (Cell Phone)	---
TOTAL	\$8.00

EXPERIMENTAL SET-UP:





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PROCEDURE:

1. In groups of 4, label five cups: Sun, Primary Producer *PP*, Primary Consumer *PC*, Secondary Consumer *SC*, Tertiary Consumer *TC*.
2. Fill the Sun cup completely with water. Add a few drops of food coloring and stir.
3. Decide which person will be the PP, PC, SC, and TC, and sit in order like a real food chain.
4. Start a timer for 60 seconds while the primary producer (PP) uses the plastic pipette to transfer water from the Sun into the PP cup.
5. Record the number of pipettes that were transferred under “PP” in the data table.
6. Repeat steps 4 and 5 for the PC, SC, and TC, but only allow 45 seconds for the PC, 30 seconds for the SC, and 15 seconds for the TC.
7. When finished, pour all water back into the Sun and repeat the entire simulation twice more.

DATA/OBSERVATIONS:

Number of Pipettes				
Round	PP (Primary Producer)	PC (Primary Consumer)	SC (Secondary Consumer)	TC (Tertiary Consumer)
1				
2				
3				

POST-LAB QUESTIONS:

1. In this simulation, explain what the **water** represents in a real ecosystem.
2. Looking at the data, which organism always receives the **MOST water**? Why does this make sense?
3. Looking at the data, which organism always receives the **LEAST water**? Why does this make sense?
4. Why did **time** have to be shortened by 15s as you moved up trophic levels in this simulation?
5. If we added a **quaternary consumer** to this food chain, how would this trophic level’s amount of water compare to the other cups?