

Energy Upward Flow

Trace how energy moves and shrinks through a marsh food chain.

7.12.A “diagram the flow of energy within trophic levels and describe how the available energy decreases in successive trophic levels in energy pyramids; and”

NAME _____ DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each phrase that tells where energy starts or moves. Circle each phrase that explains why less energy is available at higher trophic levels.

Energy in a Marsh Chain

- 1 Energy enters most ecosystems when producers, such as cordgrass, capture sunlight through photosynthesis. The plant stores some light energy as chemical energy in its tissues. A marsh food chain can begin with cordgrass, then move to a grasshopper, a frog, a snake, and a hawk. Arrows point from an eaten organism toward the organism receiving energy.
- 2 An energy pyramid places producers at the wide bottom and consumers above them. At each transfer, organisms use much of the energy they take in for life processes, and much of that energy leaves as heat. Only a small portion becomes biomass available to the next trophic level. The table shows estimated energy available at each level in the chain.

ESTIMATED ENERGY IN THE MARSH CHAIN

Trophic level and organism	Available energy (units)
Producer, cordgrass	10,000
Primary consumer, grasshopper	1,000
Secondary consumer, frog	100
Tertiary consumer, snake	10
Quaternary consumer, hawk	1

- 3 The decrease is not caused by energy disappearing between organisms. Energy changes form as organisms use it, especially when cellular processes release heat. Because less energy is available higher in the pyramid, top consumers usually need many organisms and much biomass below them. Energy flows in one direction, from sunlight to producers and then through consumers.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 List the marsh organisms in order from the producer to the top consumer.

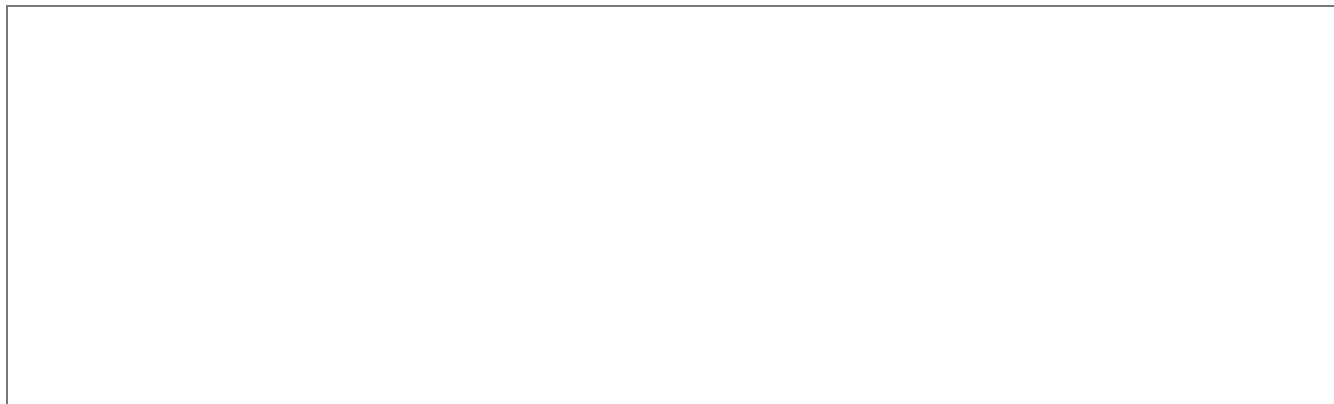
2 What does an arrow show in a food chain?

3 Use the table to describe how available energy changes from cordgrass to the hawk.

4 Why does less energy reach each higher trophic level, and what does this mean for top consumers?

3 YOUR TURN _____ Your own words

In the box, draw an energy pyramid for this forest chain: oak leaves, caterpillar, robin, hawk. Label each trophic level, draw arrows showing energy flow, and use 8,000, 800, 80, and 8 energy units from bottom to top. Then write two sentences explaining the energy pattern.



PART 1 • READ AND MARK

Underline each phrase that tells where energy starts or moves. Circle each phrase that explains why less energy is available at higher trophic levels. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	List the marsh organisms in order from the producer to the top consumer.	Cordgrass, grasshopper, frog, snake, hawk.
2	What does an arrow show in a food chain?	It shows energy moving from the organism that is eaten to the organism that receives the energy.
3	Use the table to describe how available energy changes from cordgrass to the hawk.	Available energy decreases at every level, from 10,000 units in cordgrass to 1 unit in the hawk.
4	Why does less energy reach each higher trophic level, and what does this mean for top consumers?	Organisms use much of the energy for life processes, and much leaves as heat. Top consumers need many organisms and much biomass below them.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Diagram: Oak leaves, producer, 8,000 units → caterpillar, primary consumer, 800 units → robin, secondary consumer, 80 units → hawk, tertiary consumer, 8 units. Energy decreases because organisms use energy for life processes and release much of it as heat. The hawk receives the least energy, so it depends on many organisms at lower trophic levels.

Accept equivalent descriptions of one-way energy flow and decreasing available energy. For the open task, accept a correctly ordered pyramid or chain with arrows from food to consumer and approximately one-tenth as much energy at each higher level.