

Food Webs and Trophic Pyramids: Mastery Check

Learning target: I can read a food web, calculate with the 10 percent model, explain how matter cycles and energy flows through an ecosystem, and predict direct and indirect effects of a change.

Retrieval and mastery check

About 35 min

Individual

MS-LS2-3 · assesses

MS-LS2-4 · practice

independent practice

writing

Name _____

Date _____

Period _____

Directions

Answer every item on your own without notes. For multiple-choice items, circle one letter. For numeric items, show your calculation and give units. For the drawing item, label every level with its name and its energy value. Finish with the synthesis paragraph in Part B. There are 12 items and 30 points.

You will need: This worksheet, Pencil, Calculator (optional)

Part A: Retrieval (items 1-11)

1. In a meadow food web, an arrow runs from *grasshopper* to *meadowlark*. What does the arrow mean? 2 pts
 - ☐ A. The grasshopper eats the meadowlark.
 - ☐ B. The meadowlark eats the grasshopper, and matter and energy move from the grasshopper to the meadowlark.
 - ☐ C. The grasshopper and the meadowlark compete for the same food.
 - ☐ D. The grasshopper is a producer and the meadowlark is a decomposer.
2. Which organism is a producer? 2 pts
 - ☐ A. A mushroom growing on a dead log
 - ☐ B. Zooplankton drifting in a lake
 - ☐ C. Phytoplankton drifting in a lake
 - ☐ D. An earthworm in garden soil
3. What do decomposers do with dead remains and wastes, and why do producers depend on them even though no feeding arrow runs from decomposers to producers? 3 pts

4. The producers in a marsh store 40,000 energy units in a year. Using the 10 percent model, how many energy units are stored at the **third** trophic level (the second-stage consumers)? Show each step. 3 pts

5. Which statement about an ecosystem is true? 2 pts

- ☐ A. Decomposers recycle energy back to the producers.
- ☐ B. Matter is destroyed at each trophic level.
- ☐ C. Matter cycles between living and nonliving parts, while energy flows through and leaves as heat.
- ☐ D. Each trophic level stores more energy than the one below it.

6. True or false: 'The matter a deer eats but does not turn into body mass is destroyed.' Circle your answer and explain where that matter actually goes. 3 pts

☐ True ☐ False Explain your thinking:

7. A kelp-forest web has these arrows: kelp → sea urchins, sea urchins → sea otters, kelp → snails, snails → sheephead fish. If the sea otter population increases, name one **direct effect** and one **indirect effect**, and say which population sits in between for the indirect one. 3 pts

8. Draw a trophic pyramid for this chain: grass → grasshoppers → lizards → hawks. The grass stores 6,000 energy units. Using the 10 percent model, label each level with its name and its energy units, and add one arrow showing where most of the energy goes at each step. 3 pts

9. Why are top predators such as mountain lions rare compared with the plant eaters they hunt? 2 pts
- ☐ A. Top predators are poor hunters, so most starve.
 - ☐ B. Only a small fraction of the energy stored at each level reaches the next, so very little is left for the top level.
 - ☐ C. Top predators have no decomposers to recycle their matter.
 - ☐ D. Top predators are larger, so they need less food.

10. In a stream, the producers store 500 energy units per square meter each year and the first-stage consumers store 75. What percent of the producers' energy was passed on? Show the calculation. 2 pts

11. Explain why an ecosystem needs sunlight every day but does not need a daily supply of new carbon atoms. 2 pts

Part B: Synthesis (item 12)

12. Choose any ecosystem (a pond, a desert, a kelp forest, a creek). In one paragraph, describe how matter and energy move through it. Your paragraph must name a producer, a consumer and a decomposer, must include a nonliving part of the ecosystem, must say where the energy comes from and where it ends up, and must use the words *cycle* and *flow* correctly. 3 pts

Two rules to remember

Rule 1: an arrow in a food web points from the food to the eater, and it shows matter and energy moving to the eater. Rule 2: matter cycles (atoms leave an organism as wastes, carbon dioxide and remains, are recycled by decomposers and taken in again by producers), but energy flows one way (it enters as sunlight and leaves as heat at every level). When you are unsure about an item, ask which rule it is testing.

Write the thirteenth item

Write one new multiple-choice item for this quiz that tests the difference between a pyramid of energy and a pyramid of numbers of individuals. Include four options, one correct answer, and a one-sentence explanation of why each wrong option is tempting. Then explain, using an oak tree and its caterpillars, when a pyramid of numbers can be upside down even though the pyramid of stored energy never is.