

## Data Analysis 4 The 10-Percent Rule

### Goal

Relate a food web to an energy pyramid.

### Skills Focus

Interpret Visuals, Calculate, Predict

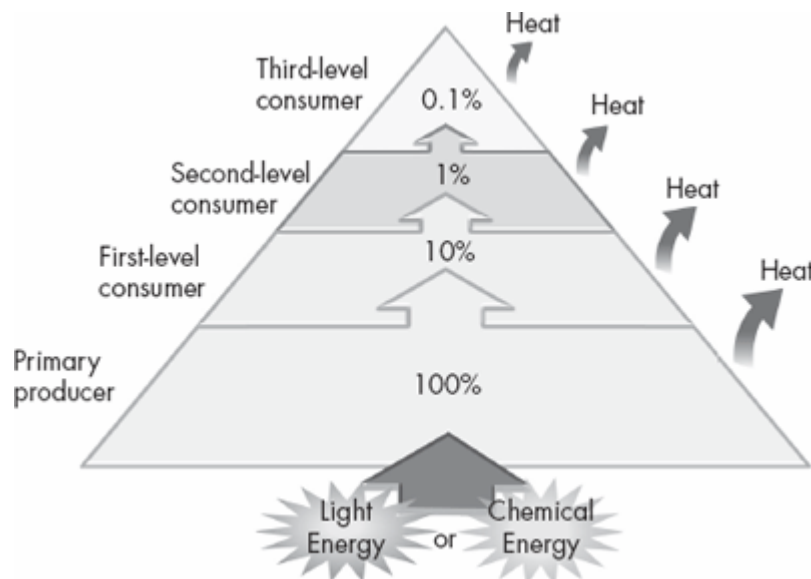
### Build Connections

All organisms need energy. Energy enters most ecosystems from the sun and flows through the ecosystem by way of food webs. Pyramids of energy show the energy flow. Energy flows from one level to the next when organisms at a higher level eat organisms from a lower one. Humans tend to be at the top of the pyramid.

Primary producers are the base, or bottom level, of a pyramid of energy. Most primary producers turn light energy into food through photosynthesis. When a first-level consumer eats a primary producer, that consumer gets energy from the producer. Only 10 percent of the energy in the organisms at one level gets stored as energy in the bodies of the animals that eat them. Most of the energy is lost as heat or is used up by the body processes of the organism. This rule is called the “10-percent rule.”

### Analyze and Conclude

Use this energy pyramid to answer Analyze and Conclude Questions 1–6.



1. **Interpret Visuals** What is the original source of the energy that flows through most ecosystems? What would happen without this source?

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2. **Calculate** If 10 percent of energy moves up to the next level of the ecosystem, what percentage of energy is lost as heat?

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3. **Calculate** Remember that percentages are based on one-hundredths. The value 100% is equal to 100 one-hundredths or  $100/100$ . The value 50% equals  $50/100$ , which can also be written as the decimal 0.50. The value 5% equals  $5/100$  or 0.05. The value 0.5% equals  $0.5/100$  or  $5/1000$  or 0.005. Convert the following percentages into one-hundredths and then into a decimal: 75%, 20%, 0.8%.

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4. **Calculate** Assume there are 1000 units of energy in the producer level of the energy pyramid. How many units of energy are available at each of the three consumer levels? Show your calculations. *Hint:* First, change the percentages to decimals.

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5. **Calculate** Suppose there are 500 units of energy available at the base of a pyramid of energy. How many units of that energy will the first-level consumers store? How many units will the second-level consumers store?

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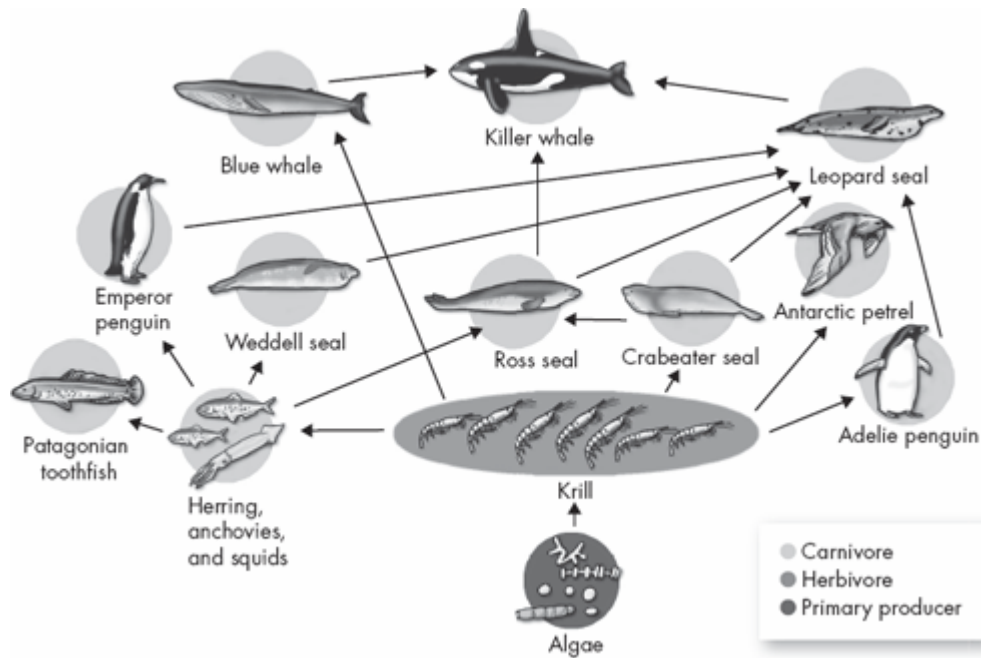
6. **Infer** Why are there usually so few organisms at the top level of a pyramid of energy?

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Use this diagram of an antarctic food web to answer Questions 7–9 and Build Science Skills.



7. **Interpret Visuals** How are the blue whale and Adelie penguin alike as consumers?

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8. **Draw Conclusions** What effect would a drop in the size of the krill population have on the antarctic food web and why?

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9. **Predict** Adult krill feed on algae found in open water. Their larvae feed on algae found under the sea ice. More and more sea ice is melting. Will melting sea ice affect the killer whale? Explain.

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## Build Science Skills

Draw a pyramid of energy to show how energy flows through the antarctic food web. Use the pyramid on page 231 as a model. Include five levels of consumers in your pyramid. Place at least one organism at each level.

