Birds Against Extremes

How birds manage heat in cold and hot habitats

ZOO.9.3 "Define the term endothermic and describe how birds regulate body temperature in extreme environments."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the definition of endothermic. Circle actions that help a bird stay warm, and number actions that help a bird cool down so you can compare how birds regulate body temperature.

From Sea Ice to Desert Sand

1 At dawn on Antarctic sea ice, an emperor penguin stands in air far colder than its body. At noon in a desert, a dove faces the opposite problem: the sun adds heat while the bird also produces heat inside its body. Both birds are endothermic, meaning they produce most of the heat that warms their bodies through internal metabolic activity. This heat comes from using energy stored in food. Being endothermic does not mean a bird's temperature never changes. It means the bird can regulate body temperature by producing heat and adjusting how much heat it loses.

2 An emperor penguin must limit heat loss to survive the Antarctic cold. Dense feathers trap a layer of air near its skin, slowing the movement of heat into the colder air. When penguins crowd into a huddle, fewer birds face the wind, and birds take turns at the exposed edge. Blood flowing down toward a penguin's feet passes close to blood returning from its feet. Heat moves from the warmer outgoing blood to the cooler returning blood. This heat exchange helps keep the body core warm while the feet remain cooler, so less heat escapes into the ice.

3 A desert dove has a different challenge: releasing heat when the air is hot. Panting moves air over moist surfaces in its mouth and throat. As water evaporates, it carries heat away from the bird. The dove may also rest in shade during the hottest hours and become active when the air is cooler. Evaporative cooling costs water, so a bird in a dry habitat must balance heat loss against dehydration. These actions help an endothermic bird prevent its internally produced heat, along with heat from the sun, from pushing its body temperature too high.

2 ANSWER WITH EVIDENCE

Use the passage

1. What does endothermic mean, and where does a bird get the energy to produce heat?

2. How do feathers and huddling each help an emperor penguin stay warm?

3. How does blood flow near a penguin's feet help limit heat loss?

4. How does panting cool a desert dove, and what does the dove lose as it cools this way?

3 YOUR TURN

Your own words

Imagine a small bird that lives where mornings are freezing and windy but afternoons are hot and dry. Write one paragraph of 5 to 6 sentences that defines endothermic, explains two ways your bird could stay warm in the morning and one way it could cool down later, and describes one cost or limit of a strategy.

ANSWER KEY

Birds Against Extremes

PART 1 · READ AND MARK

Underline the definition of endothermic. Circle actions that help a bird stay warm, and number actions that help a bird cool down so you can compare how birds regulate body temperature. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What does endothermic mean, and where does a bird get the energy to produce heat?	**An endothermic bird produces most of the heat that warms its body through internal metabolic activity, using energy stored in food.**
2	How do feathers and huddling each help an emperor penguin stay warm?	**Feathers trap insulating air near the skin. Huddling reduces the number of birds exposed to the wind, with birds taking turns at the edge.**
3	How does blood flow near a penguin's feet help limit heat loss?	**Warmer blood flowing toward the feet transfers heat to cooler blood returning toward the body. This keeps the body core warm and the feet cooler, reducing heat loss into the ice.**
4	How does panting cool a desert dove, and what does the dove lose as it cools this way?	**Panting allows water to evaporate from moist surfaces in the mouth and throat, carrying heat away. The dove loses water.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

My imaginary bird is endothermic, so it uses energy from food to produce most of the heat that warms its body. On a freezing morning, its dense feathers trap air near its skin and slow heat loss. It also huddles with other birds so fewer of them face the wind. In the hot afternoon, it pants to release heat as water evaporates from its mouth and throat. Panting costs water, so the bird must avoid losing too much in its dry habitat.

Accept equivalent descriptions of internal heat production and the stated heat-saving or cooling mechanisms. For Part 3, look for a plausible application to both conditions and a correct cost or limit.