

Name: _____

BREAK IT DOWN

Reread "Puffin' Up" (p. 8), about how scientists are studying a population of Atlantic puffins. Then use this work sheet to analyze the text and summarize what you learned.

1. Write definitions or descriptions for the terms below:

a. Farne Islands: _____

b. burrow: _____

c. wreck: _____

d. biometrics: _____

2. Explain the following:

a. What are two reasons scientists are concerned about the Farne Islands puffin population? _____

b. How do scientists count the total number of puffins in a population? _____

c. Why are burrows important for maintaining the size of a puffin population? _____

d. How do the results of the latest survey of Farne Islands puffins compare with those from 2008? _____

3. Do you think scientists should still be concerned about the Farne Islands puffin population? Explain your answer.

4. Are Atlantic puffins at risk of extinction? _____

Name: _____

TOXIC BUILDUP

In "Puffin' Up" (p. 8), you read that scientists have been monitoring the health of a puffin population. One threat seabirds face is toxic chemicals in the environment. Animals like puffins, which are near the top of their food chain, can be particularly at risk from pollution because of *bioaccumulation*.

Bioaccumulation is the buildup of a substance in living organisms. The higher an animal is on the food chain, the more it will tend to bioaccumulate chemicals. Organisms at the bottom of the food chain, such as plankton, ingest pollutants from the water and store the chemicals. Then small fish eat the plankton and absorb the toxins that were in the plankton. When larger fish eat the small fish, they can ingest the chemicals at concentrations hundreds or thousands of times higher than the level found in the water.

Complete the following calculations to see how toxins can bioaccumulate in puffins. Then answer the questions that follow.

A. Suppose an individual small plankton contains 50 molecules of a toxin. A larger organism called a copepod eats 5 of the small plankton. How many toxin molecules does the copepod ingest?

B. An anchovy then eats 5 copepods. How many molecules of toxin does the anchovy ingest?

C. A puffin eats 10 anchovies. How many toxin molecules does the puffin consume?

ANALYZE IT

1. Suppose the concentration of toxins in small plankton above reflects the concentration of pollution in the environment. How many times higher is the toxin concentration in the puffin in question C than in the environment?

2. How would you expect the amount of toxins in an adult puffin's body to compare with that in a young puffin's? Explain your answer.

3. How might humans be affected by bioaccumulation?

Name: _____

HOME SWEET HOME

In “Puffin’ Up” (p. 8), you read about Atlantic puffins. These seabirds spend time in different biomes, or regions with distinct climates and communities of organisms. The chart below describes three biomes where puffins can be found. Use the information in the chart to answer the questions below.

	Rocky Shore Biome	Arctic Tundra Biome	Open Ocean Biome
Description	Found where ocean meets land. Rocky basins flood at high tide, creating pools, and are exposed to air at low tide. Coastline includes steep rocky cliffs and grassy areas.	Found at high latitudes in the Northern Hemisphere, temperatures here remain so cold that a layer of soil called permafrost remains permanently frozen.	Earth’s largest biome. The open ocean, or pelagic zone, is the part of the ocean that is far from land.
Climate	Can range from extremely cold and wet to warm and dry. Exposed to high wind, salt spray, rain, and sun.	Characterized by long, cold winters and short, warmer summers. Generally dry with little precipitation.	Varies greatly depending on location, temperature, and ocean currents. The North Atlantic, home to Atlantic puffins, is generally cold.
Typical Plants and Animals	Hardy organisms such as lichens, seabirds such as murre and puffins, invertebrates like sea stars and crabs.	Lichens; hardy plants such as mosses; low shrubs; animals such as caribou, arctic fox, arctic hare, and polar bears.	Seaweeds and algae; plankton; fish; marine mammals such as dolphins and whales. Puffins spend most of their lives here.

QUESTIONS

- In which biome do puffins spend most of their lives?
- What is permafrost?
- What is the pelagic zone?
- Describe the climate of the Arctic tundra.
- In which biome do you think conditions are the harshest for life? Explain your answer.

Name: _____

FAST FLAPPERS

In “Puffin’ Up” (p. 8), you learned about a population of Atlantic puffins in England. One characteristic that scientists study in birds is how fast they flap their wings. Flapping frequency varies among flying animals, and this characteristic can help observers identify different species.

The chart below shows the average mass and flapping frequencies of puffins and several other bird and insect species. Flapping frequency is measured in hertz (Hz). The number of hertz corresponds to the number of complete up-and-down flaps per second. Use the data in the chart to answer the questions that follow.

Animal Mass and Flapping Frequency

Species	Mass (kg)	Flapping Frequency (Hz)
puffin	0.398	9
brown pelican	3.39	3
great blue heron	1.92	2.5
tree swallow	0.0201	9
hummingbird	0.0084	23
fruit fly	0.000002	200
bumblebee	0.000175	150

SOURCES: AN INTRODUCTION TO FLAPPING WING AERODYNAMICS, SHYY ET AL. 2013; PENNYCUIK, J. EXP. BIOL. 150, 171-185 (1990)

GRAPH IT

Use a separate sheet of paper to create a bar graph of the flapping frequencies of just the birds in the chart (the first five species). Don't forget to label the *x*- and *y*-axes and give your graph a title.

ANALYZE IT

- Which bird has the highest flapping frequency? How many times does it flap its wings per second?
- How many more times per second does a puffin flap its wings than a brown pelican?
- What is the mass of the bird with the lowest flapping frequency?
- What is the average flapping frequency of the two insects on the chart?
- Based on the chart, what might you conclude about the flapping frequency of insects compared with that of birds?