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Making an Ocean Ecosystem

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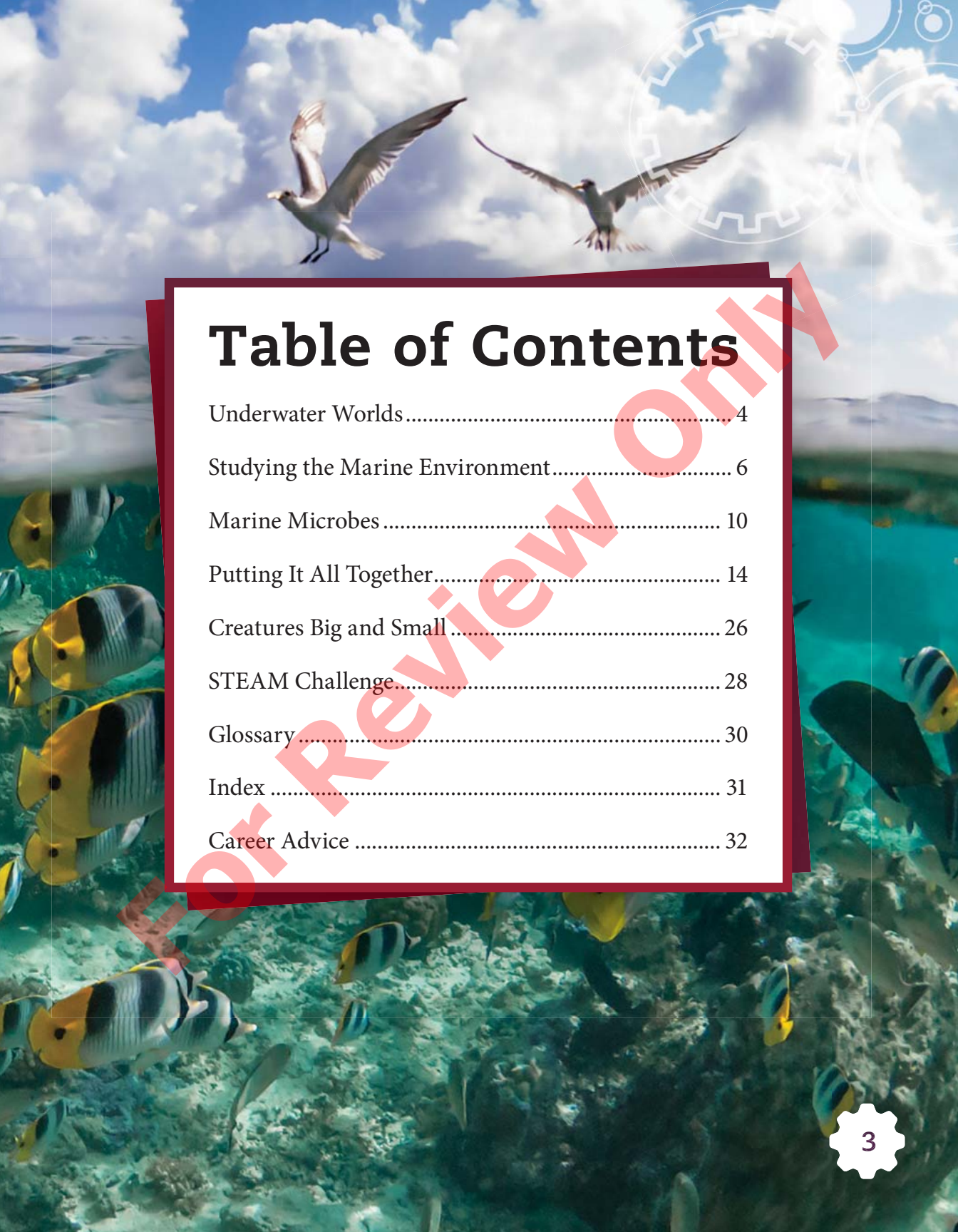

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Underwater Worlds

There are many worlds to explore under water. They can be in shallow, sandy lakes. Or they can be deep within the ocean. Entire **ecosystems** exist when you venture off land.

Marine ecosystems exist along coral reefs. They exist within **mangrove** forests. They are along limestone ledges. They're within seagrasses close to the coastline.

Scuba divers explore these worlds. Sometimes, they are shallow enough for snorkelers to see. Other times, only scientists in submarines can reach them. Or they might be displayed for everyone to see at museums or zoos.

A pygmy seahorse blends in with red coral.

Aquariums have tanks that model marine ecosystems. They re-create underwater worlds. People often enjoy watching the biggest creatures in these tanks. They notice the most unique or most colorful creatures. Jellies and sea stars are fun to watch. It's hard not to wonder about seahorses and sea urchins. Blue crabs and spiny lobsters draw attention.

But, what about creatures too tiny to see? Do bacteria exist in the sea? Do microbes affect ocean life? Can the smallest creatures in underwater worlds also be the mightiest?

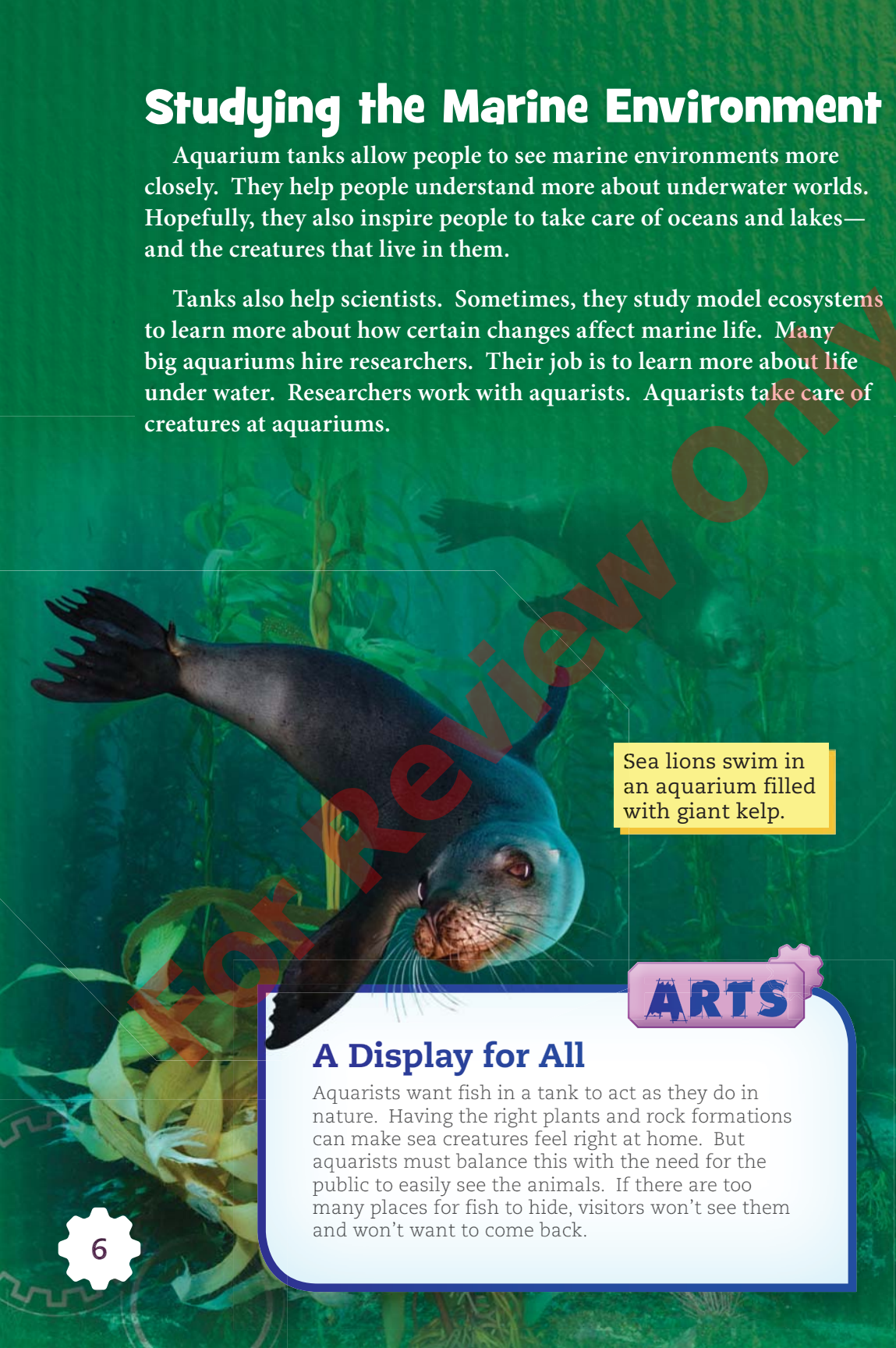
spiny lobster

Bacteria come in many shapes, such as spheres, rods, and spirals.

Studying the Marine Environment

Aquarium tanks allow people to see marine environments more closely. They help people understand more about underwater worlds. Hopefully, they also inspire people to take care of oceans and lakes—and the creatures that live in them.

Tanks also help scientists. Sometimes, they study model ecosystems to learn more about how certain changes affect marine life. Many big aquariums hire researchers. Their job is to learn more about life under water. Researchers work with aquarists. Aquarists take care of creatures at aquariums.



Sea lions swim in an aquarium filled with giant kelp.

ARTS

A Display for All

Aquarists want fish in a tank to act as they do in nature. Having the right plants and rock formations can make sea creatures feel right at home. But aquarists must balance this with the need for the public to easily see the animals. If there are too many places for fish to hide, visitors won't see them and won't want to come back.

Untangling the Food Web

Aquarium researchers study marine food webs. A food web is a bit like a food chain. But it shows many different ways marine plants and animals are connected.

Sea jellies, for instance, were once thought of mainly as predators. They eat the eggs of many sea creatures. They didn't seem as though they would be good food for other fish because they are mostly water. Now, we know that many sea creatures *do* eat sea jellies. Penguins and sea turtles consider them a good snack!

Researchers also know that some squid are **cannibals**. Their research shows that swordfish, whales, and seals eat squid too. This is just another way in which marine food webs are very complex.

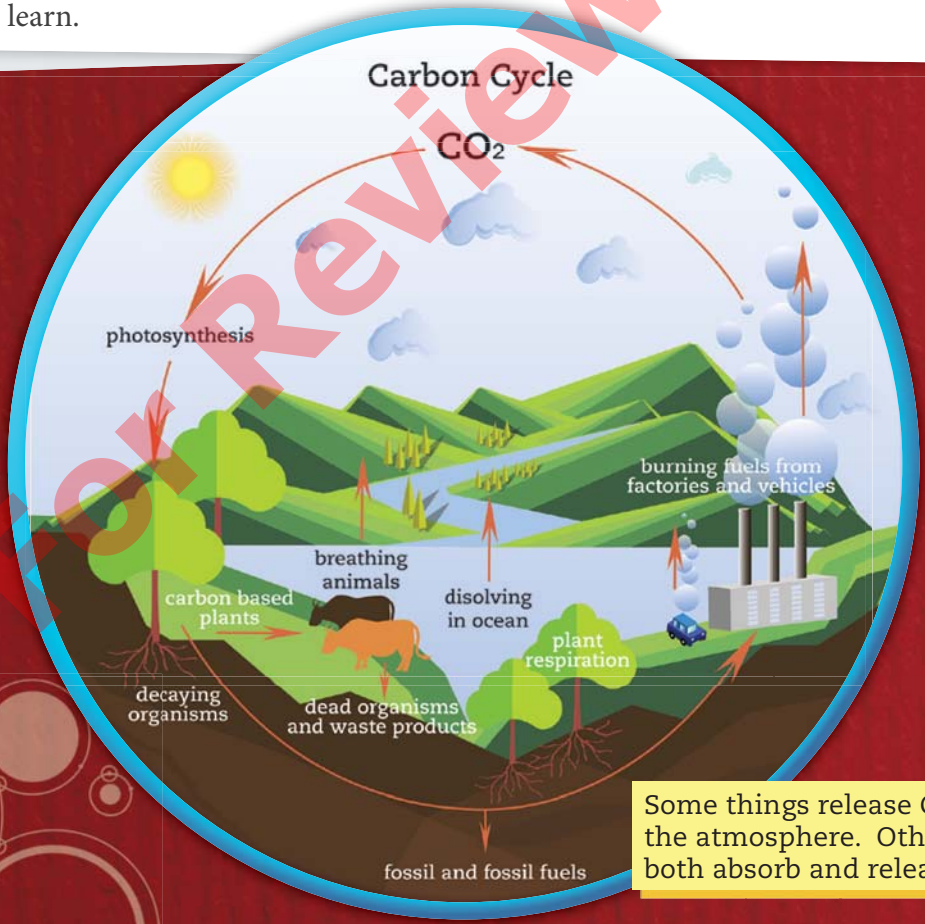
A sea turtle eats a jellyfish.

Changes in the Water

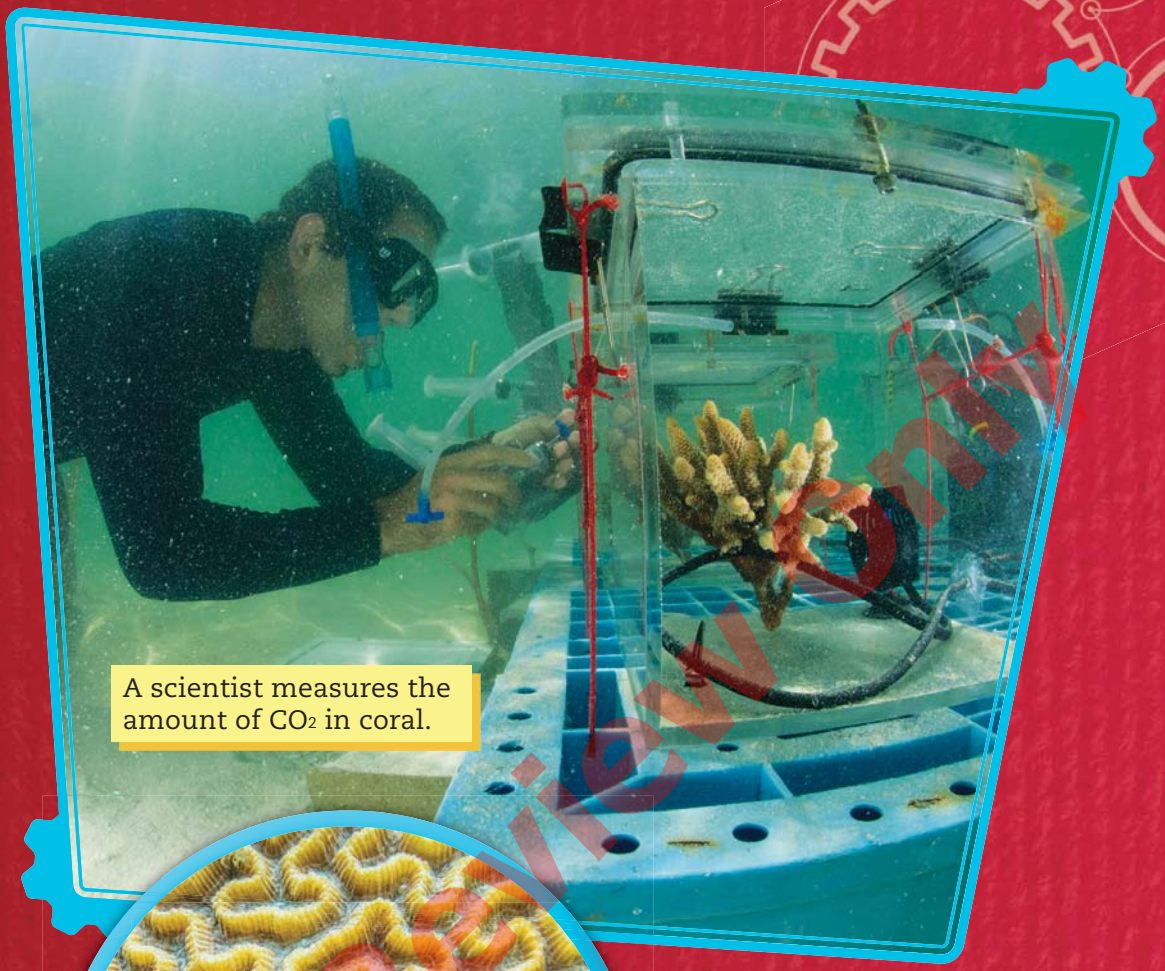
Aquarium researchers also study how marine creatures find their food in the water. But pollution can change water. That makes it hard for animals to eat and stay healthy. And scientists are learning about other threats.

Scientists know that carbon dioxide (CO_2) levels have changed the **atmosphere**. But are they changing underwater worlds too? Researchers are trying to find out by measuring levels of CO_2 in samples of water. Levels are increasing. This might be bad news for some coral. They need certain conditions to grow. And CO_2 makes seawater more **acidic**. It affects the conditions that let coral grow.

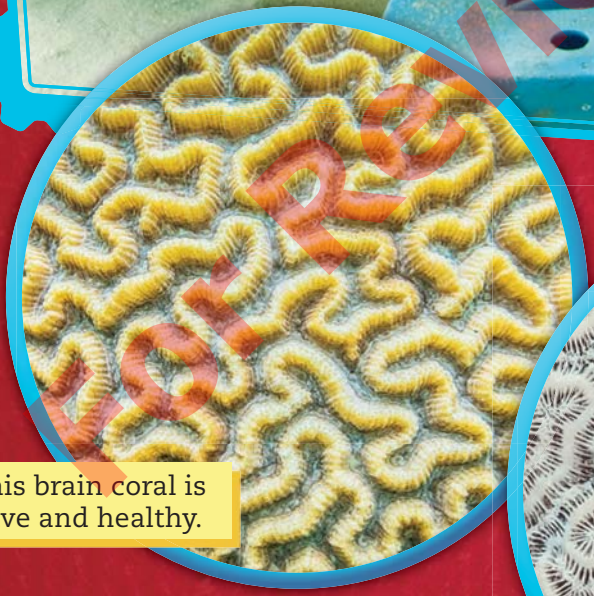
Some aquarium researchers are trying to learn more about how CO_2 affects freshwater lakes. Does it make the water harmful for creatures who live there? Does it make it harder for them to find food? There is much to learn.



Some things release CO_2 into the atmosphere. Other things both absorb and release CO_2.



A scientist measures the amount of CO_2 in coral.



This brain coral is alive and healthy.

This brain coral is dead.

STEAM CHALLENGE

Define the Problem

Imagine you are an aquarist at the Georgia Aquarium, the largest aquarium in the United States. Your task is to maintain the coral reef exhibit. The fish are fed a meal of frozen brine shrimp twice daily. The frozen shrimp are stored far from the exhibit, and you are looking for an effective way to transport the frozen shrimp.

Constraints: The interior of your container must be at least 20 centimeters (8 inches) across to maximize the amount of shrimp you can carry in one trip.

Criteria: A successful container will prevent ice from melting for 15 minutes.

Research and Brainstorm

How do aquarists make sure that all organisms in an exhibit are fed? Is it important for a container to be closed during transport? How will you carry the container?

Design and Build

Sketch your container design. What purpose will each part serve? What materials will work best? Build the model.

Test and Improve

Place an ice cube in the container and allow it to remain undisturbed for 15 minutes. Then, measure any water in the container. Did it work? How can you improve it? Modify your design and try again.

Reflect and Share

Which parts of your model worked best to slow the melting of the ice cube? Could your model be used to prevent ice from melting for a longer period of time? What do you think would happen if you added multiple ice cubes to your model?