



LESSON 1

The Intertidal Zone: Tides and How Creatures Survive

Grades 4 - 7

Objectives

- To discover the properties of ocean water and tides through observations and experiments.
- To describe the appearance and behaviour of a variety of animals that live in the intertidal zone.

Materials

Bottle of salt water coloured with blue food colouring, a clear glass, pitcher to pour water, clear baking dish, water balloons (one spare) tied onto a string, hula hoop, barnacle, limpet and crab shells, sea creature cards.

Concepts

- Tides rise and fall twice a day here.
- Tides are caused by gravitational pull of the sun and moon on the ocean.
- Tidal currents can cause movement of objects. Heavier objects are more stable.
- Intertidal animals have adapted to survive tidal action.

Activities

1. How much of the earth is covered by water?

Students stand in a circle and throw an inflatable globe back and forth around the circle. Each time a student catches the ball, they look to see where their thumbs have landed. They say “Water” if their thumb is on water and “Land” if their thumb is on land. Have students predict whether they will land more often on water or on land. Discuss why they land on water more times than land. Water covers more than 70% of the earth’s surface.

2. Set up classroom stations to examine tides and how intertidal creatures stay put.

Students go to each station and answer the questions at each station.

Station 1 – As students are watching, add the coloured salt water to fresh tap water. Students notice which is heavier: salt or fresh water. Explain how they know.

Station 1 question

Which is heavier, salt water or fresh water? (The salt water is blue) Explain why.
A. Saltwater is heavier because it has a higher concentration of salts and minerals dissolved in the water, making it more dense than freshwater. You can see that the saltwater (blue colour) is heavier because it sinks to the bottom when added to the freshwater.

Station 2 – Put a dye-coloured ice cube in a narrow dish of lukewarm freshwater. Students observe whether cold or warm water is heavier.

Station 2 question

Which is heavier, cold water or warm water? Explain why.
A. Cold water is heavier than warm water because cold water is more dense. You can see that the cold dye-coloured water is heavier because it sinks to the bottom when melting in the water.

Station 3 – Place a water filled balloon in the table. Students notice the shape of the water balloon when it is sitting on the table. Then have the students spin the balloon around horizontally. Students notice how the shape of the balloon changes as it is spinning. Students describe the change and name the force if they know it (centrifugal force).

Station 3 question

Draw the shape of the balloon when it is sitting on the counter.
A. The balloon should be a blob with a bulge in the middle of the balloon.



How does the shape change when the balloon is spinning around? Draw it.

A. The bulge of the balloon should move from the centre to the far outer side.

Why does the shape change?

A. The force placed on the water in the balloon from spinning around you causes the water to collect on the outer side.

What is the name of the force that causes the change?

A. Centrifugal force. It is the name of the force of the sun and moon on the earth that causes the tides to rise and fall.

Station 4 – Place a hula hoop at the station. Students take turns spinning a hula hoop around their waist. They imagine that they are the earth and the hula hoop is the ocean. Students notice how the hula hoop moves around them.

Station 4 question

Imagine you are the earth and the hula hoop is the ocean. What happens when you spin the hula hoop around your waist?

A. The bulge of the hoop moves around you as the hoop spins around your waist. This is similar to how the ocean is pulled on the earth's surface to create high and low tides.

Station 5 – Place a barnacle, limpet and crab shell on the table along with photos of each animal. Students determine how each animal stays put when the tide comes in and the waves crash on the shore. They note the shape of the shell and other features that help the animals stay put.

Station 5 question

How does each animal stay put when the tide comes in?

A. Barnacles are cemented to rocks; Limpets suction onto rocks with their strong foot; and Crabs use their legs to get to shelter under stable objects such as cobbles and boulders.

How do they avoid drying out when the tide goes out?

A. Barnacles close their protective shells; Limpets suction tightly to rocks; and Crabs hide under stable objects where they are protected from exposure to the sun, rain and wind.

When all the students have finished with the Stations, discuss the answers with the class.

3. How are tides caused?

Explain tides and look at pictures of the same intertidal location at low and high tides.

A: Tides are caused by a combination of the gravitational pull of the moon, sun and centrifugal force. The moon has the most effect because it's closer to the earth than the sun. The pull of the moon creates a bulge in the ocean near the moon and a second bulge on the opposite side of the earth is formed due to centrifugal force.

4. Currents

Discuss currents and what students have found on the beach that has come from other places.

A. What is a current?

A: It's like a river in the ocean.

B. What did you notice about the ice cube in the Station 2 experiment?

A: The water from the ice cube sunk to the bottom of the dish.

C. Scientists often study currents by putting objects in the ocean at one location and finding out where they travel.

Where do many objects come from that you find on the beach? *A: Japan, Korea.*

Why? *A: The current brings them here.*

D. What have you found on the beach that has come from somewhere else?

E. Have you ever found a message in a bottle?

Extensions

Tide Zone Activity

Divide the room into four areas using flagging tape. Label each area different intertidal zones: spray, high, middle, and low tides.

Students get a card with a creature and tide zone on it. They go to the tide zone they would be found in and act out how they are able to move and stay put. They should look around them and notice the other creatures in their zone and those in the other zones.

Students can also draw or colour their creature in the correct tide zone.

Field trip

Go to the beach at low tide to see what lives in the intertidal zone. Look at tide tables to see when high and low tides occur that day. Look at what part of the intertidal zone different creatures live in.