

Section 4

Understanding Earth and Space Systems

EXPLORATION 1

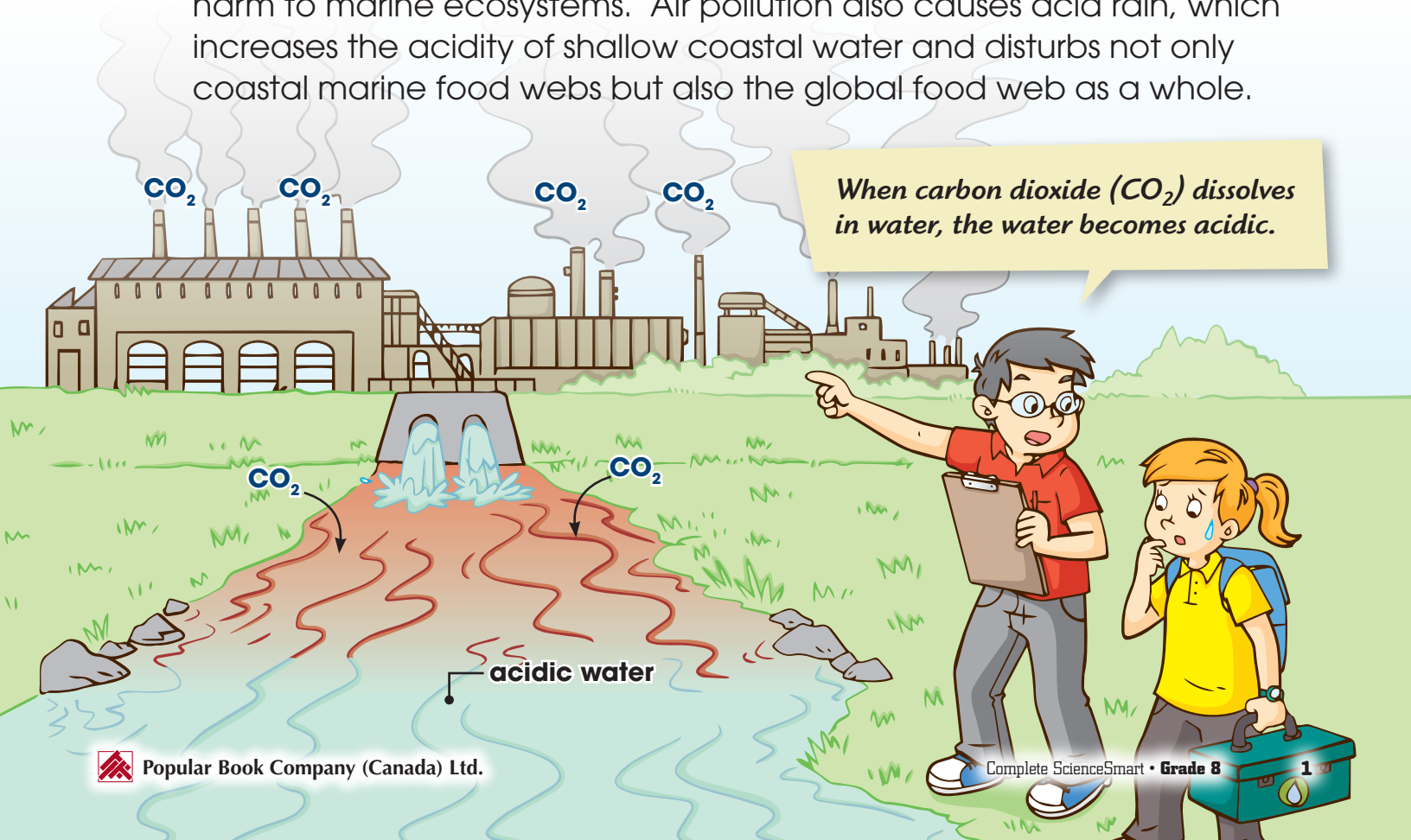
Acidification of Oceans

Investigate how air pollution causes oceans to become acidic.

Climate change has been an alarming global issue for years. From global warming and extreme weather to shrinking glaciers and rising sea levels, the negative impacts of climate change are catastrophic. All these are detrimental to ecosystems and wildlife, and adversely affect water sources, food production, and eventually, global human health and quality of life.

Human activities, such as burning fossil fuels in industries and agriculture, are major contributors to climate change. These activities cause air pollution and create an excess of greenhouse gases, which trap harmful amounts of the sun's heat in our atmosphere. These activities also affect our oceans, which naturally help regulate Earth's temperature by absorbing the heat and carbon dioxide in the atmosphere. When carbon dioxide dissolves in seawater, chemical reactions take place and result in the formation of carbonic acid. With increased absorption of carbon dioxide, the amount of carbonic acid formed also increases, resulting in ocean acidification. This brings great harm to marine ecosystems. Air pollution also causes acid rain, which increases the acidity of shallow coastal water and disturbs not only coastal marine food webs but also the global food web as a whole.

When carbon dioxide (CO_2) dissolves in water, the water becomes acidic.



Section 4

Understanding Earth and Space Systems

EXPLORATION
1

Acidification of Oceans

In this experiment, you will create a model of ocean acidification and observe how carbon dioxide impacts the acidity of water.

Level of Difficulty:

moderate

Time Needed:

1 hour

Hypothesis:

Circle the correct word to show your hypothesis.

Vinegar and baking soda will create a solution that is **acidic / neutral / alkaline** .

Materials:

- red cabbage
- vinegar
- 2 big, clear jars with lids
- 2 smaller paper cups
- a measuring cup
- a mug
- baking soda
- tape
- tap water
- a pot

Steps:

1. **Prepare the cabbage juice:**
 - Chop half of a head of red cabbage into small pieces.
 - Put the pieces in the pot and submerge them in water. Then boil the water.
 - Remove the pot from the heat and leave it to cool.
 - Strain the cabbage juice into the mug.



red cabbage

Red cabbage contains a water-soluble pigment that changes colour when it is mixed with an acid or a base.

This **purple** pigment turns

- **red** when it is in an acidic environment.
- **blue** when it is in an alkaline environment.

Ask an adult for help to prepare the cabbage juice.

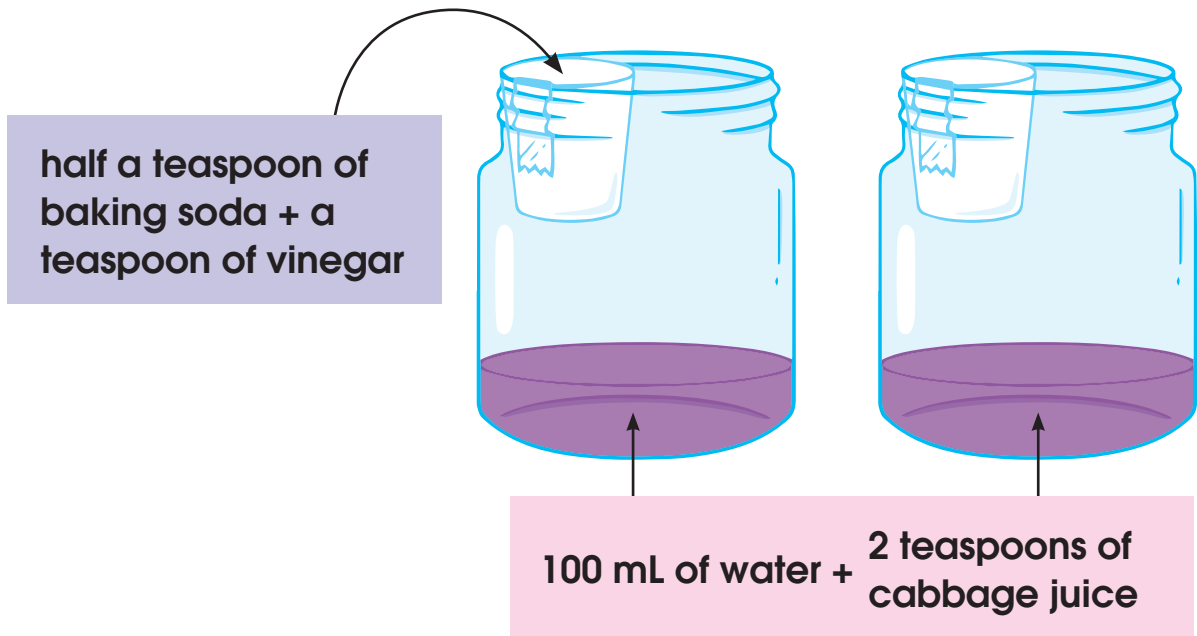
Section 4

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EXPLORATION 1

Acidification of Oceans

2. Add about 100 mL of tap water and two teaspoons of cabbage juice to each jar.
3. Put a paper cup into each jar and tape it to the edge. Make sure the paper cups do not get wet.
4. Add half a teaspoon of baking soda followed by a teaspoon of vinegar into one of the paper cups.
5. Put the lids back on both jars quickly.
6. Observe the jars for ten minutes.



Conclusion:

Fill in the blanks after conducting the experiment.

The cabbage juice in the jar with the cup of baking soda and vinegar changes from purple to _____ .

My hypothesis was _____ .
correct/incorrect

Section 4

Understanding Earth and Space Systems

EXPLORATION 1

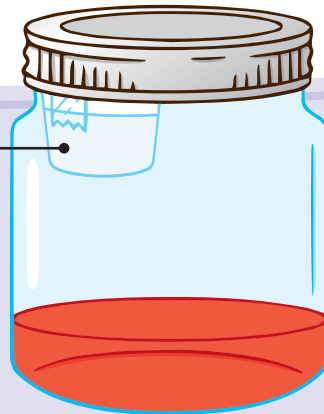
Acidification of Oceans

Explanation:

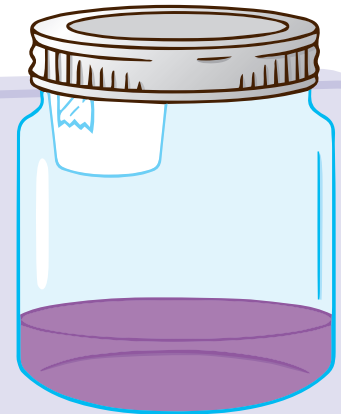
When the vinegar and baking soda reacted, they created carbon dioxide. The released carbon dioxide in the sealed jar reacted with the water in the cabbage juice, making the water acidic. Therefore, the purple pigment of the cabbage juice turned red and showed that the water had become acidic.

The cabbage juice in the other container was a control to show that the colour of the solution remains unchanged when the water is neutral.

vinegar +
baking soda



acidic



control