

Activity 7.4

Changing the density of a liquid—Adding salt

Can the density of a liquid be changed?

In this activity, students will see that a carrot slice sinks in fresh water and floats in saltwater. Considering the placement of the carrot slice in water and salt water, students will infer that the density of salt water must be greater than the density of fresh water. As a challenge, students will adjust the density of the salt water until they get the carrot slice to hover somewhere in the middle of the cup.

Materials needed for the demonstration

Water
Salt
2 Clear plastic cups
Plastic teaspoon
2 Carrot slices

Materials needed for each group

Water
Salt
Clear plastic cup
Plastic teaspoon
Carrot slice

Notes about the materials

- Be sure you and the students wear properly fitting goggles.
- One carrot will be more than enough for an entire class to do this activity.

Preparing materials

- Slice a carrot into round pieces about $\frac{1}{2}$ cm thick. Each group will need only one slice. Test one carrot slice by placing it in a cup of water ahead of time. It should sink.

Activity sheet



Copy *Activity sheet 7.4—Changing the density of a liquid—Adding salt*, pp. 419–420, and distribute one per student when specified in the activity.

Assessment

An assessment rubric for evaluating student progress during this activity is on pp. 437–439. For this formative assessment, check a box beside each aspect of the activity to indicate the level of student progress. Evaluate overall progress for the activity by circling either “Good”, “Satisfactory”, or “Needs Improvement”.

Activity 7.4

Changing the density of a liquid—Adding salt

Question to investigate

Can the density of a liquid be changed?

Demonstration

1. Do a demonstration to show students that a carrot slice sinks in fresh water but can float in salt water.

Procedure

1. As students watch, pour $\frac{3}{4}$ cup of fresh water into 2 clear plastic cups. Place 1 similar-sized carrot slice in each cup. The carrot slices will sink.
2. Add about 1 teaspoon of salt to one of the cups and stir. The carrot should begin to rise. Continue adding salt and stirring until the carrot floats to the top and stays there.



Expected results: The carrot slice in the salt water floats, while the carrot slice in the fresh water sinks.

2. Ask students what this demonstration tells them about density.

Ask students questions like the following:

- Before I added salt to the water, how did the density of the carrot compare with the density of the water?
- What happened to the density of the water as salt was added?
- What can you conclude about the weight of a carrot slice compared with the weight of an equal volume of fresh water? Salt water?

Since the carrot sinks in fresh water, the density of the carrot must be greater than the density of the fresh water. Students should suggest that adding salt to the water increases the density of the water and causes the carrot to float. Since the carrot sinks in fresh water, a carrot slice must weigh more than an equal volume of fresh water. Since the carrot floats in salt water, it must be less dense than salt water. Therefore, a carrot slice must weigh *less* than an equal volume of salt water.

3. Challenge students to make a carrot slice “hover” in a cup of salt water.

Tell students that they can make a carrot slice “hover” in the middle of a cup of salt water. By adding small amounts of salt and fresh water, they can adjust the density of the water so that the carrot doesn’t float or sink, but “hovers” in the water.



Distribute *Activity sheet 7.4—Changing the density of a liquid—adding salt.*

Procedure

1. Half-fill a tall clear plastic cup with room-temperature water.
2. Place a slice of carrot in the cup. It should sink because it is more dense than water.
3. Add about 1 teaspoon of salt and stir with a spoon until as much salt dissolves as possible.



4. Continue adding salt and stirring until the carrot floats to the top.
5. Very carefully add fresh water to the top of the salt water until the carrot begins to sink.
6. If the carrot sinks to the bottom, add small amounts of salt and fresh water as needed to cause it to hover.

4. Have students discuss their procedures and results.

The carrot slice will hover when the density of the salt water and the density of the carrot slice are about the same.

Ask students what affects whether something will sink or float in a liquid. Students should realize that whether or not something sinks or floats in a liquid will depend on its density compared to the density of the liquid.