

# DUNKED NAPKIN

## Objectives

The students will:  
Experiment to determine if air occupies space.

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## Standards and Skills

### Science

Science as Inquiry  
Physical Science  
Properties of Objects and Materials  
Evidence, Models, and Explanations

### Mathematics

Verifying and Interpreting Results

### Science Process Skills

Predicting  
Observing  
Investigating  
Interpreting Data

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## Background

Gas, solid, and liquid are states of matter found on Earth. One of the basic characteristics of matter is that it occupies space. An observer can "see" a glass of milk sitting on a table. The milk and table are objects that occupy a measurable part of the total volume or space in the room.

Although air is present in the room with other matter, a visual aid is necessary for an observer to "see" that air occupies a portion of space as well. In this experiment a plastic cup containing air and a crumpled napkin are turned upside down and placed into a container of water. Air and water cannot occupy the same space at the same time, therefore the napkin remains dry.



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When conducting scientific inquiry, scientists begin by asking questions about why something is a certain way. In this case, "does air take up space?" Based on the question, they predict what the answer is. This is called forming a *hypothesis*.

The next step is to test the hypothesis with an experiment. Scientists draw *conclusions* from the results of their experiment, which leads them to either accept or reject their hypothesis.

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## Materials

Clear plastic cup  
Napkin  
Water  
Basin or small aquarium  
Newspapers or drop cloth  
Balloon

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## Warm-up

Have students discuss what they think air is. Which of the five senses lets them experience air? Can you taste or smell air? *Probably not.* Can they see it? *No, but you can see things like a wind sock blow in the wind.*

Can you feel air? *Try holding your hand over a heating vent, fanning your face with a folded paper fan, or whirling around with a paper lunch bag on your arm. You might not be able to see air, but you can feel air molecules moving.*

Does air take up space? To help students answer this question, take a deflated balloon and blow air into it so it is partly filled. Ask them what is in the balloon and then blow up the balloon until it is full. Is there more air in the balloon now than there was before? *Obviously air takes up space.*

The balloon has air in it, but does the cup? In this exercise have students predict if there is air in the cup and what will happen to a napkin inside the cup if you put the cup in the basin of water.



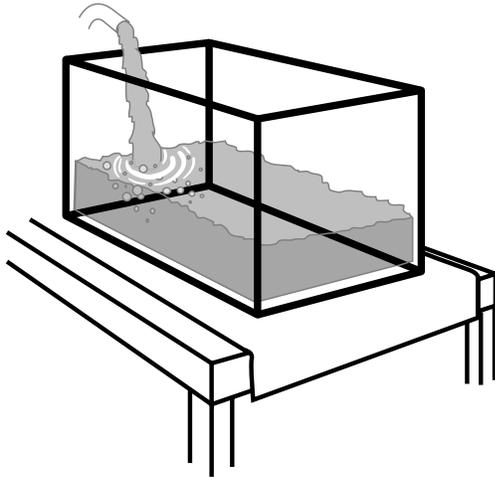
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## Management

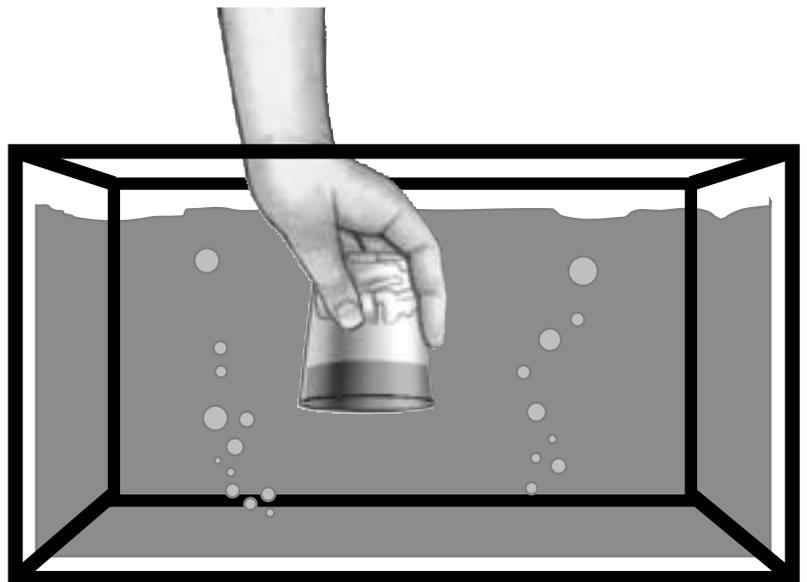
This activity can be done as a teacher demonstration or student activity. It will take about 15 minutes to complete and there is a potential for water spillage. Students can work individually or in pairs.

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## Activity



1. Prepare a table for water spillage by covering it with newspapers or a drop cloth.
2. Fill an aquarium or other large container with water.
3. Crumple a napkin and stuff it into a plastic cup.
4. Turn the cup upside-down and plunge it completely into the water. Do not tilt the cup.
5. Remove the cup from the water, and extract the napkin.
6. Observe whether the napkin is wet or dry.



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## Discussion

1. What is an experiment and why is it conducted? *An experiment is an activity or action designed to answer questions.*
2. What is a hypothesis? *A hypothesis is a proposed answer to a problem, or an explanation that accounts for a set of facts and can be tested by further experimentation and observation. The results of experimentation provide evidence that may or may not support the hypothesis.*
3. What is a conclusion? *A conclusion is an answer based on the experiment.*
4. Why did the napkin stay dry? *Air trapped in the cup with the napkin prevented water from entering the cup.*
5. What is air? *Air is a mixture of gases that make up the Earth's atmosphere.*
6. Can you taste, see, feel, hear, or smell air? *Impurities in air will allow our senses to detect the presence of air. For example, smoke contains particles we can see and smell. Moving air or wind can be felt and heard.*

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## Assessment

Students will have successfully met the objectives of this activity by:

- Conducting the experiment.
- Stating a conclusion based on the experiment.

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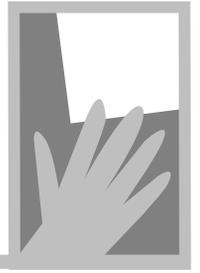
## Extensions

1. Have the students alter variables like cup size, speed, and angle of insertion and removal, and liquids other than water.
2. Discuss where air pockets can occur: in landfills, underwater or underground caves, capsized canoes, etc.
3. Brainstorm a list of examples of air taking up space that students might see in school, at home, or on television: balloons, bubbles, basketballs, etc.
4. Discuss ways to store air. Space travellers and scuba divers must store air in tanks.





# Dunked Napkin



This experiment will help answer the question "Does air take up space?"

Materials: Clear plastic cup, napkin, water, basin or small aquarium, and newspaper or drop cloth

1. Place a drop cloth or newspaper on your work surface. Fill a basin with water.
2. Crumple a napkin and put it at the bottom of the cup. The napkin should fit tightly, and not fall out when the cup is inverted.
3. Predict what will happen to the water and napkin when you turn the cup so that the mouth faces downward and place it in the basin of water.

I predict \_\_\_\_\_

4. Place the inverted cup into the basin of water. Hold it under water for two minutes and observe what happens.

5. Write or draw what you saw happen to the napkin. \_\_\_\_\_

6. Carefully pull the cup out of the water and remove the napkin. Is the napkin wet or dry?

7. Can you explain the results of your experiment? \_\_\_\_\_

8. Use the results of your experiment to answer this question: Does air take up space?





# Dunked Napkin

