

**Forces in Fluids** ▪ *Skills Lab*

# Sink and Spill

**Problem**

How is the buoyant force on a floating object related to the weight of the water it displaces?

**Skills Focus**

controlling variables, interpreting data, drawing conclusions

**Materials**

paper towels	triple-beam balance
table salt	pie pan
beaker, 600 mL	jar with watertight lid, about 30 mL

**Procedure**

1. Preview the procedure.
2. Find the mass, in grams, of a dry paper towel and the pie pan together. Multiply the mass by 0.01. This gives you the weight in newtons. Record it in your data table.
3. Place the 600-mL beaker, with the dry paper towel under it, in the middle of the pie pan. Fill the beaker to the very top with water.
4. Fill the jar about halfway with salt. (The jar and salt must be able to float in water.) Then find the mass of the dry jar (with its cover on) in grams. Multiply the mass by 0.01. Record this weight in your data table.
5. Gently lower the jar into the 600-mL beaker. (If the jar sinks, take it out and remove some salt. Repeat Steps 2, 3, and 4.) Estimate the fraction of the jar that is underwater, and record it.
6. Once all of the displaced water has been spilled, find the total mass of the paper towel and pie pan containing the water. Multiply the mass by 0.01 and record the result in your data table.
7. Empty the pie pan. Dry off the pan and the jar.
8. Repeat Steps 3 through 7 several more times. Each time fill the jar with a different amount of salt, but make sure the jar still floats.
9. Calculate the buoyant force for each trial and record it in your data table. (*Hint: When an object floats, the buoyant force is equal to the weight of the object.*)
10. Calculate the weight of the displaced water in each case. Record it in the data table.

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**Data Table**

Jar	Weight of Empty Pie Pan and Dry Paper Towel (N)	Weight of Jar, Salt and Cover (N)	Weight of Pie Pan with Displaced Water and Paper Towel (N)	Fraction of Jar Submerged in Water	Bouyant Force (N)	Weight of Displaced Water (N)
1						
2						
3						
4						
5						
6						
7						



**Analyze and Conclude**

*Write your answers in the space provided.*

**1. Controlling Variables** In each trial, the jar had a different weight. How did this affect the way that the jar floated?

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**2. Interpreting Data** The jar had the same volume in every trial. Why did the volume of displaced water vary?

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**3. Drawing Conclusions** What can you conclude about the relationship between the buoyant force and the weight of the displaced water?

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**Sink and Spill** *(continued)*

4. **Drawing Conclusions** If you put too much salt in the jar, it will sink. What can you conclude about the buoyant force in this case? How can you determine the buoyant force for an object that sinks?

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5. **Communicating** Write a paragraph suggesting places where errors may have been introduced into the experiment. Propose some ways to control the errors.

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**Design an Experiment**

How do you think your results would change if you used a different liquid that is more dense or less dense than water? Design an experiment to test your hypothesis. What liquid or liquids will you use? Will you need equipment other than what you have used for this experiment? If so, what will you need? *Obtain your teacher's permission before carrying out your investigation.*