Share with Your Students

What Is Air?

1. Make copies of Student Resource 1.1, Vocabulary, and distribute to students. Discuss the definitions with students as terms come up throughout the section.

2. Review with students the definitions for solid, liquid, and gas. Explain that there are many different kinds of gases, such as water vapor (evaporated water), natural gas (what burns in a gas stove), and carbon dioxide (the gas that you breathe out of your lungs).

3. Point out the helium-filled balloon and the inflated latex balloon that you set up earlier under the heavy book. Tell students that both are filled with gases. Lift the book off of the strings. (The helium-filled balloon will float to the ceiling and the air-filled balloon will fall to the floor.) Explain that some gases are lighter than others. Helium is lighter than air, so helium-filled balloons float in air.

4. Gather students around you. Open the plastic bag that contains the extract-soaked cotton ball. Ask students to raise their hands when they smell the scent.

5. Explain that gases are made of tiny particles that float around. Ask: How does the vanilla smell get to your nose? (Tiny particles of vanilla float in the air to your nose.) Can you see the vanilla particles? (No) Can you see the air? (No; air, like most gases, is invisible.)

Extension

Gas Is All Around Us

Have students draw pictures to show where gas is found. Challenge them to illustrate at least four gases. For example, they might draw a helium balloon floating, gas burning on the stove, a person breathing out, water evaporating from a puddle, gas bubbles in soda, a sky filled with air, and so on.
Air Takes Up Space

**Objectives**
- Students observe that air takes up space by trying to compress sealed, air-filled containers.

**Materials**

<table>
<thead>
<tr>
<th>For each pair</th>
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<tbody>
<tr>
<td>1 balloon, large</td>
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<tr>
<td>1 plastic bag, slim</td>
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<tr>
<td>1 plastic jar, tall</td>
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<tr>
<td>1 rubber band</td>
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**In Advance**
Attach plastic bags above each tall jar with a rubber band as shown in the picture. Make sure the rubber band is on tightly and the bag is inflated with air.

**1. Discuss the properties of air.**
Discuss that air is all around us. Ask: **Can you see air?** *(no)* **Can you taste air?** *(no)* **Can you smell air?** *(no)* Then how do you know air is really there? *(Answers will vary.)*

**2. Distribute the balloons.**
Distribute a large balloon to each pair of students. Help students as needed to blow up the balloons and tie them off.

**3. Students fill balloons with air and press on them.**
Have students observe the balloons. Ask: **How did the shape of the balloon change when you blew air into it?** *(It used to be flat, then it became round.)* Tell students to gently press on the balloon. Ask: **What happens?** *(The balloon presses back.)* **How can you tell that there is something in the balloon?** *(The balloon presses back when I press it.)* Point out that if the balloon were empty, it wouldn’t press back.

**4. Students identify the air in the prepared jars.**
Show students one of the bag-covered jars you prepared. Ask: **Is there anything in the jar?** *(air)* Have students predict whether or not they can push the bag into the jar.

**Teaching Tip**
- **Step 2:** You may need to blow up and tie off the balloons before class.
- **Step 3:** Make sure that students do not press the balloons so hard that they pop.

**Safety**
Talk to students and parents to be aware of any allergies students may have. Some people have severe allergic reactions to latex.

**Inquiry Focus**
- Observe

**Teaching Tip**
- **Step 2:** You may need to blow up and tie off the balloons before class.
- **Step 3:** Make sure that students do not press the balloons so hard that they pop.
5. **Students gently push the bag.**

Pass out the prepared jars to each pair of students. Have students push the bag gently. Ask: **What happens when you try to push the bag into the jar? (The bag will not go into the jar.) What do you think is keeping the bag from going into the jar? (The air in the jar is taking up space. The jar is full of air so there is no room for the bag.)** Explain that the bag will not go in because air takes up space.

**Assessment**

Have students write about or draw two objects that contain air. Have them identify how pressing or squeezing these objects can show how air takes up space.

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**Teaching Tip**

**Step 5:** Make sure students push the bags gently. If they push too hard, the bag will pop and the seal will be broken.

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### Investigate 2

#### Balloon in a Bottle

**20 minutes**

**Teacher Demonstration**

**Objectives**

- Students observe that air takes up space when they attempt to inflate a balloon inside a bottle.

**Materials**

- For the teacher
  - balloon, large
  - *plastic soda bottle, 2-L, empty
  - *Not provided in kit

- Student Resource
  - 1.2 Balloon Bottle

**Inquiry Focus**

- Predict

1. **Distribute the Student Resource.**

   Make copies of Student Resource 1.2, *Balloon Bottle*, and distribute to students.

2. **Students predict what will happen to the balloon.**

   Inflate the balloon outside the bottle to show that it is not faulty. Then put the balloon inside a 2-liter bottle, and attach it to the bottle lip as shown in the picture. Have students draw the balloon on the Resource page to show what they think the bottle and balloon will look like when you blow hard into the balloon.
3. Students observe what happens to the balloon.
Try to inflate the balloon in the bottle. Have students
draw what they observe. Ask: **What happened when I
blew into the bottle?** *(The balloon did not inflate.)*

4. Discuss what happened to the balloon.
Ask: **Why didn’t the balloon inflate?** *(The bottle is
full of air, so there is not room for more air to enter the
bottle and inflate the balloon.)*

5. Poke a hole in the bottle and try to inflate the
balloon again.
Poke a hole in the plastic bottle. Ask: **What do you
think will happen when you try to inflate the
balloon now?** *(Answers will vary.)* Try to blow up
the balloon again. *(The balloon will inflate this time.)*
Explain that the hole allows the air in the bottle to
move out, leaving room for the blown-up balloon.

**Assessment**
Explain that a bicycle tire pump is used to push
air into a bicycle tire. Ask: **Why do you think it is hard
to pump up a bicycle tire once it gets near full?** *(Air
takes up space, so it is hard to push more air into the filled
tire. It starts to push back.)*

**Homework**

**Escaping or Entering?**

Explain that a hissing sound indicates that gas is escaping
a container or rushing into a container. Have students look
around their homes for examples of objects that make a
hissing sound when opened. Have them identify whether
gas is escaping or entering the object. For example, gas
escapes when you open a can of soda, and gas enters a
freshly opened can of tennis balls.