5. Help students analyze the results.
Remind students that an object’s position on the electrostatic series chart determines how strong a charge it will produce on the balloon. Objects further apart on the list, when rubbed together, produce a greater charge.

Assessment
Have each student rub the balloon with the same item (for example, the wool cloth) and measure the distance at which the balloon causes a reaction in the pepper. Have the class compare their results to see if they all got similar data.

Investigate 4

20 minutes
Whole Class

Objectives
• Students form and justify predictions of interactions caused by static electricity.

Materials
For the teacher
2 balloons, small
1 *marker
2 pc. string (10-cm length)
1 pc. wool cloth
*Not provided in kit

Student Resource Pages
• 1.4 Electrostatic Series (from Investigate 3)
• 1.7 Static Balloons

Inquiry Focus
• Predict

Static Balloons

1. Prepare the materials.
Fill two balloons with air and tie them off. Tie each balloon to the end of a piece of string. Use the marker to draw an X on each balloon to show where you plan to rub it.

2. Distribute the Resource Pages.
Make copies of Student Resource Page 1.7, Static Balloons, and distribute to students. Redistribute copies of the Electrostatic Series Resource Page used in Investigate 3.
3. **Students observe interaction between neutral objects.**
   Hold the two strings up so that the balloons hang about 3 cm apart. Have students observe. (Both balloons are neutral so there is no reaction.)

4. **Students predict how a charged object affects a neutral object.**
   As students observe, rub on the X of one balloon with the wool. Have students use the Electrostatic Series Resource Page to identify the charge on the balloon. (negative) Have students predict what will happen when you hang the balloons together again. Tell them to record their prediction under **Experiment 1** on the Resource Page. Suspend the balloons. Have students record and explain their observations. (The balloons attract.)

5. **Students predict how objects with like charges interact.**
   Have students predict how rubbing both balloons with the wool will affect the balloons and record their prediction under **Experiment 2**. Rub both balloons and suspend them from the strings. Have students record and explain their observations. (The balloons repel.)

6. **Discuss the interactions.**
   Ask: **Why was there no reaction between the balloons when they were first hung from the strings?** (The balloons were neutral, so they exerted no force of attraction or repulsion.) **What happened when the first balloon was rubbed with wool?** (It became negatively charged.) Explain that the charge on the balloon pushed like charges away from the surface of the other balloon, leaving that balloon with an opposite charge. Because opposite charges attract, the balloons then attracted each other. By contrast, rubbing both balloons with wool gives them the same charge, causing them to repel each other.

**Assessment**
Have students use the Electrostatic Series Resource Page to identify the charges on, and predict the interaction between, balloons rubbed with plastic wrap and wool. (The balloons will attract each other because the balloon rubbed with plastic wrap will have a positive charge and the one rubbed with wool will have a negative charge.)
Research Lightning

Remind students that the shock received from a doorknob after walking across a carpeted floor results from a static discharge. A static discharge occurs when electrons on the hand are quickly pulled to the positively charged doorknob. This movement of electrons, which is felt as a shock, causes the body to lose its negative charge. Tell students that lightning is another example of a static discharge. Have students use an encyclopedia on the computer to find out how lightning forms. Have students report their findings in a drawing or a graphic organizer.

Section Assessment

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**Vocabulary**

1. What is static electricity?

   Static electricity is a buildup of charges on an object.

**How Charges Interact**

Study the charges on the balloons shown in each drawing. Write repel, attract, or no reaction on the lines below each drawing to identify how the balloons will affect each other.

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**Creating Static Charge**

Rub one balloon with plastic wrap. Rub the other balloon with wool cloth. Then place the balloons near each other and observe.

1. What did the balloons do?

   The two balloons attracted.

2. Use the Electrostatic Series Resource Page to explain your observations.

   Rubbing the balloon with plastic wrap gave the balloon a positive charge. Rubbing the other balloon with wool gave it a negative charge. Since opposite charges attract, the two balloons attracted.

**Materials**

- For each station
  - 2 balloons, small
  - 1 pc. plastic wrap (30 cm x 15 cm)
  - 1 pc. wool cloth

**Student Resource Pages**

- 1.4 Electrostatic Series (from Investigate 4)
- 1.8 Section 1 Assessment

1. Set up enough materials stations around the room to allow one-third of the class to work alone at a station during the hands-on portion of the assessment. Place a copy of the Electrostatic Series Resource Page at each station.

2. Make copies of the Section 1 Assessment Resource Page and distribute to students.

3. Divide the class into three groups. While one group is working at the stations to complete the hands-on portion of the assessment, the other two groups can be completing the top part of the Resource Page. Rotate the groups through the stations until each has completed the hands-on portion of the assessment.

4. Discuss the answers as a whole-class activity.