

## Pop Can Induction Lab

### Teacher's Guide

**Topic:**

Static Electricity

**The following information is provided to the student:**

**Question:**

What is the result when two connected conductors are charged using an induction charging process?

**Purpose:**

To determine the result of charging by induction using a charged object and two initially connected conductors.

A complete lab write-up includes a Title, a Purpose, a Data section, and a Conclusion/Discussion of Results. The Data section should include diagrams showing the steps of the induction charging process and diagrams and notes to show the test used to determine the charge of the two objects once charging was complete. The Conclusion/Discussion should clearly describe the result of the charging by induction, citing evidence from the Data section to support the conclusion.

**Materials Required:**

Pop cans; Styrofoam cups; balloon; synthetic fur; scotch tape; paper bits.

**Description of Procedure:**

Two pop cans are taped separately to the bottom side of two Styrofoam cups in such a manner that the cans rest on top of the cups; the cups are used as insulating handles. The two cans are placed next to each other so that they are touching on their ends. A balloon is charged negatively by friction by rubbing it vigorously with synthetic fur. The balloon is brought near one of the cans (referred to as can A). With the balloon held near can A, the other can (referred to as can B) is slowly pulled away using the insulating handle. The balloon is set aside and a bottom rectangle and a top triangle tape is made (refer to the directions in the Action at a Distance Lab). These two tapes (whose charges are known) are used to determine the charge on Can A and Can B. Observations are made and recorded. The cans are grounded by touching and the process is repeated to insure identical results.

**Alternative Materials and Procedure:**

If synthetic fur is not available, the balloons can be rubbed on a student's hair.

**Safety Concern:**

There is always a higher than usual level of risk associated with working in a science lab. Teachers should be aware of this and take the necessary precautions to insure that the working environment is as safe as possible. Student *horseplay* and off-task behaviors should not be tolerated.

**Suggestions, Precautions, Notes:**

1. The best cans for use in this lab are those which hold weight watchers beverage meals. Ironically, they tend to be heavier and (more importantly) do not have the protective film on top of the metal.

## The Laboratory

2. The balloon should not touch the pop cans and should not transfer a charge to the pop cans through sparking. Inform students to keep their ears open for a spark. If a spark occurs, the cans should be grounded (by touching) and the process should be started over from the beginning.
3. Challenge students to determine the results of the charge on Cans A and B if a positively-charged object is placed near Can A before Can B is pulled away.
4. Objects tend to lose their charge over time (especially in humid environments). The tapes may need to be re-charged if a second and a third test is conducted with them.
5. Be aware of students who might be prone to allergic reactions to latex balloons.

### Auxiliary Materials:

None

### Scoring Rubric:

<b>SE3. Pop Can Induction Lab</b>	<b>Score</b>
— Included, labeled and organized all parts of the lab report. — Data section includes diagrams showing the steps involved in the induction charging process of two connected pop cans; the charge on the object being used to polarize the system is shown; labels are given to the cans for the sake of a clear discussion. The test used to determine the charges on the cans are noted and the resulting charge is indicated. Documentation reveals a strong ability to experiment. — Conclusion/Discussion thoroughly, accurately and clearly describes the induction process and the result of the process. Reveals understanding.	—/—

### Connections to The Physics Classroom Tutorial:

The following reading is a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/Class/estatics/u8l2b.cfm>

### Connections to Minds on Physics Internet Modules:

Sublevel 5 of the Static Electricity module is a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/mop/module.cfm>