

Name _____ Date _____ Period _____



HOW FUSES WORK

INTRODUCTION: An essential safety component of any electrical device is the fuse. Most household circuits today as well as some electrical devices (such as a hair dryer) are protected by a circuit breaker. The fuse is part of the circuit it is designed to protect. Most fuses include a filament with a lower melting point than the rest of the wiring in the circuit. A circuit breaker causes a temporary interruption to the current flow, and can be reset once the problem in the circuit has been corrected.

PURPOSE:

Demonstrate what it means to "blow a fuse" and show why fuses are important safeguards against electrical fires.

MATERIALS:

- Lantern Battery, 6-V
- Aluminum Foil, Household Type
- Lamp Receptacles, Economy Choice
- Connector Cords with Alligator Clips
- Miniature Light bulb, 6.15-V
- Alligator clips or clamps

PREPARATION

1. Cut a narrow strip of aluminum foil, 2 mm x 10 cm for each demonstration. *Note:* Cut the aluminum very thin—less than 2 mm wide if possible. The ends may be slightly wider so they do not break when the alligator clips are attached.
2. Screw a 6-V miniature light bulb into the lamp receptacle.
3. Set up a support stand and clamp. This will allow students a better view of the balloon "fuse."

PROCEDURE:

1. Blow up a balloon, leaving it slightly underinflated. *Note:* Overinflating the balloon may increase the chance of an unexpected "pop" while completing the circuit or adjusting the foil strip.
2. Tie the open end of the balloon in a knot.
3. Tape a 2 mm x 10 cm strip of aluminum foil to the widest part of the balloon, leaving 2-3 cm of the aluminum strip free at

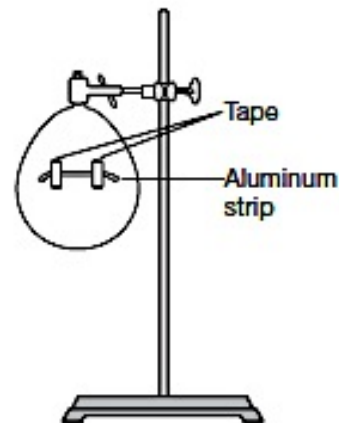
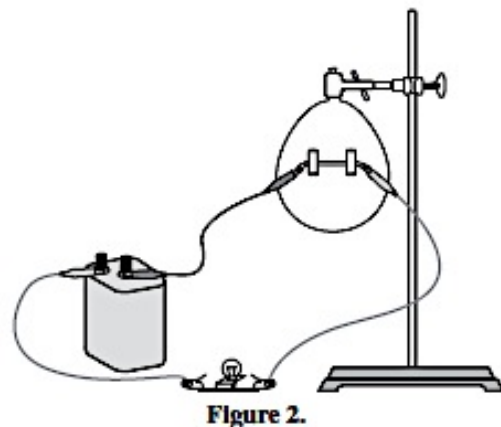


Figure 1.

each end (see Figure 1). Make sure the center portion of the foil strip between the two pieces of tape is flat against the balloon.

4. Place the knot of the balloon in the clamp and tighten the clamp to secure the balloon for better viewing.

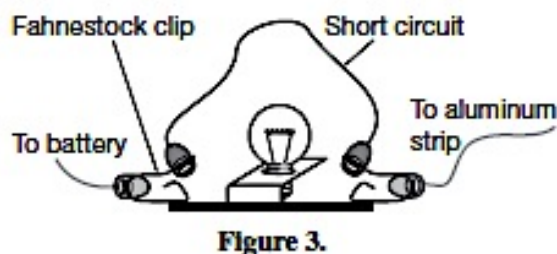
5. Using three connector cords with alligator clips, connect a 6-V lantern battery, the light bulb, and the aluminum strip in series (see Figure 2).



6. Be sure the metal of the alligator clips is not touching any part of the balloon.

7. The light bulb should light, showing the circuit is complete.

8. Standing away from the balloon, create a short circuit by attaching each end of a fourth connector cord to the clips on the lamp receptacle (see Figure 3). The bulb should go out or become very dim.



9. Make note of the time the short circuit was created. The balloon should burst in a few seconds. *Note:* Do not leave the short circuit in place for more than 15 seconds. If the balloon does not burst, disconnect the wires from the battery first, and then check to make sure the aluminum strip is flat against the balloon. Adjust if necessary. Repeat steps 4-7.

10. Once the balloon pops disconnect the battery immediately.

11. Observe the broken aluminum strip.

ANALYSIS & CONCLUSION:

1. What is the purpose of a fuse?

2. Why does a circuit get too hot?

3. What is a "short circuit"?

4. Less resistance results in _____
flowing through the circuit than was intended which can cause damage to the circuit
from overheating, and may eventually start a fire or cause an explosion.

5. When a circuit overload occurs, what happens to the filament?

6. In this demonstration, what does the balloon assembly represent?

7. Explain step by step how the short circuit is established with the balloon lab:

8. When a fuse is "blown", what needs to be done in order to reestablish the current?
