LESSON: GRAPHITE LIGHT BULB

Name _____

Date _____

Making a Better Light Bulb

Observations - Teacher Demonstration

What was good about this light bulb? How do you know?

What could be improved? How would you measure this?

YOUR TURN: ENGINEERING DESIGN

Investigate ways to improve upon the graphite light bulb.

Use the Engineering Design Process to make better light bulb. What changes would you make? Changes need to be tested to determine if an improvement was made.

Ideate and Test:

IDEATE: Consider how you will alter the circuit to make the light bulb better? e.g. make the graphite rod smaller		**TEST:** What will you measure to determine improvement? e.g.: brightness, duration	
Group #	**What will you change?**	**What will you measure?**	**Test result**

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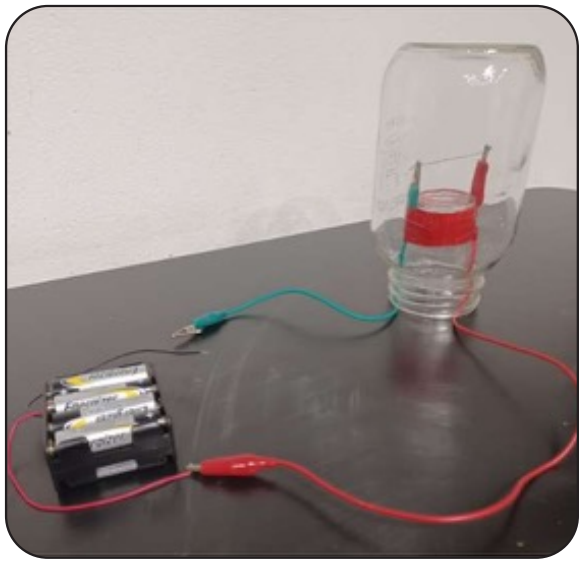
Materials

- 8 x AA batteries (1.5 V each)
- Battery holder
- 2 wire leads with alligator clips
- Large wide-mouth jar/beaker
- Small glass (50 mL beaker)
- 0.5 mm graphite pencil refills
- Electrical tape
- Timer (optional)
- Thermometer (optional)
- Switch (optional)
- Light sensor (optional)
- Porcelain or glass plate (if not working on a heat resistant surface)

Instructions

You will be repeating the experiment as demonstrated using the steps below. This time, though, you'll introduce your variable—or change.



1. Turn the small glass upside down. Tape two alligator clips to opposite sides of the small glass using the electrical tape. Clips should be facing up and aligned.
2. Carefully clip one graphite pencil refill in between the two alligator clips. Graphite is fragile and may break if alligator clips are moved.
3. Place the wide mouth jar over the small glass and alligator clip wires. Include a switch in the circuit, if using.
4. When instructed by your teacher, connect the remaining clips to the terminals of the battery holder that contains the 8 batteries in series (12 V total).
5. **Do not remove the jar during the experiment.** This traps any smoke produced and provides a barrier to prevent accidental burns. Allow equipment to cool down after the experiment before removing the jar.

Safety

- Warning: The wires can get hot.
- Do not increase voltage beyond 12 V total.
- Only turn on the switch/connect the batteries when the graphite rod is completely covered by the jar to avoid fumes building up in the air.
- Leave the jar on after the experiment to allow for complete cooling down.
- If you're not working on a heat-resistant surface, a porcelain or glass plate is advised to protect the surface from hot graphite.
- To avoid short circuits, make sure wires do not contact any metal surfaces.

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Conclusion

1. Which changes showed an improvement over the original design?

2. Identify one change and use your knowledge of electricity to explain why it affected the results (better or worse).

3. If time and materials allowed, what other changes might you make to improve the light bulb?