

Lighten Up!



Hi, GEERlings! It's Flynn, writing to you from northern Canada. It's freezing up here! My parents are here to work on a climate-change study. I'm going to go on a whale-watching tour to see orca whales! It's dark outside, so I brought my flashlight with me on my way to the dock where the tour group is meeting. I slipped on some ice and fell down, though, and I broke my flashlight! Now I'm out here in the dark, and I can't see which way to go. I still have some of the pieces from the flashlight. Maybe I can use them to make a new light source that will help me see. Do you think you can help me with that? The light source needs to be bright enough to light my way, it needs to be able to switch on and off, and it needs to work reliably without flickering or turning off unexpectedly. It would be so awesome if you could help me with that. Take a look at the videos I posted so you can find out more about what's happening to me. Thanks for your help!

Good luck,

Flynn

Student Vocabulary List

Resistor: a part of an electrical circuit that uses electricity like a light bulb



Switch: something that can easily break a circuit and reconnect it to turn the flow of electricity off and on.



Fossil Fuels: an energy source that comes from very old decomposed plant and animal matter, like coal, oil, and natural gas.



Instructions for GEERlings

Segment 1—Lights Out



Hi GEERlings! Thanks for helping me solve this problem. I'd be lost in the dark without you!

Inside Flynn's Fun Pack, there are items that represent the materials Flynn has with her. These are the materials she was able to find in her environment or in her backpack. Here's what you have to work with:

Material:

What it Represents:

Small 2. 2 Volt Light Bulb (1)	⇒ From broken flashlight
Double D Batteries (2)	⇒ From broken flashlight
Insulated Wire (Three 5 inch long pieces with 1/2in of rubber stripped off)	⇒ From broken flashlight
Brads (10)	⇒ Flynn's earrings
Paper Cup (2)	⇒ Flynn's hot chocolate cup
Paper Towel Roll (2)	⇒ Empty snack container from backpack
Duct Tape (1 Roll)	⇒ From Flynn's backpack
Electrical Tape (1 Roll)	⇒ From Flynn's backpack
Cardstock (4 Large Sheets)	⇒ Whale watching tour brochure
Paperclips (10)	⇒ From Brochure Packet

Your Challenge

Segment 1—Lights Out

Flynn needs to walk to the dock for a whale-watching tour in the dark, and her flashlight is broken! She needs your help making a new light source so that she can walk to the dock safely. Your design must be bright enough to read a poster in a dark room, it must be able to turn on and off, and it must stay on without flickering for 30 seconds.

Before you start working, see if you can plan what you think your solution will look like in the space below. Write out what materials you plan to use just like real engineers do!

My solution will look like this, and I will use this amount of each material to build it:

- ___ Small 2. 2 Volt Light Bulb
- ___ Double D Batteries
- ___ Insulated Wire
- ___ Brads
- ___ Paper Cup
- ___ Paper Towel Roll
- ___ Duct Tape
- ___ Electrical Tape
- ___ Cardstock
- ___ Paperclips

Let's Engineer It!

Segment 2—Get Your Chill On

Flynn needs to make something that will light her way while she walks to the dock for her whale-watching tour. Her engineering intuition tells her that an electrical circuit will help her get the job done. Your job today is to answer the questions below. The answers will help you design a light source that will be bright enough, turn on and off, and keep working long enough.

Take notes while you research, but only write notes that make sense to you. Don't write something that you don't understand or can't explain in your own words.

Don't forget to use the links on the growinggeers.com website to help you with your research!



1. What is an electrical circuit?
2. What are electrons and what do they do in an electrical circuit?
3. What is a power source? Why is it important?
4. What are some examples of power sources?

5. How does a battery work? Why does a battery have a positive and negative end?
6. How can you use more than one power source in an electrical circuit?
7. What is a conductive path? What does it do?
8. What is a resistor and what does it do?
9. What would cause an electrical circuit to stop working?
10. What is a switch and what does it do to a circuit?
11. Name three household items that use electrical circuits.
12. What is the main power source that each of those household items use for power?



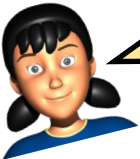
Now that you've researched and learned more about electrical circuits, try to use your new knowledge to design a light source that will light Flynn's way in the dark.



Let's Put It All Together!

Segment 3—Get Your Chill On

With your new knowledge of electrical circuits, try to design a new light source for Flynn. Think about what you've learned from your research and use your own creative ideas to create a light source that will help Flynn find her way to the dock for her whale-watching tour. Your light source needs to be bright enough to read a poster in a dark room, it needs to be able to turn on and off, and it must shine for 30 seconds without flickering.



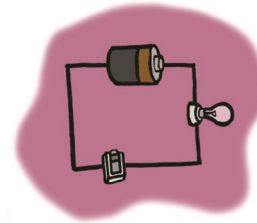
Think about what you built last time. What can you improve from that design?

I think I can build my solution like this, using these materials:

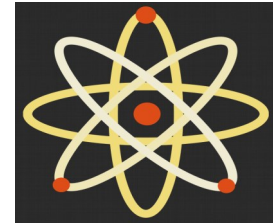
- ___ Small 2.2 Volt Light Bulb
- ___ Double D Batteries
- ___ Insulated Wire
- ___ Brads
- ___ Paper Cup
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Student Vocabulary List

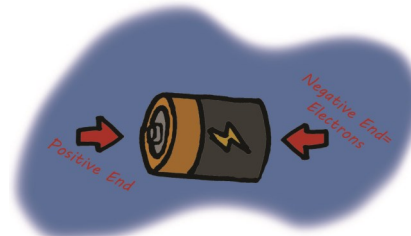
Electrical Circuit:
a complete path that electricity flows through.



Electron: a very small particle that has an electrical charge. Electrons flow to make electricity.



Power source:
something that creates electricity.



Conductive Path:
a path that electricity can travel along, usually a wire.

