

LIGHTS OUT ADVENTURE JOURNAL

TAKING ON THE
WORLD, ONE
ENGINEERING
CHALLENGE AT A TIME

PROPERTY OF THE FUTURE ENGINEER,

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, and while they do that, I am 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. Can you help me to create a new source of light? It 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 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

Instructions for GEERlings

Segment 1— Lights Out



Hi GEERlings! The Canada/USA border is the longest international border in the world. No wonder those two countries get along so well!

Inside Flynn's Supply Sack, there are items that represent the materials Flynn has with her. Some of these are things she can find in her environment, and some of them are things she already has in her Supply Sack. 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 (1)	⇒ Empty snack container from Supply Sack
Duct Tape (1 Roll)	⇒ From Flynn's Supply Sack
Electrical Tape (1 Roll)	⇒ From Flynn's Supply Sack
Cardstock (1 Sheet)	⇒ Whale watching tour brochure
Paperclips (10)	⇒ From Brochure Packet

You will also need to use scissors and wire cutters for this activity. Have fun!

Did you know that 30% of Canada's total landmass is occupied by forests? It is so beautiful!



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.

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

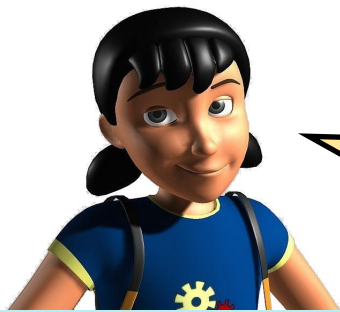
- Small 2.2 Volt Light Bulb
- Double D Batteries
- Insulated Wire
- Brads
- Paper Cup
- Paper Towel Roll
- Duct Tape
- Electrical Tape
- Cardstock
- Paperclips

Let's Engineer It!

Segment 2—Lights Out



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.



Canada was the first country to build a UFO landing pad in 1967. Looks like they are prepared for anything!

You can use websites to read, watch videos, or listen to explanations of different ways that electrical circuits are built and used.

Take notes while you research, but only write notes that make sense to you. Don't write something down that you don't understand or can't explain in your own words. If it helps you, you can also draw pictures to help describe what you learned. Don't get discouraged if you don't know the answer to the question. Research is all about challenging yourself to learn about things you didn't know before, so have fun!

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? List a few examples.

10. What is a switch and what does it do to a circuit?



11. Name three household items that use electrical circuits. Draw them and label the power source, switch, conductive path, and resistor on each.

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.



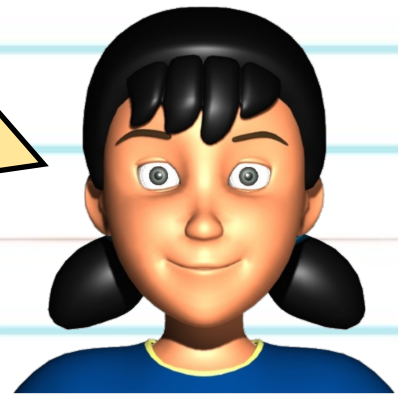
Let's Put It All Together!

Segment 3—Lights Out



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? Draw a picture of what you plan to make and label the materials you plan to use for each part of the light source. That will make it easier for you to follow the plan while you're building, and it will be easier for me to follow your plan too!



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

- Small 2.2 Volt Light Bulb
- Double D Batteries
- Insulated Wire
- Brads
- Paper Cup
- Paper Towel Roll
- Duct Tape
- Electrical Tape
- Cardstock
- Paperclips

Test for Success

Lights Out



This problem requires a room where the lights can be turned on and off easily. The room should be fairly dark when the lights are off. If possible, setup a poster or piece of paper with writing on it from the other end of the room to see if it can be read while only using the light source. If a poster is not available, see if the light can reach the other side of the room. Ideally, the light source should be able to be used at least 6 feet away from the poster or written material on the wall.

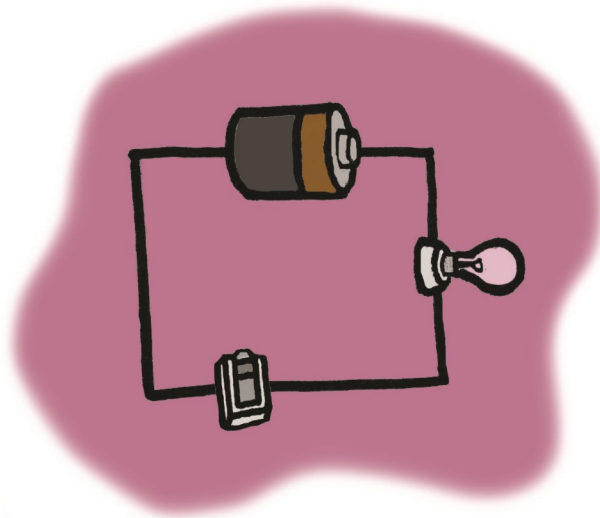
GEERling Vocabulary List

Lights Out



In Banff National Park, Canadians have built natural bridges designed to allow wildlife to pass safely over highways and other man-made road ways. They are used by all types of animals like bears, wolves, moose, and more! Canadians treat their animals well!

Electrical circuit: a complete path that electricity flows through



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

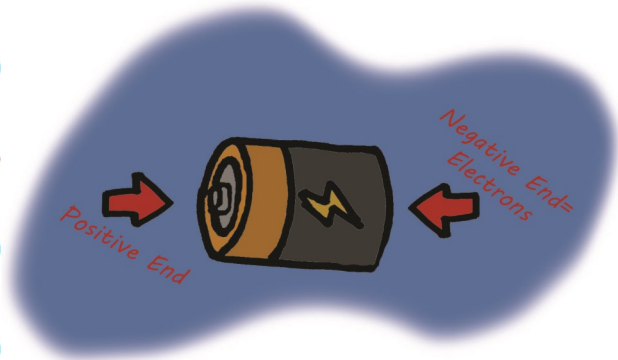


GEERling Vocabulary List

Lights Out



Power source: something that creates electricity



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



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



GEERling Vocabulary List

Lights Out



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



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



We rely on fossil fuels every day! Do you know some of the ways we use coal, oil, and natural gas? Try to learn more about this while you research electricity.

