

Draw a Circuit

Can a pencil conduct electricity?

Description

In this activity, kids complete an electrical circuit with graphite (pencil “lead”).

Suitable for kids ages 5 and up.



Materials

Soft drawing pencil (6B is best)

Paper

5mm LED bulb

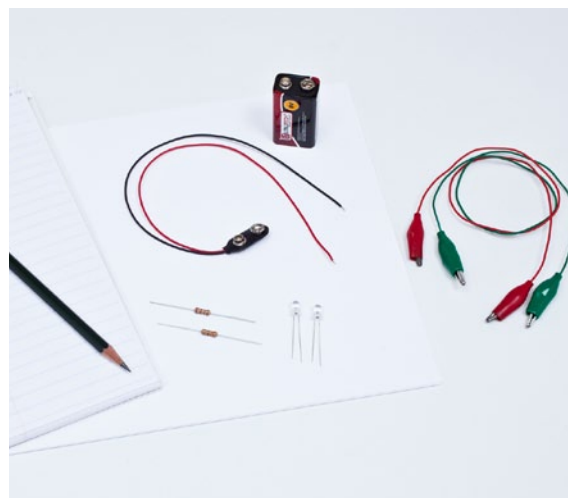
9 volt battery

9 volt snap connectors

330 ohm resistor

Two insulated wire leads

Notes: Battery and bulb circuit materials can be purchased from www.radioshack.com (LED bulb #276-021, 9v battery #55039849, battery connectors #270-324, resistor #271-1113, insulated leads #278-1156).



Time

Preparation: 15 minutes

Activity: 15 minutes

Cleanup: 5 minutes

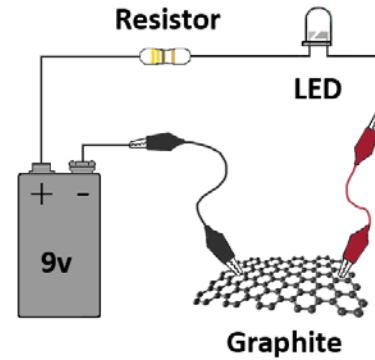
Safety

Use normal precautions while doing this activity.

Step 1

Grown-ups, make the battery and bulb circuit!

Follow the diagram.



Step 2

Kids, lay down some graphite! (Graphite is the real name for pencil “lead.”)

Use the drawing pencil to color a thick, dark box on the piece of paper. Make it several inches long and around half an inch thick.

TIP

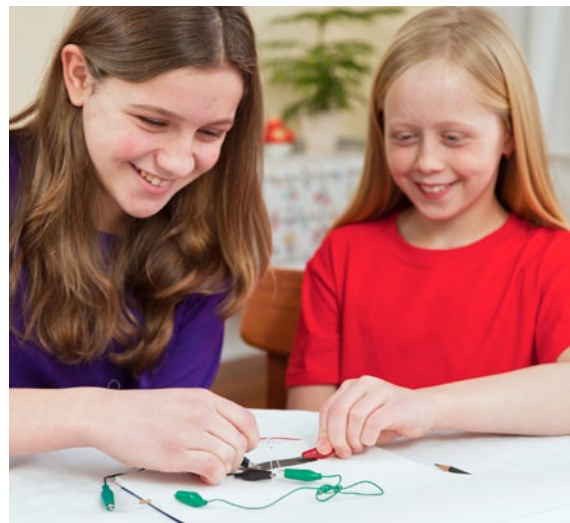
Make the box thick and heavy—try not to let any patches of paper show through.



Step 3

Touch the two insulated wire leads to the graphite box. Watch the bulb—what happens?

Now try moving the leads closer together and further apart. Do you notice a difference?



What's going on?

The bulb lights up! The graphite on the card conducts electricity, completing the electrical circuit.

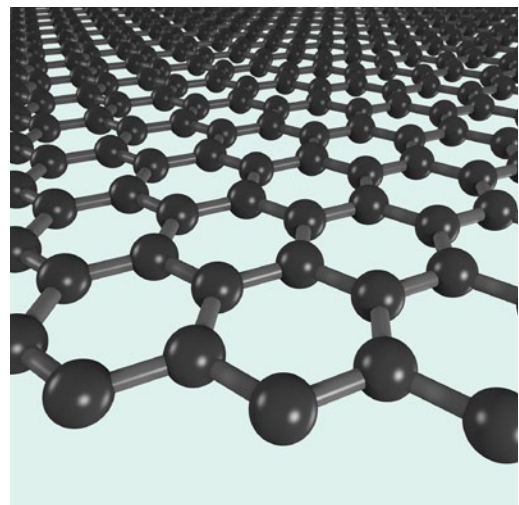
Graphite is commonly called “pencil lead,” but it’s actually not lead at all. Graphite is a mineral made of many layers of carbon stacked on top of each other.



How is this nano?

Graphene is a single layer of carbon atoms arranged in a honeycomb pattern. It’s the thinnest material in the world!

In 2010, Andre Geim and Konstantin Novoselov won a Nobel Prize in Physics for creating a material called graphene out of graphite. Their celebrated method was simple. They used ordinary transparent tape to peel apart layers of graphite until it was very thin. They measured their results and found out that they’d made graphene.

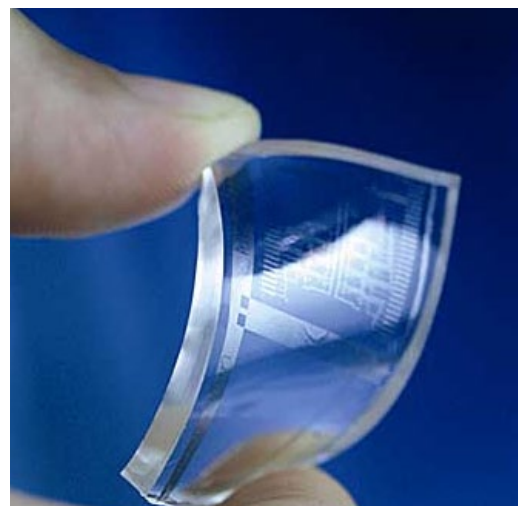


Model of graphene

Graphene

In the field of nanotechnology, scientists and engineers make new, nano-sized materials and devices. (A nanometer is a billionth of a meter.) Graphene is an example of a nano-sized material.

Graphene has a lot of potential in nanotechnology because of its useful properties. It’s flexible, super-strong, nearly transparent, and conducts electricity. One day, graphene could be used to make see-through, bendable electronic displays, and tiny, fast computer chips.

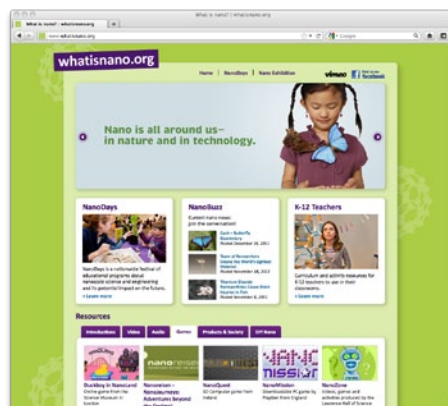


Flexible graphene circuit

Learn more

Learn more at:

www.whatisnano.org



Credits



This project was supported by the National Science Foundation under Award No. ESI-0532536. Any opinions, findings, and conclusions or recommendations expressed in this program are those of the author and do not necessarily reflect the views of the Foundation.

Copyright 2012, Sciencenter, Ithaca, NY.



Text published under an Attribution-NonCommercial-ShareAlike Creative Commons License.
<http://creativecommons.org/licenses/by-nc-sa/3.0/us/>

Activity photographs: Gary Hodges Photography for the NISE Network
Graphene model: Martin McCarthy for the NISE Network
Flexible graphene circuit: Courtesy of Ji Hye Hong