

# Conductors vs Insulators

Name:

Date:

Block:

**Question:**

How can we identify which objects are able to conduct electrical current?

**Background:**

Conductivity is the ability or power to conduct or transmit heat, electricity, or sound. Conductors are materials that allow for electricity to easily pass through; it does not resist the flow of electricity. Insulators are materials that resist the flow of electricity, so electricity does not easily pass through.

**Hypothesis:**

**IF** we place a conductor into a closed circuit, **THEN** electrons will be able to flow through it.

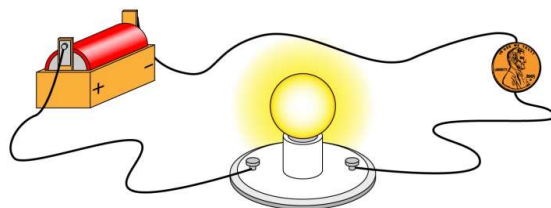
**Procedure:**

1. Type in the following URL: <https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc>
2. Click the play button to begin the simulation.
3. Click the 'Intro' simulation.
4. Create the following circuit:

\*The lightbulb that should be used should look like:

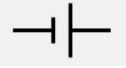


\*The battery that should be used should look like:



5. You are able to replace the coin with the different objects provided on the side. Complete the following table:

Object	Conductor or Insulator?
Dollar Bill	
Paper Clip	
Coin	
Pencil	
Eraser	
Hand	
Dog	
Wire	

6. Put the **coin** back into the circuit and click on the following button: . The diagram shown is called a **circuit diagram**.

7. Add a switch to the circuit. What is the role of the switch in the circuit?

8. Draw out the circuit diagram using the symbols that you see:

9. From the circuit diagram, what is the symbol that represents:

a. A battery:

b. An object:

c. A lightbulb:

d. A wire:

e. A switch:

10. Would these objects (the dollar bill, the paper clip, the coin, etc.) be considered a source, a resistor, a load, voltage, or a current? Explain your choice.

11. In which direction does the electrons flow? Be sure to refer to the positive and negative terminals of the battery in your response.

12. Attach an ammeter beside the negative terminal of the battery. Ammeters are able to measure the amount of current (the rate of electric charge) that is flowing through the circuit. \*\*\*Be sure that the object placed in the circuit is the coin
- What is the amount of current that is able to flow through the circuit? \_\_\_\_\_
  - If you were to place the ammeter in another position within the circuit, what do you notice?

13. Attach the two ends of the voltmeter around the battery. Voltmeters are able to measure the amount of voltage that is flowing through the circuit. Be sure that your voltmeter reading is positive.

- What is the amount of voltage around the battery? \_\_\_\_\_
- What is the amount of voltage around the light bulb? \_\_\_\_\_
- Attach another lightbulb into your circuit and re-measure the amount of voltage across your battery and the two lightbulbs:
  - Battery: \_\_\_\_\_
  - Lightbulb 1: \_\_\_\_\_
  - Lightbulb 2: \_\_\_\_\_

What do you notice about the voltages within the circuit when the circuit has one lightbulb compared to two?

14. Remove one of the lightbulbs so that your circuit only contains one lightbulb. Click on the values button in the top right hand box.

- What is the amount of resistance that is provided by the lightbulb? \_\_\_\_\_

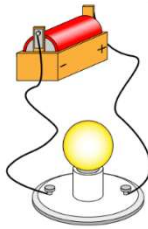
**Follow-up Questions/Conclusion:**

- What are some characteristics that make an object an insulator? Name at least 2.
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- What are some characteristics that make an object a conductor? Name at least 2.
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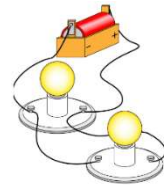
3. Why would civil engineers, or others designing a structure, have to be very familiar with insulators and conductors?
  
4. In the simulation, compare the resistance provided by each of the objects tested (i.e., the coin, the eraser, the dog, the hand, etc.). What do you notice about the resistance of the conductors and the resistance of the insulators?

5. Using the simulation, draw a circuit diagram for the following diagrams:

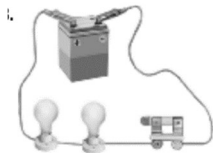
a.



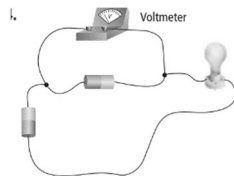
b.




c.



d.



\*The symbol for a voltmeter is 

6. \*\*\*From the information found in procedure 12, 13, and 14, what is the relationship between voltage, current, and resistance? (Try and develop an equation between voltage, resistance, and current based off of the values that you measured)