

## MAGNETIC OBSERVATIONS

.....

**1. How does your magnet interact with test objects?**

Things that stick	Things that don't stick
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Magnets only stick to \_\_\_\_\_

**2. Where did you detect iron or steel in your classroom?**

Things made of iron or steel	Things <i>not</i> made of iron or steel
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

**3. Describe what happens when two magnets come together.**

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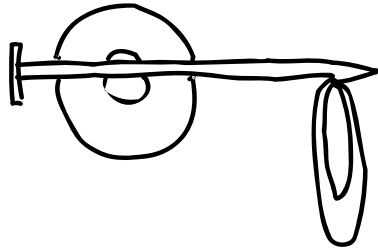
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## RESPONSE SHEET—MAGNETS

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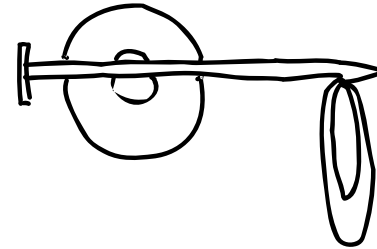
Students in a fourth-grade class were investigating which objects stick to magnets. One of them drew a picture in his journal like the one you see above, and then wrote,

I was surprised! I had a nail stuck to a magnet, and when I accidentally touched the nail to a paper clip, the paper clip stuck to the nail. I wonder why this happens.

Write a note to this student. See if you can help him understand more about what is happening.

## RESPONSE SHEET—MAGNETS

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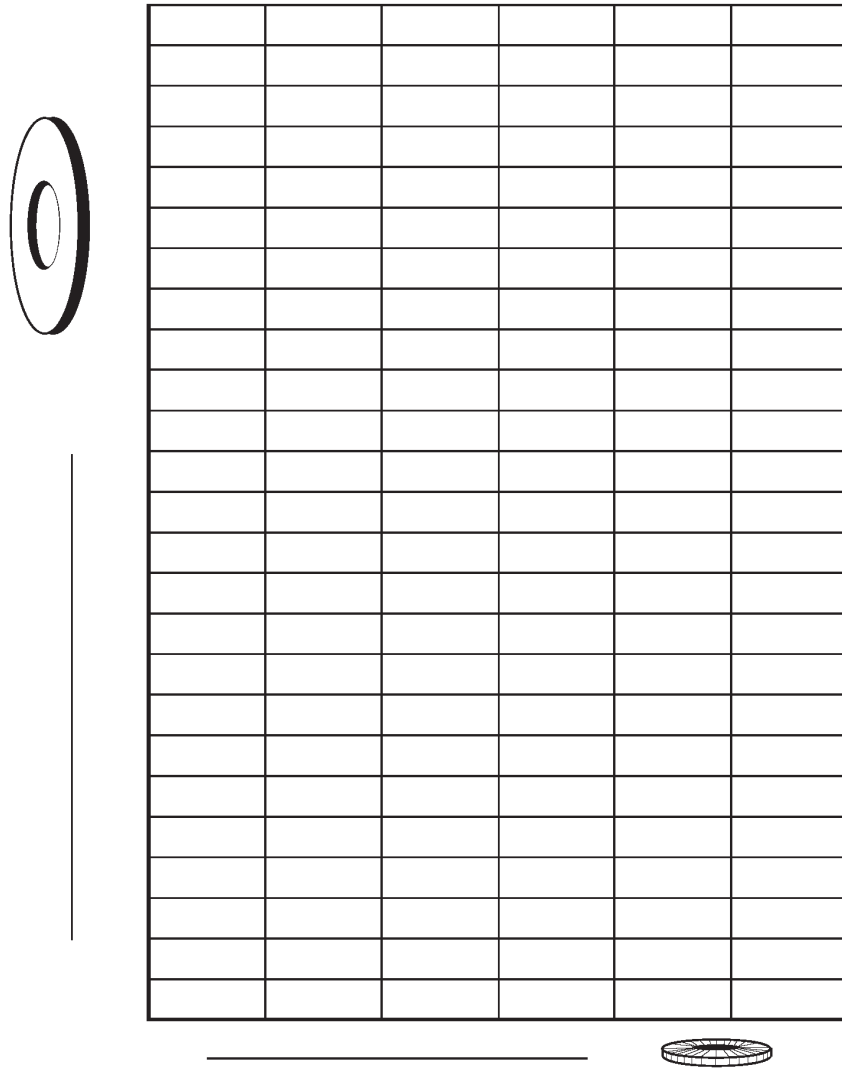
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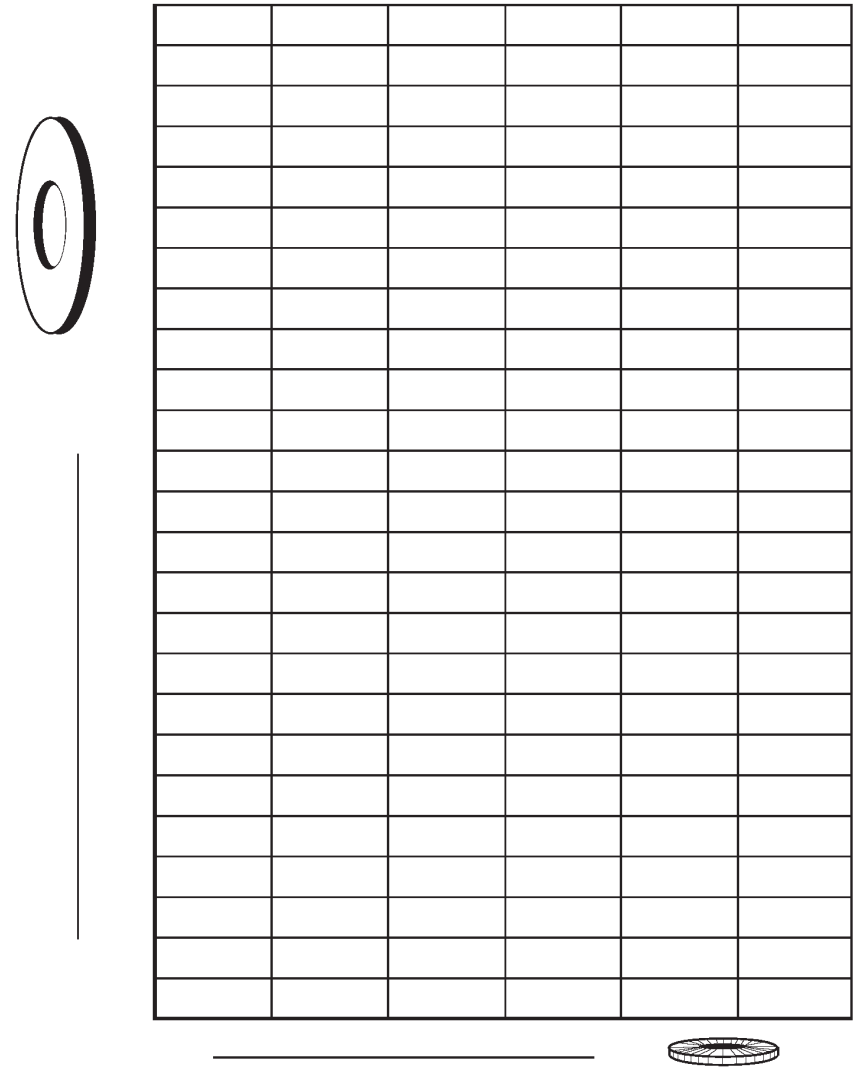
# THE FORCE

.....



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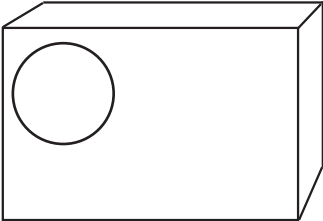
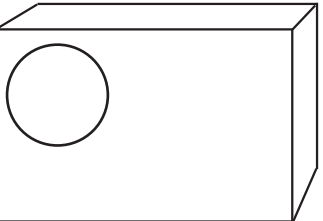
.....



## DETECTING MAGNETS

.....

1. Draw where you found magnets in the box.
2. Explain how you know the magnets are there.
3. If you explore more boxes, record your observations in your notebook.

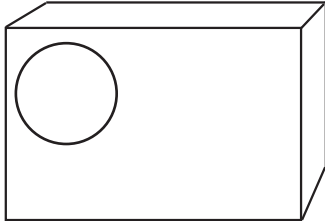
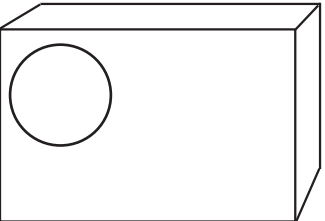
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4. Which device worked the best for detecting magnets?  
Why do you think so?

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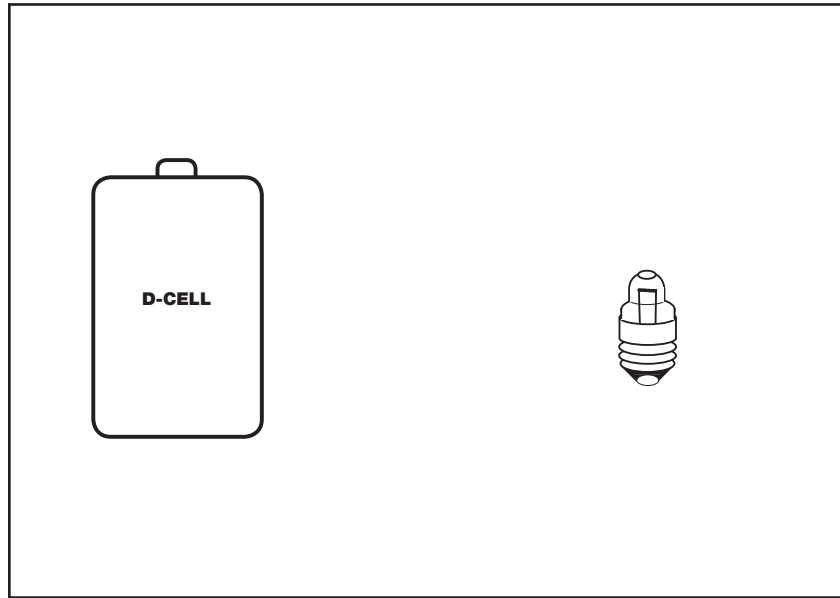
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## THE FLOW OF ELECTRICITY

.....

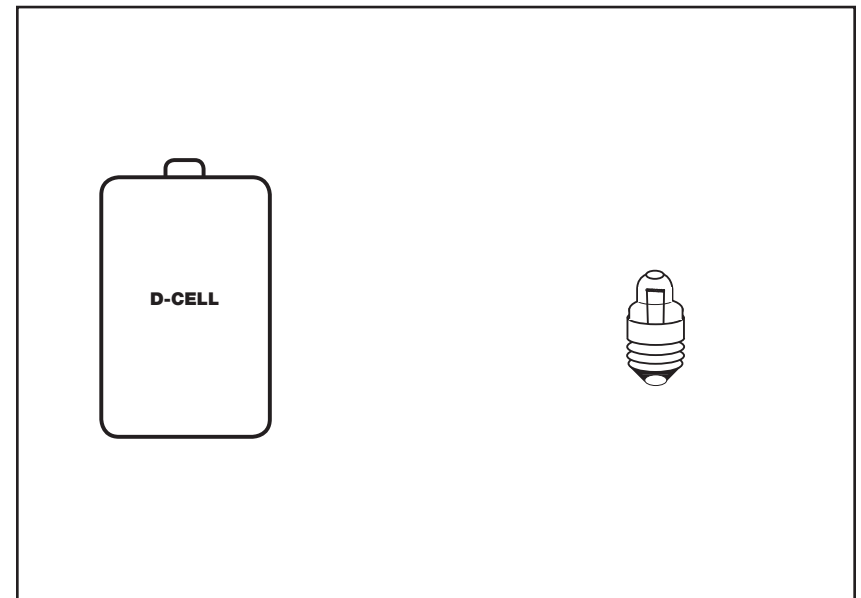


Connect the D-cell to the bulb.

Use arrows to show how the electricity flows. Use large and small arrows if you need to show different amounts of electricity. On the next notebook page, describe how electricity flows in your drawing above.

## THE FLOW OF ELECTRICITY



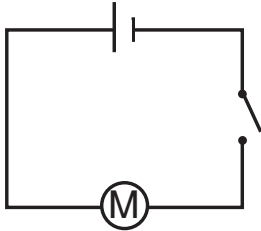




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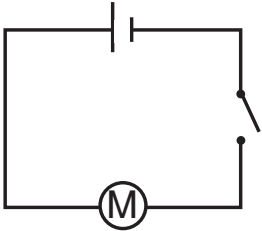




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## DRAWINGS AND SCHEMATICS

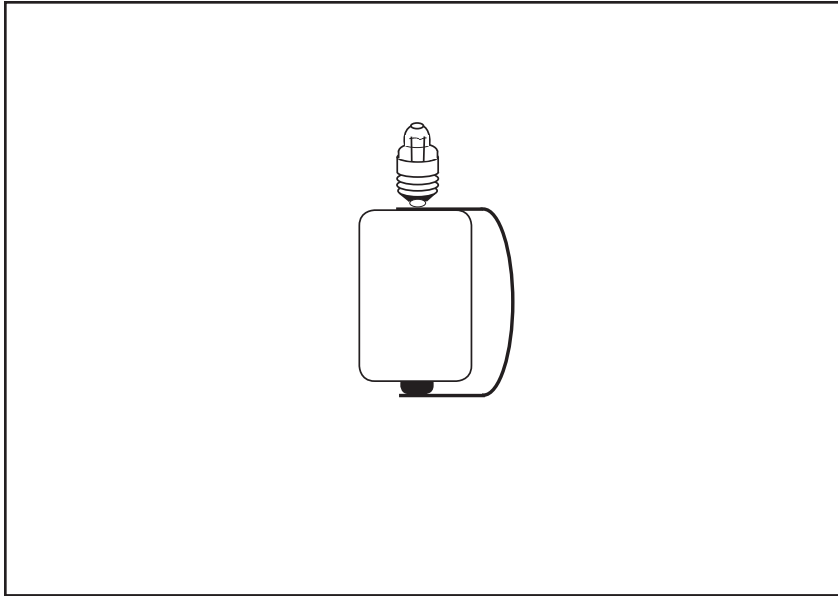
DRAWING OF A BATTERY AND BULB CIRCUIT		SCHEMATIC DIAGRAM OF A BATTERY	
			
KEY TO SYMBOLS FOR SCHEMATIC DIAGRAMS		A SCHEMATIC DIAGRAM SHOWING A BATTERY, SWITCH, AND MOTOR	
D-CELL			
WIRES			
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## RESPONSE SHEET—BULBS

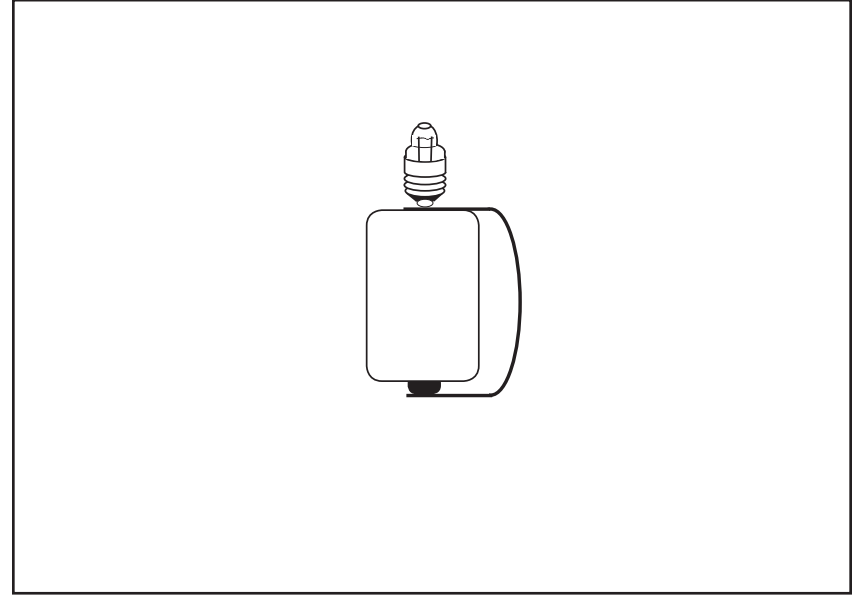
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1. Look at the diagram above. Do you think the bulb will light? Why or why not?
2. If you don't think the bulb will light, draw a picture to show a way to light the bulb.

## RESPONSE SHEET—BULBS

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## CONDUCTORS AND INSULATORS

.....

**1. List the test objects that are conductors and insulators.**

CONDUCTORS	INSULATORS
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

**2. List the classroom objects that are conductors and insulators.**

CONDUCTORS	INSULATORS
_____	_____
_____	_____
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**3. What do you notice that is similar about all the conductors?  
What can you say about the insulators?**

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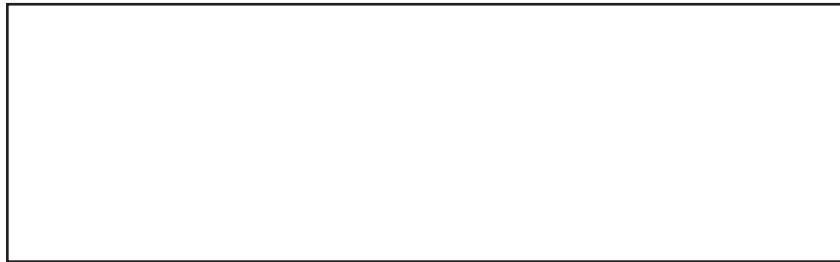
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## MYSTERY CIRCUITS

.....

1. Use the bulb, D-cell, switch, and wires to construct an electric circuit to turn the bulb on and off.
2. Draw a schematic diagram of your circuit.

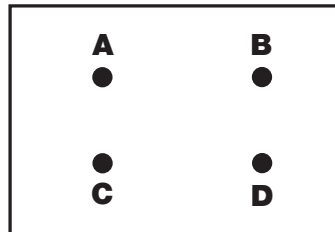


3. Find the mystery board on the table. Some of the paper fasteners on the mystery board are connected by hidden wires. Find out which paper fasteners are connected by wires.

Draw on this picture →

to show where the hidden wires are.

Write the number of your mystery board on the line.



Mystery board number: \_\_\_\_\_

Explain how you know where the wires are.

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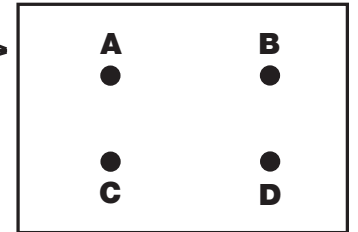


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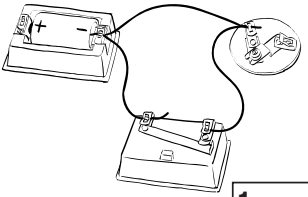
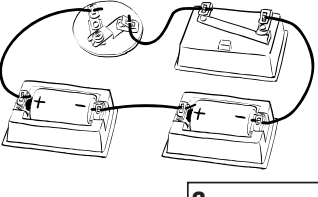
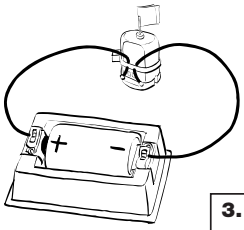
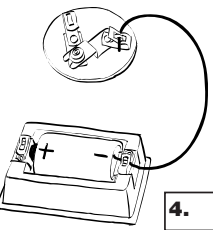
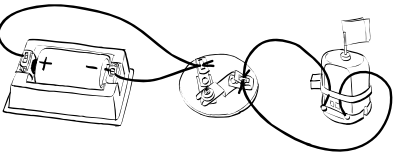
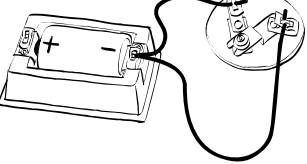


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Explain how you know where the wires are.

## MAKING CONNECTIONS

Look at the pictures below. If the bulb will light or the motor will run, write "Yes" in the box below the circuit. Write "No" if the circuit will not make the bulb light or the motor run.

 <p>1. <input type="text"/></p>	 <p>2. <input type="text"/></p>
 <p>3. <input type="text"/></p>	 <p>4. <input type="text"/></p>
 <p>5. <input type="text"/></p>	 <p>6. <input type="text"/></p>

Choose one of the circuits above that will NOT work. Explain what you would do to fix it.

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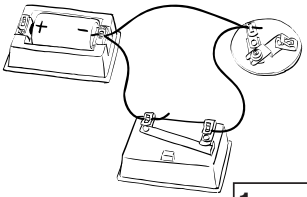
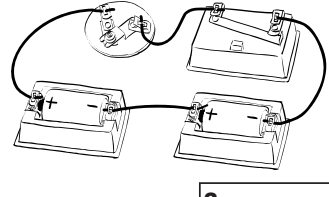
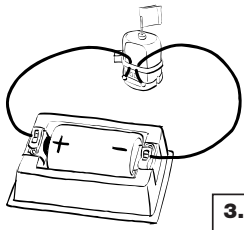
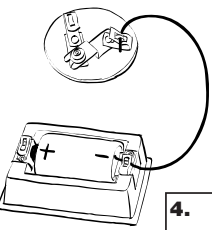
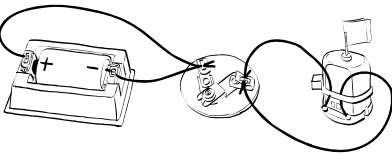
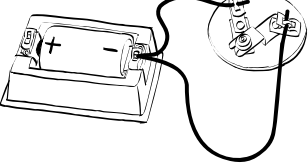
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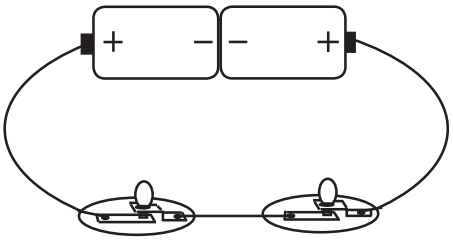
<p><b>1. I think I can light two bulbs with this circuit.</b></p>	<p><b>2. This is one way I made two bulbs light.</b></p>
	<p><i>This is a _____ circuit.</i></p>
<p><b>3. This is how I made two bulbs shine brightly with one battery.</b></p>	<p><b>4. This is another way to make more than one bulb shine.</b></p>
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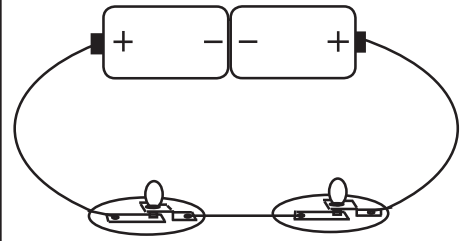
## RESPONSE SHEET—CIRCUIT DESIGN

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 <p>A circuit diagram showing two batteries connected in series at the top. The left battery has its positive terminal (+) on the left and negative terminal (-) on the right. The right battery has its negative terminal (-) on the left and positive terminal (+) on the right. Wires connect the positive terminal of the left battery to the left terminal of the first lamp. The right terminal of the first lamp is connected to the left terminal of the second lamp. The right terminal of the second lamp is connected to the positive terminal of the right battery. The negative terminal of the right battery is connected back to the negative terminal of the left battery, completing the circuit.</p>	<p>A student thought she could get two lamps shining brightly with this circuit. Use drawings and writing to explain what you think about her plan.</p>
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## RECOMMENDATION TO THE BOARD

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### MEMO

Date: \_\_\_\_\_

To: Board of Directors

From: \_\_\_\_\_

Re: Recommendation for new light design

1. This is a schematic diagram of the best design for a string of eight lights.
2. This is a \_\_\_\_\_ circuit.
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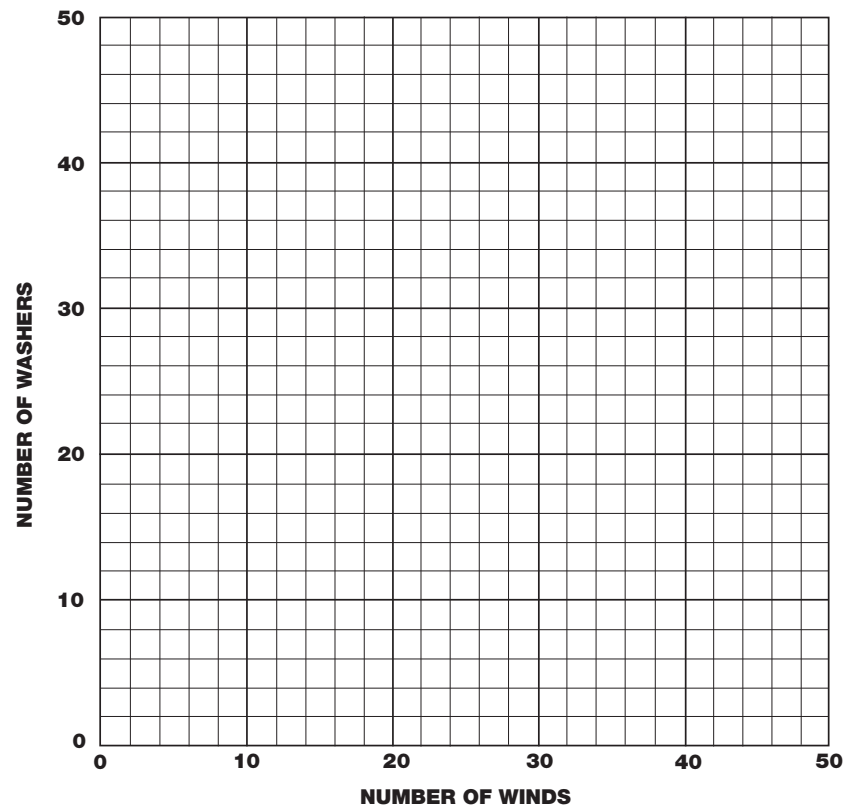
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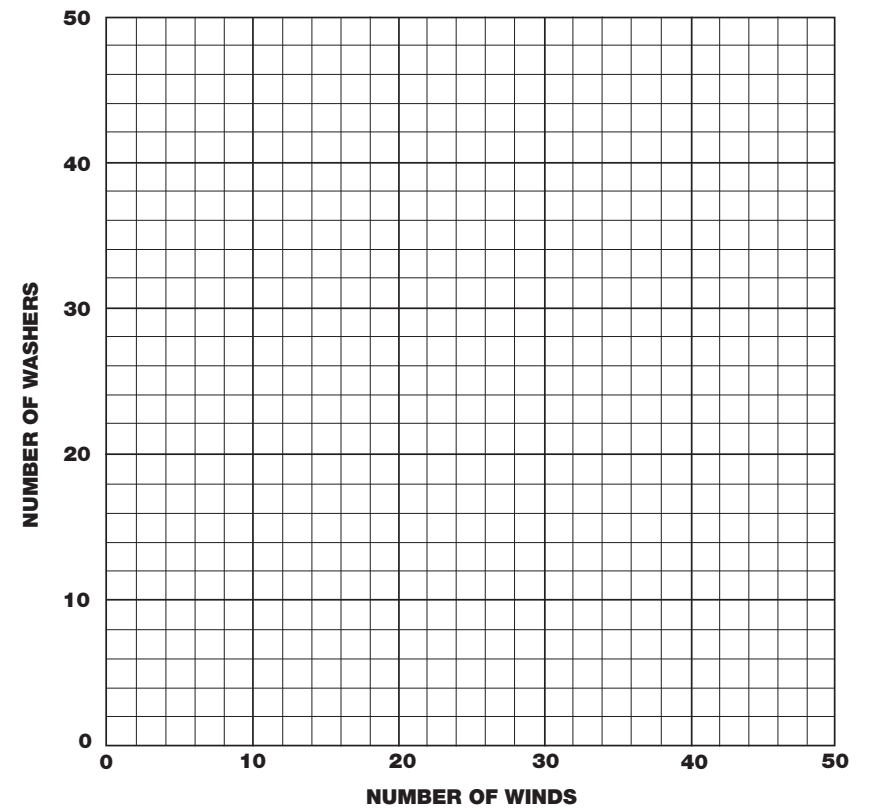
## WINDING ELECTROMAGNETS

NUMBER OF WINDS OF WIRE	NUMBER OF WASHERS LIFTED
_____	_____
_____	_____
_____	_____
_____	_____



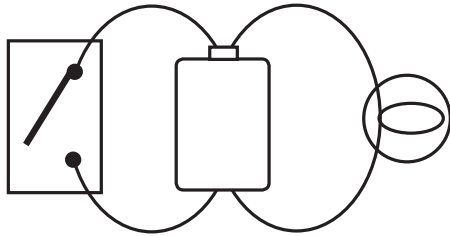
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## RESPONSE SHEET—REVERSE SWITCH

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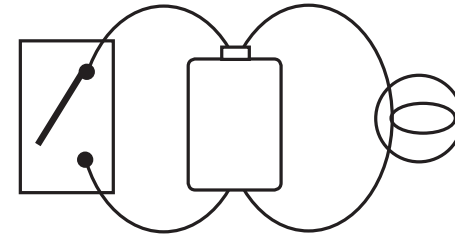
She wrote a note to her teacher:

I think this circuit will work in an unusual way. When the circuit is built and the switch is open, the light will shine. When the switch is closed, the light will go off.

Do you agree or disagree with this student? What do you think will happen when the switch is open and when it is closed? Explain why you think the circuit will work the way you described.

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## **ELECTROMAGNET INVESTIGATION**

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**1. What question about electromagnets did your group work on?**

**2. Describe what you did to answer your question.**

**3. What did you find out (answer to the question you wrote for #1)?**

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## S-T-R-E-A-M CODE

S T R E A M  
1 2 3 4 5 6

Use the code above to send messages on the telegraph.

*Write your messages here.*

### GRID CODE

Here's another code to try.  
When you use this code,  
you have to send two sets of  
clicks for each letter.

What conventions (or  
rules) do you need to set so  
everyone understands how  
the message is being sent?

Can you set up the alphabet  
grid in a more efficient way?  
(HINT: What letters are used  
the most in words?)

	1	2	3	4	5
1	A	B	C	D	E
2	F	G	H	I	J
3	K	L	M	N	O
4	P	R	S	T	U
5	V	W	X	Y	Z

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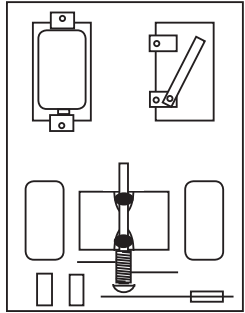
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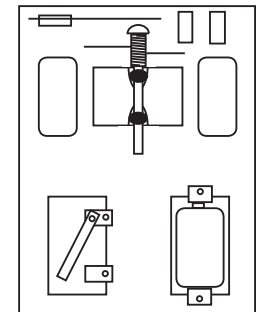
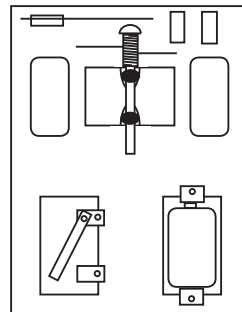
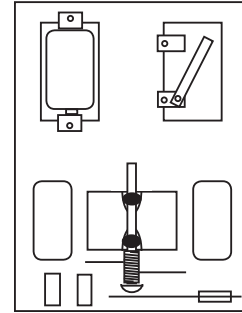
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## LONG-DISTANCE TELEGRAPH



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## **PROJECT PROPOSAL**

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- 1. *What is the question or the project that you are proposing?***
- 2. *What materials or references will you need to complete the project?***
- 3. *What steps will you follow to complete the project?***

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