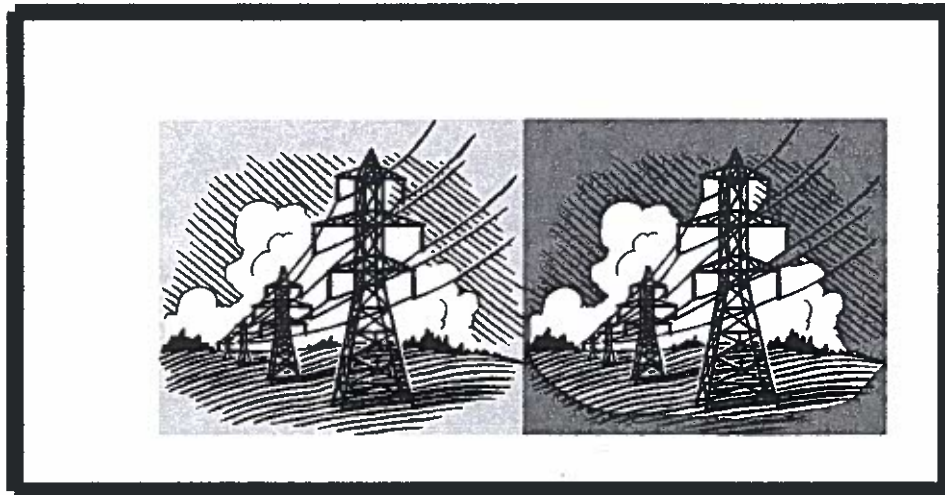
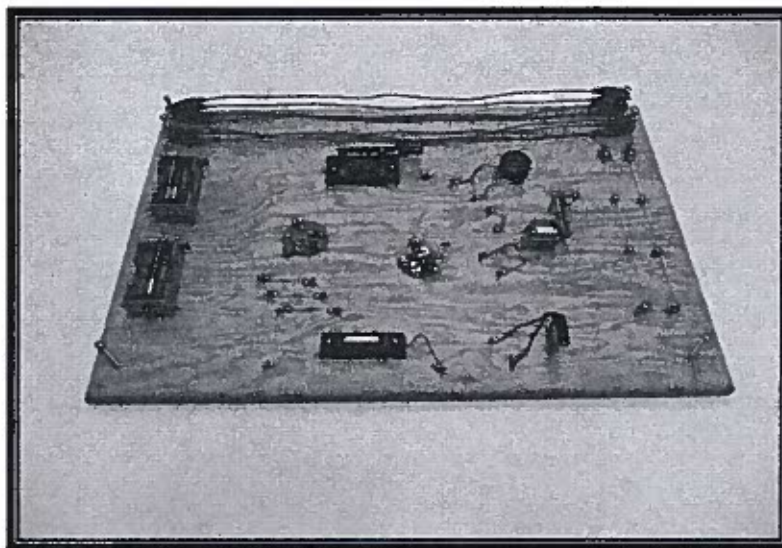


# ELECTRICITY



## Activity Booklet

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

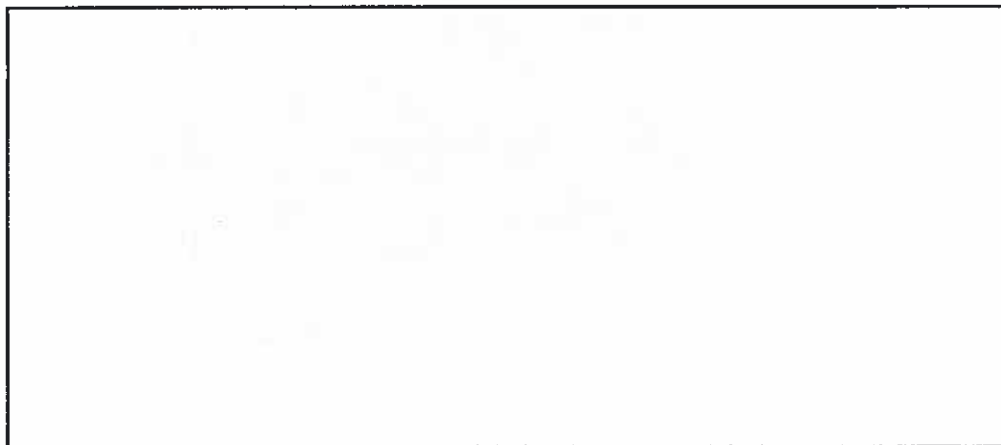




## Electrical Principles

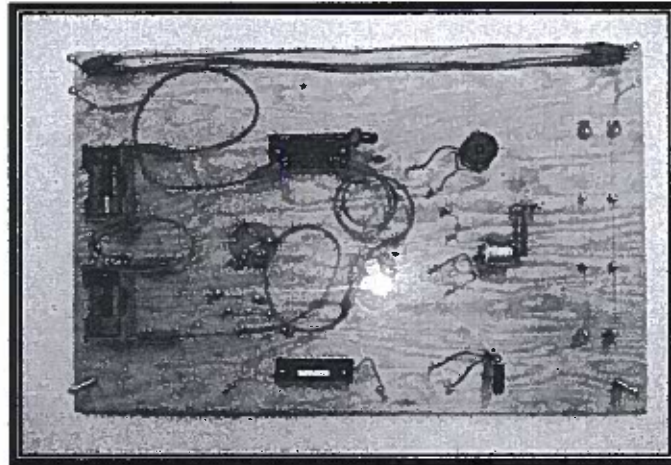
### Electrical Circuits

1. Define the term 'electrical circuit'.
  
2. What are the 4 main components of an electrical circuit?
  - a)
  - b)
  - c)
  - d)
  
3. What is the difference between an opened circuit and a closed circuit?
  
4. Indicate the symbol for each circuit component:
  - a) cell
  - b) light
  - c) resistor
  
  - d) switch
  - e) motor
  - d) variable resistor
  
5. Draw a schematic diagram for a circuit consisting of 2 cells, 1 light and a switch.



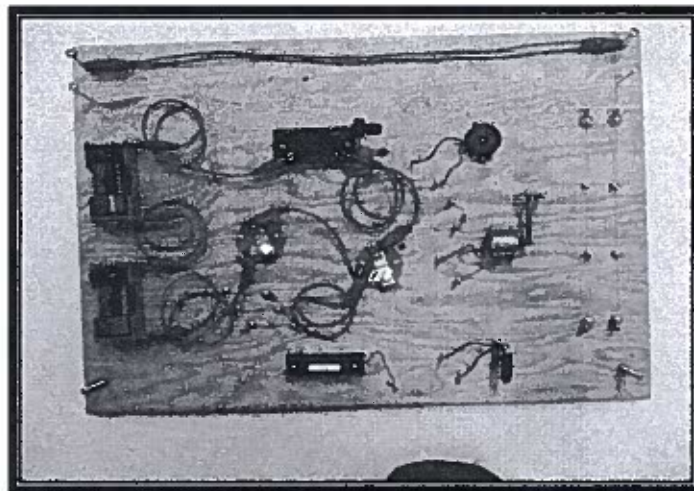
## Making Electrical Circuits

1. Use the circuit board to construct a circuit consisting of 2 cells, 1 light and a knife switch.



The brightness of the light in this circuit is rated as **2**. Remember this for future reference.

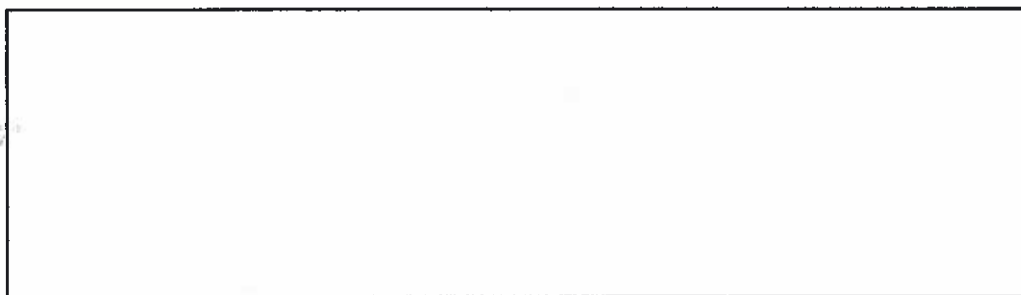
2. Construct a series circuit consisting of 2 cells, 2 lights and a knife switch.



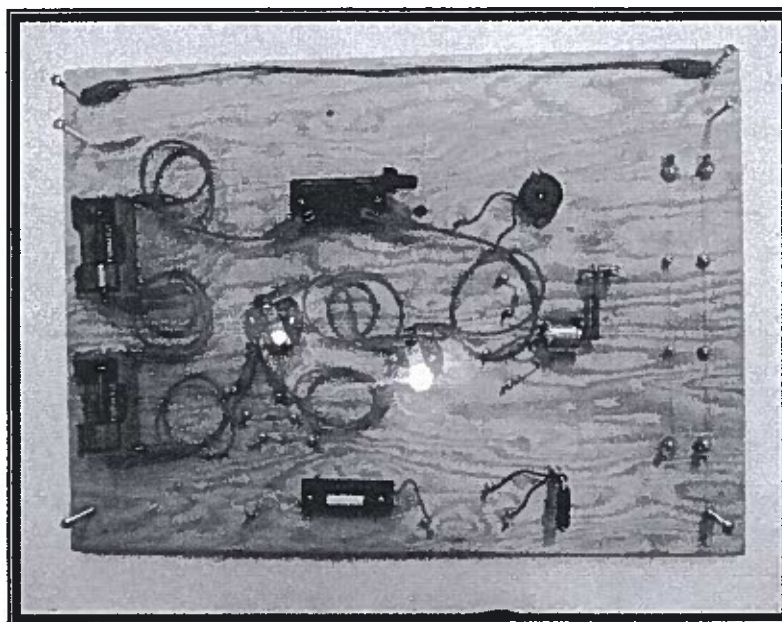
3. How does the bulb brightness compare with the previous circuit? 1 2 3  
(1 is less bright, 3 is more bright)

Explain your answer:

4. Carefully loosen one light bulb. What happens to the other light?
5. Give an example where lights are often connected in series.
6. Draw a schematic diagram for this circuit.



7. Connect 2 cells in series to a knife switch that controls 2 lights connected in parallel.



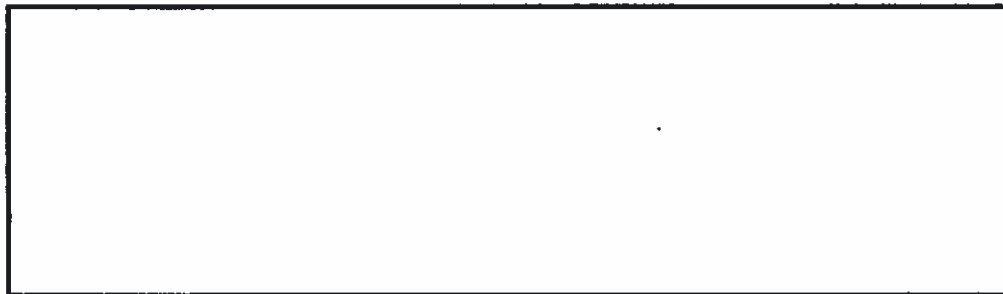
8. How do the brightness of the bulbs compare to the initial circuit? 1 2 3  
(1- less bright, 3- brighter)

9. Loosen one bulb.

a) What happens to the other light? \_\_\_\_\_

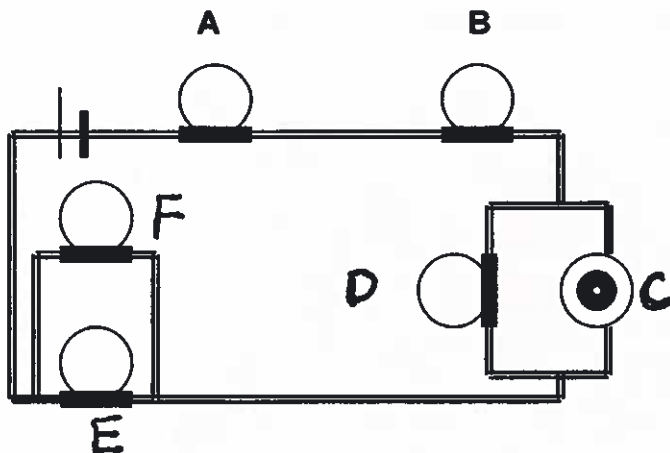
b) Why does the other bulb continue to light? \_\_\_\_\_

10. Draw a schematic diagram for this circuit.



*The lights in a house are wired in parallel.*

11. An electrician has designed a lamp and motor circuit for his workshop. His circuit is represented in the given illustration.



If bulb E is removed from the socket, what will the effect be on the other components? Indicate “will work” with a “+” and “will not work” with a “-”.

A    B    C    D    F

—    —    —    —    —

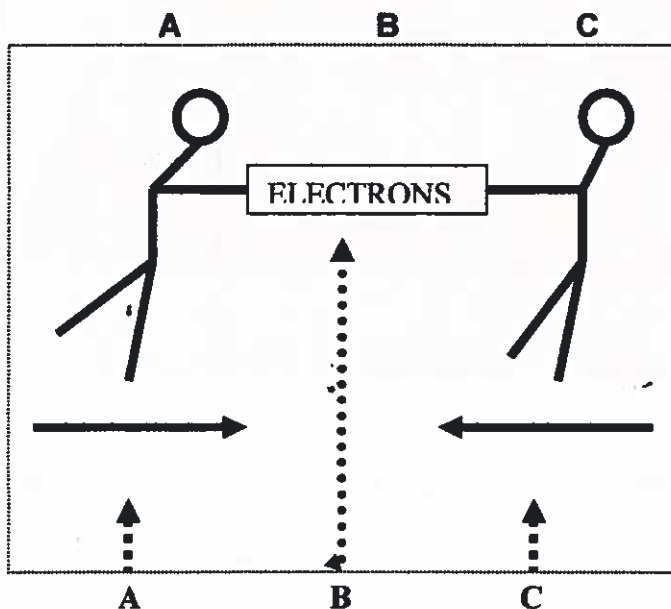
## Electrical Measurement

The electrical energy carried in a circuit can be measured as voltage, current or resistance.

1. Complete the chart of electrical terms.

Electrical term	Definition	Units Expressed In	Symbol
Voltage			
Current			
Resistance			

2. Relate the sports picture to the main electrical terms: Which letter represent the resistance, voltage and current ?



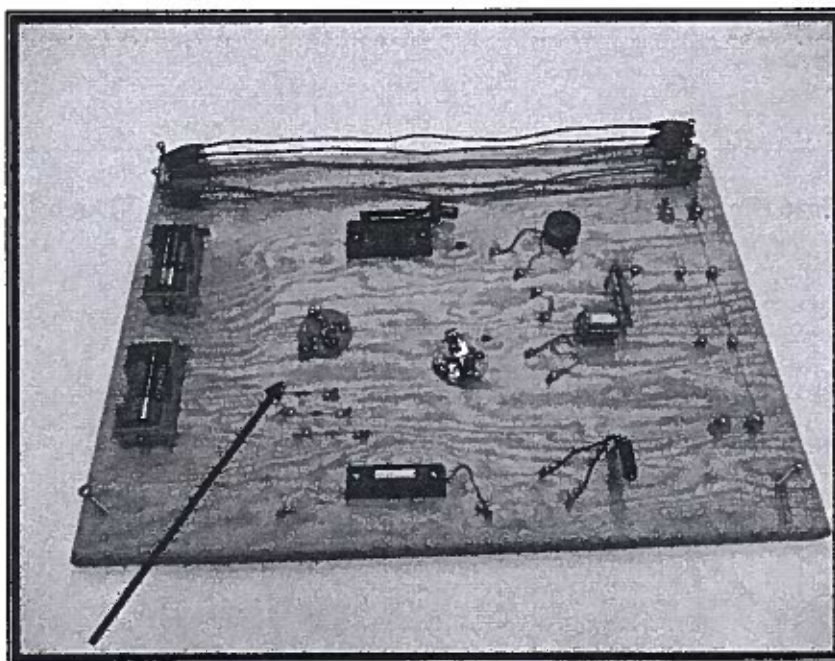
A \_\_\_\_\_ B \_\_\_\_\_ C \_\_\_\_\_



**When using a multimeter, remember to follow these directions:**

- **measure the resistance between the terminals**
- **measure the voltage between the terminals in a completed circuit**
- **measure the current in line using the red and black probes to complete the circuit.**

**Measuring resistance:** Use the multimeter to measure the resistance in Resistor A. Set the dial to the 200 ohm reading and touch each probe to the separate ends of the resistor.



**Resistor A**

3. What is the resistance reading in \_\_\_ ohms ( $\Omega$ ); in \_\_\_ kilo ohms ( $k\Omega$ ) ?

**Measuring voltage:** Set up a circuit consisting of 2 cells, 1 light, knife switch and Resistor A.

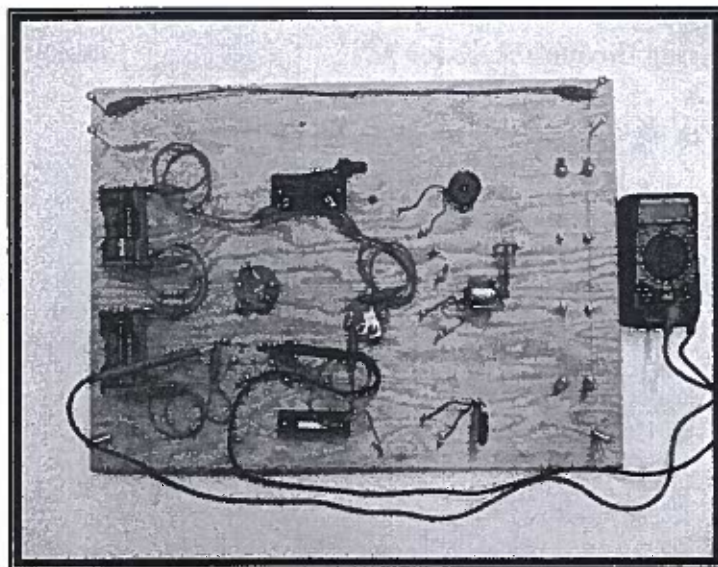
4. Why is the light dimmer when connected to the resistor?

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**Steps in measuring voltage:**

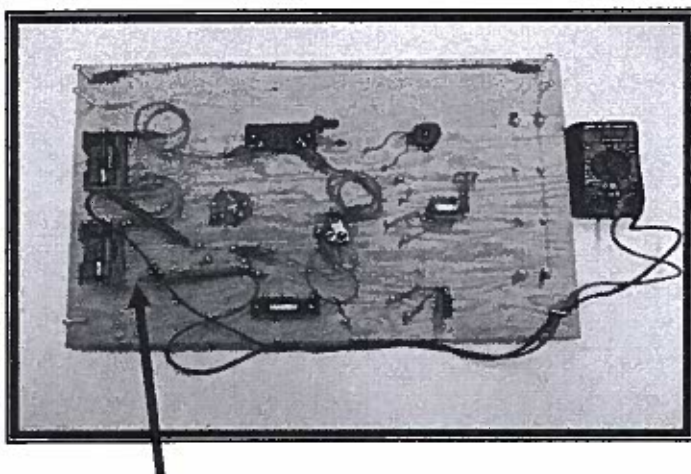
1. Make a complete circuit.
2. Turn the meter dial to the DCV 20 reading.
3. Connect the red probe of the multimeter to one end of Resistor A and the black probe to the other end.
4. Record the display reading.

**Measuring Voltage Across Resistor A.**

What is the  
voltage across  
Resistor A?

\_\_\_\_\_ V

**Measuring Current:** Determine the current passing through Resistor A.



**Connect the red probe of the multimeter to the '+' cell pole.**

- Steps:**
1. Make a complete circuit (cells, lamp, switch and resistor)
  2. Set the meter to DCA 200 mA
  3. Remove the clip wire from one end of the resistor terminal
  4. In its place connect the black probe of the meter
  5. Connect the red probe to the + cell terminal

5. Record the current passing through Resistor A? \_\_\_\_\_ mA
6. Convert this current to **A** (amperes) by dividing by **1000**. \_\_\_\_\_ A
7. Use **Ohm's Law** to calculate the resistance of Resistor A.

-Voltage passing through Resistor A is \_\_\_\_\_ V

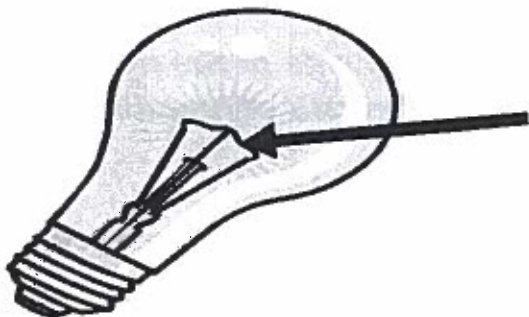
-Current passing through Resistor A is \_\_\_\_\_ A

**Formula:**

**Work:**

**Answer:** \_\_\_\_\_ ohms

8. How does this calculated resistance compare to the multimeter reading in Part A?
- \_\_\_\_\_



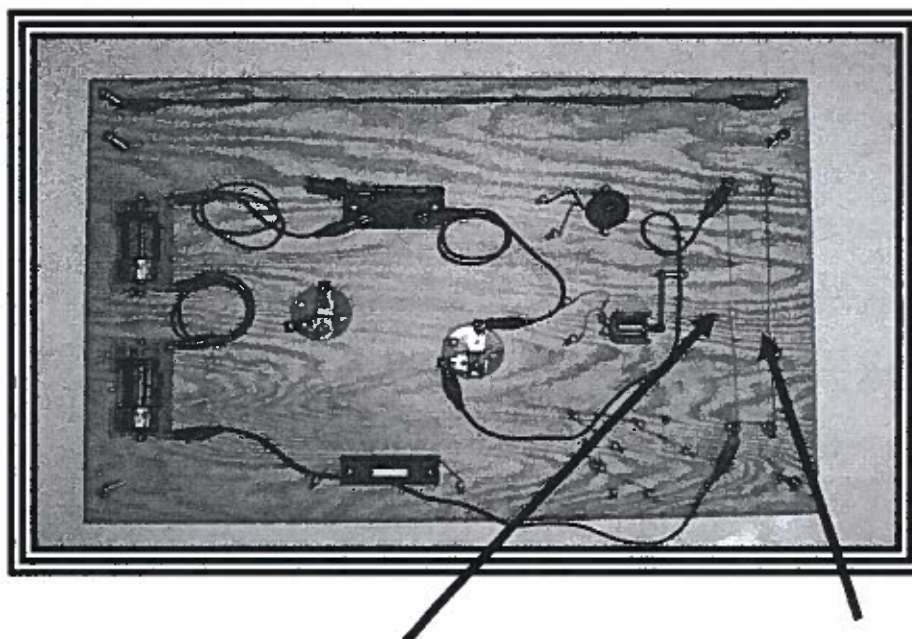
**Tungsten wire filament resists the flow of an electrical current to produce light and heat in an incandescent light bulb.**

## Resistance

**Copper wire is a good conductor of electrical current. It allows the electrons to flow freely.**

**Nichrome wire is a conducting wire but does not allow the free movement of electrons. The electrons must work harder to pass through the wire. Nichrome wire has more resistance.**

**Observe the resistance in the thin nichrome wire by making a connection from the cells to a light to the wire.**



**Thin nichrome wire**

**Thick nichrome wire**

***Slide the alligator clip gently along the right side of the nichrome wire ( marked with a V) in order to avoid the risk of breaking the wire.***

**1. What happens to the brightness of the light when the clip wire connecting the light is **gently** slid along the **right side** of the nichrome wire?**

**Repeat the experiment with the thick nichrome wire.**

**2. Does the light dim as much? How is the resistance affected by the thick wire?**

**3. What 2 forms of energy does the resistance wire in a toaster produce?**

a) \_\_\_\_\_

b) \_\_\_\_\_

**Use the multimeter to test the resistance of the thin and thick nichrome wires.**

**Steps:**

- 1. Set your multimeter dial to the **200 ohm** position.**
- 2. Connect the red probe to one terminal of the thin wire and the black probe to the other terminal**
- 3. Record your display reading.**
- 4. Repeat the steps for the thick wire.**

**4. What is the resistance reading for each thickness of wire?**

a) thin wire \_\_\_\_\_ ohms ( $\Omega$ )

b) thick wire \_\_\_\_\_ ohms ( $\Omega$ )

**5. Does resistance change when the length of wire is different? Provide evidence to support your answer.**

**6. What 2 factors affect the resistance of nichrome wire?**

a) \_\_\_\_\_

b) \_\_\_\_\_

**Try This Analogy**

**A short thick pipe has less resistance than a long thin pipe. Water will flow more freely in a short thick pipe.**

**There is more. Try these experiments.**

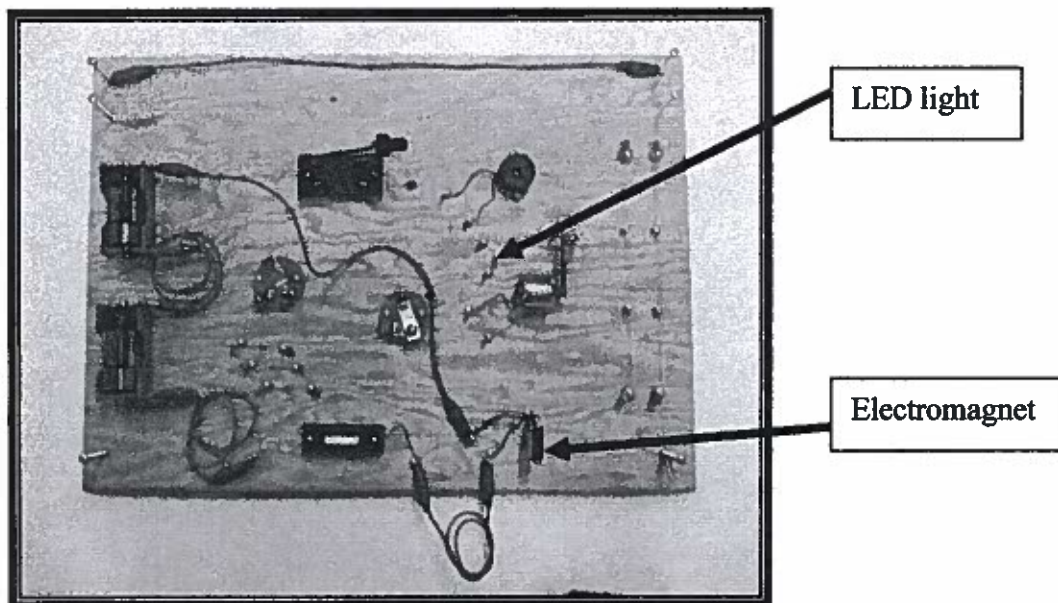
1. Use the multimeter to determine the resistance of

Resistor B \_\_\_\_\_ Resistor C \_\_\_\_\_

2. Make the door buzzer work.

3. Make a circuit using the LED (light emitting diode).

4. Experiment with the electromagnet component.



## Trouble Shooting An Electrical Problem

A simple circuit consisting of 2 cells, 1 light and a knife switch does not work. Trouble shoot this circuit and list 4 possible causes for the problem.

- 1.
- 2.
- 3.
- 4.

## Problem Solving

**Scenario A:** A 3 V power source produces a 0.5 A current in a single light circuit.

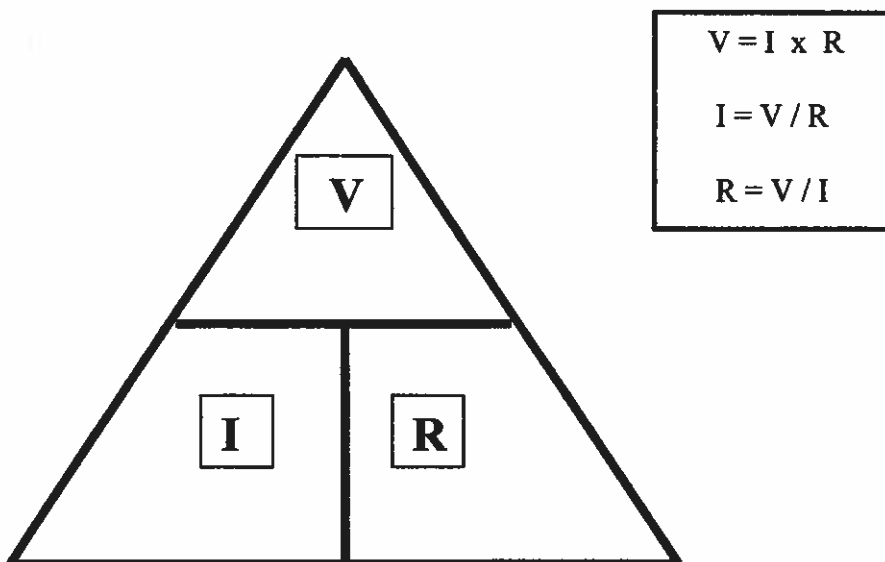
**Scenario B:** A 6 V power source produces a 0.25 A current in a two light circuit.

1. Calculate the resistance in each scenario.

**Scenario 1**

**Scenario 2**

2. In which situation is the light brighter? \_\_\_\_\_

**Helpful Hint: Remembering the Formula**

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**Energy Conversion**

Devices convert one form of energy into another. Indicate the energy conversion that occurs in each of the following devices.

1. cell
2. bulb ————— electrical to light
3. buzzer
4. motor
5. resistor

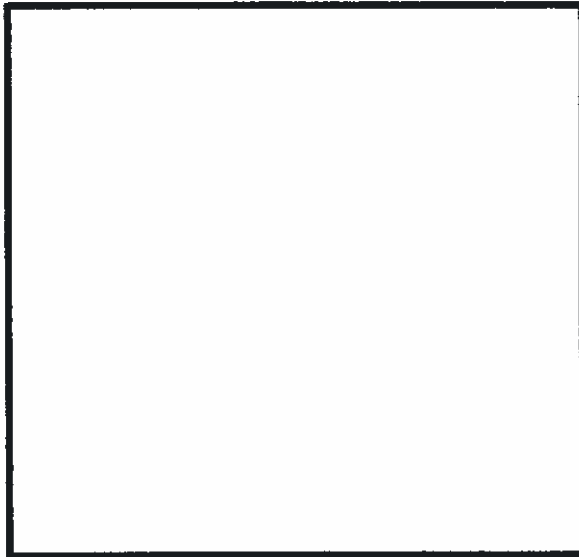
**Motor**

1. What are the 5 main components of an electric motor?

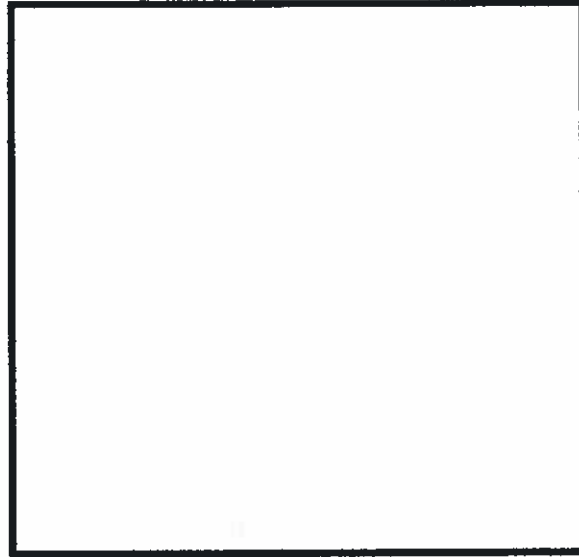
- a) \_\_\_\_\_ b) \_\_\_\_\_ c) \_\_\_\_\_ d) \_\_\_\_\_ e) \_\_\_\_\_



**2. Draw a simplified diagram of an electric motor.**

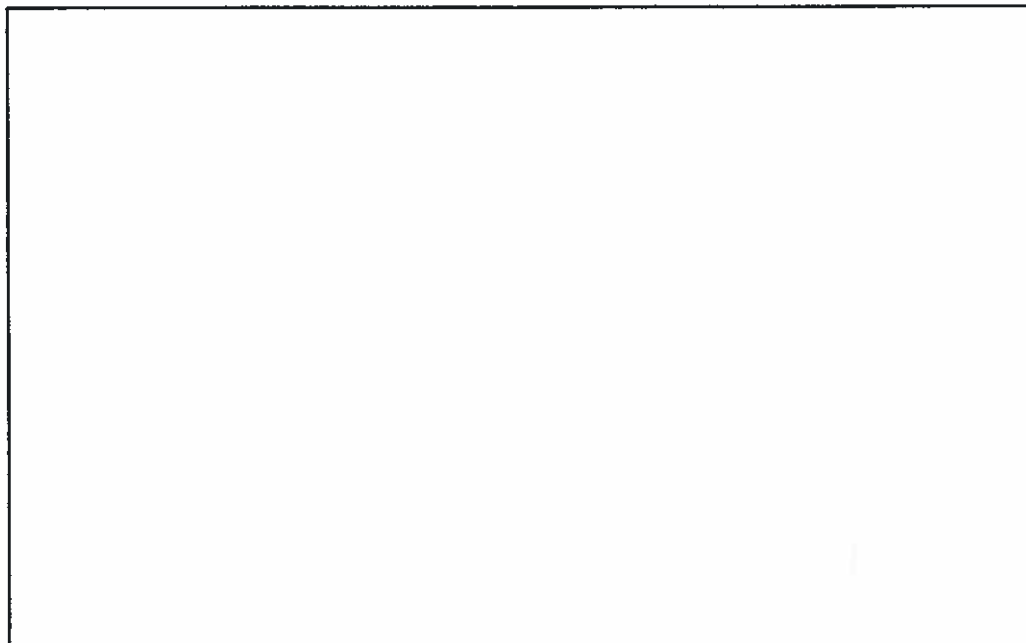


**3. Explain how an electric motor works.**



### **Challenge Questions**

**1. Draw a schematic diagram to show how 2 cells, a knife switch, a button switch, one light and one motor can be connected in parallel and operated independently by the separate switches. Make this circuit on your board.**



2. Use the nichrome wire as a rheostat to show how the motor speed can be changed. Explain how a rheostat (variable resistor) works.

### Review Activity

1. Interconnect 8 additional electricity-related words to form of a crossword puzzle.

C  
U  
E L E C T R I C I T Y  
R  
E  
N  
T

**2. State the definition of 5 words from the puzzle that you consider to be the most difficult to remember.**

**Electrical term**

**Definition**

Electrical term	Definition

**3. Draw a cartoon that represents an electrical safety message.**

