

### Practical Techniques: Before the Experiment

Read through the method and equipment and complete the risk assessment below.

#### Risk Assessment

| Hazard      | Risk | Control |
|-------------|------|---------|
| Electricity |      |         |
| Wires       |      |         |
| Bulb        |      |         |
|             |      |         |

#### Variables

|                      |  |
|----------------------|--|
| Dependant Variable   |  |
| Independent Variable |  |
| Control Variable/s   |  |

### Practical Techniques: After the Experiment

Reflect on the experiment you have just conducted.

Are there any ways you could improve your results/accuracy?

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How might comparing your results with another group help?

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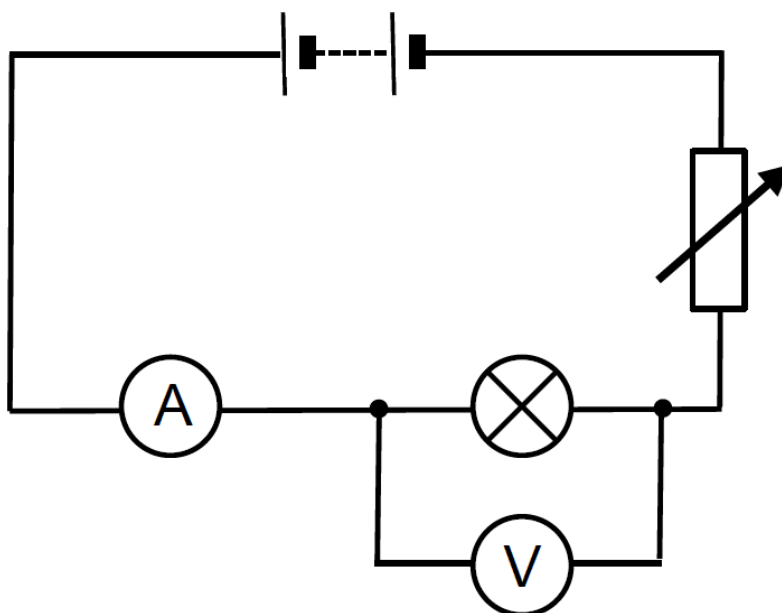
List any possible sources of error or uncertainty in your readings/results.

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**Experiment:** Investigating the I-V characteristics of circuit components.

**Equipment:**

A battery or suitable power supply.  
Multi-meter (Ammeter/Voltmeter).  
Element/Component Holders.  
Variable resistor  
Filament lamp/ Resistor/ Diode  
Connecting leads.  
For Diode circuit and extra resistor  
labelled P.



**Activity 1: The characteristic of a filament lamp**

**Method**

1. Use the circuit diagram as below to set up your circuit.
2. Record the readings on the ammeter and voltmeter in the appropriate columns in **Table 1**.
3. Adjust the variable resistor and record the new readings on the ammeter and voltmeter.
4. Repeat this to obtain several pairs of readings.
5. Swap the connections on the battery/power supply. The ammeter is now connected to the negative terminal and variable resistor to the positive terminal. The readings on the ammeter and voltmeter should now be negative.
6. Continue to record pairs of readings of current and potential difference into **Table 2** with the battery reversed.

**Before moving onto activity 2 please complete the results analysis for the filament lamp.**

Results:

Table 1 – With Battery NOT reversed.

| Filament Lamp |                          | Resistor<br>(at Constant Temp) |                          | Diode       |                          |
|---------------|--------------------------|--------------------------------|--------------------------|-------------|--------------------------|
| Current (A)   | Potential Difference (V) | Current (A)                    | Potential Difference (V) | Current (A) | Potential Difference (V) |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |

Table 2 – With Battery reversed.

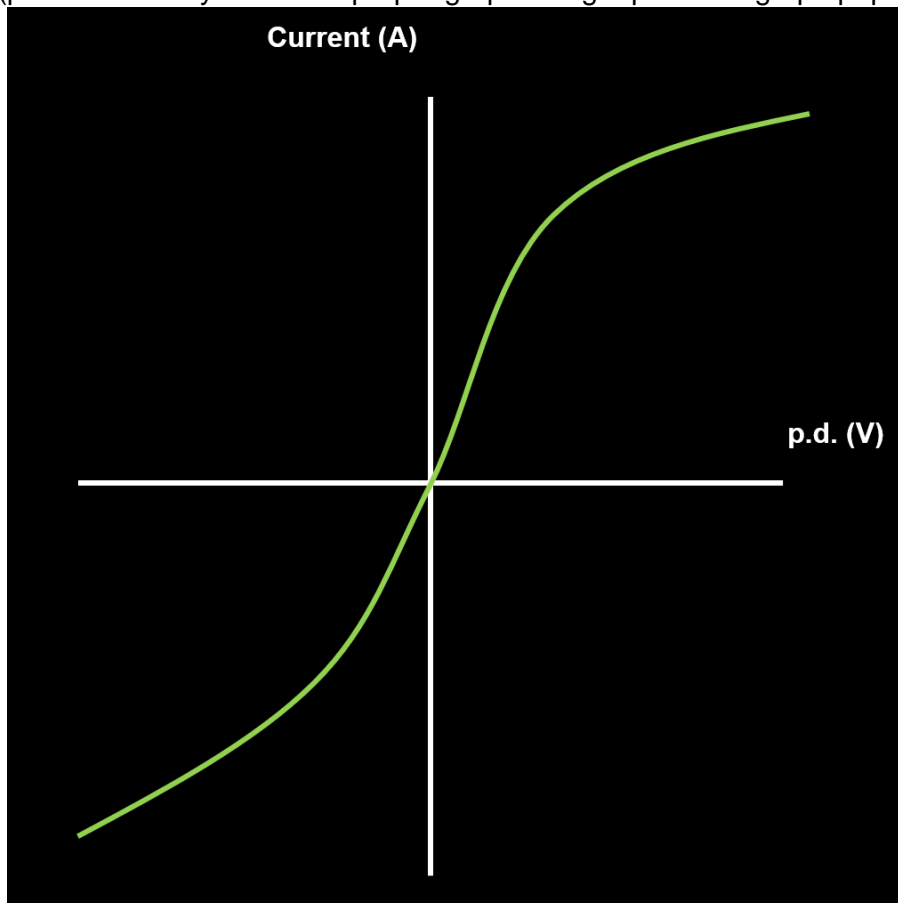
| Filament Lamp |                          | Resistor<br>(at Constant Temp) |                          | Diode       |                          |
|---------------|--------------------------|--------------------------------|--------------------------|-------------|--------------------------|
| Current (A)   | Potential Difference (V) | Current (A)                    | Potential Difference (V) | Current (A) | Potential Difference (V) |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |
|               |                          |                                |                          |             |                          |

**Results Analysis: I-V Characteristic of a Filament Lamp.**

- a. Plot a graph of current against potential difference. As the readings include negative values the origin of your graph will be in the middle of the graph paper. You should be able to draw a line of best fit through the origin.

**Example: Sketch of results graph.**

(please ensure you draw a proper graph using squared or graph paper)



**This is the characteristic of a filament lamp.**

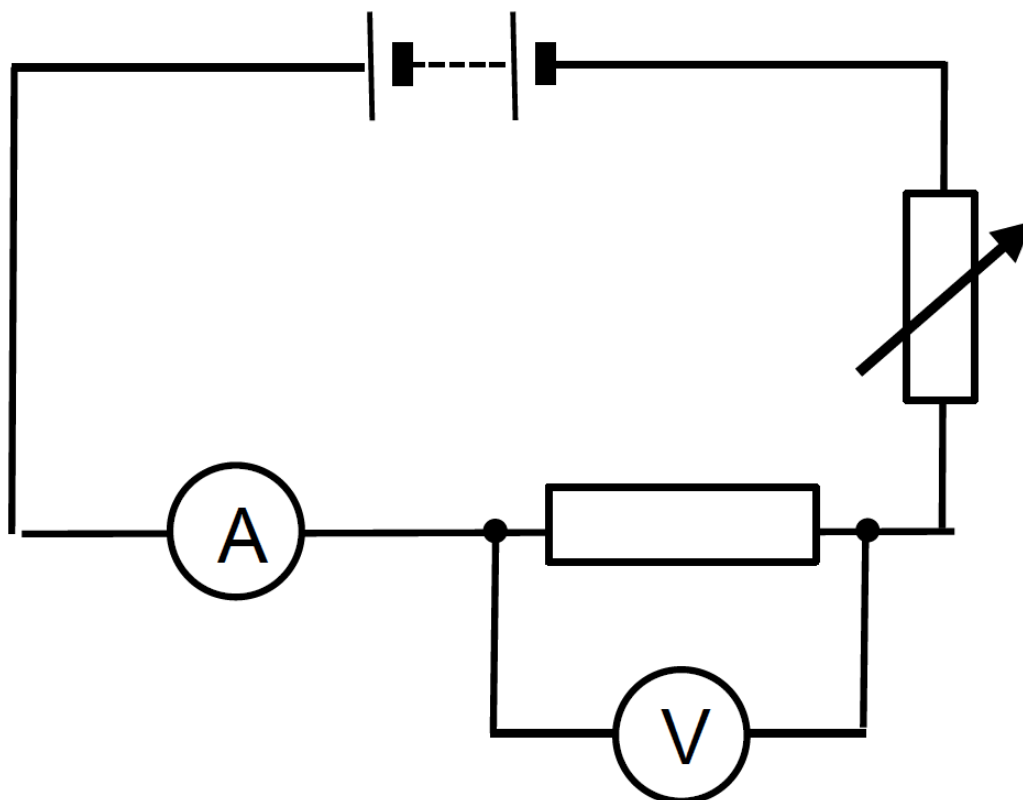
- b. The current does not increase as fast as the potential difference. Doubling the amount of energy does not cause a current twice as fast. What is the cause of this?

**Hint. Think about factors that affect resistance.**

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### Activity 2: The characteristic of a Resistor.

#### Method

1. Swap the leads on the battery/power supply back to their original positions.
2. Replace the filament lamp with the resistor.
3. Record the readings on the ammeter and voltmeter in the appropriate columns in **Table 1**.
4. Adjust the variable resistor and record the new ammeter and voltmeter readings. Repeat this to obtain several pairs of readings.
5. Swap the connections on the battery/power supply. The ammeter is now connected to the negative terminal and variable resistor to the positive terminal. The readings on the ammeter and voltmeter should now be negative.
6. Continue to record pairs of readings of current and potential difference into **Table 2** with the battery reversed.

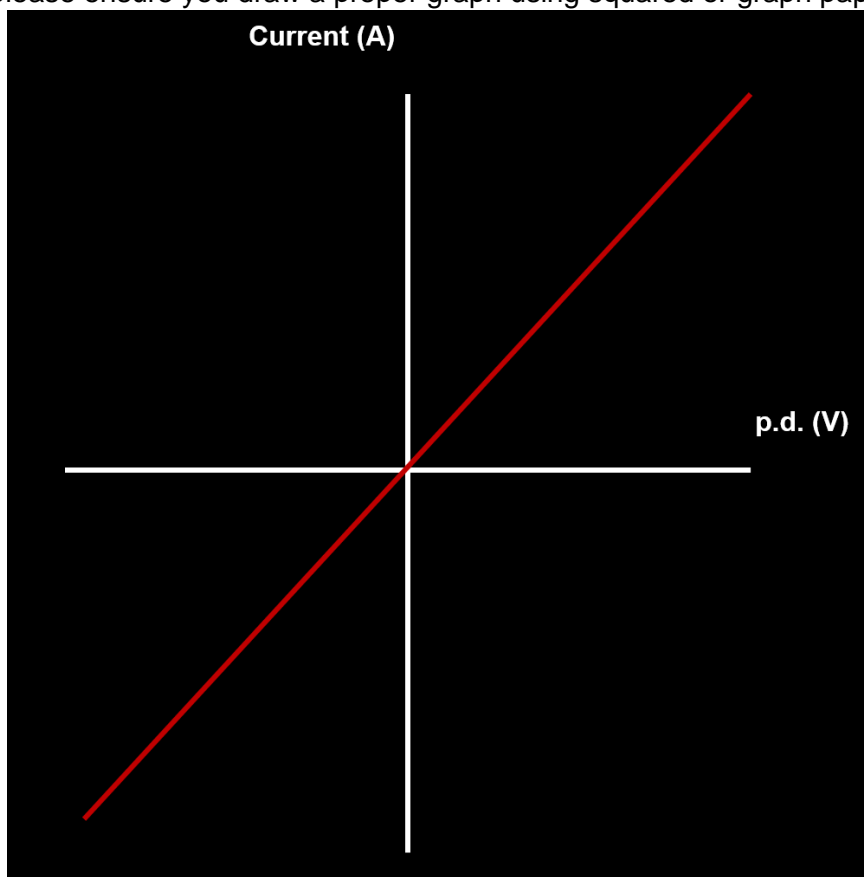
**Before moving onto activity 3 please complete the results analysis for the resistor.**

**Results Analysis: I-V Characteristic of a Resistor.**

- a. Plot a graph of current against potential difference. As the readings include negative values the origin of your graph will be in the middle of the graph paper. You should be able to draw a line of best fit through the origin.

**Example: Sketch of results graph.**

(please ensure you draw a proper graph using squared or graph paper)



**This is the characteristic of a resistor.**

- b. Explain why the data for the resistor can be described as following 'Ohm's Law'.

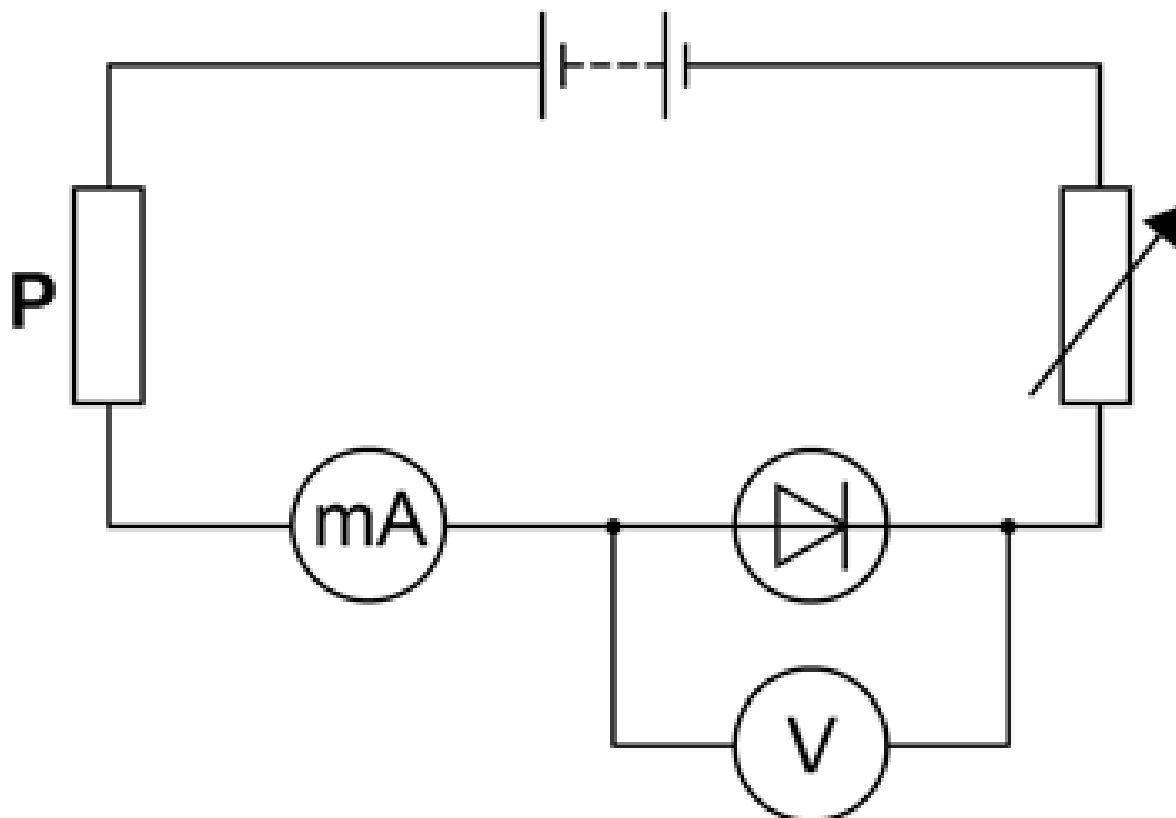
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### Activity 3: The characteristic of a Diode.

#### Method

1. Swap the leads on the battery/power supply back to their original positions.
2. If you can, reduce the battery/power supply potential difference to less than 5V.
3. Connect the extra resistor labelled P.
4. Replace the ammeter with a milliammeter or change the setting on the multi-meter to milliamps.
5. Replace the resistor used in activity 2 with the diode.
4. Adjust the variable resistor and record the new milli-ammeter and voltmeter readings into the appropriate columns in **Table 1**. Repeat this to obtain several pairs of readings.
5. Swap the connections on the battery/power supply. The milli-ammeter is now connected to the negative terminal and variable resistor to the positive terminal. The readings on the ammeter and voltmeter should now be negative.
6. Continue to record pairs of readings of current and potential difference into **Table 2** with the battery reversed.

**Please complete the results analysis for the Diode.**

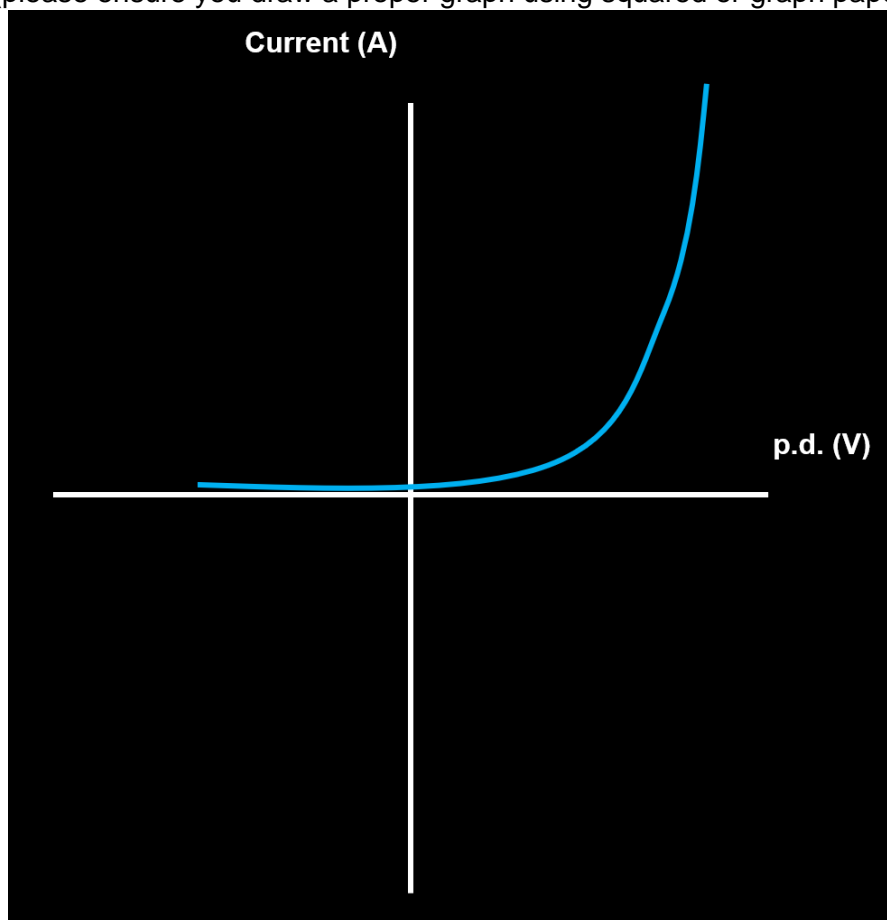
**Results Analysis: I-V Characteristic of a Diode.**

a. Plot a graph of current against potential difference. As the readings include negative values the origin of your graph will be in the middle of the graph paper.

You should be able to draw a line of best fit through the origin.

**Example: Sketch of results graph.**

(please ensure you draw a proper graph using squared or graph paper)



**This is the characteristic of a Diode.**

b. Explain why the reading for current were zero when the battery was reversed.

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