

Combined Science - Physics - Key Stage 4 - Electricity

Filament Lamps Worksheet

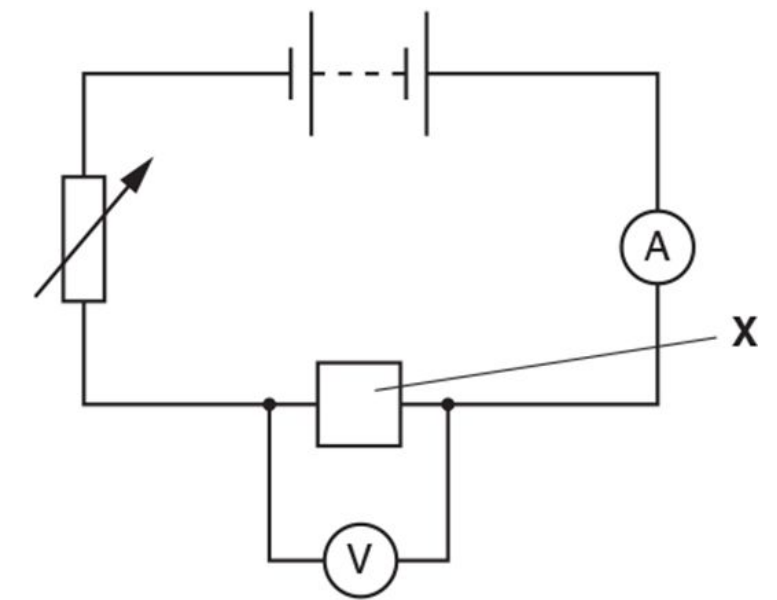
Miss Walrond



Q1.

A student builds a circuit to investigate the resistance of component **X**. The student uses the circuit to take current and potential difference readings.

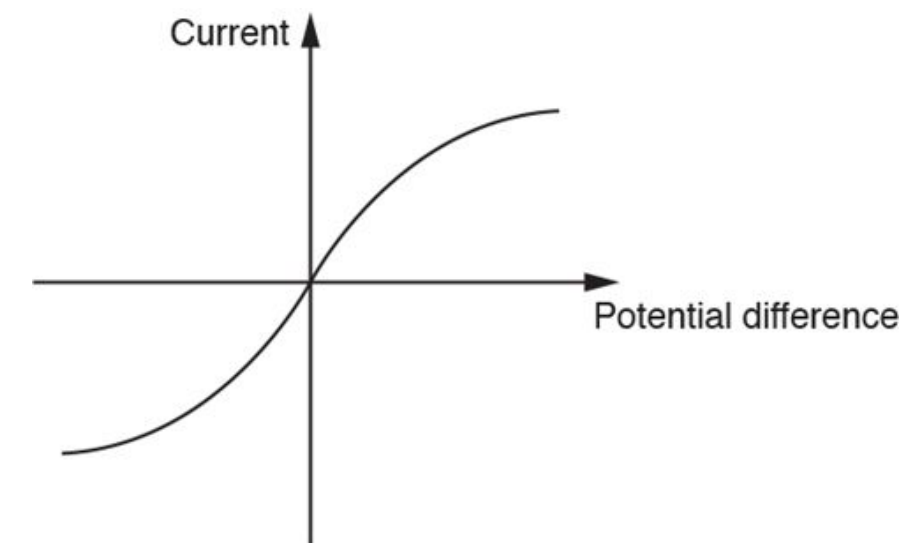
The student plots a graph of her results.



[1]

- Look at the graph. What is component **X** in the circuit?
- The resistance of component **X** varies as the potential difference changes. Describe how the graph shows this and explain why this happens.

[3]



OCR, Gateway Physics B, Paper j249/03, June 2018



Answers



Q1 Answers

1. i. Filament bulb / filament lamp **1**
- ii. Gradient / slope of the the graph changes as potential difference changes) **1**
Resistance increases as potential difference increases **1**
This is because the temperature increases. **1**



In lesson questions



Independent Task - Practical - Measuring the resistance of a filament lamp

- 1) Name the pieces of apparatus used to measure the current and potential difference.
- 2) Describe how we collect a set of data (pairs of different current and potential difference values).
- 3) Describe what happened to the brightness of the lamp:
As the potential difference increased the brightness of the lamp



Independent Task - Calculating Resistance

Potential Difference (V)	Current (A)	Resistance (Ω)
2.79	0.20	14.0
1.76	0.16	
0.89	0.11	
0	0	
-0.89	-0.10	
-1.80	-0.17	
-2.78	-0.20	



Independent Task - The Filament Lamp

Explain how the resistance of the filament lamp changes as potential difference increases. Use the sentence starters below:

As the potential difference increases the delocalised electrons collide

When the delocalised electrons collide they transfer

This transfer of energy causes the filament wire to heat up and the ions

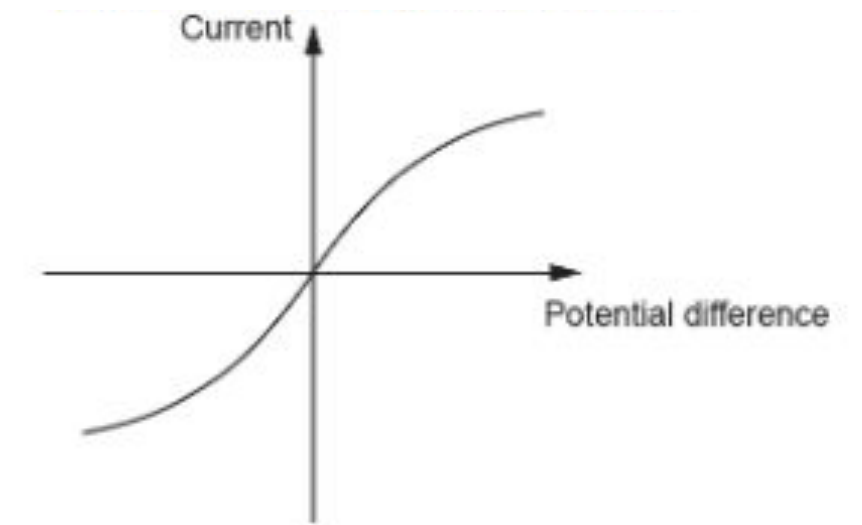
These vibrations mean that it is harder for the electrons

This results in the resistance



Independent Task - I-V Graph

- 1) Sketch the I-V graph shown on the right.
- 2) Describe how the steepness of the line is related to the resistance.
When the line is steep the resistance is
When the line is shallow....
- 3) Describe how the resistance varies for a filament lamp as the potential difference changes.



Worked Example

1. i. Draw a circuit diagram that could be used to find out how the resistance of a filament bulb changes with current.

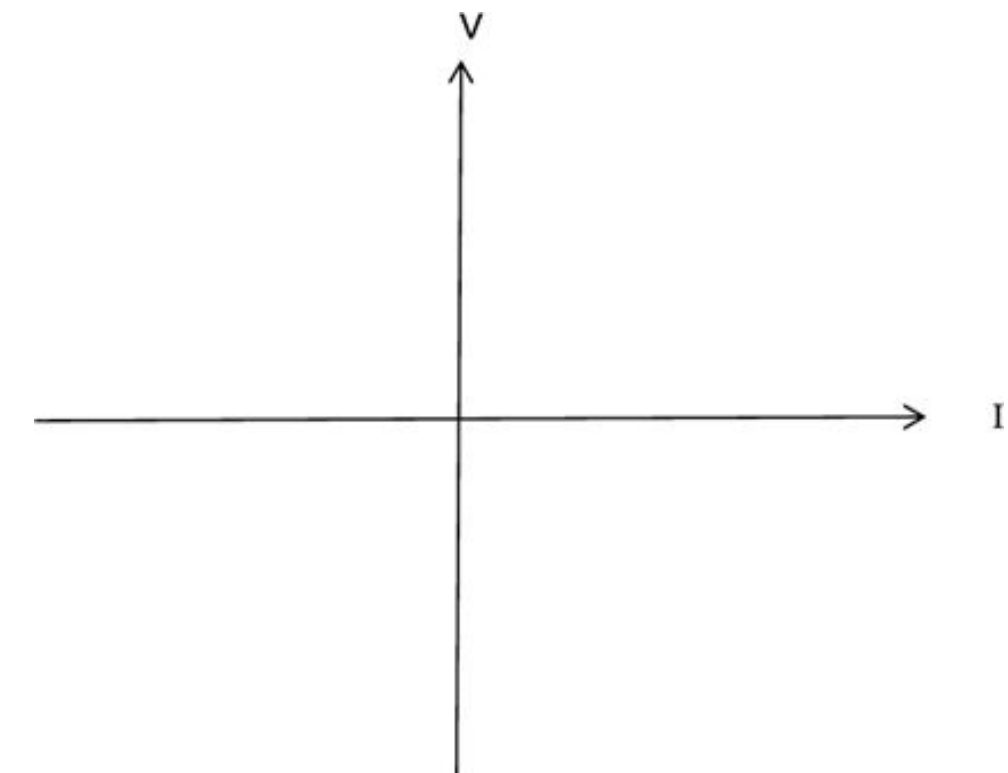
Describe the readings you need to take.

[4]

- ii. Sketch the shape of the graph using the axes below.

State how this graph can be used to calculate resistance at any specific value of current.

[2]



OCR, Gateway Physics B, Paper j249/03, Specimen



Answers



Review: Practical - Measuring the resistance of a resistor

- 1) Name the pieces of apparatus used to measure the current and potential difference.

The current is measured with an ammeter.

The potential difference is measured with a voltmeter.

- 2) Describe how we collect a set of data (pairs of different current and potential difference values).

We collect a set of data pairs by adjusting the variable resistor to vary the current.

- 3) Describe what happened to the brightness of the lamp:

*As the potential difference increased the brightness of the lamp **increased.***



Review: Independent Task - Calculating Resistance

Potential Difference (V)	Current (A)	Resistance (Ω)
2.79	0.20	14.0
1.76	0.16	11.0
0.89	0.11	8.1
0	0	0
-0.89	-0.10	8.9
-1.80	-0.17	10.6
-2.78	-0.20	13.9



Review: Independent Task - The Filament Lamp

As the potential difference increases the delocalised electrons collide **more often with the ions in the filament wire.**

When the delocalised electrons collide they transfer **energy.**

This transfer of energy causes the filament wire to heat up and the ions **vibrate more.**

These vibrations mean that it is harder for the electrons **to pass through the filament wire.**

This results in the resistance **increasing.**



I-V Graph for Lamp

2) When the line is steep the resistance is low.
When the line is shallow the resistance is high.

3) When the potential difference is low the resistance is low, but as the potential difference increases the resistance of the filament lamp also increases.

