Physics - Key Stage 3

Lesson 7- Electricity and Magnetism

Measuring Resistance

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OAK NATIONAL ACADEMY

Questions from video

Name the 3 factors affecting resistance (if temperature is kept the same)

1. _____

2. _____

3. _____

Variables - match up

Independent variable

Dependent variable

Control variables

The variable that is measured to judge the outcome of the test

The quantities we need to keep the same (because they would affect the outcome)

The variable we choose to change to see its effect on the outcome

‘The length of a wire affects resistance’

1. State the unit of electrical resistance.

2. What are the:
    a. Independent variable
    b. Dependent variable
    c. Control variables

Results Table

Independent Variable

Dependent Variable

Length of wire (cm)	p.d. (V)	Current through the wire (A)	Resistance (Ω)

Put the method in the correct order

Repeat, decreasing the distance between the crocodile clips by 10cm each time until you have at least 5 readings

Connect the voltmeter in parallel with the 1m wire using crocodile clips

Connect the power pack and ammeter in series with the wire

Switch off the power pack. Turn dial back to zero.

Switch power pack on, adjust p.d. so that current through the wire is 0.50A then record current and p.d.

Example data - Calculate resistance

Length of wire (cm)	Potential difference (V)	Current (A)	Resistance (Ω)
100	2.50	0.50	
90	2.25	0.50	
80	2.00	0.50	
70	1.75	0.50	
60	1.50	0.50	

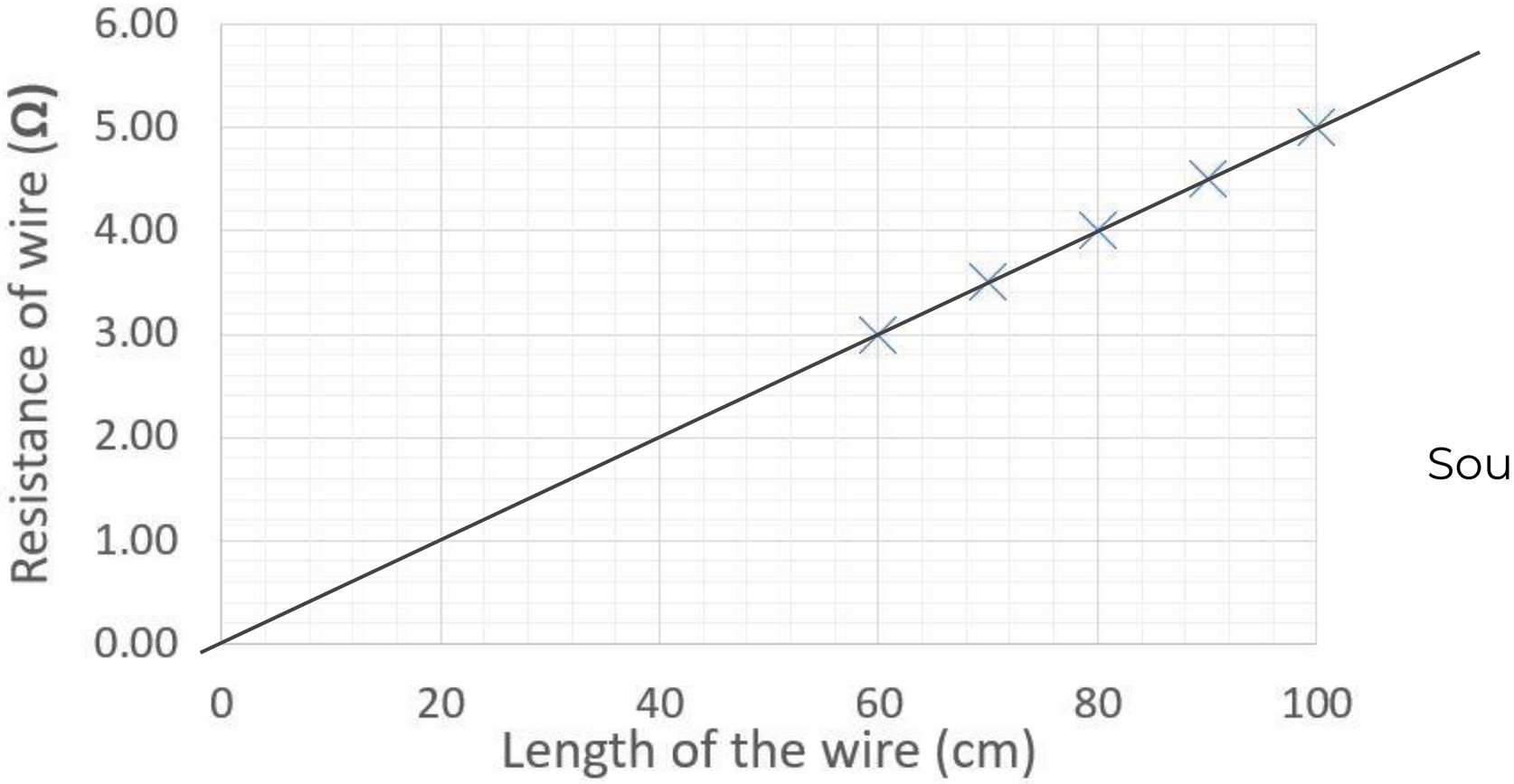
Potential difference = **Resistance** x **Current**

(V) **(Ω)** **(A)**

Graph

What is the relationship between length and the resistance of the wire?

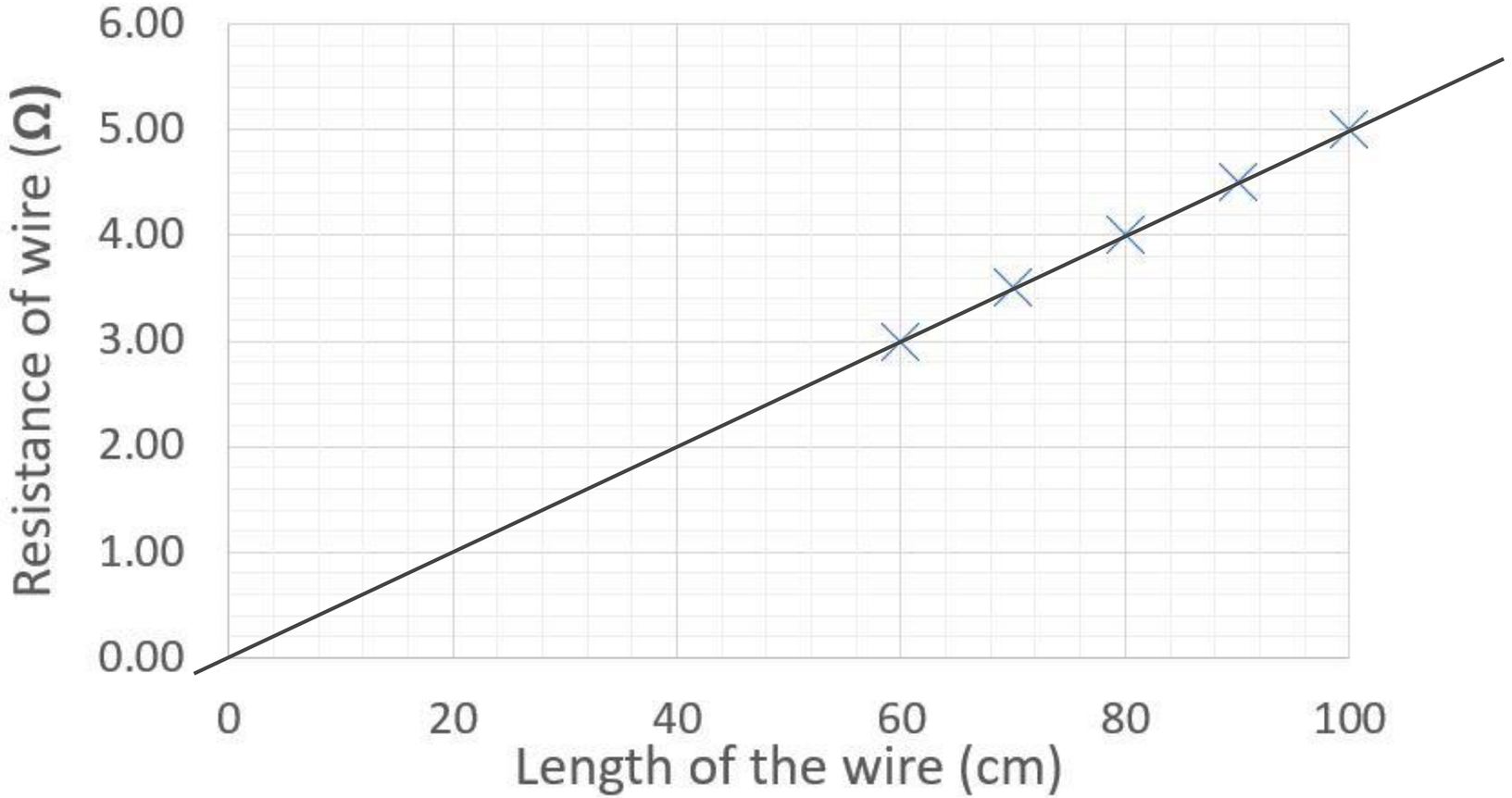
“As the length of the wire increases, the resistance _____”



Source: C White

Conclusion

Describe the relationship between the length of a constant thickness wire and the resistance of the wire at constant temperature.
Use your data (i.e. your graph) to back up your statements



Source: C White

Which conclusion is better, and why?

1. As the length of a wire increases, the resistance increases. For example, when the length is 40cm the resistance is 2.0Ω, and when the length is 80cm it is 4.0Ω.

2. The length is directly proportional to the resistance, so that if we double the length of a wire the resistance also doubles. For example, when the length is 40cm the resistance is 2.0Ω, and when the length is 80cm it is 4.0Ω.

N.B. This only applies if the wire is the same thickness, material and temperature.

Your turn

Length of wire (cm)	Potential difference (V)	Current (A)	Resistance (Ω)
100	2.50	0.50	**5.0**
90	2.25	0.50	**4.5**
80	2.00	0.50	**4.0**
70	1.75	0.50	**3.5**
60	1.50	0.50	**3.0**

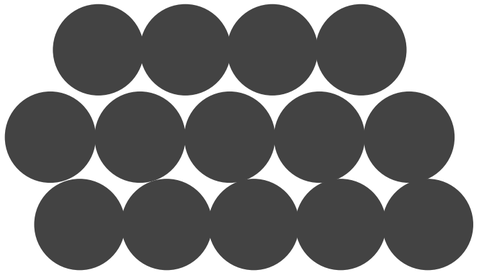
- Describe the relationship between the length of a wire and the resistance.

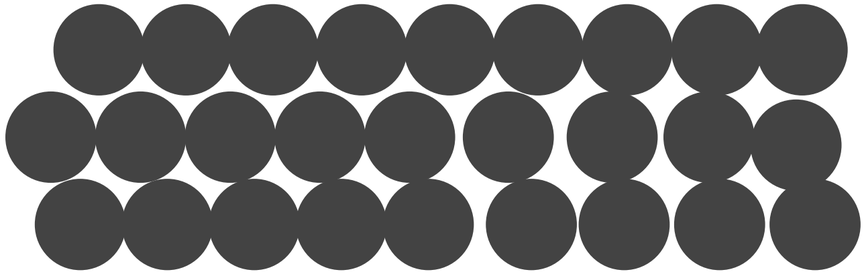
- Use your data to back up your statements.

Answers

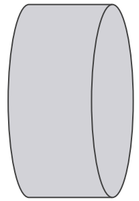
Name the 3 factors affecting resistance (if temperature is kept the same) - Answers

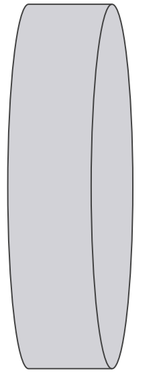
Length





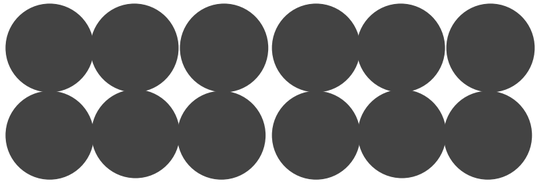
Cross Section

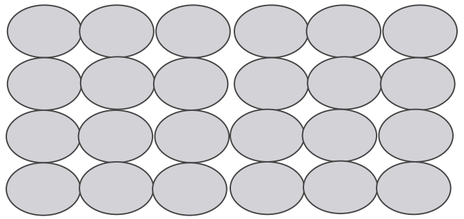




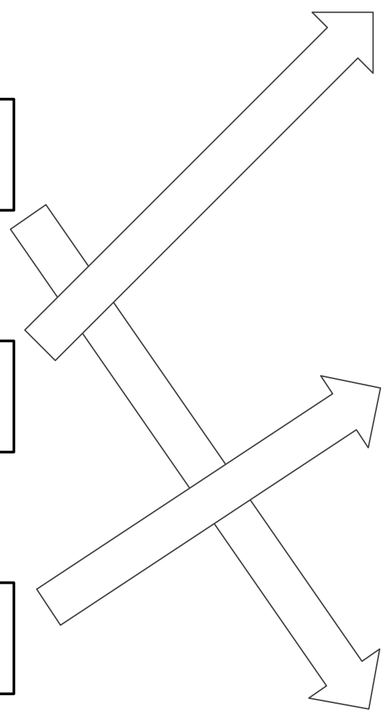
Material

(how conductive the material is)





Variables - answers



Independent variable

Dependent variable

Control variables

The variable that is measured to judge the outcome of the test

The quantities we need to keep the same (because they would affect the outcome)

The variable we choose to change to see its effect on the outcome

‘The length of a wire affects resistance’ - Answers

1. What units are used to measure resistance?

   Ohms

2. What are the:
   a. Independent variable **Length of the wire**
   b. Dependent variable **Resistance of the wire**
   c. Control variables **Diameter of the wire, material of the wire, current through the wire (to keep the temperature constant)**

Put the method in the correct order - answers

Connect the power pack and ammeter in series with the wire

Connect the voltmeter in parallel with the 1m wire using crocodile clips

Switch power pack on, adjust p.d. so that current through the wire is 0.50A then record current and p.d.

Switch off the power pack. Turn dial back to zero.

Repeat from step 3, decreasing the distance between the crocodile clips by 10cm each time until you have at least 5 readings

Example data - Answers

Control variable

Dependent variable

Length of wire (cm)	Potential difference (V)	Current (A)	Resistance (Ω)
100	2.50	0.50	**5.0**
90	2.25	0.50	**4.5**
80	2.00	0.50	**4.0**
70	1.75	0.50	**3.5**
60	1.50	0.50	**3.0**

Independent variable

Resistance = Potential difference ÷ Current

(Ω) (V) (A)

Which conclusion is better, and why?

1. As the length of a wire increases the resistance increases. For example, when the length is 20cm the resistance is 2Ω, and when the length is 40cm it is 4 Ω.

2. The length is directly proportional to the resistance, so that if we double the length of a wire the resistance also doubles. For example, when the length is 20cm the resistance is 2Ω, and when the length is 40cm it is 4 Ω.

Your turn - answers

Length of wire (cm)	Potential difference (V)	Current (A)	Resistance (Ω)
100	2.50	0.50	**5.0**
90	2.25	0.50	**4.5**
80	2.00	0.50	**4.0**
70	1.75	0.50	**3.5**
60	1.50	0.50	**3.0**

The length is directly proportional to the resistance, so that if we double the length of a wire the resistance also doubles.

ALWAYS MAKE YOUR CONCLUSIONS FROM THE BEST FIT LINE, NOT RAW DATA IN A RESULTS TABLE. Some of the data may be anomalous!

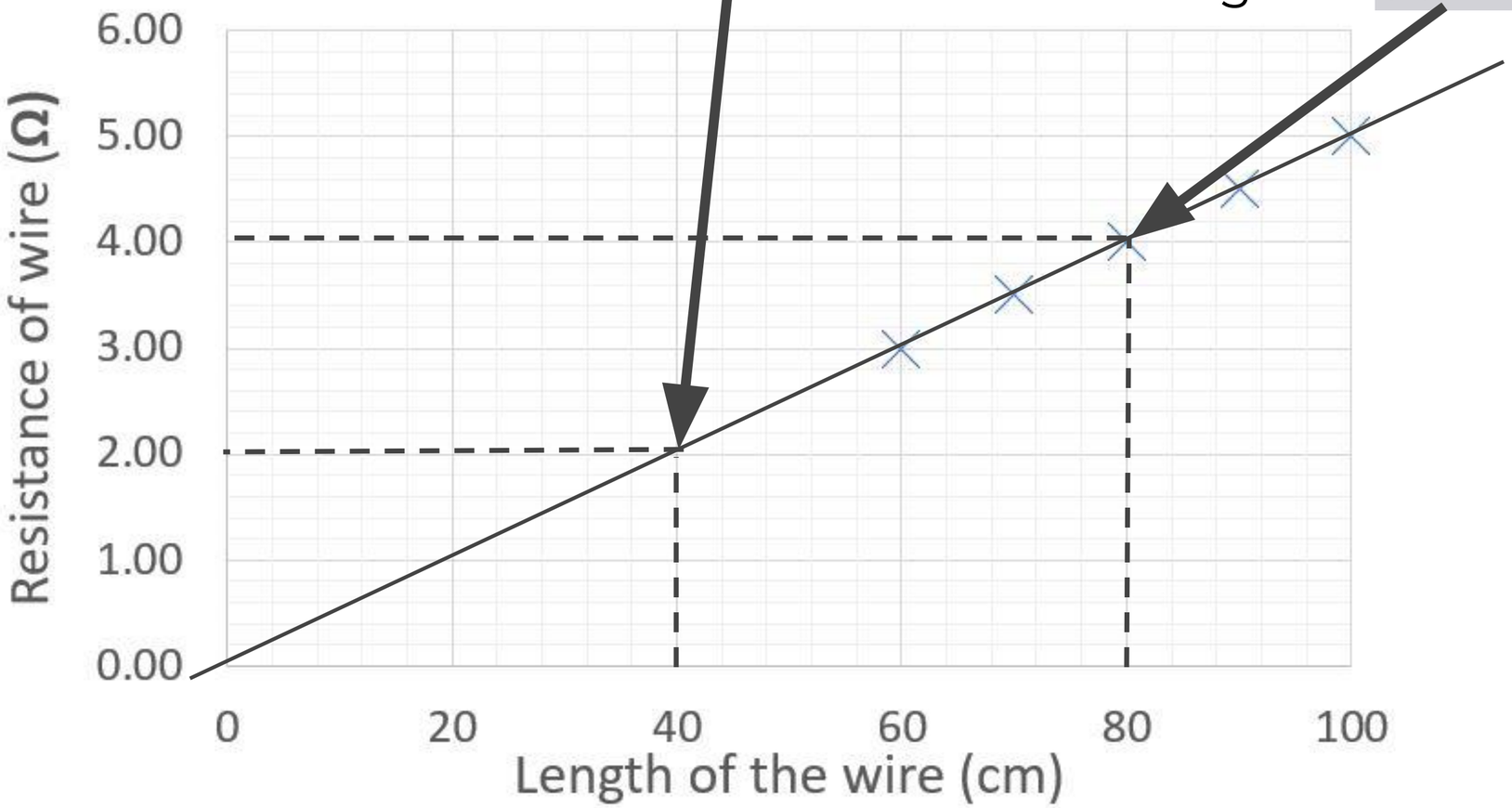
Conclusion

The length is directly proportional to the resistance, so that if we double the length of a wire the resistance also doubles.

Examples:

when the length is 40cm the resistance is 2.0 Ω

and when the length is 80cm it is 4.0Ω.



Source: C White