Resistance of a wire and of circuits

Physics required practical | AQA Combined Science 8464 and AQA GCSE Physics 8463 | 14 questions, 36 marks

GCSE science required practicals

This practical online

Name: _____ **Date:** _____ **Score:** _____ / 36

Aim: To find out how the length of a wire affects its resistance, and how the total resistance of two resistors in series compares with two in parallel.

Equipment: Metre rule; Length of thin resistance wire (for example constantan) taped along the metre rule; Two crocodile clips; Low voltage power supply or battery; Variable resistor; Ammeter; Voltmeter; Connecting leads; Switch; Two fixed resistors (for example 22 Ω and 33 Ω).

Results

Chen moved a crocodile clip along a constantan wire and recorded the voltmeter and ammeter readings at five lengths. He adjusted a variable resistor each time to keep the current close to 0.4 A so the wire would not heat up. He has not yet worked out the resistance for 60 cm, so it is shown as X.

Length of wire in cm	Potential difference in V	Current in A	Resistance in Ω
20	0.60	0.42	1.43
40	1.04	0.41	2.54
60	1.50	0.40	X
80	2.08	0.39	5.33
100	2.29	0.38	6.03

Questions

1 For Chen's investigation of the wire, name:

a. the independent variable

b. the dependent variable.

(2 marks)

2 Chen used the same wire for every reading. Give one other control variable and explain why it must be kept the same.

(2 marks)

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3 Describe how the ammeter and the voltmeter should be connected in Chen's circuit. (2 marks)

4 Chen opened the switch after each pair of readings. Explain why this makes his results more accurate. (2 marks)

5 Give one hazard in this practical and a way of reducing the risk. (2 marks)

6 Calculate the value of X, the resistance of 60 cm of the wire. (2 marks)

7 One of Chen's results is anomalous. Identify it and say what Chen should do about it. (2 marks)

8 Write a conclusion for Chen's investigation of the wire. (2 marks)

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9 **Higher tier**

Use Chen's results for 20 cm and 100 cm.

a. Calculate the increase in resistance for each centimetre of wire.

b. Use your answer to estimate the resistance of 50 cm of the wire.

Give your answer to part b) to 2 significant figures. Show your working.

(4 marks)

10 **Higher tier**

When Chen draws his line of best fit, it cuts the resistance axis at about 0.3 Ω instead of passing through zero. Explain what this shows about his measurements.

(2 marks)

11 Bethany connected a 22 Ω resistor and a 33 Ω resistor in series. The voltmeter across both resistors read 6.0 V and the ammeter read 0.11 A.

Calculate the total resistance from her readings and compare it with the sum of the two resistances. Give your answer to 2 significant figures. Show your working.

(3 marks)

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12 Bethany then connected the same two resistors in parallel. The voltmeter still read 6.0 V and the ammeter now read 0.46 A.

Calculate the total resistance of the parallel combination to 2 significant figures, and explain how it compares with the resistance of each resistor. Show your working.

(3 marks)

13 Chen's crocodile clips have wide jaws, so it is hard to tell exactly where along the rule they touch the wire. Suggest an improvement and explain how it helps.

(2 marks)

14 Plan an investigation to find out how the thickness (diameter) of a wire affects its resistance. You have five constantan wires of different diameters.

(6 marks)

End of questions | Total 36 marks | The answers sheet has the full method as revision notes.

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