

Instructions for candidates

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Your assignment has two stages:

- ♦ research
- ♦ report

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- ♦ research
- ♦ report

In this assignment, you have to investigate a topic in physics by doing research.

Your research involves gathering data either from one experiment and an internet/literature source, or from two experiments.

In addition, you may gather extracts about the underlying physics from internet/literature sources.

You then produce a report on your investigation.

Your teacher or lecturer will not mark your report at any point. It is sent to SQA for marking.

Page 3

Research stage

Choosing your topic

- ♦ You need to choose a relevant topic in physics to investigate.
- ♦ You must agree your topic with your teacher or lecturer.

Page 4

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- ♦ You must agree your topic with your teacher or lecturer.

Deciding your aim

- ♦ Once you have chosen your topic, you need to decide what the aim of your investigation is.
- ♦ Remember that:
 - you need to carry out and collect data from one experiment and find data from internet/literature source(s) which is relevant to your experimental data.
- Or
 - you need to carry out and collect data from two experiments related to your aim.
- ♦ Your teacher or lecturer will provide advice on the suitability of your aim.

Page 5

Research stage

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- ♦ Your teacher or lecturer will provide advice on the suitability of your aim.

Experimental research

- ♦ When choosing your experiment(s), remember that it/they must allow measurements to be taken.
- ♦ When carrying out your experiment(s), you must work either on your own or as part of a small group. If you are working as part of a small group, you must take an active part.
- ♦ Make sure you take a sufficient number of measurements over a wide enough range to meet the aim of your investigation.
- ♦ You must repeat measurements.
- ♦ You must estimate the scale reading uncertainty in all the measurements you make.
- ♦ You will use your raw experimental data during the report stage.

Page 6

Internet/literature research

- If you have gathered experimental data from a single experiment, you need to find data from websites, books and/or journals that is relevant to your experimental data. This could be a table or a graph, or data from diagrams or text.
- In your report, you will need to describe the physics relevant to your aim. You can gather extracts from websites, books and/or journals to help you write your description of the underlying physics. During the report stage you will need to show your understanding by writing this description using your own words.
- It is important that you record where you get your data or extracts from in enough detail that another person could find it. This is known as a reference.

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Report stage

Producing the report

- The report must be all your own work.
- When producing your report, you will be supervised at all times.
- You have 2 hours to complete your report.

Page 8

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Resources

During the report stage you are only allowed to have certain materials.

| You can have: | You cannot have a previously prepared: |
|---|--|
| <ul style="list-style-type: none">• these instructions for candidates• extracts you have gathered from websites, books and/or journals to help you describe the physics relevant to your aim• the experimental method(s)• your raw experimental data• data from websites, books and/or journals that is relevant to your experimental data, if you have data from a single experiment• the references to the sources of data or extracts | <ul style="list-style-type: none">• draft of your report• draft of your description of physics relevant to your aim• specimen calculation or set of calculations for mean or derived values• specimen calculation or set of calculations for uncertainties• graph• analysis of data• conclusion• evaluation |

Your teacher or lecturer cannot provide you with feedback or tell you how to improve your report.

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Sample Assignment

To show you what is required for the assignment, we will do a sample assignment on **Ohm's Law**.

This is not actually a suitable topic for a Higher Physics assignment as it is actually a National 5 Physics topic.

Page 10

Title

- Your title must tell the reader what your report is about.

Page 11

Title

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Page 12

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- ♦ Your title must tell the reader what your report is about.

Ohm's Law

Page 13

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Ohm's Law

Note: "Physics Assignment" is not a suitable title.

Page 14

Aim

- ♦ Your aim must describe clearly the purpose of your investigation.

Page 15

Aim

- ♦ Your aim must describe clearly the purpose of your investigation.

Take your time with this.

Page 16

Aim

- ♦ Your aim must describe clearly the purpose of your investigation.

Aim: to find out about Ohm's Law.

Page 17

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- ♦ Your aim must describe clearly the purpose of your investigation.

Aim: to find out about Ohm's Law.

This is not detailed enough and won't get the mark.
It could cost you further marks later on.

Page 18

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- ♦ Your aim must describe clearly the purpose of your investigation.

Aim: to find out the how resistance affects the voltage and current in a circuit.

Page 19

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Aim: to find out the how resistance affects the voltage and current in a circuit.

This is not how you prove Ohm's Law so is an incorrect aim.

Page 20

Aim

- ♦ Your aim must describe clearly the purpose of your investigation.

Aim: to find out the current affects the voltage across a resistor, and use this relationship to find the resistance.

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This is an acceptable aim.

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This is an acceptable aim.

Make sure this is what you do in your assignment.

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Aim

- ♦ Your aim must describe clearly the purpose of your investigation.

Aim: to find out the current affects the voltage across a resistor, and use this relationship to find the resistance.

This is an acceptable aim.

Make sure this is what you do in your assignment.

Feel free to change your aim slightly during your research.

Page 24

Underlying physics

- ♦ You must describe the physics relevant to your aim.
- ♦ You must use your own words as much as possible.
- ♦ You may choose to include:
 - relationships or equations
 - definitions of symbols used
 - explanations or justifications of relationships or equations
 - explanations of physical properties
 - copies of diagrams which you would find difficult to draw
- ♦ You can quote from sources as long as you give a description or explanation showing that you understand the physics.
- ♦ Do not include a passage copied directly from a source. This would not show that you understand the physics.

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Consider this to be an open ended question.

Research and show off what you know!

You can bring a copy of textbook and internet pages when you write your report but you can't have already turned it in to your own words beforehand.

Page 28

Description of experiment(s)

- ♦ You must give only a brief description of the experiment you carried out.
- ♦ If you carried out two experiments, you should give a brief description of both. You will be awarded the mark if one of the two descriptions is acceptable.
- ♦ You must show that you can summarise your experimental method(s) and must not give a full description.
- ♦ Your description must include the measuring instruments you used, although you don't need to give details of the range of measurements or the number of repeats.

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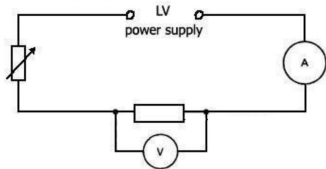
A diagram may be useful however it is not enough for the mark on its own.

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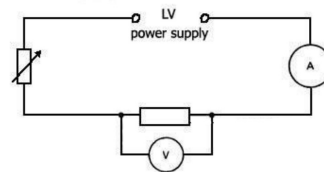
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Page 31

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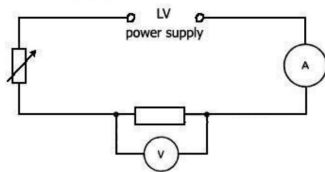
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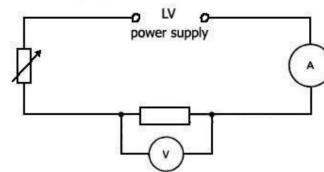


Keep it simple!

Page 33

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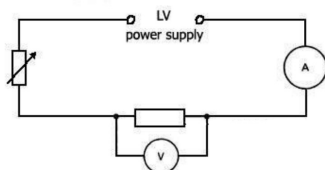
Keep it simple!

State how you changed the independent variable.
State how you measured the dependant and independent variables.

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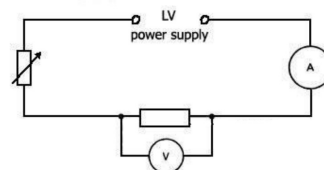
The current through the resistor was altered using a variable resistor and was measured with an ammeter.

The voltage across the resistor is measured with a voltmeter.

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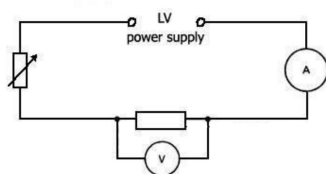


If you do two experiments, you should describe BOTH experiments.

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You can bring a copy of your experimental method when writing your report.

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Experimental data

- You must include a table showing all of the measurements you recorded in your experiment.
- If you carried out two experiments, you should include a table of measurements from each experiment. You will be awarded the mark if one of the two tables is acceptable.
- Make sure you include column headings and units.
- You must calculate mean values for your repeated measurements. These must be included in your table.
- Any derived values needed for graphing must be included in your table.

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RULE OF FIVE

There should be a minimum of **five** values of independent variable and the experiment should be repeated **five** times.

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RULE OF FIVE

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All averages should be calculated when you write the report, not before.

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Raw Data

| Current (mA) | Voltage 1 (V) | Voltage 2 (V) | Voltage 3 (V) | Voltage 4 (V) | Voltage 5 (V) | Average Voltage (V) |
|--------------|---------------|---------------|---------------|---------------|---------------|---------------------|
| 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 50 | 0.43 | 0.42 | 0.39 | 0.41 | 0.39 | |
| 100 | 0.78 | 0.78 | 0.78 | 0.81 | 0.81 | |
| 150 | 1.20 | 1.21 | 1.22 | 1.21 | 1.22 | |
| 200 | 1.61 | 1.59 | 1.59 | 1.60 | 1.61 | |
| 250 | 1.98 | 2.00 | 1.99 | 2.01 | 2.02 | |

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| 100 | 0.78 | 0.78 | 0.78 | 0.81 | 0.81 | 0.79 |
| 150 | 1.20 | 1.21 | 1.22 | 1.21 | 1.22 | 1.21 |
| 200 | 1.61 | 1.59 | 1.59 | 1.60 | 1.61 | 1.60 |
| 250 | 1.98 | 2.00 | 1.99 | 2.01 | 2.02 | 2.00 |

Page 42

Graphical presentation

- You must produce a scatter graph of your experimental data.
- If you carried out two experiments, you should include scatter graphs of your data from both experiments. In this case, both graphs will be marked, and you will be awarded the mark for the better of your graphs.
- You must use graph paper or graphing software. If you are using graphing software, include both major and minor gridlines, and use plotting symbols which are clear but not too large.
- A line or curve of best fit should usually be drawn. However, if there is no obvious pattern to your plotted data points, you should not try to draw a line or curve of best fit.
- The graph(s) must be large enough to allow points to be read accurately and have suitable scales. It/they must also have labels and units on the axes.

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Graphs can be completed using Excel or graph paper.

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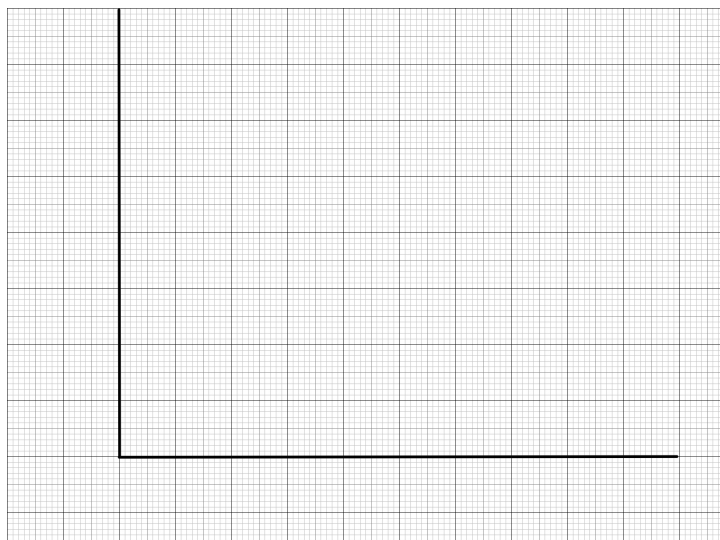
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Graphs can be completed using Excel or graph paper.

If using Excel, make sure that major and minor gridlines are selected and data points aren't too large.

A scatter graph is the only acceptable graph.
No bar or pie charts allowed!

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