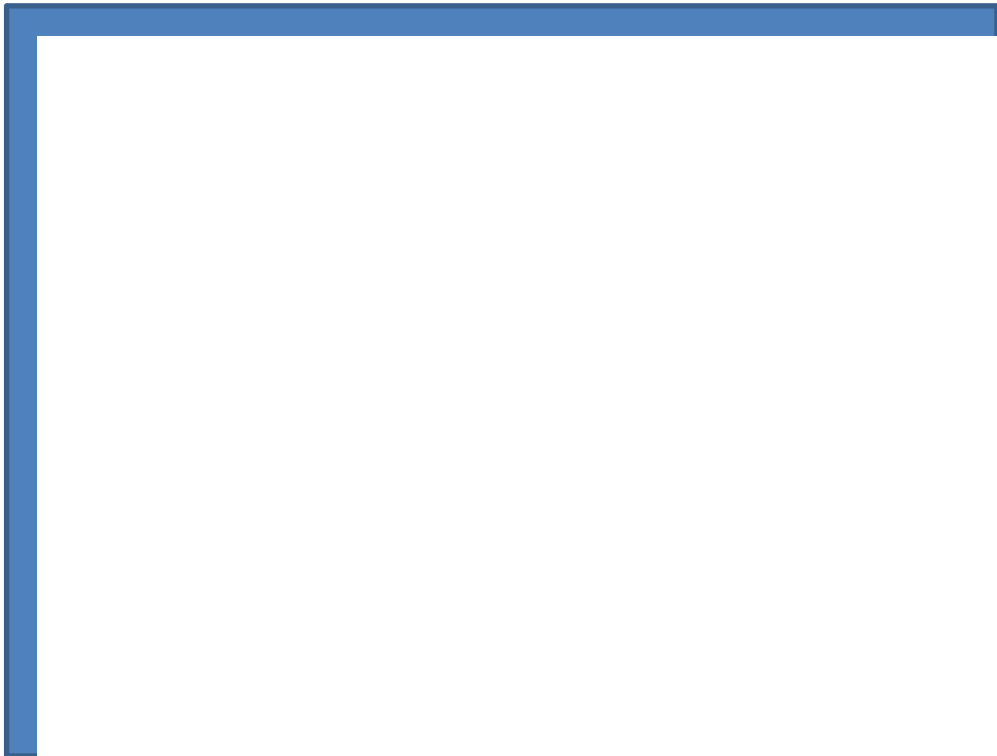
Additonal/Separate Physics ISA 2013-14
Resistance

PART 1

In groups of 4 – What do you know about electrical resistance?

2 minutes…



Some ideas…

CAN BE CALCULATED FROM R=V/I

OHM'S LAW STATES THAT CURRENT IS DIRECTLY PROPORTIONAL TO CURRENT AT A FIXED TEMPERATURE

IT INCREASES WITH TEMPERATURE AS IN A LIGHT BULB

WHAT IS ELECTRICAL RESISTANCE?

MATERIAL WHICH RESTRICTS CURRENT

RESISTORS HAVE RESISTANCE

MEASURED IN OHMS (Ω)

What is a HYPOTHESIS?

A proposal intended to explain facts or observations

YOU'RE GOING TO MAKE YOUR OWN HYPOTHESIS AND YOU'RE GOING TO DO AN INVESTIGATION TO SEE IF IT'S TRUE

ADDITIONAL PHYSICS ISA INVESTIGATION:

"WHAT FACTORS AFFECT THE RESISTANCE OF A LIGHT BULB"

VARIABLES:

INDEPENDENT: CURRENT OR VOLTAGE

DEPENDENT: RESISTANCE

CONTROLS: POWER AND TYPE OF LIGHT BULB

QUESTION 1 FROM THE PHYSICS ISA SUMMER 2013

1 Write down your hypothesis.

Explain why you made this hypothesis.

Hypothesis THE AFFECTS THE RESISTANCE OF A LIGHT BULB

Explanation AS THE INCREASES THE THERMAL ENERGY CAUSES THE POSITIVE IONS IN THE METAL TO VIBRATE MORE, THUS INCREASING THE RESISTANCE OF THE METAL FILAMENT

(3 marks)

QUESTION 2 FROM THE PHYSICS ISA SUMMER 2013

2 Think about the research that you did to find out how to test your hypothesis.

Identify **two** sources that you used for your research.

SOURCE 1 – FULL WEBSITE ADDRESS

SOURCE 2 – FULL WEBSITE ADDRESS

Which of these sources did you find the more useful?

Why was this source better than the other source?

E.G.: SOURCE 1 IS BETTER THAN SOURCE 2

BECAUSE SOURCE 1 HAS A MORE DETAILED METHOD AND SOURCE 2

ALSO DOESN'T HAVE A RISK ASSESSMENT

(3 marks)

SAME QUESTION FROM EVERY ADDITIONAL SCIENCE ISA

3 *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

From the research that you have done, describe in detail how you are going to do your investigation.

You should include:

- the equipment that you plan to use
- how you will use the equipment
- the measurements that you are going to make
- how you will make it a fair test
- a risk assessment.

USE THESE AS GUIDANCE

FURTHER TIPS FOR 9 MARKS:

- **WRITE IN POINT FORM LIKE THE SOURCES HAVE DONE**
- **MENTION THE CONTROL VARIABLES NEEDED SO THE INVESTIGATION ISN'T AFFECTED BY THEM ("FAIR TEST")**
- **MENTION THE RANGE AND INTERVALS YOU WANTED TO USE, E.G.: CURRENT RANGE FROM 0.0 – 2.0A INCREASING IN 0.25A INTERVALS**
- **MEASURING THE INDEPENDENT VARIABLE**
- **REPEATS NEEDED TO GET REPEATABLE AND RELIABLE RESULTS AND THUS BEING ABLE TO CALCULATE A MEAN**
- **USING V AND I TO CALCULATE THE RESISTANCE (USING OHMS LAW)**

Errors:

The **error** might be a **systematic error**. This means that the method was carried out consistently but an error was being repeated. A systematic error will make your readings be spread about some value other than the true value. This is because your results will differ from the true value by a consistent amount each time a measurement is made.

No number of repeats can do anything about systematic errors. If you think that you have a systematic error, you need to repeat using a different set of equipment or a different technique. Then compare your results and spot the difference!

A **zero error** is one kind of systematic error. Suppose that you were trying to measure the length of your desk with a metre rule, but you hadn't noticed that someone had sawn off half a centimetre from the end of the ruler. It wouldn't matter how many times you repeated the measurement, you would never get any nearer to the true value.

What is wrong with the following?

(a) And (c) don't start at zero

They have zero errors

How could you correct this error?

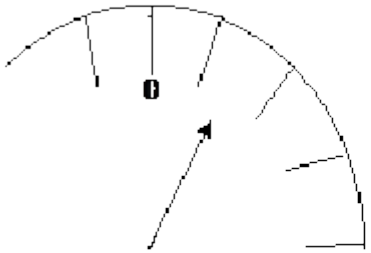
Either:

1) Replace the measuring device with a calibrated one

OR

2) Subtract/Add the extra to the final reading

(a)



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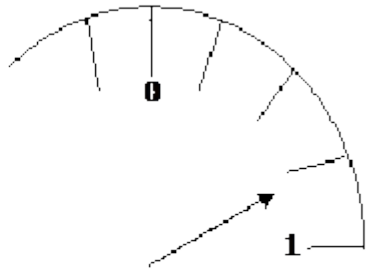

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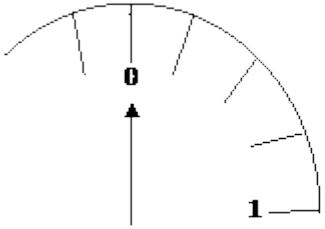
(b)



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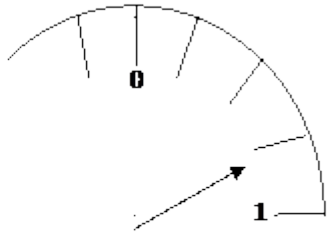

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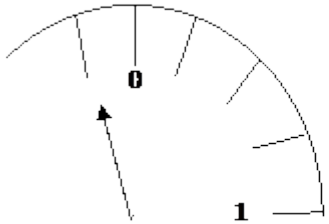
(c)



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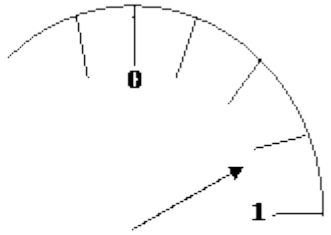

After

CONTEXT: DIMMING DESK LAMPS

INVESTIGATION RELATING TO THE CONTEXT: If the current is too high for a cold bulb, the resistance will be low and so the bulb filament could blow. Therefore allowing lamps to heat up will prevent this from occurring.

Switching a light on can off will cause a surge in current to occur – this too could cause a bulb to blow and in fact this is the most common point in a bulb's life when they do blow.

Results from your investigation could support a potential question in paper 2 as the resistance would be low when the bulb is cold (ie at low currents)

Use the sources to design an experiment to investigate your hypothesis or even help you write a hypothesis.

Things to write on your Candidate Research Form (CRF):

- Your name, candidate number and sign it
- Write the hypothesis, context and context relating to the experiment on your CRFs.

In the rest of the boxes:

- draw a simple diagram and write the list of equipment
- write down the independent, dependent and control variables – identify them from the hypothesis
- Write a step by step guide which is **PRECISE** in the method (don't worry about going over the lines and writing in other boxes)
- Say in the method what you **controlled** for a fair test.

From the sources, choose the best two to help you. Write on your CRF:

- **the names/ websites of the sources**
- **give a reason for each one, saying which one is the best and why one is better than the other.**

How to draw a table to get maximum marks (2):