Hows does changing the length of wire affect resistance? essay sample

The objective for my coursework (as already stated above) is to investigate how changing the length of wire can affect the resistance.

There are factors which can affect how accurate our expriment is come on four levels.

As in any scientific experiment, there are always variables (“ likely to change or vary subject to variation; changeable.”) which can alter a potentially good set of results into a bad set full of anomalies. In this particular test there are five main variables.

Length affects resistant, this is the variable which we are changing. As water in a hose pipe, the longer the pipe the longer the water takes to reach its destination. This can be applied in the variables of resistance. The electrons ‘ bounce’ off the atoms – this causes the electrons to head elsewhere rather than the desired direction. In a long tube there are more atoms, this slows the electrons down as they ‘ bounce’ off into another direction. In a short tube, there are less atoms which means there are less to deflect the electron any more speeding the speed up. In theory, the length should be proportional to the resistance. This is the variable which we will be changing in the experiment.

Diameter, we are keeping the same. Again, with the hose pipe, if the tube is thick it allows more water molecules to pass through at one time compared to a thinner tube. Once again this can be applied to resistance in wires.

If the wire is ‘ thin’ then there are less paths for a electron to travel. This slows down the electron slowing down the speed. If the wire is thick

then it allows more paths for the electron to follow and therefore, speeds up the flow of electrons.

Both Length and diameter work with each other. A thick wire that is long has more atoms but also more paths, these “ cancel each other out” and may cause the electrons to move faster but have to move further. Vice versa with short thin wires. We keep this the same by not changing the wire throughout the whole experiment.

If the wire is heated, the atoms will move around more because there will be an increase in energy. This would cause more collisions between the atoms and the electrons. The increase in collisions would cause the resistance to rise. We keep this variable the same by turning the power of nearly straight after we have seen a result (without it fluctuating) too keep the temperature down.

The choice of materials that we could use for the wire affects the resistance that we receive. A wire with too little resistance would be hard and complex to collect results due to a 5th or 6th decimal point change. A wire with a lot of resistance may not let any current through at all making it hard to take down a result. We keep this variable the same by keeping the material the same.

METHOD

APPARATUS

Crocodile Clips

Power Supply (Power Pack)

Wires

Chrome Nickel

Ammeter

Voltmeter

Metal Ruler

4. 5v bulb

METHOD STEPS

(BASIC OVERVIEW)

Decide which wire to use by creating a simple test of the most varied results

Measure 100cm of the wire and attach to a metre ruler.

Ÿ Check equipment works well;

Power source

Connecting wires

Ammeter

Voltmeter

Ÿ Set up the appropriate circuit

Ÿ decrease the length of wire by 10cms

Ÿ Write down Voltage and the current in the circuit

Continue until the two clips are touching at 0cms

Ÿ Repeat two more times to give more reliable results

METHOD

(ADVANCED)

At first we conduct tests on two sets of wire – copper and chrome nickel. This was so we could decide which was the most suitable wire to use, if we were to use a wire which had extremely low resistance the changes would too minute it would be impossible to take down results since both ammeter and voltmeter were only capable of showing to two decimal places. If we were to use a wire with too high resistance then no elections would be able to move thus, not having any readings on the ammeter or voltmeter.

Once the equipment has been tested, we then set up the circuit that we will use to take the readings. Using the equipment that has been checked we set up a circuit using the Meter ruler (with wire), connecting wires, ammeter, voltmeter and power pack. (Shown below)

After the first test we will use the wire (which is decided the most reliable source of results with no fluctuations of voltage or current and a obvious pattern of increasing/decreasing results) and attach to the metre ruler using sticky tape. This needs to be as accurate as possible.

We then check the equipment that we are about to use. This involves checking the power pack work; that the wires conducted electricity; testing the ammeter and voltmeter.

To make the results are reliable as we are able to receive, we will conduct the three times and find the resistance..

MY PREDICATION

I predict that, the longer the wire is, the more resistance there will be due to more collisions between the electrons and atoms. The length of the wire should be approximately proportionally the same as the resistance.
In theory, if the wire is doubled, then so will the resistance. If the length is twice as much, then there will be twice as much collisions, which would increase the resistance

RESULTS

The test was done several times, I have rewritten my results into a clearer table, this can bee seen on a the next separate sheet.

The equation for finding resistance is..

Resistance = Voltage/current

This was used in calculating the resistance of results

CONCLUSION

My results have a small number of Anonmyles but the line of best fit shows that the results are proptional. The line of best fit proves me prediction correct as the line is in proportion that doubling the length of the wire theoreticly double resistance.

A wire has electrons colliding with the Atoms

If the length is double then the electrons are doubles, as well as Atoms and therefore resistance..

The results on the graph show that the resistance steadily increases but only up to a resistance of 9 Ohms. Further beyond this point we do not know. The graph could hit a point which the resistance ‘ stops’ and has reached a maxium amount of resistance.

EVALUATION

I think that the experiment, generally went quite well, although there were mistakes in the results they are expected from a experiment which has many variables that are hard to control with standard school equpitment..

There were Three anonamylees when the resistance went about 7 ohms, this may of been because heat of the wire may of increased, causing the particles to vibrate more.

I think that the amount of times that we did the tests were appropriate and this was enough to satisfy me and my partner that we had a set of reliable results.

Measuring the wire we had proved a problem, the Meter ruler we used was relatively old. Some of the numbers and markings were rubbed off (through over use) which may of caused inaccuracy in some results. The markings (or lack of in this case) was one of three things which could of hindered our results regarding the Meter ruler and the wire.

The tools we used were far from simple but were not as complex as tests conducted in a laboratory would of been, for example the way the wire was straightened, if this were to of been done in a laboratory, then the wire would of been near perfectly placed and straightened. However, we were unable to place the wire to this standard and I estimate that we added an extra 3-5 Cm’s of wire to the 100 Cm’s we ideally should of used. Even if we were able to keep the length exactly to 100cms we would of needed an extra 2 Cm’s of wire to allow the crocodile clips to fit underneath the wire to allow the circuit to be completed.

The use of crocodile clips added resistance to the results. Crocodile clips have their own resistance but were vital to connect the components together, next time, or in a repeat of the test I would not use the clips, I would connect the wires without using Crocodile clips.

To prove my theory even more so i would double the length of the wire, two to three times more untill 300cms, the resistance should still be proportaional to the length of the wire.