In this piece of coursework, I have been set the task of investigating factors that affect the resistance of a wire. There are many things that affect the resistance of a wire but I have only got the chance to do one of these. The one I will choose will depend on it being the most effective and on its ease to do.

Firstly, I will give an explanation of how resistance works. Resistance is when travelling electrons in a wire collide with the atoms of the wire. The collisions between the electrons and the atoms cause the electrons to move slower, which in effect causes resistance. So, resistance is how hard it is to move electrons through a wire.

Now, the factors that affect the resistance of a wire are going to be described.

Firstly, temperature is a factor. 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.

This would be very hard to do, because the equipment needed to do this experiment effectively has not been given to us.

Secondly, the width of the wire is a factor. This will cause resistance to **decrease** because of the increase in space in the wire. The increase in space means that there is more space for the electrons to flow freely because there would be fewer collisions with atoms.

I could do this by using different widths of a wire; for example thin, medium, or thick copper could be used.

Thirdly, the material used would be a factor. If the material being used contains atoms with a large number of electrons on the outer shells, then this means there are more electrons available. So, in theory, if the material has a large number of atoms, there should be less resistance, because of the higher number of electrons .If the atoms in the wire are closely packed, then this will cause an **increase** in resistance, due to frequent collisions.

To do this I would use the same length and width of many different wire materials, using the same amount of voltage each time.

Finally, the length of the wire is a factor. The longer the wire, the longer it will take electrons to get to the end of the wire. This is because there will be more collisions between electrons and atoms. So, in theory, the length of the wire should be directly proportional to the resistance.

This would be very easy to do, and give accurate results. Because of the length being proportional to the resistance, I could link the length of a wire with the resistance of the wire, which would make my graph more interesting.

Due to the effectiveness of this method, I have decided to use the length of the wire as the factor that I am going to use.

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.

Method

Apparatus

The reason I have chose to use Constantine wire is because of its high resistance. This makes it a lot easier to record the results, as it gives me higher numbers to work with.

The resistance is going to be recorded at nine different lengths. I have chosen to record the results at this amount of lengths, as it will give me a much more accurate result at the end of the experiment.

As you can see in the diagram, I have chose to use a digital voltmeter instead of a conventional analogue voltmeter, as this can give me a much more precise result than an analogue meter. This is because the needle on an analogue meter could be bent and give me the wrong reading, but a digital meter does not involve needles, so would give a much clearer reading.

The way to calculate the Resistance relies on this formula:

Resistance = Voltage/current

I will use the Voltmeter provided to get the voltage, and the ammeter provided to get the current (in amps).

Conclusion

In conclusion, I have found that my prediction was correct. I said that the resistance will increase approximately proportionally to the length, and as you can see from the graph, this was correct. This is emphasised because the line of best fit is a straight

line, which means the resistance is proportional to the length. This proves the fact that the longer the wire is, the more collisions there are between atoms and electrons. So if the wire increases in length, so does the resistance. If the wire decreases in length, so does the resistance. This can be shown in the diagram below:

As you can see in the diagram, the wire on the top is twice as big as the one below it, so it has twice the electrons too.

Evaluation

This experiment has gone satisfactory, but there have been certain things in the experiment that I have not been pleased with.

I have noticed, now that I have finished my coursework, that there are a number of things I could have done to get more accurate results.

Firstly, I would do the experiment using the width and the material used as a factor too, just to make sure that my averages are as correct as possible.

The next thing I would have done is to use pointers instead of the crocodile clips which I used. This is because pointers are a lot more accurate, because they have a smaller surface area on their tips than crocodile clips. This in effect would give much more accurate measurements.