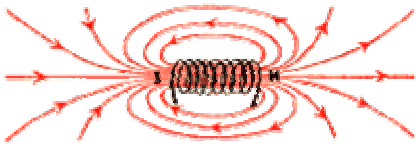
'What effects the strength of an electromagnet?'

Introduction:

An electric current flowing through a wire produces a magnetic field. Coiling the wire produces a stronger magnetic field. Coiling it around a soft iron core increases the strength effect; raising the current or the number of coils increases it further.



I am going to investigate the raising of the current and how it affects an electromagnet.
I think the electromagnet will produce a stronger magnetic filed and pick up more iron fillings.

Aim:

To investigate factors which affect the strength of the electromagnet and make the strongest electromagnet possible.

Apparatus:

· Iron Rod
· Leads
· Power Pack
· Crocodile Clips
· Insulated Wire
· Iron Filings
· Voltmeter
· Plastic Beakers
· Electronic Balance

Hypothesis:

I expect the strongest electromagnet to have a 'soft' iron core; the number of coils being (45) the current varies, the strongest amps being (7.00A) and have the coils evenly spread across the iron rod.
The 'soft' iron core means it changes easily between being magnetised and de-magnetised, it is perfect for electromagnets, which need to be turned on and off. From a previous experiment, using an electromagnet, I found out that the iron rod picked up many filings when turned on and dropped them all when switched off but the steel rod picked few filings up when switched on, yet held on to them even after the current was switched off. For this

experiment, the iron rod is needed. A high number of coils provides a stronger solenoid. When current flows through the wires it cerate's a magnetic field, therefore with more current a stronger magnetic field and therefore a stronger electromagnet would be created. The higher the voltage means the size of current will increase too. The stronger the magnetic field, the more filings will be attracted by the electromagnet. When the coils will be evenly spread across the rod, the current across the rod and the magnetic field will be even.

Method:

The apparatus will be set up to form a circuit, as below:

I will use an iron rod and make (5) coils around the rod with a piece of wire. They will be spread as evenly as possible across the rod. The ends of the wire will then be connected to the circuit with crocodile clips. The voltage on the power pack will be turned onto 0.5 amps. As this is the ampere reading from the power pack, it may not be exactly 0.5A, which is why a voltmeter has

been added so the actual number of amps could be measured each time. This will also be written in the results table. When the current is switched on, I will hold the rod from one end and put the other end into a beaker full of iron filings, allowing it to pick up as many filings as possible. The mass of the nails picked up will be weighed on an electronic scale and recorded. This will be repeated 2 times so a precise average can be taken. The same experiment will be carried out, increasing the voltage by 0.5 amps each time, up to 7 amps. All of these will be written to 1 decimal point.

Fair Test:

In order to keep the experiment a fair test I will repeat each experiment 2 times to get an accurate average result. I will use the average results to plot a graph.
I will only use the iron rod because it's 'soft', it changes easily between magnetised and demagnetised. The rod will pick up nails when the power's turned on and drop them when it is turned off, whereas steel has a 'hard' core it retains magnetism. A 'soft' iron core will increase the magnetic field strength, and so there is no need to try the 'hard' steel core, as it will not be as powerful as the iron rod and it will hold the iron filings for longer that, is not necessary. I will also be keeping the coils spread evenly across the whole rod, instead of in the middle/left/right, because this will allow the magnetic field strength to increase. I will keep the power pack on long enough for the rod to pick up any iron filings and so I could read the value from the voltmeter. I will find the resistance for my experiment and using this, I will work out a current value for each result and an average current too. I will weigh the mass of the iron nails picked up. This is because there are too many filings to count and they will not have the same mass so consequently I am unable to count the number of iron fillings picked up. To get an accurate value (to 2 decimal points) I will use an electronic weighing scale and the same scale each time the mass of fillings must be weighed.