

AQA Physics A-level

Required Practical 10

Investigate how the force on a wire varies with flux density, current and length of wire using a top pan balance

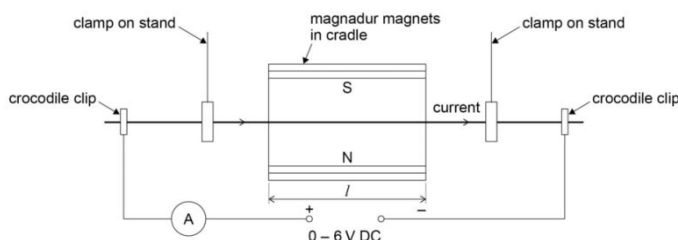
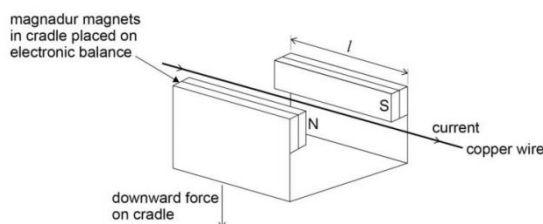
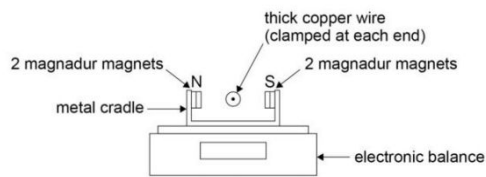


• **Equipment:**

- Wire to suspend
- Two stands with clamps
- Two identical magnets
- Weighing scales
- Ammeter
- Variable power supply
- Ruler

• **Method:**

- Set up the apparatus as shown in the diagrams.
- With no current flowing, tare the balance.
- Adjust the voltage of the supply so that the current I as measured by the ammeter is 0.50A. Read and record the mass m displayed on the balance.
- Increase the voltage such that the current increases by 0.50A and repeat this, increasing the current by 0.50A each time up to 6.00A.
- Repeat the experiment twice more and find and record the mean m for each I .
- Measure and record the length L of the magnets (i.e. the length of the wire in the magnetic field).



• **Graphs and calculations:**

- Calculate the force F by converting each m into kilograms and multiplying by 9.81 and then tabulate this.
- Plot a graph of F against I and draw a line of best fit. The magnetic field strength B will be the gradient divided by L .
- $F = BIL \Rightarrow B = \frac{F}{IL} = \frac{G}{L}$ where G is the gradient.

• **Safety:**

- High currents will flow so do not touch the wire because it will get warm and could cause burns.

• **Improvements and notes:**

- A variable resistor can be added in series with the wire to make it easier to get the desired currents.
- Scales with a very high resolution should be used because the forces are generally very small.

