

## 1 Magnetic shielding

## Purpose

To test which materials a magnetic field can pass through and which materials will block a magnetic field.

## Materials

- 50 g mass
- paper clips
- cotton thread
- Blu Tack
- bar magnet
- retort stand and clamp
- sheets of different materials such as cardboard, plastic, aluminium foil, iron, steel, tin, wood, glass, copper

## Procedure

- 1 Set up the equipment as shown in Figure 7.4.17.

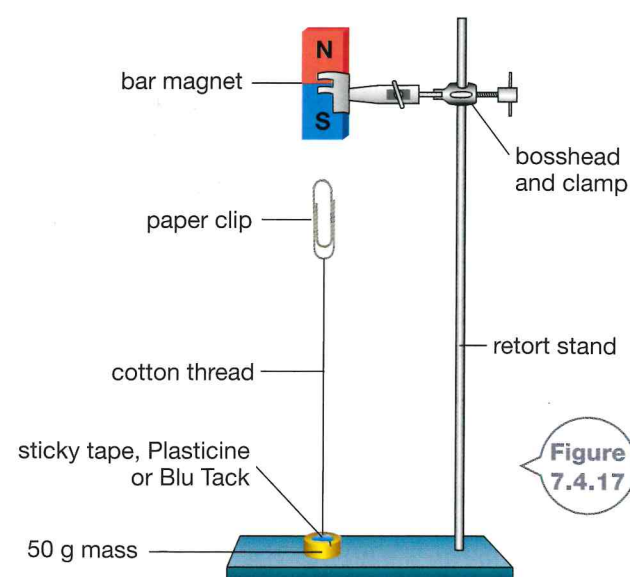


Figure 7.4.17

- 2 Find the maximum distance that can be left between the paper clip and the magnet before the paper clip falls.
- 3 Insert each different sheet between the paper clip and the magnet and record what happens in your results table.

## Results

In your workbook, construct a table like that shown below to record your observations.

| Material | Paper clip stayed/dropped |
|----------|---------------------------|
|          |                           |

## Discussion

- 1 In terms of the strength of a magnetic field, **explain** why the paper clip fell when it was moved further from the bar magnet.
- 2 **List** the materials that allowed a magnetic field to pass through them.
- 3 **List** which materials acted as a magnetic shield.
- 4 Magnetic fields can damage sensitive electronic equipment. **Propose** a use for materials that act as magnetic shields.

## 2 Making an electromagnet

## Purpose

To make an electromagnet and test how its strength can be increased.

## Materials

- 6V lantern battery or a power pack
- large nail or bolt (at least 7 cm long)
- compass
- paper clips
- switch
- 2 insulated wires (one long) with alligator clips

## Procedure

- 1 Test to see if the nail on its own will pick up any paper clips.
- 2 Connect the shorter wire from the battery/power pack to the switch.
- 3 Carefully wind the long wire 10 times around the nail as neatly as you can.

## SAFETY

Take care when connecting your circuits.



- 4 Connect one end to the switch and the other to the power supply as shown in Figure 7.4.18.

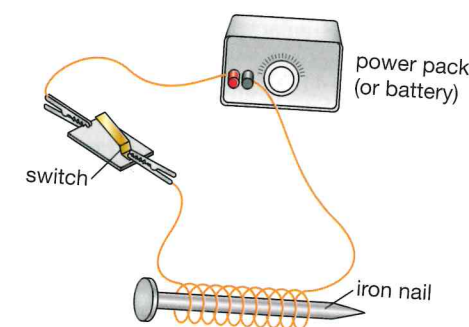


Figure 7.4.18

Setting up your circuit with the electromagnet

## Results

- 1 Copy the table below into your workbook.
- 2 Set the power pack to 6 volts DC.
- 3 Press the switch down and record the number of paper clips raised for each number of turns of the wire.
- 4 Test which end of the nail is the north and south pole using a compass.
- 5 Reverse the connections to the power supply and repeat step 4.

| Number of turns on wire | Number of paper clips picked up |
|-------------------------|---------------------------------|
| 0                       |                                 |
| 10                      |                                 |
| 20                      |                                 |
| 30                      |                                 |
| 40                      |                                 |
| 50                      |                                 |

## Discussion

- 1 **State** the effect of the number of turns of the wire on the number of paper clips picked up.
- 2 **Describe** what happened to the poles of the electromagnet when the connections were reversed.

## 3 Investigating static electricity

## Purpose

To explore static electricity.

## Materials

- plastic comb
- sheet of paper
- woollen material
- balloons
- string
- retort stand and clamp

## Procedure

- 1 Rub the plastic comb vigorously on the woollen material. Bring it close to some tiny pieces of paper. Write down what happens.
- 2 Turn a water tap on and carefully turn it down to get the finest stream that you can of steadily flowing water. Rub the comb with the woollen material and hold it close to the stream of water. Draw a diagram to show what you observe.
- 3 Blow up a balloon and rub it with the woollen material. See if you can make the balloon 'stick' to the wall.
- 4 Blow up a second balloon. Attach a piece of string to each of the balloons and then tie these to a retort stand. Rub both balloons with the woollen material. Draw a diagram to show what happened.

## Discussion

- 1 **Explain** why you could pick up the pieces of paper with the comb.
- 2 **Describe** what happened to the stream of water when the charged comb was brought near to it.
- 3 **Explain** why the water behaved in this way.
- 4 **Propose** an explanation for your observations in the two balloon activities.