

## 1 Electroscopes

An electroscope detects whether an object is charged, and indicates whether it is positive or negative.

## Purpose

To construct an electroscope and use it to test the charge on different objects.

## Materials

- 3M Scotch Magic Tape® or similar
- small plastic cup such as the top from a soft drink bottle
- play dough or plasticine
- 2 plastic straws with an end that can be bent
- marking pen
- plastic comb
- various electrostatic rods (Perspex, ebonite) and cloths (wool, cotton)

## Procedure

## Part A: Testing the tape

- 1 Cut two strips of sticky tape (each about 10 cm long). Record what happens when you hold the two strips of tape close to each other:
  - with their sticky sides facing each other
  - with the sticky side of one tape facing the non-sticky side of the other.

## Part B: Constructing your electroscope

- 2 Make a base by adding play dough or plasticine to the small plastic cup. Then stick the straws in the base and bend the other end so that your set-up looks like Figure 6.1.10.
- 3 Cut two 10 cm lengths of tape. Stick one on your bench, leaving a little overhanging that can be used as a 'handle'. Stick the other tape on top of the first tape, once again leaving a little 'handle'. Label the tape on top with 'TOP'.
- 4 Rip the top tape off and stick it to the arm of one straw. Rip the bottom tape off the bench and stick it to the other straw.

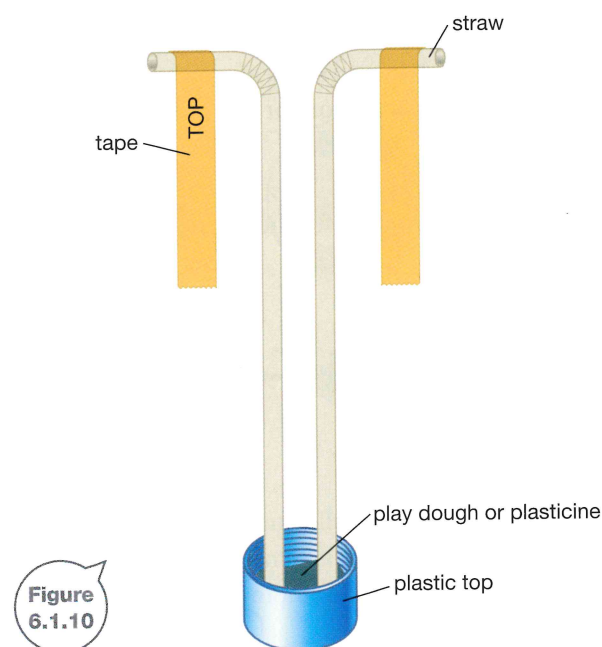


Figure 6.1.10

## Part C: Using your electroscope

- 5 In your workbook, construct a table like the one shown on page 189.
- 6 Rub the plastic comb on your hair. Place the comb near (don't touch) the tapes and record your observations in the table.
- 7 Repeat step 6 with a balloon and different rods rubbed against different materials.
- 8 Finally, point your finger (don't touch) at each of the tapes.

## Results

- 1 Record what you saw when you brought the following sides of the tapes to face each other:
  - a sticky facing sticky
  - b sticky facing non-sticky.
- 2 Record your results to Part C in your table.
- 3 The charge on the comb is negative when rubbed against your hair. Use the results obtained for the comb to predict the charges of the other objects based on what they do to the electroscope.

Object	Rubbed against	Top tape	Unmarked (bottom) tape	Object's charge (+, - or neutral)
Comb	Hair	Attracts	Repels	-
Balloon	Hair			
Perspex				
Ebonite				

## Discussion

- 1 **State** which arrangement of tapes (sticky side facing sticky or sticky side facing non-sticky):
  - a attracted
  - b repelled.
- 2 **Use** the idea of static electricity to **explain** your results in the previous question.
- 3 **Propose** reasons why the tapes were charged after being ripped off:
  - a the roll
  - b each other.
- 4 **Explain** why charged objects repel or attract the tapes.

## 2 How steady are you?

## Purpose

To construct a simple, fun electrical circuit.

## Materials

- 1 wire coat hanger
- wooden board
- 2 screws
- 1 empty plastic pen casing
- sticky tape
- electrical leads
- alligator clip
- globe
- switch
- battery
- access to pliers or multi-grips
- access to screwdriver

## Procedure

- 1 Cut a length of coat hanger wire and bend it into a twisted shape. Use screws to secure it to the wood so that the wire stands upright.
- 2 Cut another length of coat hanger wire and bend one end into a loop around the twisted wire. Insert the other end into the plastic body of a used pen. Secure both ends with tape.
- 3 Connect up the circuit as shown in Figure 6.1.11.
- 4 Test how steady your hand is by trying to pass the loop along the twisty wire without making the globe light up.

## Discussion

- 1 **Explain** why the globe only lights up when you touch the twisty wire with the loop.
- 2 Electrical current can pass along a coat hanger wire. **Justify** this claim.
- 3 Imagine you touched the loop half way along the twisty wire. **Contrast** what is happening to the electrons in each half of the twisty wire when this happens.

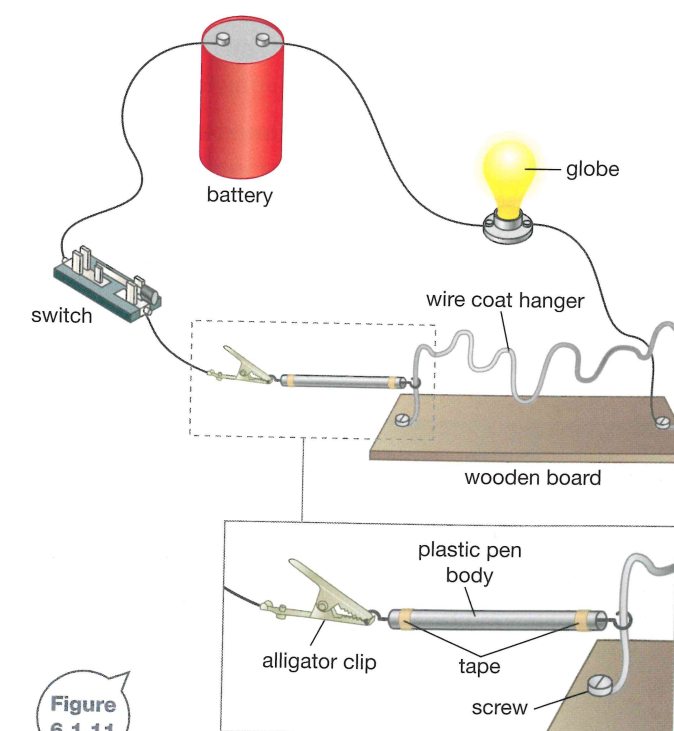


Figure 6.1.11