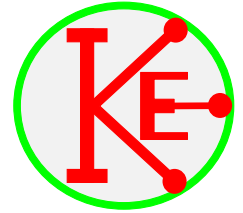


## 28 STEM Squeekie



### EQUIPMENT

- 1 x drilled hardboard, 10cm x 10cm
- 1 x 10cm x 10cm cardboard base
- 2 x bent 22.5cm paper clips
- 1 x 22.5mm paper clip
- 30cm x 2cm thick aluminium foil
- 3 x countersunk M3 x 16mm bolts
- 3 x M3 nuts
- 3 x M3 washers
- 1 x 9.5cm x 2cm drilled hardboard
- 1 x 2cm x 2cm drilled hardboard
- 1 x squeekie unit
- Prit-stik type glue
- Blu-tak

### RISKS

Tiny items - do not eat

Pierce injuries from screw drivers

Do not short circuit cell (battery).

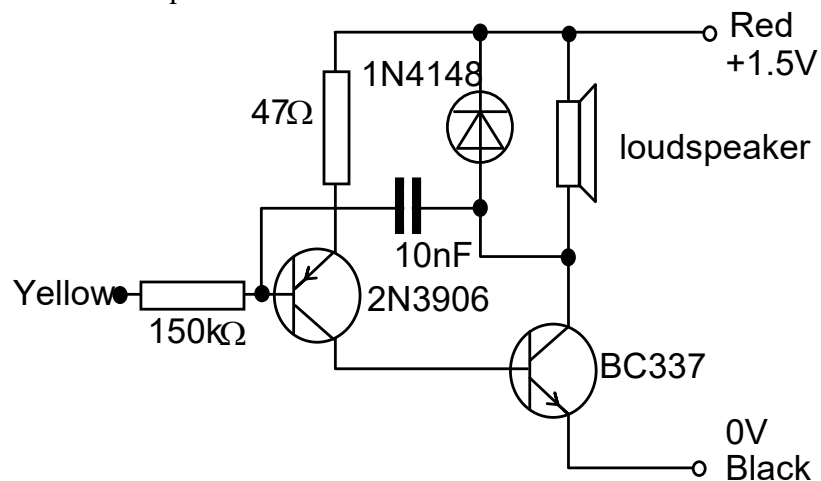
Do not connect squeekie to any powered device.

### SESSIONS

- 1). Construction
- 2). Discussion of what electricity is.
  - Introduce the concept of the electron
  - Discussion of communication
    - Direct and Indirect
    - Communication in history
    - Mobile phones
    - Morse code - uses and practice
- 3/4). Using Squeekie for conductivity and testing devices.
  - Discussion of electricity terms
    - Base on the electron, 'voltage' - their energy, current - how many per second.
    - Warn of danger in testing anything connected to the mains electricity
    - Warn of danger in testing anything containing batteries or cells
    - How to test - fuses, cables, LDR, switches, thermistors (danger of freezer spray), capacitors, etc
    - Students test a range of conductors and insulators.

## SQUEEKIE UNIT

The circuit diagram for the Squeekie unit is shown below.

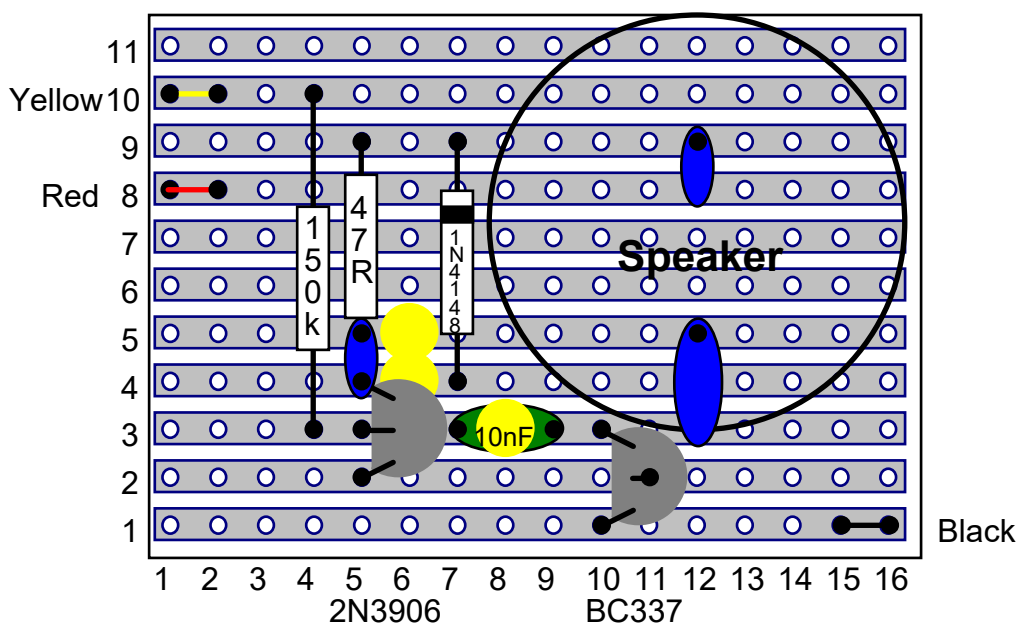


The loudspeaker is a small 8Ω device.

The Squeekie units can be made on strip board, 11 strips by 16 holes

The view is looking down on the components.

Yellow circles are breaks in the copper strip, Blue ovals are solder blobs to bridge the copper strips.



## Construction

1). Aluminium foil.

Need - Glue, scissors and a pencil.

Need - 1 × baseboard and a strip of aluminium foil. Note the aluminium foil is delicate.

Baseboard



Neatly write your name on the base board.

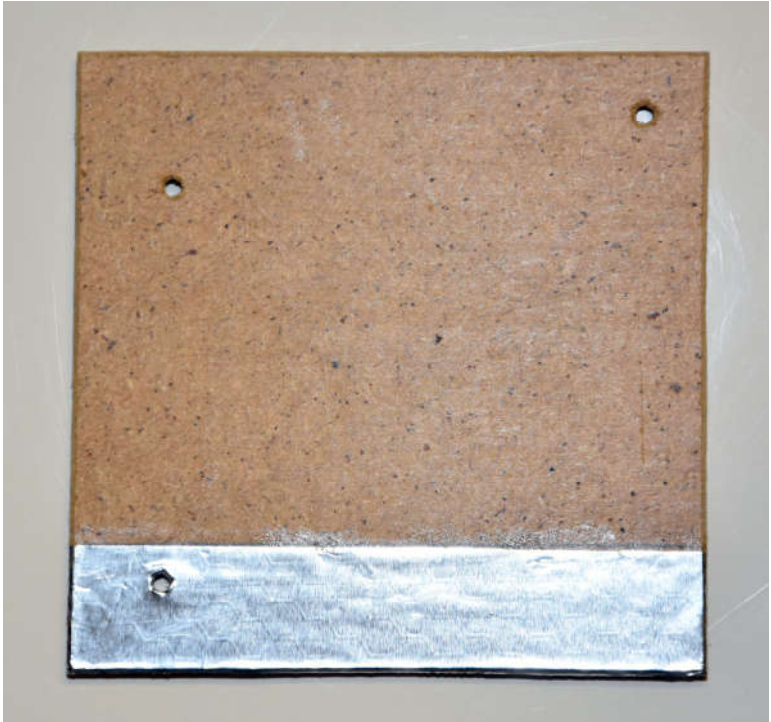
Apply glue to the marked lower part of the baseboard.

Carefully stick a strip of aluminium foil onto the baseboard.

Cut off any excess.



Carefully push the point of a pencil through the aluminium into the hole.



To make the morse code key, you will Need the two pieces of board shown below.



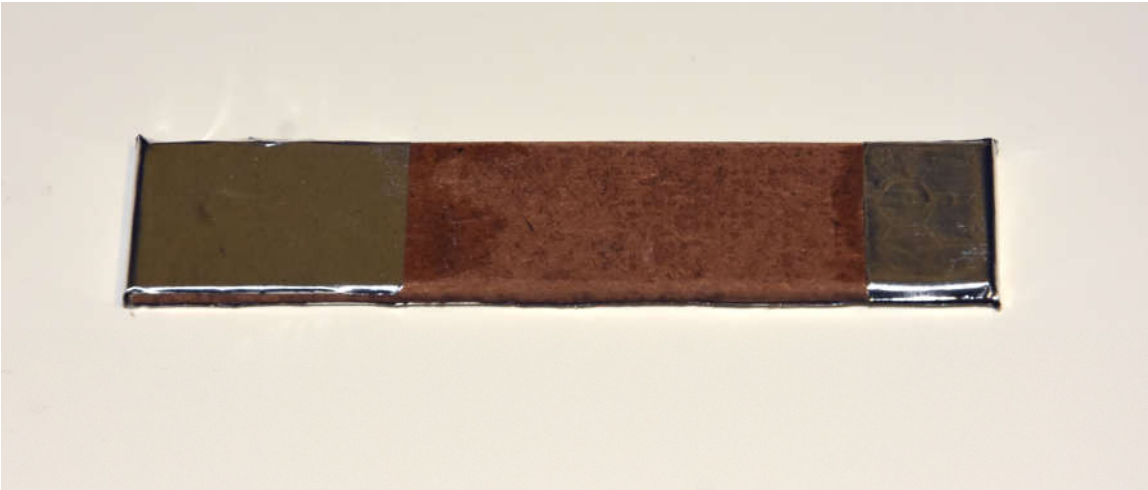
Put a good coat of glue on the rough side of the longer piece of board.



Carefully stick a strip of aluminium foil over the glue.  
It MUST extend beyond the ends of the board.



Turn the board over and put glue on each end of the board.  
Fold over the aluminium foil and stick on to the board.  
Ensure that the aluminium foil covers the hole in the board.



Push the point of a sharp pencil through the aluminium foil to remake the hole.



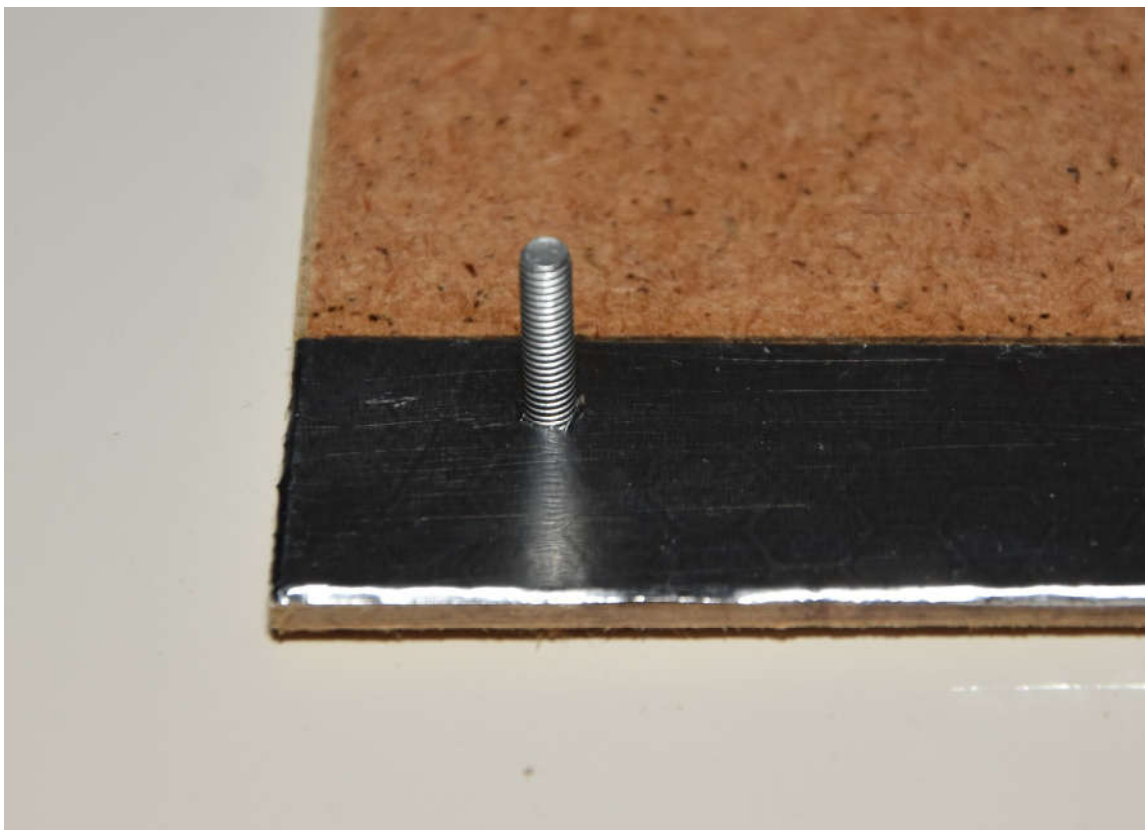


Bolts, washers and nuts are used to fix parts to the baseboard.

Need - 3 × bolts, 3 × nuts and 3 × washers.



Carefully, push a bolt through the hole in the aluminium foil on the base board.



Need - 2 × bent paper clips and 1 × straight paper clip.

Put one of the bent paper clips over the bolt and then place a washer on top. Make sure the paper clip is the right way round.



Carefully screw a nut onto the bolt. Hold the nut and paper clip with your finger and thumb of your left hand and **CAREFULLY** tighten the bolt with a screwdriver in your right hand.



This makes the negative connection for the 'AA' cell.



Use another bolt, paperclip, washer and nut to make the positive connection for the 'AA' cell.



Need - AA cell.

Check that an 'AA' cell fits in between the paperclips.



Put a bolt through the last hole in the base board and then fit the small, square piece of board onto the bolt.

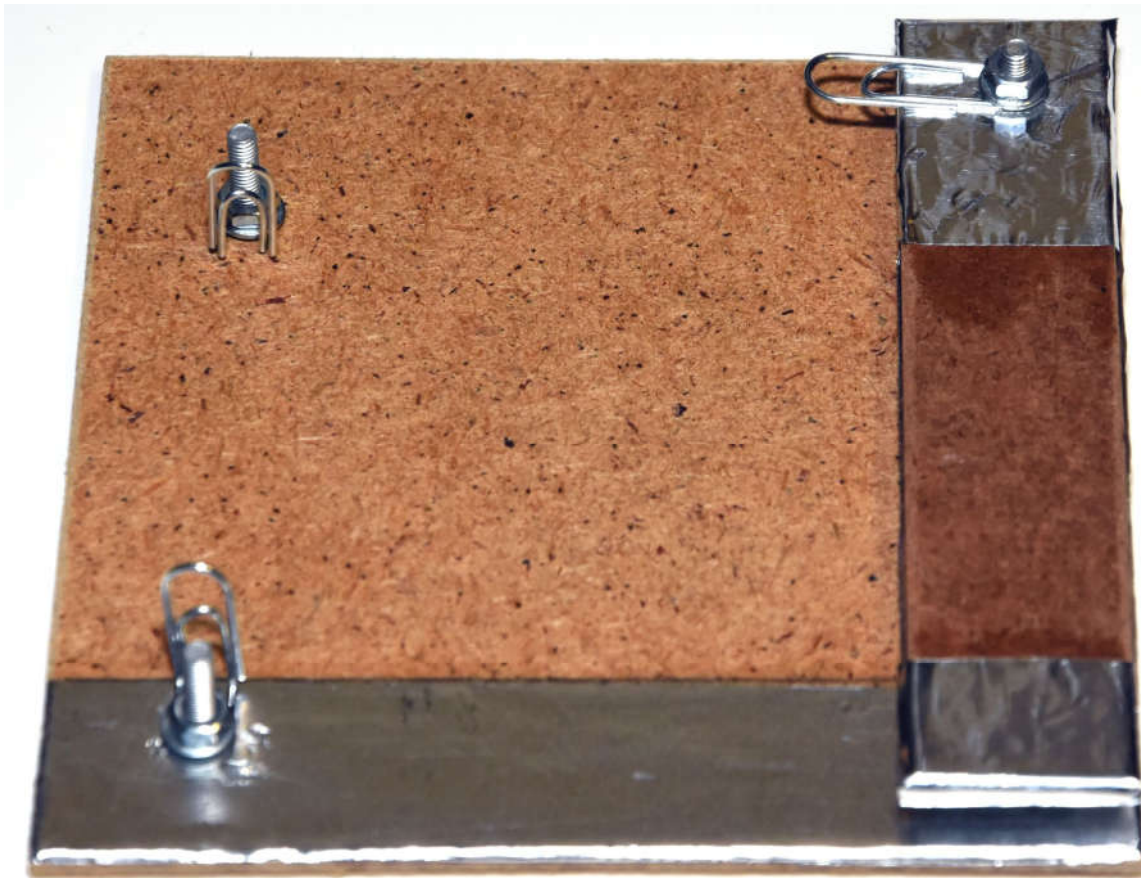


Put the morse key board onto the bolt.

Put a paperclip onto the bolt with the lip pointing down.

Put a washer onto the bolt.

Screw a nut onto the bolt and carefully tighten with a screw driver.



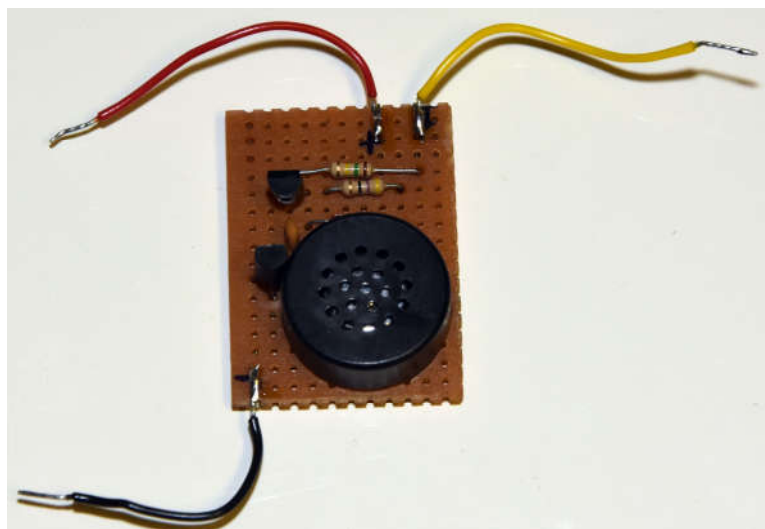
Need - 1 × squeekie oscillator.

The oscillator has three leads.

The red lead goes to the + connection of the AA cell.

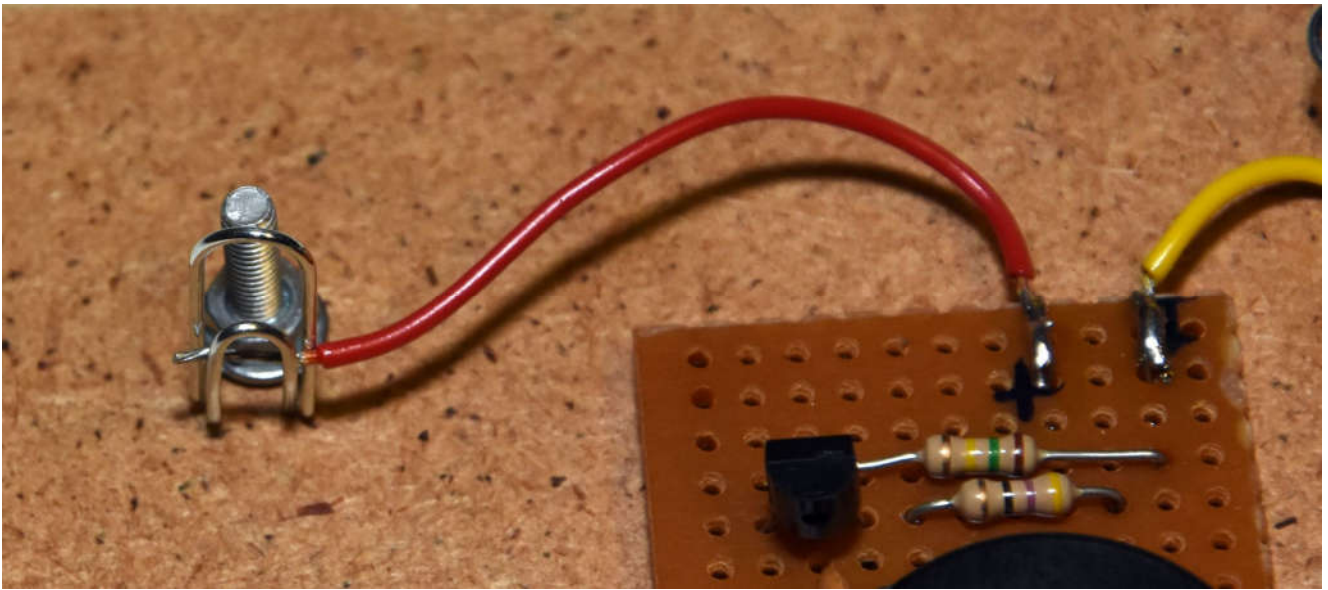
The black lead goes to the – connection of the AA cell.

The yellow lead is the control input and goes to the morse key.

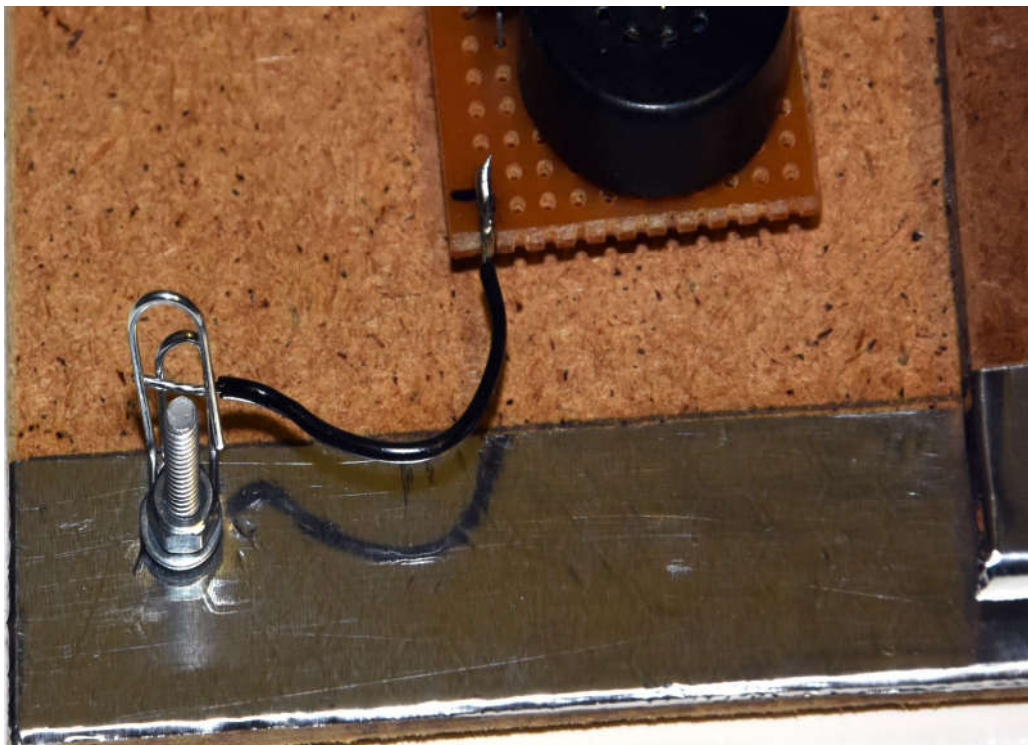




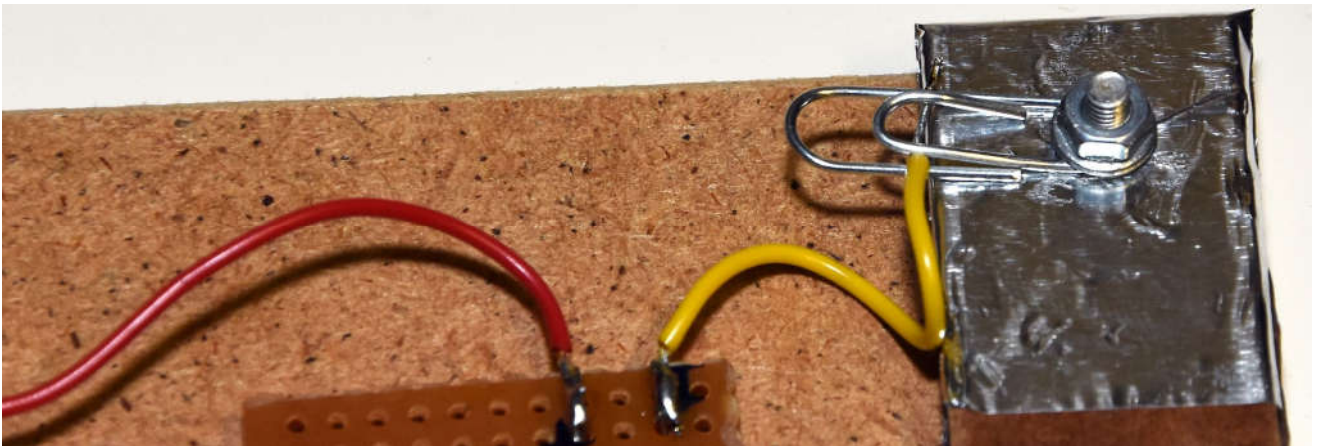
Ensure that the bared part of the red lead is put in between the parts of the paper clip making the positive cell connection.



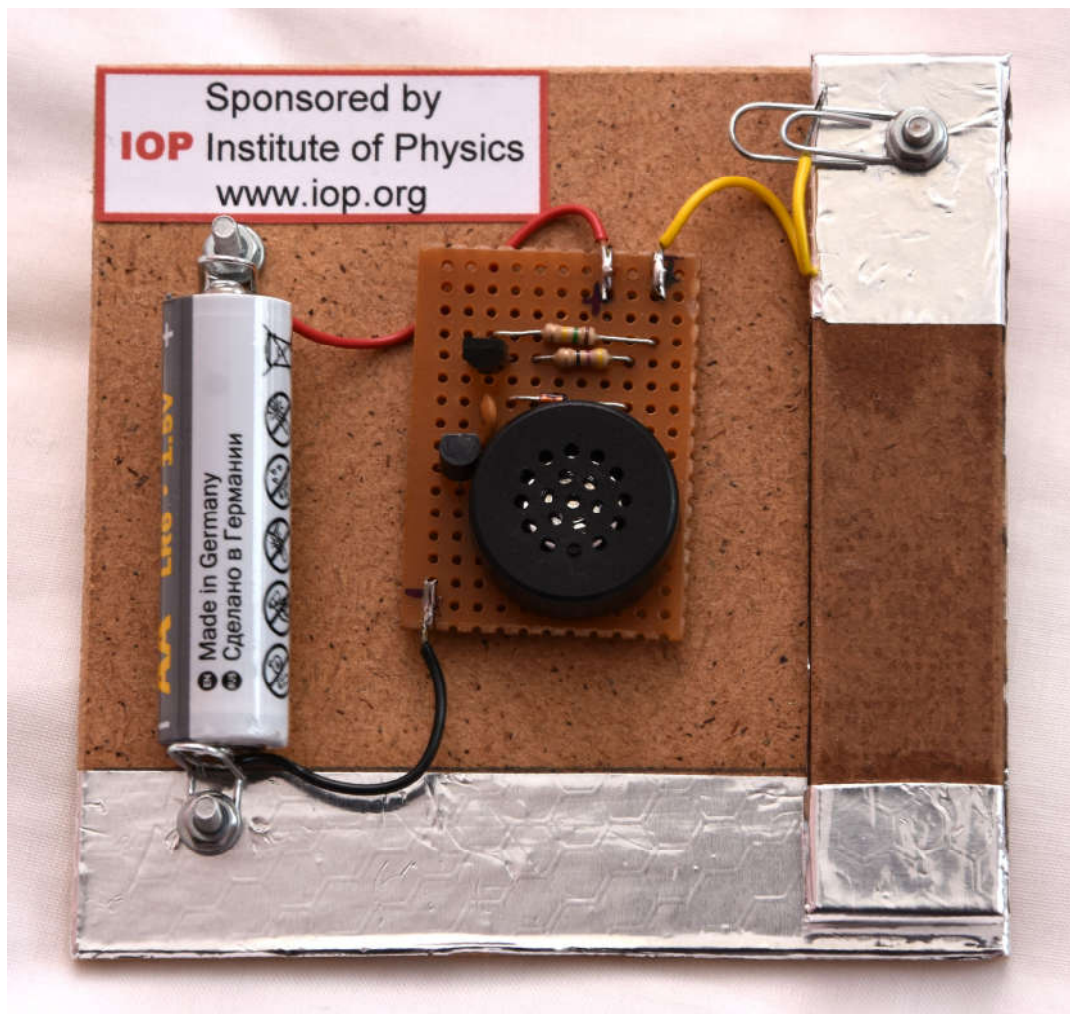
Ensure that the bared part of the black lead is put inbetween the parts of the paper clip making the negative cell connection.



Ensure that the bared part of the yellow lead is put inbetween the parts of the paper clip on the morse key.

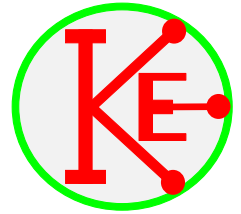


Put a small piece of Blu-tac under the oscillator to fix it to the baseboard.  
Put two small pieces of Blu-tac onto the baseboard where the AA cell fits.  
Put an AA cell in between the paper clips and push into the Blu-tac.



Press the morse key. If all is well a sound will be heard.  
If not, check the connections and check that the cell is making good contact with the paper clips.

## Electricity



What is electricity?

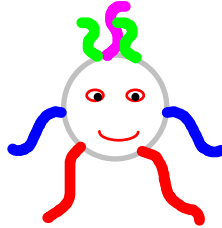
What are electrons?

size 1million, million in 1mm

mass 1million, million, million, million, million in a bag of sugar.

What do they look like?

mental image -



The smallest amount of electric charge - a quantum of charge.

Potential difference - (Voltage) - the energy of the electrons - measured in Volts.

Electric current - the number of electrons flowing per second - measured in Amps.

If electrons pass freely through a material - Good Conductor.

If electrons pass with difficulty through a material - Poor Conductor.

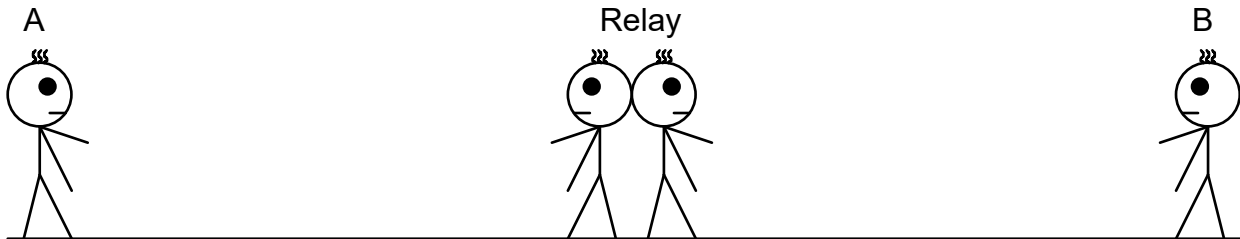
If electrons do not pass through a material - Insulator

## Communication

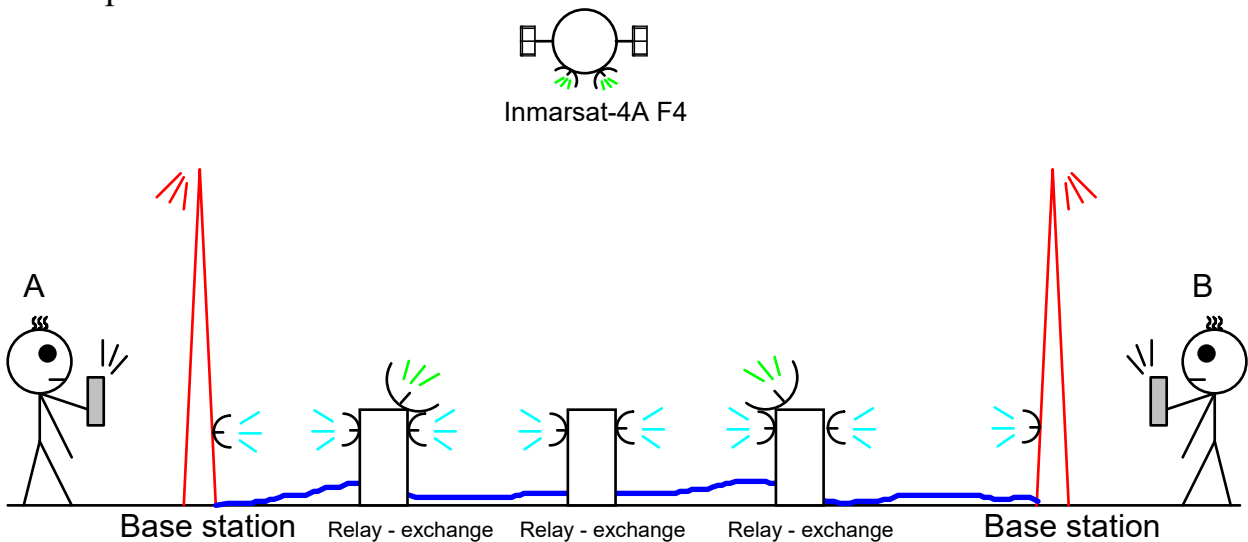
### Direct



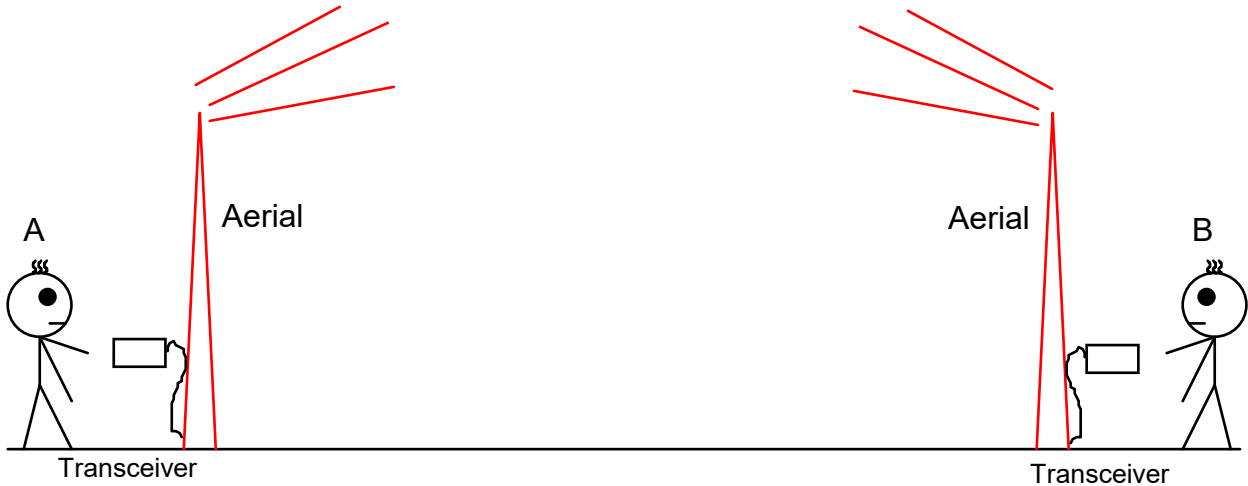
### Indirect



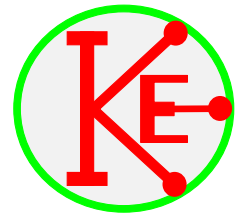
### Mobile phones - Indirect



### Radio - direct







**NAME:** .....

### Using Squeekie to test conductivity.

Clip the **BLACK** lead to the negative (black) bolt of the 'battery' connector, and the **RED** lead to the morse key bolt.

Touch the test wires onto the object being tested.

If Squeekie makes a high note, it is a good conductor.

If Squeekie makes a low note or croaks, it is a poor conductor.

If Squeekie is silent, it is an insulator.

Test the following materials and tick the box which best describes the material.

When you are using the **INSULATION** setting, ensure that your fingers do not touch the contacts as your fingers are poor conductors and your results will be incorrect.

Material	Good conductor	Poor conductor	Insulator
Paper			
Wood			
Plastic			
Copper			
Iron nail			
Cardboard			
Tin can			
Rubber			
Pencil lead			
Glass			
Aluminium			
Potato			
Potato skin			
Stone			

**Using Squeekie to test devices.**

**NEVER CONNECT TO ANY DEVICE CONNECTED TO THE  
MAINS ELECTRICITY  
OR THAT CONTAINS A BATTERY**

<b>Device</b>	<b>Notes</b>
Fuse	
Cable	
Diode	
LDR	
Thermistor	
Capacitor	
Switch	
Playdoh	
Water	
Vinegar	
Milk	

