ELECTRICITY AND MAGNETISM: HANDS-ON ACTIVITIES

- Objectives
- Balloons: static electricity
- Electric Circuits: dynamic electricity
- Pictures of Magnetic Fields: magnetism
- Facts Sheet: Electricity and Magnetism; put it to the test.
- Record Sheet

Hands on Activity
Electricity and Magnetism:
Put it to the Test!

1. **Balloons: static electricity**
2. **Electric circuit: current electricity**
3. **Magnetic fields prints: magnetism**

The purpose of this activity is to prove right the facts sheet Electricity and Magnetism: Put it to the Test, by carrying out three experiments.
Every experiment should begin with the reading of this fact sheet, and it should end with checking if the experiment proves some of the facts. The survey sheet and record sheet can also be used with either activity.

- **Objectives: 1. To understand the properties of repulsion and attraction that rule electricity and magnetism. 2. To show understanding of what the electric current is and how an electric circuit works. 3. To learn that magnets produce magnetic fields and so does the Earth.**

1. BALOONS

- **Before you start:** With this activity, the children will prove that objects can become electrically charged, and that this will produce an attraction or repulsion effect upon other objects. They will make a balloon move around following their hands but without touching, and they will see that two charged balloons will repel each other.

You will need:

- Two balloons of two different colours per group
- String or yarn to tie the balloons
- Sticky tape
- Two pegs per group
- A duster or wool cloth per group

Procedures: part I

1. Give each group two balloons, each of a different colour, two pieces of string or yarn, and two pieces of sticky tape.

2. Ask the children to inflate the balloons (not too much) and tie a knot at the open end. Inflate both balloons to a similar size to make the test fair.

3. Tie the string to the knots, and stick them separately to the table, so you don't have all the balloons rolling around the classroom.

4. Explain the children that they will test how the two balloons behave, after they rub one of them with the wool cloth but not the other. Write this question on the board: Will the two balloons behave the same way? Have children write the question and prediction on the experiment record sheet.

5. Ask the children to rub one of the balloons with the wool cloth, but not the other.

6. Now ask the children to move their open hand near the balloon they didn't rub, but without touching it. Demonstrate if necessary (nothing should happen). Then ask them to do the same with the balloon they rubbed (the balloon should follow their hand and spin around as they move their hand.

7. Complete the record sheet.

Procedures: part II

1. With drawing pins, tie a string from the back of one chair to the back of another chair (approximately 1 meter distance).

2. Hang the two balloons with the pegs.

3. Write this question on the board: Will the balloons behave the same way when I rub only one of them and when I rub both? Have the children write the question on record sheet.

4. Ask the children to rub only one balloon and write observations on record sheet (the balloons will attract each other).

5. Now ask them to rub both balloons and write their observations (the balloons will move away from each other).

6. Ask the children to hold their hand between both balloons, and write their observations (both balloons will be attracted to the hand).

7. Have children write their conclusion on the record sheet.

2. ELECTRIC CIRCUIT

- **Before you start:** This activity will demonstrate how an electric circuit works, and what elements are necessary. The children will also see that electricity can produce light and heat (by touching the light bulb).

You will need:

- A 'D' battery or 9v battery per group
- Two pieces of insulated wire per group
- A cutter to strip the plastic off the end of the wire
- A 2.5 volts light bulb per group (have extra ones)
- A light bulb holder per group
- Two pins or screws to hold the bulb holder in place
- A Styrofoam plank or thick cardboard to make a base
- Sticky tape to fix the battery
- Diagram sheet per group

Procedures:

1. Write this question on the board: Will the light bulb light up?

2. Give each group a Styrofoam or cardboard plank (20cm x 10cm aprox) to make a base for the circuit. With blunt scissors, they can carve a bed at one end of the base for the battery, or stick it to the base with tape.

3. Give each group the rest of materials and diagram.

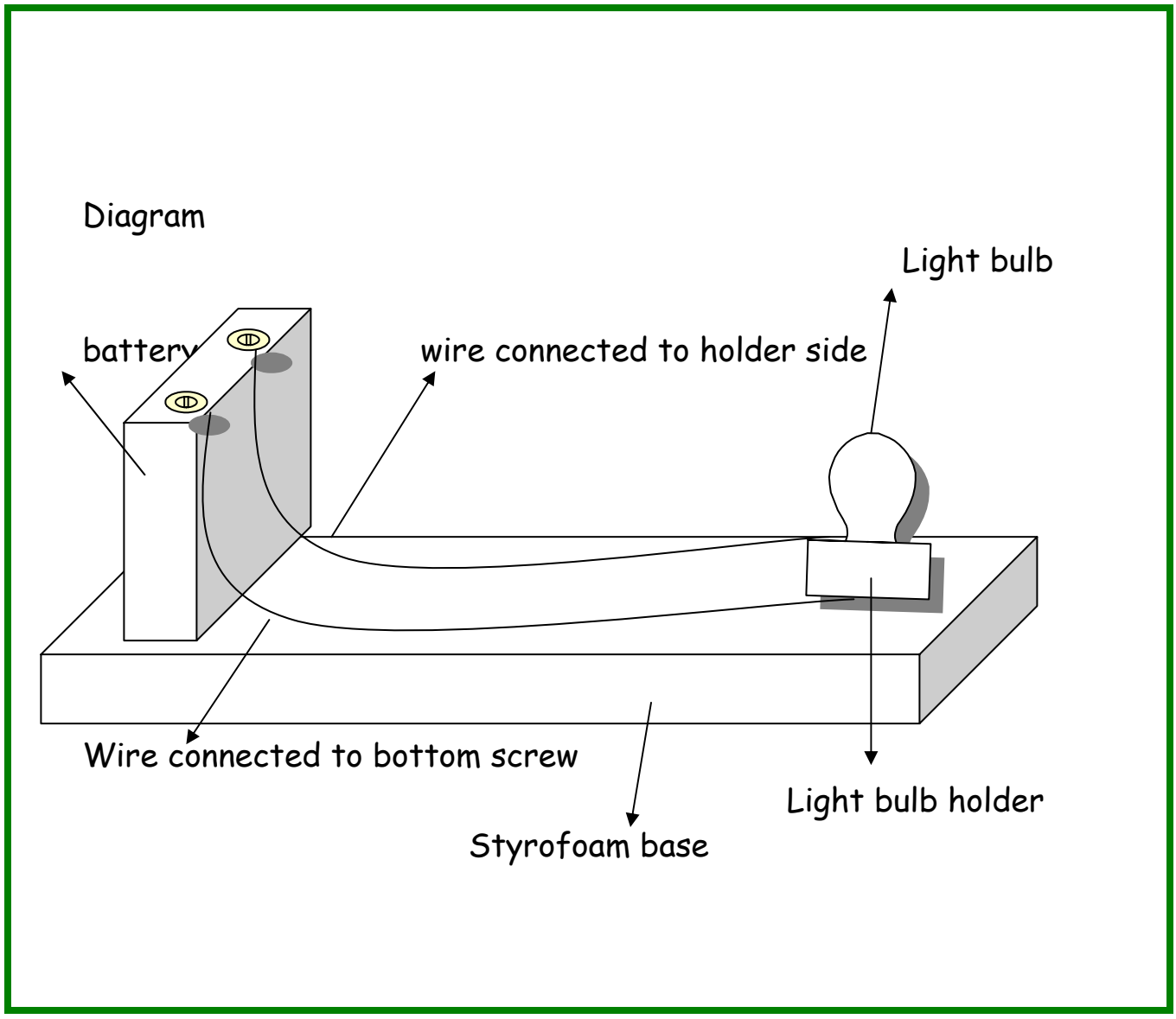
4. Tell the children to coil the stripped end of one of the wires around the screw underneath the light bulb holder, and to coil the other wire around the side of the light bulb holder.

5. Now have them pin the holder to the Styrofoam.

6. Ask them to complete the circuit. If they finish quickly, help them to add a switch using paper clips. You can add a second light bulb to the circuit too.

7. Have the children complete the record sheet, and draw a labelled diagram on the back of it.

Simple Circuit Diagram



3. MAGNETIC FIELDS PRINTS

- **Before you start:** This activity will show the children what magnetic fields look like and how they operate. With a shoebox and a bar magnet underneath, they will create magnetic fields prints out of iron filings.

You will need:

- The top of a shoebox per group, or a piece of card.
- A bar magnet per group (you can buy them at the hardware shop).
- A small zip-lock bag with iron filings per group (ask for the filings at a place where they cut keys, possibly the hardware shop where you are buying the magnets).
- An aluminium baking pan, tray, or similar per group.
- Sticky tape to stick the card to the aluminium tray or pan.

Iron filings under magnetic field

Procedures:

1. Write this question on the board: What does a magnetic field look like?

2. Give each group the aluminium tray, the shoebox top, the magnet and the iron filings.

3. Ask the children to place the magnet in the centre of the tray, and the cardboard on top of the magnet.

4. Warn the children that if they let the iron filings get in direct contact with the magnet, they will spend a whole week's playtime clearing the filings off the magnet…

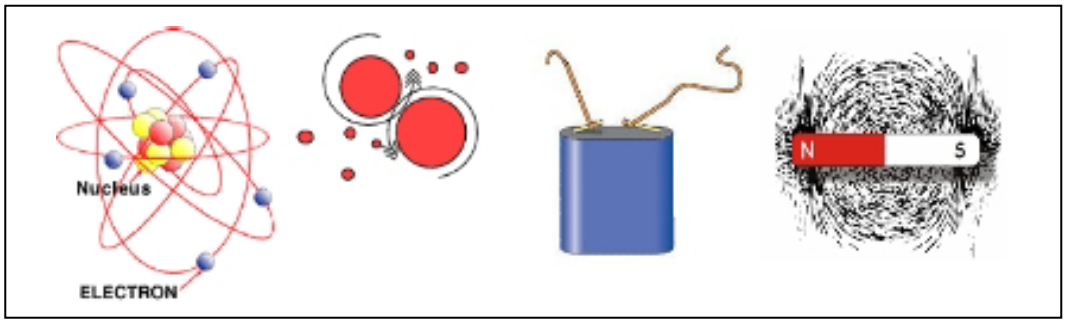
5. Tell the children to sprinkle the iron over the cardboard, to create a clear pattern. If necessary, remove the filings and try again until a clear pattern appears.

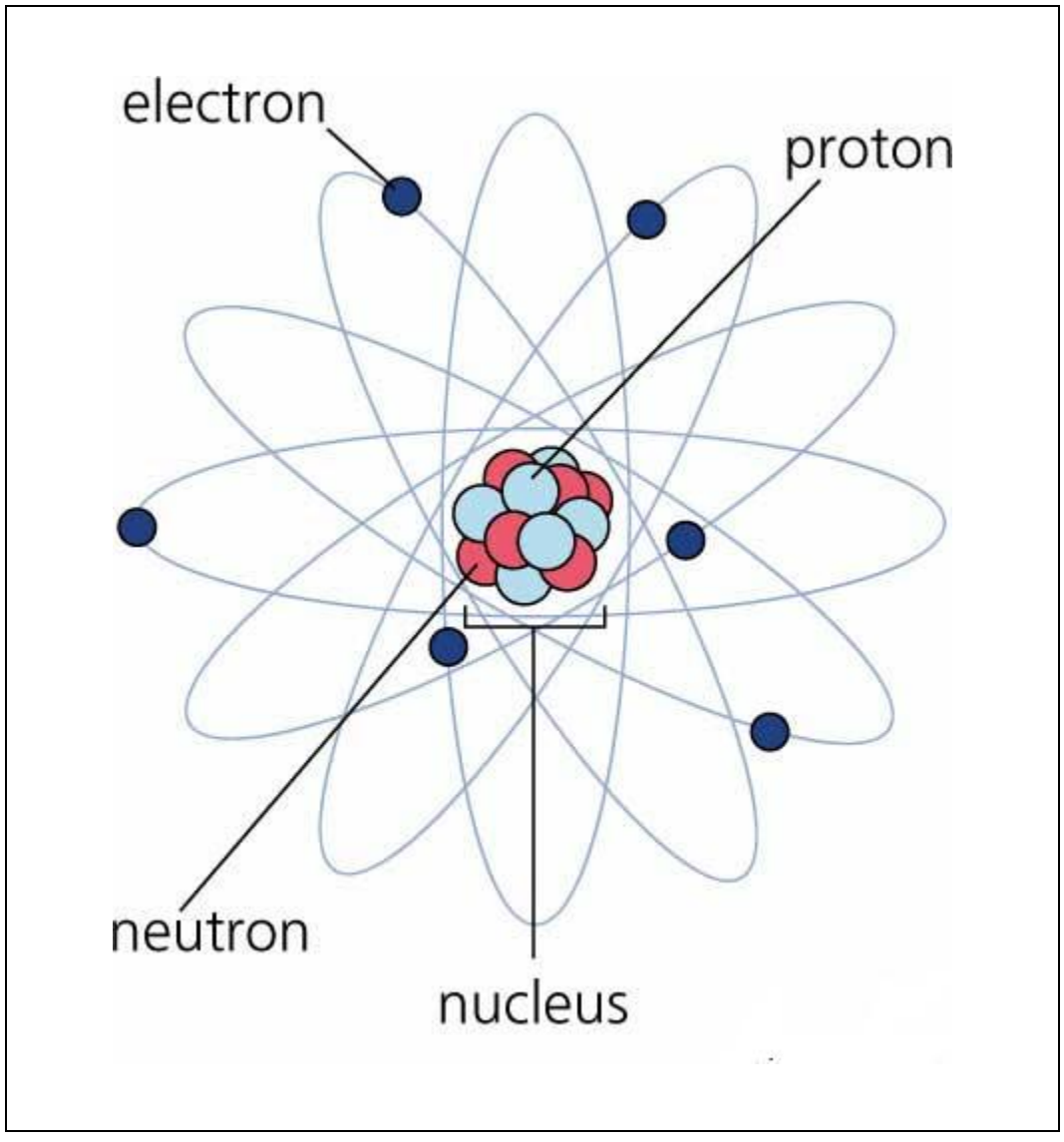
6. Ask the children to write their observations and conclusion on their record sheet, and ask them to draw a sketch of the magnetic fields on the back of the sheet.

Extension: have the children feel the magnetic field. Place one bar magnet on the aluminium tray, and ask the children to grab another magnet, place it above the one on the tray and move it slowly.

ELECTRICITY AND MAGNETISM

Put it to the test!





- **Electricity** is a type of energy. Energy is the capacity to do work. We use electricity for all sorts of works; get light in our homes, start the car, play music, watch television, and many more.
- **This is how electricity happens:** All matter is made out of incredibly tiny parts called **atoms**. Atoms have a **nucleus**, with neutrons, and protons. Neutrons are neutral, and **protons are positive**. Spinning around the nucleus, there is a cloud of tiny particles called **electrons, which are negative.**
- **Atoms like balance:** atoms like the same number of positive protons as of negative electrons. But electrons can move from one atom to another, creating an unbalance. When this happens, we say **there is a negative charge** in the atom that picked the new electron, and **a positive charge** in the atom that lost it.
- **Once the atom is negatively charged,** it will look for balance, and so the extra electron will begin to travel looking for a positively charged atom. **This is the electric current! Many electrons travelling in search of positive atoms.**
- In their search, **electrons will attract their opposite: negative and positive attract; positive and positive repel; negative and negative repel.**

- **Static electricity is** what happens when you rub an object against another, and one of them loses electrons and the other gains them. They will tend to stick together, to recover the balance in their atoms.
- **Electrons** travel well through **conductors**, and they find resistance in **insulators**. This is why the wires in an electric circuit are made of copper, but they are covered in plastic.
- **An electric circuit** needs a source of electricity, like the mains, or a battery, wires for the electric current to flow, and the device we want to make work; a light bulb, a motor, a buzz. All of it has to be connected.
- **The mains** get the electricity from a power station, and the current is very high (220 volts). This is a very strong voltage and it can kill a person, **so you mustn't experiment with this type of electricity.**
- **Batteries** produce electricity mixing chemicals, and they have a lower voltage. We can use them safely to learn how to make a circuit. **Batteries have a positive end and a negative end,** to allow the electrons (-) to flow in search of the positive end (+).
- **Magnetic attraction** is an energy that allows a magnet to pick up things made of iron or steel. Some rocks have this property naturally. These rocks produce a magnetic field, or area of attraction. The energy always flows from one end (pole) of the magnet to the other. Under this magnetic field, magnetized items will be attracted or repelled, depending on the pole they face, in a similar way to electricity.
- **The Earth is surrounded by magnetic fields**, and this is why a compass points north and south.

EXPERIMENT RECORD SHEET

Question: (What we want to test)

Procedures: (How we conducted the test)

Conclusion: (why)