Activity 1: Build, Label, and Test a Mini Circuit Map

Objective

- To identify and use common circuit symbols correctly.
- To understand how a complete circuit allows current to flow.
- To connect the idea of a circuit diagram with a real working model.

Materials Required

- 1 small torch bulb with holder or LED
- 2 cells of 1.5 V each with holder
- Connecting wires with clips or stripped ends
- Switch
- Chart paper or notebook
- Pencil, ruler, coloured pens
- Common circuit symbol chart: cell, battery, bulb, switch, wire

Setup Instructions

- Arrange all materials on a flat table.
- Keep the battery/cell disconnected until the circuit sketch is ready.
- Draw a simple workspace on chart paper with space for:

Circuit diagram

Symbol key

Observation notes

- If using an LED, remind students to connect it in the correct direction.

Step-by-Step Procedure

1. **Observe the symbols**

Look at the symbols for cell, battery, switch, bulb, and wires.

Copy each symbol neatly into a symbol key section.

2. **Plan the circuit**

Draw a simple circuit diagram with:

one battery

one switch

one bulb

Predict: Will the bulb glow if the switch is open? Why?

3. **Build the circuit**

Connect the battery, switch, and bulb using wires.

First keep the switch open.

Close the switch and observe what happens.

4. **Test changes**

Add a second cell to make a battery.

Compare brightness with one cell and two cells.

Draw attention to how more cells may increase current and brightness.

5. **Record and compare**

Write down:

When the bulb glowed

When it did not glow

Which arrangement gave the brightest light

6. **Label the final diagram**

Draw the actual circuit you made.

Label each component using its correct symbol.

Expected Learning Outcomes

- Students will be able to:

Recognize and draw basic electrical symbols.

Explain that a closed circuit is needed for current to flow.

Compare the effect of one cell and two cells on bulb brightness.

Link a real circuit to its diagram representation.

Optional Reflection or Extension Task

- Write 3 reasons why a bulb may not glow in a circuit.
- Challenge: Redraw the circuit so that it includes two bulbs in series and predict what will happen.
- Reflection question: Why is a circuit diagram useful before making a real circuit?

Activity 2: Heat Detective — Exploring the Heating Effect of Current

Objective

- To investigate how electric current can produce heat.
- To understand that some materials and wires get warmer when current flows through them.
- To connect the heating effect to real-life appliances.

Materials Required

- 1.5 V or 3 V battery pack
- Connecting wires
- Small torch bulb or LED
- Thin resistance wire or nichrome wire piece, if available
- Paper clip
- Small piece of cardboard or thermocol base
- Tape
- Stopwatch or clock
- Notebook for observations

Setup Instructions

- Work on a heat-safe surface.
- Use only small batteries, not mains electricity.
- Prepare two simple test circuits:

Circuit A: bulb with battery

Circuit B: wire segment connected across the battery for a short time

- Keep the contact time very short to avoid overheating.

Step-by-Step Procedure

1. **Predict first**

Ask: Which parts of a circuit may become warm after current flows?

Write a prediction in the notebook.

2. **Observe a working bulb circuit**

Connect the bulb to the battery using wires.

Let it glow for 20–30 seconds.

Carefully touch the bulb holder area, not the hot filament.

Note any warmth.

3. **Test the wire effect**

Connect the resistance wire/nichrome wire across the battery for just a few seconds.

Observe whether it becomes warm.

If using a paper clip, compare whether it warms less or more than the resistance wire.

4. **Compare materials**

Record which material seemed to heat faster.

Discuss why thin resistance wire may heat up more than thicker metal parts.

5. **Relate to daily life**

List appliances that use heating effect, such as electric iron, toaster, kettle, heater, or fan heater.

6. **Make a conclusion**

Write one sentence explaining how electric current can produce heat in a conductor.

Expected Learning Outcomes

- Students will be able to:

Describe the heating effect of electric current.

Observe that some wires and components can become warm when current flows.

Compare materials based on how much heat they produce.

Connect the concept to household appliances.

Optional Reflection or Extension Task

- Draw a “heat appliance circuit” and label the parts.
- Think and write: Why are wires in appliances covered with insulation?
- Extension: Find two school or home appliances that use heating effect and explain their purpose.

Activity 3: Magnetic Lift Challenge — Making a Simple Electromagnet

Objective

- To show that electric current can produce a magnetic effect.
- To observe how an electromagnet works.

- To investigate how the number of turns in a coil can change magnetic strength.

Materials Required

- Iron nail or bolt
- Insulated copper wire
- 1–2 dry cells or a small battery pack
- Paper clips or safety pins
- Tape
- Sandpaper or a knife to remove insulation from wire ends
- Notebook and pencil

Setup Instructions

- Prepare the wire by removing insulation from both ends.
- Keep battery connections brief to prevent heating.
- Place paper clips in a small pile for testing attraction.
- Make sure the nail is clean and dry.

Step-by-Step Procedure

1. **Make the coil**

Wind the insulated copper wire tightly around the iron nail.

Leave two free wire ends for connection.

Count and write the number of turns, such as 20 or 30.

2. **Create the electromagnet**

Connect the wire ends to the battery terminals.

Bring the nail near paper clips.

Observe whether it picks them up.

3. **Test magnetic strength**

Count how many paper clips the nail can lift.

Disconnect the battery and check whether the nail still attracts paper clips.

Notice that the magnet effect stops when current stops.

4. **Change the number of turns**

Rewind the coil with more turns, if possible.

Repeat the test and compare the number of paper clips lifted.

5. **Record findings**

Make a simple table for:

Number of coil turns

Number of paper clips lifted

Strength of attraction

6. **Discuss real-life use**

Identify where electromagnets are useful, such as cranes in scrapyards, electric bells, and headphones.

Expected Learning Outcomes

- Students will be able to:

Explain that electric current can create a magnetic effect.

Build a simple electromagnet.

Observe that more coil turns can increase magnetic strength.

Connect the idea to common devices using electromagnets.

Optional Reflection or Extension Task

- Draw a labelled diagram of your electromagnet setup using correct circuit symbols.
- Write a short comparison: permanent magnet vs electromagnet.
- Extension: Design a mini “paper clip picker” challenge and predict how to make it stronger.
