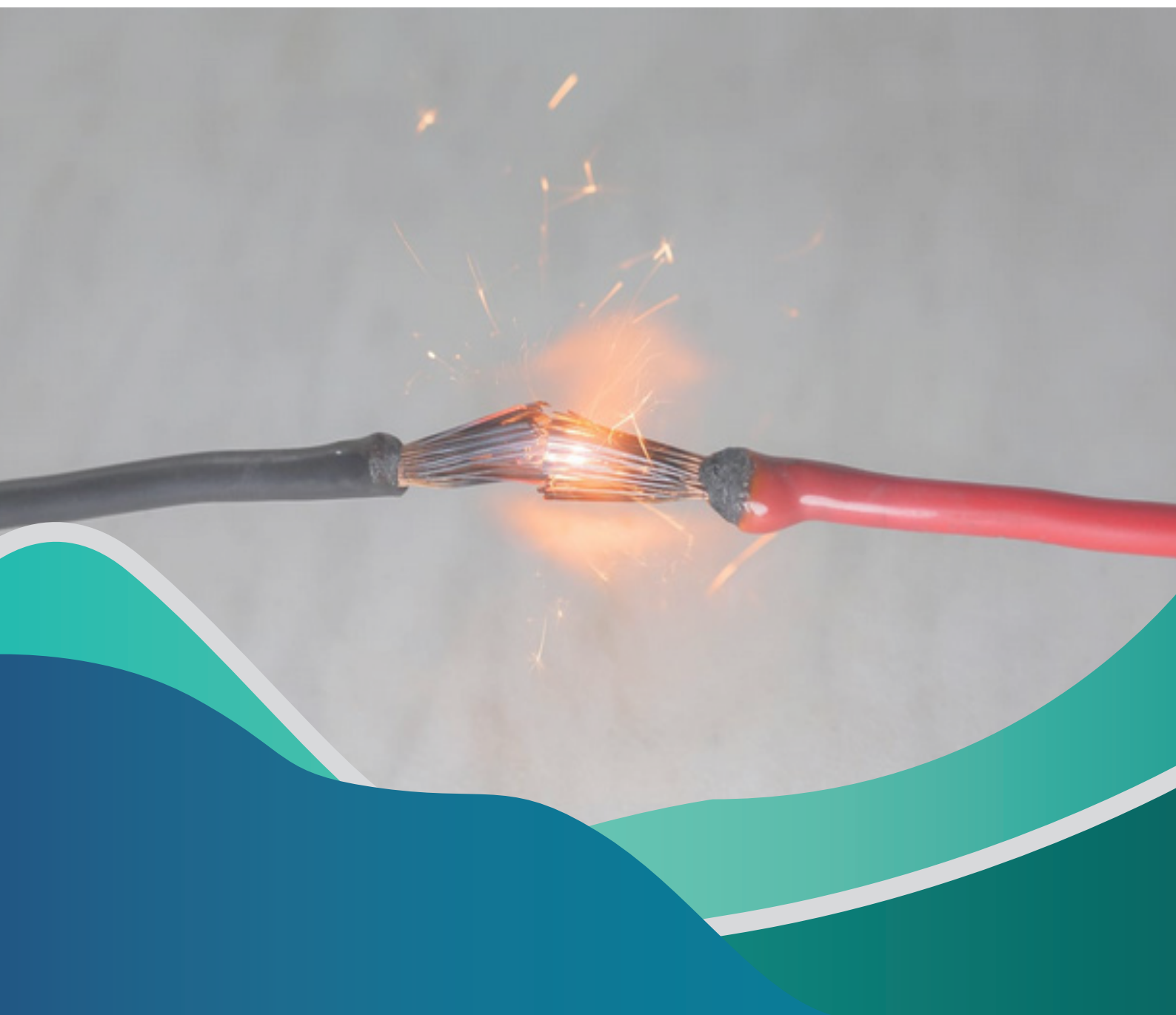


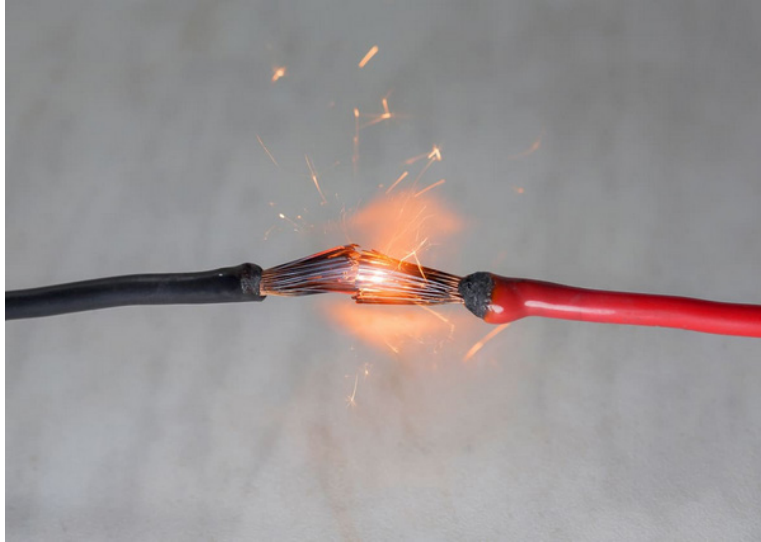
DOMESTIC APPLIANCE MAINTENANCE

Lesson 3: Teacher's guide

Short circuit



A. Understanding what is a short circuit, its danger and how it can be avoided



B. Competencies

Main competency: Identify and mitigate potential electrical hazards in appliances and work environments.

Sub competencies:

1. Identify risks associated with overloading sockets or using damaged appliances.
2. Explain how to prevent short circuits and electrical shocks.
3. Propose practical solutions to mitigate identified hazards (e.g., unplugging appliances, repairing broken wires).
4. Recognise common electrical hazards (e.g., exposed wires).
5. Correctly identify components such as switches, fuses, wires, and bulbs in appliances.

C. Learning outcomes

By the end of this lesson, students should be able to show an understanding of:

1. what is a short circuit
2. how a short circuit occurs

3. why a short circuit can be dangerous
4. how to avoid short circuits in simple circuits.

D. Resources and materials

Set of items for students working in groups of 4:

For Activity 1:

- Two 1.5 V cells and cell holders
- Connection wires
- Bulb of 2.5 V
- Bulb holders
- Piece of wire (for short circuit)

For Activity 2:

- 1.5 V cell and cell holder
- 9 V cell and cell holder
- Two crocodile clips (mounted on a small wooden block)
- Two connection wires
- A few pieces of steel wool (about 2 cm long)

E. Implementation guidelines

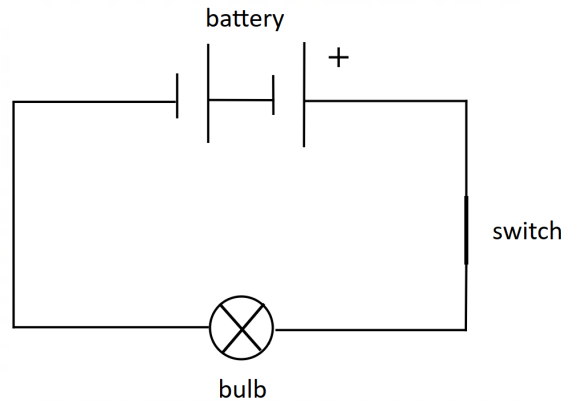
Introduction

- Begin with a brief discussion about electrical safety:
- Ask students: “What happens if wires touch each other accidentally?”
- Explain that when wires bypass the load (like a bulb) and connect directly to each other, it creates a short circuit.
- Emphasize that short circuits can cause overheating, damage batteries, or even start fires.

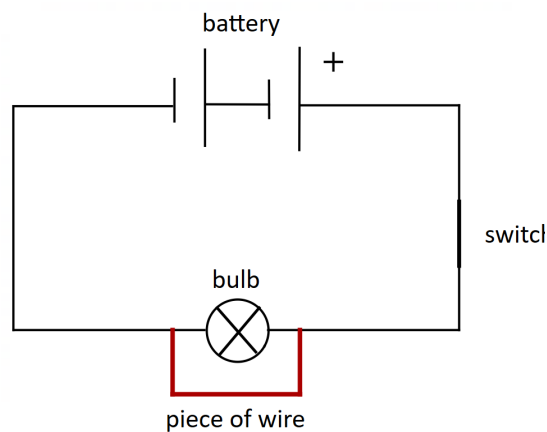
Activity 1: Creating a Short Circuit

Instructions:

1. Ask the students to connect the circuit as shown.



2. Switch on and confirm that the bulb lights up.
3. Switch off the circuit.
4. Instruct them to connect a piece of wire directly across the two terminals of the bulb (effectively short circuiting the bulb).



5. Switch ON the circuit. Do NOT touch the wire. Observe what happens.

Some possible observations are:

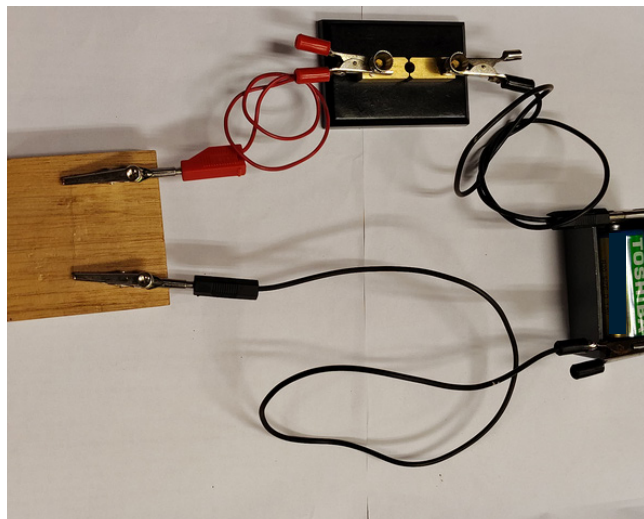
- The bulb may not light up.
- The piece of wire may heat up slightly.
- The battery may drain quickly.

6. Allow students to physically trace the flow of electricity in the circuit to see where the short circuit occurs.
7. Remove the piece of wire and observe what happens to the bulb.
8. Discuss the results:
 - What happened to the bulb when the piece of wire was connected? (It does not light up because the electricity flows through the shortest path).
 - Why did the wires get warm? (The electricity took the easiest path, creating a short circuit, large current flows).
 - What happened to the bulb when the piece of wire was removed? (It lights up again because the electricity flows through it again).

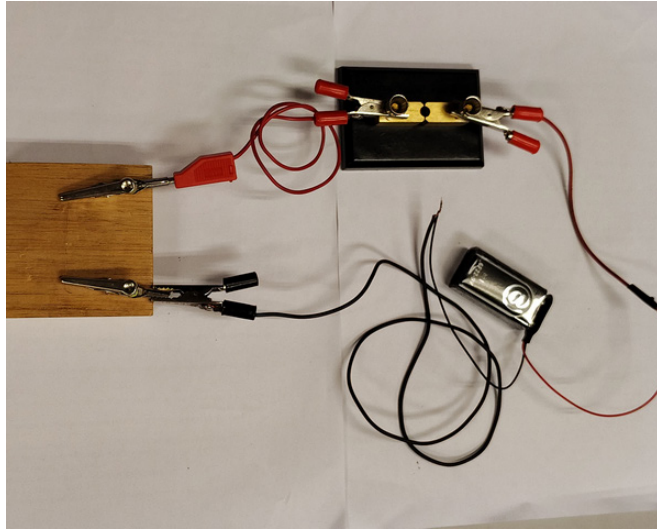
Safety Aspect: Remind students NOT to hold the wires for too long during the short circuit, as they can get hot.

Activity 2: Burning of wire during Short Circuit

1. Place the 1.5 V cell in the cell holder and connect its positive terminal to a switch.
2. Connect a wire to the negative terminal of the cell. The hanging ends of the wires must be fitted with crocodile clips [see picture of circuit].
3. Clip the piece of steel wool between the crocodile clips



4. Switch the circuit on and observe what happens.
5. Repeat steps 2 and 3 using a 9 V cell and observe what happens.



6. Switch the circuit on and observe what happens.

- Stress upon the dangers of short circuits (heating of wires, triggering fire).
- Use real-life examples (e.g., frayed wires in appliances causing sparks) to explain why short circuits are dangerous.

Safety Aspect:

- Supervise closely to ensure safety.

Conclusion

Recap the key points:

- A short circuit happens when electricity bypasses the load (like a bulb) and flows directly through the wires.
- Short circuits can cause overheating, damage batteries, or even start fires.
- Always check for loose or exposed wires to prevent short circuits.
- Ask students to share one thing they learned about short circuits today.

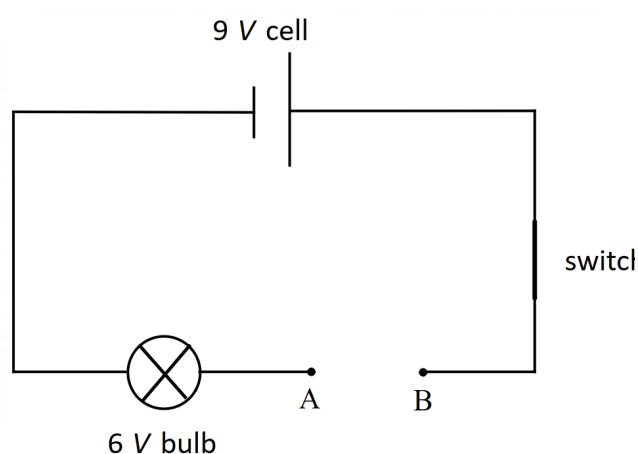
Final Notes for the Lesson

- Ensure all materials are checked for safety before the lesson.
- Supervise students closely during hands-on activities, especially when handling wires.
- Use repetition, visuals, and real-life examples to reinforce understanding for low-ability students

F. ASSESSMENT (in worksheet)

Note to the teacher:

Set up the circuit as shown below. The terminals A and B should be crocodile clips. Students will be required to connect a piece of steel wool and a piece of bare wire in turn between the terminals A and B and observe whether the materials melt or not.



G. Extension activity

The circuit provided in the worksheet could be completed by using different thicknesses of wires (for example s.w.g. 26, 28, 30, 32, 34, 36) and observe for which thickness the wire melts. This will help further consolidate the understanding of how a fuse operates.