
Volta Electricity Discovery Kit — Teacher’s Guide (Version 1.0)

Designed for KS2–KS3 Classrooms

1. Introduction

This guide supports teachers in delivering the **Volta Electricity Discovery Kit** with scientific accuracy and confidence. It aligns with the **How It Works** guide and the **Pupil Worksheet**, providing background knowledge, teaching strategies, and model answers.

Pupils will build a real working **galvanic battery**, recreating Alessandro Volta’s 1800 discovery — the foundation of all modern batteries.

2. Learning Objectives

By the end of the lesson, pupils will:

- Understand that electricity can be produced chemically
 - Observe how **two different metals** and **saltwater** create a voltage
 - Explain how electrons and ions move in a simple battery
 - Connect the experiment to **modern batteries** and real-world applications
 - Use scientific vocabulary confidently:
electrolyte, electrode, voltage, electrons, ions, chemical reaction
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3. Background for Teachers

3.1 Volta’s Discovery

In 1800, Alessandro Volta built the first **chemical battery** using alternating discs of zinc and copper separated by salty cloth.

He showed that electricity could be produced **without magnets or motion**, but through **chemical reactions**.

This became known as the **voltaic pile**.

3.2 How the Volta Cell Works

Each test tube in the kit is a **single battery cell**.

Inside the cell:

- **Zinc** gives up electrons (oxidation)
- **Copper** receives electrons (reduction)
- **Saltwater** allows ions to move between the metals
- Electrons travel through the wires to the LED or voltmeter

Only **electrons** move through the wires.

Protons and neutrons stay tightly packed in the nucleus and do not take part.

3.3 Energy Conversion

Chemical energy → electrical energy.

The reaction between zinc, copper, and the electrolyte releases energy that pushes electrons through the circuit.

When multiple cells are connected **in series**, their voltages **add together**, allowing pupils to power an LED.

4. Preparing the Classroom

- Ensure all kit components are present and clean
 - Pre-mix saltwater if working with younger pupils
 - Demonstrate safe handling of metals and wires
 - Position pupils so they can clearly see the **voltmeter reading**
 - Keep tissues or paper towels available for spills
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5. Teaching Tips

- Begin with a discussion about **batteries** pupils use every day
- Encourage predictions before assembling the first cell
- Emphasise the need for **two different metals**
- Highlight the difference between **electron movement** (in wires) and **ion movement** (in the liquid)
- Use questioning to guide understanding:

- *Why do we need saltwater?*
 - *What changes when we add more cells?*
 - *Why does the LED get brighter?*
 - Reinforce the key idea: **chemical reactions can produce electricity**
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6. Suggested Lesson Flow

Starter (5 minutes)

Show a battery and ask:

“Where does the electricity inside this come from?”

Introduce Volta and the idea of chemical electricity.

Main Investigation (15–20 minutes)

Pupils build a single cell using:

- Copper plate
- Zinc plate
- Saltwater

Then they:

- Measure voltage
- Add more cells
- Test the LED

Observation (5 minutes)

Record voltmeter readings for each number of cells.

Discussion (10 minutes)

Analyse results using the Pupil Worksheet prompts.

Highlight the relationship between **number of cells** and **voltage**.

Key Idea (2 minutes)

A **chemical reaction** pushes electrons through the circuit.

Challenge / Extension (optional)

Compare the kit to **AA batteries**, **phone batteries**, or **electric car battery packs**.

7. Answers to Pupil Questions

- **Why do we need two different metals?**
Because different metals hold electrons with different strengths. This difference creates a voltage.
 - **Why does saltwater help?**
It allows ions to move between the metals so the reaction can continue.
 - **Why does adding more cells increase the voltage?**
Each cell adds its own voltage. In series, they add together.
 - **What makes the electricity?**
A chemical reaction pushes electrons from zinc → copper.
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8. Extension Ideas

- Test different electrolytes (lemon juice, vinegar, salty water)
 - Try different metal combinations
 - Compare **series** vs **parallel** connections
 - Explore early telegraph batteries
 - Investigate rechargeable vs non-rechargeable batteries
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9. Safety Notes

- Handle metals carefully to avoid sharp edges
 - Avoid spilling saltwater on desks or equipment
 - Do not connect the voltmeter or LED to high-voltage sources
 - Wash hands after handling metals and saltwater
 - Supervise pupils during assembly and disassembly
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10. Summary

This guide ensures teachers can confidently deliver the Volta Electricity Discovery Kit with clear scientific explanations, structured enquiry, and engaging hands-on activities. Pupils learn how chemical reactions can produce electricity and how modern batteries evolved from Volta's original design.
