LESSON PLAN

Electrolysis of Water: Splitting Water with Electricity

Chemistry · Year 10 · 60 min

CURRICULUM ALIGNMENT

Aligns to The New Zealand Curriculum. Science, Level 5 (Years 9 to 10), strand: Physical World and Material World. Achievement objective: investigating chemical and physical change, including the decomposition of water by electrolysis. (Refreshed Te Mātaiaho version available 2026; mandatory 2027.)

Te Mātaiaho: Science

LEARNING INTENTION

Explain and investigate the electrolysis of water, including the role of electricity, the products formed at each electrode, and how to test for those products

SUCCESS CRITERIA

- I can explain what electrolysis means using the correct scientific vocabulary.
- I can identify the products formed at the cathode and anode during water electrolysis.
- I can describe the chemical equation for the decomposition of water.
- I can explain how to test for hydrogen and oxygen using standard lab tests.
- I can connect electrolysis to the idea that water is a compound, not an element.

Lesson Structure

HOOK

• Two gas-filled test tubes. Which gas burns? Which relights a glowing splint?
• Water looks simple. Is it actually one substance or two?
• Water powers rockets. How does splitting it work?

TEACHING

• Electrolysis: using electrical current to break a compound apart.
• Water decomposes: $2H_2O \rightarrow 2H_2 + O_2$.
• Cathode is negative. Hydrogen gas collects there (twice the volume).
• Anode is positive. Oxygen gas collects there.
• Think aloud: I notice twice as much hydrogen. The formula explains why.

PRACTICE

• Diagram of the electrolysis cell on the board. Label each part together.
• Pairs predict: which electrode produces more gas, and why?
• Thumbs up or sideways: can you state what forms at each electrode?

CLOSURE

- At the cathode: which gas forms, and how do you test it?
- At the anode: which gas forms, and how do you test it?
- Water is a compound. Electrolysis proves it. How?

Task Details

TASK

- Set up the electrolysis cell. Observe gas collection at each electrode.
- Record which electrode produces more gas. Note the volume difference.
- Test the gas at the cathode with a burning splint. Record the result.
- Test the gas at the anode with a glowing splint. Record the result.
- Write the word equation and the symbol equation for the decomposition.

MATERIALS

Electrolysis apparatus (1 per group of 3 to 4), 9V DC power supply (1 per group), dilute sulfuric acid or sodium sulfate solution (100 mL per group), carbon or platinum electrodes (2 per group), connecting leads with crocodile clips (2 per group), test tubes (2 per group), wooden splints (4 per group), matches or gas lighter (1 per group, teacher-held), safety goggles (1 per student), student result sheet (1 per student), whiteboard markers and mini whiteboards (1 set per pair)

TEACHER ROLE

- Circulate during setup. Check electrodes are correctly connected before power is switched on.
- Prompt groups who finish early: what does the volume ratio tell you about the formula?
- Listen for correct vocabulary: cathode, anode, electrolysis, decomposition.

ASSESSMENT NOTES

- Criterion 1: Students use electrolysis, cathode, anode, and decomposition correctly in their written records.
- Criterion 2: Result sheet names hydrogen at the cathode and oxygen at the anode. Check for correct volume ratio noted.
- Criterion 3: Symbol equation $2H_2O \rightarrow 2H_2 + O_2$ is written correctly and balanced. Word equation also present.
- Criterion 4: Burning splint test recorded for hydrogen. Glowing splint relight recorded for oxygen.
- Criterion 5: Closing written response explains water is a compound because electrolysis separates it into two different elements.

RESOURCES

YouTube electrolysis water splitting video

Pinterest electrolysis water splitting activities

RELIEF TEACHER NOTES

- Electrolysis apparatus, solutions, and splints are stored in the science prep room. Ask the lab technician to confirm setup before the lesson.
- Students work in groups of 3 to 4. All groups follow the same result sheet.
- Safety: goggles on before power is connected. Teacher holds matches and lights splints for each group.
- The result sheet guides every step. Students do not need prior lab experience to follow it.