



## Electrolysis of Water: Splitting Water with Electricity

*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*

CHEMISTRY · YEAR 10 · 60 MIN



TODAY

## What we will do

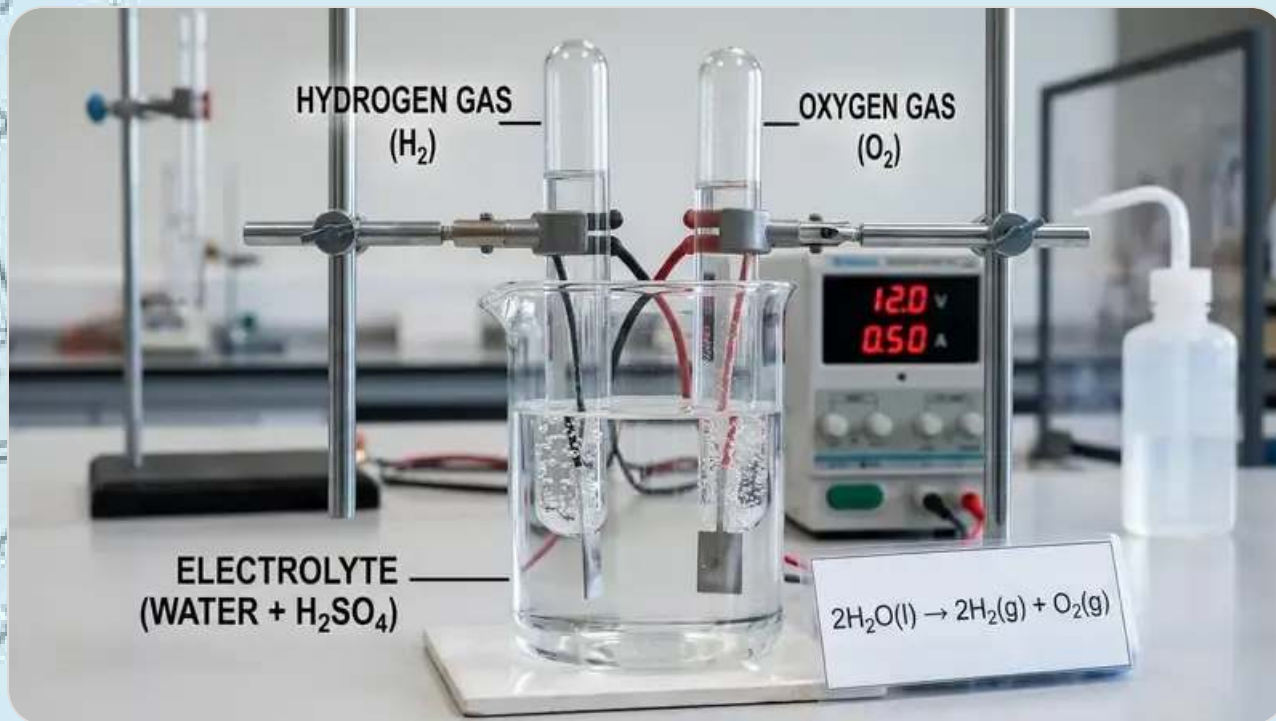
Explain and investigate the electrolysis of water, including the role of electricity, the products formed at each electrode, and how to test for those products

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

LOOK CLOSELY

## Two test tubes of gas. Which one burns?

Water looks simple. But is it actually one substance or two?



TALK What do you think is inside each tube?



## KEY CONCEPT

# Electrolysis

*ee-lek-TROL-ih-sis*

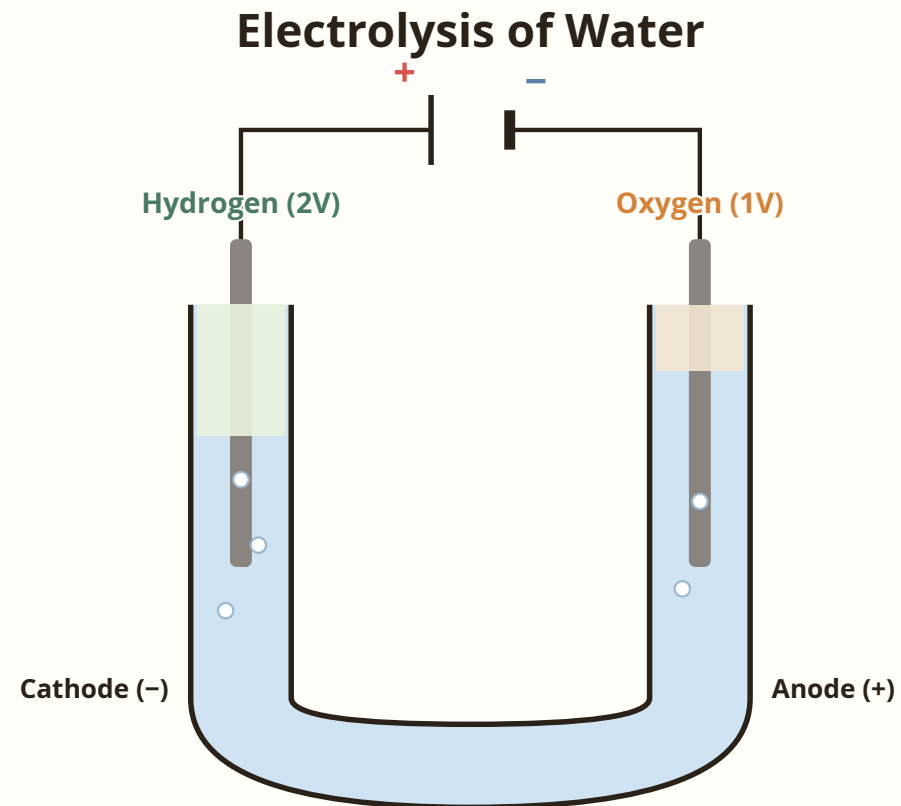
Using an electrical current to break a compound into simpler substances.

**WHY IT MATTERS** *Electrolysis proves water is a compound, not a single element.*

## THE APPARATUS

# How the electrolysis cell works

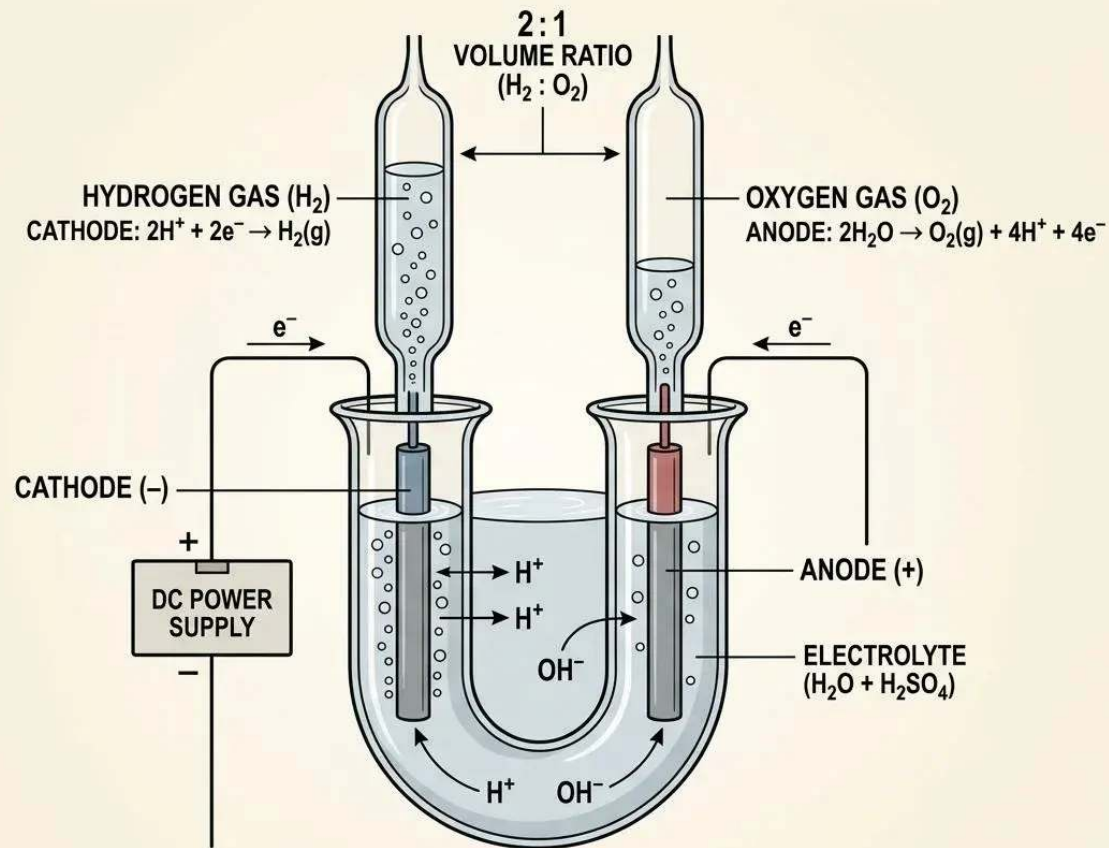
Current flows through water, splitting it into two gases at separate electrodes.



## THE DECOMPOSITION EQUATION

# Water splits into hydrogen and oxygen

$2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ . Two molecules of water yield two hydrogen for every one oxygen.



### AT EACH ELECTRODE

Cathode (-): hydrogen gas. Anode (+): oxygen gas.

### WATCH OUT

Hydrogen collects at the cathode in TWICE the volume of oxygen. The ratio 2:1 matches the formula.

## TESTING THE GASES

# How to confirm each product

Each gas has a standard lab test that gives a clear, observable result.

### HYDROGEN TEST



Hold a burning splint to the tube. A squeaky pop confirms hydrogen gas.

### OXYGEN TEST



Insert a glowing splint into the tube. It relights when oxygen is present.

*Two different tests, two clear results. One for each electrode product.*

## CHECK YOUR THINKING

# Match each term to its description

Think about what you have just learned before checking the answers.

### TERM

1 Cathode

2 Anode

3 Electrolysis

4 Hydrogen

### DESCRIPTION

a Gas that relights a glowing splint

b Negative electrode; more gas collects here

c Breaking a compound using electricity

d Positive electrode; less gas collects here

## ANSWERS

# Match each term to its description

Check your answers below.

### TERM

1 Cathode



2 Anode



3 Electrolysis



4 Hydrogen



### DESCRIPTION

b Negative electrode; more gas collects here



d Positive electrode; less gas collects here



c Breaking a compound using electricity



a Gas that relights a glowing splint



## PRACTICAL ACTIVITY

# Set up and run the electrolysis cell



- 1 Set up the cell. Observe gas collecting at each electrode and record which tube fills faster.
- 2 Test the cathode gas with a burning splint and record the result.
- 3 Test the anode gas with a glowing splint, then write the word and symbol equations.

**RECORD THIS** *Note the volume difference between the two tubes before you test.*



## DISCUSS

# Electrolysis and what it tells us

*Which electrode produced more gas, and why?*

*What result told you hydrogen was present?*

*What result told you oxygen was present?*

*How does this experiment prove water is a compound?*

**SHARE BACK** Use the equation  $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$  in your explanation.



TODAY WE LEARNED

## Three things to remember

I can explain that electrolysis uses electricity to split a compound.

I can identify hydrogen at the cathode and oxygen at the anode, with a 2:1 volume ratio.

I can use the splint tests to confirm each gas, proving water is a compound.