# Electrolysis of aqueous solutions: supporting resources

### This resource supports the practical video Electrolysis of aqueous solutions, available here [rsc.li/3a7LS37](http://rsc.li/3a7LS37)

## Using the structure strips

Writing about chemistry encourages learners to reflect on their understanding, formulate new ideas and make links between ideas in new ways. Learners also need to practice for longer-answer questions in examinations. Structure strips provide scaffolded prompts and help overcome ‘fear of the blank page’. The learner sticks the strip into the margin of their exercise book or onto an A4 sheet of paper and writes alongside it. Use this long- answer question to consolidate learning after the practical or for revision. (Read more at <rsc.li/2P0JDlW>.)

**Long-answer question:**

*A student has a beaker containing 50 cm3 sodium chloride solution. They are going to apply a direct electrical current to the solution using inert carbon electrodes.*

*Using your knowledge of reactivity, predict what substance will be produced at the positive and negative electrodes. Write a half equation for each reaction, identifying whether oxidation or reduction has occurred.*

*What tests could you carry out to show that your prediction is correct?*

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| **Electrolysis Structure strip** | **Electrolysis Structure strip** | **Electrolysis Structure strip** | **Electrolysis Structure strip** | **Electrolysis Structure strip** |
| Identify the ions present in NaCl(aq) solution. | Identify the ions present in NaCl(aq) solution. | Identify the ions present in NaCl(aq) solution. | Identify the ions present in NaCl(aq) solution. | Identify the ions present in NaCl(aq) solution. |
| Which electrode would the ions travel towards? | Which electrode would the ions travel towards? | Which electrode would the ions travel towards? | Which electrode would the ions travel towards? | Which electrode would the ions travel towards? |
| State the rule used to work out which ion reacts at the positive electrode. | State the rule used to work out which ion reacts at the positive electrode. | State the rule used to work out which ion reacts at the positive electrode. | State the rule used to work out which ion reacts at the positive electrode. | State the rule used to work out which ion reacts at the positive electrode. |
| Identify the ion. | Identify the ion. | Identify the ion. | Identify the ion. | Identify the ion. |
| Write a half equation for the positive electrode. | Write a half equation for the positive electrode. | Write a half equation for the positive electrode. | Write a half equation for the positive electrode. | Write a half equation for the positive electrode. |
| Is this oxidation or reduction? | Is this oxidation or reduction? | Is this oxidation or reduction? | Is this oxidation or reduction? | Is this oxidation or reduction? |
| What will you observe at the positive electrode? | What will you observe at the positive electrode? | What will you observe at the positive electrode? | What will you observe at the positive electrode? | What will you observe at the positive electrode? |
| How could you test to confirm? | How could you test to confirm? | How could you test to confirm? | How could you test to confirm? | How could you test to confirm? |
| State the rule used to work out which ion reacts at the negative electrode. | State the rule used to work out which ion reacts at the negative electrode. | State the rule used to work out which ion reacts at the negative electrode. | State the rule used to work out which ion reacts at the negative electrode. | State the rule used to work out which ion reacts at the negative electrode. |
| Identify the ion. | Identify the ion. | Identify the ion. | Identify the ion. | Identify the ion. |
| Write a half equation for the negative electrode. | Write a half equation for the negative electrode. | Write a half equation for the negative electrode. | Write a half equation for the negative electrode. | Write a half equation for the negative electrode. |
| Is this oxidation or reduction? | Is this oxidation or reduction? | Is this oxidation or reduction? | Is this oxidation or reduction? | Is this oxidation or reduction? |
| What will you observe at the negative electrode? | What will you observe at the negative electrode? | What will you observe at the negative electrode? | What will you observe at the negative electrode? | What will you observe at the negative electrode? |
| How could you test to confirm? | How could you test to confirm? | How could you test to confirm? | How could you test to confirm? | How could you test to confirm? |

### Structure strip: suggested answer content

**Electrolysis Structure strip**

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| Identify the ions present in NaCl(aq) solution. | Sodium chloride is an ionic substance containing sodium (Na+) and chloride (Cl-) ions. Since the sodium chloride is in aqueous solution the solution will also contain hydrogen H+ and hydroxide (OH-) ions. |
| Which electrode would the ions travel towards? | The positive Na+ and H+ ions will be attracted to the negative electrode. The negative Cl- and OH- ions will be attracted to the positive electrode.  At the positive electrode, if a halide is present, it will react to form a halogen gas. The halide chloride is present so the Cl- ions will react at the positive electrode to form chlorine gas.  The half equation for the reaction at the positive electrode is:  2Cl-(aq) → Cl2(g) + 2e-  The chloride ion has lost electrons therefore oxidation has occurred at the positive electrode. (The electrode where oxidation occurs is called the anode.)  If chlorine gas is produced you will observe bubbles of a green gas forming at the positive electrode. (Chlorine gas is hazardous therefore the reaction should take place in a fume cupboard.)  You can test for chlorine gas using damp litmus paper (usually blue litmus paper but red will work also). A positive test for chlorine will see the litmus paper bleached to white.  At the negative electrode, if the metal in the aqueous solution is less reactive than hydrogen it will react and the metal solid will appear. If the metal is more reactive than hydrogen, it will stay in solution and hydrogen gas will be produced.  Sodium is more reactive than hydrogen, so the hydrogen ion will react to produce hydrogen gas.  The half equation for the reaction at the negative electrode is:  2H+(aq) +2e- → H2(g)  The hydrogen ion has gained electrons therefore reduction has occurred at the negative electrode. (The electrode where reduction occurs is called the cathode.)  If hydrogen gas is produced you will observe bubbles of a colourless gas forming at the negative electrode.  You can test for hydrogen gas using a lighted splint. A positive test for hydrogen will produce a squeaky pop sound. |
| State the rule used to work out which ion reacts at the positive electrode.  Identify the ion. |
| Write a half equation for the positive electrode.  Is this oxidation or reduction? |
| What will you observe at the positive electrode?  How could you test to confirm? |
| State the rule used to work out which ion reacts at the negative electrode.  Identify the ion. |
| Write a half equation for the negative electrode.  Is this oxidation or reduction? |
| What will you observe at the negative electrode?  How could you test to confirm? |

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