# Halogen displacement reactions: supporting resources

# This resource supports the practical video Halogen displacement reactions, available here: <rsc.li/3tZxFgu>

## 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 and/or for revision. (Read more at <rsc.li/2P0JDlW>.)

**Long-answer question:**

*Group 7 of the periodic table contains the elements known as the halogens. The order of reactivity of the halogens can be determined experimentally by carrying out displacement reactions.*

*Explain how displacement reactions can be used to show the relative reactivity of chlorine, bromine and iodine.*

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| **Halogen displacement Structure strip** | **Halogen displacement Structure strip** | **Halogen displacement Structure strip** | **Halogen displacement Structure strip** | **Halogen displacement Structure strip** |
| State the order of reactivity of the halogens. | State the order of reactivity of the halogens. | State the order of reactivity of the halogens. | State the order of reactivity of the halogens. | State the order of reactivity of the halogens. |
| What is a displacement reaction? | What is a displacement reaction? | What is a displacement reaction? | What is a displacement reaction? | What is a displacement reaction? |
| Choose suitable reactants to show the relative reactivity of **chlorine** and **bromine**. | Choose suitable reactants to show the relative reactivity of **chlorine** and **bromine**. | Choose suitable reactants to show the relative reactivity of **chlorine** and **bromine**. | Choose suitable reactants to show the relative reactivity of **chlorine** and **bromine**. | Choose suitable reactants to show the relative reactivity of **chlorine** and **bromine**. |
| Describe the change you would observe. | Describe the change you would observe. | Describe the change you would observe. | Describe the change you would observe. | Describe the change you would observe. |
| Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. |
| Choose suitable reactants to show the relative reactivity of **bromine** and **iodine**. | Choose suitable reactants to show the relative reactivity of **bromine** and **iodine**. | Choose suitable reactants to show the relative reactivity of **bromine** and **iodine**. | Choose suitable reactants to show the relative reactivity of **bromine** and **iodine**. | Choose suitable reactants to show the relative reactivity of **bromine** and **iodine**. |
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| Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. |
| Choose suitable reactants to show the relative reactivity of **chlorine** and **iodine**. | Choose suitable reactants to show the relative reactivity of **chlorine** and **iodine**. | Choose suitable reactants to show the relative reactivity of **chlorine** and **iodine**. | Choose suitable reactants to show the relative reactivity of **chlorine** and **iodine**. | Choose suitable reactants to show the relative reactivity of **chlorine** and **iodine**. |
| Describe the change you would observe. | Describe the change you would observe. | Describe the change you would observe. | Describe the change you would observe. | Describe the change you would observe. |
| Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. | Write a balanced symbol equation for the reaction. |
| Explain how these results will lead to a conclusion about the relative reactivity of the halogens. | Explain how these results will lead to a conclusion about the relative reactivity of the halogens. | Explain how these results will lead to a conclusion about the relative reactivity of the halogens. | Explain how these results will lead to a conclusion about the relative reactivity of the halogens. | Explain how these results will lead to a conclusion about the relative reactivity of the halogens. |

### Structure strip: suggested answer content

**Halogen displacement Structure strip**

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| State the order of reactivity of the halogens. | The reactivity of the halogens decreases down the group. Therefore, chlorine is more reactive than bromine and bromine is more reactive than iodine. |
| What is a displacement reaction? | Relative reactivity can be determined using a displacement reaction. A displacement reaction occurs when a more reactive element displaces a less reactive element from a compound.  A suitable reaction to determine the relative reactivity of chlorine and bromine would be the reaction of aqueous chlorine (chlorine water) with potassium bromide (accept any metal iodide).  The solution would change from colourless to pale yellow (accept yellow or orange).  chlorine + potassium bromide → bromine + potassium chloride  Cl2(aq) + 2KBr(aq) → Br2(aq) + 2KCl(aq)  A suitable reaction to determine the relative reactivity of bromine and iodine would be the reaction of bromine water with potassium iodide.  The solution would change from pale yellow to brown (accept yellow or orange, red or brown).  bromine + potassium iodide → iodine + potassium bromide  Br2(aq) + 2KI(aq) → I2(aq) + 2KBr(aq)  A suitable reaction to determine the relative reactivity of chlorine and iodine would be the reaction of aqueous chlorine (chlorine water) with potassium iodide (accept any metal iodide).  The solution would change from colourless to pale yellow (accept yellow or orange).  chlorine + potassium bromide → bromine + potassium chloride  Cl2(aq) + 2KI(aq) →I2(aq) + 2KCl(aq)  Since both reactions with chlorine water have resulted in a displacement reaction we can conclude that chlorine is more reactive than bromine and iodine. Chlorine has displaced both of the other halogens from their solution. Chlorine is the most reactive.  In the reaction between bromine water and potassium iodide, bromine displaced the iodine from its solution. Therefore we can conclude that bromine is more reactive than iodine. Therefore the order of reactivity is:  chlorine > bromine > iodine |
| Choose suitable reactants to show the relative reactivity of **chlorine** and **bromine**. |
| Describe the change you would observe. |
| Write a balanced symbol equation for the reaction. |
| Choose suitable reactants to show the relative reactivity of **bromine** and **iodine**. |
| Describe the change you would observe. |
| Write a balanced symbol equation for the reaction. |
| Choose suitable reactants to show the relative reactivity of **chlorine** and **iodine**. |
| Describe the change you would observe. |
| Write a balanced symbol equation for the reaction. |
| Explain how these results will lead to a conclusion about the relative reactivity of the halogens. |

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