

## Displacement reaction snap

This resource accompanies the articles **How chemistry keeps trains on track** in *Education in Chemistry* which can be viewed at: <https://rsc.li/3O8cjrP> and **How to teach displacement reactions at 11-14** which can be viewed at: <https://rsc.li/3hLhWjE>

### Learning objectives

- 1 Identify the more reactive metal using a reactivity series.
- 2 State whether a reaction would occur between two substances using the reactivity series.
- 3 Write word equations for simple displacement reactions.

The displacement reaction snap activity will assess LO1 and LO2. The formative assessment grid activity will assess LO1, LO2 and LO3.

### Introduction

How do railway engineers join together 50-metre-long rail tracks so that they can stand up to trains rolling past at over 100 mph? Hand welding would be time consuming and assessing the quality of these deep welds would also be tricky out on the track. Instead, engineers turn to some of chemistry's most spectacular reactions for the solution – metal displacement reactions. A mixture of aluminium and iron oxide is ignited, and liquid iron flows into the joint.

At 11–14, students need to understand that metals can be placed in order of reactivity and that a more reactive metal will displace a less reactive metal from its compound. They also need to appreciate that carbon and hydrogen are included in the reactivity series. They should learn to use the reactivity series to make predictions about possible reactions.

Consolidate and assess learning with these engaging activities:

- Displacement reaction snap
- Reactivity series strips
- Formative assessment grid

## Displacement reaction snap

### Preparation

1. Print out pages 3–6 on card (laminates if you wish) and cut out the individual cards. This is one 'pack'.
2. You will need one pack per pair of learners. Using a different coloured card for each set will help with clearing up and keep the packs together.

### Play

- Play in pairs (or threes – one player can be the referee).
- Shuffle and deal the cards face down.
- Each player then places a card face up. If they don't match:
  - Two metals: shout out the most reactive metal.
  - Two compounds: shout out 'mixture'.
  - Metal and compound: shout out 'reaction' if the metal is more reactive than the metal in the compound. Shout out 'no reaction' if the reverse.
- The first person to shout the correct answer picks up both cards. The winner is the first person to get all the cards or the person holding the most cards when time is up.

## Reactivity series strips

Provide learners with a copy of the reactivity series from page 7, to refer to.

Some learners will want to memorise the series; developing mnemonics for this can be helpful. However, this isn't necessary, and could be just as off-putting as learning the periodic table. Recognising where groups of metals are in the series is helpful, for example that the more reactive groups are at the top and jewellery metals are at the bottom.

Knowing how to use the series would also be helpful. Learners can use the reactivity series strips while playing the displacement reaction snap or while completing the formative assessment grid.

## Formative assessment grid

Display the grid from the presentation (available at [rsc.li/3GI8Jsh](https://rsc.li/3GI8Jsh)) or print it out and put it on the board. This works well with individual whiteboards for instant assessment, but learners could also write the equations in their exercise books to be checked later.

Place a sticky note in a cell. Learners then write the word equation on their whiteboards. You can do this one reaction at a time, or assess as you go, putting several sticky notes up as the faster learners complete the equations.

Edit the metals/metal compounds on the slide to change the reactions possible.

## Displacement reaction snap page 1/4

aluminium

potassium

carbon

sodium

zinc

calcium

iron

magnesium

## Displacement reaction snap page 2/4

silver

tin

gold

lead

platinum

hydrogen

copper

## Displacement reaction snap page 3/4

magnesium  
nitrate

potassium  
nitrate

aluminium  
nitrate

sodium  
nitrate

zinc  
nitrate

lithium  
nitrate

iron  
nitrate

calcium  
nitrate

## Displacement reaction snap page 4/4

gold  
nitrate

tin  
nitrate

platinum  
nitrate

lead  
nitrate

copper  
nitrate

silver  
nitrate

## Reactivity series strips

Cut out and give to learners for them to refer to while playing the snap game or completing the formative assessment grid.

<p><b>Reactivity series</b></p> <p>potassium sodium calcium magnesium aluminium <b>carbon</b> zinc iron tin lead <b>hydrogen</b> copper silver gold platinum</p>	<p><b>Reactivity series</b></p> <p>potassium sodium calcium magnesium aluminium <b>carbon</b> zinc iron tin lead <b>hydrogen</b> copper silver gold platinum</p>	<p><b>Reactivity series</b></p> <p>potassium sodium calcium magnesium aluminium <b>carbon</b> zinc iron tin lead <b>hydrogen</b> copper silver gold platinum</p>	<p><b>Reactivity series</b></p> <p>potassium sodium calcium magnesium aluminium <b>carbon</b> zinc iron tin lead <b>hydrogen</b> copper silver gold platinum</p>	<p><b>Reactivity series</b></p> <p>potassium sodium calcium magnesium aluminium <b>carbon</b> zinc iron tin lead <b>hydrogen</b> copper silver</p>
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