Displacement reactions of metals

Aims

To study the reactions of magnesium, zinc, iron and copper in solutions of their salts, and to work out a **reactivity series** for them. The most reactive metal will be coated by all the others, and the least reactive metal will not be coated by any of the others.

Apparatus

Goggles
Bench mat
Spotting tile
Teat pipette
Strips of magnesium, zinc, iron, copper

magnesium sulphate
zinc sulphate
iron sulphate
copper(II) sulphate

Methods

1. Copy the table shown below into your book. Allow a minimum of three lines for each row.
2. Put copper(II) sulphate solution into one of the wells in the spotting tile.
3. Hold a strip of magnesium under the surface of the liquid for about a minute.
   Note down any changes in the table below. If there is no change, write **No change**.
4. Repeat step 3 for each of the other three metals.
5. Repeat steps 2, 3 and 4, but replace the copper(II) sulphate solution with each of the other three solutions in turn.

Results

metal	magnesium sulphate	zinc sulphate	iron sulphate	copper(II) sulphate	number of times coated
magnesium					
zinc					
iron					
copper					

Analysis

1. For each metal, count up the number of times it was coated by the metal from the solution. Write the number in the right hand column of your table.
2. Put the metals in order from the most reactive to the least reactive; this is a **reactivity series**. Explain **why** you put the metals in this order.
3. Write word equations (and symbol equations if you can) for each of the reactions seen, e.g. for magnesium dipped in copper(II) sulphate solution the word equation is:

   magnesium + copper(II) sulphate → magnesium sulphate + copper

   … and the symbol equation is: $Mg(s) + CuSO_4(aq) \rightarrow MgSO_4(aq) + Cu(s)$

Evaluation

Consider the limitations of the experiment. How could you improve it, and why?

metal	magnesium sulphate	zinc sulphate	iron sulphate	copper(II) sulphate	number of times coated
magnesium					
zinc					
iron					
copper					

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magnesium					
zinc					
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Displacement reactions of metals Technician's Notes

Per class

Strips of magnesium ribbon, zinc, iron, copper (about 40mm x 5mm)

(Allow 2 strips per pair - i.e. 30 each for a class of 30)

250cm^3 each of:

Magnesium sulphate solution (approx. 0.5M)
Zinc sulphate solution (approx. 0.5M)
Iron sulphate solution (approx. 0.5M)
Copper sulphate solution (approx. 0.5M)

Per pair of pupils

1 x copy of worksheet (N-m05-03)
1 x teat pipette
1 x test tube