

## Oxidation and reduction in terms of electrons

- ① Magnesium reacts with a solution of copper(II) chloride to form a solution of magnesium chloride and solid copper.

a Write an ionic equation, including state symbols, for this reaction. (3 marks, ★★★★★)

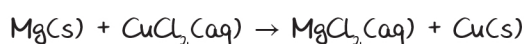
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b Which species is oxidised and which is reduced? (1 mark, ★★★)

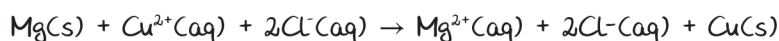
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## WORKIT!

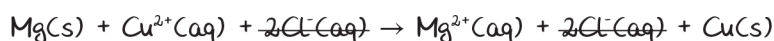
**Step 1** Write a balanced chemical equation, including state symbols.



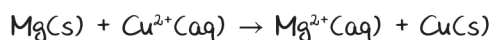
**Step 2** Any aqueous solution will split up into its ions. Rewrite the equation to show this.



**Step 3** Cancel out any species that appear on both sides of the equation. These are **spectator ions** and don't take part in the reaction.



**Step 4** Rewrite the equation with the remaining ions.



**Step 5** Finish with a conclusion. The Mg has lost electrons and formed a positive ion, so according to OILRIG, it has been oxidised. The  $\text{Cu}^{2+}$  has gained electrons and has therefore been reduced.

- ② Write ionic equations for the following reactions. In each case, state which species has been oxidised and which has been reduced.

a Zinc(II) nitrate reacts with magnesium to form magnesium nitrate and solid zinc.

(4 marks, ★★★★★)

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b Sodium reacts with a solution of zinc(II) chloride to form a solution of sodium chloride and solid zinc.

(4 marks, ★★★★★)

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c Silver(I) sulfate reacts with copper to form copper(II) sulfate and silver metal. (4 marks, ★★★★★)

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d Calcium reacts with a solution of iron(III) chloride to form solid iron and a solution of calcium chloride. (4 marks, ★★★★★)

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## NAILIT!

Writing ionic equations is tricky and you need to make sure you can write formulae correctly. You cannot always use the periodic table to work out the charges on metal ions, as the transition metals often form more than one ion. Here are some common ones.

Zinc –  $\text{Zn}^{2+}$       Iron(II) –  $\text{Fe}^{2+}$

Copper –  $\text{Cu}^{2+}$     Iron(III) –  $\text{Fe}^{3+}$

Silver –  $\text{Ag}^{+}$