



Ionic Formulae

Topic Summary

- Ionic compounds form when metals transfer electrons to non-metals, creating positive and negative ions.
- Ions combine in ratios that balance overall charge to form a neutral compound.
- Dot-and-cross diagrams show the electron transfers to determine ion charges and empirical formulae for ionic compounds.
- The charges of some ions can be predicted from the periodic table, for example: Group 1 - 1^+ , Group 2 - 2^+ and Group 7 - 1^- .
- To predict an empirical formula, match the ionic charges so positives balance out negatives (e.g. Mg^{2+} with O^{2-} lead to MgO and Li^+ with O^{2-} lead to Li_2O).
- Polyatomic anions act as single charged units (e.g. $[\text{OH}]^{1-}$, $[\text{CO}_3]^{2-}$, $[\text{SO}_4]^{2-}$, $[\text{NO}_3]^{1-}$).
- Roman numerals show the charge of metals with multiple possible ions (e.g. copper (II) oxide vs. copper (I) oxide).
- The crossover method can help find ratios quickly—but always simplify to the lowest whole number ratio to get the formula.



Recall and basic skills

1. This question is about the empirical formula for the compound **sodium oxide**.

What is the most common charge on a sodium ion? (1 mark)

What is the most common charge on an oxide ion? (1 mark)

How many sodium ions will be required for each oxide ion, if the final compound is to be neutral overall?

..... (1 mark)

What is the correct empirical formula for the compound **sodium oxide**?

..... (1 mark)

2. Write the electron configurations of the following **ions**.

Na^{1+} : , (1 mark)

Cl^{1-} : , , (1 mark)

Mg^{2+} : , (1 mark)

O^{2-} : , (1 mark)



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Basic Questions

Write the empirical formula of each of these compounds

Lithium chloride:	Calcium chloride:
Sodium fluoride:	Aluminium chloride:
Potassium bromide:	Magnesium fluoride:
Magnesium oxide:	Sodium oxide:
Calcium oxide:	Aluminium oxide:



Questions with polyatomic anions

Write the empirical formula of each of these compounds

Lithium nitrate:	Calcium carbonate:
Sodium carbonate:	Sodium hydroxide:
Potassium sulphate:	Potassium nitrate:
Magnesium nitrate:	Magnesium hydroxide:



Questions with other ions

Write the empirical formula of each of these compounds

Copper (II) oxide:	Copper (II) sulphate:
Iron (II) chloride:	Lead (II) nitrate:
Lead (II) chloride:	Zinc (II) Oxide:



Do this later...

Give your brain a break and come back to these questions later. Cover the rest of the sheet while you have a go. By doing this 24-48 hours after watching the video you will boost your chances of remembering the key points in an exam. If you struggle with these questions, re-watch the video and then try again.

1. Write out the electron configuration for a magnesium atom and an Mg^{2+} ion.
2. Write out the empirical formula of magnesium carbonate
3. Write out the empirical formula of copper (II) sulphate
4. Draw out a dot and cross diagram to show the bonding in sodium chloride.

