

Ionic Equations Notes

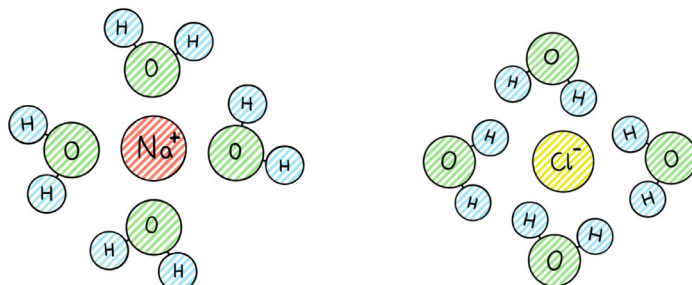
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An ionic equation: an equation that only shows the ions which take part in a reaction.

When an ionic compound such as NaCl dissolves in water, the ions completely separate and are surrounded by water molecules. The figure below shows a molecule of sodium chloride, NaCl, which is separated by water molecules.



Being separated by water molecules, being aqueous means the ions can now move and react with other ions if they are available. But they have to be soluble to do this.

Soluble salts split into ions for example: $\text{Ca}(\text{NO}_3)_2 (\text{aq}) \rightarrow \text{Ca}^{2+} (\text{aq}) + 2\text{NO}_3^- (\text{aq})$

Acids also split into ions for example: $\text{H}_2\text{SO}_4 (\text{aq}) \rightarrow 2\text{H}^+ (\text{aq}) + \text{SO}_4^{2-} (\text{aq})$

Writing ionic equations

There are three rules for writing ionic equations. If we learn these rules and apply them in each question we will find ionic equations are lovely questions to get. Boring? Absolutely! But perfectly fine 😊

Rule 1: Solid ionic compounds consist of ions held together tightly so the ions cannot be written separately.

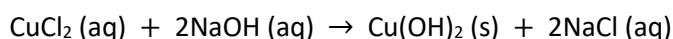
Rule 2: Covalent molecules such as H_2O , H_2 , CO_2 , Cl_2 , Br_2 etc DO NOT contain ions so must be left as they are.

Rule 3: Metals as uncombined elements consist of atoms so are left alone, for example Pb. We wouldn't do anything with this lead atom in an ionic equation.

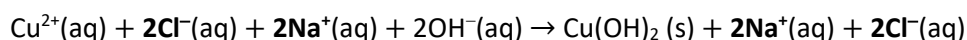
How to Write an Ionic Equation

Below I have shown a step by step method for writing ionic equations. They are nice and straight forward 😊 There's nothing really difficult about them, they're just a bit boring.

Example 1: a precipitation reaction. Convert the following equation into an ionic equation:

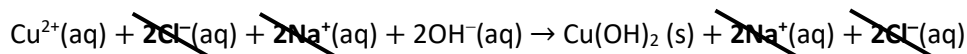


1. Write the equation out with all the **AQUEOUS IONS** written out separately. (**Don't forget the state symbols!**)

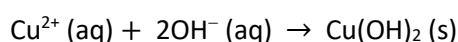


2. Any ions which appear on both sides of the equation can be cancelled out as they do not take part in the reaction. They are called **SPECTATOR IONS**.

Here the spectator ions are Na^{+} and Cl^{-} so we cross these out.



The ionic equation is therefore:



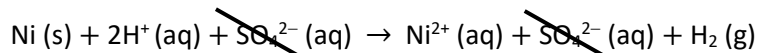
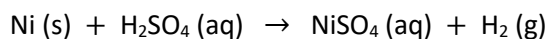
Helpful Tip

When doing ionic equations, you can make your life a lot easier if you remember this tip.

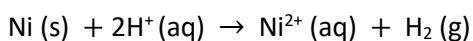
"Get rid of anything that goes in to the reaction as an ion and comes out of the reaction as an ion. Even if it's only one ion on each side. Whatever is left over is your ionic equation".

Example 2: a displacement reaction.

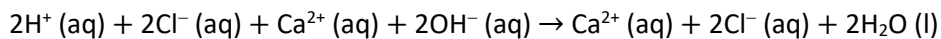
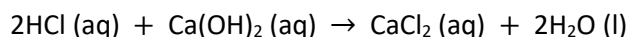
Write an ionic equation for the reaction of sulfuric acid with nickel metal.



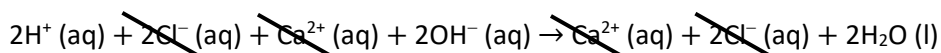
SO_4^{2-} is a spectator ion. The ionic equation is:



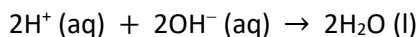
Example 3: a neutralisation reaction.



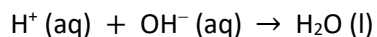
Ca^{2+} and Cl^- are spectator ions.



Therefore, our ionic equation is:



This can be further simplified by dividing by 2 to give the ionic equation:



This is the ionic equation for any acid neutralising any alkali. 😊 A handy one to know.

