

# Starting with confidence >>

## Chemistry

The following is a list of activities you may like to do during your summer holidays, in preparation for studying A Level Chemistry.

In this activity you will work out and write down the formulae of some compounds. It is an opportunity for you to check your understanding of ionic and covalent bonding you learned at GCSE.

### Introduction to ionic compounds

Positive ions (cations) are usually produced when metal atoms lose electrons. The name of the element tells you which metal is involved.

Some metals can produce more than one kind of positive ion because they can lose different numbers of electrons to form stable ions. In this case we need to include the oxidation number with the name of the metal to enable us to tell which ion it is, for example, iron can produce iron(II) ions,  $\text{Fe}^{2+}$ , or iron(III) ions,  $\text{Fe}^{3+}$ . One cation that is not produced from a metal is the ammonium ion,  $\text{NH}_4^+$ .

Negative ions (anions) are produced when non-metal atoms, or groups of atoms, gain electrons. Where the anion is just the non-metal element itself, then the anion name ends in *-ide*. So,  $\text{Cl}^-$  is the chloride ion and  $\text{S}^{2-}$  is the sulfide ion. Where the anion contains both a non-metal atom and oxygen, the name of the ion ends in *-ate*. So,  $\text{SO}_4^{2-}$  is the sulfate ion and  $\text{NO}_3^-$  is the nitrate ion.

Non-metal elements form ions by gaining sufficient electrons to achieve a full outermost electron shell. Chlorine, in Group 7, gains one electron to become the  $\text{Cl}^-$  ion. Sulfur in Group 6 gains 2 electrons to form the  $\text{S}^{2-}$  ion.

### Introduction to covalent compounds

Atoms in the middle of the periodic table form covalent bonds. Carbon always has 4 covalent bonds, oxygen forms two, Hydrogen and chlorine always form just one covalent bond to another atom.

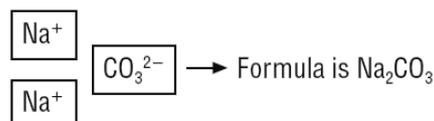
### What you do

To work out the formula of an ionic compound you need to know the ions that are involved and the charges on the ions. You then combine sufficient numbers of ions so that the positive and negative charges balance.

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For example, in sodium carbonate, two  $\text{Na}^+$  ions are needed to balance one  $\text{CO}_3^{2-}$  ion to give the formula,  $\text{Na}_2\text{CO}_3$ .

## Activity



1. Complete Table 1 by writing in the names of the cations and anions.
2. Complete Table 2 by writing in the formulae of some common ionic compounds.
3. Complete Table 3 by writing in the formulae of some common covalent compounds.
4. Learn your ions by heart.

**Table 1**

Formula	Name	Formula	Name
$\text{Na}^+$		$\text{Al}^{3+}$	
$\text{K}^+$		$\text{Cl}^-$	
$\text{Ag}^+$		$\text{Br}^-$	
$\text{NH}_4^+$		$\text{I}^-$	
$\text{Ca}^{2+}$		$\text{F}^-$	
$\text{Mg}^{2+}$		$\text{NO}_3^-$	
$\text{Pb}^{2+}$		$\text{OH}^-$	
$\text{Zn}^{2+}$		$\text{HCO}_3^-$	
$\text{Cu}^{2+}$		$\text{CO}_3^{2-}$	
$\text{Fe}^{2+}$		$\text{S}^{2-}$	
$\text{Fe}^{3+}$		$\text{SO}_4^{2-}$	

**Table 2**

Name	Formula	Name	Formula
sodium carbonate	$\text{Na}_2\text{CO}_3$	zinc nitrate	
silver(I) nitrate		potassium sulfate	
calcium bromide		magnesium sulfide	
copper(II) hydroxide		aluminium hydroxide	
iron(II) nitrate		ammonium chloride	
iron(III) iodide		sodium hydrogencarbonate	
lead(II) sulfate		iron(III) carbonate	

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Table 3

Compound	Formula	Compound	Formula
Methane	CH <sub>4</sub>	Sulphur trioxide	
Ethane		Water	
Propane		Sugar	
Carbon dioxide		Carbon tetrachloride	
Hydrogen chloride			