

GCSE to Further Education

A Level Chemistry

Charges on ions

Task 1

Learn the formulas of the ions in the table below:

Positive ions		Negative ions	
Group 1 ions: Lithium, Li^+ Sodium, Na^+ potassium, K^+	Group 3 ions: aluminium, Al^{3+} Other common ions: Silver, Ag^+ Zinc, Zn^{2+} Ammonium, NH_4^+ Hydrogen, H^+	Group 7 ions: fluoride, F^- chloride Cl^- bromide Br^- iodide I^-	Other common ions: Nitrate, NO_3^- Sulfate, SO_4^{2-} Carbonate, CO_3^{2-} Hydrogencarbonate, HCO_3^- Hydroxide, OH^- Hydride, H^- Phosphate, PO_4^{3-}
Group 2 ions: magnesium, Mg^{2+} calcium Ca^{2+} barium Ba^{2+}		Group 6 ions: oxide, O^{2-} Sulphide, S^{2-}	

Task 2 Working out Formulas of ionic compounds

Use the charges on the ions to work out the formulas of the ionic compounds listed below:

- 1) silver bromide
- 2) sodium carbonate
- 3) potassium oxide
- 4) iron (III) oxide
- 5) chromium (III) chloride
- 6) calcium hydroxide
- 7) aluminium nitrate
- 8) sodium sulfate
- 9) lead (II) oxide
- 10) sodium phosphate
- 11) zinc hydrogencarbonate
- 12) ammonium sulphate
- 13) gallium hydroxide
- 14) strontium selenide
- 15) radium sulfate
- 16) sodium nitride

Balancing Equations

From an early age you should have been able to balance chemical equations. However, at A level, you will often need to:

- work out the formulas yourselves
- work out what is made (so you need to know some basic general equations)
- for reactions involving ions in solution, write ionic equations

Some general reactions you should know:

General Reaction	Examples
substance + oxygen → oxides	$2 \text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ $2 \text{H}_2\text{S} + 3 \text{O}_2 \rightarrow 2 \text{H}_2\text{O} + 2 \text{SO}_2$ $\text{C}_3\text{H}_8 + 5 \text{O}_2 \rightarrow 3 \text{CO}_2 + 4 \text{H}_2\text{O}$
metal + water → metal hydroxide + hydrogen	$2 \text{Na} + 2 \text{H}_2\text{O} \rightarrow 2 \text{NaOH} + \text{H}_2$
metal + acid → salt + hydrogen	$\text{Mg} + 2 \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
oxide + acid → salt + water	$\text{MgO} + 2 \text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2\text{O}$
hydroxide + acid → salt + water	$2 \text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$
carbonate + acid → salt + water + carbon dioxide	$\text{CuCO}_3 + 2 \text{HCl} \rightarrow \text{CuCl}_2 + \text{H}_2\text{O} + \text{CO}_2$
hydrogencarbonate + acid → salt + water + carbon dioxide	$\text{KHCO}_3 + \text{HCl} \rightarrow \text{KCl} + \text{H}_2\text{O} + \text{CO}_2$
ammonia + acid → ammonium salt	$\text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4\text{Cl}$
metal carbonate → metal oxide + carbon dioxide (on heating)	$\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$

Task 3

Learn the word equations (in the above table) for the general reactions. Expect to be tested on this in week 2 or 3.

Task 4

1) Balance the following equations.



2) Give balanced equations for the following reactions.

a) sodium + oxygen → sodium oxide

b) aluminium + chlorine → aluminium chloride

c) calcium + hydrochloric acid → calcium chloride + hydrogen

d) ammonia + sulphuric acid → ammonium sulphate

Atomic Number, Mass Number and Isotopes

Task 5

Complete the following passages and the table:

Atomic number = number of

Mass number = number of + number of

The number of protons, neutrons and electrons in an atom can be worked out using the atomic number and mass number.

Number of protons =

Number of neutrons =

Number of electrons =

Atoms of the same element have the same number of In fact, it is the number of that determines what type of atom it is (e.g. all atoms with 6 protons are carbon atoms). Atoms of different elements have different numbers of **Isotopes** are atoms with the same number of but a different number of This means they are atoms of the same with the same number but a different number

Atom	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons
²³ ₁₁ Na					
Li	3	7			
Ar		40	18		
K			19	20	
Al				14	13
²³⁵ ₉₂ U					
²³⁸ ₉₂ U					

Structure and Bonding

Key ideas from structure and bonding at GCSE will be revised and developed in term 1. Make sure you are confident with concepts from GCSE.

Task 6

Make a summary of the different types of bonding and structure in the table below:

	Monatomic	Simple Molecular	Giant Covalent	Ionic	Metallic
Type of substances And examples	Group 0 elements e.g. He, Ar, Ne				
Type of bonding present	None				
Description of structure	Individual atoms with very weak forces between them				
Labelled Diagram to represent the structure					
Name of particles	Atoms				
Properties	Very low Boiling points Non-conductors Insoluble				

Task 7

Draw dot and cross diagrams to represent the covalent bonding in the following molecules:



c) HCl

d) O₂

e) CO₂

Task 8

a) Draw diagrams to show how a magnesium atom reacts with an oxygen atom to form magnesium oxide, MgO Your diagram should show the electron transfer process.

b) Draw diagrams to show how a calcium atom reacts with chlorine atoms to form magnesium oxide, CaCl₂. Your diagram should show the electron transfer process.

