

Edexcel GCSE Chemistry

Topic 1: Key concepts in chemistry

Ionic bonding

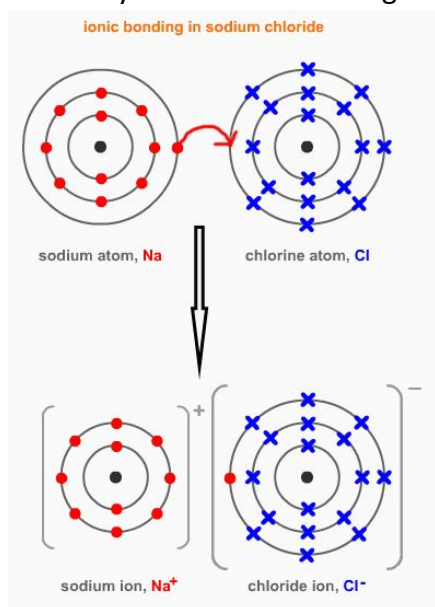
Notes





1.21 Explain how ionic bonds are formed by the transfer of electrons between atoms to produce cations and anions, including the use of dot and cross diagrams

- Metals + nonmetals: electrons in the outer shell of the metal atom are transferred
 - Metal atoms lose electrons to become positively charged ions (cation)
 - Nonmetal atoms gain electrons to become negatively charged ions (anion)
- Electron transfer during the formation of an ionic compound can be represented by a dot and cross diagram (see eg for NaCl below)



1.22 Recall that an ion is an atom or group of atoms with a positive or negative charge

- Since an ion is formed from a metal losing an electron, i.e. becoming a positive metal ion or from a non-metal gaining an electron, i.e. becoming a negative ion... an ion is an atom or group of atoms with a positive or negative charge





1.23 Calculate the numbers of protons, neutrons and electrons in simple ions given the atomic number and mass number

- Atomic number = proton number = number of protons
- Mass number = nucleon number = number of protons + neutrons
- In an atom number of protons = number of electrons, but in an ion, there is a different number of electrons to protons. to work out electrons in an ion:
 - work out how many electrons an atom of the element would have (same as proton number)
 - work out how many electrons have been lost or gained (using charge-remember -ve means electrons gained, +ve means electrons lost)
 - calculate number of electrons in atom plus electrons gained or minus electrons lost

1.24 Explain the formation of ions in ionic compounds from their atoms, limited to compounds of elements in groups 1, 2, 6 and 7

- Ions produced by metals in Groups 1 and 2 and by nonmetals in Groups 6 and 7 have the electronic structure of a noble gas (Group 0)
- this means group 1 metals will lose 1 electron and form +1 ions
- group 2 metals will lose 2 electrons and form +2 ions
- group 6 nonmetals will gain 2 electrons and form 2- ions
- group 7 nonmetals will gain 1 electron and form 1- ions
- remember a compound will have an overall charge of 0 so you need to balance out the + and - charges

1.25 Explain the use of the endings *-ide* and *-ate* in the names of compounds

- these endings are used for the negatively charged ions in a compound
- -ide means the compound contains 2 elements (one is the nonmetal -ve ion)
- -ate means the compound contains at least 3 elements, one of which is oxygen





1.26 Deduce the formulae of ionic compounds (including oxides, hydroxides, halides, nitrates, carbonates and sulfates) given the formulae of the constituent ions

- Oxide -> involves O^{2-} ion (e.g. sodium oxide: Na_2O)
- Hydroxide -> involves OH^{-1} ion (e.g. sodium hydroxide: $NaOH$)
- Halide -> involves a -1 halide ion (e.g. sodium chloride $NaCl$)
- Nitrate -> involves NO_3^{-1} ion (e.g. sodium nitrate: $NaNO_3$)
- Carbonate -> involves CO_3^{2-} ion (e.g. sodium carbonate: $NaCO_3$)
- Sulfate -> involves SO_4^{2-} ion (e.g. sodium sulfate: $NaSO_4$)

to deduce the formula of ionic compounds, you need to balance out the + and - charges to make the overall charge 0. You do this by writing a little number below the element e.g. Cl_3 or for ions with more than one element you draw a bracket round first e.g. $(SO_4)_2$

1.27 Explain the structure of an ionic compound as a lattice structure: consisting of a regular arrangement of ions; held together by strong electrostatic forces (ionic bonds) between oppositely-charged ions

- A giant structure of ions = ionic compound
- Held together by strong electrostatic forces of attraction between oppositely charged ions
- The forces act in all directions in the lattice, and this is called ionic bonding.
- The lattice has a regular arrangement of ions

An example is sodium chloride (salt):

Na^+ (small blue particles) and Cl^- (larger green ones)

