



Box 1: Keywords

Conduct	To allow electricity, heat or other energy forms to pass through
Electrostatic force	A force of attraction between particles with opposite charges (positive and negative)
Ion	Electrically charged particle, formed when an atom or molecule gains or loses electrons.
Ionic bonding	Electrostatic attraction between oppositely charged ions
Ionic compound	An ionic compound occurs when a negative ion joins with a positive ion.
Ionic lattice	The regular arrangement of ions in an ionic substance.
Properties	The characteristics of something, e.g. melting point, conductivity

Box 2: Key skills

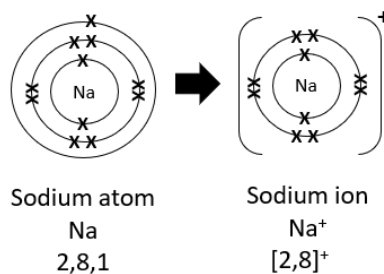
- Draw dot and cross diagrams for ionic compounds
- Describe and explain the properties of ionic compounds
- Work out the empirical formula of an ionic compound from a given model or diagram that shows the ions in the structure

Box 3: Ions

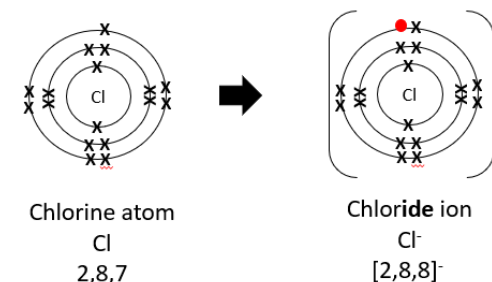
Ions form when atoms lose or gain electrons to get a full outer shell:

- Metal atoms lose electrons to form positively charged ions
- Non-metal atoms gain electrons to form negatively charged ions

Forming positive ions

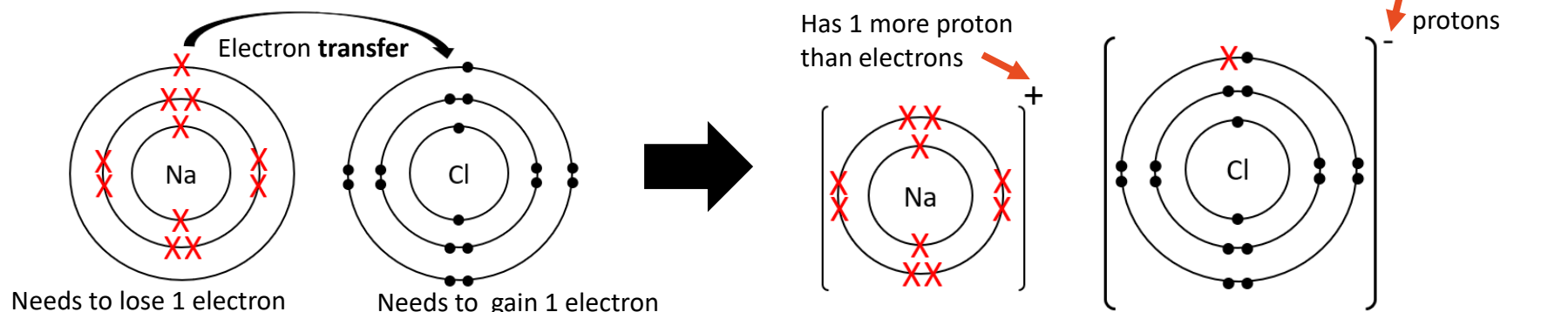


Forming negative ions



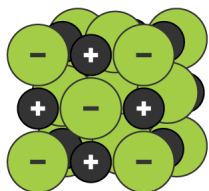
Box 4: Ionic bonding

When metal atoms react with non-metal atoms they **transfer** electrons to the non-metal atom



Box 5: Ionic structure

An ionic compound is a giant structure. Ionic compounds are made of oppositely charged ions that have a regular, repeating pattern, we call this a **giant ionic lattice**.

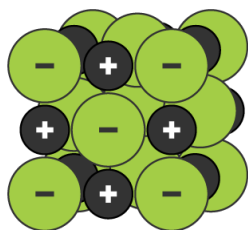


A giant ionic lattice is held together by strong **electrostatic forces** of attraction between the oppositely charged ions. The forces act in all directions in the lattice. The structure is held together by **ionic bonding**.

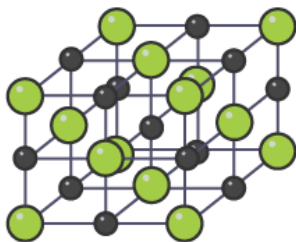
Box 6: Representing ionic compounds

Different types of model are used to represent giant ionic structures. Each has its advantages and limitations.

- the 3D space-filling model shows the arrangement of ions in one layer, but it does not show the layers behind
- the 3D ball and stick model shows the arrangement of ions inside the structure, but using sticks for bonds is misleading because the forces of attraction between ions actually act in all directions. This model is also misleading because it shows lots of free space between the ions, which there isn't



3D space-filling model

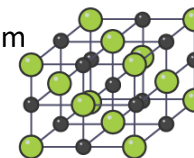


3D ball and stick model

Box 7: Formulae

The empirical formula of an ionic compound can be worked out

- From its dot-and-cross diagram: For every one sodium there is one chloride ion – so the formula is NaCl
- From a lattice diagram: for every green Cl⁻ there is a black Na⁺ ion – so the formula is NaCl



Box 8: Properties of ionic compounds

The structure and bonding of ionic compounds explain their properties.

High melting points

Ionic compounds have high melting points because the electrostatic force of attraction between oppositely charged ions is strong and so requires a lot of energy to break.

Conducting electricity

- Solid ionic compounds do not conduct electricity because the ions are in a fixed position and are not free to move and carry charge
- Molten or dissolved ionic compounds can conduct electricity because the ions are free to move and carry charge.

Box 9: Pathway

Previous knowledge: KS3 particle model, atoms, elements and compounds, electricity

Future links: KS4 electrolysis, redox, chemical analysis

Careers: nanotechnologists, material scientists, researchers, Science editors, Science authors, engineers, electricians

Box 10: Cross curricular links

Physics: changing state, electricity

Biology: ions in the body