3 Chemical bonding – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	**Write it 3 times** (English)		
electrons			
Electronegativity			
nuclear charge			
atomic radius			
shielding			
ionic bonding			
ions			
covalent bonding			
metallic bonding			
delocalised electrons			
coordinate bond			

Recall

At IGCSE you met **ionic**, **covalent** and **metallic** bonding. Now we explain *why* atoms pull on electrons, and draw the bonds more carefully.

- A bond is really about where the **electrons** go.
- Some atoms pull electrons harder than others.

Nothing here is harder than IGCSE – it just adds the right words.

New ideas

Read these first, then do the Practice.

1 Electronegativity

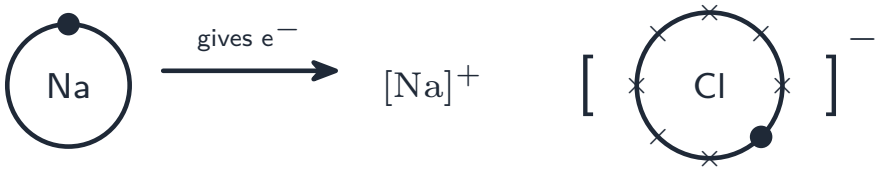
Electronegativity is the power of an atom to attract the electrons in a bond towards itself. It depends on:

- **nuclear charge** – more protons pull harder.
- **atomic radius** – closer to the nucleus pulls harder.
- **shielding** – more inner shells weaken the pull.

So it **rises** across a period and **falls** down a group. **Fluorine** is the most electronegative element.

2 The three strong bonds

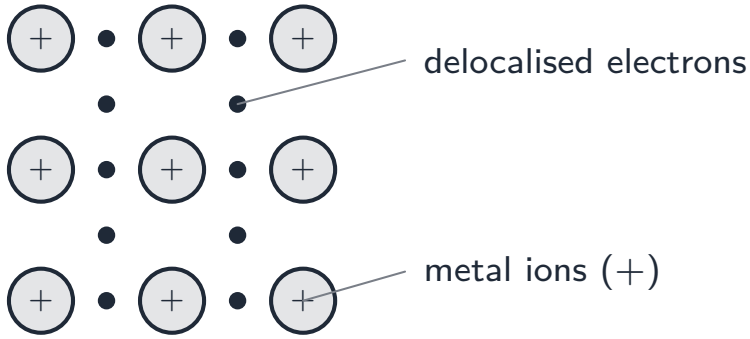
- **ionic bonding** – the attraction between oppositely charged **ions** (a metal gives electrons to a non-metal).
- **covalent bonding** – a **shared pair** of electrons between two atoms.
- **metallic bonding** – positive metal ions in a "sea" of **delocalised electrons**.



3 Metallic bonding

The outer electrons are free to move through the whole metal. This is why metals **conduct electricity** and are strong.

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4 Coordinate bonds

A **coordinate bond** (dative bond) is a covalent bond where **both** shared electrons come from the **same** atom. Example: the lone pair on nitrogen forms the fourth N–H bond in the ammonium ion, NH_4^+.

Watch out: ionic and covalent are the two ends of a scale – the *bigger* the electronegativity difference between the atoms, the more ionic the bond; two identical atoms share the electrons equally (pure covalent).

Practice

Try these in order.

3.1 Define *electronegativity*. [1]

3.2 Which is the most electronegative element? [1]

3.3 State how electronegativity changes (a) across a period, (b) down a group. [2]

3.4 Define *ionic bonding*. [2]

3.5 Explain why metals conduct electricity, using the idea of delocalised electrons. [2]

3.6 What is a *coordinate (dative) bond*? [1]

3.7 Challenge. Using electronegativity, explain why the bond between sodium and chlorine is ionic, while the bond between the two chlorine atoms in Cl_2 is covalent. [2]

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