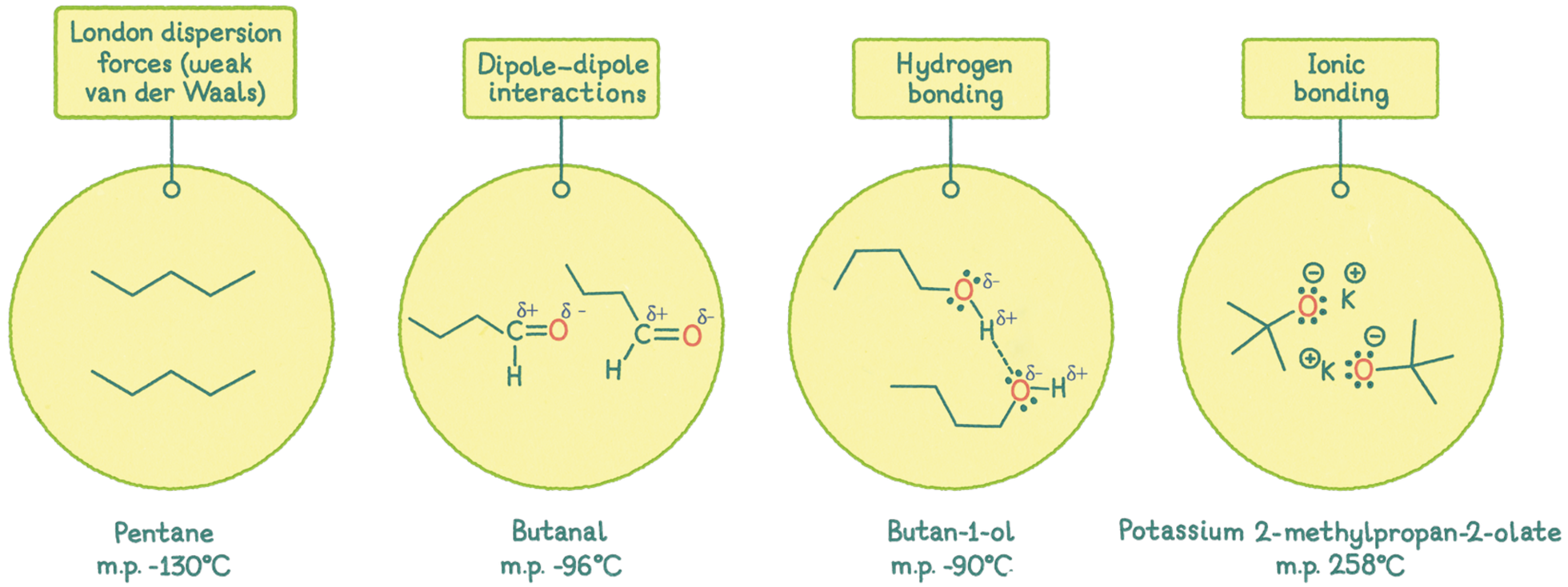
The bonding spectrum

Pure covalent bonding and ionic bonding can be considered to be opposite ends of a **bonding continuum**, or **spectrum**.

In a **covalent bond**, atoms share pairs of electrons. The covalent bond is the result of two positive nuclei being held together by their common attraction for the shared pair of electrons. The ionic bond is the **electrostatic attraction** between **positive and negative ions** within a **crystal lattice**.

The type of bonding gives rise to different intermolecular forces



London dispersion forces, also known as **van der Waals forces**, arise from the movement of electrons which creates a **temporary dipole** in the molecule. This can then induce a **dipole** in a neighbouring molecule. The two dipoles attract.

Permanent dipole–dipole forces occur between **polar covalent bonds.** These form when the **electronegativity** of the bonding atoms is different, resulting in an uneven distribution of charge. This gives rise to a **permanent dipole** as atoms have partial charges (δ+)(δ-).

Hydrogen bonds form between molecules that have hydrogen atoms bonded to **electronegative atoms**, such as nitrogen, oxygen or fluorine. The bonds are particularly strong as hydrogen atoms are very small and are attracted to the lone pair of electrons on the adjacent molecule.

Ionic bonds are electrostatic attractions between positive and negative molecular ions. The ions are arranged so the attractive forces between oppositely charged ions are stronger than the repulsive forces between same-charged ions.

Did you know ...?

The **electronegativity** of an element is the tendency of an atom to attract the shared electrons towards itself in a covalent bond. **Electronegativity** trends across the periodic table can be rationalised by **covalent radius**, **nuclear charge** and the **shielding effect of core electrons**.

Did you know ...?

Hydrogen bonding is responsible for holding together macromolecules such as DNA, proteins and cellulose. It also accounts for water's unique, life-sustaining properties as well as explaining the different boiling points of isomeric amines.

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