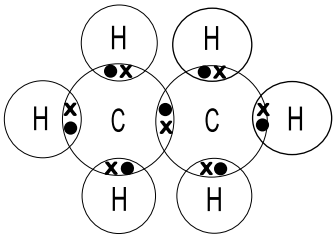
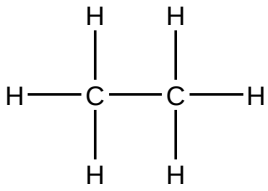
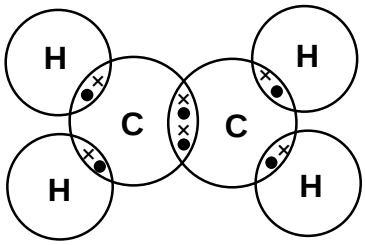
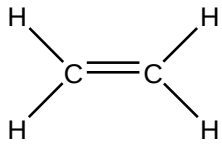
Ethane			The carbon atoms now share an electron with each other to form an carbon-carbon bond. They still have a full outer shell of 8 electrons.
Ethene			Notice that the carbons are sharing two electrons each between them, forming a double covalent bond between the carbon atoms.

PROPERTIES

Most covalently bonded compounds have a simple molecular structure - they form small, discrete molecules, in which the atoms are held together by the covalent bonds.

PROPERTY	EXPLANATION
Low melting and boiling points	Although the covalent bonds holding the atoms together to form molecules are very strong, the forces **between the molecules** are very weak, and it is these *weak intermolecular forces* which are broken when the substance is melted or boiled, requiring little heat energy to overcome.
Soft	To break apart a simple molecular solid, it is not necessary to break the strong covalent bonds which hold the atoms together to form molecules. Only the weak intermolecular forces between the molecules must be overcome, which requires only a small force.
Electrical insulators	There are no ions present in covalent compounds, and all electrons are *localised* on particular atoms, or in the covalent bonds, so there are no free-moving charged particles to carry an electric current.
Soluble in non-polar solvents	Because covalent substances do not contain ions, they are generally more soluble in solvents which are non-polar - solvents made from molecules which do not have a positive and negative end.

SUMMARY

TYPE OF SUBSTANCE	FORMED FROM	STRUCTURE	BONDING	DESCRIPTION	TYPICAL PROPERTIES	EXAMPLES
METALLIC	Metals	Giant	Metallic	Giant lattice of positive metal ions held together by strong electrostatic attraction to a 'sea' of delocalised outer-shell electrons.	Hard; high melting and boiling points; malleable; electrical conductors	Gold, copper, steel, silver
IONIC	Compounds of metals with non-metals (also ammonium compounds and acids).	Giant	Ionic	Giant lattice of alternating positive and negative ions, formed by transfer of electrons from a metal to a non-metal, and held together by strong electrostatic attractions.	Hard but brittle; high melting and boiling points; electrical insulators as solids, but conductors when molten or in solution	Sodium chloride (salt); magnesium oxide
SIMPLE MOLECULAR	Non-metals	Simple	Covalent	Small, separate molecules, consisting of clusters of atoms held together by strong covalent bonds (shared pairs of electrons), but with only weak intermolecular forces between the molecules.	Soft; low melting and boiling points; electrical insulators; often soluble in non-polar solvents	Water, ammonia, carbon dioxide, methane, iodine
GIANT COVALENT	Non-metals	Giant	Covalent	Giant lattice of atoms held together by strong covalent bonds throughout the structure.	Sublimes at very high temperatures; very hard; electrical insulator; insoluble	Diamond
				Layer lattice of atoms held together by strong covalent bonds, producing giant molecular layers attracted to each other by weak intermolecular forces.	Sublimes at very high temperatures; soft; electrical conductor; insoluble	Graphite