4. Chemical Bonding and Structure

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Keyword	Definition
Allotropes	Different forms of an element in the same physical state. Different bonding gives rise to distinct forms with different properties.
Anions	Negatively charged ions.
Bent or V-Shaped	A shape of molecule. (1) With 117 degrees, produced with 3 electron domains and 1 lone pair. (2)With 105 degrees, produced with 4 electron domains and 2 lone pairs.
Binary Compound	A compound made of only two elements.
Bond Enthalpy	The energy needed to break one mole of bonds in gaseous molecules under standard conditions.
Bond Length	A measure of the distance between the two bonded nuclei.
Bond Strength	A measure of the energy required to break a covalent bond.
Bonding Continuum	The gradual change from pure covalent bonding to ionic bonding.
Cations	Positively charged ions
Chemical Bond	A stable association of a combination of different atoms.
Coordinate Bonds	A covalent bond in which both the shared electrons are provided by one of the atoms. See: dative bond
Coordination Number	The number of ions that surround a given ion in a lattice.
Covalent Bond	The electrostatic attraction between a pair of electrons and positively charged nuclei.
Dative Bonds	A covalent bond in which both the shared electrons are provided by one of the atoms. See coordinate bond.
Delocalised	An electron (pair) that is no longer attached to any one particular atom or bond.
Dipole	A molecule with two separated oppositely charged electric charges.
Dipole Moment	The overall pull of electrons in a molecule.
Dipole-Dipole Attraction	When opposite ends of two permanent dipoles are attracted to each other
Double Bond	When two pairs of electrons are involved in a covalent bond.
Electron Deficient	Molecules with incomplete octets.
Electron Domain	A region of space occupied by either a lone pair, single, double or triple bonds.
Electronegativity Values	A measure of the ability of an atom to attract electrons in a covalent bond, described by the Pauling scale of values.
Formula Unit	The simplest ratio of ions in an ionic compound.
Giant Molecular	A single molecule with a regular repeating pattern of covalent bonds with no finite size.
Graphone	Graphene with added hydrogen. It has variable magnetic properties.
Hydrated	When individual ions are surrounded by water molecules (dissolved)
Hydrogen Bond	A intermolecular force occurring between molecules in which hydrogen is bonded directly to fluorine, chlorine or oxygen.
Incomplete Octet	Small atoms which can form stable molecules in which the central atom has

	fewer than eight electrons in their valence shell.
Induced Dipole	When a molecule displays a separation of charge that has been caused by the charge of a neighbouring molecule.
Instantaneous Dipole	When a molecule displays a momentary separation of charge.
Intermolecular Forces	Forces that exist between covalently bonded molecules.
Ion	An atom with an electric charge.
Ionic Bond	Electrostatic forces that hold oppositely charged ions together.
Ionic Compound	Ions held together by ionic bonds.
Ionic Lattice	The three-dimensional crystalline structure seen in ionic compounds.
Ionisation	The process by which electrons are transferred between atoms.
Lattice Energy	A measure of the strength of attraction between ions within an ionic lattice.
Lewis Structure	A simple notation using dots and crosses to represent the outer energy level of all the atoms in the molecule.
Linear	A shape of molecule with 180 degrees. (1) Produced with 2 electron domains. (2) Produced with five electron domains and three lone pairs.
London (Dispersion) Forces	Weak forces of attraction between temporary dipoles and induced dipoles.
Lone Pairs	Pairs of electrons that are not involved in forming a covalent bond.
Macromolecular Structure	A single molecule with a regular repeating pattern of covalent bonds with no finite size.
Metallic Bonding	The strong forces of attraction between delocalised electrons and positive metal ions.
Metals	Elements that form cations.
Molecule	A group of atoms held together by covalent bonds.
Nanotechnology	The branch of technology that deals with dimensions and tolerances of less than 100 nanometres, especially the manipulation of individual atoms and molecules.
Network Covalent	A single molecule with a regular repeating pattern of covalent bonds with no finite size.
Noble Gases	Group 18 elements.
Non-Bonding Pairs	Pairs of electrons that are not involved in forming a covalent bond.
Non-Metals	Elements that form anions.
Octet Rule	States that when atoms react, they tend to achieve an outer shell with eight electrons.
Permanent Dipole	When a molecule shows a permanent separation of charge, caused by the polarity of bonds.
Polar	A covalent bond with an asymmetrical distribution of electron density.
Polyatomic Ions	Ions made up of more than one atom which together experience a loss or gain of electrons and so carry a charge.
Pure Covalent	A covalent bond between atoms of the same element so there is no difference in electronegativity and no polarity.
Resonance	A way of describing delocalised electrons within certain molecules which cannot be expressed with a Lewis diagram.

Resonance Hybrid	The 'true' molecule when there is a variable double bond, with the electrons distributed evenly over all possible bonds.
Resonance Structures	A structure showing the variable positions of a double bond in a molecule in a Lewis structure.
Solvated	When individual ions are surrounded by a solvent that is not water.
Temporary Dipole	When a molecule displays a momentary separation of charge.
Tetrahedral	A shape of molecule with 109.5 degrees. Produced with 4 electron domains and no lone pairs.
Transition Elements	Metals occurring in the middle of the Periodic Table with incomplete d-shells.
Triangular Planar	A shape of molecule with 120 degrees. Produced with 3 electron domains and no lone pairs.
Trigonal Pyramidal	A shape of molecule with 107 degrees. Produced with 4 electron domains and 1 lone pair.
Triple Bond	When three pairs of electrons are involved in a covalent bond.
Valence Electrons	Electrons held in the outer shell of an atom.
Van der Waals' Forces	An umbrella term which includes London forces, dipole-dipole attraction and the less common dipole-induced dipole attraction.
Volatility	The tendency of a substance to vaporise.
VSEPR Theory	Valence Shell Electron Pair Repulsion Theory. Suggests that electron pairs in the same valence shell carry the same charge and so repel each other and spread out as far apart as possible.

Higher

Keyword	**Definition**
Atmosphere	The layer of gas above the Earth
CFCs	Chlorofluorocarbons, a family of molecules.
Excitation	The process where an electron is promoted in the atom from the 2s orbital to the 2p.
Expanded Octet	Atoms found in Period 3 and below that can form valence shells with more than 8 electrons due to the closeness in energy levels of the p and d orbitals.
Formal Charge	Is determined for each atom in a structure from FC = V - (0.5B + L) where V = valence electrons, B = number of bonding electrons and L = number of lone pair electrons.
Free Radical	A reactive species that contains an unpaired electron.
Ground-State	The lowest energy state of an atom or other particle.
Hybrid Atomic Orbitals	Made from two unequal atomic orbitals that have mixed to form new equal atomic orbitals.
Hybridization	The process where atomic orbitals within an atom mix to produce hybrid orbitals of intermediate energy.
Molecular Orbital	A region of space between two bonded atoms where electron density will be found.
Octahedral	A shape of molecule with angles of 90°. Produced with six electron domains.
Ozone Layer	The lower part of the stratosphere that contains 90% of the atmospheric ozone.
Pi Bond	When two p orbitals overlap sideways, concentrating electron density above and below the plane of the bond axis.

Sigma Bond	When two atomic orbitals overlap along the bond axis, concentrating electron density along the bond axis.
Sp Hybrid Orbital	When one s orbital combines with one p orbitals
Sp^2 Hybrid Orbital	When one s orbital combines with two p orbitals
Sp^3 Hybrid Orbital	When one s orbital combines with three p orbitals.
Square Bipyramidal	A shape of molecule with distorted angles. Produced with six electron domains and one lone pair.
Square Planar	A shape of molecule with angles of 180°. Produced with six electron domains and two lone pairs.
Stratosphere	The region of the atmosphere between 12-50km above the Earth.
Triangular Bipyramidal	A shape of molecule with angles of 90°, 120° and 180°. Produced with five electron domains.
T-Shaped	A shape of molecule with angles of 90° and 180°. Produced with five electron domains and two lone pairs.
Unsymmetrical Tetrahedron	A shape of molecule with angles of 90°, 117°and 180°. Produced with five electron domains and one lone pair.