**Glossary Of Leaving Cert Chemistry**

**Activation energy**  
The minimum amount of energy which colliding molecules must have before they can react together.

**Addition polymer**  
A polymer made by the combining together of small unsaturated molecules of the same compound.

**Addition reaction**  
A reaction in which the double or triple bond of an unsaturated compound *opens up* and other atoms add on to the molecule. Addition reactions are characteristic of the alkenes and alkynes.

**Alkali metals**  
The elements of Group 1 of the Periodic Table.

**Allotropes**  
Allotropes are different physical forms of the same element (and are due to different arrangements of the atoms of the element). The allotropes of carbon are diamond, graphite and charcoal.

**Aliphatic compound**  
Compound whose molecule contain only chains of carbon atoms.

**Alkali**  
A base that is soluble in water.

**Alkaline earth metals**  
The elements of Group 2 of the Periodic Table.

**Alkanes**  
Hydrocarbons in which there are only single bonds between carbon atoms.

**Alkenes**  
Hydrocarbons in which there is a double bond between two carbon atoms.

**Alkynes**  
Hydrocarbons in which there is a triple bond between two carbon atoms.

**Alloy**  
A mixture of metals.

**Amphoteric oxide**  
An oxide which shows both acidic and basic properties (i.e., it can react with both alkalis and acids).

**Amphoteric substance**  
One which can act both as an acid and as a base.

**Anion**  
The ion which is attracted to the anode.

**Anode**  
The positive electrode in electrolysis.

**Anodising**  
Anodising is a process in which the normal thin layer of oxide on the surface of aluminium is artificially thickened to give it added protection from corrosion. It is done by making aluminium the anode in an electrolysis cell in which dilute sulphuric is electrolysed.

**Aromatic compounds**  
Compounds whose molecules contain a 6-membered ring of carbon atoms (Benzene ring).

**Atomic number**  
The atomic number corresponds to the number of protons in the nucleus of an atom of that element. It also corresponds to the number of electrons in the neutral atom.

**Aufbau principle**  
Electrons occupy the lowest available energy level.

**Autocatalysis**  
The catalysis of a reaction by one of the products of that reaction.

**Avogadro constant**  
The number of carbon atoms in exactly 12 grams of the carbon-12 isotope.

**Avogadro's law**  
Equal volumes of all gases at the same temperature and pressure contain equal numbers of molecules.

**Biochemical oxygen demand (BOD)**  
A measure of the amount of organic pollution in water. It is defined as the amount of dissolved oxygen consumed by biochemical action, when a sample of water is kept in the dark at 20° C for 5 days.

**Boyle's law**  
For a fixed mass of gas is kept at constant temperature, the volume is inversely proportional to the pressure.

**Brønsted acid**  
A substance (molecule or ion) that can donate protons.

**Brønsted base**  
A substance that can accept protons.

**Catalysis**  
The process of changing the rate of a chemical reaction by the action of a catalyst.

**Catalyst**  
A substance that alters the rate of a chemical reaction but which is not used up during the reaction, and which is chemically unchanged at the end of it.

**Catalyst poison**  
A substance which destroys the activity of a catalyst e.g. lead in car catalytic converter.

**Cathode**  
The negative electrode in electrolysis

**Cation**  
The ion which is attracted to the cathode.

**Charles' law**  
For a fixed mass of gas kept at constant pressure, the volume is directly proportional to the absolute temperature.

**Concentration**  
The amount of a substance per unit volume of solution.

**Condensation reaction**  
A reaction in which two compounds combine together and eliminate water (or other small molecule such as HCl).

**Conjugate acid**  
The substance formed when a Brønsted base has accepted a proton.

**Conjugate base**  
The substance formed when a Brønsted acid has lost a proton.

**Conjugate pair**  
A pair of substances that differ by a proton.

**Co-product**  
In an industrial process, a substance that is also formed along with the substance being manufactured.

**Covalent bond**  
One or more shared pairs of electrons, each of the bonded atoms contributing one electron towards the shared pair. Covalent bonds may be either pure or polar.

**Cracking**  
The breaking down of long-chain hydrocarbon molecules into smaller molecules.

**D-block element**  
One whose atoms' highest-energy electron occupies a d orbital.

**Dehydration**  
The removal of water, or the elements of water, from a compound or compounds e.g. when making ethene from ethanol.

**Deionised water**  
Water in which ions that were present in it have been removed by passing the water through an ion exchanger, which replaces any positive ions by H+ ions and any negative ions by OH- ions. (Deionised water may contain covalent substances.)

**Dissociation constant of an acid (Ka) (or a base (Kb))**  
A measure of the extent to which the acid (or base) dissociates (ionises) in solution, and which is given by Ka = http://www.skoool.ie/skoool/uploadedImages/contentimages/ch_gloss01.gif. It is only applicable to weak acids and bases.

**Distilled water**  
Water which has been boiled and the steam from it condensed; it therefore contains no dissolved solids.

**Double bond**  
Two shared pairs of electrons.

**Dynamic equilibrium**  
See Equilibrium

**Effluent**  
Liquid industrial waste

**Electrochemical series**  
A list of elements in decreasing order of ease with which they lose electrons.

**Electrodes**  
The conductors by which the current enters and leaves the solution in electrolysis. The positive electrode is called the anode and the negative electrode is the cathode.

**Electrolysis**  
The process in which an electrolyte is decomposed by passing a current through it.

**Electrolyte**  
A compound which in liquid state conducts electricity and is decomposed in doing so.

**Electronegativity**  
A measure of the attraction of an atom of an element for the shared pair of electrons in a covalent bond.

**Electroplating**  
The process of covering one metal (usually a cheap and/or plentiful one) with a thin layer of a more expensive one, to provide protection and/or better appearance.

**Electropositive**  
Describes elements that readily lose electrons to form positive ions.

**Empirical formula**  
The formula of a compound that shows only the ratio in which the different types of atom are present in the molecule.

**Endothermic reaction**  
A reaction in which heat is taken in or "used up".

**Energy level**  
A measure of the amount of energy possessed by an electron when it is in an atom.

**Equilibrium**  
A balanced state of constant change in a system. Chemical equilibrium refers to the state in a reversible reaction when the rate of the forward reaction is equal to the rate of the backwards reaction.

**Equilibrium constant, Kc**  
For a reversible system, a constant that tells how far the reaction has gone to the right-hand side, by the time equilibrium has been established. For the system: A + B ⮀ C + D, the equilibrium constant is given by: K= http://www.skoool.ie/skoool/uploadedImages/contentimages/ch_gloss03.gif

**Esterification**  
A reaction in which an acid and alcohol react together, to form an ester and water.

**Eutrophication**  
The enrichment of natural waters by nutrients (nitrates and phosphates in particular); it causes the very rapid growth of algae which, when they die and decay, consume large amounts of oxygen. The water is then depleted of oxygen, and fish and aquatic life die.

**Excited state**  
The state of an atom when one or more of its electrons have been promoted to higher energy levels.

**Exothermic reaction**  
A reaction in which heat is liberated.

**Feedstock**  
Raw materials needed for a chemical manufacturing process.

**Fixation of nitrogen**  
The process in which atmospheric nitrogen is made to combine with other elements to form useful compounds.

**Flocculation**  
The process in which small particles in water are made to coagulate (clump together) and form a precipitate. It is done by adding a FLOCCULATING AGENT such as aluminium sulphate or iron (III) sulphate.

**Fractional distillation (or fractionation)**  
The process in which a mixture of liquids is separated into components or fractions of different boiling points (or different boiling points ranges).

**Functional group**  
A group of atoms on which the characteristic properties of a particular compound depend.

**Gay Lussac's law**  
In a reaction between gases, the volumes of the reacting gases and the volumes of the products, if gaseous, are in the ratio of small whole numbers (at the same temperature and pressure).

**General gas law**  
This is a combination of Boyle's and Charles' laws, and is most simply expressed as

**Ground state**  
The state of an atom when all of its electrons are in their lowest available energy levels.

**Halogens**  
The elements of Group 7 of the Periodic Table (i.e., fluorine, chlorine, bromine and iodine).

**Halides**  
Compounds which contain a halogen and one other element (e.g., fluorides, chlorides, bromides and iodides).

**Hard water**  
Hard water is water which will not readily form lather with soap due to the presence of dissolved calcium or magnesium salts in the water.

**Heat of combustion**  
The heat change which occurs when one mole of a substance is completely burnt in excess oxygen.

**Heat of formation**  
The heat change which occurs when one mole of a compound is formed from its elements in their standard states.

**Heat of reaction**  
The heat change which occurs when a reaction takes place according to a given chemical equation.

**Heat of neutralisation**  
The heat change that occurs when one mole of H+ ions from an acid reacts with one mole of OH– ions from an alkali.

**Heisenberg's uncertainty principle**  
It is not possible to ascertain both the position and the momentum of an electron in an atom simultaneously.

**Hess' law**  
The heat change for a given reaction depends only on the initial and the final states of the system, and is independent of the path followed.

**Heterogeneous catalysis**  
A system in which the catalyst and the reactants are in different phases.

**Heterolytic fission**  
The breaking of a covalent bond so that one atom retains the two shared electrons and the other atom retains none. Ions are thus formed.

**Homologous series**  
A series of compounds, all members of which contain the same functional group, and successive members differ by CH2.

**Homolytic fission**  
The breaking of a covalent bond so that each atom retains one of the shared electrons, forming two free radicals (or free atoms).

**Homogenous catalysis**  
A system by which both the catalyst and the reactants are in the same phase or state.

**Hund's rule**  
When two or more orbitals of equal energy are available to electrons, the electrons occupy them singly before filling them in pairs.

**Hydrolysis**  
The decomposition of a compound by means of water (or the OH– ion), the water also being decomposed in the reaction.

**Hydrocarbons**  
Compounds containing hydrogen and carbon only. Hydrogenation Action The reaction in which hydrogen adds on across a double or triple bond.

**Hydration**  
A reaction in which a compound combines with water.

**Hydrogen bond**  
The electrical attraction between the slightly positive hydrogen atoms of one molecule and a slightly negative atoms in another molecule.

**Ideal gas**  
One that obeys the gas laws at all temperatures and pressures. In reality no such gas exists.

**Ideal gas equation**  
*pV = nRT*, where *p* is the pressure (in pascals (Pa)), *V* is the volume (in m3), *n* is the number of moles, *R* is the general gas constant, *T* is the temperature (in kelvins).

**Indicator**  
A substance, which by means of a colour change, indicates the presence of another substance.

**Ion**  
An atom or group of atoms which has either lost or gained electrons and has therefore become either positively or negatively charged.

**Ionic bond**  
The electrical attraction between the oppositely charged ions which are produced when electrons are transferred from one atom to another.

**Ionic product of water**  
The product of the H+ and the OH - concentrations in water (and all aqueous solutions), or, Kw = [H+] [OH–].

**Ionisation energy**  
The first ionisation energy of an element is the minimum energy required to completely remove the most loosely-bound electron from an isolated atom of the element.

**Isomers**  
Compounds having the same molecular formula but different structures.

**Isomerism**  
The existence of compounds which have the same molecular formula but different structural formulae. The different compounds are called isomers.

**Isotopes**  
Atoms of the same element but which differ in the numbers of neutrons in their nuclei (or, have different mass numbers).

**Kilogram Calorific value**  
The quantity of heat liberated when 1 kg of a fuel is completely burnt.

**Law of conservation of energy (or first law of thermodynamics)**  
This states that energy can neither be created nor destroyed but changed from one form into another.

**Le Chatelier's principle**  
If a system in equilibrium is subjected to a stress, then the system will alter so as to oppose the effect of the stress.

**Lone pair**  
Pair of electrons in the outer shell of an atom not involved in bonding.

**Mass number**  
The number of protons and neutrons in an atom of the element.

**Metal**  
An element that ionises to give positive ions.

**Metal ore**  
A mineral that contains a compound of the metal and from which the metal is extracted.

**Melting point**  
The temperature at which a solid changes to a liquid.

**Micro-organisms**  
Organisms that are too small to be seen with the unaided eye. (Examples are bacteria and viruses.)

**Molarity**  
The concentration of a solution in moles per litre.

**Molar solution**  
A solution that contains one mole of the solute per litre (dm3) of solution.

**Molar volume of gas**  
The volume occupied by one mole of the gas. It is equal to 22.4 litres at s.t.p. and about 24 litres at room temperature.

**Mole [mol]**  
That amount of a substance which contains the Avogadro Constant number of particles.

**Molecular formula**  
The molecular formula of a compound indicates the number of atoms of each kind in the molecule.

**Negative catalyst (or inhibitor)**  
A substance that decreases the rate of a chemical reaction.

**Noble gas**  
One of the elements of Group 0 of the Periodic Table

**Octane number (of a fuel)**  
The percentage of 2,2,4 trimethylpentane in an 2,2,4 trimethylpentane /heptane mixture that gives the same engine performance of the fuel OR the measure of a tendency of a fuel to resist knocking.

**Octet Rule**  
This states that when atoms bond together, they attain the stable structure of having eight electrons in the outer shell of their atoms. However, the Octet Rule is nothing more than just a guide and there are many exceptions to it.

**Orbital**  
The region in space around the nucleus of an atom in which the electrons are most likely to be found.

**Oxidation**  
A process in which there is loss of electrons from an atom or ion.

**Oxidation number**  
The charge which an atom of the element has, or appears to have, in a compound.

**Oxidising agent**  
A substance that causes oxidation. The oxidising agent takes the electrons and is therefore reduced in the process (since it gains the electrons).

**Oxygenate**  
A fuel that has a very high octane number because of the presence of some oxygen in it e.g. MTBE.

**Pauli exclusion principle**  
No more than two electrons can occupy an orbital, and this they can only do if they have opposite spin.

**Peroxide**  
An oxide in which contains two oxygen atoms joined to each other.

**Permanent hardness**  
The type of hardness which cannot be removed by boiling the water; it is caused by dissolved sulphates. Sulphates are unaffected by heat.

**pH**  
Minus the log (to the base 10) of the H+ concentration, or, pH = -log10 [H+]. pH is thus a measure of the acidity or alkalinity of a solution.

**Pi bond**  
A covalent bond made by the sideways overlapping of two p orbitals. The second bond in a double bond is a pi bond.

**pOH**  
Minus the log10 of the OH–concentration. The sum of the pH and the pOH of any aqueous solution is 14.

**Plastic**  
A material which can be softened and moulded by heat and pressure.

**Polar bond (Polar covalent)**  
A covalent bond in which the shared pair of electrons is attracted more to one or the joined atoms than to the other (e.g., H-Cl and O-H bonds).

**Polymer**  
A substance formed by the combining together of large numbers of small molecules.

**Polymerisation**  
A process in which many small and simple molecules (called monomers) join together to form a much larger molecule, called a polymer.

**Primary standard**  
A substance that is available in a stable and pure enough state to be made up directly into a standard solution.

**Principle quantum number**  
A number that indicates the main energy level, or shell number, of an electron in an atom.

**Product**  
A substance formed in a chemical reaction.

**Promoter**  
A substance that improves the activity of a catalyst, but which itself is not a catalyst.

**Pure covalent bond**  
A covalent bond in which the pair of electrons is shared equally between the two joined atoms.

**Rate of a reaction**  
The change in the amount (or of the concentration) of reactant (or product) per unit time.

**Reactant**  
One of the substances which reacts in a chemical reaction (See product).

**Recrystallisation**  
A process used to purify substances. The impure substance is dissolved in a suitable solvent, the solution filtered and allowed to crystallise.

**Reducing agent**  
A substance that causes reduction. The reducing agent supplies the electrons and is therefore oxidised in the process (since it loses the electrons).

**Reduction**  
A process in which an atom or ion gains electrons.

**Reforming**  
A process in which straight-chain hydrocarbons are heated under pressure with a catalyst, when they form branched-chain hydrocarbons.

**Relative atomic mass (Ar)**  
The mass of an atom of that element compared with one twelfth of the mass of the carbon-12 isotope.

**Relative molecular mass (Mr)**  
The mass of a molecule of that substance compared with one twelfth of the mass of the carbon-12 isotope.

**Reversible reaction**  
A reaction that can go in either direction (i.e., from left to right, or from right to left).

**Salt**  
The substance formed when the hydrogen of an acid is replaced by a metal.

**Saponification**  
A hydrolysis of an ester carried out in the presence of alkali. (Saponification of natural fats and oils yields soaps and glycerol.)

**Saturated compounds**  
Compounds which contain only single bonds between atoms. The alkanes are saturated hydrocarbons.

**Shift reaction**  
A reaction used in hydrogen manufacture in which carbon monoxide reacts with steam to produce hydrogen and carbon dioxide.

**Sigma bond**  
A covalent bond made by the end-on overlapping of two p orbitals. A single covalent bond is a sigma bond.

**Slag**  
A waste substance formed during the extraction or refining of a metal from its ore. (Sometimes however, uses can be found for a slag.)

**Smelting**  
The process in which a metal is extracted from its ore.

**Soft water**  
Soft water is that which will readily form a lather with soap because there are no calcium or magnesium salts present.

**Specific heat capacity formula**  
*E = m cΔT* , where *E* (in joules) is the heat energy required to heat a substance of mass m and specific heat capacity c, through a rise in temperature T.

**Standard solution**  
A solution whose concentration is known accurately.

**Standard temperature and pressure (S.T.P)**  
273 K or 0 °C and 101 kPa (101 x 103 Pa).

**Steam reforming**  
A reaction used for the manufacture of hydrogen, by reacting steam with natural gas at high temperature.

**Strong acid**  
An acid that is fully dissociated in solution

**Structural formula**  
The formula of a compound showing the way in which the atoms are arranged in the molecule.

**Substitution reaction**  
A reaction in which an atom or group of atoms in a molecule is replaced by other atoms or groups of atoms. Substitution reactions are characteristic of the alkanes.

**Temporary hardness**  
The type of hardness which can be removed by boiling the water; it is caused by dissolved hydrogencarbonates. These salts are decomposed on being heated (forming the corresponding carbonate – which is precipitated).

**Transition element**  
One whose atoms have an incomplete d orbital.

**Triple bond**  
Three shared pairs of electrons.

**Unsaturated compounds**  
Compounds which contain one or more double or triple bond between carbon atoms. The alkenes and alkynes are unsaturated.

**Valency**  
The number of electrons which an atom of an element must either gain or lose to attain a noble gas structure.

**Voltameter**  
A vessel fitted with electrodes in which electrolysis takes place. (Do not confuse voltameter with voltmeter, which is an instrument to measure voltage.)

**Weak acid**  
An acid that is only slightly dissociated in solution.