

# The A to Z

# Chemical Definitions

# You Must Know

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## KEY DEFINITIONS



In this section, you will have a quick review on all the possible definitions that can be tested in your major chemistry examinations. This is a comprehensive list of definitions that covers the most important and frequent definitions tested in past years exams. You are required to know them as questions on “definitions” are very popular.

### **Acid**

A substance that dissociates in water to produce hydrogen ions ( $H^+$ ) as the only positive ions

### **Activation Energy**

The minimum energy that reactant particles must possess during their collisions in order for a chemical reaction to occur

### **Actual Yield**

The amount of pure products that is actually produced in the experiment  
Actual Yield is always less than the Theoretical Yield

### **Addition Reaction**

A reaction in which a molecule (element or compound) adds to an unsaturated compound to form a single saturated compound

### **Addition Polymer**

A polymer made by addition polymerisation

### **Addition Polymerisation**

A polymerisation reaction where monomer units join together without losing any molecules or atoms

### **Air Pollution**

The condition in which air contains a high concentration of certain chemicals that may harm living things or damage non-living things

### **Alcohol**

An organic compound containing the hydroxyl group ( $-OH$ )

### **Alkali**

A substance that dissociates in water to produce hydroxide ions ( $OH^-$ )  
Bases that are soluble in water are known as Alkalis

### **Alkali Metals**

The elements in Group I of the Periodic Table

### **Alkane**

Hydrocarbons having the general formula  $C_nH_{2n+2}$

### **Alkene**

Hydrocarbons that contains one or more carbon-carbon double bonds

Alkenes with only one carbon-carbon double bond have the general formula  $C_nH_{2n}$

Other alkenes that have more than one carbon-carbon double bonds will have different general formula

### **Allotropes**

Different forms of the same element

Diamond and Graphite are allotropes of Carbon

### **Alloy**

A mixture of a metal with non-metals or other metals

### **Amphoteric Oxides**

An oxide that reacts with both acids and alkalis to form salts

### **Anhydrous Salts**

Anhydrous salts are salts without water of crystallisation

### **Anion**

A negatively charged ion which moves towards the anode during electrolysis

### **Anode**

A positively charged electrode in an electrolytic cell

### **Aqueous Solution**

Describe the solution of a substance in water, i.e. the aqueous solution

In chemical equations, symbol (aq) are used to represent aqueous solutions

### **Atom**

The smallest particles of an element that have the chemical properties of the element

### **Atomic Number**

Another term for proton number

It shows the total number of protons in the atom

### **Avogadro's Constant / Number**

The number of particles in one mole of a substance

Has the value of  $6 \times 10^{23}$

### **Avogadro's Law**

At constant temperature, the volume of a gas is directly proportional to the number of moles of the gas present

### **Base**

A substance that reacts with an acid to form a salt and water only

Metal oxides and hydroxides are bases

A soluble base is called an alkali

**Basicity**

The number of hydrogen atoms in one molecule of acid that form hydrogen ions

**Biodegradable**

Ability to be broken down into simpler substances by micro-organisms

**Biogas**

A gas that is produced when organic matter (waste material from plants and animals) is allowed to decay in the absence of air

**Boiling Point**

The temperature at which a liquid turns rapidly to its vapour and it occurs throughout the whole liquid

**Burning**

Combustion in which a flame is produced

**Carboxylic Acid**

An organic acid containing the carboxyl group (-COOH)

**Catalyst**

A catalyst is a substance which increases the speed of a chemical reaction and remains chemically unchanged at the end of the reaction

**Cathode**

A negatively-charged electrode in an electrolytic cell

**Cation**

A positively charged ion which moves towards the cathode during electrolysis

**Chemical Bond**

A force that holds particles (atoms or ions) together in chemical reaction

**Chemical Change**

A change that results in the formation of a new substance

**Chemical Property**

A property of a substance in which there is a chemical reaction, e.g. combustion

**Chromatography**

A method of separating two or more components that dissolve in the same solvent. Also used to determine the purity of a sample since they only give one spot on a chromatogram

**Chromatogram**

The chromatography paper with the separated components

**Collision Theory**

A chemical reaction can only occur when the reacting particles collide with one another

**Combustion**

The chemical name for process of burning  
It occurs when a substance reacts rapidly with oxygen

**Compound**

A pure substance formed in a chemical change when two or more elements are joined together

**Concentration**

The amount of a solute that is dissolved in a unit volume of the solution  
Expressed in  $\text{g/dm}^3$  or  $\text{mol/dm}^3$  (Molar Concentration)

**Condensation**

The process by which a vapour or a gas turns to a liquid on cooling

**Condensation Polymerisation**

A polymerisation reaction that involves the release of a small molecule as by-product (such as water) when a polymer is formed when monomers react together

**Conductor**

A substance that allows heat or electricity to pass through it

**Corrosion**

The wearing away of the surface of a metal by chemical action

**Covalent Bond**

The type of bond formed when electrons are shared between two atoms  
Bond formed between non-metals and non-metals

**Cracking**

The breaking down of long chain hydrocarbon molecules with heat and/or catalyst to produce smaller hydrocarbon molecules and/or hydrogen gas

**Crystallisation**

A physical method used to purify crystals and substances that decompose on strong heating

**Crystal**

A solid with a definite regular shape

**Decanting**

A physical process that is used to separate a dense, insoluble solid from a liquid

**Decomposition**

A chemical reaction that results in the breaking down of a compound into two or more components

**Delocalised electrons**

Electrons from atoms in metals that move freely through the metal  
Commonly known as "Sea of Electrons" in metallic bonding

**Desalination**

The removal of salt from sea water or salty water

**Desulfurisation**

The process of removing sulfur dioxide from flue gases

**Diatomic molecule**

A molecule that consists of two atoms

**Diffusion**

The process by which particles move freely to fill up any available space

From region of higher concentration to region of lower concentration

Gas particles of different sizes diffuse at different rates

**Discharge**

The process of gaining or losing electrons at the electrodes in electrolysis

**Displacement reaction**

A reaction in which an atom or molecule takes the place of another atom or molecule in a compound

e.g. Halogen Displacement Reactions

e.g. Metal Displacement Reactions

**Distillation**

A process of obtaining the pure solvent from a solution

When the solution is boiled, the solvent is vaporised and the vapour condenses to reform the pure liquid

**Ductile**

Ability to be pulled into wires without breaking

A physical property of metals

**Electrode**

A rod or a plate which carries electricity in or out of an electrolyte during electrolysis

Can be Inert Electrode such as Graphite (Carbon) or Platinum, or Reactive Metal

Electrodes such as Copper, etc

**Electrolysis**

The process in which electrical energy is used to break down or decompose a compound

**Electrolyte**

A compound that conducts electricity in the molten or aqueous solution

**Electron**

A negatively charged sub-atomic particle that surrounds the nucleus of an atom

**Electronic Configuration**

The arrangement of electrons in the various shells of an atom or a molecule

**Electroplating**

The process of depositing a layer of metal on another substance using electrolysis

**Element**

A pure substance made from only one type of atom

It cannot be separated into simpler substances by chemical processes or by electricity

**Empirical Formula**

Shows the types of elements present in the simplest ratio in the compound

**End Point**

The point in a titration at which an indicator changes colour

**Endothermic Reaction**

A reaction which takes in heat energy from the surroundings

**Energy Level Diagram**

Shows the heat change (enthalpy change) in an exothermic or endothermic reaction

**Energy Profile Diagram**

Shows the activation energy ( $E_a$ ) required and the enthalpy change ( $\Delta H$ ) for a chemical reaction

**Enthalpy Change or Heat Change**

The amount of energy involved in a reaction and is represented by  $\Delta H$

**Enzymes**

Substances that catalyse the chemical reactions in plants and animals

Often known as biological catalysts

**Equation**

A way of describing a chemical reaction by using formulae for the reactants and products

**Ester**

An organic compound formed from the reaction of an alcohol and a carboxylic acid

**Esterification**

A chemical reaction that involves a carboxylic acid reacting with an alcohol to form an organic compound called esters

**Evaporation**

The process by which liquid changes to its vapour on the surface of the liquid

It occurs below boiling point

**Excess Reactant**

Reactants that are not used up at the end of a chemical reaction

**Exothermic Reaction**

A reaction that gives off heat energy to the surroundings

**Feedstock**

A raw material for a reaction or process in the chemical industry

**Fermentation**

The conversion of glucose by microorganisms such as yeast into ethanol and carbon dioxide

**Filtrate**

The liquid / aqueous solution which passes through the filter paper during filtration

**Filtration**

The process of separating an insoluble solid from a liquid or a solution using filter paper

**Fossil Fuels**

Fuels produced millions of years ago from the decaying remains of animals or plants

**Fractional Distillation**

A process that separates the components in a mixture on the basis of their different boiling points

The components with the lowest boiling point boils off first and is distilled over

**Freezing Point**

The temperature at which a liquid changes to a solid

**Fuel**

A substance that burns easily to produce energy

**Fuel Cell**

A chemical cell in which reactants (usually a fuel and oxygen) are continuously supplied to produce electricity directly

**Functional Group**

An atom or group of atoms that gives characteristic properties to an organic compound

**Giant Structure**

A three-dimensional network of atoms or ions packed together in a regular pattern

**Global Warming**

The warming of the earth by greenhouse gases

Also known as the Greenhouse Effect

**Greenhouse Effect**

The warming of the earth by greenhouse gases

Also known as the Global Warming



**Greenhouse Gas**

A gas in the atmosphere that contributes to global warming  
Carbon dioxide is the main greenhouse gas

**Group**

A vertical column of elements in The Periodic Table

**Haber Process**

A process where nitrogen and hydrogen react to produce the ammonia gas in a reversible reaction

**Halogen**

The non-metallic elements in Group VII of The Periodic Table

**Homologous Series**

A family of organic compounds with members of the family having the same general formula and similar chemical properties

**Hydrated Salts**

Salts that contain water of crystallisation

**Hydrocarbons**

Organic compounds made up from the elements hydrogen and carbon only

**Hypothesis**

A tentative explanation for an observation or pattern among observations that can be tested by further investigations

**Immiscible**

Two liquids that do not mix with each other

**Indicators**

Compounds that have distinctly different colours in acidic and alkaline solutions

**Inhibitors**

Substances that slows down the speed of chemical reactions

**Ion**

A positively or negatively charged particle  
It is formed when an atom or group of atoms loses or gains electrons

**Ionic Bond**

The electrostatic forces of attraction that holds positive and negative ions together in an ionic compound  
Ionic bond is formed when electrons are transferred from a metallic atom to a non-metallic atom

### **Ionic Compound**

A compound that consists of ions arranged in a giant lattice structure called a crystal lattice

### **Ionic Equation**

A simplified chemical equation that shows the ions taking part in a reaction and the products formed, leaving out the spectator ions that do not react

### **Isomers**

Compounds that have the same molecular formula but different structural formulae

### **Isotopes**

Atoms of the same element that have the same atomic number but different nucleon numbers

Isotopes have the same chemical properties but slightly different physical properties

### **Kinetic Particle Theory**

All matter is made up of tiny particles and that these particles are in constant, random motion.

### **Limiting Reactant**

The reactant that is completely used up in a chemical reaction

It determines or limits the amount of products formed in a chemical reaction

### **Locating Agents**

A substance that is applied to a chromatogram in order to help us see colourless substances / spots

### **Macromolecule**

A large molecule made by joining together many small molecules i.e. monomers

Also known as Polymer

### **Malleable**

Ability to be beaten into thin sheets of different shapes without breaking

A physical property of metal

### **Mass Number**

Another term for Nucleon Number

### **Matter**

A substance that has mass and occupies space

3 states of matter are solid, liquid and gas

### **Melting Point**

The temperature at which a solid changes to a liquid

### **Metal**

An element that is shiny and conducts electricity in the solid state

Metals burn in oxygen to form a basic oxides or amphoteric oxides

**Metallic Bond**

Force of attraction between positive metal ions and the 'sea of delocalized electrons'

**Metalloid**

An element that has properties between those of metals and non-metals

**Mineral**

A naturally occurring substance (elements or compounds) in rocks

**Mixture**

A substance made by mixing other substances together

The components in a mixture can be easily separated by physical means

**Molar Gas Volume**

The volume occupied by one mole of a gas

At room temperature and pressure (r.t.p), the molar volume =  $24 \text{ dm}^3$  or  $24,000 \text{ dm}^3$

**Molar Mass**

It refers to the mass of one mole of a substance. Unit is  $\text{g mol}^{-1}$

Has the same value as  $A_r$  or  $M_r$

**Mole**

The amount of a substance that contains the same number of particles as 12.0 g of Carbon-12

**Molecule**

A group of two or more atoms that are chemically held together by covalent bonds

Molecules may be elements or compounds

**Molecular Compound or Covalent Compound**

Molecules that are made from two or more different types of atoms linked together by covalent bonding

**Molecular Formula**

Shows the exact amount of atoms of each element in a molecule

**Monomer**

A small molecule which can be joined together in large numbers to form one big molecule known as polymer

**Noble Gases**

Gases that are unreactive and do not form compounds because they have the duplet or octet configuration (noble gas structure)

**Non-biodegradable**

It is a biological term which means that substance cannot be broken down into simpler substances by bacteria in the soil

**Neutralisation**

The reaction between an acid and a base to produce a salt and water only

**Neutron**

A sub-atomic particle in the nucleus of an atom  
It has a mass but has no electrical charge

**Noble Gas**

A gaseous element found in Group 0 of The Periodic Table

**Nucleon Number**

The sum of number of protons and neutrons in the nucleus of an atom

**Nucleus**

The central part of an atom consisting of neutrons and protons

**Organic Chemistry**

Chemistry that deals with carbon-based compounds

**Organic Compounds**

Compounds that contain carbon and often contain hydrogen, oxygen and nitrogen as well

**Oxidation**

A reaction where a substance gains oxygen or loses hydrogen  
Also defined as the loss of electron(s) or the increase in oxidation state of the element

**Oxidation States**

Refers to the charge of an ion but it also applies to covalent compound  
The oxidation state of an atom in a covalent compound is the charge it would have if the bond is really ionic

**Oxides**

Compounds of an element with oxygen

**Oxidising Agent**

A substance that brings about oxidation of another substance  
It is itself reduced in the process of oxidising others  
An oxidising agent is an acceptor of electrons

**Percentage Yield**

Shows the relationship between actual yield and theoretical yield  
Expressed as a % of actual yield over theoretical yield

**Period**

A horizontal row of elements in The Periodic Table

**Periodic Table**

A table that contains horizontal rows and vertical columns of elements  
The elements are arranged in order of their atomic numbers and in accordance with their chemical properties

### **Petrochemicals**

The substances in petroleum fractions and the chemicals made from them

### **pH Scale**

A scale that measures the acidity and alkalinity of a solution

### **Photochemical Smog**

Smog produced by the action of sunlight on oxides of nitrogen and hydrocarbons in the atmosphere

### **Physical Change**

A change to a substance in which no new substance is formed

### **Physical Property**

A property that can be observed or measured without a substance changing into another substance

Examples are: density, mass, viscosity, melting point, colour, etc

### **Pollutant**

Any substance that is harmful to living things or to the environment

### **Pollution**

The presence of toxic substances in the environment which are harmful to living things

### **Polyatomic Ion**

A group of atoms that carries a charge

Or, an ion containing two or more atoms

### **Polymer or Macromolecule**

A very large molecule made up of a number of repeating units called monomers

### **Polymerisation**

A chemical reaction in which simple molecules, called monomers, react with each other to form large molecules called Polymers

### **Polyunsaturated**

Organic compounds (such as vegetable oil) that contain many carbon-carbon double bonds in their molecules

### **Precipitate**

An insoluble solid that is produced in a solution as a result of a chemical reaction

### **Protein**

A natural polymer of amino acids

### **Protons**

Positively charged sub-atomic particles found in the nucleus of an atom

**Proton Number**

The number of protons in the nucleus of an atom  
Also known as Atomic Number

**Pure Substance**

A single substance which is not mixed with other substances  
It has fixed melting and boiling points

**Qualitative Analysis**

The process of identification of cations and anions

**Reactivity Series**

A list of elements in order of their reactivity  
The more reactive the element, the higher its position in the series  
An element at the top of the series will displace a less reactive one from a solution of its salt

**Redox Reaction**

A reaction where both oxidation and reduction take place simultaneously

**Reducing Agent**

A substance that brings about reduction in the other substance  
It is itself being oxidised  
A reducing agent is a donor of electrons

**Reduction**

The removal of oxygen, the addition of hydrogen, the gain of electrons, or the decrease in the oxidation state of the substance

**Relative Atomic Mass ( $A_r$ )**

The number of times the mass of one atom of an element is heavier than 1/12 of the mass of a carbon-12 atom

**Relative Molecular Mass ( $M_r$ )**

The sum of the relative atomic masses of each of the atoms in one molecule of a substance

**Repeating Unit**

The smallest part of a polymer which, when repeated many times, forms the whole polymer

**Residue**

The solid which remains on the filter paper after filtration process

**Respiration**

The slow combustion of food in the cells of living organisms

**Reversible Reaction**

A reaction that can take place in both directions

**R<sub>f</sub> Value**

The ratio between the distance travelled by the substance and the distance travelled by the solvent, on the chromatography paper

**R.T.P**

Room temperature and pressure

**Rusting**

The slow oxidation of iron in the presence of air and water to form hydrated iron (III) oxide, commonly known as rust

**Sacrificial Protection**

A method to prevent rusting by connecting a more reactive metal to the iron / steel  
Rusting is prevented because oxygen reacts with the more reactive metal

**Salt**

The ionic compound formed by the replacement of one or more hydrogen ions of an acid by a metallic ion or an ammonium ion

**Saturated Hydrocarbons**

Hydrocarbons that contain only single carbon-carbon bonds

**Saturated Solution**

A solution in which no more solid can be dissolved

**Selective Discharge**

In electrolysis, when more than one type of cation or anion is present in a solution, only one cation and one anion are preferentially discharged

**Simple Cells**

A device which converts chemical energy to electrical energy  
Also known as Electric Cell

**Solute**

The substance that dissolves in a solvent to form a solution

**Solution**

A mixture made up of a solute dissolved in a solvent

**Solvent**

The liquid in which a solute dissolves

**Spectator Ions**

Ions that have not taken part in any chemical reactions and still remains as ions in solution at the end of reaction

**Speed of Reaction**

The speed at which a reactant is used up or a product is formed in a chemical reaction

**State Symbol**

A letter placed after a chemical formula in a chemical equation to indicate whether the substance is a solid, liquid, gas or an aqueous solution

**Steel**

An alloy of iron and carbon

**Stoichiometry**

Shows the relationship between the amounts (measured in moles) of reactants and products involved in a chemical reaction

**Strength of Acid / Alkali**

Refers to how easily an acid or alkali dissociates when dissolved in water

**Strong Acid**

An acid that dissociates completely in water to produce a large concentration of hydrogen ions

**Strong Alkali**

An alkali that dissociates completely in water to produce a large concentration of hydroxide ions

**Structural Formula**

A formula which shows how the atoms are arranged in a molecule

**Sublimation**

The process of changing from the solid state directly to the gaseous state without passing through the liquid state

**Substitution Reaction**

An organic chemical reaction in which one or more atoms of an organic compound are replaced with one or more other atoms

**Suspension**

A mixture of a liquid and an insoluble solid where the insoluble solid remains suspended throughout the solution

**Thermal Decomposition**

The chemical reaction that involves the use of heat energy to break down compounds into elements or simpler compounds

**Theoretical Yield**

The calculated amount of products that would be obtained if the reaction is completed

**Titration**

The gradual addition of a solution from a burette to another solution in a conical flask until the chemical reaction between the two solutions is complete



### **Transition Elements**

Elements occurring in the middle of the Periodic Table with a number of characteristic properties such as forming coloured ions in water  
Also known as Transition Metals

### **Unsaturated Molecule**

Any hydrocarbon that contains one or more carbon-carbon double bonds

### **Valence Electrons**

Electrons in the outer shell that are used by the atom for forming chemical bonds  
Important because they affect the chemical properties of an element

### **Valency**

The number of bonds that is formed by an atom with other atoms  
Example, carbon has a valency of four since it forms four covalent bonds

### **Vapour**

The gas that is formed from a boiling or evaporating liquid

### **Viscosity**

The ease of flow of a liquid  
Thicker liquids are more viscous

### **Volatile Liquids**

Liquids with a low boiling point that can easily be made to evaporate

### **Volumetric Analysis**

A technique used to determine the volumes of solutions that react together

### **Water of Crystallisation**

Water molecules that are chemically bonded in the crystals of some salts

### **Weak Acid**

An acid that dissociates partially in water to produce a low concentration of hydrogen ions

### **Weak Alkali**

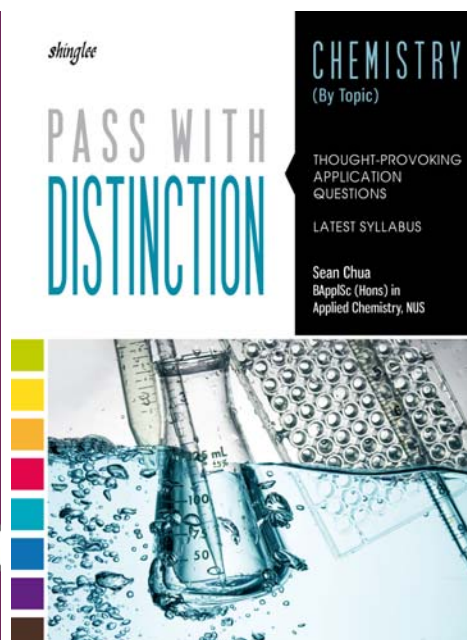
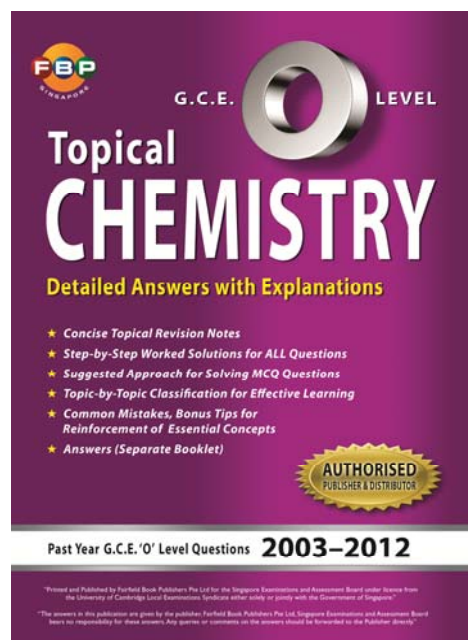
An alkali that dissociates partially in water to produce a low concentration of hydroxide ions

### **Yield**

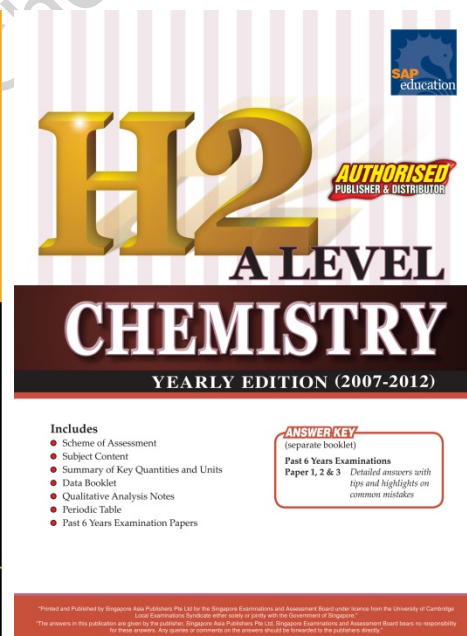
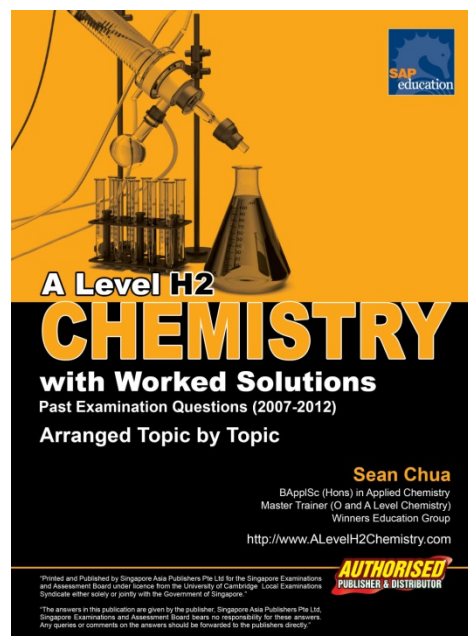
The amount of products formed in a reaction

## List of books in Popular Bookstores

### GCE O-Level Pure Chemistry



### GCE A-Level H2 Chemistry



Topical Edition

Yearly Edition