

Lanthanum Series													
58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
140.12 +0.005	140.907 +0.0005	144.24 +0.005	(147)	150.35 +0.005	151.96 +0.005	157.25 +0.005	158.924 +0.0005	162.50 +0.005	164.930 +0.0005	167.26 +0.005	168.934 +0.0005	173.04 +0.005	174.967 +0.005
Actinium Series													
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lw
232.038 +0.0005	231 (231)	238.03 +0.005	237 (237)	242 (242)	243 (243)	247 (247)	247 (247)	251 (251)	254 (254)	255 (255)	258 (258)	259 (259)	261 (261)

Periodic Table of the Elements

GLOSSARY OF CHEMICAL TERMS

SECOND EDITION

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AND

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Editor, CONDENSED CHEMICAL DICTIONARY

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PREFACE TO FIRST EDITION

Dr. Samuel Johnson, who compiled the first *Dictionary of the English Language*, once remarked that people need less to be informed than to be reminded. This generalization must have been a source of comfort and hope to all who have undertaken to present definitions in any area of human knowledge. It applies with particular force to the authors of this *Glossary*, whose purpose may best be explained by two additional definitions.

The first is that of the word *definition* itself. Primarily, it involves the setting of limits or boundaries to the meaning of terms and expressions. In chemistry, as in other fields, this is far more easily said than done, for there is no predetermined way in which such limits can be established. What may be quite satisfactory to one person may be only the beginning of an extended area of further knowledge to another. The inherently tricky nature of words is also a factor: many words have two or more quite different meanings even within the framework of a single major subject, and distinctions must be drawn carefully without obscuring their underlying relationship.

A useful definition should certainly tell *what* a substance or process or phenomenon is, with an appropriate example or two; but to explain *why* it is often leads one into ever more profound depths, the ultimate reason seeming to retreat in an endless succession of *why's*. Thus, it is necessary to set limits not only to the terms themselves but also to the informational background of those for whom the definitions are intended. Since definitions that a beginning chemistry student would find illuminating would be of little value to a professional chemist, it is essential that the definer have in mind the level of knowledge and experience of his expected audience.

The second definition concerns the word *glossary*. It is a group of definitions of *selected* terms in a field of knowledge, as opposed to *dictionary*—a much more pretentious and scholarly compendium, presenting intensive coverage of the terminology of a subject area.

This *Glossary* is intended for those who have had minor exposure to chemistry or who require a source of review information. Superficial though it may be by some criteria, it is the only volume of chemical definitions that serves this need. The several chemical dictionaries now existing are impressive and highly useful volumes which have established well-deserved reputations; they differ among themselves in respect to emphasis and treatment and are designed primarily for professional chemists, engineers, and industrial technologists. They are of little practical use to the introductory student or to those without considerable background in chemistry.

The emphasis in this *Glossary* has been placed on the following:

- (a) All major chemical classifications, e.g., aldehyde, alcohol, amine, sugar, protein, carbohydrate, gum, resin, wax, etc.
- (b) All important functional terms, e.g., catalyst, plasticizer, solvent, surface-active agent, antioxidant, etc.
- (c) Basic phenomena and processes, e.g., oxidation, photosynthesis, polymerization, optical rotation, distillation, filtration, vapor pressure, surface tension, etc.
- (d) All the chemical elements, both natural and man-made.
- (e) The most important compounds, e.g., ammonia, ethyl alcohol, acetone, carbon dioxide, acetic acid, etc. (the number of these has been purposely restricted).
- (f) General terms, e.g., acid, base, indicator, pH, bond, intermediate, etc.
- (g) Biographies of outstanding past contributors to the science of chemistry.

hydrocarbons called askarels, and silicone oils. *See also* dielectric.

transistor. *See* germanium.

transition element. Any of a large number of metallic elements occurring in the fourth, fifth, sixth, and seventh periods of the Periodic Table. Some authorities prefer the term transitional element. Specifically, they are as follows:

Period 4	Period 5
scandium	yttrium
titanium	zirconium
vanadium	niobium
chromium	molybdenum
manganese	technetium
iron	ruthenium
cobalt	rhodium
nickel	palladium
copper	silver
Period 6	Period 7
lanthanum	actinium
lanthanide series	actinide series
hafnium	
tantalum	
tungsten	
rhenium	
osmium	
iridium	
platinum	
gold	

The transition elements or metals are so named because they represent a gradual shift from the strongly electropositive elements of Groups IA and IIA to the electronegative elements of Groups VIA and VIIA. They are also more versatile in their chemical bonding properties than are other elements, using the two outer shell orbitals instead of only those of the outermost shell. Most are active complexing agents, particularly cobalt, iron, and chromium. *See also* coordination compound.

transmutation. Conversion of one element into another by introducing one more proton into its nucleus by nuclear bombardment. This was first achieved by the British physicist, Sir Ernest Rutherford (1871-1937), Nobel Prize 1908, who utilized the heavy helium nucleus (alpha particle) to initiate the change in a nitrogen nucleus. One of the protons and the two neutrons of the helium enter the nitrogen nucleus (atomic num-

ber 7), thus increasing its atomic number by 1 and its atomic weight by 3, so that it becomes the 17 isotope of oxygen (atomic number 8). The additional proton is emitted as a hydrogen nucleus. The reaction is represented as ${}^4_2\text{He}^1 + {}^{14}_7\text{N}^1 \rightarrow {}^{17}_8\text{O}^{17} + {}^1_1\text{H}^1$. Similarly, sodium can be transmuted to magnesium by addition of a proton to its nucleus. By far the most important transmutation is that of U-238 to plutonium, first accomplished in 1940 by deutron bombardment in a cyclotron. This can now be effected in the breeder reactor; it represents a practical means of extracting maximum energy from uranium for future power supply. *See also* breeder; fission; Rutherford.

transuranic. A term used by chemists to denote the series of synthetic or artificially created elements which lie beyond uranium in the Periodic Table, beginning with neptunium (atomic number 93) and extending to the most recently discovered element 106. None of these elements was known before 1940, and further discoveries are to be expected.

tribasic. (1) An acid, either inorganic or organic, whose molecule contains three hydrogen atoms that can be replaced by basic elements to form salts.

(2) An inorganic compound whose molecule contains three atoms of a basic univalent element, e.g., tribasic sodium phosphate (Na_3PO_4).

tricarboxylic acid cycle. *See* Krebs cycle.

trichloroethylene. A heavy chlorinated hydrocarbon liquid, b.p. 87°C (189°F), used principally as a solvent for removing greases from metals, for cleaning of precision equipment, and in dry cleaning. It has also been used as an anesthetic. Its formula is CHClCCl_2 . Its toxic properties are sufficient to cause prohibition of its use in some areas. It is nonflammable.

trichlorofluoromethane. *See* fluorocarbon.

trichloropicolinic acid. *See* defoliant.

tricresyl phosphate. One of the most widely used plasticizers in the processing of plastics such as nitrocellulose, vinyl, and styrene polymers, etc. Made from cresol and phosphorus oxychloride, it is a mixture of isomers whose formula is $(\text{CH}_3)_2\text{C}_6\text{H}_4\text{O})\text{PO}$. It is a water-white liquid, b.p. 420°C (788°F), soluble in organic substances but insoluble in water. It is somewhat heavier than water and also has some application as a hydraulic liquid. *See also* plasticizer.

tricyclic. An organic compound in which three cyclic or ring structures occur, as in anthracene and phenanthrene.

triethanolamine. A nitrogenous organic base, m.p. 21 2°C (70°F), b.p. dec. at 335°C (634°F), having the formula $(\text{HOCH}_2\text{CH}_2)_3\text{N}$, formed by reacting ammonia with ethylene oxide. It is a transparent, syrupy liquid, somewhat heavier than water. Its major uses are in detergents, emulsifiers, and plasticizers; its ability to absorb water (hygroscopicity) makes it useful as a humectant. It has a number of minor uses as a textile cleaning agent, rubber accelerator, etc.

triethylaluminum. A toxic organometallic liquid, b.p. 194°C (381°F), having the formula $(\text{C}_2\text{H}_5)_3\text{Al}$, developed for use as a stereospecific catalyst of the Ziegler type. It is dangerous to handle, as it burns on exposure to air and may explode in contact with many common substances such as water and alcohols. It is made by bringing finely divided aluminum into contact with ethylene and hydrogen with heat and pressure. It is usually used in conjunction with titanium dichloride. The catalyst is used primarily for making crystalline polyethylene and polypropylene. *See also* stereospecific; Ziegler catalyst.

triglyceride. *See* glyceride.

trihydric. An alcohol whose molecule contains three hydroxyl groups (OH) each attached to a different carbon atom, for example, glycerol $(\text{CH}_2\text{OHCHOHCH}_2\text{OH})$ or $\text{C}_3\text{H}_7(\text{OH})_3$. Such alcohols are also called polyhydric. *See also* polyhydric alcohol.

trimer. A macromolecule comprised of three monomer units.

trimethylamine. *See* amine.

triolefin. *See* olefin.

triple bond. A chemical linkage characteristic of acetylene ($\text{HC}\equiv\text{CH}$) and its derivatives, though it also occurs in some other compounds, for example, certain fatty acids. Its presence indicates a highly unsaturated and reactive compound. Triple bonds are more stable to high temperature than single and double bonds and are strong electron receptors. They are active in many types of reactions, e.g., Diels-Alder, vinylation, and polymerization with Ziegler catalysts; they tend to react strongly with water, alcohols, and amines. *See also* acetylene.

tris- A prefix indicating that a certain chemical grouping occurs three times in a molecule, for

example, tris (hydroxymethyl) aminomethane $(\text{CH}_2\text{OH})_3\text{CNH}_2$. *See also* bis-

tritium. The only artificial radioactive isotope of hydrogen (H^3); its nucleus contains two neutrons and one proton, giving an atomic weight of 3.017. It is made by impingement of slow neutrons on lithium nuclei and has a half-life of about 12 years. It is used to induce thermonuclear (fusion) reactions, as well as in biochemical tracer work and specialized research. Its nucleus is called a triton, and its symbol is T. *See also* hydrogen; deuterium.

triton. *See* tritium.

trivial name. A name applied by early chemists to a number of simple organic compounds, usually based on their sources or properties, e.g., acetone and acetic acid (from Latin *acetum*, vinegar); urea (from urine); glucose and glycerol from Greek *glyc-* (sweet). *See also* nomenclature.

true solution. *See* solution.

trypsin. *See* bating; proteolytic.

tungsten. An element.

Symbol	W	Atomic Wt.	183.85
State	Solid	Valence	2,4,5,6
Group	VIB	Isotopes	5 stable
Atomic No.	74		

Tungsten does not occur as such in nature but is obtained in the form of the compound tungstic oxide, WO_3 , by reduction of the ores wolframite and scheelite. For this reason, it is often called wolfram, with the symbol W. Most of the supply is located in China, but there are also extensive deposits in the United States, Europe, and South America. The major properties of tungsten which make it an essential natural resource are its extremely high melting point of 3410°C (6170°F) and its strong electrical conductivity. It is one of the heaviest metals, with a specific gravity of 19.3. Its first important application was as a filament in electric light bulbs. It is also an alloying element in tool steels and a component of cathodes in electronic devices and of welding electrodes. Tungsten is also valuable in aerospace technology. One of its most important compounds is tungsten carbide (WC), used in machine tools, metal-cutting dies, etc. Various alloys are used in electric circuitry and as aerospace materials; these and other tungsten products (wire and filament) are made by powder metallurgy techniques.