

CHAMBERS
SCIENCE AND
TECHNOLOGY
DICTIONARY

Chambers Science and Technology Dictionary

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Preface

It is almost fifty years since what was then called *Chambers's Technical Dictionary* was first published. In 1958 a substantial supplement was added and further revisions were made in 1971 and 1974. It seems a particular truism that changes in science and technology in the intervening years appear to have been as great as in the whole of earlier history. As the rate of change accelerates, so this body of knowledge becomes yet more fragmented. The result is that not only is the educated layman baffled but one professional may not know what another is talking about.

Chambers Science and Technology Dictionary will be useful both to the layman and to the professional but will not replace the expert's own specialist dictionaries. The book will help the physician to understand a term in molecular biology, the layman to comprehend a medical term and both to talk to their builder in an informed manner.

As a scientist I am particularly pleased to be General Editor of a dictionary which gives equal weight to the technologies. We are increasingly affected by technology, whether it is nuclear power, telecommunication or modern medicine, and understanding specialist terms is the first step in applying intelligent control.

Arrangement

The entries in this dictionary are strictly alphabetical with single letter entries occurring at the beginning of each letter. Greek letters will be found under the nearest anglicized equivalent, 'omega' under 'o' and 'psi' under 'p'.

Numbers in chemical nomenclature: the convention is for any leading numerals to be ignored, so that '2,4,5,-T' will be found at the position determined by 'T'; in other areas the entry occurs at the position determined by the number spelt out, thus '32mo' will be found at the position of 'thirtytwo'.

Italic and Bold

Italic is used for:

- (1) alternative forms of, or alternative names for, the headword. Entries for conditions in Medicine and Veterinary Medicine frequently list synonyms at the beginning of the entry. In other entries synonyms may be added in italics at the end of an entry after 'also' or 'also called';
- (2) terms derived from the headword, often after 'adj.' or 'pl.';
- (3) variables in mathematical formulae;
- (4) generic and specific names in binomial classification in the Biological Sciences;
- (5) for emphasis.

Bold is used for:

- (1) cross-references, either after 'see', 'cf.' etc. or in the body of the entry. Such a cross-reference indicates that there is a headword elsewhere which amplifies the original entry;
- (2) vector notation in Physics etc.

Appendices

These contain tables of chemical formulae, chemical elements, SI conversion factors, physical constants, plant and animal kingdom classifications, SI units, geological eras and paper sizes.

Wherever the symbol \Rightarrow occurs at the end of an entry a diagram representing its chemical formula will be found in an appendix which contains the formulae of most of the main ring compounds together with representative sugars, amino acids and nucleic acid bases.

Trade Names

These are shown by initial capitals, the prefix TN or some other statement. If we have failed to acknowledge trade names we will be happy to make amends in future editions.

How the dictionary was made

The most recent edition of *Chambers Dictionary of Science and Technology*, as *Chambers's Technical Dictionary* became, was typed into an electronic database, held on an Olivetti M24 personal computer with 70 megabytes of disk storage and tape back-up. The software was a library database program called Inmagic which allowed all the material including additions to be indexed and any entry to be revised quickly and simply. On completion of data entry the dictionary was divided into subjects which were sent for revision to the experts listed on pp. xi-xii. The original entries together with the experts' revisions and other alterations were then incorporated into the final database after adding the printer codes needed for the scientific and mathematical typesetting.

Subject categories

Abbreviations where appropriate are shown in brackets.

- Acoustics (Acous.)
- Aeronautics (Aero.)
- Architecture (Arch.)
- Astronomy (Astron.)
- Automobiles (Autos.)
 - including*
 - Internal Combustion Engines
- Behaviour (Behav.)
 - including*
 - Animal Behaviour
 - Ethology
 - Psychiatry
 - Psychology
- Biology (Biol.)
 - including*
 - Bacteriology
 - Biochemistry
 - Cell Biology
 - Cytology
 - Genetics
 - Histology
 - Microscopy
 - Molecular Biology
- Botany (Bot.)
- Building (Build.)
 - including*
 - Carpentry
 - Joinery
 - Painting
 - Plumbing
 - Sanitary Engineering
- Chemical Engineering (Chem. Eng.)
- Chemistry (Chem.)
- Civil Engineering (Civ. Eng.)
 - including*
 - Railways
- Computers (Comp.)
- Crystallography (Crystal.)
- Ecology (Ecol.)
- Electrical Engineering (Elec. Eng.)
- Electronics
- Engineering (Eng.)
 - including*
 - Heating
 - Instruments
 - Metallurgy
 - Powder Metallurgy
 - Tools
- Forestry (For.)
- Foundry Practice (Foundry)
- General (Genrl.)
- Geology (Geol.)
 - including*
 - Geophysics
 - Oceanography
- Glass
- Hydraulic Engineering (Hyd. Eng.)
- Image Technology (Image Tech.)
 - including*
 - Cinematography
 - Photography
 - Television
- Immunology (Immun.)
- Mathematics (Maths.)
- Medicine (Med.)
 - including*
 - Anatomy
 - Nutrition
 - Pharmacology
 - Physiology
 - Surgery
- Meteorology (Meteor.)
- Mineralogy (Min.)
- Mineral Extraction (Min. Ext.)
 - including*
 - Mineral Processing
 - Mining
 - Oils
- Nuclear Engineering (Nuc. Eng.)
- Paper
- Physics (Phys.)
 - including*
 - Heat
 - Hydraulics
 - Light
 - Magnetism
 - Mechanics
 - Nucleonics
 - Optics
- Plastics
- Powder Technology (Powder Tech.)
- Printing (Print.)
 - including*
 - Bookbinding
 - Typography
- Radar
- Radiology (Radiol.)
- Ships
 - including*
 - Navigation

Space
Statistics (Stats.)
Surveying (Surv.)
Telecommunications (Telecomm.)
 including
 Cables
 Radio
 Telegraphy
 Telephony

Textiles
 including
 Spinning
 Weaving
Veterinary Science (Vet.)
Zoology (Zool.)

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Abbreviations used in the dictionary

The following are the more common abbreviations used in this dictionary. Many others (including contractions, prefixes and symbols) occur in their alphabetical position in the text, especially at the beginning of each letter of the alphabet. For SI and other symbols, see the Tables on pages 1002-1004 and 1008.

<i>abbrev(s).</i>	abbreviation(s)	<i>K</i>	kelvin(s)
<i>adj(s).</i>	adjective(s)	<i>L.</i>	Latin
<i>approx.</i>	approximately	<i>lb</i>	pound(s)
<i>asym.</i>	asymmetrical	<i>m</i>	metre(s)
<i>at. no.</i>	atomic number	<i>min.</i>	minute(s)
<i>bp</i>	boiling point	<i>MKS(A)</i>	metre-kilogram(me)-second (-ampere)
<i>c.</i>	century	<i>mp</i>	melting point
<i>°C</i>	degree(s) Celsius (centigrade)	<i>n.</i>	noun
<i>ca</i>	circa	<i>N.</i>	North
<i>Can.</i>	Canada	<i>px.</i>	prefix
<i>cf.</i>	compare	<i>pl(s).</i>	plural(s)
<i>C.G.</i>	centre of gravity	<i>°R</i>	degree(s) Rankine
<i>CGS</i>	centimetre-gram(me)- second	<i>r.a.m.</i>	relative atomic mass
<i>circum.</i>	circumference	<i>rel.d.</i>	relative density
<i>CNS</i>	central nervous system	<i>r.m.s.</i>	root-mean-square
<i>colloq.</i>	colloquially	<i>S.</i>	South
<i>conc.</i>	concentrated	<i>S., sec.</i>	second(s)
<i>contr.</i>	contraction	<i>SI</i>	Système International (d'Unités)
<i>CRO</i>	cathode-ray oscilloscope	<i>sing.</i>	singular
<i>CRT</i>	cathode-ray tube	<i>sp</i>	species (<i>sing.</i>)
<i>deg.</i>	degree(s)	<i>spec.</i>	specific
<i>dim.</i>	diminutive	<i>spp</i>	species (<i>pl.</i>)
<i>E.</i>	East	<i>sq.</i>	square
<i>elec.</i>	electrical	<i>s.t.p.</i>	standard temperature and pressure
<i>esp.</i>	especially	<i>sym.</i>	symmetrical
<i>°F</i>	degree(s) Fahrenheit	<i>syn.</i>	synonym
<i>ft</i>	foot, feet	<i>temp.</i>	temperature
<i>g</i>	acceleration due to gravity; gram(me)(s)	<i>TN</i>	trade (proprietary) name
<i>G</i>	constant of gravitation	<i>TR</i>	transmit-receive (tube)
<i>Gk.</i>	Greek	<i>UK</i>	United Kingdom
<i>h., hr</i>	hour(s)	<i>US</i>	United States (of America)
<i>in</i>	inch(es)	<i>W.</i>	West
<i>kg</i>	kilogram(me)(s)	<i>y., yr</i>	year(s)
<i>km</i>	kilometre(s)	<i>yd</i>	yard(s)

Greek alphabet

The letters of the Greek alphabet, frequently used in technical terms, are given here for purposes of convenient reference. The roman letters refer to the dictionary letter at which any headwords beginning with Greek letters will be found.

A	α	alpha	a	N	ν	nu	n
B	β	bēta	b	Ξ	ξ	xi	x
Γ	γ	gamma	g	O	ο	omicron	o
Δ	δ	delta	d	Π	π	pi	p
E	ε	epsilon	e	P	ρ	rho	r
Z	ζ	zēta	z	Σ	σ s	sigma	s
H	η	ēta	e	T	τ	tau	t
Θ	θ θ	thēta	t	Υ	υ	upsilon	u
I	ι	iōta	i	Φ	φ	phi	p
K	κ	kappa	k	X	χ	chi	k
Λ	λ	lambda	l	Ψ	ψ	psi	p
M	μ	mu	m	Ω	ω	ōmega	o

Acknowledgements

I would like to express on behalf of the publishers and myself grateful thanks to all who have revised the entries in their subjects. In many cases this was clearly an immense task, and it says much for the hard and skilful work of the contributors that the whole revision was completed in under two years.

I would also like to thank the Computing Laboratory of the University of St Andrews for organizing the original data entry and for their technical support and backup. My particular thanks are due to Dr Maurice Shepherd, Director of the Industrial Liaison Office of the University, for arranging the link between the publishers and the laboratory, writing the software for the addition of the printer codes and for guiding my efforts in writing the utility programs needed for this work.

Peter M. B. Walker

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A

a- (*Genrl.*). Prefix signifying *on*. Also shortened form of *ab-*, *ad-*, *an-*, *ap-*.

a (*Genrl.*). Symbol for: acceleration; relative activity; linear absorption coefficient; amplitude.

a- (*Chem.*). An abbrev. for: (1) asymmetrically substituted; (2) *ana-*, i.e. containing a condensed double aromatic nucleus substituted in the 1,5 positions.

α (*Genrl.*). See under **alpha**. Symbol for: absorption coefficient; attenuation coefficient; acceleration, angular acceleration; fine structure constant; helium nucleus.

α - (*Chem.*). Symbol for: (1) substitution on the carbon atom of a chain next to the functional group; (2) substitution on a carbon atom next to one common to two condensed aromatic nuclei; (3) substitution on the carbon atom next to the hetero-atom in a hetero-cyclic compound; (4) a stereo-isomer of a sugar.

A (*Eng.*). Same as **Ae**. The equilibrium temperature of a phase transformation.

A (*Phys.*). Symbol for Ångström.

A (*Genrl.*). Symbol for: area; ampere; absolute temperature; relative atomic mass (atomic weight); magnetic vector potential; Helmholtz function.

[A] (*Phys.*). A strong absorption band in deep red of the solar spectrum (wavelength 762.128 nm) caused by oxygen in the earth's atmosphere. The first of the Fraunhofer lines.

$[\alpha]_D$ (*Chem.*). Symbol for the specific optical rotation of a substance at $t^\circ\text{C}$, measured for the D line of the sodium spectrum.

A & AEE (*Aero.*). Abbrev. for *Aeroplane & Armament Experimental Establishment*, at Boscombe Down, UK.

A-amplifier (*Acous.*). One associated with, or immediately following, a high-quality microphone, as in broadcasting studios. N.B. Not the same as **class-A amplifier**.

A and R display (*Radar*). See **r-display**.

ab (*Build.*). Abbrev. for *As Before* in bills of quantities, etc.

ab- (*Elec.Eng.*). Prefix to name of unit, indicating derivation in the CGS system.

ABA (*Bot.*). Abbrev. for *Abscisic Acid*.

abactinal (*Zool.*). See **ambulacral**.

abacus (*Arch.*). The uppermost part of a column capital or pilaster, on which the architrave rests.

abacus (*Maths.*). A bead frame. Used as an arithmetical calculating aid.

ambulacral (*Zool.*). Pertaining to that part of the surface of an Echinoderm lacking tube feet.

abemurus (*Arch.*). A supporting wall or buttress, built to add strength to another wall.

abandonment (*Min.Ext.*). Voluntary surrender of legal rights or title to a mining claim.

abapical (*Zool.*). Pertaining to, or situated at, the lower pole: remote from the apex.

abapjour (*Arch.*). An opening to admit light, and generally to deflect it downwards: a skylight.

abaxial (*Bot.*). The surface of a leaf, petal etc., that during early development faced away from the axis. Usually it is therefore the under-surface of an expanded leaf.

abaxial (*Image Tech., Phys.*). Said of rays of light which do not coincide with the optical axis of a lens system.

abaxial (*Zool.*). Remote from the axis.

Abbe refractometer (*Chem.*). An instrument for measuring directly the refractive index of liquids.

abdominal air sac (*Zool.*). Posterior part of the lung in Birds.

abdominal cavity (*Med.*). See **peritoneal cavity**.

abdominal gills (*Zool.*). In the aquatic larvae of many Insects, paired segmental leaflike or filamentous expansions of the abdominal cuticle for respiration.

abdominal limbs (*Zool.*). Segmented abdominal appen-

dages in most Crustacea which are used for swimming, setting up currents of water for feeding and/or respiration or carrying eggs and young. In Diplopoda, segmented ambulatory appendages on the abdomen.

abdominal pores (*Zool.*). Apertures leading from the coelom to the exterior in certain Fish and in Cyclostomata.

abdominal reflex (*Zool.*). Contraction of the abdominal wall muscles when the skin over the side of the abdomen is stimulated.

abdominal regions (*Med.*). Nine regions into which the human abdomen is divided by two horizontal and two vertical imaginary planes, i.e. right and left hypochondriac, right and left lumbar, right and left iliac, epigastric, umbilical and hypogastric.

abducens (*Med.*). In Vertebrates, the 6th cranial nerve, purely motor in function, supplying the rectus externus muscle of the eye.

abduction (*Med.*). The action of pulling a limb or part away from the median axis.

abductor (*Zool.*). Any muscle that draws a limb or part away from the median axis by contraction; e.g. the abductor pollicis, which moves the thumb outward.

Abegg's rule (*Chem.*). Empirical rule that solubility of salts of alkali metals with strong acids decreases from lithium to caesium, i.e. with increase of rel. at. mass, and those with weak acids follow the opposite order. Sodium chloride is an exception to this rule, being less soluble than potassium chloride.

Abegg's rule of eight (*Chem.*). The sum of the maximum positive and negative valencies of an element is eight, e.g. S in SF₆ and H₂S.

Abel flash-point apparatus (*Min.Ext.*). A petroleum-testing apparatus for determining the flash-point.

Abelian group (*Maths.*). A group in which the group operation is commutative. It is important in the study of rings and vector spaces.

abelite (*Chem.*). Explosive, composed mainly of ammonium nitrate and trinitrotoluene.

aberrant (*Bot., Zool.*). Having characteristics not strictly in accordance with the type.

aberration (*Astron.*). An apparent change of position of a heavenly body, due to the velocity of light having a finite ratio to the relative velocity of the source and the observer.

aberration (*Phys.*). In an image-forming system e.g., an optical or electronic lens, failure to produce a true image i.e. a point object as a point image etc. Five geometrical aberrations are recognized by von Seidel, viz., spherical aberration, coma, astigmatism, curvature of the field and distortion. See also **chromatic aberration**.

abiogenesis (*Bot., Zool.*). *Spontaneous generation*. The development of living organisms from non-living matter; either the spontaneous generation of yeasts, bacteria etc. believed in before Pasteur, or the gradual process postulated for the early Precambrian in modern theories of the origin of life.

abiolic (*Bot.*). Pertaining to non-living things.

ablation (*Med.*). Removal of body-tissue by surgery.

Abney law (*Phys.*). If a spectral colour is de-saturated by the addition of white light, and if its wavelength is less than 570 nm, its hue then moves towards the red end of the spectrum, while if the wavelength is more than 570 nm its hue moves towards the blue.

Abney level (*Surr.*). Hand-held instrument in which angles of steep sights are measured while simultaneously viewing a spirit-level bubble.

Abney mounting (*Phys.*). A form of mounting for a concave diffraction grating, in which the eye-piece (or

photographic plate holder) is fixed at the centre of curvature of the grating and the slit can move around the circumference of the Rowland circle, to bring different orders of spectrum into view.

abnormal glow discharge (*Electronics*). One carrying current in excess of that which is required to cover the cathode completely with visible radiation.

abnormal reflections (*Telecomm.*). Those from the ionosphere for frequencies in excess of critical frequency.

ABO blood group substances (*Immun.*). Large glycopeptides with oligosaccharide side chains bearing ABO antigenic determinants identical to those of the erythrocytes of the same individual, present in mucous secretions of persons who possess the secretor gene.

ABO blood group system (*Immun.*). The most important of the antigens of human red blood cells for blood transfusion serology. Humans belong to one of four groups; A, B, AB, and O. The red cells of each group carry respectively the A antigen, the B antigen, both A and B antigens, or neither. Natural antibodies (resulting from immunization by bacteria in the gut) are present in the blood against the blood group antigen which is absent from the red cells. Thus persons of group A have anti-B, of group B have anti-A, of group O have anti-A and anti-B, and group AB have neither. Before blood transfusion the blood must be cross-matched to ensure that red cells of one group are not given to a person possessing antibodies against them.

abomasitis (*Vet.*). Inflammation of the abomasum.

abomasum (*Zool.*). In ruminant Mammals, the fourth or true stomach. Also called *reed*, *rennet*.

A-bomb (*Phys.*). See *atomic bomb*.

aboral (*Zool.*). Opposite to, leading away from, or distant from, the mouth. See *ambulacral*.

abort (*Space*). The termination of a vehicle's flight either by failure or deliberate action to prevent dangerous consequences; if manned, a predetermined sequence of events is followed to ensure the safety of the crew.

abortifacient (*Med.*). Anything which causes artificial abortion; a drug which does this.

abortion (*Med., Zool.*). (1) Expulsion of the foetus from the uterus during the first 3 months of pregnancy. Abortion may be spontaneous or induced. (2) Termination of the development of an organ.

abradant (*Eng.*). A substance, usually in powdered form, used for grinding. See *abrasive*.

abrade (*Eng.*). Cut or tear, at two surfaces in contact and relative motion.

Abram's 'law' (*Civ. Eng.*). Ratio of water to cement for chemical action to impart strength to concrete is 0.35:1.

abbranchiate (*Zool.*). Lacking gills.

abrasion (*Med.*). A rubbed-away area of the surface-covering of the body; i.e. of skin or of mucous membrane.

abrasion hardness (*Min. Ext.*). Resistance to abrasive wear, under specified conditions, of metal or mineral.

abrasive (*Chem.*). A substance used for the removal of matter by scratching and grinding (abrasion); e.g. silicon carbide (carborundum).

abrasive blast cleaning (*Build.*). A method for preparing steel for painting whereby abrasive particles, e.g. copper slag, are projected under air pressure through a nozzle. Very effective in removing rust and mill scale leaving an anchor pattern on the substrate affording good paint adhesion.

abrasive papers (*Build.*). Special papers coated in grit used for flattening down. Supplied in a range of grits from very fine to coarse in two main types. (1) Dry abrasive papers. (2) Waterproof abrasive papers.

abreaction (*Behav.*). In psychoanalytic theory, an intense emotional outburst to a previously repressed experience, the therapeutic effect is called *catharsis*.

A & B roll printing (*Image Tech.*). Method of film printing with alternate scenes assembled in two rolls, each having black spacing equivalent in length to the omitted scene; double printing from the two allows the inclusion of *fade* and *dissolve* effects and avoids visible splice marks between scenes in 16 mm printing.

ABS (*Plastics*). *Acrylonitrile-Butadiene-Styrene*. Range of copolymers based on cyanoethene/but 1,2,3,4-diene/phenylethene.

ABS brake (*Autos.*). Commonly used for anti-lock brake. Germ. *anti blockier system*.

abscess (*Med.*). A localised collection of pus in infected tissue, usually confined within a capsule.

abscisic acid (*Bot.*). *Dormin*. A sesquiterpenoid plant growth substance, ($C_{15}H_{26}O_4$) with a variety of reported effects, e.g. inhibiting growth, causing stomatal closure, and promoting senescence, abscission and dormancy. Abbrev. *ABA*.

abscissa (*Maths.*). For rectilinear axes of co-ordinates, the distance of a point from the axis of ordinates measured in a direction parallel to the axis of abscissae, which is usually horizontal. The sign convention is that measurements to the right from the axis of ordinates are positive, measurements to the left negative. pl. *abscissae*. Cf *Cartesian co-ordinates*.

abscission (*Bot.*). The organised shedding of parts of a plant by means of an abscission layer.

abscission layer, separation layer (*Bot.*). In the *abscission zone*, a layer of cells the disjunction or breakdown of which causes abscission.

abscission zone (*Bot.*). Zone at the base of leaf, petal, fruit etc. that contains the *abscission layer* and *protective layer*.

absolute (*Maths.*). In general there are two points at infinity on every line. The assemblage of these points at infinity is a conic (a quadric in three dimensions) called the absolute. Its form determines the metrical properties of the geometrical system being operated. Thus in Euclidean geometry, the absolute is the degenerate conic comprising the line at infinity taken twice, while in non-Euclidian geometry, the absolute is either a real conic (hyperbolic geometry) or an imaginary conic (elliptic geometry).

absolute address (*Comp.*). Code designation of a specific store location as determined by the *hardware*. Cf. *relative address*.

absolute age (*Geol.*). The geological age of a fossil, mineral, rock or event, generally given in years. Preferred synonym *radiometric age*. See *radiometric dating*.

absolute alcohol (*Chem.*). Water-free ethanol; rel.d. 0.793 (15.5°C); bp 78.4°C; obtained from rectified spirit by adding benzene and refractionating. Very hygroscopic.

absolute ampere (*Phys.*). The standard MKS unit of electric current; replaced the international ampere in 1948. See *ampere*.

absolute block system (*Civ. Eng.*). See *block system*.

absolute ceiling (*Aero.*). The height at which the rate of climb of an aircraft, in standard atmosphere, would be zero; the maximum height attainable under standard conditions.

absolute coefficient (*Maths.*). A coefficient with an absolute value, that is a multiplier which is numerical rather than symbolic.

absolute configuration (*Chem.*). The arrangement of groups about an asymmetric atom, especially a tetrahedrally bonded atom with four different substituents. See *chirality* and *Cahn-Ingold-Prelog system*.

absolute convergence (*Maths.*). A series $\sum a_n$ is absolutely convergent if the series $\sum |a_n|$ is convergent.

absolute electrometer (*Phys.*). High-grade attracted-disk electrometer in which an absolute measurement of potential can be made by 'weighing' the attraction between two charged disks against gravity.

absolute humidity (*Meteor.*). Alternative to *vapour concentration*.

absolute instrument (*Phys.*). An instrument which measures a quantity directly in absolute units, without the necessity for previous calibration.

absolute magnitude (*Astron.*). See *magnitudes*.

absolute permeability (*Elec. Eng.*). See *permeability*.

absolute potential (*Chem.*). The theoretical true potential difference between an electrode and a solution of its ions, measured against a hypothetical reference electrode, having an absolute potential of zero, with reference to the same solution.

absolute pressure (*Phys.*). Pressure measured with respect to zero pressure, in units of force per unit of area.

absolute reaction rates (*Chem.*). Theory that if the rate of a chemical reaction is governed by the rate of crossing an energy barrier or of forming an activated complex, then it can be calculated from statistical thermodynamics. See Arrhenius theory of dissociation.

absolute-rest precipitation tanks (*Build.*). Those for batch treatment of sewage, as opposed to tanks taking a continuous flow. After 2- or 3-hr settlement, the top water is drawn off from above and the precipitated sludge from below.

absolute temperature (*Phys.*). A temperature measured with respect to absolute zero, i.e. the zero of the Kelvin thermodynamic scale, a scale which cannot take negative values. See kelvin, Rankine scale.

absolute threshold (*Behav.*). The minimal intensity of a physical stimulus required to produce a response.

absolute units (*Phys.*). Those derived directly from the fundamental units of a system and not based on arbitrary numerical definitions. The differences between absolute and international units were small; both are now superseded by the definitions of the SI.

absolute value (*Maths*). See modulus.

absolute viscosity (*Phys.Eng.*). See coefficient of viscosity.

absolute wavemeter (*Telecomm.*). One in which the frequency of the injected RF signal is by calculation of physical properties (circuit elements or dimensions) of a resonant circuit line or cavity.

absolute weight (*Phys.*). The weight of a body in a vacuum.

absolute zero (*Phys.*). The least possible temperature for all substances. At this temperature the molecules of any substance possess no heat energy. A figure of -273.15°C is generally accepted as the value of absolute zero.

absorbance (*Chem.*). The logarithm of the ratio of the intensity of light incident on a sample to that transmitted by it. It is usually directly proportional to the concentration of the absorbing substance in a solution. See Beer's Law.

absorbed dose (*Radiol.*). The energy absorbed by the patient from the decay of a radionuclide given for diagnostic or therapeutic purposes. The unit is a gray (GY). $1\text{ GY} = 1\text{ Joule/kg}$.

absorbency tests (*Paper*). Any test methods intended to measure the capacity of a paper to absorb liquids or fluids. Results are usually expressed as the gain in weight of the test piece, the capillary rise in a test strip in given time, or the time required to reach a predetermined capillary rise.

absorber (*Phys.*). Any material which converts energy of radiation or particles into another form, generally heat. Energy transmitted is not absorbed. Scattered energy is often classed with absorbed energy. See total absorption coefficient, true absorption coefficient.

absorber rod (*Nuc.Eng.*). Alternative name for control rod.

absorbing material (*Phys.*). Any medium used for absorbing energy from radiation of any type.

absorbing well (*Civ.Eng.*). A shaft sunk through an impermeable stratum to allow water to drain through to a permeable one.

absorbance (*Phys.*). A measure of the ability of a body to absorb radiation; the ratio of the radiant flux absorbed by the body to that incident on the body. Formerly absorptivity.

absorptometer (*Chem.*). An apparatus for determining the solubilities of gases in liquids or the absorption of light.

absorption (*Immun.*). Used in immunology to describe the use of reagents to remove unwanted antibodies or antigens from a mixture.

absorption band (*Phys.*). A dark gap in the continuous spectrum of white light transmitted by a substance which exhibits selective absorption.

absorption capacitor (*Elec.Eng.*). One connected across spark gap to damp the discharge.

absorption coefficient (*Chem.*). The volume of gas,

measured at s.t.p., dissolved by unit volume of a liquid under normal pressure (i.e. 1 atmosphere).

absorption coefficient (*Phys.*). (1) At a discontinuity (*surface absorption coefficient*), (a) the fraction of the energy which is absorbed, or (b) the reduction of amplitude, for a beam of radiation or other wave system incident on a discontinuity in the medium through which it is propagated, or in the path along which it is transmitted. (2) In a medium (*linear absorption coefficient*), the natural logarithm of the ratio of incident and emergent energy or amplitude for a beam of radiation passing through unit thickness of a medium. (The *mass absorption coefficient* is defined in the same way but for a thickness of the medium corresponding to unit mass per unit area.) N.B. *True absorption coefficients* exclude scattering losses, *total absorption coefficients* include them. See atomic absorption coefficient.

absorption discontinuity (*Phys.*). See absorption edge.

absorption dynamometer (*Eng.*). A dynamometer which absorbs and dissipates the power which it measures; e.g. the ordinary rope brake and the Froude hydraulic brake. Cf. transmission dynamometer.

absorption edge (*Phys.*). The wavelength at which there is an abrupt discontinuity in the intensity of an absorption spectrum for electromagnetic waves, giving the appearance of a sharp edge in its photograph. This transition is due to one particular energy-dissipating process becoming possible or impossible at the limiting wavelength. In X-ray spectra of the chemical elements the K-absorption edge for each element occurs at a wavelength slightly less than that for the K-emission spectrum. Also *absorption discontinuity*.

absorption hygrometer (*Meteor.*). An instrument by which the quantity of water vapour in air may be measured. A known volume of air is drawn through tubes containing a drying agent such as phosphorus pentoxide; the increase in weight of the tubes gives the weight of water vapour in the known volume of air.

absorption inductor (*Elec.Eng.*). See Interphase transformer.

absorption lines (*Phys.*). Dark lines in a continuous spectrum caused by absorption by a gaseous element. The positions (i.e., the wavelengths) of the dark absorption lines are identical with those of the bright lines given by the same element in emission.

absorption plant (*Min.Ext.*). Plant where oils are removed from natural gas by absorption in suitable oil.

absorption refrigerator (*Eng.*). A plant in which ammonia is continuously evaporated from an aqueous solution under pressure, condensed, allowed to evaporate (so absorbing heat), and then reabsorbed.

absorption spectrum (*Phys.*). The system of absorption bands or lines seen when a selectively absorbing substance is placed between a source of white light and a spectroscope. See Kirchhoff's law.

absorption tubes (*Chem.*). Tubes filled with solid absorbent for the absorption of moisture (e.g. silica gel) and gases (e.g. charcoal).

absorption wavemeter (*Elec.Eng.*). One which depends on a resonance absorption in a tuned circuit, constructed with very stable inductance and capacitance.

absorptivity, absorptive power (*Phys.*). See absorbance.

abundance (*Ecol.*). See relative abundance, frequency.

abundance, abundance ratio (*Phys.*). For a specified element, the proportion or percentage of one isotope to the total, as occurring in nature.

abutment (*Civ.Eng.*). A point or surface provided to withstand thrust; e.g. end supports of an arch or bridge. See knapsack.

abutment load (*Min.Ext.*). In stoping or other deep-level excavation, weight transferred to the adjacent solid rock by unsupported roof.

abutting joint (*Build.*). A joint whose plane is at right angles to the fibres, the fibres of both joining pieces being in the same straight line.

abyssal (*Geol.*). Refers to the ocean floor environment between ca 4000-6000 m. See littoral, bathyal.

abyssal deposits (*Geol.*). Pelagic marine sediments,

accumulating in depths of more than 2000m including, with increasing depth, calcareous oozes, siliceous oozes and red clay (> 500 m).

abyssopelagic (*Ecol.*). Refers to the region of deep water which excludes the ocean floor: floating in the ocean depths.

ac (*Chem.*). Symbol for Actinium.

a.c. (*Elec.Eng.*). Abbrev. for alternating current.

Ac (*Eng.*). The transformation temperature on heating of the phase changes of iron or steel, subscripts indicating the designated change.

ac- (*Chem.*). Abbrev. indicating substitution in the alicyclic ring.

acacia (*For.*). A member of the Leguminosae giving a coarse-textured hardwood, reddish-brown in colour. Used for tool handles, vehicle parts, walking sticks and turned articles.

acacia gum (*Chem.*). See gum arabic.

acanthite (*Min.*). An ore of silver, Ag_2S , crystallizing in the monoclinic system. Cf. *argentite*.

acantho- (*Bot.*). Prefix from *Gk. akantha*, spine, thorn.

Acanthocephala (*Zool.*). A phylum of elongate worms with rounded body and a protrusible proboscis, furnished with recurved hooks; there is no mouth or alimentary canal; the young stages are parasitic in various Crustaceans, the adults in Fish and aquatic Birds and Mammals. Thorny-headed worms.

acanthoma (*Med.*). A tumour of epidermal cells.

acanthosis nigricans (*Med.*). A rare disease characterized by pigmentation and warty growths on the skin, often associated with cancer of the stomach or uterus.

acanthozoid (*Zool.*). In Cestoda, the prosclex, or head-portion, of a bladder-worm. Cf. *cystozoid*.

acariasis (*Vet.*). Contagious skin disease caused by mites (*acar*).

Acarina (*Zool.*). An order of small *Arachnida*, with globular, undivided body. The immature stages (hexapod larvae) have 6 legs. A large worldwide group, occupying all types of habitat, and of great economic importance. Many are ectoparasitic. Mites and ticks.

acarophily (*Bot.*). A symbiotic association between plants and mites.

acaulescent (*Bot.*). Having a short stem.

acauline, acaules (*Bot.*). Stemless or nearly so.

a.c. balancer (*Elec.Eng.*). An arrangement of transformers or reactors used to equalize the voltages between the wires of a multiple-wire system. Also called a *static balancer*.

a.c. bias (*Electronics*). A high-frequency signal applied to a magnetic tape recording head along with the signal to be recorded. This stabilizes magnetic saturation and improves frequency response, at the same time reducing noise and distortion. The bias signal frequency has to be many times the highest recording frequency.

AC-boundary layer (*Acous., Aero.*). See Stokes layer.

accelerated aging test (*Elec.Eng.*). A stability test for cables using twice normal working voltage. It is claimed this gives quick results that correlate with service records.

accelerated fatigue test (*Eng.*). The application, mechanically, of simulated operating loads to a machine or component to find the limit of safe fatigue life before it is reached in service.

accelerate-stop distance (*Aero.*). The total distance, under specified conditions, in which an aircraft can be brought to rest after accelerating to critical speed for an engine failure at takeoff.

accelerating chain (*Electronics*). That section of an electron beam tube or system, e.g. CRT or electron microscope, in which electrons are accelerated by voltages on accelerating electrodes. Also used in *particle accelerators*.

accelerating contactor (*Elec.Eng.*). One of the contactors of an electric-motor control panel which cuts out starting resistance, thereby causing the motor to accelerate.

accelerating electrode (*Electronics*). One in a thermionic valve or CRT maintained at a high positive potential with respect to the electron source. It accelerates electrons in

their flight to the anode but does not collect a high proportion of them.

accelerating machine, accelerator (*Electronics*). Machine used to accelerate charged particles to very high energies. See also *betatron, cyclotron, linear accelerator, synchrocyclotron, and synchrotron*.

accelerating potential (*Electronics*). That applied to an electrode to accelerate electrons from a cathode.

acceleration (*Phys.*). The rate of change of velocity, expressed in metres (or feet) per second squared. It is a vector quantity and has both magnitude and direction.

acceleration due to gravity (*Phys.*). Acceleration with which a body would fall freely under the action of gravity in a vacuum. This varies according to the distance from the earth's centre, but the internationally adopted value is 9.80665 m/s^2 or 32.1740 ft/s^2 . See *Helmert's formula*.

acceleration error (*Aero.*). The error in an airborne magnetic compass due to manoeuvring; caused by the vertical component of the earth's magnetic field when the centre of gravity of the magnetic element is displaced from normal.

acceleration stress (*Space*). The influence of acceleration (or deceleration) on certain physiological parameters of the human body. Man can withstand transverse accelerations better than longitudinal ones which have a profound effect on the cardiovascular system. The degree of tolerance also depends on the magnitude and duration of the acceleration.

acceleration tolerance (*Space*). The maximum of *g* forces an astronaut can withstand before 'blacking out' or otherwise losing control.

accelerator (*Aero.*). A device, similar to a *catapult*, but generally mounted below deck level, for assisting the acceleration of aircraft flying off aircraft carriers. Land versions have been tried experimentally.

accelerator (*Autos.*). A pedal connected to the carburettor throttle valve of a motor vehicle, or to the fuel injection control.

accelerator (*Build.*). A hardener or catalyst mixed with synthetic resins in *two pack materials* to speed up the hardening rate.

accelerator (*Chem.*). (1) A substance which increases the speed of a chemical reaction. See *catalysis*. (2) A substance which increases the efficient action of an enzyme. (3) Any substance effecting acceleration of the vulcanization process of rubber. The principal types are aldehyde derivatives of Schiff's bases, butyraldehyde-butylidene-aniline, di-orthotolyl-guanidine, diphenyl-guanidine, benzthiazyl disulphide, tetramethylthiuran disulphide, zinc dimethyl-dithiocarbamate.

accelerator (*Civ.Eng.*). Any substance mixed with cement concrete for the purpose of hastening hardening.

accelerator (*Electronics*). See *accelerating machine*.

accelerator (*Image Tech.*). A chemical used to increase the rate of development; e.g. sodium carbonate or borax.

accelerator (*Plastics*). Substance which increases catalytically the hardening rate of a synthetic resin.

accelerator (*Zool.*). Any muscle or nerve which increases rate of action.

accelerator pump (*Autos.*). A small cylinder and piston fitted to some types of carburettor, and connected to the throttle so as to provide a momentarily enriched mixture when the engine is accelerated.

accelerometer (*Acous., Electronics*). Transducer used to provide a signal proportional to the rate of acceleration of a vibrating or other body, usually employing the piezoelectric principle. See also *pick-up head*.

accelerometer (*Aero.*). An instrument, carried in aircraft, guided missiles and spacecraft for measuring acceleration in a specific direction. Main types are *indicating, maximum reading, recording* (graphical), and *counting* (digital, totalling all accelerations above a set value). See *impact accelerometer, vertical-gust recorder*.

accentuation (*Telecomm.*). See *pre-emphasis*.

acceptance angle (*Electronics*). The solid angle within which all incident light reaches the photocathode of a phototube.

acceptor (*Chem.*). (1) The reactant in an induced reaction