

# I

**I** 1. Inosine. 2. Hypoxanthine. 3. Isoleucine. 4. Iodine. 5. Ionic strength. 6. Luminous intensity. 7. Electric current.

**IAA** 1. Indoleacetic acid. 2. Monoiodoacetamide.

**Ia antigens** I-region-associated antigens.

**i-assay** The construction of a thermal denaturation profile by measurements of the system after it has been rapidly returned to standard conditions; the assay measures the reversibility of the transition. *See also* d-assay.

**iatrogenic disease** A disease caused by treatment or by diagnostic procedures; a disease brought about by medical personnel, medical procedures, or exposure to the environment of a health care facility.

**I band** The transverse light band that is seen in electron microscope preparations of the myofibrils from striated muscle and that is formed by the thin filaments.

**ic** 1. *adj* Intracutaneous. 2. *adv* Intracutaneously.

**ICD** Isocitrate dehydrogenase; an enzyme of the citric acid cycle.

**iceberg** A cluster of water molecules that have become stabilized around a nonpolar group; the process is accompanied by a loss of entropy, and the water molecules possess greater crystallinity than that of the molecules in ordinary water.

**I-cell disease** A genetically inherited metabolic defect in humans that results in early death and that is due to a deficiency of the enzyme *N*-acetylglucosamine-1-phosphotransferase and other lysosomal enzymes; a mucopolipidosis. It is called I-cell disease because of the formation of unusual inclusion bodies in fibroblasts. *Aka* mucopolipidosis II.

**ICH** Interstitial cell hormone.

**ichthyotocin** ISOTOCIN.

**icosadeltahedron** The solid obtained by subdividing the surfaces of an icosahedron into smaller equilateral triangles.

**icosahedral** Of, or pertaining to, an icosahedron.

**icosahedral virion** A virus, such as poliovirus or adenovirus, in which the capsid has the shape of an icosahedron.

**icosahedron** A symmetrical polyhedron having 12 vertices and 20 faces, with each face being an equilateral triangle; frequently descriptive of the structure of viruses.

**ICP** Inductively coupled plasma.

**ICSH** Interstitial cell stimulating hormone.

**icterus index** A liver function test that measures the approximate level of bilirubin in either serum or plasma; based on a comparison of the color of either diluted serum or diluted plasma with a standard solution of potassium dichromate.

**ictotest** A semiquantitative test for bilirubin in the urine; based on the production of a blue-purple color by diazotization of bilirubin.

**icy group** A group of compounds that have neither very high nor very low melting points and that are believed to have occurred in the original gas dust of the solar nebula. *See also* earthy group; gaseous group.

**i.d** Inside diameter.

**ID<sub>50</sub>** Median infectious dose.

**ideal gas** A gas, the behavior of which is accurately described by the various gas laws.

**ideal solution** A dilute solution in which all of the solutes follow Raoult's law; a solution such that the chemical potential  $\mu_i$  of each component is given by  $\mu_i = \mu_i^0 + RT \ln X_i$ , where  $\mu_i^0$  is the standard chemical potential (the potential of the substance in its pure state),  $R$  is the gas constant,  $T$  is the absolute temperature, and  $X_i$  is the mole fraction of component  $i$ .

**identical twins** MONOZYGOTIC TWINS.

**identifier sequence** One of a group of nucleotide sequences, about 80 base pairs long, that are transcribed in the brain. They are located in the introns of genes that are expressed in neural tissues and are believed to control the tissue-specific expression of genes. *Abbr* ID sequence.

**idiogram** A diagrammatic representation of the chromosome complement of an individual according to the size and/or a numbering system of the chromosomes.

**idiopathic** 1. Denoting a disease of unknown cause. 2. Peculiar to an individual.

**idiopathic hypertension** ESSENTIAL HYPERTENSION.

**idiopathic pentosuria** PENTOSURIA.

**idiotype** An antigenic determinant, or a collection of antigenic determinants, peculiar to an individual immunoglobulin molecule. Idiotypes represent regions in or near the antigen-binding site of an antibody that are themselves capable of acting as antigens.

thereby stimulating the production of antibodies. It is believed that the production of a particular antibody is kept in check by the corresponding anti-idiotypic antibodies (idiotype suppression) and that the normal immune system involves an interlocking network of antibodies directed at one another's idiotypes. *See also* allotype; isotype.

**idiotype suppression** Suppression of the synthesis of idiotype antibodies that is brought about by anti-idiotypic antibodies. The process involves activation of suppressor T cells by the anti-idiotypic antibodies. *See also* idiotype.

**idiotypic antibody** ANTI-IDIOTYPE ANTIBODY.

**idiotypic marker** An antigenic determinant in the antigen-binding site of an idiotypic antibody.

**idling reaction** The reaction that takes place on a ribosome when an uncharged tRNA molecule becomes bound at the A-site. In addition to the temporary stoppage of polypeptide chain growth, there is an idling reaction in which ATP serves as a pyrophosphate donor leading to the conversion of GDP to  $ppG_{pp}$  and  $pppG_{pp}$ .

**IDP** 1. Inosine diphosphate. 2. Inosine-5'-diphosphate.

**ID sequence** Identifier sequence.

**IE** Immunoelectrophoresis.

**IEF** Isoelectric focusing.

**IEMA** Immunoenzymometric assay.

**IEP** Isoelectric point.

**IF** 1. Initiation factor. 2. Intrinsic factor. 3. Isoelectric focusing. 4. Intermediate filament.

**IFMA** Immunofluorometric assay.

**IFN** Interferon.

**I form** Independent form.

**Ig** Immunoglobulin.

**IgA** A human immunoglobulin that constitutes about 15% of the total serum immunoglobulins, has a variable sedimentation coefficient of 7–11S, exists as a monomer or as a dimer (MW 180,000–500,000), contains about 8% carbohydrate, does not activate complement, and does not cross the placenta. IgA is the major immunoglobulin in secretions. *Aka*  $\gamma$ A.

**IgD** A human immunoglobulin that constitutes less than 1% of the total serum immunoglobulins, has a sedimentation coefficient of 6.8–7.9S and a molecular weight of 180,000, contains about 13% carbohydrate, does not activate complement, and does not cross the placenta. The physiological function of IgD is unknown. *Aka*  $\gamma$ D.

**IgE** A human immunoglobulin that constitutes less than 1% of the total serum immunoglobulins, has a sedimentation coefficient of 8.2S and a molecular weight of 190,000, contains about 11% carbohydrate, does not activate complement, and does not cross the placenta.

IgE binds to mast cells and basophils, and is associated with allergic reactions. *Aka*  $\gamma$ E.

**IGF** Insulin-like growth factor.

**IgG** The most predominant human immunoglobulin which constitutes about 80% of the total serum immunoglobulins, has a sedimentation coefficient of 6.5–7.0S and a molecular weight of 150,000, contains about 3% carbohydrate, activates complement, and crosses the placenta. IgG aids in phagocytosis, and is the major immunoglobulin produced during the secondary immune response. *Aka*  $\gamma$ G.

**IgM** A human immunoglobulin that constitutes about 5% of the total serum immunoglobulins, has a sedimentation coefficient of 19S, exists as a pentamer (MW 950,000), contains about 12% carbohydrate, is very efficient in activating complement but does not cross the placenta. IgM is the first type of antibody produced in response to an antigen (primary response) and binds antigens efficiently because of its multiple binding sites; it is found primarily in blood plasma. *Aka*  $\gamma$ M.

**IHF** Integration host factor.

**IL-2** Interleukin-2.

**ILA** Insulin-like activity.

**Ile** 1. Isoleucine. 2. Isoleucyl.

**ileum** The third and lowest portion of the small intestine.

**Ilkovic equation** A basic equation of polarography.

**Illegitimate recombination** The process whereby a transposon is inserted into recipient DNA; so called because it requires no homology between donor and recipient DNA.

**illicit transport** The entry of a substance into a cell by means of a transport system that is designed for another substance; the transport of the derivative of a compound, where the compound itself cannot be transported, is an example.

**im** 1. *adj* Intramuscular. 2. *adv* Intramuscularly.

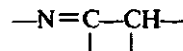
**imbalance theory** A theory of cancer according to which all organisms must evolve systems of growth regulation; a tumor arises when there is a failure in this regulation, and the imbalance in favor of growth passes a certain threshold.

**imbibition** The uptake of fluid by a substance, as the uptake of water by a colloidal system.

**ImD<sub>50</sub>** Median immunizing dose.

**imidazole group** The heterocyclic ring system of the amino acid histidine. *Aka* imidazolium group.

**imine** An organic compound that contains the grouping



**imine-enamine tautomerism** The tautomerism that is due to a shift of a hydrogen atom so that one of the isomers is an imine and the other is an enamine.

**imino acid** An acid derived from an imine; proline and hydroxyproline are alpha imino acids in which the nitrogen of the imino group and the carboxyl group are attached to the same carbon atom.

**imino group** The grouping  $\text{—NH—}$ .

**2-iminothiolane** A cross-linking reagent that forms a covalent bridge between two epsilon amino groups of lysine residues in a protein.

**immediate early RNA** PREEARLY RNA.

**immediate-type hypersensitivity** An allergic response that occurs soon, generally within a few minutes, after the administration of an antigen to an animal organism; the response is mediated by circulating antibodies. *See also* anaphylaxis; type 2 reaction; type 3 reaction.

**immersion oil** An oil that has a refractive index of about 1.52 and that is used with an oil immersion objective in microscopy.

**immiscible** Incapable of being mixed.

**immobile phase** STATIONARY PHASE (2).

**immobilized enzyme** An enzyme that is physically confined while it carries out its catalytic function. This may occur naturally, as in the case of particulate enzymes, or it may be produced artificially by chemical or by physical methods. In the chemical methods, the enzyme is linked covalently to a support. These methods include attachment of the enzyme to a water-insoluble support, incorporation of the enzyme into a growing polymer chain, or cross-linking of the enzyme with a multifunctional low molecular weight reagent. In the physical methods, the enzyme is not linked covalently to a support. These methods include adsorption of the enzyme to a water-insoluble matrix, entrapment of the enzyme within either a water-insoluble gel or a microcapsule, or containment of the enzyme within special devices equipped with semipermeable membranes.

**immune** Of, or pertaining to, an organism that has been immunized.

**immune adherence** The attachment of a complex, composed of particulate antigens, antibodies, and complement, to the surfaces of nonsensitized particles such as erythrocytes, platelets, yeast, or starch granules.

**immune adsorbent** *See* immunoabsorbent.

**immune antibody** ACQUIRED ANTIBODY.

**immune clearance** IMMUNE ELIMINATION.

**immune competent cell** *See* immunocompetent cell.

**immune complex** ANTIGEN-ANTIBODY COMPLEX.

**immune conglutination** A conglutination reaction caused by an immunocoagulin.

**immune conglutinin** *See* immunocoagulin.

**immune cytotoxicity** The lysis of cells by antibodies in the presence of complement.

**immune deficiency diseases** A group of diseases linked to deficiencies in the immune system. Thus, for example, a deficiency of either purine nucleoside phosphorylase or adenosine deaminase leads to a decrease in the number of lymphocytes. *See also* AIDS.

**immune elimination** The stage in an immune response during which the antigen is rapidly removed from the blood as a result of its combination with the antibody.

**immune globulin** *See* immunoglobulin.

**immune hemolysis** Hemolysis that results from complement fixation.

**immune lysis** IMMUNE CYTOLYSIS.

**immune opsonin** *See* opsonin.

**immune reaction** The reaction between a specific antigen and an antibody.

**immune response** The formation of antibodies in an animal organism in response to an immunization and the reactions of these antibodies with the antigens used in the immunization; may involve humoral immunity or cell-mediated immunity.

**immune response gene** A gene that controls the ability of lymphocytes to produce an immune response upon stimulation by specific antigens. *Abbr* Ir gene.

**immune serum** (*pl* immune sera). ANTISERUM.

**immune surveillance theory** *See* immunological surveillance theory.

**immunity** 1. The resistance of an individual or an animal to a specific disease, infecting agent, or toxic antigen. 2. The capacity of lysogenic bacteria to withstand infection by phage particles that are of the same kind as the prophage of the bacteria.

**immunity substance** A cytoplasmic factor that is formed under the control of a phage gene and that confers immunity on a lysogenic bacterium against infection by a phage of the same type as its prophage. The immunity substance also functions as a repressor of the vegetative replication of the prophage in that bacterium.

**immunization** 1. The administration of an antigen to an animal organism to stimulate the production of antibodies by that organism. 2. The administration of antigens, antibodies, or lymphocytes to an animal organism to produce the corresponding active, passive, or adoptive immunity.

**immuno-** Combining form meaning immunology.

**immunoabsorbent** An insoluble material that is used for the purification of antibodies by adsorbing them from a serum; a gel for trapping antibodies, or an inert solid, to which

either antigens or haptens have been covalently linked, are two examples.

**immunoassay** An assay that utilizes antigen-antibody reactions for the determination of biochemical substances.

**immunoblast** A blast cell that is a forerunner of an immunocyte.

**immunochemistry** The science that deals with the chemical aspects of immunology and combines the techniques of biochemistry and immunology.

**immunochromatography** IMMUNO-GEL FILTRATION.

**immunocompetent cell** A cell that has the capacity to recognize antigens and/or to synthesize antibodies.

**immunoconglutinin** An antibody that is specific for antigenic determinants which are exposed in fixed complement, but which are unavailable for reaction in free complement. *See also* conglutinin.

**immunocore electrophoresis** A separation technique that is based on the combined use of electrophoresis and immunodiffusion. Antigens or antibodies are first separated by disc gel electrophoresis, and the gel column is then extruded. A core of the gel column is removed and replaced with either an antiserum or a solution containing antigens. Following this, the gel is incubated to allow for the formation of precipitin bands of antigen-antibody complexes.

**immunocyte** 1. IMMUNOCOMPETENT CELL. 2. An immunocompetent lymphocyte.

**immunocyte adherence** A technique for detecting cells that carry antibodies on their surfaces either because they produce the antibodies or because the antibodies have become bound to the cells. The cells are reacted with the corresponding antigens or with other cells that are coated with soluble antigens. An antibody-bearing cell binds the antigens and forms a rosette-type structure, and the number of these rosettes is then determined microscopically. *Aka* rosette technique.

**immunodeficiency** *See* immune deficiency diseases.

**immunodiffusion** A method for carrying out the precipitin reaction in a gel that is based on the diffusion of antibody and/or antigen molecules through the gel. *See also* double diffusion; single diffusion.

**immunodominant** 1. Descriptive of that part of an antigenic determinant that binds most strongly to the antibody. 2. Descriptive of that part of the antigenic determinant that elicits the greatest immune response.

**immunoelectroadsorption** A method for measuring antibody concentrations in serum. A layer of the appropriate antigens is ad-

sorbed onto a glass slide with the aid of an electrical current, and the antibodies in the given serum are then adsorbed onto the antigens. The thickness of the antibody layer is determined and it provides a measure of the antibody concentration in the serum.

**immuno-electrofocusing** One of several separation techniques that are based on the combined use of gel electrophoresis and either immunodiffusion or immunoelectrophoresis; performed by incorporating either all or fractions of the gel from a gel electrophoresis experiment into a gel to be used for either immunodiffusion or immunoelectrophoresis.

**immuno-electronmicroscopy** The use of electron microscopy in conjunction with immunochemical methods, as in the staining of electron microscope specimens with ferritin-labeled antibodies.

**immuno-electrophoresis** A technique for identifying antigens in complex mixtures by first separating the antigens in one dimension by means of gel electrophoresis, and then allowing them to react with antibodies by means of two-dimensional double diffusion through the gel; a pattern of precipitin arcs is thereby produced. *Abbr* IE.

**immuno-enzymometric assay** A variation of an enzyme immunoassay that is based on the use of enzyme-labeled antibodies. *Abbr* IEMA. *See also* ELISA.

**immunoferritin** FERRITIN-LABELED ANTIBODY.

**immunofiltration** The purification of an immunological solution by passing it through an immuno-adsorbent.

**immunofluorescence** *See* direct fluorescent antibody technique; indirect fluorescent antibody technique; anticomplement fluorescent antibody technique.

**immunofluorometric assay** A variation of a fluoroimmunoassay that is based on the use of antibodies labeled with a fluorochrome. *Abbr* IFMA.

**immuno-gel filtration** A separation technique that is based on the combined use of immunodiffusion and thin-layer gel filtration.

**immunogen** 1. ANTIGEN. 2. A substance capable of producing an immune response that leads to the synthesis of antibodies.

**immunogenetics** The branch of immunology that deals with the interrelations of immunological reactions and the genetic makeup of an organism.

**immunogenic** Capable of producing an immune response.

**immunogenicity** ANTIGENICITY.

**immunoglobulin** 1. A protein of animal origin that has a known antibody activity. 2. A protein that is closely related to an antibody by its chemical structure and by its antigenic spe-

cificity. 3. A protein of immunological significance, such as myeloma or Bence-Jones protein. *See also* IgA, IgD, etc.

**immunoglobulin chains** *See* heavy chain; light chain.

**immunoglobulin fold** The very similar three-dimensional structure of the various domains of an immunoglobulin molecule; a "sandwich-type" structure that consists of two antiparallel pleated sheets.

**immunoglobulin genes** Genes that code for the light and heavy chains of the immunoglobulin molecules.

**immunoelectric focusing** IMMUNOELECTROFOCUSING.

**immunoliposome** An artificial organelle, produced by chemically coupling a monoclonal antibody to a liposome.

**immunologic** IMMUNOLOGICAL.

**immunological** Of, or pertaining to, immunology.

**immunological competence** *See* competence (2).

**immunological enhancement** *See* enhancement.

**immunological equivalence** The amounts of antigen and antibody that precipitate each other in the equivalence zone of the precipitin curve.

**immunological inhibition** The competitive inhibition of antibody formation that is produced either by the administration of antibodies against the stimulating antigen, or by the administration of unconjugated hapten together with active hapten-protein conjugates.

**immunologically competent cell** *See* immunocompetent cell.

**immunological memory** The enhanced capacity of an animal to respond to a second dose of antigen that is characteristic of the secondary immune response.

**immunological paralysis** 1. IMMUNOLOGICAL TOLERANCE. 2. Immunological tolerance produced by large doses of polysaccharide antigens.

**immunological rejection** The destruction of foreign cells and tissues, which are either inoculated or transplanted into a recipient from a donor, by a specific immune reaction.

**immunological suppression** *See* immunosuppression.

**immunological surveillance theory** A theory according to which cell-mediated immunity represents a defense mechanism that evolved in order to recognize and destroy newly emerged cancer cells and cells containing pathogens. As a result, the frequency of naturally arising tumors is less than that expected from the spontaneous mutation rate of DNA.

**immunological tolerance** The decrease in, or the loss of, the ability of an animal to produce an immune response upon the administration of a particular antigen. Tolerance is induced by prior exposure of the animal to the same antigen and does not affect the ability of the animal to respond to other antigens.

**immunological unresponsiveness** 1. IMMUNOLOGICAL TOLERANCE. 2. Immunological tolerance produced by large doses of protein antigens (overloading).

**immunological zoo** The set of reagents required in the complement fixation test.

**immunology** The science that deals with resistance to disease.

**immunoprecipitation** The precipitation of either antigens or antibodies as a result of a precipitin reaction.

**immunoprecipitation test** A test that permits the identification of a bacterial colony that secretes a specific protein; involves growing the colonies on an agar surface that contains antibodies to the protein. If the protein is secreted, an antigen-antibody reaction will take place and a precipitin precipitate will be formed around the colony producing the protein.

**immunoradiometric assay** A variation of a radioimmunoassay that is based on the use of labeled antibodies for the assay of unlabeled antigens. *Abbr* IRMA; IRA.

**immunoreactive insulin** That fraction of serum insulin that is not protein-bound and that is readily neutralized by anti-insulin serum; the bulk of this insulin is called little insulin and the rest is called big insulin. *Abbr* IRI.

**immunosedimentation** An analytical technique that involves ultracentrifugation, using acrylamide-containing sucrose gradients, followed by immunodiffusion in agarose gel. The gradients obtained after ultracentrifugation are photopolymerized in the tubes and the gel thus formed is then removed from the tube, cut into slabs, and incorporated into an agarose gel for immunodiffusion.

**immunoselection** A technique for isolating cell-line variants that lack certain antigens; involves treating the cells with a specific antiserum and complement. This treatment leads to the death of all cells except those few that lack the corresponding antigens. These living, variant cells can then be isolated.

**immunosorbent** An immunological sorbent. *See also* absorption (4); adsorption (2).

**immunosuppressant** *See* immunosuppressive agent.

**immunosuppression** The prevention of an immune response by physical, chemical, or biological means.

**immunosuppressive agent** A physical, chemi-

al, or biological agent that prevents the production of an immune response by an antigen.

**immunotherapy** The treatment of a disease by immunization.

**IMP** 1. Inosine monophosphate (inosinic acid).  
2. Inosine-5'-monophosphate (5'-inosinic acid).

**impedance** The resistance to the flow of an alternating electric current; equal to the ratio of the complex potential difference applied across a circuit element to the complex current flowing through the element. *Sym Z.*

**imperfect excision** The excision of a genetic element from DNA, such as a prophage or an insertion sequence, in which the segment excised is either larger or smaller than the actual genetic element.

**impermeable** Not permeable.

**impenetrable** Impenetrable; not permeable.

**imphilyte** An immobilized amphipathic ampholyte.

**implantation** The artificial introduction of material, such as a tissue transplant or an encapsulated enzyme, into an organism.

**import** 1. Transport of material into a cell. 2. PROTEIN IMPORT.

**inactivated vaccine** A vaccine that contains microorganisms or virus particles that have been inactivated; they are no longer capable of causing disease.

**inactivation** The destruction of biological activity.

**inactivation cross section** A measure of the sensitivity of a target to inactivation by irradiation that is equal to the product of the quantum yield and the absorption cross section.

**inactivation probability** The ratio of the target molecular weight, calculated from radiation inactivation experiments, to the actual molecular weight.

**inanition** The exhaustion that results from either the lack of food or the inability to assimilate it.

**inapparent infection** A transient viral infection that does not produce overt disease symptoms. *See also* latent infection (2).

**inborn error of metabolism** A genetically inherited metabolic defect that results in the synthesis of a modified enzyme or other protein, or in the complete lack of synthesis of an enzyme or other protein. *See also* genetic disease.

**inbred strain** A strain of experimental animals produced by sequential brother-sister matings over many generations so that all the individuals are genetically identical.

**inbreeding** The crossing of plants or animals that are closely related genetically.

**incapsidate** ENCAPSIDATE.

**inchworm theory** The theory that, during the enzymatic binding of aminoacyl-tRNA to the A-site of the ribosome, a kink is created in the mRNA. The kink may be formed by rotation of the tRNA (which is hydrogen-bonded to the mRNA) about its long axis. Rotation of the tRNA results in the amino acid being brought into close proximity of the peptide in the P-site so that a peptide bond can now be formed. When the kink in the mRNA is straightened out, as a result of GTP and translocase activity, the peptidyl-tRNA is translocated from the A- to the P-site. This movement of the mRNA along the ribosome has been compared to that of an inchworm moving across a surface.

**incident** Falling on or striking.

**incision** A break in a single strand of a nucleic acid; a nick.

**incision enzyme** An enzyme that catalyzes the cleavage of a polynucleotide chain; an endonuclease.

**inclusion** A discrete mass within the cell of either foreign or metabolically passive material.

**inclusion body** 1. A mass of virus particles within the cell of an animal that is infected with the virus. 2. An aggregate formed in vivo by a number of abnormal hemoglobins; these aggregates deform the red blood cell and shorten its life span. *Aka* Heinz body.

**incompatibility** *See* histoincompatibility.

**incompatible plasmids** Two plasmids that cannot coexist in the same cell as is the case in superinfection immunity.

**incomplete antibody** An antibody that does not give the serologic reactions of precipitation and agglutination, and that can only be demonstrated either indirectly by means of special techniques or by means of its in vivo biological effect.

**incomplete antigen** HAPTEN.

**incomplete lectin** A lectin that requires the presence of some other substance for full activity.

**incomplete oxidation** The oxidation of organic compounds such that partially oxidized organic compounds are the final products; the term may refer either to a group of reactions or to a single reaction.

**incomplete protein** A protein that is deficient in one or more of the amino acids commonly found in proteins.

**incubation** The maintaining of organisms, reaction mixtures, and the like in an incubator or in some other constant temperature environment.

**incubation mixture** A reaction mixture that is maintained at a specified temperature.

**incubation period** 1. The time interval between the invasion of an organism by a virus or by a bacterium and the appearance of overt disease symptoms. 2. The length of time that a reaction mixture is maintained at a constant temperature.

**incubator** A constant temperature chamber used principally to provide a controlled environment for growth of cells and organisms.

**independent assortment** The random distribution of genes, located on nonhomologous chromosomes, during gametogenesis.

**independent binding** The binding of ligands to a macromolecule such that the binding of one ligand to one binding site has no effect on the binding of subsequent ligands to other sites on the same molecule. The ligands and the binding sites may be of one type each or they may be of different types. Independent binding is noncooperative binding.

**independent form** The dephosphorylated form of the enzyme glycogen synthase that is active in the absence of glucose-6-phosphate.

**independent variable** A quantity that can assume any arbitrarily chosen value independent of the values of other related variables.

**indeterminacy principle** UNCERTAINTY PRINCIPLE.

**indeterminate error** An error in measurement which is due to the fact that all physical measurements require a degree of estimation in their evaluation; such errors can be decreased in magnitude but cannot be eliminated entirely.

**index fossil** A fossil that is of widespread occurrence in one or in a few contiguous geological layers and that can be used to correlate the ages of geological deposits at various locations.

**index of discrimination** The ratio of the activities of a hormone that is assayed by two different methods.

**index of hydrogen deficiency** A measure of the degree of unsaturation in a molecule; equal to the number of pairs of hydrogen atoms that must be removed from the formula of a saturated hydrocarbon, which has the same number of carbon atoms as a given compound, to yield the molecular formula of the given compound.

**index of precision** 1. The standard deviation of the responses to a hormone divided by the slope of the dose-response curve. 2. The reciprocal of the slope of the dose-response curve of a hormone assay.

**index of refraction** *See* refractive index.

**indicator** A weak acid or a weak base in which the proton donor and the proton acceptor species have different colors; used for indicating

end points of acid-base titrations, since the color of the indicator is determined by the relative concentrations of the two species, which, in turn, are determined by the pH of the solution. *Aka* acid-base indicator.

**indicator enzyme** MARKER ENZYME.

**indicator strain** SENSITIVE STRAIN.

**indicator virus** A virus that has been heated so that its neuraminidase activity is destroyed but its hemagglutinating capacity is retained.

**indirect-acting bilirubin** The water-insoluble and unconjugated form of bilirubin that does not give a color reaction with diazotized sulfanilic acid unless alcohol is added first to solubilize the bilirubin. *See also* direct-acting bilirubin.

**indirect calorimetry** A method for determining the basal metabolic rate of an animal from measurements of the amount of nitrogen excreted in the urine, the volume of oxygen inhaled, the volume of carbon dioxide exhaled, and the respiratory quotient. *See also* direct calorimetry.

**indirect complement fixation test** A complement fixation test for determining antibodies that fail to fix guinea pig complement; entails the addition of an antiserum of known ability to fix guinea pig complement to an antigen-antibody-guinea pig complement system, followed by the addition of a hemolytic system.

**indirect Coombs' test** A Coombs' test in which the red blood cells are coated with antibody *in vitro*. *See also* direct Coombs' test.

**indirect coupling** COTRANSPORT.

**indirect effect** The change brought about in a molecule as a result of its interaction with molecules, radicals, atoms, or electrons that are produced by a direct interaction of atoms or molecules with radiation. *See also* direct effect.

**indirect fluorescent antibody technique** A fluorescent antibody technique in which the antigen of interest is first reacted with its immunoglobulin and then with a fluorescent antibody against the immunoglobulin. This technique is more sensitive than the direct one, since it multiplies the number of fluorochromes per antigen that is being stained. The technique can also be applied to the staining of antibodies. *Aka* sandwich technique; antiglobulin method. *See also* direct fluorescent antibody technique.

**indirect induction** CROSS-INDUCTION.

**indirect mutagenesis** *See* mutagenesis.

**indirect photoreactivation** The recovery of cells from the damage caused by their irradiation with ultraviolet light that is brought about by exposure of the damaged cells to light in the wavelength range of 310 to 370 nm; may be

due to an inhibition of growth which allows more time for the repair of the damaged DNA.

**indispensable amino acid** ESSENTIAL AMINO ACID.

**indispensable enzyme** ESSENTIAL ENZYME.

**indispensable fatty acid** ESSENTIAL FATTY ACID.

**indispensable gene** ESSENTIAL GENE.

**indole** The aromatic and heterocyclic ring system of the amino acid tryptophan. *See also* antipromoter.

**indoleacetic acid** An auxin that also has vasoconstrictor activity. *Abbr* IAA.

**indole alkaloids** *See* alkaloids.

**induced dipole moment** A dipole moment produced in a substance by the application of an external electric or magnetic field.

**induced enzyme** *See* inducible enzyme.

**induced-fit theory** A modification of the lock and key theory for the binding of a substrate to an enzyme. According to this theory, the active site is not preformed but, rather, is formed as a result of an interaction between the substrate and the enzyme. The substrate first induces a conformational change in the enzyme such that the catalytic and the binding groups of the enzyme achieve the required active site orientations which then permits the substrate to become bound to the enzyme.

**induced hypersensitivity** The hypersensitivity produced in an animal by contact with an antigen.

**induced mutation** A mutation produced by the intentional exposure of an organism to a mutagen, in contrast to a spontaneous mutation.

**induced radioactivity** Radioactivity that is artificially produced by bombardment of nuclei with high-velocity particles.

**induced tumor** A tumor that arises subsequent to, and as a result of, the exposure of an organism to a carcinogen.

**inducer** 1. The substance that brings about the synthesis of an inducible enzyme in the process of enzyme induction and that is generally either a substrate of the enzyme or a compound which is structurally similar to the substrate. 2. The substance used to induce an allergic state in an animal.

**inducer T cells** HELPER T CELLS.

**inducible enzyme** An enzyme that is normally either absent from a cell or present in very small amounts, but that is synthesized in appreciable amounts in response to an inducer in the process of enzyme induction. *See also* constitutive enzyme.

**inducible system** The regulatory system consisting of the components that function in enzyme induction. *See also* enzyme induction.

**inductance** The property of a conductor by which an electromotive force is induced in it by variations in an inducing electric current.

**induction** 1. ENZYME INDUCTION. 2. The stimulation of a lysogenic bacterium that causes it to shift to a lytic cycle, to produce infective phage particles, and ultimately to lyse in a burst; the derepression of a prophage. 3. The reasoning from particulars to generals. 4. MORPHOGENIC INDUCTION. 5. INDUCTIVE EFFECT.

**induction effect** DIPOLE-INDUCED DIPOLE INTERACTION.

**induction period** 1. LAG PERIOD. 2. *See* pre-steady-state kinetics.

**induction profile** The pattern of enzyme induction that is produced by a given inducer.

**induction ratio** The ratio of the concentration of the induced enzyme to that of the basal enzyme. *Abbr* IR.

**inductive effect** The partial charge induced in an atom, or in a group of atoms, of a molecule as a consequence of the electron-withdrawing and electron-donating properties of neighboring atoms and groups of atoms.

**inductively coupled plasma** An analytical technique for the analysis of multiple elements that has greater sensitivity than atomic absorption and that is useful for the analysis of trace elements in biological samples. The method involves the use of an argon plasma, at temperatures of about 9000 K, for emission spectrometry and mass spectrometry. A liquid sample is converted to an aerosol that is carried into the very hot plasma region where the various elements are excited to emission temperatures. Either the emitted light intensities or the masses of the various species present are then determined.

**inductive phase** The time interval between the administration of an antigen to an animal and the appearance of antibodies in the serum.

**inductor** 1. A substance that increases the rate of a chemical reaction and that is used up during the reaction. 2. A substance that acts like an organizer in affecting the development of embryonic and other undifferentiated tissues.

**inelastic collision** A collision in which there is a loss of kinetic energy; the sum of the kinetic energies of the colliding particles after the collision is less than that before the collision; some kinetic energy is lost in the form of excitation or ionization.

**inert** Chemically and/or physiologically inactive.

**infantile myxedema** CRETINISM.

**infantile paralysis** POLIOMYELITIS.

**infarct** An area of coagulation necrosis in a tissue due to local ischemia resulting from ob-



struction of circulation to the area, most commonly by a thrombus or an embolus.

**infarction** 1. An infarct. 2. Formation of an infarct.

**infection** 1. The introduction of an infective agent, such as a virus or a bacterium, into a host cell or a host organism. 2. The condition produced by the introduction of an infective agent into a cell or an organism.

**infectious center** *See* infective center.

**infectious disease** Any disease that can be transmitted from one person, animal, or plant to another.

**infectious hepatitis** *See* hepatitis.

**infectious mononucleosis** An acute infectious disease, primarily of lymphoid tissue, that is caused by the Epstein-Barr virus. It is characterized by enlarged lymph nodes, an enlarged spleen, and the presence of abnormal leukocytes in the blood.

**infectious nucleic acid** A purified viral nucleic acid that can infect a host cell and lead to the production of infective viral particles.

**infectious RNA** VIROID.

**infectious titer** The number of infective units in a viral sample. *Aka* infective titer.

**infectious transfer** The rapid spread of extrachromosomal episomes from donor to recipient cells in a population of bacterial cells.

**infective center** The phage particle or the phage-infected bacterium that forms a single plaque in the plaque assay.

**infective unit** A virus particle in a viral sample that leads to the infection of a host cell. *Aka* infectious unit.

**infectivity** The capacity of bacteria and viruses for interacting with, and altering, host cells.

**infinite dilution** A solute concentration of zero to which the values of physical parameters are commonly extrapolated.

**infinite thickness** SATURATION THICKNESS.

**infinite thinness** A layer of solid radioactive material that is so thin that self-absorption is negligible and that the sample can be counted as if it were infinitely thin.

**influent** ELUENT.

**influenza virus** The flu virus that causes respiratory infections and that belongs to the group of myxoviruses. *See also* antigenic drift.

**influx** Inward flow, as that into a cell.

**informational molecule** A molecule that carries genetic information in the form of specific sequences of building blocks. The term is generally restricted to DNA, messenger RNA, viral RNA, and to the anticodon segment of transfer RNA.

**information theory** The branch of science that deals with the measurement, processing, and transmission of information; an extension of

thermodynamics and probability theory that attempts to resolve information into a series of binary (yes/no) decisions.

**informofers** Globular protein particles with which HnRNA is complexed.

**informosome** A cytoplasmic messenger RNA-nonribosomal protein complex that occurs in eukaryotic cells. It is believed to function in the protection of mRNA against nuclease activity and in the transport of mRNA from the nucleus to the cytoplasm.

**infra-** Prefix meaning under or below.

**infrared dichroism** The dichroism of polarized infrared light that is used in the study of polypeptides.

**infrared spectrum** That part of the electromagnetic spectrum that covers the wavelength range of about  $7.5 \times 10^{-5}$  to  $4.2 \times 10^{-2}$  cm and that includes photons that are emitted or absorbed during vibrational and rotational transitions. *Abbr* IR spectrum.

**infusion** An extract made by soaking a substance, such as meat or a plant, in water.

**ingest** To take material, such as food, into either a cell or a body.

**INH** Isonicotinic acid hydrazide. *See* isoniazid.

**inheritance of acquired characteristics** The hereditary transmission of structural changes in organisms that is postulated by the Lamarckian theory.

**inherited immunity** NATURAL IMMUNITY.

**inhibin** A postulated protein hormone, of testicular origin, believed to function in the feedback regulation of gonadotropic secretion, particularly that of follicle-stimulating hormone (FSH); inhibin is believed to be a feedback inhibitor of FSH secretion. The existence of inhibin is not yet universally accepted.

**inhibition** A decrease in the extent and/or the rate of an activity, or the complete abolition of an activity.

**inhibition analysis** The study of secondary agents that can bring about the reversal of the inhibition of an enzyme; based on measurements of the precursors and products of the inhibited enzymatic reaction, and on measurements of substances that increase the enzyme concentration or influence the rates at which metabolites or inhibitors are destroyed.

**inhibition coefficient** The lowest concentration of a bacteriostatic agent that inhibits bacterial growth under defined conditions.

**inhibition constant** INHIBITOR CONSTANT.

**inhibition index** A measure of the potency of an antimetabolite; equal to the ratio of the concentration of antimetabolite that is required to inhibit the effect of an essential metabolite, to the concentration of the metabolite.

**inhibition ratio** The ratio of the amount of an antivitamin that is required to inhibit the effect of a given amount of a vitamin.

**inhibition zone** The antigen excess zone in a precipitin curve.

**inhibitor** An agent that produces inhibition.

**inhibitor constant** The equilibrium dissociation constant of the reaction  $EI \rightleftharpoons E + I$ , where E is the enzyme, and I is the inhibitor. *Sym*  $K_i$ .

**inhibitor source material** A plasma glyceride that inactivates factor VIII of blood clotting.

**inhibitor stop technique** A method for measuring transport across the mitochondrial membrane. Involves addition of a transportable metabolite to the mitochondrial suspension, followed by addition of a specific inhibitor at timed intervals. The inhibitor must stop the transport immediately and completely upon addition to the mitochondria. The mitochondria are then separated from the medium and assayed for the transportable metabolite.

**inhibitory autacoid** *See* autacoid.

**inhibitory medium** A medium that contains one or more substances designed to inhibit the growth of one or more types of organisms.

**inhibitory transmitter** A substance that is released by one neuron and that serves to dampen, or inhibit completely, the firing of another, target, neuron. The compound  $\gamma$ -aminobutyric acid (GABA), which is secreted by special neurons referred to as GABAergic neurons, is an example. *Aka* inhibitory neurotransmitter.

**initial heat** The heat produced by a muscle when it is stimulated by either an electric shock or a nerve impulse.

**initial velocity** The reaction velocity at the early stages of an enzymatic reaction; measured before the substrate concentration has decreased significantly (usually meaning that less than 5% of the initial substrate has been utilized) and while the concentrations of the products are low, so that the reverse reaction can be neglected. The initial velocity is given by the tangent, at the origin, to the curve that is obtained by plotting reaction velocity as a function of time. *Sym*  $v$ . *Aka* initial rate; initial steady-state rate; instantaneous velocity.

**initiation** 1. The process of chain initiation during protein synthesis, specifically the formation of the ribosome-mRNA-initiator tRNA complex. 2. The first stage in a two-stage or multistage mechanism of carcinogenesis during which a normal cell is converted to a precancerous cell by the action of a carcinogen. Initiation involves a brief and irreversible interaction between a carcinogen and the genetic material of the target tissue. This results in a molecular lesion, or mutation, that may transform some cells to an abnormal state but

does not generate a clinically observable tumor unless acted upon by a promoter. Initiation and promotion are regulated independently at different times by different agents. 3. The first stage of transcription. 4. The second stage in the germination of a spore. *See also* germination. 5. The first step in a chain reaction.

**initiation codon** The codon AUG that codes for the binding of the initiator tRNA for the initiation of protein synthesis; in prokaryotic systems, the codon binds *N*-formylmethionyl-tRNA and in eukaryotic systems the codon binds methionyl-tRNA. *Aka* initiator codon; start codon.

**initiation complex** The initial complex formed during protein synthesis which, in bacterial systems, consists of *N*-formylmethionyl-tRNA, mRNA, and a 30S ribosomal subunit. *Aka* initiator complex.

**initiation factor** 1. One of several protein factors that function in the initiation of protein synthesis. In prokaryotes there are 3 such factors, in eukaryotes there are at least 9. Prokaryotic and eukaryotic initiation factors are designated as IF and eIF, respectively. 2. The sigma subunit of RNA polymerase.

**initiation point** The site on the DNA molecule at which DNA replication begins.

**initiator** 1. A structural gene that forms part of the replicon and that forms a product, believed to be a protein, that interacts with the replicator and initiates the replication of the DNA that is attached to the replicator. 2. The product that is formed by the initiator structural gene and that interacts with the replicator to initiate DNA replication. 3. PRIMER. 4. A carcinogenic agent that brings about the first stage in a two-stage or multistage mechanism of carcinogenesis; generally a substance that interacts with cellular DNA. *See also* replicon.

**initiator locus** *See* replicon.

**initiator transfer RNA** The transfer RNA molecule that is responsible for the initiation of protein synthesis; in both prokaryotic and eukaryotic systems this is methionine-tRNA. In prokaryotes, it is bound to the initiator codon as *N*-formylmethionyl-tRNA, in eukaryotes it is bound as methionyl-tRNA.

**innate immunity** NATURAL IMMUNITY.

**inner compartment** MATRIX.

**inner filter effect** The decrease in the intensity of light passing through a sample that is due to the absorption of light by the sample. The effect constitutes a source of error in emission spectroscopy, as in fluorescence, since under these conditions only some of the molecules of the sample will be excited by the incident beam.

**inner membrane** 1. The internal mitochondrial

membrane which is the site of the electron transport system. 2. The membrane forming the thylakoid disks in chloroplasts. 3. The cell membrane (cytoplasmic membrane) of bacteria; it houses the systems for active transport, oxidative phosphorylation, and the biosynthesis of certain macromolecules. 4. The inner membrane of the nuclear envelope that is connected via nuclear pores to the outer membrane.

**inner-membrane particle**  $F_0F_1$ -ATPase.

**inner-membrane sphere** The elementary particle, or supermolecule, that is observed when inner mitochondrial membranes are examined with the electron microscope.

**inner orbital** An orbital that functions in the bonding of a low-spin complex.

**innervation** The distribution, or supply, of nerves to a particular tissue or organ.

**inner volume** The volume of solvent that is trapped within the gel particles of the bed in gel filtration chromatography.

**Ino** Inosine.

**inoculation** 1. The introduction of an inoculum into a culture or a culture medium. 2. The introduction of a substance into a cell or an organism, particularly the introduction of immunological substances for the purpose of producing immunity.

**inoculum** (*pl* inocula) A mass or a suspension of either cells or viruses that is used to initiate the growth of a new culture or to infect another culture.

**inorganic** 1. Pertaining to compounds other than those of carbon. 2. Pertaining to substances other than those derived from plant, animal, or microbial sources.

**inorganic phosphate** An anion, or a mixture of anions, derived from orthophosphoric acid ( $H_3PO_4$ ). *Sym*  $P_i$ ;P.

**inorganic pyrophosphate** An anion, or a mixture of anions, derived from pyrophosphoric acid ( $H_4P_2O_7$ ). *Sym*  $PP_i$ ;PP.

**inosine** The ribonucleoside of hypoxanthine. Inosine mono-, di-, and triphosphate are abbreviated, respectively, as IMP, IDP, and ITP. The abbreviations refer to the 5'-nucleoside phosphates unless otherwise indicated. *Abbr* Ino;I.

**inosinic acid** The ribonucleotide of hypoxanthine.

**inositol** An optically and biologically active, cyclic sugar alcohol; frequently classified with the B vitamins, since it is a growth factor for some organisms. *Aka* *i*-inositol; *meso*-inositol; *myo*-inositol; *inosite*.

**inositolphospholipid** Any phospholipid derived from inositol or related compounds.

**inotropic effect** An effect on the contractility of muscular tissue, especially that of the heart.

**insect hormones** A group of substances that direct the life cycle of insects; the post-embryonic development of insects is controlled by the activation hormone, the molting hormone, and the juvenile hormone.

**insecticide** An agent that kills insects.

**insert** PASSENGER.

**insertase** An enzyme that catalyzes the attachment of the proper base to an apurinic or apyrimidinic site (AP site).

**insertion** 1. A mutation in either DNA or RNA in which one or more extra nucleotides are inserted into a polynucleotide chain. 2. INTEGRATION (c). 3. GENE INSERTION.

**insertional inactivation** The inactivation of a gene that results from the insertion of a segment of foreign DNA into the coding sequence of the gene. The inactivation can be detected by a plating test and can serve as a means for isolating a plasmid that contains foreign DNA. *See also* recombinant DNA technology.

**insertion element** INSERTION SEQUENCE.

**insertion model** A model, proposed by Campbell, for the attachment of the prophage to the bacterial DNA. According to this model, the prophage first becomes attached in cyclic form to the bacterial DNA. The bacterial DNA is then interrupted by opening the ring at the point of contact, and the prophage is inserted linearly into the bacterial DNA which is attached to it at both ends. *See also* hook model.

**insertion sequence** 1. A small, transposable element in bacteria (a small transposon) that can insert into several sites in a genome. Insertion sequences function in the transposition of segments which they flank. They usually contain genes coding for proteins that function in their transposition but contain no other genes and have no other known effect than to function in transposition. The termini of each insertion sequence consist of inverted repeats. *Aka* IS element. 2. The C-terminal hydrophobic tail of a free protein that allows it to become inserted in, and translocated across, a biological membrane.

**insertion vector** *See* lambda cloning vector.

**insertosome** A small segment of DNA (800–1400 bp) that can insert itself randomly into the chromosome of *E. coli* to cause polar mutations analogous to those produced by phage Mu-1.

**inside-out particles** Subcellular particles, produced by disruption of mitochondria, that consist chiefly of fragments of the inner mitochondrial membrane which have become released to form vesicles.

**inside-out protein** A protein (such as bacteriorhodopsin) that has an organization of

amino acid residues that is opposite that of typical soluble, globular proteins; a protein in which polar amino acids tend to be concentrated in the interior of the molecule while nonpolar amino acids predominate on the exterior side of the molecule.

**inside-outside transition** FLIP-FLOP (1).

**in situ** In the normal, natural location or position.

**in situ hybridization** A technique for localizing specific DNA segments within intact chromosomes; involves incubating chromosomes, devoid of RNA and protein, with tritium-labeled nucleic acid and visualizing the hybridized segments by radioautography.

**in situ hybridization assay** COLONY HYBRIDIZATION.

**insoluble enzyme** An enzyme that is linked covalently to a water-insoluble support, such as agarose or polyacrylamide, without destruction of its activity. Applications of such enzymes occur in batch-type reactions, adsorption chromatography, and gel filtration. *See also* immobilized enzyme.

**insoluble fibrin** HARD CLOT.

**inspire** To inhale.

**instability factor** One of a set of arbitrary values assigned to substituents, interactions, and the like, that affect the stability of monosaccharide conformations. The values obtained by summing these factors permit an estimation of the relative stabilities of different conformations of a given compound.

**instructive theory** A theory of antibody formation according to which the information for antibody synthesis results from an instructive effect by the antigen, rather than from a genetic determination; the antigen instructs the biosynthetic machinery to synthesize specific antibodies which, in the absence of the antigen, would either not be formed at all or be formed only very rarely as a result of a chance event. *See also* selective theory.

**insulin** A protein hormone that lowers the level of blood sugar and stimulates the utilization of glucose by affecting the rate of transport of glucose across the cell membrane. Insulin is secreted by the islets of Langerhans in the pancreas and also has anabolic effects in protein and lipid metabolism.

**insulinase** A protease that hydrolyzes both of the separated A and B chains of insulin but does not attack the intact insulin molecule.

**insulin-dependent diabetes** *See* diabetes.

**insulin-independent diabetes** *See* diabetes.

**insulin-like activity** A group of substances in serum that have some of the biological properties of insulin, but do not react with insulin antibodies. *Abbr* ILA.

**insulin-like growth factor** *See* somatomedin.

**insulinoma** A benign, insulin-secreting tumor of the beta cells of the pancreas.

**insulin resistance index** The sum of the values for the blood glucose concentration at 60, 90, and 120 min as determined in an insulin tolerance test. *Abbr* IRI.

**insulin shock** A condition characterized by anxiety, delirium, and convulsions, that is occasionally produced upon the administration of insulin to an animal; it results from a lowering of the blood sugar by insulin to a level below that which is required for normal functioning of the brain.

**insulin stimulation test** A test for assessing the integrity of the hypothalamus-pituitary-adrenal system; based on the fact that, in normal individuals, an intravenous injection of insulin that is sufficient to lower blood glucose, will also result in a rapid and marked rise of plasma ACTH and cortisol.

**insulin tolerance test** A test for evaluating insulin resistance and certain endocrine disorders. The test is performed by placing an individual on a carbohydrate diet, followed by an injection of insulin and a determination of the blood sugar level as a function of time.

**integral counting** The counting, in a scintillation counter, of pulses that are above a certain level of intensity; the pulses are selected by means of a discriminator that rejects pulses of lower intensity.

**integral discrimination** The selection of pulses that takes place in integral counting.

**integral dose** The total, cumulative dose of radiation received by an individual.

**integral proteins** Membrane proteins that are integrated into the structure of the cell membrane. They may extend partially or completely through the phospholipid bilayer of the membrane. They usually cannot be removed from the membrane without the use of drastic conditions which disrupt the membrane. *Aka* intrinsic proteins.

**integrase** A phage-specific enzyme that catalyzes the site-specific exchange occurring when a prophage is inserted into, or excised from, a bacterial chromosome; in the excision process, an accessory host protein (excisionase) is also needed.

**integrated circuit** CHIP.

**integrated state** The state of an episome in which it is incorporated into, and replicates with, the chromosome. *See also* integration.

**integrating circuit** An electronic circuit for measuring the total number of ionizations and the resulting electrical currents that are produced in an ionization chamber in a given time interval. *See also* differentiating circuit.

**integration** The incorporation of one DNA segment into another as in (a) the incorpora-

tion of donor DNA into recipient DNA in genetic recombination; (b) the incorporation of episomal DNA into chromosomal DNA; and (c) the insertion of prophage DNA into the host bacterial DNA.

**integration efficiency** The frequency of incorporation of foreign DNA into recipient bacterial DNA; used particularly for foreign DNA incorporation during transformation.

**integration host factor** EXCISIONASE.

**integrator gene** See Britten-Davidson model.

**integrin** One of a group of receptors that bind the RGD sequence of adhesive proteins. Integrins are heterodimeric proteins with two membrane-spanning subunits. See also RGD.

**intensive property** A property of a system, such as density or concentration, that is intrinsic to the system and that does not depend on the amount of substance involved. See also extensive property.

**inter-** Prefix meaning between.

**interacting flows** See interaction of flows.

**interacting sites** See cooperative binding.

**interaction of flows** The interdependence of the diffusion of different solutes in a solution that contains two or more solutes; due to the effect of the concentration gradient of one solute on the diffusion of another.

**interaction of heme groups** See heme-heme interaction.

**interactive** Descriptive of a computer in which a two-way interaction goes on between the user and the computer.

**interactive graphics** The interaction of an individual with a computer, the output of which is shown in graphical form; the interaction occurs while the computer is in operation, and with the computer being coupled to oscilloscopes or other display devices.

**interallelic complementation** INTRAGENIC COMPLEMENTATION.

**inter-alpha-globulin** THYROXINE-BINDING GLOBULIN.

**interband** A region between two adjacent bands in a polytene chromosome.

**intercalary deletion** A deletion in which genetic material is lost from some part of the chromosome other than its end; a deletion occurring at the end of a chromosome is called a terminal deletion.

**intercalation** The process whereby a flat molecule, such as an acridine dye, becomes inserted between two adjacent, stacked bases in a double-helical nucleic acid. Intercalation results in a frameshift mutation, since the subsequent replication of the nucleic acid leads to either a deletion or an insertion of a nucleotide.

**intercept replot** See secondary plot.

**intercistronic region** That section of DNA, in a

polycistronic transcription unit, that lies between the termination point of one gene and the initiation point of the next gene.

**interconversion** 1. The change of one metabolite into another. 2. The change of one enzyme form into another. See covalently modified enzyme.

**interconvertible enzyme** An enzyme capable of undergoing covalent modification by another enzyme; glycogen phosphorylase, which can be converted enzymatically from the a to the b form, and vice versa, is an example.

**interesterification** The formation of a new ester by the reaction of an ester with an acid, an alcohol, or another ester; these three reactions are known as acidolysis, alcoholysis, and ester interchange.

**interface** 1. The boundary between two phases. 2. COMPUTER INTERFACE.

**interface centrifugation** A centrifugal technique in which there are two immiscible phases in the centrifuge tube, and transfer of solute particles occurs from one phase to the other.

**interfacial tension** The surface tension at the interface between two liquid phases.

**interfacial test** RING TEST.

**interference** 1. The mutual effect upon meeting of two sets of waves, such as light waves, that results in neutralization (destructive interference) at some points, and in reinforcement (constructive interference) at other points. 2. The effect of a crossover at one locus on a chromosome on the probability of a crossover at another locus; the interference is said to be positive if the probability of the second crossover is decreased and it is said to be negative if that probability is increased. 3. VIRAL INTERFERENCE.

**interference filter** A filter that allows the passage of a narrow range of wavelengths, about 10 to 20 nm wide. It is made by depositing semitransparent silver films on both sides of a dielectric so that constructive and destructive interference take place when light passes through the films.

**interference fringe** One of either the light or the dark bands that are produced by the interference or the diffraction of light.

**interference microscope** A microscope that utilizes interference effects and that permits the observation of transparent objects and the measurement of refractive indices.

**interference optics** INTERFEROMETRIC OPTICAL SYSTEM.

**interfering virus** A virus that interferes with the multiplication of another virus.

**interferogram** The photographic record of an interference pattern.

**interferometer** An instrument for the precise

determination of wavelengths or distances; based on the separation of light in the instrument into two parts that travel unequal paths and that, when reunited, interact with each other to produce an interference pattern.

**interferometric optical system** An optical system that focuses ultraviolet light passing through a solution in such a fashion that a photograph of interference fringes is obtained. A boundary in the solution appears as a break in the interference fringes and measurements are made on the photographic plate by counting the interference fringes. An optical system of this type, incorporating a Rayleigh interferometer, is used in the analytical ultracentrifuge. *See also* Gouy interferometer.

**interferons** A family of proteins, occurring in a large number of vertebrates, which have a variety of cell regulatory functions. They affect cell motility and immunological processes; they also interfere with the replication of various viruses (hence the name). Interferons are species-specific and can generally not be detected unless induced. They are induced in response to a variety of agents including viruses, microorganisms, and endotoxins. Upon induction, interferons circulate to neighboring cells which they stimulate to make antiviral proteins that prevent the translation of viral mRNA. Human interferons are classified into three, antigenically distinct, types:  $\alpha$ - (or leukocyte),  $\beta$ - (or fibroblast),  $\gamma$ - (or immune) interferons. The names indicate the types of cells that synthesize the particular interferon.

**intergenic complementation** Complementation that is produced by two mutant chromosomes that carry a mutation in different genes. The unmutated gene of one chromosome makes up for, or complements, the mutated gene of the other chromosome so that the necessary gene products of both genes are formed, and the wild-type allele of each gene is expressed.

**intergenic suppression** The restoration of a genetic function, which was lost by mutation, through a second mutation in a gene other than the one that sustained the primary mutation; often refers to the ability of a tRNA molecule to recognize a termination codon or two different sense codons.

**intergenic suppressor mutation** *See* suppressor mutation.

**interkinesis** The interphase between the first and the second division in meiosis.

**interleukin-2** A lymphokine produced naturally by some helper T cells in response to infection. It causes a rapid amplification of the number of T cells at the site of infection and may be used in tissue culture to produce

antigen-specific T cell lines. It has also been used to reduce the mass of certain tumors and to prevent metastasis. *Var sp* interleukin-2. *Abbr* IL-2. *See also* cytokines; lymphokines.

**intermediary metabolism** 1. The enzyme-catalyzed reactions in cells whereby nutrients are transformed and energy is extracted from them for the growth and maintenance of the cells. 2. The sum total of all the chemical transformations of the nutrients in an animal subsequent to the absorption of the nutrients into the blood.

**intermediate** A compound that participates in a reaction and that occurs between the starting materials and the final products of the reaction; in metabolism, an intermediate occurs between the nutrients on the one hand, and the cellular components and waste products on the other hand.

**intermediate filaments** Intracellular fibers, having a diameter of about 8–12 nm, which is between that of microfilaments and microtubules. Intermediate filaments are heterogeneous in their protein composition and are an important component of the cytoskeleton. In general, a given class of filaments is characteristic of a specific cell type. For example, keratin filaments are found in epithelial cells, neurofilaments in neurons, and vimentin filaments in fibroblasts. *Abbr* IF.

**intermedin** MELANOCYTE-STIMULATING HORMONE.

**internal conversion** 1. A mode of radioactive decay in which gamma rays that emanate from a nucleus collide with an orbital electron, transfer all their energy to it, and then eject the electron from the atom. 2. A mode of vibrational deexcitation in which the energy of an excited electronic state of a molecule is dissipated by conversion to vibrational energy of a lower electronic state that has the same multiplicity (i.e., singlet to singlet or triplet to triplet).

**internal conversion electron** CONVERSION ELECTRON.

**internal energy** The energy within a system. In chemistry, this usually refers only to those types of energy that can be modified by chemical processes; these include translational, vibrational, and rotational energies of molecules, energy involved in chemical bonding, and energy involved in noncovalent interactions between molecules.

**internal gas counter** A radiation counter in which a radioactive gaseous sample is counted by being incorporated into the detector-filling gas mixture.

**internal indicator** An indicator that is added to the titration vessel in which a liquid is being titrated.

**internalization** See coated pit; receptosome.

**internal monooxygenase** A monooxygenase in which the cosubstrate that incorporates the second oxygen atom is itself a product of the reaction.

**internal protein** A protein that is complexed with DNA and occurs in the head of T-even phages.

**internal quenching** The quenching of an ionization detector that occurs when a specific gas, such as butane or chlorine, is added to the mixture used for gas amplification. See also organic quenching.

**internal radiation** The radiation emitted by radioactive substances that are deposited in the tissues.

**internal resolution site** A region, in some transposable elements, at which a site-specific exchange of genetic elements occurs.

**internal respiration** See respiration (3).

**internal-sample scintillation counter** A scintillation counter in which the sample and the fluor are in intimate contact, as in a liquid scintillation counter.

**internal standard** A standard that is added to, and treated with, the sample.

**internal standardization** A method for determining the counting efficiency of radioactive samples that is based on counting the sample both by itself and together with a known amount of added isotope.

**internal volume** INNER VOLUME.

**International Union of Biochemistry** The organization that standardizes biochemical nomenclature, symbols, etc. *Abbr* IUB.

**International Union of Pure and Applied Chemistry** The organization that standardizes chemical nomenclature, symbols, atomic weights, etc. *Abbr* IUPAC.

**international unit** An arbitrarily defined measure for the activity of a natural substance such as an enzyme, a hormone, or a vitamin; for enzymes, an international unit is identical to an enzyme unit. *Sym* IU.

**interphase** The period between two successive mitotic divisions; composed of successive G<sub>1</sub>, S, and G<sub>2</sub> phases of the cell cycle.

**interphase cycle** CELL CYCLE.

**interpolation** The estimation of the value of a function between two known values without using the equation of the function itself.

**interrupted gene** A gene containing intervening sequences (introns).

**interrupted mating experiment** An experiment designed to study the transfer of genetic information during bacterial conjugation; performed by withdrawing samples at various times from a culture of mating bacteria and separating the mating bacteria by intense agitation in a blender. The bacterial fractions

thus obtained contain recipient bacteria which have received varying amounts of the chromosome from the donor bacteria.

**interrupted trough technique** An immunoelectrophoretic technique for comparing the antigens in two mixtures.

**intersome** A collective term for the intermediate-size particles that either are naturally occurring precursors of ribosomes or are produced from ribosomes by the stepwise removal of proteins.

**interstice** A small space between two structures such as cells, organs, or tissues.

**interstitial** Of, or pertaining to, interstices.

**interstitial cell hormone** LUTEINIZING HORMONE.

**interstitial cell-stimulating hormone** LUTEINIZING HORMONE.

**interstitial volume** The total volume of the mobile phase within the length of the column in column chromatography.

**intersystem crossing** A nonradiative transition of a molecule from one energy state to another that has a different multiplicity; the transition from an excited singlet state to a triplet state by a decrease in the energy of the molecule as a result of collisions is an example.

**intervening sequence** INTRON.

**intervent** A solute that intervenes in, and reduces, the interactions between macromolecules.

**intervent dilution chromatography** A chromatographic technique for the separation of strongly interacting macromolecules that is based on forcing the macromolecules repeatedly across a boundary in an ion-exchange gel. On one side of the boundary the intervent concentration is high, so that the macromolecules are relatively independent of each other and macromolecular complexes dissociate; on the other side of the boundary the intervent concentration is low, so that the macromolecules are in an aggregated form and can be separated by adsorptive and ion-exchange processes.

**interwound helix** A supercoiled duplex in which the axis is twisted around itself.

**intestinal juice** The digestive juice that consists of the secretion of the intestinal mucosa and that is discharged into the small intestine; contains enterokinase, lipases, peptidases, carbohydrases, nucleases, and phosphatases. *Aka* intestinal fluid.

**intima** The inner lining of a blood vessel.

**in toto** Totally; altogether.

**intoxication** The abnormal state of an animal produced by relatively large amounts of a chemical agent such as a poison, a drug, or a vitamin.

**intra-** Prefix meaning within.

**intracellular accumulation period** The period, during viral infection, that extends from the end of the eclipse to the first appearance of extracellular virus particles.

**intracellular digestion** Digestion within the cell in which the lysosomes play an important role; the processes of pinocytosis and phagocytosis.

**intracellular titer** The total titer of phage particles minus the extracellular titer.

**intracellular transport** The transport across membranes of subcellular organelles, such as the transport across mitochondrial or chloroplast membranes. *See also* homocellular transport; transcellular transport.

**intracellular virus** CELL-ASSOCIATED VIRUS.

**intracistronic complementation** INTRAGENIC COMPLEMENTATION.

**intracistronic suppression** INTRAGENIC SUPPRESSION.

**intracristael space** The intermembrane space between the inner and the outer mitochondrial membranes.

**intradermal injection** An injection into the skin.

**intragenic complementation** Complementation that is produced by two mutant chromosomes that carry a mutation in the same gene but at different sites. Such complementation may arise when the product of the genes is a multimeric protein and when the individual gene products, or monomers, are nonfunctional but combine to produce an aggregate, or multimer, that is functional and nearly normal in its properties.

**intragenic recombination** The genetic recombination between mutons of the same cistron.

**intragenic suppression** The restoration of a genetic function, which was lost by mutation, through a second mutation in the same gene that sustained the primary mutation but at a different site in that gene.

**intragenic suppressor mutation** *See* suppressor mutation.

**intramuscular injection** An injection into the muscle. *Abbr* im.

**intraperitoneal injection** An injection into the peritoneal cavity. *Abbr* ip.

**intrapleural injection** An injection into the chest fluid.

**intrathecal injection** An injection into the spinal cord.

**intravenous injection** An injection into a vein. *Abbr* iv.

**intravital staining** The staining of living cells without killing them.

**intrinsic activity** A measure of the potency of an agonist that binds to a receptor; equal to the maximum response the agonist is capable of evoking and expressed as a fraction of the

response evoked by a full agonist.

**intrinsic association constant** The association constant that describes the binding of a ligand to a particular site on a protein molecule, provided that all sites of this type present on the same molecule are identical and noninteracting. *Aka* intrinsic binding constant.

**intrinsic blood coagulation** INTRINSIC PATHWAY.

**intrinsic Cotton effect** A Cotton effect that is caused by the protein itself and not by a small molecule that is bound to the protein.

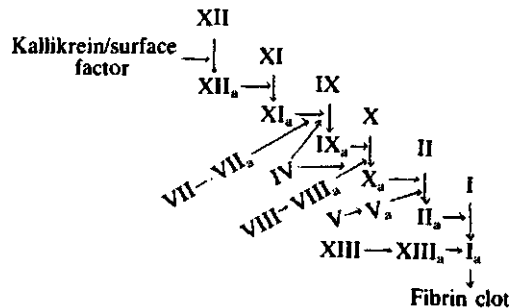
**intrinsic dissociation constant** The reciprocal of an intrinsic association constant.

**intrinsic factor** A glycoprotein in the gastric juice that combines with free vitamin B<sub>12</sub> and aids in its absorption from the intestine. *Aka* intrinsic factor of Castle.

**intrinsic fluorescence** Fluorescence that is caused by the aromatic amino acids of the protein itself and not by a small molecule that is bound to the protein. *See also* autofluorescence.

**intrinsic heterogeneity** The heterogeneity of antibodies that results from intrinsic factors, such as the different genes that are responsible for the synthesis of antibodies.

**intrinsic pathway** The series of reactions in blood clotting that involve factors normally present in the circulation and that are initiated by surface contact in the blood capillaries or by kallikrein. The pathway proceeds in the form of a cascade mechanism, with each stage involving protease activation of a zymogen to its enzymatically active form. Major steps of the pathway are as follows (Roman numerals indicate factor numbers; the subscript a indicates the active form of the factor):



The sequence from factor X<sub>a</sub> on is common to both the intrinsic and the extrinsic pathways. The common names of the factors are listed under factor. *Aka* intrinsic system.

**intrinsic proteins** INTEGRAL PROTEINS.

**intrinsic system** INTRINSIC PATHWAY.

**intrinsic viscosity** The limiting value, at infinite dilution, of the reduced viscosity; it is equal to the product of the partial specific volume of the solute and its viscosity increment. *Sym*  $[\eta]$ .



**intron** An intervening sequence in the DNA of eukaryotic genes. Such sequences are transcribed into RNA but are then excised and are not translated. The term is also used for the excised RNA sequence. Introns and exons (translated sequences) make up split genes. *Aka* intervening sequence (IVS).

**intron intrusion** The breakup of a functional gene through the insertion of an intron into it. Intron intrusion, exon shuffling, and junctional sliding have been proposed to help explain the evolutionary diversification of genes.

**intron-mediated recombination** *See* exon shuffling.

**intussusception** A mode of growth in which new material is incorporated within an existing matrix. The deposition of material in a plant cell wall or in a cell membrane are two examples.

**inulin** A homopolysaccharide of D-fructose that occurs in some plants and that is used for measurements of renal clearance.

**in utero** Within the uterus.

**in vacuo** In a vacuum.

**invagination** 1. The process of infolding and pocket formation. 2. The structure formed by infolding, as that produced by an infolded membrane.

**invariant residues** Amino acid residues that show sequence homology; amino acids that are identical in their location and sequence in a protein of a given type, isolated from various species. The term can likewise be applied to nucleotides in a nucleic acid.

**invariants** Identical amino acid sequences in a protein of a given type, isolated from various species.

**invasin** HYALURONIDASE.

**invasiveness** The spreading of bacteria, viruses, or cancer cells from the site of infection, or the site of the original tumor, to other sites and other tissues in the same organism.

**inverse isotope dilution analysis** A technique for determining the amount of a labeled compound of known specific activity by the addition of a known amount of the same, but unlabeled, compound. The mixture of labeled and unlabeled compounds is then isolated and its specific activity is measured.

**inverse square law** The law stating that a property, such as radiation intensity or Coulomb's force, varies inversely as the square of the distance from a given point.

**inverse substrate** A substrate for an enzyme in which the arrangement of the site-specific groups is reversed, compared to that of the normal substrate.

**inversion** 1. The hydrolysis of sucrose to an equimolar mixture of glucose and fructose; so called because the optical rotation changes

sign as the hydrolysis proceeds. 2. A chromosomal aberration in which a block of genes is rotated by 180° so that the sequence of genes in that block is inverted.

**inversion of configuration** The change from one enantiomeric configuration about an asymmetric carbon atom to the other in the course of a chemical reaction; requires the breaking of covalent bonds in a compound and the remaking of these bonds in the reverse sense.

**inversion symmetry** The symmetry of a body that exists when identical structures are produced by an inversion about an inversion center.

**invertase** The enzyme sucrase that catalyzes the hydrolysis of sucrose to glucose and fructose. *See also* inversion (1).

**invertebrate** 1. *n* An animal that lacks a backbone. 2. *adj* Of, or pertaining to, an animal that lacks a backbone.

**inverted repeat** PALINDROME.

**inverted repetition** PALINDROME.

**inverted terminal repeats** Identical, or closely related, nucleotide sequences that have opposite orientations (run in opposite directions); they occur at the ends of some transposons.

**invert sugar** The equimolar mixture of glucose and fructose that is formed by the hydrolysis of sucrose. *See also* inversion (1).

**Inv group** A group of allotypic antigenic sites in the constant region of the kappa chains of human immunoglobulins.

**in vitro** Outside a living organism; pertaining to conditions of or to experiments with a perfused organ, a tissue slice, cells in tissue culture, a homogenate, a crude extract, or a subcellular fraction. *See also* in vivo.

**in vitro complementation** The in vitro demonstration of intragenic complementation by the mixing of nonfunctional monomeric proteins and the formation of a functional multimeric protein.

**in vitro marker** An induced mutation of mammalian cells that permits their phenotypic detection in tissue culture.

**in vitro mutagenesis** The introduction of mutations into DNA by treatment of the DNA with chemical or physical mutagens. The mutated DNA is then assayed for biological activity using either in vitro (cell-free) or in vivo (plasmid) systems.

**in vitro packaging** The process of encapsidating naked DNA, by means of phage lambda packaging proteins and preheads, to produce infectious particles.

**in vitro protein synthesis** CELL-FREE AMINO ACID INCORPORATING SYSTEM.

**in vivo** Within a living organism; pertaining to conditions of or to experiments with a whole

animal, an intact plant, an intact organ, or a population of microbial cells. *See also* in vitro.

**in vivo marker** A naturally occurring mutation of mammalian cells that permits their phenotypic detection in tissue culture.

**iodide pump** The active transport mechanism that concentrates iodide in the thyroid gland. *Aka* iodide trapping mechanism.

**iodine** An element that is essential to humans and several classes of animals and plants. Symbol, I; atomic number, 53; atomic weight, 126.9044; oxidation states, -1, +1, +5, +7; most abundant isotope, <sup>127</sup>I, a radioactive isotope, <sup>131</sup>I, half-life, 8.1 days, radiation emitted, beta particles and gamma rays.

**iodine number** A measure of the extent of the unsaturation in a fat that is equal to the number of grams of iodine taken up by 100 g of fat. The greater the iodine number, the greater the extent of unsaturation in the fat. *Aka* iodine value.

**iodophor** A complex formed between iodine and a surface active compound. Iodophors have both antimicrobial activity, due to the iodine, and detergent properties, due to the surface active compound; they are widely used as disinfectants. *Var sp* iodophore.

**iodopsin** The visual pigment, consisting of cone opsin plus retinal, that occurs in mammals and other vertebrates and that has an absorption maximum at 562 nm.

**ion** An atom, a group of atoms, or a molecule that carries an electrical charge. *See also* ionization.

**ion antagonism** The phenomenon in which one or more ions lead to an activation of a reaction or a set of reactions, while one or more similar ions lead to an inhibition of the same reaction or set of reactions.

**ion atmosphere** The region surrounding a charged atom, a charged group of atoms, or a charged molecule in which there is a statistical preference for ions of opposite charge.

**ion carrier** *See* ionophore.

**ion chamber** IONIZATION CHAMBER.

**ion channel** *See* ionophore.

**ion chromatography** Originally defined as a liquid chromatographic technique involving the separation of ions by means of a low-capacity ion-exchange column and an analysis of the effluent by conductivity measurements. The term is now used to describe the separation of ions by means of high-performance liquid chromatography (HPLC); a variety of columns can be used and a variety of detection methods (conductivity, fluorescence, refractive index, etc.) can be employed.

**ion cloud** ION ATMOSPHERE.

**ion cluster** An aggregate of ion pairs that is formed in the immediate vicinity of a primary

ionizing event, and that is produced by the secondary electrons which are generated by the incident ionizing particle or by the incident photon. *See also* ion pair (1).

**ion-dipole interaction** The attractive or repulsive electrical force between an ion and a dipole; the energy of such interactions is proportional to  $r^{-4}$ , where  $r$  is the distance between the ion and the dipole.

**ion electrode** *See* ion-selective electrode.

**ion etching** The exposure of a biological specimen to a beam of inert ions, such as those of argon, prior to an examination of the specimen with the scanning electron microscope.

**ion-exchange chromatography** A chromatographic technique in which molecules are separated on the basis of their charge. The stationary phase is an ion-exchange resin, and the mobile phase is an aqueous solution. Ion-exchange chromatography is usually performed in columns, and the charged molecules are retarded in their movement through the column depending on the sign and the magnitude of their charge. *Aka* ion exchange.

**ion-exchange resin** A high molecular weight, insoluble, branched, ionized polymer that is used as a support in ion-exchange chromatography; may be natural or synthetic. *Aka* ion exchanger.

**ion exclusion** A process whereby strong electrolytes are separated from weak electrolytes or from nonelectrolytes by passage of the mixture through an ion-exchange resin; the strong electrolytes are excluded from the ionized resin and elute more readily than the other substances. *See also* ion retardation.

**ion-filtration chromatography** A chromatographic technique that is based on the combined use of gel filtration and ion-exchange chromatography; performed by eluting macromolecules in the sieving range from a cross-linked ion-exchange gel under precisely controlled conditions of pH and ionic strength. Performed, for example, by using cross-linked DEAE-cellulose as the support in column chromatography.

**ionic** Of, or pertaining to, ions.

**ionic bond** The attractive force, described by Coulomb's law, between a cation and an anion or between a cationic and an anionic group of atoms; the cationic and anionic groups may be on the same molecule or on different molecules.

**ionic contact distance** The distance between two oppositely charged and interacting ions at which the attractive force due to the opposite charges is just balanced by the repulsive force due to the orbital electrons of the two ions.

**ionic detergent** *See* anionic detergent; cationic

detergent; detergent.

**ionic double layer** The region encompassing the charges on an atom, a group of atoms, or a molecule together with the layer of counterions that surrounds these charges.

**ionic migration** ISOTACHOPHORESIS.

**ionic mobility analysis** ISOTACHOPHORESIS.

**ionic orbital** An orbital that functions in the bonding of a high-spin complex.

**ionic sieving** Gel filtration chromatography of ions.

**ionic strength** A measure of the ionic concentration of a solution that is equal to  $\frac{1}{2}\sum c_i Z_i^2$ , where  $c_i$  is the concentration of the  $i$ th ion and  $Z_i$  is its charge. *Sym* I;  $\Gamma/2$ ;  $\mu$ .

**ion-induced dipole interaction** The attractive electrical force between an ion and a dipole which is induced by the ion; the energy of such interactions is proportional to  $r^{-4}$ , where  $r$  is the distance between the ion and the induced dipole.

**ion-ion interaction** The attractive or repulsive electrical force between two ions that is described by Coulomb's law. *See also* electrostatic interactions.

**ionizable** Capable of undergoing ionization.

**ionization** 1. The breakup of a molecule into two or more ions when it is dissolved in water. 2. The formation of a charged group in a molecule by either the association or the dissociation of a group, most commonly a proton. 3. The formation of an ion pair by either an ionizing particle or a strong electrostatic field.

**ionization chamber** A chamber for the production and collection of ions and for the measurement of the electric currents produced by these ions. The ions are commonly produced by bombardment of a gas with an ionizing radiation. Simple ionization chambers are used especially for measurements of x or gamma rays; ionization chambers with gas amplification are used for measurements of alpha and beta rays, and are incorporated in proportional and Geiger-Mueller counters.

**ionization constant** The dissociation constant for a reaction in which ions are produced, as in the dissociation of an acid to form a proton and an anion.

**ionization detector** An instrument for the detection of ionizing events, such as those occurring in an ionization chamber.

**ionization energy** The energy required to remove an orbital electron from an atom; expressed in terms of the energy required to remove a mole of electrons (kcal/mol or kJ/mol). *Aka* ionization potential.

**ionization interference** The interference that occurs in atomic absorption spectrophotometry when the atoms, in addition to being

dissociated from the molecule, are also excited by the flame; as a result, the excited atoms emit radiation that is of the same wavelength as that which is being absorbed.

**ionization potential** IONIZATION ENERGY.

**ionization track** The trace of ion pairs that are produced by either an ionizing particle or a photon as it passes through matter, commonly water vapor.

**ionized** In the form of an ion or ions.

**ionized calcium** The physiologically active form of calcium in the serum that consists of unbound, ionized calcium.

**ionizing energy** *See* ionization energy.

**ionizing event** Any process that produces an ion or a group of ions as a result of interaction of matter with radiation; the formation of ions in an ionization chamber or in an irradiated cell are examples.

**ionizing particle** A charged particle that has sufficient energy to dislodge an orbital electron from an atom and to produce an ion pair.

**ionizing radiation** The electromagnetic or corpuscular radiation that produces ion pairs in the matter through which it passes; types of ionizing radiation include x rays, protons, neutrons, alpha particles, and high-speed electrons.

**ionogenic** Capable of forming ions; an amino group, for example, is ionogenic.

**ionography** ZONE ELECTROPHORESIS.

**ionomer** A cross-linked copolymer of an unsaturated hydrocarbon, such as ethylene, and a vinyl monomer with an acid group, such as methacrylic acid. These polymers contain covalent bonds between elements of the chain and ionic bonds between the chains; they contain both positively and negatively charged groups.

**ionone ring** The cyclic structural component of the carotenoids.

**ionophore** A lipid-soluble compound that increases the permeability of a membrane to metal ions by interacting with the metal ions and mediating their transport across the membrane. Many ionophores are antibiotics and two major types are ion carriers and ion channels. An ion carrier, such as the antibiotic valinomycin, has a hydrophilic cavity that binds that ion, forming a complex. This shields the ion from the hydrophobic region of the lipid bilayer in the membrane, makes the ion effectively lipid soluble, and facilitates its transport across the membrane. An ion channel, such as the antibiotic gramicidin, does not complex the metal ion but rather provides a tube that spans the membrane and through which the cation can pass.

**ionophoresis** 1. The electrophoresis of small ions. 2. ELECTROPHORESIS.

**ionophorous antibiotic** See ionophore.

**ionotropy** The ionization of a tautomeric compound in which a charged atom or a charged radical separates from an unsaturated molecule, thereby forming an oppositely charged fragment. The process is referred to as anionotropy or cationotropy depending on whether the separated atom or radical has a negative or a positive charge. *Aka* ion shifting.

**ion pair** 1. The positive ion formed by the action of ionizing radiation together with the orbital electron that was ejected from the uncharged atom when the ion was formed. 2. The two ions consisting of either an anion and a cation that has remained in the secondary hydration shell of the anion, or a cation and an anion that has remained in the secondary hydration shell of the cation.

**ion-pair chromatography** A form of ion-exchange chromatography in which the charged species of interest (such as a protonated amine) forms an ion pair with an appropriate counterion (such as  $\text{Cl}^-$  or  $\text{ClO}_4^-$  ions) that is partitioned between the stationary and the mobile phases; the ion pair is then eluted. See also zwitterion pair chromatography.

**ion pairing** SPECIFIC ADSORPTION.

**ion product of water** The product of the hydrogen and hydroxyl ion concentrations, in moles per liter, in pure water at 25°C; approximately equal to  $10^{-14}$ . *Sym*  $K_w$ .

**ion pump** See pump.

**ion retardation** A process whereby nonelectrolytes are separated from electrolytes by passage of the mixture through a specially prepared ion-exchange resin; the resin absorbs electrolytes preferentially so that the nonelectrolytes elute more readily. See also ion exclusion.

**ion-selective electrode** An electrode that responds in a reproducible manner to changes in the activity of a specific ion and that is almost insensitive to changes in the activities of other ions in the solution. The selectivity of the electrode results from the incorporation of an ion exchanger, a specially formulated glass, or a specific crystal into the design of the electrode. *Aka* ion-specific electrode.

**iontophoresis** An electrophoretic technique in which drugs, in ionic form, move through the skin (or some other structure) under the influence of an electric field applied across the skin.

**ion-translocating antibiotic** See ionophore.

**ion-transporting antibiotic** See ionophore.

**ip** 1. *adj* Intraperitoneal. 2. *adv* Intraperitoneally.

**IP** Isoelectric point.

**I protein** A protein that regulates the ATPase active site of  $\text{F}_0\text{F}_1$ -ATPase.

**IPTG** Isopropylthiogalactoside.

**IR** 1. Infrared. 2. Induction ratio. 3. Inverted repeat.

**IRA** Immunoradiometric assay.

**I region** The section of DNA that contains the immune response genes (*Ir* genes).

**I region-associated antigens** A group of cell-surface glycoprotein antigens that are coded for by genes located in the DNA region that also contains the immune response genes (*I* region). *Abbr* Ia antigens.

**Ir gene** Immune response gene.

**IRI** 1. Immunoreactive insulin. 2. Insulin resistance index.

**iridescent virus** IRIDOVIRUS.

**iridovirus** A naked, icosahedral virus that contains double-stranded DNA and that is parasitic in a wide range of insects. Iridoviruses, when present in masses, show the property of iridescence (displaying colors like the rainbow).

**IRMA** Immunoradiometric assay.

**iron** An element that is essential to all animals and plants. Symbol, Fe; atomic number, 26; atomic weight, 55.847; oxidation states, +2, +3; most abundant isotope,  $^{56}\text{Fe}$ ; a radioactive isotope,  $^{59}\text{Fe}$ , half-life, 45 days, radiation emitted, beta particles and gamma rays.

**iron-binding globulin** TRANSFERRIN.

**ironophore** SIDEROPHORE.

**iron overload** See hemosiderosis.

**iron porphyrin** HEME.

**iron protein** See nitrogenase.

**iron-sulfur cluster** An aggregate of iron and sulfur atoms in an iron-sulfur protein that mediates a one-electron transfer reaction. *Aka* iron-sulfur center.

**iron-sulfur protein** A protein in which iron is bound by means of sulfur-containing ligands of the protein. Three known types of iron-sulfur proteins are those in which (a) a single iron atom is linked to four cysteine sulfur atoms as in rubredoxin; (b) two iron atoms are linked to four cysteine sulfur atoms and to two bridging, acid-labile sulfur atoms as in plant-type ferredoxin; and (c) four iron atoms are linked to four cysteine sulfur atoms and to four bridging, acid-labile sulfur atoms as in bacterial-type ferredoxin and in high-potential iron-sulfur proteins. *Sym* FeS.

**irradiation** The exposure to radiation.

**irradiation chimera** See radiation chimera.

**irreversible antagonist** A ligand that binds to a receptor with high affinity, elicits no biological response, and subsequently becomes covalently linked to the receptor.

**irreversible inhibitor** An inhibitor that binds to an enzyme (usually covalently) in an irreversible reaction so that the inhibition cannot be reversed by attempts to remove the inhibitor from the enzyme by such processes as dialysis or ultrafiltration. It may, however, be possible to restore the enzymatic activity by removing the inhibitor through a chemical reaction. *See also* active site-directed irreversible inhibitor; reactivation; reversible inhibitor.

**irreversible process** A process in equilibrium thermodynamics in which a system goes from an initial equilibrium state to a final equilibrium state through stages that are not equilibrium states. In such a process, the net entropy change for the system plus its surroundings is greater than zero.

**irreversible reaction** A chemical reaction that (a) proceeds to completion and cannot be reversed, (b) proceeds essentially to completion because of an equilibrium constant that is much larger than 1.0, or (c) is made to proceed overwhelmingly in one direction because of other factors.

**irreversible shock** A shock that has progressed so far that it cannot be reversed even by the proper therapy.

**irreversible thermodynamics** A branch of thermodynamics that deals with changes between nonequilibrium states of open systems.

**irritability** EXCITABILITY.

**ischemia** A localized anemia; a deficiency of blood in a tissue or an organ due to a functional constriction or an obstruction of a blood vessel. May be produced, for example, by the narrowing of arteries as a result of a spasm or disease.

**IS element** INSERTION SEQUENCE (1).

**Ising model** A model for interacting sites on a protein, enzyme, or other polymer, in which the sites are arranged in a linear array to form a one-dimensional lattice. *Aka* Ising chain.

**islets of Langerhans** Clusters of hormone-secreting cells in the pancreas some of which, the alpha cells, secrete glucagon while others, the beta cells, secrete insulin.

**iso-** 1. Combining form meaning equal or like. 2. Prefix in the Cleland nomenclature of enzyme kinetics denoting a mechanism in which a stable enzyme form must isomerize to a different form before further reaction can occur. 3. Combining form meaning genetically different individuals of the same species. 4. Combining form meaning genetically identical individuals.

**isoacceptor transfer RNA** One of two or more transfer RNA molecules that differ in their anticodon structure but are specific for the same amino acid. *Abbr* iso-tRNA. *Aka* isoac-

cepting transfer RNA.

**isoagglutination** An agglutination reaction of isoagglutinins.

**isoagglutinin** An antibody that is formed in one individual and that causes the agglutination of cells derived from another individual of the same species.

**isoagglutinogen** A cell surface antigen that can induce the formation of isoagglutinins (homologous antibodies) in another individual of the same species.

**isoallele** An allele that is very similar to the normal allele and that can be distinguished from it only by means of special tests.

**isoalloxazine** The heterocyclic ring structure that occurs in riboflavin and in the flavin nucleotides.

**isoantibody** An antibody that is formed in one individual in response to antigens derived from another individual of the same species.

**isoantigen** An antigen that is derived from one individual and that is immunogenic in other individuals of the same species.

**isoascorbic acid** An isomer of ascorbic acid that has only slight vitamin C activity; erythorbic acid.

**isobacteriochlorin** A specific porphyrin structure that occurs in siroheme.

**isobar** 1. A graph or an equation that describes changes of temperature or volume at constant pressure. 2. One of two or more nuclides that have the same mass but have a different number of protons, and hence possess different atomic numbers.

**isobaric ions** Ions, as those produced in a mass spectrometer, that have the same mass.

**isobaric process** A process in which the pressure is maintained constant.

**isobologram analysis** A graphical method for determining the extent and type of interaction between several drugs. Inspection of the plots allows deductions regarding the occurrence of antagonism, synergism, or lack of interaction. In the case of three drugs, one plots the concentration of each drug along the x, y, and z axes, respectively, and examines the shape of the surface thus formed.

**isocapsidic virus** *See* segmented genome.

**isocaudamers** One of a group of restriction endonucleases that recognize different nucleotide sequences but produce identical cohesive (sticky) ends. The term means "same tail."

**isochore** A graph or an equation that describes changes in temperature or pressure at constant volume.

**isochoric process** A process in which the volume is maintained constant.

**isochromosome** A chromosome having two

identical arms that contain homologous loci but in reverse sequence.

**isocitric acid** An isomer of citric acid that is formed from *cis*-aconitic acid in the reactions of the citric acid cycle.

**isocoding mutation** A point mutation in DNA that leads to an altered, but synonym codon in mRNA. As a result, the same amino acid is incorporated into protein in response to the mutated codon as was incorporated in response to the original codon. *See also* silent mutation.

**isocratic elution** The chromatographic elution with one solvent of constant composition as opposed to a gradient elution.

**isodense** Of equal density.

**isodensity equilibrium centrifugation** DENSITY GRADIENT SEDIMENTATION EQUILIBRIUM.

**isodesmic structure** A structure of indefinite composition or description; a protein self-associating system in which aggregates of varying composition form, or a crystal structure in which no distinct groups are formed within the structure and no bond is stronger than any other, are some examples of isodesmic structures.

**isodiametric** Having equal diameters, as a cell that has essentially the same length and width.

**isodynamic enzyme** One of two or more different enzymes or enzyme forms that catalyze the same reaction but differ in their properties. *See also* heteroenzyme; isozyme; multiple forms of an enzyme; pseudoisoenzyme.

**isodynamic law** The generalization, enunciated by Rubner in 1878 and disproven since, that foodstuffs can replace each other in proportion to their caloric value; thus one food, containing a certain number of calories, is equivalent to any other food that contains the same number of calories, regardless of the composition of the foods.

**isoelectric analysis** ISOELECTRIC FOCUSING.

**isoelectric condensation** ISOELECTRIC FOCUSING.

**isoelectric equilibrium electrophoresis** ISOELECTRIC FOCUSING.

**isoelectric focusing** An electrophoretic technique for fractionating amphoteric molecules, particularly proteins, that is based on their distribution in a pH gradient under the influence of an electric field that is applied across the gradient. The molecules distribute themselves in the gradient according to their isoelectric pH values. Positively charged proteins are repelled by the anode and negatively charged proteins are repelled by the cathode; consequently, a given protein moves in the pH gradient and bands at a point where the pH of the gradient equals the isoelectric pH of the protein. The pH gradient is produced in a chromatographic column by the electrolysis of

amphoteric compounds and is stabilized by either a density gradient or a gel. *Abbr* IEF.

**isoelectric fractionation** ISOELECTRIC FOCUSING.

**isoelectric point** The pH at which a molecule has a net zero charge; the pH at which the molecule has an equal number of positive and negative charges, which includes those due to any ions bound by the molecule. The isoelectric pH is operationally defined as the pH at which the molecule does not move in an electric field. *Sym* pI. *Aka* isoelectric pH. *See also* isoelectrophoretic point; isoionic point.

**isoelectric precipitation** A fractional precipitation of proteins; a mixture of proteins is adjusted to the isoelectric pH of one of them so that all or most of the protein is precipitated.

**isoelectric protein** A protein at its isoelectric pH; a protein that has a net charge of zero.

**isoelectric separation** ISOELECTRIC FOCUSING.

**isoelectric spectrum** The distribution pattern of the proteins that are separated by isoelectric focusing.

**isoelectronic** Describing two atoms, two groups of atoms, two ions, or two molecules that have the same number and arrangement of valence electrons.

**isoelectrophoretic point** The pH at which the electrophoretic mobility of a protein is zero; this pH may coincide with the theoretical isoelectric pH of the protein, depending on the surface structure of the protein, the ionic strength, and the nature of the ionic double layer around the protein. *Aka* isoelectrophoretic pH. *See also* isoelectric point; isoionic point.

**isoenzyme** ISOZYME.

**iso fatty acid** A fatty acid that is branched at the penultimate carbon atom at the hydrocarbon end of the molecule.

**isofocusing** ISOELECTRIC FOCUSING.

**isoforms** Two or more isomeric forms of a protein or of a protein subunit; two or more molecular forms of functionally related proteins that differ only slightly in their structure. Examples of isoforms include the two forms of the  $\alpha$ -catalytic subunit of the  $\text{Na}^+$ ,  $\text{K}^+$ -ATPase and the two forms of ribonuclease ( $\text{U}_2\text{A}$  and  $\text{U}_2\text{B}$ ) from the fungus *Ustilago*. In the latter case, the two enzymes differ in only one peptide bond involving either the  $\alpha$ -( $\text{U}_2\text{A}$ ) or the  $\beta$ -( $\text{U}_2\text{B}$ ) carboxyl group of aspartic acid.

**isofunctional enzymes** Two or more different enzymes that catalyze the conversion of the same substrate to the same product. Such enzymes may be involved at the first step of a branched metabolic pathway and may be subject to feedback inhibition; the end product of one branch inhibits one of the enzymes while the end product of the second branch inhibits

the other enzyme.

**isogenic** SYNGENEIC.

**isogenic** Referring to genetically identical individuals.

**isogenous** Having the same origin.

**isograft** SYNGRAFT.

**isohemagglutinin** A hemagglutinin that has the capacity to react with isoantigens on the surface of red blood cells.

**isohormone** One of two or more different forms of the same hormone.

**isohydric shift** A set of two reactions, occurring in the red blood cell, whereby the oxygenation and deoxygenation of hemoglobin during respiration are linked to the reversible ionization of carbonic acid. As a result, the intracellular pH of the red blood cell remains essentially constant despite the fact that protons participate in both reactions. *Aka* isohydric transport; isohydric carriage.

**isoimmunity** The immunity acquired through reactions of antigens and antibodies that are derived from different individuals of the same species.

**isoionic dilution** The dilution of a polyelectrolyte solution with a salt solution that has the same ionic strength as the polyelectrolyte solution, so that the total concentration of mobile counterions remains constant.

**isoionic point** The pH at which the number of positive and negative charges of a protein that arise exclusively from proton exchange are equal to each other. The isoionic pH is operationally defined as either (a) the pH of a solution of isoionic protein in water, or (b) the pH of a protein solution that does not change with increasing concentrations of the protein. *Aka* isoionic pH. *See also* isoelectric point; isoelectrophoretic point.

**isoionic protein** A protein that has an equal number of protonated basic groups and deprotonated acidic groups; operationally defined as a protein from which all bound ions have been removed by electro dialysis or by mixed-bed ion-exchange chromatography. Such a protein contains no ions other than those arising from the dissociation of the solvent.

**isokinetic gradient** A density gradient in which the sedimentation coefficient, for all particles of a given density, is constant throughout the gradient. An isokinetic gradient can be approximated by a properly chosen exponential density gradient such that both the density and the viscosity of the gradient change linearly with concentration.

**isokinetic sedimentation** Sedimentation in an isokinetic gradient.

**isolable** Capable of being isolated. *aka* isolatable.

**isolate** To separate and purify a substance.

**isolated rat uterus assay** A bioassay for neurohypophyseal hormones that is based on measurements of the contractility of rat uterus.

**isolated system** A thermodynamic system that exchanges neither matter nor energy with its surroundings.

**isolectins** Closely related forms of an individual lectin; a group of closely related proteins the synthesis of which is under direct genetic control. Isolectins appear to be different aggregates of distinct subunits much as is the case for isoenzymes.

**isoleucine** An aliphatic, branched, nonpolar alpha amino acid that contains six carbon atoms. *Abbr* Ile; I.

**isologous** 1. HOMOLOGOUS (1,6). 2. SYNGENEIC.

**isologous association** An association of identical protein subunits in which the interacting surfaces of the subunits are identical.

**isologous bonds** The identical interactions between subunits linked via isologous associations.

**isologous cell lines** Cell lines derived from identical twins or from highly inbred animals.

**isomer** One of two or more compounds that have the same molecular composition but have different molecular structures and hence possess different properties.

**isomerase** An enzyme that catalyzes the interconversion of one isomer into another. *See also* enzyme classification.

**isomeric** Of, or pertaining to, isomers.

**isomeric transition** The transition of one nuclear isomer to another that is accompanied only by the emission of gamma rays from the nucleus, and during which there is no change in either the atomic mass or the atomic number of the nuclide *Abbr* IT.

**isomerism** The phenomenon in which two or more compounds have the same molecular composition but have different molecular structures and hence possess different properties.

**isomerization** The interconversion of one isomer into another; the formation of an isomer.

**isomer number** The total number of possible stereoisomers that have the same structural formula.

**isometric** Having the same dimensions.

**isometric contraction** The exertion of force by a muscle without a shortening in the length of the muscle; may be achieved by stimulating a muscle while maintaining it mechanically at constant length.

**isometric virus** A virus, the structure of which can be described by a symmetrical polyhedron of the isometric crystal system; this system is characterized by three identical axes at right

angles to each other and includes the cube and the regular octagon.

**isomorphic** Morphologically alike; having the same shape and structure. *Aka* isomorphous.

**isomorphous replacement** A method for solving the phase problem in an x-ray diffraction study of a protein by using a heavy atom derivative of the protein. The introduction of the heavy atom or atoms into the protein must be isomorphous, so that there is no change in the conformation of the protein nor any change in the size or in the symmetry of the unit cell. A comparison of the diffraction patterns of the original protein and of its heavy metal derivative permits the localization of the heavy atom in the unit cell and hence permits a determination of phase angles. The determination of all the phase angles requires the use of several heavy atom derivatives.

**isoniazid** Isonicotinic acid hydrazide; a synthetic antibiotic that is active against *Mycobacterium tuberculosis*. It also has antivitamin activity against both nicotinic acid and vitamin B<sub>6</sub>. *Abbr* INH.

**isonicotinic acid hydrazide** ISONIAZID.

**isosmolar solution** ISOTONIC SOLUTION.

**isosmotic** ISOSMOTIC.

**isopeptide bond** A covalent amide bond formed between the epsilon amino group of lysine and the side chain carboxyl group of aspartic or glutamic acid. The bond has been found in polymerized fibrin and in native wool; it is not hydrolyzed by human proteases but is hydrolyzed by bacterial proteases in the intestine.

**isophane insulin** NPH INSULIN.

**isophile antibody** An antibody that reacts only with antigens that are derived from the same species.

**isopiestic technique** A technique for measuring the binding of solute and/or solvent molecules to a macromolecule in a solution in which only one of the solvent components, generally water, is volatile. A number of solutions of known initial composition, and all containing the same volatile solvent component, are allowed to equilibrate with each other with respect to the activity of the volatile solvent component. Equilibration may be carried out in a vacuum desiccator and the equilibrium compositions of the solutions are determined by weighing; any change in composition from an initial to an equilibrated solution is due to the transfer of the volatile solvent component.

**isoplith** ISOSTICH.

**isopolar substitution** The replacement of one amino acid in a protein by another amino acid of similar polarity; the replacement of a polar (nonpolar) amino acid by another polar (nonpolar) amino acid. Many mutations lead

to isopolar substitutions as a result of the degeneracy of the genetic code.

**isoprene** The five-carbon compound, 2-methyl-1,3-butadiene, that occurs in the structure of several biochemically important compounds, including coenzyme Q, vitamin A, and vitamin K.

**isoprene rule** The principle that the hydrocarbon skeletal structure of open-chain and cyclic terpenes can be considered to have been constructed by head-to-tail joining of isoprene units.

**isoprenoid** 1. *n* A compound containing two or more isoprene units or derivatives of isoprene units. 2. *adj* Of, or pertaining to, isoprene.

**isopropylthiogalactoside** A gratuitous inducer of the enzyme beta galactosidase. *Abbr* IPTG.

**isoproteins** Multiple forms of a specific protein. Isoproteins may be coded by a single genetic locus (allelic isoproteins), such as abnormal hemoglobins and major histocompatibility complex antigens, or they may be coded by multiple genetic loci (nonallelic isoproteins), such as the lactate dehydrogenase, hexokinase, actin, and globin families of proteins.

**isoprotic point** ISOIONIC POINT.

**isopycnic** Having the same density, specifically buoyant density.

**isopycnic gradient centrifugation** DENSITY GRADIENT SEDIMENTATION EQUILIBRIUM.

**isoquinoline alkaloids** *See* alkaloids.

**isorheic** Of, or pertaining to, any period during gas chromatography in which there is a constant flow rate of carrier gas.

**isoration rule** The rule, proposed by Hudson in 1902, which states that the optical rotation of a carbohydrate can be approximated by a sum of two factors; one factor represents a contribution due to the anomeric carbon, and the other factor represents a contribution due to the rest of the molecule. The rule further states that these two contributions are approximately independent of each other and have similar values for similar molecules.

**isobestic point** The wavelength at which the absorptivity of two or more compounds is identical; the wavelength at which the absorption spectra of two or more compounds intersect when the absorbance is measured for solutions of equimolar concentrations.

**isoschizomer** One of a group of restriction endonucleases, isolated from different organisms, that recognize the same DNA base sequence for cleavage but do not necessarily cleave the DNA at the same position within that sequence.

**isosemantic substitution** The incorporation of an amino acid into a polypeptide chain that results from a mutation in which the normal codon of an amino acid has been mutated to a



synonym codon; consequently, the amino acid that is incorporated into the polypeptide chain is identical to the normal one, but is incorporated in response to one of its synonym codons.

**isosmotic** Having the same osmotic pressure.

**isosmotic solution** ISOTONIC SOLUTION.

**isostere** 1. A compound that has apparently different chemical characteristics from those of a naturally occurring essential metabolite, but that can substitute for the metabolite because it fits a specific binding site for that metabolite; the binding site may be the active site of an enzyme, the receptor site of a hormone, or a similar site. 2. One of two or more compounds that are similar in their physical properties and that have the same number and arrangement of valence electrons; compounds such as  $\text{CO}_2$  and  $\text{N}_2\text{O}$  or  $\text{N}_2$  and  $\text{CO}$  are examples.

**isosteric** Of, or pertaining to, isosteres.

**isostich** A cluster of either purine or pyrimidine oligonucleotides, as one of the clusters obtained by the hydrolysis of apurinic or apyrimidinic acid. *Var sp* isostiche.

**isotachophoresis** An electrophoretic technique in which the sample is introduced into a capillary tube between a leading electrolyte and a terminator electrolyte that have mobilities that are, respectively, greater and smaller than those of any of the sample ions; a displacement analysis in which the separation and the sharpness of the fronts between two substances are a function of the properties of the substances, and not of their concentration in the original sample. *Abbr* ITP.

**isotactic polymer** A polymer in which the monomers have been polymerized in a stereospecific manner so that all the R groups of the monomers are on one side of the plane which contains the main chain.

**isotherm** A graph or an equation that describes changes of volume or pressure at constant temperature. *See also* adsorption isotherm.

**isothermal process** A process in which the temperature is maintained constant.

**isotocin** A peptide hormone of nine amino acids that is secreted by the posterior lobe of the pituitary gland of bony fishes and that is related to oxytocin in its structure and in its function.

**isotone** One of two or more nuclides that have the same number of neutrons but have a different number of protons and hence possess different atomic numbers.

**isotonic contraction** 1. An alteration in the water and electrolyte balance in the body in which there is an increase in the volume of the extracellular fluid and an equivalent increase in electrolyte, so that the osmotic pressure of

the extracellular fluid remains unchanged. 2. The exertion of force by a muscle that is accompanied by a shortening in the length of the muscle.

**isotonic expansion** An alteration in the water and electrolyte balance in the body in which there is a decrease in the volume of the extracellular fluid and an equivalent decrease in electrolyte, so that the osmotic pressure of the extracellular fluid remains unchanged.

**isotonic solution** A solution that has the same osmotic pressure as another solution.

**isotope** One of two or more nuclides of the same element that have the same number of protons and the same atomic number, but that have a different number of neutrons and different atomic masses.

**isotope derivative method** A quantitative analytical method that may be used as an enzyme assay; based on adding an isotopically labeled compound to a sample, reacting it with the sample, and determining the labeled derivative that is formed.

**isotope dilution analysis** The quantitative determination of a substance by means of isotopes. *See also* direct isotope dilution analysis; double isotope dilution analysis; inverse isotope dilution analysis; modified inverse isotope dilution analysis.

**isotope effect** The effect of an isotope on the rate and/or the mechanism of a reaction. *See also* primary isotope effect; secondary isotope effect; kinetic isotope effect.

**isotope exchange** The replacement of one isotope in a compound by another. *See also* deuterium exchange.

**isotope incorporation** The introduction of an isotope into a compound by synthesizing the compound in the presence of one or more labeled precursors.

**isotopically enriched** Descriptive of a substance in which the relative amounts of one or more isotopes has been increased.

**isotopic competition** A method for demonstrating that compound X is a precursor of metabolite Y. A labeled form of X is added to the *in vivo*, or the *in vitro*, system in the presence of a general, unlabeled carbon source, and the extent of label in Y is then determined. The appearance of label in Y indicates that X is a direct precursor of Y.

**isotopic dilution analysis** *See* isotope dilution analysis.

**isotopic enrichment** *See* isotopically enriched.

**isotopic label** The isotope that serves to label a compound.

**isotopic tracer** TRACER (1).

**isotopic trapping** A method for demonstrating that compound X is an intermediate in a metabolic pathway. A labeled precursor of

the pathway is added to the *in vivo* or the *in vitro* system, followed by the addition of large amounts of unlabeled X. The appearance of label in X indicates that it is an intermediate of the pathway at a position subsequent to that of the labeled precursor.

**iso-tRNA** Isoacceptor transfer RNA.

**isotropic** Of, or pertaining to, isotropy.

**isotropic band** I BAND.

**isotropy** The constancy in the physical properties of a substance, regardless of the direction in which these properties are measured. *Aka* isotropism.

**isotype** One of a group of identical antigenic determinants of a given serum protein or immunoglobulin that occur in all individuals of the same species. *See also* idio-; allotype.

**isovalent resonance** Resonance in which the various resonance structures have the same number of bonds.

**isovaleric acidemia** A genetically inherited metabolic defect in humans that is characterized by elevated levels of  $\alpha$ -ketoisovaleric acid in blood and urine, and that is due to a deficiency of the enzyme isovaleryl CoA de-

hydrogenase. *Aka* isovaleric aciduria.

**isozyme** 1. One of two or more isodynamic enzymes derived from a single homogeneous biological source; isozymes may occur within a single species, a single organism, or a single cell. *Aka* pseudoisozyme. 2. One of two or more multiple forms of an enzyme that arise from genetically determined differences in primary structure; excludes enzymes derived by modification of the same primary structure. *Aka* isoenzyme. *See also* heteroenzyme; isodynamic enzyme; multiple forms of an enzyme; pseudoisozyme.

**IT** Isomeric transition.

**iterative** Marked by, or involving, repetition or reiteration.

**ITP** 1. Inosine triphosphate. 2. Inosine-5'-triphosphate. 3. Isotachopheresis.

**IU** International unit.

**IUB** International Union of Biochemistry.

**IUPAC** International Union of Pure and Applied Chemistry.

**iv** 1. *adj* Intravenous. 2. *adv* Intravenously.

**IVS** Intervening sequence; intron.

# J

**J** 1. Joule. 2. Coupling constant.

**Jablonski diagram** The energy diagram of a molecule in which discrete molecular energy states are indicated by a series of horizontal and parallel lines.

**Jacob and Monod hypothesis** See operon hypothesis.

**J chain** A third type of immunoglobulin chain (in addition to light and heavy chains) found in molecules of the IgA and IgM type; a polypeptide (MW 15,000) that serves to join (hence the term J chain) monomeric units in the multimeric structures of IgA and IgM.

**Jerne plaque technique** See plaque technique.

**jet lag** The desynchronization of biological rhythms that occurs when an individual crosses a number of time zones rapidly (as in a jet), particularly when traveling west to east. Recovery requires several days and complete reestablishment of the normal circadian rhythms usually requires about a week.

**J genes** A group of genes that code for parts of the light and heavy immunoglobulin chains in humans and mice. The term derives from the fact that these genes help join one of the genes for the variable region to one of the genes for the constant region; hence, J genes play an important role in the mechanism leading to antibody diversity.

**JH** Juvenile hormone.

**Jimpy mice** Mice having the Quaking mutation.

**Jimpy mutation** An X-linked recessive mutation in mice that produces a myelin-deficient animal.

**Johnston-Ogston effect** The changes in the values of the sedimentation coefficients and of the apparent concentrations that are obtained for two or more components when they are present in a mixture as compared to the values obtained when each component is present alone. The effect is due to the dependence of the sedimentation coefficient on concentration, and it leads to a decrease in the observed sedimentation coefficients for both the slow and the fast components in a mixture. The apparent concentration, which is proportional to the area under the ultracentrifuge peak, will be increased for the slow component and will be decreased for the fast component.

**joinase** LIGASE.

**joining enzyme** 1. LIGASE. 2. DNA LIGASE.

**Joining genes** J GENES.

**joint transduction** LINKED TRANSDUCTION.

**joint transformation** LINKED TRANSFORMATION.

**Jones-Mote reaction** A delayed-type hypersensitivity reaction of the skin that is of low intensity and that is produced only by several daily injections of antigen.

**joule** The standard unit of work, energy and heat that is equal to  $10^7$  erg. The proportionality between joules and calories is as follows: 1 calorie = 4.184 joules. *Sym J*.

**jumping gene** TRANSPOSABLE ELEMENT.

**jump method** See temperature jump method; pH jump method.

**junction** See cell junction.

**junctional complex** Any specialized region of intercellular adhesion that can be discerned with the electron microscope; a desmosome is an example.

**junctional sliding** The change in the location of the junction between an intron and an exon that is brought about by an increase or a decrease in the length of the exon, and that is observed for different members of a given gene family. Junctional sliding, exon shuffling, and intron intrusion have been proposed to help explain the evolutionary diversification of genes.

**junction potential** The potential that arises either across the junction between two half cells or across the boundary between two solutions of different concentrations; it is due to differences in diffusion rates of the ions on the two sides.

**junk DNA** 1. Unusual DNA, containing branches, which can arise during the *in vitro* replication of DNA by DNA polymerase I (Kornberg enzyme). 2. SELFISH DNA.

**justification hypothesis** A hypothesis that attributes mental retardation in phenylketonuria (PKU) to an inability of the heterozygous mother to deliver an appropriate amount of tyrosine to the PKU fetus who, in turn, is unable to correct for this deficiency because of its genetic constitution.

**juvenile hormone** One of a group of insect hormones, composed of modified linear isoprenoid units, that promote larval development; produced by neuroendocrine structures known as corpora allata and hence also referred to as allatum hormone. *Abbr JH*.

**juvenile-onset diabetes** See diabetes.

# K

- k** 1. Kilo. 2. Boltzmann constant. 3. Rate constant.
- K** 1. Equilibrium constant. 2. Degree Kelvin. 3. Potassium. 4. Lysine. 5. Abbreviation for kilobyte (1000 bytes) which, actually, contains 1024 bytes.
- $K_0$**  Average intrinsic association constant.
- $K_{0.5}$**  The substrate concentration at which one-half of the maximum velocity for an allosteric enzyme is obtained. *See also*  $K_m$ .
- $K'$**  Apparent equilibrium constant; an equilibrium constant that is based on molar concentrations, as opposed to the thermodynamic equilibrium constant  $K$  that is based on activities.
- $K_a$**  Dissociation constant of an acid.
- KAF** Conglutinogen activating factor; an enzyme, present in serum, that modifies the bound C3b component of complement in conglutination.
- kairomone** *See* allomone.
- kallidin** *See* kinin.
- kallidin I** LYSYL-BRADYKININ.
- kallidin II** BRADYKININ.
- kallikrein** One of a group of plasma serine proteases that catalyze the formation of kinins from kininogens. Kallikrein can also initiate the intrinsic pathway of blood clotting.
- kanamycin** An aminoglycoside antibiotic, produced by *Streptomyces kanamyceticus*. It inhibits protein synthesis by binding to the 30S ribosomal subunit and causes misreading of the genetic code.
- K antigens** Polysaccharide antigens of bacterial capsules.
- kaolin** A clay that consists principally of hydrated aluminum silicate.
- kappa** RECIPROCAL ION-ATMOSPHERE RADIUS.
- kappa chain** One of the two types of light chains of the immunoglobulins.
- kappa particles** *See* killer paramecia.
- karyogram** A photographic representation of the chromosome complement of an individual according to the size and/or a numbering system of the chromosomes.
- karyokinesis** The division of the cell nucleus in either mitosis or meiosis.
- karyolymph** NUCLEOPLASM.
- karyon** NUCLEUS (1).
- karyoplasm** NUCLEOPLASM.
- karyosome** 1. A nucleolus or a nucleolus-like body. 2. A subnuclear body, found in *Drosophila* and in some plant species, that contains DNA.
- karyotheca** NUCLEAR ENVELOPE.
- karyotype** 1. The sum of the characteristics (size, number, shape, etc.) of the chromosomes of an individual or a species. 2. The sum of the characteristics of the somatic metaphase chromosomes of an individual or a species, frequently described by photomicrographs arranged as in an idiogram.
- kasugamycin** An antibiotic, produced by *Streptomyces kasugaensis*, that inhibits the binding of tRNA<sup>met</sup> to ribosomes in prokaryotes.
- kat** Katal.
- $\mu$ kat** Microkatal.
- katabolism** Variant spelling of catabolism.
- katal** The amount of enzymatic activity that converts one mole of substrate per second; the katal (kat) is related to an enzyme unit (U) by the relation  $1 \text{ kat} = 6 \times 10^7 \text{ U}$ . In some cases "conversion of 1 mol of substrate" is equivalent to the number of reaction cycles which equals the number of carbon atoms in 0.012 kg of the nuclide <sup>12</sup>C.
- kat F unit** A unit of catalase activity no longer in use and equal to the unimolecular rate constant divided by the number of grams of enzyme under specified conditions.
- katharometer** A thermal conductivity detector that is similar to a thermistor and that is used for determining the composition of gas mixtures in gas chromatography and in studies of basal metabolism.
- $K_b$**  Dissociation constant of a base.
- kb** Kilobase; a unit of length in nucleic acids equal to 1000 nucleotides.
- KB cells** An established cell line of cells derived from a human carcinoma in 1954 and maintained in tissue culture since then.
- kbp** Kilobase pairs; a unit of length in nucleic acids equal to 1000 base pairs.
- kcal** Kilocalorie; 1000 (small) calories; a large calorie.
- K-capture** 1. The capture of a K-shell electron by an atomic nucleus. 2. ELECTRON CAPTURE.
- $k_{\text{cat}}$**  The catalytic rate constant of an enzyme reaction; the turnover number, which is equal to  $V_{\text{max}}/[E]$  where  $V_{\text{max}}$  is the maximum velocity and  $[E]$  is the molar concentration of active sites on the enzyme.
- K cells** Killer cells.
- kd, kD, kDa** Kilodalton; 1000 daltons.

**Kellin-Hartree particles** A particulate sub-mitochondrial preparation from heart muscle that can carry out electron transport, but cannot carry out oxidative phosphorylation.

**Kelvin temperature scale** ABSOLUTE TEMPERATURE SCALE.

**kemptide** A synthetic heptapeptide substrate (leu-arg-arg-ala-ser-leu-gly) that contains an exposed serine residue which can be phosphorylated enzymatically. *Aka* phosphate acceptor peptide.

**Kendall's compound** A designation for some steroids; Kendall's compounds B, E, and F refer, respectively, to corticosterone, cortisone, and cortisol.

**K<sub>eq</sub>** Equilibrium constant.

**keratan sulfate** A glycosaminoglycan in which the repeating disaccharide contains D-galactose and N-acetyl-D-glucosamine and variable amounts of sulfate groups. It occurs in cornea, cartilage, and intervertebral disks.

**keratin** One of a group of diverse fibrous scleroproteins occurring in hair, wool, nails, and other epidermal structures.

**keratin filaments** Intermediate filaments, composed of various keratins and characteristic of epithelial cells.

**keratinization** The formation of keratin-rich horny sections and skin appendages.

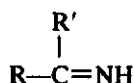
**keratohyalin** One of several proteins that constitute the matrix in which keratin fibers are embedded; the resultant fiber-matrix complex is found in the epidermis, hair, nails, and related structures.

**kernicterus** A pathological condition in newborn humans that is characterized by discoloration and degeneration of brain tissue and by elevated serum levels of unconjugated bilirubin.

**Kerr effect** ELECTRIC BIREFRINGENCE.

**ketal** A compound derived from a ketone and two alcohol molecules by splitting out a molecule of water.

**ketimine** An organic compound that has the general formula



**keto-** 1. Combining form meaning ketose. 2. Combining form meaning ketone.

**ketoacid** An organic acid that also carries a ketone group.

**ketoacidosis** An acidosis that is brought about by the accumulation of ketone bodies; a pathological state that is characterized by both ketosis and acidosis.

**$\beta$ -ketoadipate pathway** A branched pathway in bacteria that leads to succinyl-coenzyme A,

by way of  $\beta$ -ketoadipate, from either *cis,cis*-muconate or from  $\beta$ -carboxy-*cis,cis*-muconate.

**keto-enol tautomerism** The tautomerism that is due to a shift of a hydrogen atom so that one of the isomers is a ketone and the other is an enol.

**ketofuranose** A ketose in furanose form.

**ketogenesis** The formation of ketone bodies.

**ketogenic amino acid** An amino acid that can serve as a precursor of acetyl coenzyme A and ketone bodies in metabolism.

**$\alpha$ -ketoglutarate dehydrogenase** A multienzyme system that is similar in its structure and in its properties to the pyruvate dehydrogenase system and that catalyzes the oxidation of  $\alpha$ -ketoglutaric acid to succinic acid in the citric acid cycle.

**$\alpha$ -ketoglutarate pathway** The catabolic pathway whereby arginine, proline, histidine, glutamine, and glutamic acid enter the citric acid cycle by way of  $\alpha$ -ketoglutaric acid.

**$\alpha$ -ketoglutaric acid** A dicarboxylic acid that is an intermediate in the citric acid where it is formed from isocitric acid.

**ketol moiety** GLYCOLALDEHYDE GROUP.

**ketone** An organic compound that contains a ketone group.

**ketone body** One of the three compounds, acetoacetic acid, acetone, and  $\beta$ -hydroxybutyric acid, that arise from acetyl coenzyme A and that may accumulate in excessive amounts as a result of starvation, diabetes mellitus, or other defects in carbohydrate metabolism.

**ketone group** The carbonyl group attached to two carbons; the grouping



**ketonemia** The presence of excessive amounts of ketone bodies in the blood.

**ketonuria** The presence of excessive amounts of ketone bodies in the urine.

**ketopyranose** A ketose in pyranose form.

**ketose** A monosaccharide, or its derivative, that has a ketone group.

**ketosis** The presence of excessive amounts of ketone bodies in the body.

**ketosteroid** One of a group of compounds that are known as either 17-ketosteroids or neutral-17-oxosteroids and that represent degradation products of steroids; they are excreted in the urine and provide an index of androgen production in the body. Major ketosteroids are androsterone, dehydroisoandrosterone, and etiocholanolone.

**ketostix test** A rapid, semiquantitative test for the determination of ketone bodies in urine or serum by means of impregnated paper strips.

**keto sugar** A carbohydrate that carries a ketone group.

**ketotic** Of, or pertaining to, ketosis.

**ketotic hyperglycinemia** A syndrome that is characterized by severe ketoacidosis and hyperammonemia in addition to hyperglycinemia and hyperglycinuria; it is associated with a deficiency of an enzyme, other than that of the glycine cleavage system, such as propionyl-CoA carboxylase or methylmalonyl-CoA mutase.

**keV** Kiloelectronvolt; 1000 eV.

**key enzyme** An enzyme that is unique to a metabolic pathway which has several enzymes in common with other pathways.

**kg** Kilogram; 1000 g.

**K<sub>h</sub>** Hydrolysis constant.

**K<sub>i</sub>** Inhibitor constant.

**kidney stone** See calculus.

**kieselguhr** A fine-grain diatomaceous earth.

**Kiliani-Fischer synthesis** The reaction whereby a one-carbon fragment is added to a carbonyl group by means of cyanide, as in the extension of a monosaccharide from a pentose to a hexose.

**killed vaccine** A vaccine that consists of originally infectious bacteria or viruses that have been rendered noninfectious; a vaccine of either killed bacteria or of inactivated viruses.

**killer cells** Lymphocyte-like cells, which are not B or T lymphocytes, that kill a variety of tumor cells and virus-infected cells but only after previous immunization. See also natural killer cells; ADCC.

**killer paramecia** Strains of *Paramecium aurelia* that are capable of killing other (sensitive) strains of *Paramecia*. The killer strains possess kappa particles in their cytoplasm; these are released and ingested by the sensitive strains, leading to their death. Kappa particles are symbiotic bacteria and those with killing activity carry defective DNA phages.

**killer particle** A double-stranded RNA plasmid that occurs in killer strains of the yeast *Saccharomyces cerevisiae*. The killer particle contains genes for synthesis of a killer toxin and is the only known plasmid that does not contain DNA.

**killer plasmid** KILLER PARTICLE.

**killer strain** A strain of cells that kills sensitive cells of the same species; such strains have been isolated from both yeast and *Paramecium*. The former secrete a toxic substance (killer toxin) and the latter secrete a toxic particle (kappa particle).

**killer T cells** CYTOTOXIC T CELLS.

**killer toxin** The toxic protein encoded by the double-stranded RNA of the killer particle in yeast (*Saccharomyces cerevisiae*).

**killing efficiency** INACTIVATION PROBABILITY.

**killing titer** The titer of a phage suspension that is determined from the number of bacterial cells before infection and the number of cells surviving after infection.

**kilo-** Combining form meaning one thousand and used with metric units of measurements. *Sym* k.

**kilobase** A unit of length equal to either 1000 bases in a single-stranded nucleic acid (kb) or 1000 base pairs in a double-stranded nucleic acid (kbp).

**kilobase pair** See kbp.

**kilobyte** See K (5).

**kilocalorie** A large calorie; 1000 small calories. *Abbr* kcal; Cal.

**kinase** An enzyme that catalyzes the transfer of a phosphoryl group from ATP, and occasionally from other nucleoside triphosphates, to another compound.

**kinematic viscosity** The dynamic viscosity of a liquid divided by the density of the liquid. The unit of kinematic viscosity is the stoke.

**kinesis** The movement of an organism in response to a stimulus such that the latter controls the rate (not the direction) of movement. See also taxis.

**kinetic** Of, or pertaining to, kinetics.

**kinetic advantage** The phenomenon that hexoses, combined in a disaccharide, and amino acids, combined in a dipeptide, are taken up faster by the intestine than the free monosaccharides or the free amino acids.

**kinetic analysis** The study of a chemical reaction by making kinetic measurements. The velocity of the reaction is measured under various conditions for the purpose of deducing possible reaction mechanisms.

**kinetic assay** CONTINUOUS ASSAY.

**kinetic coefficient** A rate constant that depends on the concentration of either a reactant or a product.

**kinetic complexity** DNA COMPLEXITY.

**kinetic constant** RATE CONSTANT.

**kinetic energy correction** A correction term that is applied to viscosity measurements made in a capillary viscometer and that takes into account the kinetic energy that is acquired by the liquid during its flow through the capillary.

**kinetic equation** RATE EQUATION.

**kinetic isolation** The state of a chemical reaction in which it is not affected by changes in another reaction that ties in with it; may be produced, for example, by the preceding reaction either discharging a product at zero concentration or accepting a substrate that is already present at a saturation level.

**kinetic isotope effect** The effect of an isotope on the rate of a reaction that is due to the

differences in mass of the isotopes in question.

**kinetic law** RATE EQUATION.

**kinetic pK** A pK that does not represent a real ionization step but rather is composed of a ratio of rate constants; a kinetic pK occurs in enzymology when there is a change of a rate-determining step with pH.

**kinetic proofreading** A proofreading mechanism that permits a discrimination between correct and incorrect enzyme substrates (or intermediates) on the basis of kinetic considerations. The distinctive characteristic of kinetic proofreading is that there is no hydrolytic site on the enzyme at which hydrolysis of undesired intermediates would take place. Instead, it is postulated that an incorrect intermediate diffuses away from the enzyme and into solution where it is hydrolyzed nonenzymatically at a faster rate than it reacts to give products on the surface of the enzyme. See also proofreading; proofreading function.

**kinetics** 1. The science that deals with the rate behavior of physical and chemical systems. 2. The rate behavior of a physical or a chemical system.

**kinetin** 6-Furfurylaminopurine; a cytokinin.

**kinetochore** 1. CENTROMERE. 2. One of two faces of the centromere that point toward the spindle poles and to which the spindle fibers attach.

**kinetogene** A plasmagene that is attached to a kinetosome.

**kinetoplast** 1. An organelle, located within the mitochondria of trypanosomes, that consists of linear and circular DNA and that is believed to code for some mitochondrial components; it is located near the kinetosome. 2. The specialized mitochondrion of trypanosomes that is located near the kinetosome.

**kinetosome** The self-duplicating cytoplasmic organelle to which a cilium or a flagellum is attached. Kinetosomes are responsible for the synthesis of cilia and flagella.

**King-Altman procedure** An algorithmic method for deriving complicated steady-state rate equations for enzyme reactions. The method involves construction of a reaction scheme (master pattern) in which all relevant enzyme forms (free and complexed) are connected by appropriate arrows, and the latter are annotated with the corresponding unitary rate constants. The method provides a shortcut for obtaining expressions for the concentrations of various enzyme species and these expressions are then substituted into an appropriate equation for the net steady state velocity.

**kinin** One of a group of vasoactive peptide hormones that are formed from kininogens by the action of enzymes known as kallikreins.

Kinins are potent vasodilators, leading to an increase in the diameter of blood vessels, hypotension, and increased capillary permeability. Bradykinin is a nonapeptide and kallidin (lysyl bradykinin) is a decapeptide.

**kininase** A peptidase acting on kinin; two are known (I and II).

**kininogen** One of a group of plasma globulins that are precursors of the vasoactive kinins. They are secretory proteins, synthesized primarily in the liver, and have a number of other functions in addition to their role as kinin precursors. See also cystatins.

**kininogenase** KALLIKREIN.

**K<sub>int</sub>** Intrinsic dissociation constant.

**K<sub>ion</sub>** Ionization constant.

**Kirkwood-Shumaker interactions** The attractive charge-fluctuation interactions between ionized macromolecules that result from fluctuations in their dipole moments caused by the movement of protons over the surfaces of the macromolecules. Since at any instant only a random fraction of the ionizable groups on the macromolecule are fully ionized, the protons move in random fashion from one group to another; for example, from such groups as  $-\text{NH}_3^+$  to such groups as  $-\text{CO}_2^-$  in the case of a protein. The fluctuations in the dipole moment of one molecule then induce fluctuations in the dipole moment of a neighboring molecule which results in an attractive interaction between the two molecules.

**Kirschner value** The number of milligrams of butyric acid in the fraction of volatile water-soluble fatty acids obtained from 5 g of fat.

**Kjeldahl method** A procedure for determining protein nitrogen by digesting the sample with concentrated sulfuric acid in the presence of a catalyst. The protein nitrogen is converted to ammonia that is distilled over into standard acid, and the excess acid is then titrated. The Kjeldahl method is used especially for the standardization of other protein determinations. Aka Kjeldahl digestion.

**Kjeldahl nitrogen** The protein nitrogen determined by means of the Kjeldahl method.

**Kleinschmidt technique** A technique for preparing monomolecular films of DNA for electron microscopy in which the DNA is stabilized by complexation with a basic protein, such as cytochrome c.

**Klenow fragment** A fragment of DNA polymerase I (Kornberg enzyme) which contains the DNA polymerizing activity and the 3' → 5' exonuclease activity but lacks the 5' → 3' exonuclease activity of the intact enzyme. It is prepared by the proteolytic digestion of DNA polymerase I and has been used for DNA sequencing. Aka Klenow polymerase; Klenow enzyme.

**Klotz plot** A plot of binding data in which the average binding number ( $\nu$ ) is plotted as a function of the logarithm of the free ligand (S) concentration; (a plot of  $\nu$  versus  $\log[S]$ ). *Aka* Bjerrum formation function.

**$K_m$**  Michaelis constant.

**Knallgas bacteria** Bacteria of the genus *Hydrogemonas* which utilize the Knallgas reaction.

**Knallgas reaction** The reaction between hydrogen and oxygen, forming water, that is utilized as an energy-yielding reaction by bacteria of the genus *Hydrogemonas*.

**KNF model** Koshland, Nemethy, and Filmer model; *See* sequential model.

**knife and fork model** KORNBERG MECHANISM.

**knife breaker** An apparatus for breaking glass into sharp pieces which are then used as knife edges to cut tissue specimens for electron microscopy.

**Knoop's hypothesis** The hypothesis, proposed by Knoop in 1905, that fatty acids are oxidized in metabolism by means of successive removals of two-carbon fragments in the form of acetic acid. *See also* beta oxidation.

**Knop's solution** A solution that contains the major inorganic constituents that are required for the growth of plant cells: calcium nitrate, potassium chloride, magnesium sulfate, and potassium dihydrogen phosphate. The solution will support plant growth if it is supplemented with a carbon source, trace elements, vitamins, etc.

**Koagulations Vitamin** VITAMIN K.

**Koch phenomenon** A delayed-type hypersensitivity reaction in which skin inflammation to injected tubercle bacilli is more intense in a previously infected individual than in a noninfected one.

**Koettstorfer number** SAPONIFICATION NUMBER.

**Kok effect** The phenomenon in which the quantum efficiency above the compensation point differs from that below it. *See also* compensation point.

**Kornberg enzyme** The DNA-dependent DNA polymerase, first isolated by Kornberg in 1958 from *E. coli*, that is believed to function primarily in the repair-synthesis of DNA and secondarily in DNA replication. *Aka* DNA pol I.

**Kornberg mechanism** A mechanism for the in vitro replication of DNA that requires the action of three enzymes, endonuclease, DNA polymerase, and DNA ligase, and allows for the essentially simultaneous replication of both strands of an antiparallel duplex DNA.

**Koshland, Nemethy, and Filmer model** SEQUENTIAL MODEL.

**Kostoff genetic tumor** A plant tumor that develops spontaneously in certain interspecific

hybrids of the genus *Nicotiana*.

**Kovats retention index system** A system for characterizing retention volumes in gas chromatography in which the retention volume of a compound is compared with the retention volumes of a series of saturated aliphatic hydrocarbons, chromatographed on the same column as that used for the compound.

**Krabbe's disease** A genetically inherited metabolic defect in humans that is associated with mental retardation and that is characterized by an accumulation of galactocerebrosides and by the almost complete absence of myelin; due to a deficiency to the enzyme galactosyl ceramide  $\beta$ -galactosidase. *Aka* Krabbe's leukodystrophy.

**Krafft temperature** The temperature at which the solubility of a surfactant is sufficient to achieve the critical micelle concentration. Since unassociated surfactant molecules have limited solubility while micelles are highly soluble, the solubility of a surfactant increases sharply above the Krafft temperature.

**Kranz anatomy** The arrangement of mesophyll and bundle sheath cells in  $C_4$  plants.

**Krebs cycle** CITRIC ACID CYCLE.

**Krebs fluid** A manometer fluid containing NaBr, Triton X-100, and Evan's blue; it has a density of 1.033 g/mL.

**Krebs-Henseleit cycle** UREA CYCLE.

**Krebs-Kornberg cycle** GLYOXYLATE CYCLE.

**Krebs-Ringer solution** A modified Ringer's solution that contains magnesium sulfate and phosphate buffer in addition to the other components of Ringer's solution.

**K region** A bond in an aromatic hydrocarbon that is active in addition reactions; the presence of such bonds has been correlated with the carcinogenic activity of some hydrocarbons. *See also* L region.

**kringle** A triple-looped, disulfide-cross-linked, domain that may occur once or several times in a given protein. Kringles have been found in many plasma proteinases and they are believed to play a role in binding involving membranes, proteins, or phospholipids and in the regulation of the proteolytic activity of enzymes.

**Kronig-Kramer transformation** An equation that permits the interconversion of circular dichroism data and optical rotatory dispersion data.

**$K_s$**  Substrate constant.

**K system** A system composed of a regulatory enzyme and an effector, such that the effector alters the substrate concentration at which one-half of the maximum velocity of the reaction is obtained but does not alter the value of the maximum velocity.

**Kuhn statistical length** The length of a polymer



that is equal to twice its persistence length.

**Kunitz inhibitor** A soybean trypsin inhibitor.

**Kupffer cells** Liver macrophages.

**kurtosis** The extent to which a frequency distribution is "peaked"; the extent to which the curve shows a steeper or shallower ascent in the neighborhood of the peak relative to a normal distribution with the same parameters.

**K<sub>w</sub>** Ion product of water.

**kwashiorkor** A disease caused by nutritional deficiency, primarily protein deficiency, that occurs in children between the ages of one and three. The disease generally occurs in children of underdeveloped areas of the tropical belt when the children are weaned from

the breast and are placed on a low-protein diet.

**Kwok's disease** CHINESE RESTAURANT SYNDROME.

**kymograph** An apparatus that consists of a smoked drum and that is used for recording physiological responses.

**kynureninase** An enzyme that functions in tryptophan metabolism and requires pyridoxal phosphate as a coenzyme.

**kynurenine** An intermediate in the catabolism of tryptophan that is excreted in the urine in cases of vitamin B<sub>6</sub> deficiency. *See also* tryptophan dioxygenase.

# L

**l** 1. Levorotatory. 2. Liter.

**L** 1. L-Configuration. 2. Leucine. 3. Linking number. 4. Designating a ribosomal protein from the large ribosomal subunit. 5. Designating the three-dimensional structure of tRNA. 6. Liter.

**LAA** See LATS-P.

**label** 1. A radioactive or a stable isotope that is introduced into a molecule. 2. A group of atoms or a molecule that is linked covalently to another molecule for purposes of identification.

**labeled compound** A compound containing a label.

**label triangulation method** A method for determining the quaternary structure of protein complexes. The subunits of the complex are separated, labeled with heavy atoms, and allowed to aggregate and reform the complex. The distances between the subunits are then measured by some technique such as x-ray diffraction, neutron diffraction, or spectroscopy.

**labile** Unstable; readily undergoing change.

**labile factor** PROACCELERIN.

**labile methyl group** A methyl group that can be transferred from one compound to another by transmethylation, such as the methyl group attached to either a nitrogen or a sulfur atom of certain organic compounds.

**labile phosphate group** A phosphate group that is readily liberated from a compound by hydrolysis at 100°C in 1 N HCl for 7 to 10 min. The terminal phosphate group of nucleoside triphosphates and the phosphate groups of pyrophosphate fall into this category; the phosphate group of ordinary esters generally requires longer times for hydrolysis. *Aka* 7-min phosphate; 10-min phosphate.

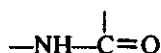
**labile proteins** Proteins that are lost rapidly upon starvation and whose loss does not lead to any measurable impairment of function.

**labile sulfur** Sulfur, such as that in some iron-sulfur proteins, that is readily released from the protein in the form of H<sub>2</sub>S when the pH is lowered to about 1.0.

**lac operon** The operon in *E. coli*, isolated in pure form in 1969, that consists of three genes that code for the enzymes that function in the hydrolysis and transport of β-galactosides, particularly lactose. The genes code for beta galactosidase, beta galactoside permease, and beta galactoside transacetylase.

**lactalbunin** The fraction of whey proteins that consists principally of beta lactoglobulin and alpha lactalbumin.

**lactam** The keto form of a cyclic amide that contains the grouping



**lactam-lactim tautomerism** The tautomerism that is due to a shift of a hydrogen atom so that one of the isomers is a lactam and the other isomer is a lactim.

**lactate acidosis** A metabolic acidosis that is characterized by elevated levels of lactic acid along with a decrease of blood pH; may result from overproduction of lactate, underutilization of lactate, or both. Congenital lactate acidosis is a hereditary disease in which there is decreased gluconeogenesis.

**lactate dehydrogenase** The pyridine-linked dehydrogenase that catalyzes the oxidation of lactic acid to pyruvic acid and that occurs in the form of five isozymes. *Abbr* LDH.

**lactation** 1. The formation of milk by the mammary gland. 2. The period following childbirth during which milk is formed by the mammary gland.

**lacteal** 1. Of, or pertaining to, milk. 2. An intestinal lymph vessel that transports chyle.

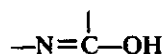
**lactic acid** The hydroxy acid that is formed from pyruvic acid when glycolysis proceeds under anaerobic conditions.

**lactic acid bacteria** Bacteria of different genera that are characterized by the production of lactic acid as their main metabolic product. *See also* homofermentative lactic acid bacteria; heterofermentative lactic acid bacteria.

**lactic acid fermentation** *See* homofermentative lactic acid bacteria; heterofermentative lactic acid bacteria.

**lactic acidosis** *See* lactate acidosis.

**lactim** The enol form of a cyclic amide that contains the grouping



**Lactobacillus bulgaricus factor** PANTETHEINE.

**Lactobacillus casei factor** FOLIC ACID.

**lactochrome** LACTOFLAVIN.

**lactoferrin** *See* siderophilin.

**lactoflavin** An impure preparation of riboflavin from milk.

**lactogen** *See* placental lactogen.

**lactogenic** Stimulating lactation; having prolactin activity.

**lactogenic hormone** PROLACTIN.

**lactoglobulin** See beta lactoglobulin.

**lactonase** An enzyme that catalyzes the hydrolysis of a lactone.

**lactone** An intramolecular ester that is formed by elimination of a molecule of water between a hydroxyl group and a carboxyl group.

**lactone rule** A rule, proposed by Hudson in 1910, which states that the specific rotation of the  $\gamma$ - or  $\delta$ -lactone of a D-alonic acid is positive when the hydroxyl group on carbon atom 4 or 5 of the acid is to the right in the Fischer formula, and that the specific rotation is negative when the hydroxyl group is to the left.

**lacto-ovo vegetarian** An individual who is not a strict vegetarian (vegan) and who will eat plant and dairy products as well as eggs.

**lactopoiesis** LACTATION.

**lactose** A disaccharide of galactose and glucose that is present in milk. *Aka* milk sugar.

**lactose intolerance** In some cases, a genetically inherited metabolic defect in humans due to a deficiency of the enzyme lactase; in other cases, a condition that develops in adults. See *also* milk intolerance.

**lactose operon** See lac operon.

**lactose permease** A beta galactoside permease that controls the rate of entry of lactose from the medium into the *E. coli* cell. A transmembrane protein that is the carrier for lactose and that functions as a proton symport system; one proton is cotransferred across the membrane for every molecule of lactose transported into the cell. Lactose permease represents an active transport system.

**lacto-series glycosphingolipids** See glycosphingolipids.

**lactose synthetase** The enzyme system composed of two proteins, denoted A and B, that catalyzes the synthesis of lactose from glucose and UDP-galactose in the mammary gland.

**lactose tolerance test** A test used for evaluating intestinal lactase activity by a measurement of the level of blood glucose as a function of time following the administration of a dose of lactose to an individual.

**lactosuria** The presence of excessive amounts of lactose in the urine.

**lactotropin** PROLACTIN.

**lacto vegetarian** An individual who is not a strict vegetarian (vegan) and who will eat both plant and dairy products.

**lacuna** 1. A small space or cavity in a tissue. 2. A clean area in a bacterial lawn as that produced by addition of a growth inhibitor.

**ladder sequencing** Any one of the nucleic acid sequencing techniques (such as the Maxam-Gilbert and Sanger-Coulson methods) that

entails "reading" the nucleotide sequences off the bands of an electrophoresis gel which has the appearance of a ladder.

**laetrile** The compound 1-mandelonitrile- $\beta$ -glucuronic acid. It has been claimed, but not supported experimentally, that laetrile has therapeutic value in the treatment of cancer due to the cyanide, present in laetrile, which acts specifically to destroy the cancer cells. Normal animal cells contain the enzyme beta glucuronidase, which hydrolyzes laetrile to glucuronic acid and mandelonitrile, but do not contain the enzymes required to release cyanide from mandelonitrile. See *also* vitamin B<sub>17</sub>; amygdalin.

**lagging strand** See DNA replication.

**lag period** 1. The delay in cell-free protein synthesis that occurs when synthetic polyribonucleotides are used as messenger RNA and that is thought to be caused by the absence of an initiating codon in the polyribonucleotide. 2. INDUCTIVE PHASE.

**lag phase** The phase of growth of a bacterial culture that precedes the exponential phase and during which there is only little or no growth.

**lake** To lyse erythrocytes by suspending them in a hypotonic medium.

**Laki-Lorand factor** FACTOR XIII.

**Lamarckian theory** A theory of evolution, proposed by Lamarck in 1809 and no longer accepted, according to which the environment leads to structural changes in organisms, especially through new or increased uses of organs and through disuse and atrophy of other organs; these acquired characteristics are then transmitted to the offspring. *Aka* Lamarckism.

**lambda** 1. A temperate phage that infects *E. coli* and that contains linear, double-stranded DNA. 2. A microliter. *Sym*  $\lambda$ .

**lambda chain** One of the two types of light chains of the immunoglobulins.

**lambda cloning vector** A lambda phage that is genetically engineered so that it can accept foreign DNA and serve as a vector in recombinant DNA experiments. This involves cleavage of the phage DNA with restriction endonucleases and insertion of the foreign DNA. Vectors that have a single site at which the phage DNA is cleaved, and the foreign DNA inserted, are called insertion vectors; vectors that have two sites, which span a segment of DNA that can be excised and replaced with foreign DNA, are called substitution or replacement vectors.

**lambda pipet** A pipet for the transfer of volumes in the microliter range.

**Lambert's law** The law which forms part of the Beer-Lambert law. It states that the intensity

of monochromatic light passing through an absorbing medium decreases exponentially with increasing thickness of the absorbing medium.

**lamella** (*pl* lamellae). 1. LAMINA. 2. The thylakoid membrane.

**lamellar** LAMINAR.

**lamellar bone** Bone that consists of ordered, parallel bundles of collagen fibers and that is the normal type of bone found in adults. There are two types of lamellar bone: (a) cortical bone, which has a dense structure and is found in the shafts of long bones; (b) trabecular (or cancellous) bone, which is more porous and is found at the end of long bones.

**lamellipodia** RUFFLED EDGES.

**lamin** One of a group of proteins found in the polymeric network (lamina) that underlies the nuclear membrane.

**lamina** (*pl* laminae) A thin layer; a thin plate.

**laminar** Arranged in the form of layers or plates.

**laminar flow** The undisturbed flow of a liquid along a tube; flow without obstacles. *See also* turbulent flow.

**laminar-flow burner** PREMIX BURNER.

**laminin** A large, complex, noncollagenous glycoprotein, synthesized by a variety of cell types, that is a major component of basement membranes; believed to be a critical adhesive protein of hepatocytes.

**Lamm equation** CONTINUITY EQUATION.

**Lamm scale displacement method** A method for measuring diffusion coefficients from the distortion of a transparent scale that is placed in front of a diffusion cell and that is photographed with light that has passed through the cell. The displacements of the scale lines are proportional to the refractive index gradient in the cell.

**lampbrush chromosomes** Very large chromosomes found in amphibians; they are neither polytene nor unusually condensed chromosomes but have a fuzzy structure resulting from the presence of hundreds of paired loops extending laterally from the main axis of each chromosome.

**Lande G factor** G VALUE.

**Landsteiner's rule** The rule that a blood group antigen and its antibody do not coexist in one individual.

**Langmuir adsorption isotherm** An equation that describes the adsorption of a gas onto a solid and that has the same mathematical form as the Michaelis-Menten equation.

**Langmuir trough** A surface tension balance.

**language** *See* computer language.

**lanolin** The wax of sheep wool; a complex mixture of fatty acids, alcohols, fats, and waxy substances, including esters of steroids (such

as cholesterol and lanosterol), and long-chain aliphatic alcohols.

**lanosterol** The first biosynthetic sterol formed from squalene; the immediate precursor of cholesterol and the parent steroid in animals.

**LAP** Leucine aminopeptidase.

**Laplacian distribution** NORMAL DISTRIBUTION.

**lard factor** VITAMIN A.

**large-angle x-ray diffraction** A method of x-ray diffraction in which the scattering of the x rays is measured at large angles; used for the analysis of small molecular spacings, as those between individual atoms.

**large calorie** A kilocalorie; 1000 small calories. *Abbr* kcal; Cal.

**lariat form** A "tailed circle"; *See* sigma structure.

**laser** Acronym for light amplification by stimulated emission of radiation; a device capable of producing intense beams of monochromatic light.

**laser dye** A dye that is useful for production of laser beams at a specific wavelength (lasing wavelength) or range of wavelengths.

**laser microprobe** Part of a microscopic technique in which a laser beam is used to vaporize a very small tissue area; the vapor is then analyzed spectrographically.

**lasing** *See* laser dye.

**lasing droplet** A droplet that emits laser radiation when irradiated with a laser beam. The emitted radiation highlights the liquid-air interface and shows the changes in droplet size, shape, and orientation.

**late enzyme** A virus-specific enzyme that is transcribed from a late gene.

**late gene** A viral gene that is transcribed late after the infection of a host cell by the virus. *Aka* late function gene. *See also* late protein.

**late mRNA** A virus-specific messenger RNA that is synthesized by RNA polymerase late after the infection of the host cell by the virus.

**latence** The mean time, generally measured in days, between the exposure of animals to a carcinogen and the appearance of tumors. In humans, latence ranges from 10 to 20 years.

**latency** The phenomenon of an inactive particulate enzyme that either becomes active after it is exposed, while still attached to an insoluble matrix, or becomes active after it is detached from the insoluble matrix. *See also* crypticity.

**latent enzyme** An enzyme, especially a particulate enzyme, that exhibits activity only when the conditions are changed. *See also* latency.

**latent image** The invisible image that is produced on a photographic film when it is exposed to radiation and that is rendered visible by subsequent photographic development of the film.

**latent infection** 1. A bacterial infection that does not produce overt disease symptoms and in which the bacteria cannot be detected by currently available techniques. 2. A persistent viral infection that does not produce overt disease symptoms. *See also* inapparent infection.

**latent iron-binding capacity** UNSATURATED IRON-BINDING CAPACITY.

**latent period** 1. The time interval between the infection of a bacterium by a phage and the first appearance of extracellular phage progeny. 2. The time interval between the injection of a sensitizing antiserum into an animal and the time at which a second injection will elicit an anaphylactic response. 3. LATENCE.

**latent virus** A tumor virus that has pathogenic activity and that has infected a host, but that does not lead to manifestations of the disease for a period of time.

**late protein** A virus-specific protein that is transcribed from a late gene; late proteins are typically structural proteins of the virus as distinct from early proteins which are viral enzymes.

**lateral** Of, pertaining to, or directed to, the side; away from the center line toward the left or right side.

**lateral diffusion** Diffusion that proceeds sideways; used specifically for the movement of proteins and lipids within the plane of the lipid bilayer of biological membranes.

**lateral phase separation** The phenomenon that, at certain temperatures, a system may separate itself into two phases, a "solid" and a "liquid" phase that coexist in one plane. The term is applied particularly to the phospholipid bilayer of biological membranes where it is believed that, at certain temperatures, the phospholipid molecules separate, within the plane of the membrane, into two phases, one rich in lipids of higher melting points ("solid" phase) and one rich in lipids of lower melting points ("liquid" phase).

**lathyrism** A disease caused by ingestion of poisons such as  $\beta$ -aminopropionitrile, which is found in *Lathyrus odoratus* peas. These poisons inhibit the enzyme lysyl oxidase which initiates the reactions whereby collagen molecules are cross-linked. Lathyrctic individuals have skeletal deformities and a high excretion of hydroxyproline due to the increased turnover of collagen.

**Latin square** An array of elements that are distributed over an equal number of columns and rows, such that any element occurs only once in each column and once in each row; used for the design of experiments in which the effects of combinations of variables are to be studied. A  $4 \times 4$  Latin square consists of four columns, four rows, and four elements,

spread over a total of 16 positions.

**LATS** Long-acting thyroid stimulator.

**LATS-P** LATS-protector; an immunoglobulin that competes with LATS for binding to LAA. LAA is a LATS-absorbing activity which, upon binding LATS, inactivates the latter. LAA, LATS, and LATS-P are all found in the sera of patients with Grave's disease.

**lattice** A three-dimensional network of elements that are arranged in geometric patterns, such as the atoms in a crystal lattice or the antigens and antibodies in an antigen-antibody lattice.

**lattice microfilaments** *See* microfilaments.

**lattice theory** The theory according to which the reaction between antigens and antibodies leads to the formation of an insoluble antigen-antibody network. Each antibody has at least two binding sites for antigens, while each antigen has many binding sites for antibodies. Upon mixing antigens and antibodies an insoluble network, or lattice, is formed in which each antibody is bound to at least two antigens and each antigen is bound to several antibodies.

**Laue pattern** An x-ray diffraction pattern that is produced by nonmonochromatic x rays. *Aka* Laue photograph.

**lauric acid** A saturated fatty acid that contains 12 carbon atoms.

**LAV** *See* AIDS virus.

**Lavoisier and Laplace law** *See* thermochemistry.

**law** A statement that describes a general truth or a general relation; a principle.

**lawn** The layer of bacterial cells growing on a solid medium.

**law of constant heat summation** *See* thermochemistry.

**law of mass action** The law that, at a given temperature, the rate of a chemical reaction is directly proportional to the active masses of the reactants. The rate of the reaction is proportional to the product of the molar concentrations of the reactants (more precisely, the activities), with each concentration raised to a power equal to the number of reactant molecules of the corresponding type which participate in the reaction.

**law of parsimony** OCCAM'S RAZOR.

**law of pH monotonicity** The principle that, in convection-free electrophoresis, the pH increases monotonically from the anode to the cathode. The principle is of interest for isoelectric focusing.

**laws of thermochemistry** *See* thermochemistry.

**layered metabolic pathway** TIERED METABOLIC PATHWAY.

**layer line** One of the parallel lines of spots that

are obtained by the rotating crystal method of x-ray diffraction.

**LBF** *Lactobacillus bulgaricus* factor.

**LBM** Lean body mass.

**LC** Liquid chromatography.

**LC<sub>50</sub>** The concentration of toxic compound that is lethal to 50% of the organisms to be tested under the test conditions in a specified time. *Aka* lethal concentration. *See also* median lethal dose.

**LCAT** lecithin-cholesterol acyltransferase.

**L cell** A cell belonging to a strain of normal mouse fibroblast cells that have been maintained in tissue culture for many years. *See also* L-form.

**L-chain** Light chain.

**L-configuration** The relative configuration of a molecule that is based upon its stereochemical relation to L-glyceraldehyde.

**LD** Lethal dose.

**LD<sub>50</sub>** Median lethal dose.

**LDCF** Lymphocyte-derived chemotactic factor.

**LDH** Lactate dehydrogenase.

**LDL** Low-density lipoprotein.

**LDL receptor** A large membrane glycoprotein that binds low-density lipoproteins (LDL) and leads to their internalization; this decreases the chance of arterial wall invasion and atherosclerotic plaque formation by the LDL particles.

**lead** A highly toxic and cumulative element in humans and animals; it inhibits many steps in heme biosynthesis as well as other enzymes. Symbol, Pb; atomic number, 82; atomic weight, 207.2; oxidation states, +2, +4; most abundant isotope, <sup>208</sup>Pb; a radioactive isotope, <sup>209</sup>Pb, half-life, 3.3 h, radiation emitted, beta particles.

**leader** A segment of nucleotides at the 5'-end of mRNA, preceding the AUG initiation codon at which translation begins. The leader is an untranslated segment of mRNA that varies in length but always contains part or all of a unique nucleotide sequence (Shine-Dalgarno sequence) which base pairs with 16S rRNA and thereby places the initiation codon in the proper orientation relative to the ribosome for the initiation of translation. In addition to the ribosomal RNA binding sequence, a leader may also contain regulatory signals, such as an attenuator region. *Aka* leader sequence.

**leader peptide** A peptide, coded for by a sequence of nucleotides in the leader segment of mRNA, and believed to function in the regulation of attenuation. *Aka* leader polypeptide.

**leader protein** SIGNAL SEQUENCE.

**leader sequence** LEADER.

**leader sequence peptide** SIGNAL SEQUENCE.

**leading** The chromatographic and electrophoretic phenomenon in which a peak appears lopsided and a band, or a spot, appears ill-defined; due to the fact that in the support the front edge of the region that contains the component is diffuse while the back edge is sharp. *See also* tailing; trailing.

**leading reactant** The first substrate that is bound to an enzyme in an ordered mechanism.

**leading strand** *See* DNA replication.

**leading substrate** The substrate, in a multisubstrate enzyme system, that is the first to bind to the enzyme.

**leaflet** Each of the two monolayers of a lipid bilayer.

**leakage** The loss of material across a cell membrane.

**leak current** The transfer of charge that occurs when an electrolyte moves through a tube and that is due to back conduction by ion diffusion and to electroosmosis.

**leaky gene** HYPOMORPH.

**leaky mutant** A mutant that has a leaky gene.

**leaky patch model** A model of the conformational changes produced in a cell membrane by the action of complement. According to this model, the phospholipid bilayer of the cell membrane is temporarily disrupted either by direct enzymatic action of complement or through the production of a lytic substance by complement. The disrupted membrane represents a leaky patch that allows the passage of water and ions across the membrane. *See also* doughnut model.

**leaky protein** A protein, formed by a mutant gene, that has a fraction of the activity of the normal protein.

**lean body mass** A measure of the composition of the body that is equal to the weight of an individual after removal of excess fat (adipose tissue). *Abbr* LBM.

**LEAP** Linked enzyme assay procedure.

**least squares** *See* method of least squares.

**leaving group** A group of atoms that is displaced from a carbon atom by the attack of a nucleophile in a nucleophilic substitution reaction. *See also* S<sub>N</sub>1 mechanism; S<sub>N</sub>2 mechanism.

**Le Chatelier's principle** The principle that a system in chemical equilibrium reacts to any change in its conditions by establishing a new equilibrium position in such a manner that the effect of the change is minimized.

**lecithin** PHOSPHATIDYL CHOLINE.

**lecithin-cholesterol acyltransferase** The enzyme that converts cholesterol in high-density

lipoproteins to cholesteryl esters; it transfers an acyl group from phosphatidylcholine to cholesterol. *Abbr* LCAT.

**lectins** A large group of proteins or glycoproteins that have two or more binding sites and that bind to specific carbohydrate-containing receptor sites on animal cells. They were originally isolated from plants and shown to agglutinate red blood cells (hence, they were called phytohemagglutinins) but have since been isolated from all types of organisms and shown to bind to many kinds of animal cells. Lectins are proteins of nonimmune origin that agglutinate cells and/or precipitate complex carbohydrates; they are especially abundant in plants, particularly in the seeds of legumes. Some lectins are integrated into cellular membranes, others occur in soluble form; they have antibody-like activity in that they cause red blood cell agglutination. Some lectins are mitogenic and stimulate lymphocyte transformations; some agglutinate malignant cells preferentially; some are highly toxic and some seem to be involved in cell-cell recognition. Because of the specificity of the lectin/carbohydrate-containing receptor interaction, lectins are useful for locating and isolating such receptors and for replacing antisera in immunological studies.

**LEED** Low-energy electron diffraction.

**left splicing junction** *See* splicing junctions.

**leghemoglobin** A red pigment in the root nodules of leguminous plants; a heme protein that resembles hemoglobin structurally and functionally. Leghemoglobin combines reversibly with oxygen and is essential for symbiotic nitrogen fixation in the root nodules where it serves to transport oxygen to the bacteroids.

**legitimate recombination** GENERAL RECOMBINATION.

**Leidig cells** Variant spelling of Leydig cells.

**leiotoxin system** A regulatory mechanism of smooth muscle contraction that involves a number of proteins (called leiotoxins) and that does not appear to involve phosphorylation of myosin light chains.

**LEIS** Low-energy ion scattering.

**lente insulin** A slightly soluble form of insulin that is produced by crystallizing insulin from an acetate buffer in the presence of zinc ions. *See also* NPH insulin.

**LEP strain** Low egg passage strain; a viral strain that has been passed only a few times from one chick embryo to another (serial passage).

**lepton** *See* elementary particles.

**Lesch-Nyhan syndrome** A genetically inherited metabolic defect in humans that is due to a deficiency of the purine salvage enzyme,

hypoxanthine-guanine phosphoribosyl transferase; characterized by an overproduction of uric acid and severe neurological disorders.

**lesion** 1. A pathological change in a tissue. 2. A genetic defect; a mutation. *See also* biochemical lesion.

**-less mutant** Combining form indicating an auxotrophic mutant, as in "thymineless mutant."

**LET** Linear energy transfer.

**lethal** Fatal; causing death.

**lethal concentration** *See* LC<sub>50</sub>.

**lethal dose** The dose of a toxic compound, virus, etc., that kills 100% of the animals in a test group within a specified time. *Abbr* LD.

**lethal gene** A gene, the expression of which leads to the death of the organism that carries the gene. *Aka* lethal factor.

**lethal hit** The hit by a photon or by an ionizing particle that kills a cell or inactivates a virus.

**lethal mutation** A mutation that leads to the premature death of the organism that possesses the mutation.

**lethal mutation model** A model for the evolution of the genetic code according to which the code evolved so as to minimize the possibilities of deleterious mutations. *See also* frozen accident theory.

**lethal synthesis** The process whereby an enzyme catalyzes a metabolic reaction with a compound, other than its normal substrate, and leads to formation of a product that is lethal to the organism. Used specifically for the biological conversion of fluoroacetate to fluorocitrate. The former, by itself, has no toxic effects on cells but, once it is converted metabolically to fluorocitrate, becomes a potent inhibitor of the enzyme aconitase in the citric acid cycle. As a result, fluoroacetate is among the most deadly simple compounds known.

**LETS protein** Large external transformation-sensitive protein; fibronectin.

**letter** A nucleotide in a codon.

**Leu** 1. Leucine. 2. Leucyl.

**leucine** An aliphatic, branched, nonpolar alpha amino acid that contains six carbon atoms. *Abbr* Leu; L.

**leucine aminopeptidase** An aminopeptidase that acts on most amino acids and that catalyzes the sequential hydrolysis of a polypeptide chain from the N-terminal. *Abbr* LAP.

**leuco-** Combining form meaning white or colorless.

**leucocidin** One of a group of extracellular proteins (such as Streptolysin-S), produced by pathogenic species of *Staphylococcus* and *Streptococcus*, that kill leukocytes of certain species and exhibit toxic or lytic activity

against other cells, such as erythrocytes.

**leucocyte** Variant spelling of leukocyte.

**leuco dye** The colorless form of a dye.

**leuco methylene blue** The colorless, reduced form of methylene blue.

**levomycin** A macrolide antibiotic.

**leucoplast** Variant spelling of leukoplast.

**leucovirus** Variant spelling of leukovirus.

**leucovorin** FOLINIC ACID.

**Leu-enkephalin** See enkephalin.

**leukemia** One of a group generally fatal, cancerous diseases of the blood. The disease affects the white blood cells, which are usually overproduced, and the blood-forming organs.

**leukocyte** A white blood cell that protects the organism against infection by eliminating invading bacteria through phagocytosis.

**leukocyte inhibitory factor** A lymphokine that inhibits the migration of polymorphonuclear leukocytes. *Abbr* LIF.

**leukocytosis** An abnormal increase in the number of circulating white blood cells.

**leukopenia** An abnormal decrease in the number of circulating white blood cells.

**leukoplast** A plastid that does not contain pigments.

**leukopoiesis** The formation of white blood cells.

**leukosis** An abnormal proliferation of one or more of the leukocyte-forming tissues.

**leukotrienes** A group of biologically active molecules, formed by leukocytes, macrophages, and other cells and tissues in response to immunological and nonimmunological stimuli. They produce contraction of bronchial smooth muscles, stimulation of vascular permeability, attraction and activation of leukocytes, and are involved in asthma and allergy. Chemically, leukotrienes are derived from arachidonic acid, or other unsaturated fatty acids, and are noncyclic as distinct from the prostaglandins. They are classified as follows: LTA (epoxide form); LTB (hydroxide form); LTC (linked to glutathione, glutamyl-cysteinyl-glycine), LTD (linked to cysteinyl-glycine); LTE (linked to cysteine); the last three categories represent peptolipids.

**leukovirus** An enveloped, complex, animal virus that contains single-stranded RNA. Leukoviruses mature by budding from cytoplasmic membranes and some leukoviruses are oncogenic.

**lev** Levorotatory.

**levan** A homopolysaccharide of fructose.

**level of significance** A value, generally set in terms of percentages, that indicates the level at which a statistical test may yield an erroneous result. Thus, a 5% level of significance indicates that there is a 5% chance that the particular value is incorrect.

**levodopa** L-Dopa.

**levorotatory** Having the property of rotating the plane of plane-polarized light to the left, or counterclockwise, as one looks toward the light source. *Abbr* lev; l.

**levulose** D-Fructose; a levorotatory monosaccharide.

**Lewis acid** An atom, an ion, or a molecule that acts as an electron pair acceptor.

**Lewis acid-base catalysis** The catalysis in solution in which the catalysts are Lewis acids and/or Lewis bases.

**Lewis base** An atom, an ion, or a molecule that acts as an electron pair donor.

**Lewis factor** One of two antigens, designated Le<sup>a</sup> and Le<sup>b</sup>, that are closely related to those of the ABO blood group system. The two factors constitute the Lewis blood group system. *Aka* Lewis antigen.

**LEXA** LexA repressor.

**LexA repressor** See SOS repair.

**Leydig cells** Cells in the testes that are the major source of androgens in the male and that store cholesterol in the form of cholesterol esters.

**LI family** See long interspersed repeated sequences.

**L-form** One of number of bacterial variants of different genera that lack a rigid mucopeptide cell wall and that are capable of growth and multiplication. L-forms are formed spontaneously or as a result of a variety of treatments such as temperature shock, osmotic shock, or the presence of antibiotics which inhibit cell wall synthesis; in L-forms, the cell wall is either defective or totally absent.

**LFT** Low-frequency transduction.

**LFT lysate** Low-frequency transduction lysate; a lysate prepared by induction of a prophage that possesses normal, low transducing power.

**LH** Luteinizing hormone.

**LHR** Liquid holding recovery.

**LHRF** Luteinizing hormone releasing factor; See luteinizing hormone releasing hormone.

**LHRH** Luteinizing hormone releasing hormone.

**LIBC** Latent iron-binding capacity.

**liberin** A releasing hormone; also used as a suffix for the names of the hypothalamic releasing hormones.

**library** See clone library; gene library; genomic library; cDNA library.

**librational motion** A rotational oscillation about an equilibrium position.

**Liebermann-Burchard reaction** A colorimetric reaction for cholesterol and related sterols that is based on the successive production of a red, blue, and blue-green color upon treatment of the sample with acetic anhydride and concentrated sulfuric acid.



**LIF** Leukocyte inhibitory factor.

**life** The sum of the properties that distinguish animals, plants, and microorganisms from nonliving matter, such as metabolism, reproduction, growth, excitability, movement, function, and complexity; the state of existence of a functioning cell, a group of cells, or an organism.

**lifeboat response** The escape of a prophage from a doomed host cell through formation of an infectious viral particle (induction).

**life cycle** 1. The sequence of the developmental stages of an organism from its formation to its death, or from any specified stage to the recurrence of that stage. 2. CELL CYCLE.

**lifetime** 1. For a chemical species: the reciprocal of the sum of all the rate constants for the reactions that the species can undergo ( $1/(k_1 + k_2 + \dots)$ ). 2. For a process: the reciprocal of the first-order rate constant of the process.

**ligand** 1. An atom, a group of atoms, or a molecule that binds to a metal ion. 2. An atom, a group of atoms, or a molecule that binds to a macromolecule.

**ligand chromatography** A column chromatographic method in which metal ion complexes, as those formed with amino acids, are chromatographed on an ion-exchange resin.

**ligand-exchange chromatography** A column chromatographic technique in which one ligand in the mobile phase replaces another ligand bound to the column much as one ion replaces another ion in ion-exchange chromatography. The method has been used to resolve racemic mixtures.

**ligand field theory** An extension of the crystal field theory to include covalent character in the bonding. The theory describes the way in which the electrons of a metal ion in a metal ion-ligand complex reduce the repulsion of ligand electrons through angular polarization.

**ligand-gated channel** See gated channel.

**ligandin** See mercapturic acids.

**ligand-induced endocytosis** A mechanism for the selective uptake by cells of specific ligands which bind to receptors on the cell surface and are then internalized via coated pits. See also coated pits.

**ligand-receptor internalization** See coated pits; rezeptosome.

**ligase** An enzyme that catalyzes the joining together of two different molecules or of two ends of the same molecule in a reaction that is coupled to the hydrolysis of a pyrophosphate bond (high-energy bond) in ATP or some other nucleoside triphosphate. See also DNA ligase; RNA ligase; enzyme classification.

**ligate** To bind a ligand.

**ligation** Formation of a 3',5'-phosphodiester

bond that links two adjacent nucleotides in the same nucleic acid strand in either DNA or RNA. See also splicing.

**ligature** 1. The act of tying off a vessel or a duct, typically a blood vessel. 2. A thread, cord, or band, used for tying off a vessel or a duct.

**light** 1. *n* A form of electromagnetic radiation that has both wave and particle aspects. 2. *adj* Unlabeled, as opposed to being labeled with a heavy isotope. 3. *adj* Labeled with a light isotope, as opposed to containing either the natural or a heavy isotope.

**light chain** One of two polypeptide chains that are linked to two heavy chains to form the immunoglobulin molecule. The molecular weight of a light chain is about 25,000 and that of a heavy chain is about 50,000. The light chains of type K and type L immunoglobulins are known respectively, as  $\kappa$  and  $\lambda$  chains. *Abbr* L-chain.

**light chopper** See chopper.

**light compensation point** The light intensity, at a given CO<sub>2</sub> concentration, at which the rate of carbon dioxide fixation by a plant (photosynthesis) is equal to the rate of photorespiration. See also CO<sub>2</sub> compensation point.

**lightening hormone** An octapeptide neurohormone, produced by the eye stalk glands of crustaceans. The hormone is released in response to visual stimuli and acts on pigment granules in the skin, allowing the organism to adjust its color to match that of the surroundings.

**light-harvesting Chl a/b protein** The complex, composed of chlorophylls *a* and *b*, carotenoid, and one or more polypeptides, that functions in conjunction with photosystems I and II in photosynthesis of green plants.

**light-harvesting molecules** ANTENNA MOLECULES.

**light isotope** An isotope that contains a smaller number of neutrons in the nucleus than the more frequently occurring isotope.

**light label** A light isotope that is generally introduced into a molecule to facilitate its separation from identical molecules containing the more frequently occurring isotope.

**light meromyosin** The terminal tail fragment of the myosin molecule. *Abbr* L-meromyosin; LMM. *Aka* F<sub>3</sub> fragment.

**light microscope** An ordinary microscope that consists of an optical system for use with visible light.

**light path** The thickness of sample through which light passes for optical measurements.

**light reaction** A photosynthetic reaction or reaction sequence that depends directly on light energy and that serves to convert light energy into chemical energy.

**light respiration** PHOTORESPIRATION.

**light scattering** The dispersion of light rays by matter in directions other than that of the incident beam; commonly refers to the light scattered by solutions of macromolecules and to the use of this scattering for determining molecular weights of the solute macromolecules. *See also* Mie scattering; Raman effect; Rayleigh scattering.

**light strand** 1. A polynucleotide chain that is either not labeled with a heavy isotope or that is labeled with a light isotope. 2. The naturally occurring polynucleotide chain of a duplex that has a lower density than the complementary chain.

**lignification** The formation of lignin.

**lignin** The complex phenylpropanoid polymer that strengthens the cellulose framework of wood fibers and vascular plants.

**lignoceric acid** A saturated fatty acid that contains 24 carbon atoms.

**limit dextrin** The branched core of amylopectin or glycogen that remains after digestion of the carbohydrate with either alpha or beta amylase.

**limit dextrinosis** GLYCOGEN STORAGE DISEASE TYPE III.

**limited chromosome** A chromosome that does not occur in nuclei of somatic cells but only in nuclei of germ cells.

**limited proportional region** That portion of the characteristic curve of an ionization chamber that is above the proportional region and similar to it except for the fact that the amplification that can be achieved has a limiting value.

**limiting amino acid** That essential amino acid that is present in a given protein in the smallest amount; the ratio of the amount of the limiting amino acid in the protein to the amount required by the organism provides an estimate of the nutritional value of the protein. *See also* chemical score.

**limiting current** The maximum current obtainable in a polarographic system which, in simple cases, may be equal to the diffusion current.

**limiting reagent** That reagent (reactant) in a chemical reaction whose amount determines the amount of product formed; the reactant that is used up completely in the reaction.

**limiting velocity** MAXIMUM VELOCITY.

**limiting viscosity number** INTRINSIC VISCOSITY.

**lincomycin** An antibiotic, produced by *Streptomyces lincolnensis*, that inhibits protein synthesis in prokaryotes by inhibiting peptidyl transferase.

**Linderström-Lang column** A density gradient column, consisting of varying mixtures of two miscible organic liquids that are immiscible with water, (bromobenzene and kerosene, for

example). The column is calibrated with drops of known aqueous solutions and the density of an unknown aqueous solution is then determined by measuring the position, in the column, of a drop of the unknown solution.

**line** 1. Abbreviation for long interspersed repeated sequence. 2. A pure-breeding group of homozygous individuals that have a distinctive phenotype.

**linear absorption coefficient** The fractional decrease in the intensity of a beam of radiation per unit thickness of the absorber.

**linear accelerator** An instrument for imparting high kinetic energy to subatomic particles that are made to move in a long and straight path.

**linear chain** OPEN CHAIN.

**linear correlation** A relation between two variables so that, as one increases, the other either increases or decreases, and a plot of one variable against the other yields a straight line. *See also* regression line.

**linear density gradient** A density gradient in which the density increases in such a fashion that a plot of density versus distance in the tube yields a straight line.

**linear dichroism** The dichroism that occurs when linearly polarized light is absorbed by partially or completely oriented molecules.

**linear electric field effect** The change in the electron paramagnetic resonance properties of a sample by the application of an electric field across the sample.

**linear energy transfer** The energy dissipation of a radiation as it passes through a tissue or other matter; generally expressed either in terms of kiloelectronvolts per micron, or in terms of megaelectronvolts per centimeter divided by the density of the substance in grams per cubic centimeter. *Abbr* LET.

**linear growth** The growth of a culture such that a plot of the number of cells (or the cell mass) as a function of time yields a straight line; may be brought about, for example, by regulating the supply of a critical nutrient by dropwise addition or diffusion.

**linear inhibition** Inhibition that yields a straight line when either slopes or intercepts from a primary plot are plotted as a function of inhibitor concentration.

**linear metabolic pathway** A metabolic pathway of the type  $A \rightarrow B \rightarrow C$ .

**linear polymer** A polymer composed of open, unbranched chains.

**linear polyphosphate** One of a group of compounds that contain a polymetaphosphate grouping,  $H_2PO_3-(HPO_3)_n-H_2PO_4$ , and that have been used to drive the polymerization of amino acids in studies on the origin of life. *Aka* polymetaphosphate.

**linear regression** *See* regression line.

**linear-sweep polarography** Oscillographic polarography in which the entire potential scan is applied to the dropping mercury electrode either once as a single sweep, or several times as a multisweep, during the life of a single mercury drop.

**linear transformation** A mathematical transformation of an equation into one for a straight line. The conversion of the Michaelis-Menten equation into its Lineweaver-Burk formulation is an example.

**linear velocity** The straight line distance moved per unit time.

**line emission** The emission of light of either one or several specific wavelengths that is produced in flame photometry by a given ion.

**Line 1 family** See long interspersed repeated sequences.

**line of best fit** See method of least squares.

**line of stability** The line drawn through the band that represents the stable nuclides in a plot of the number of protons versus the number of neutrons in the nuclides.

**line spectrum** A spectrum in which either the absorption or the emission of radiation is limited to only a few wavelengths.

**line splitting** See spin-spin splitting.

**Lineweaver-Burk plot** The double reciprocal plot of the Michaelis-Menten equation; a plot of  $1/v$  versus  $1/[S]$ , where  $v$  is the velocity of the reaction and  $[S]$  is the substrate concentration.

**linkage** 1. Any association of genes in inheritance that exceeds that to be expected from the independent assortment and that is due to their being located on the same chromosome; linkage is assessed by the tendency of two markers to remain together during recombination. 2. COUPLED REACTIONS.

**linkage group** A group of linked genes; all the genes located on the same chromosome.

**linkage map** A scale representation of a chromosome that shows the relative positions of all its known genes.

**linked assay** COUPLED ASSAY.

**linked enzyme assay procedure** A method for the detection of proteinases and proteinase inhibitors; involves coupling a reporter enzyme to a substrate protein which, in turn, is immobilized on a particulate support. Upon incubation with a proteinase, peptides containing an active enzyme label are released from the support. The labeled peptides are collected by centrifugation or filtration and are used, in a second incubation, to transfer molecules of the reporter enzyme substrate, thereby providing great amplification of the initial peptide bond hydrolysis by the proteinase. *Abbr* LEAP.

**linked gene** A gene showing linkage; a gene on

the same chromosome as another gene.

**linked reactions** COUPLED REACTIONS.

**linked transduction** A bacterial transduction in which there is a simultaneous transfer of two or more genes that lie close together on a chromosome.

**linked transformation** A bacterial transformation in which there is a simultaneous transfer to the bacterium of two or more genes that lie close together on a chromosome.

**linker DNA** 1. A section of DNA that connects adjacent nucleosomes in a chromosome and to which is bound a molecule of histone H1. 2. A short, synthetic, double-stranded DNA segment that contains a site cleavable by a restriction endonuclease. Linkers are useful in binding to double-stranded DNA segments and in inserting the latter into double-stranded DNA molecules. If the DNA segment contains several restriction endonuclease sites, it is known as a polylinker.

**linking number** The total number of times that the two strands of a double helix of a closed, circular DNA molecule cross each other. The linking number is a topological property that can change only if one or both strands are nicked and then rejoined; it is an integer and is positive for right-handed helical regions and negative for left-handed helical regions. It is defined as follows:  $L = W + T$  and  $\Delta L = \Delta W + \Delta T$ , where  $L$  is the linking number,  $W$  is the writhing number, and  $T$  is the twisting number. *Aka* linkage number; winding number.

**link protein** See proteoglycan aggregates.

**linoleic acid** An unsaturated fatty acid that contains 18 carbon atoms and two double bonds. See also promoter.

**linolenic acid** An unsaturated fatty acid that contains 18 carbon atoms and three double bonds.

**lipamino acid** Variant spelling of lipoamino acid.

**lipase** An enzyme that catalyzes the hydrolysis of fats to glycerol and fatty acids.

**lipectomy** The surgical removal of adipose tissue.

**lipemia** The presence of excessive amounts of lipid in the blood.

**lipid** One of a heterogeneous group of compounds that are synthesized by living cells and that are sparingly soluble in water but are soluble in nonpolar solvents; they can be extracted from tissues by nonpolar solvents, and they have as a major part of their structure long hydrocarbon chains that may be branched or unbranched, straight or cyclic, saturated or unsaturated. Various classifications of lipids are in use, including (a) simple lipids (neutral fats and waxes), complex

lipids (phospholipids, sphingolipids, glycolipids, etc.), derived lipids (steroids, vitamins, carotenoids, etc.); and (b) neutral lipids (neutral fats, waxes, carotenoids, etc.), amphipathic lipids (glycerolipids, sphingolipids, etc.), redox lipids (quinones, etc.).

**lipid bilayer** A layer of amphipathic lipid molecules that is two molecules thick and that is believed to form most or all of the central portion of biological membranes. In a lipid bilayer that is surrounded by a polar environment, the nonpolar parts of the lipid molecules are directed inward and the polar parts are on the outside.

**lipide** LIPID.

**lipidemia** LIPEMIA.

**lipid-globular protein mosaic model** FLUID-MOSAIC MODEL.

**lipid imbibition theory** A theory of atherosclerosis according to which the formation of atheromatous plaques is caused by the uptake of lipids, such as cholesterol, from the blood stream by the walls of the arteries.

**lipid intermediate** The compound, undecaprenyl phosphate, that functions in peptidoglycan synthesis.

**lipid mobilization** See mobilization.

**lipidosis** (*pl* lipidoses). 1. One of a number of genetically inherited or acquired diseases that are characterized by the deposition of one or more types of lipids in specific tissues or organs. 2. One of a number of genetically inherited metabolic defects in humans that are characterized by lipid accumulation in specific tissues or organs and that result from a defect in the metabolism of glycosphingolipids. See also Fabry's disease; Gaucher's disease; Krabbe's disease; Niemann-Pick disease; Tay-Sachs disease.

**lipid peroxidation** The nonenzymatic oxidation of fatty acids, especially unsaturated ones, to hydroperoxides ( $R-O-O-H$ ) by strong oxidizing agents such as hydrogen peroxide, the superoxide anion radical ( $O_2^-$ ), or the hydroxy radical ( $\cdot OH$ ).

**lipid-soluble vitamin** FAT-SOLUBLE VITAMIN.

**lipid solvent** A nonpolar solvent, such as chloroform, acetone, or methanol, that will extract lipids from tissues.

**lipid storage disease** LIPIDOSIS.

**lipid vesicle** LIPOSOME.

**lipin** Obsolete term for lipid.

**lipo-** Combining form meaning lipid.

**lipoamide** The dipeptide-like structure, formed by linking a molecule of lipoic acid through its carboxyl group to the  $\epsilon$ -amino group of a lysine residue, that is part of the enzyme for which lipoic acid serves as a coenzyme. See also lipoylprotein; lysyl-lipoamide.

**lipoamino acid** 1. A compound formed by join-

ing a fatty acid or a long-chain alcohol to an amino acid by means of either an ester or an amide bond. 2. An amino acid ester of phosphatidylglycerol.

**lipocaic** A substance, secreted by the pancreas, that prevents the fatty infiltration of liver and stimulates the oxidation of fatty acids.

**lipochondrion** (*pl* lipochondria). 1. DICTYOSOME. 2. A temporary storage form of lipids in which they are absorbed by epithelial cells in the Golgi apparatus.

**lipochrome** A naturally occurring, fat-soluble pigment.

**lipocortin** A protein (MW 37,000) that inhibits phospholipase  $A_2$ , apparently by sequestering the phospholipid substrate. The physiological significance of lipocortin is unclear.

**lipofuscin** AGE PIGMENT.

**lipogenesis** The biosynthesis of fatty acids from acetyl coenzyme A.

**lipoglycan** A polysaccharide that contains covalently linked lipids. Lipoglycans differ from lipopolysaccharides in their composition and cellular location; they appear to be integral components of the cytoplasmic membranes of various bacterial species.

**lipoic acid** A compound that is generally classified with the B vitamins, since it is a growth factor for some microorganisms; it functions as a coenzyme in the multienzyme systems that catalyze the oxidative decarboxylation of pyruvic acid to  $\alpha$ -ketoglutaric acid and of  $\alpha$ -ketoglutaric acid to succinic acid.

**lipoid** 1. LIPID. 2. Resembling a fat or an oil.

**lipolysis** The hydrolysis of lipids.

**lipolytic** Of, or pertaining to, lipolysis.

**lipolytic hydrolysis** LIPOLYSIS.

**lipoma** A benign tumor of adipose tissue.

**lipopeptide** 1. A compound formed by joining a fatty acid or a long-chain alcohol to a peptide by means of either an ester or an amide bond. 2. A peptide ester of phosphatidylglycerol.

**lipophilic** NONPOLAR.

**lipophilic Sephadex** A Sephadex preparation that can be used with organic solvents.

**lipophilic stain** A stain for lipids.

**lipophilin** A proteolipid that is the major membrane protein of brain myelin.

**lipopolysaccharide** A water-soluble, lipid-polysaccharide complex, that is an important component of the outer membrane of gram-negative bacteria. A lipopolysaccharide molecule consist of a heteropolysaccharide chain linked covalently to a glycolipid. The glycolipid (lipid A) consists of a disaccharide, substituted with long-chain fatty acids. The heteropolysaccharide consists of a core polysaccharide, which is similar or identical in closely-related bacteria, and an O-specific

chain (O-antigen), which determines the identity of cell surface antigens. The overall structure of a lipopolysaccharide can thus be represented by [glycolipid-heteropolysaccharide] or [lipid A-core polysaccharide-O-specific chain]. *Abbr* LPS.

**lipoprotein** One of a group of conjugated, water-soluble proteins in which the nonprotein portion is a lipid; the lipid is usually a glyceride, a phospholipid, cholesterol, or a combination of these. The lipid component is tightly bound (prosthetic group). Lipoproteins occur in blood plasma, cell cytoplasm, cell membranes, cell organelles, and egg yolk. Blood plasma lipoproteins function in the transport and distribution of lipids and are classified into 5 major groups on the basis of their density: chylomicrons, very low-density lipoproteins (VLDL), low-density lipoproteins (LDL), high-density lipoproteins (HDL), and very high-density lipoproteins (VHDL). *See also* specific lipoprotein groups; proteolipid.

**lipoprotein lipase** An extracellular enzyme that is most active within the capillaries of adipose tissue, cardiac muscle, and skeletal muscle; it catalyzes the hydrolysis of the 1 or 3 ester bond of di- and triacyl glycerols (di- and triglycerides) present in chylomicrons and very low-density lipoproteins. *Abbr* LPL. *Aka* clearance factor; clearing factor.

**lipoprotein tissue factor** THROMBOPLASTIN.

**liposarcoma** A malignant tumor of adipose tissue.

**liposome** An artificially prepared, cell-like structure in which one or more bimolecular layers of phospholipid enclose one or more aqueous compartments; a membrane-bound vesicle, frequently formed by dispersion of phospholipid in aqueous salt solutions. *See also* vesicle.

**lipotrophic hormone** LIPOTROPIC HORMONE.

**lipotrophin** LIPOTROPIC HORMONE.

**lipotropic** Descriptive of a compound that can contribute methyl groups for the synthesis of choline and that can prevent or alleviate a fatty liver condition that results from a dietary deficiency of choline.

**lipotropic agent** A compound, such as choline or methionine, that aids in the transport of fat and thereby prevents or alleviates the condition of fatty infiltration of the liver.

**lipotropic hormone** A polypeptide hormone, secreted by the anterior lobe of the pituitary gland, that stimulates the mobilization of lipids, especially fatty acids, from lipid deposits. *Var sp* lipotrophic hormone. *Abbr* LPH.

**lipotropin** LIPOTROPIC HORMONE.

**lipovitellenin** 1. A degraded form of a low-density lipoprotein component that is present

in hens' egg yolk. 2. LOW-DENSITY FRACTION. **lipovitellin** 1. A high-density lipoprotein in hens' egg yolk. Two such proteins, denoted  $\alpha$  and  $\beta$ , have been isolated; they are similar in their composition except for their content of protein-bound phosphorus. 2. A high-density yolk lipoprotein from any species.

**lipoxins** A group of biologically active, leukocyte-derived, arachidonic acid metabolites.

**lipoxygenase** A key enzyme in the biosynthesis of leukotrienes; it catalyzes the first reaction in the lipoxygenase pathway whereby arachidonic acid is oxidized to a hydroperoxide which is then converted to leukotrienes.

**lipoyl dehydrogenase** DIAPHORASE.

**lipoyllysine** LIPOAMIDE.

**lipoylprotein** A conjugated protein in which lipoic acid is covalently bound to the protein by way of an amide link between its carboxyl group and the  $\epsilon$ -amino group of a lysine residue in the protein. *See also* lipoamide.

**lipuria** The presence of lipid in the urine.

**liquefying amylase** ALPHA AMYLASE.

**liquid chromatography** A collective term for liquid-liquid, liquid-solid, paper, thin-layer, ion-exchange, and molecular sieve chromatography. *Abbr* LC.

**liquid crystal** A phase that has a mobility like that of a liquid and a high degree of order like that in a crystal. Liquid crystals exhibit aspects of both the liquid and the solid states but also possess properties that are not found in either state. They are classified as either lyotropic or thermotropic depending on the principal way by which the order of the parent solid state is destroyed: in lyotropic ones, by means of solvent action; in thermotropic ones, by means of heat. Lyotropic liquid crystals are frequently two-component systems, composed of amphipathic molecules and water. These can have a variety of structures involving, for example, lamellar, cubic, hexagonal, cylindrical, or micellar packing of the molecules. Thermotropic liquid crystals are further classified as either nematic (having a thread-like pattern) or smectic (having greasy or soapy properties); there are 3 known types of nematic structures (ordinary, cholesteric, and blue phase) and 9 known types of smectic structures (5 structured and 4 unstructured smectics). Nematic liquid crystals typically consist of molecules that are parallel, can rotate about their axes, and can move both up and down and from side to side. Smectic liquid crystals typically consist of molecules arranged in strata or layers which can slide over one another; the molecules in each layer can move from side to side, as well as forward and backward, but cannot move up or down from one

layer to the next. In structured smectics, the molecules in each layer form a regular two-dimensional lattice; in unstructured smectics, the molecules in each layer are positioned randomly. *Aka* mesophase; mesomorphic phase.

**liquid holding recovery** The phenomenon that bacterial cells, when allowed to stand in buffer following their irradiation with ultraviolet light, show an increased viability as compared to cells that are plated out immediately after irradiation. *Abbr* LHR.

**liquid hybridization** Nucleic acid hybridization that is carried out in solution and that requires separation of the hybrid double-stranded molecules from any unreacted, single-stranded molecules left. *See also* filter hybridization.

**liquid junction potential** *See* junction potential.

**liquid-liquid chromatography** Partition chromatography in which the mobile phase is a liquid and the stationary phase is an inert support, coated with a liquid. *Abbr* LLC.

**liquid medium** A solution of nutrients.

**liquid protein diet** A diet based on protein hydrolysates.

**liquid scintillation** The emission of light flashes by a solution containing a fluorescent chemical when the chemical is struck by either an ionizing particle or a photon; used as a method for measuring the radioactivity of a sample dissolved in the solution. When used in this fashion, the light flashes are transformed into electrical pulses by means of a photomultiplier tube and are then counted.

**liquid scintillation counter** A radiation counter in which incident ionizing particles or incident photons are counted by the scintillations that they induce in a liquid fluor; the sample and the fluor are either dissolved in a common solvent or one is suspended in a solution of the other. *Abbr* LSC.

**liquid-solid chromatography** Adsorption chromatography in which the mobile phase is a liquid and the stationary phase is a solid. *Abbr* LSC.

**liquid surfactant membrane** A water-immiscible phase that contains emulsion-size droplets and that consists of surfactants, a hydrocarbon solvent, and other compounds; the droplets may be used to hold a reagent or to encapsulate an enzyme.

**liter** A metric unit of volume equal to 1 dm<sup>3</sup>. *Sym* L, l.

**lithiasis** The formation of calculi, particularly biliary and urinary ones.

**lithocholic acid** A bile acid that has one hydroxyl group.

**lithogenic** Leading to the formation of calculi;

stone-producing.

**lithosphere** The solid, mineral part of the earth.

**lithotroph** A cell or an organism that uses inorganic compounds as electron donors for its energy-yielding, oxidation-reduction reactions.

**little gastrin** *See* gastrin.

**little insulin** That fraction of free serum insulin that is indistinguishable from pancreatic insulin.

**little t** *See* t antigen.

**live** Alive, not dead; viable.

**liver** The principal metabolic organ of animals that is capable of carrying out all the major metabolic reactions and that has a variety of functions in both anabolism and catabolism. It is a large gland, located in the abdominal cavity.

**liver filtrate factor** PANTOTHENIC ACID.

**liver function test** A quantitative determination of either a metabolite or an enzyme that is used in evaluating the functional capacity of the liver. Liver function tests include measurements of serum bilirubin concentration, alkaline phosphatase activity, and galactose tolerance.

**liver profile** The composite results obtained from a battery of liver function tests.

**live-timing** A method of timing, used in scintillation counters, in which the timing device is turned off during the interval that is required for the electronic processing of a pulse. *See also* clock-timing.

**live vaccine** A vaccine that consists of infectious bacteria or of viruses, the virulence of which has been attenuated.

**living** Possessing the properties of life; alive, not dead.

**LLC** Liquid-liquid chromatography.

**LLD factor** VITAMIN B<sub>12</sub>.

**LLF** Laki-Lorand factor.

**L-L factor** Laki-Lorand factor.

**L-meromyosin** Light meromyosin.

**LMM** Light meromyosin.

**ln** Natural logarithm.

**LNPF** Lymph node permeability factor.

**LnRNA** Low molecular weight nuclear RNA; *see* heterogeneous nuclear RNA.

**loading** 1. The *in vitro* process whereby cellular structures, such as erythrocyte ghosts or mitochondria, are made to take up or accumulate specific substances. 2. The process of applying a sample to a chromatographic or electrophoretic support.

**load test** A tolerance test in which an individual is given a dose of a specific metabolite and the urinary concentration of this metabolite, or of a related compound, is determined

as a function of time. A phenylalanine load test is used as a diagnostic tool for phenylketonuria, and a tryptophan load test is used as a diagnostic tool for schizophrenia. *See also* glucose tolerance test; galactose tolerance test.

**Lobry De Bruyn-Alberta van Eckenstein transformation** The interconversion of monosaccharides that occurs in alkaline solution as a result of the formation of enediol intermediates.

**local hormone** AUTACOID.

**localized bond** A chemical bond involving only two atoms.

**localized infection** A viral or a bacterial infection in which the infective agents remain primarily at the site of entry into the host.

**localized orbital** A molecular orbital that is spread only over two bonding atoms.

**locant** The portion of a chemical name that designates the position of an atom or a group in a molecule;  $\beta$  in  $\beta$ -naphthylamine,  $m$  in  $m$ -xylene, and 2 in 2-butanol, are examples.

**lock and key theory** A theory of the mechanism of an enzymatic reaction according to which the substrate binds to the enzyme to form an enzyme-substrate complex. The binding site on the enzyme is preformed and is called the active site; it is structurally complementary to the substrate, so that the substrate fits onto the enzyme much as a key fits into a lock. *See also* flexible active site; induced fit theory.

**Locke's solution** A solution that is similar in composition to Ringer's solution; it contains (in w/v) 0.9% sodium chloride, 0.024% calcium chloride, 0.042% potassium chloride, 0.02% sodium bicarbonate, and 0.1% glucose.

**locoweed** One of a number of plants that contain selenium or other poisons and that cause alkali disease when eaten by animals.

**locus (*p/l* loci)** A place or a position, particularly that occupied by a gene on a chromosome.

**log** Logarithm; also denoted  $\log_{10}$ .

**logarithm** The exponent that indicates the power to which a fixed number has to be raised to produce a given number; the fixed number is known as the base. In ordinary, or Briggsian, logarithms the base is 10; in natural, or Napierian, logarithms the base is the constant  $e$ . Ordinary logarithms are denoted  $\log$  or  $\log_{10}$ ; natural logarithms are denoted  $\ln$  or  $\log_e$ .

**logarithmic growth** EXPONENTIAL GROWTH.

**logarithmic paper** Graph paper in which both scales have been distorted to allow the plotting of the logarithm of one variable versus the logarithm of a second variable.

**logarithmic phase** EXPONENTIAL PHASE.

**log<sub>e</sub>** Natural logarithm.

**logit** A logarithmic quantity, defined as  $\text{logit}(x) = \log [x/(1-x)]$  when  $0 < x < 1$ ; used, for example, in animal studies where  $x$  is the probability of obtaining a particular response to a given dosage.

**log-normal distribution** A positively skewed distribution of a random variable that, when subjected to a logarithmic transformation, tends to take on the shape characteristic of a normal distribution.

**log phase** Logarithmic phase.

**Lohmann reaction** The reversible reaction, catalyzed by the enzyme creatine kinase, in which ATP and creatine are formed from ADP and phosphocreatine.

**London dispersion forces** DISPERSION FORCES.

**long-acting thyroid stimulator** A thyroid-stimulating substance that exerts its effect over a long period of time; it is an immunoglobulin (IgG) which stimulates thyroid plasma membrane adenylyl cyclase and is present in many individuals suffering from hyperthyroidism. *Abbr* LATS.

**Long cat** A pancreatectomized and adrenalectomized cat that is used in endocrinological studies.

**long-chain base** A term used to describe sphinganine, its homologues, stereoisomers, and hydroxy or unsaturated derivatives.

**long-chain fatty acid thiokinase** A fatty acid thiokinase that catalyzes the activation of fatty acids having more than 12 carbon atoms to fatty acyl coenzyme A.

**long interspersed repeated sequences** A family of long (6-7 kb) repetitive sequences that occur in the form of 20,000-50,000 copies per mammalian genome. They constitute the Line 1 (L1) family and appear to consist largely of retroposons. *Abbr* LINE.

**longitudinal** Lengthwise; parallel to the long axis of a body or a structure.

**longitudinal relaxation** SPIN-LATTICE RELAXATION.

**long patch pathway** A mechanism for DNA repair in both prokaryotes and eukaryotes in which the repaired DNA segments are relatively long.

**long period interspersion** A DNA structure that is characterized by relatively long (over 300 bp) segments of moderately repetitive DNA alternating with relatively long (over 1000 bp) segments of nonrepetitive DNA.

**long-range hydration** The hydration by water molecules that are located in the secondary hydration shell.

**long-range interactions** The attractive and repulsive forces between atoms and molecules

- that do not decrease rapidly with distance. *See also* strong interactions.
- long spacing fibrils** *See* fibrils long spacing.
- long spacing segments** *See* segments long spacing.
- Longsworth scanning method** An optical method for obtaining a photograph that depicts the refractive index gradient of a boundary; produced by photographing the boundary while a knife edge moves upward in front of the camera lens and while the photographic plate is driven horizontally at a speed that is proportional to that of the knife edge.
- long terminal repeat** One of two long sections of double-stranded DNA (250–1200 bp) that occur when a double-stranded DNA molecule is synthesized by reverse transcriptase from the RNA strand of a retrovirus. The two long terminal repeats (LTR) have an identical sequence, composed in part of sections unique to the 3'- and 5'-ends of the viral RNA. One LTR occurs at each end of the linear duplex DNA intermediate that is formed. LTRs are believed to provide functions fundamental to the expression of most eukaryotic genes, such as promotion, initiation, and polyadenylation of transcripts. *Abbr* LTR.
- loop** *See* arm; omega loop.
- looped rolling circle model** A variation of the rolling circle model for the replication of duplex circular DNA in which the progeny is a single-stranded circular molecule.
- loose coupling** The state of cellular respiration in which the mitochondria are characterized by having a low acceptor control ratio.
- low-angle x-ray diffraction** SMALL-ANGLE X-RAY DIFFRACTION.
- low background counter** A specially shielded radiation counter in which the level of background counts has been greatly reduced.
- low-copy number** *See* copy number.
- low-density fraction** 1. A low-density fraction of hens' egg yolk that contains about 89% lipid and two lipoproteins which differ primarily in their size. 2. LIPOVITELLENIN.
- low-density lipoprotein** A plasma lipoprotein that has a density of 1.006–1.063 g/mL. An increase in the concentration of low-density lipoproteins (LDL) is believed to be linked to an increase in the incidence of atherosclerosis. LDL contain about 22% protein, 22% phospholipid, 46% cholesterol and cholesterol esters, and 10% triacylglycerols (triglycerides). LDL have molecular weights of about  $3 \times 10^6$ , a flotation coefficient of 0–12S, and are classified as the beta fraction on the basis of electrophoresis. *Abbr* LDL. *See also* lipoprotein.
- low egg passage strain** *See* LEP strain.
- low-energy compound** A compound that, upon hydrolysis under standard conditions, yields a small amount of free energy; the standard free energy change for the hydrolysis reaction is less than 7 kcal/mol.
- low-energy electron diffraction** A technique for the study of surface structures in which a beam of low-energy electrons is used to probe the surface. The electrons striking the surface penetrate only the outermost layer of atoms and are diffracted by the atoms. The diffraction pattern provides information on the arrangement and the spacing of the surface atoms. *Abbr* LEED.
- low-energy ion scattering** A technique for the study of surfaces in which a low-energy beam of noble gas ions is directed at the surface. Measurements of the energy loss and scattering angles provide information as to the positions and identities of atoms in the first few layers of the surface. *Abbr* LEIS.
- low-energy phosphate acceptor** A low-energy compound that can function as an acceptor for the phosphoryl group transferred from high-energy phosphate donors by way of the ADP-ATP phosphoryl group carrier system. *Aka* low-energy phosphate compound.
- low-frequency transduction** Transduction in which the phages that are capable of transducing constitute a small proportion of the total phage population. *Abbr* LFT.
- low gate** The cutoff level in integral discrimination.
- low-level promoter** A promoter than can undergo a promoter-down mutation.
- low-lipid lipoprotein** HIGH-DENSITY LIPOPROTEIN.
- low-order antibody** INCOMPLETE ANTIBODY.
- low-potential iron protein** *See* high-potential iron protein.
- low-quality proteins** Proteins from plant sources that have a low content (limiting amount) of one or more of the essential amino acids.
- Lowry method** A modification of the Folin-Ciocalteu reaction that is used as a colorimetric reaction for the quantitative determination of proteins.
- low-speed sedimentation equilibrium** SEDIMENTATION EQUILIBRIUM.
- low spin** The state of a complex in which there is a maximum of paired electrons; referred to as a state of essentially covalent bonding and ascribed to certain hemoproteins.
- low-temperature heat method** The pasteurization of material by heating it at 61.6°C for 30 min. *Abbr* LTH method.
- LPC** Lysophosphatidyl choline; *See* lysophosphoglyceride.
- LPE** Lysophosphatidyl ethanolamine; *See*



lysophosphoglyceride.

**LPH** Lipotropic hormone.

**LPL** Lipoprotein lipase.

**LPS** Lipopolysaccharide.

**L region** Two reactive para positions in an aromatic hydrocarbon; the presence of such a region has been correlated with the lack of carcinogenic activity of some hydrocarbons. *See also* K region.

**LRF** Luteinizing hormone releasing factor; *See* luteinizing hormone releasing hormone.

**LRH** Luteinizing hormone releasing hormone.

**L-rRNA** RNA of the large ribosomal subunit.

**LS antigen** An antigen that can be dissociated from a poxvirus and that consists of a heat-labile and a heat-stable component.

**LSC** 1. Liquid-solid chromatography. 2. Liquid scintillation counter. 3. Liquid scintillation counting.

**LSD** Lysergic acid diethylamide.

**L-shaped structure** *See* L-type structure.

**L/S ratio** Lecithin/sphingomyelin ratio; a quantity that is measured in the amniotic fluid and that provides information regarding the maturity of the fetal lungs. When the L/S ratio is less than 2.0, there is great risk that the baby will develop respiratory distress syndrome.

**I-strand** WATSON STRAND.

**LT** 1. Lymphotoxin 2. Leukotriene.

**LTA** *See* leukotriene.

**LTB** *See* leukotriene.

**LTC** *See* leukotriene.

**LTD** *See* leukotriene.

**LTE** *See* leukotriene.

**LTH** 1. Lactogenic hormone. 2. Luteotropic hormone.

**LTH method** Low-temperature heat method.

**LTR** Long terminal repeat.

**L-type structure** The three-dimensional structure of tRNA, formed by folding of the cloverleaf structure to yield two helical, double-stranded branches, at right angles to each other, in the shape of an L. The structure is maintained by means of tertiary base pairs (tertiary hydrogen bonds).

**Lubrol** A nonionic detergent.

**luciferase** The enzyme that functions in the bioluminescence reactions of the firefly; it catalyzes the oxidation of luciferin with the concomitant release of visible light.

**luciferin** The substrate of the enzyme luciferase. *See also* luciferase.

**Lucite** PLEXIGLASS.

**Lugol's solution** A solution containing (in w/v) 5% iodine and 10% potassium iodide.

**lumen** 1. A passageway in a small tube or duct. 2. A unit of luminous flux; equal to the quantity of visible light falling on 1 cm<sup>2</sup> at a

distance of 1 cm from a light source of 1 cd.

**lumichrome** A blue fluorescent compound formed by photolysis of riboflavin in acidic solution.

**lumiflavin** A yellow-green fluorescent compound formed by photolysis of riboflavin in basic solution.

**luminescence** The emission of light that results from chemical reactions within, or a flow of energy into, an emitter, rather than from an increase in temperature. *See also* fluorescence; phosphorescence; luciferase.

**luminescent** Of, or pertaining to, luminescence.

**lumirhodopsin** A structurally altered form of rhodopsin that is produced after the exposure of rhodopsin to light and prior to its conversion to metarhodopsin.

**lumisome** A subcellular organelle, consisting of a membrane-bound vesicle, that is the site of bioluminescence in some organisms.

**lumisterol** A compound produced from ergosterol by irradiation with ultraviolet light.

**lung surfactants** A group of substances, manufactured and secreted by lung tissue, that are essential for normal functioning of the lungs. They have detergent action and serve to maintain the proper surface tension of the alveoli. The major component is an unusual phosphatidylcholine (dipalmitoylphosphatidylcholine).

**Luria-Delbrueck fluctuation test** *See* fluctuation test.

**Luria-Latarjet experiment** An experiment for determining the sensitivity of intracellular vegetative phage to irradiation. The phage-infected bacteria are irradiated at different stages of the phage multiplication cycle with varying doses of ultraviolet light or other radiation. The cells are then analyzed for the fraction of surviving infective phage particles.

**luteal** Of, or pertaining to, the corpus luteum.

**luteinizing hormone** A gonadotropic protein hormone, secreted by the anterior lobe of the pituitary gland, that stimulates the final ripening and rupture of the ovarian follicles and the secretion of progesterone by the corpus luteum; it also stimulates the production of testosterone in the male. *Abbr* LH. *Aka* lutropin.

**luteinizing hormone releasing hormone** The hypothalamic hormone that controls the secretion of luteinizing hormone. *Abbr* LRH; LHRH. *Aka* luteinizing hormone releasing factor (LRF; LHRF).

**luteohormone** PROGESTERONE.

**luteotrophic hormone** Variant spelling of luteotropic hormone.

**luteotrophin** Variant spelling of luteotropin.

**luteotropic hormone** PROLACTIN.

**luteotropin** PROLACTIN.

**lutropin** LUTEINIZING HORMONE.

**LUV** Large unilamellar vesicle; *See* vesicle.

**luxury genes** Genes that provide for specialized cell functions. The products of such genes are generally synthesized in large amounts only in specialized cell types, such as the synthesis of hemoglobin in erythrocytes and the synthesis of immunoglobulins in plasma cells. *See also* housekeeping genes.

**LV** Lipovitellin.

**LVP** Lysine vasopressin.

**lyase** An enzyme that catalyzes the cleavage of a molecule or the removal of a group; involves electron rearrangements (elimination reactions) but not hydrolysis or oxidation-reduction. Lyases cleave C—C, C—O, C—N, and similar bonds and create double bonds or rings in one of the products (or add a group to a double bond in the reverse reaction). *See also* enzyme classification.

**lyate ion** A solvent molecule minus a proton; in the case of water, the lyate ion is the hydroxyl ion.

**lycopene** A red pigment in tomatoes that is the parent compound of the carotenoids.

**lymph** The fluid, derived from the interstitial fluid, that bathes the tissues, circulates through the lymphatic vessels, and is ultimately discharged into the blood.

**lymphatic** 1. *n* A small lymph vessel. 2. *adj* Of, or pertaining to, lymph.

**lymph node permeability factor** A factor that occurs in extracts of lymph node cells and which, when injected into the skin, increases vascular permeability. *Abbr* LNPF.

**lymphoblast** A cell derived from a T lymphocyte upon antigenic stimulation.

**lymphocyte** A cell that occurs in lymphatic tissue, spleen, and blood and that is characterized by having a large round nucleus; a lymph cell. Lymphocytes are immunologically competent cells that recognize antigens and play a central role in the immune response. They are classified according to their origin and function into B cells and T cells. *See also* B cell; T cell.

**lymphocyte-derived chemotactic factors** Various lymphokines that stimulate leukocyte chemotaxis. *Abbr* LDCF.

**lymphocyte transformation** The formation of immunoblasts from lymphocytes, a process that is accompanied by rapid synthesis of DNA and RNA.

**lymphocytosis** An increase in the number of lymphocytes in the blood or in the tissue fluids.

**lymphocytotoxin** LYMPHOTOXIN.

**lymphoid** 1. Resembling lymph or lymphatic tissue. 2. LYMPHATIC.

**lymphoid cell** LYMPHOCYTE.

**lymphokines** A heterogeneous group of substances that are secreted by some helper T cells after they are primed by contact with an antigen. Lymphokines are not antibodies but are mediators of cellular immunity. They activate various white blood cells, including other lymphocytes. Examples of lymphokines are interleukin 2, some interferons, and migration inhibition factor (MIF). All lymphokines studied so far are proteins.

**lympholysis** The lysis of lymphocytes.

**lympholytic agent** An immunosuppressive agent that causes the destruction of lymphocytes.

**lymphoma** A tumor of lymphatic tissue.

**lymphon** The entire immune system of an individual, including lymphocytes, complement, and so on.

**lymphopoiesis** The formation of lymphocytes.

**lymphosarcoma** A malignant lymphoma composed of abnormal and immature lymphocytes.

**lymphotoxin** A lymphokine that has cytotoxic effects on various target cells.

**lyochrom** An impure preparation of riboflavin.

**lyoenzyme** SOLUBLE ENZYME.

**lyolysis** Solvolysis in which the solvent either donates or accepts protons.

**lyonium ion** A solvent molecule plus a proton; in the case of water, the lyonium ion is the hydronium ion.

**lyophilic** Descriptive of the tendency of a group of atoms or of a surface to become either wetted or solvated by the solvent. *See also* hydrophilic.

**lyophilization** The removal of water under vacuum from a frozen sample; a relatively gentle process for the removal of water in which the water sublimates from the solid to the gaseous state. *See also* cryosublimation.

**lyophobic** Descriptive of the tendency of a group of atoms or of a surface to resist becoming either wetted or solvated by the solvent. *See also* hydrophobic.

**lyophobic bond** LYOPHOBIC INTERACTION.

**lyophobic interaction** The association of nonpolar groups with each other in nonaqueous, but polar, solvents. These interactions are weaker than hydrophobic interactions, and their strength decreases with an increase in temperature.

**lyotropic liquid crystal** *See* liquid crystal.

**lyotropic series** An arrangement of cations and anions in a series according to their effect on the solubility of proteins; the ions are ordered according to decreasing salting-out efficiency and decreasing extent of hydration. *See also* salting out.

**Lys** 1. Lysine. 2. Lysyl.

**lysate** 1. The suspension of ruptured cells obtained upon lysis. 2. The suspension of phage particles released from ruptured host cells during the lytic cycle.

**Lysenkoism** A pseudoscientific doctrine, proposed by T.D. Lysenko and stressed in the Soviet Union between 1932 and 1965. Lysenko rejected the gene concept and believed in the inheritance of acquired characteristics (Lamarckism).

**lysergic acid diethylamide** The most potent psychotomimetic substance known; it induces a schizophrenic-like state in humans. A hallucinogenic drug that is believed to produce chromosomal aberrations. *Abbr* LSD.

**lysin** An antibody that can lead to cell lysis.

**lysine** An aliphatic, basic, and polar alpha amino acid; contains six carbon atoms and two amino groups. *Abbr* Lys; K.

**lysine intolerance** A genetically inherited metabolic defect in humans that is due to a deficiency of the enzyme L-lysine: NAD-oxidoreductase.

**lysine-rich histone** An older term for histone H1.

**lysine vasopressin** A vasopressin, occurring in hogs, in which the eighth amino acid residue has been replaced by a lysine residue. *Abbr* LVP.

**lysine vasotocin** A vasotocin, occurring in hogs, that contains a lysine residue at position 8.

**lysis** The rupture and dissolution of cells.

**lysis from within** The lysis of bacterial cells that occurs as a result of the intracellular multiplication of phage particles.

**lysis from without** The lysis of bacterial cells that occurs without intracellular phage multiplication and that is due to the large number of holes produced in the cell wall by lytic enzymes of the phage; the enzymes either are released into the medium or are contained within the adsorbed phage particles.

**lysis inhibition** The delay in the lysis of bacterial cells that occurs when a cell culture is inoculated with a phage and is then heavily reinoculated with the same phage a few minutes later.

**lyso-** See lysoglycerophospholipid.

**lysochrome** A substance that dissolves in lipids and thereby colors them.

**lysogen** A bacterium that contains a complete set of genes from a temperate phage; a lysogenic bacterium.

**lysogenic** Of, or pertaining to, lysogeny.

**lysogenic bacterium** 1. A bacterium that has survived the infection by a temperate phage and that has incorporated the prophage into the bacterial DNA; a lysogenized bacterium. 2. A bacterium that can be infected by a

temperate phage.

**lysogenic conversion** The phage-mediated, phenotypic changes of a bacterium, as those relating to growth and morphology, that may accompany the infection of the bacterium by a temperate phage.

**lysogenic cycle** The sequence of reactions whereby a bacterial cell becomes infected with a temperate phage, incorporates the prophage into the bacterial DNA, and then divides. A variation of this set of reactions occurs when the phage DNA becomes a plasmid rather than a segment of the host chromosome.

**lysogenic immunity** IMMUNITY (2).

**lysogenic response** The incorporation of phage DNA into the bacterial DNA that follows the infection of the bacterium by a temperate phage.

**lysogenic virus** A virus that can become a prophage; a temperate phage.

**lysogenization** The production of lysogenic bacteria by infection of a sensitive bacterial strain with a temperate phage.

**lysogenized bacterium** LYSOGENIC BACTERIUM (1).

**lysogeny** The phenomenon of bacterial infection by temperate phages.

**lysoglycerophospholipid** A glycerophospholipid of phosphatidic acid in which one of the two acyl groups (fatty acid groups), attached to the carbon atoms of glycerol, has been removed by hydrolysis; these reactions are catalyzed by phospholipases and the compounds are hemolytic. *Aka* lysophosphoglyceride.

**lysolecithin** A lysophosphoglyceride of lecithin that causes lysis of erythrocytes.

**lysophosphatide** LYSOPLHOSPHOGLYCERIDE.

**lysophosphoglyceride** LYSOGLYCEROPHOSPHOLIPID.

**lysophospholipase** See phospholipase.

**lysophospholipid** LYSOPLHOSPHOGLYCERIDE.

**lysosomal disease** A genetically inherited metabolic defect in humans that is due to a deficiency of an enzyme located in the lysosomes; examples of lysosomal diseases are Fabry's, Gaucher's, Niemann-Pick's, Pompe's, and Wolman's diseases. *Aka* lysosomal storage disease. See also mucopolipidosis; mucopolysaccharidosis.

**lysosomal storage disease** See lysosomal disease.

**lysosome** A membrane-enclosed cytoplasmic structure in eukaryotic cells that is rich in hydrolytic enzymes and functions in intracellular digestion. Lysosomes contain some 60 acid hydrolases, including glycosidases, nucleases, proteases, lipases, sulfatases, and phosphatases. Primary lysosomes are newly formed organelles that have not yet encountered substrates for digestion; secondary lyso-

somes are membranous sacs of diverse morphology formed by repeated fusion of primary lysosomes with a variety of other structures; they are frequently given special names such as digestive vacuole, multivesicular body, and autophagic vacuole.

**lysosomotropic agent** An agent that is rapidly taken up by cells and is selectively concentrated within the lysosomes; the uptake of chloroquine and  $\text{NH}_4\text{Cl}$  by adipocytes is an example.

**lysozyme** The enzyme that catalyzes the hydrolysis of polysaccharides that occur in the glycopeptide layer of bacterial cell walls; a bacteriolytic enzyme that is present in such biological fluids as egg white and saliva.

**lysyl bradykinin** See kinin.

**lysyl-lipoamide** The complex formed by the covalent linkage (via an amide bond) of lipoic acid (in either its oxidized, disulfide, or its

reduced, sulfhydryl form) to an epsilon amino group of a lysine residue in a polypeptide chain.

**lytic** Of, or pertaining to, lysis.

**lyticase** ZYMOLYASE.

**lytic cycle** 1. The sequence of reactions whereby a virulent phage infects a bacterial cell, multiplies inside the cell, and ultimately leads to the lysis of the cell. 2. The sequence of reactions whereby a prophage is induced in an infected bacterial cell, multiplies inside the cell, and ultimately leads to the lysis of the cell.

**lytic enzyme** An enzyme that catalyzes a hydrolysis reaction; a hydrolytic enzyme.

**lytic response** The intracellular multiplication of a virulent virus that leads to the lysis of the infected cell.

**lytic virus** A virus that can cause cell lysis; a virulent virus.