

# U

**U** 1. Uracil. 2. Uridine. 3. Enzyme unit. 4. Uranium. 5. Uniformly labeled.

**U1** One of a group of small nuclear ribonucleoproteins (snRNP) that function in the splicing of nuclear pre-mRNA. U1 consists of several polypeptides and an RNA molecule (165 nucleotides) that contains a segment that is complementary to the acceptor and donor junctions of introns. Other members of the group that have been identified include U2, U4, U5, and U6.

**Ubbelohde viscometer** A capillary-type viscometer that permits the measurements of viscosity as a function of concentration, since the solution can be diluted directly in the viscometer.

**ubiquinol** Reduced coenzyme Q; CoQH<sub>2</sub>.  
**ubiquinol : cytochrome C oxidoreductase** Complex III.

**ubiquinone** Coenzyme Q.

**ubiquitin** A small, heat-stable, nonenzymatic polypeptide of 76 amino acids that is widely distributed (as its name implies) in eukaryotic cells. ATP hydrolysis drives a reaction whereby ubiquitin becomes covalently linked, via its carboxyl group, to the amino group of lysine in proteins that are substrates for proteolysis. It is believed that the attachment of ubiquitin marks a given protein for rapid intracellular degradation; it may serve to tag damaged or abnormal proteins. Ubiquitin is also involved in histone modification and appears to be part of certain receptor sites on lymphocyte surfaces.

**ubiquitination** The covalent linking of ubiquitin to a protein.

**ubiquitous RNA** A class of RNA molecules that form part of the small nuclear RNA complement and that have wide occurrence. Ribosomal 5S RNA and transfer RNAs are examples.

**UDP** 1. Uridine diphosphate. 2. Uridine-5'-diphosphate.

**UDPG** Uridine diphosphate glucose; *see* UDP-glucose.

**UDP-Gal** Uridine diphosphate galactose.

**UDP-Glc** Uridine diphosphate glucose; *see* UDP-glucose.

**UDP-glucose** Uridine diphosphate glucose; a nucleoside diphosphate sugar that serves as the donor of a glucose residue in the biosynthesis of glycogen. *Abbr* UDPG; UDP-Glc.

**UEP** Unit evolutionary period.

**UFA** Unesterified fatty acids.

**UIBC** Unsaturated iron-binding capacity.

**ultimate carcinogen** The form of a carcinogen in which it ultimately reacts with cellular macromolecules; the reactive intermediate formed from a carcinogen that is inactive per se. The ultimate carcinogen is believed to be a form that contains an electrophilic center (such as a carbonium ion, free radical, epoxide, or metal cation) that attacks electron-rich centers in proteins and nucleic acids.

**ultimate precision** *See* method of ultimate precision.

**ultra-** 1. Prefix meaning excessive. 2. Prefix meaning beyond the range of.

**ultracentrifugation** Centrifugation, performed in an ultracentrifuge, in which high centrifugal forces are used.

**ultracentrifuge** A high-speed centrifuge capable of generating speeds of approximately 60,000 rpm and centrifugal forces of approximately 500,000 × g.

**ultracryotomy** The preparation of thin sections from frozen tissue specimens.

**ultrafiltration** The filtration of a solution through a filter or a membrane that will retain macromolecules.

**ultramicrotome** A microtome for cutting very thin sections of tissues, about 0.05 to 0.10 μm in thickness, for electron microscopic examination.

**ultrasonic** Of, or pertaining to, ultrasound.

**ultrasonication** The exposure of material to ultrasound; used for the rupture of cells and the denaturation of proteins.

**ultrasound** Sound waves that have frequencies greater than those of audible sound; refers particularly to sound waves that have frequencies of 500,000 cps or higher.

**ultrastructure** The fine structure of tissues, cells, and subcellular particles beyond that revealed by the light microscope.

**ultraviolet dichroism** The dichroism produced when ultraviolet light is absorbed by oriented samples such as nucleic acid preparations.

**ultraviolet microscope** A microscope that utilizes ultraviolet light for illumination of the specimen and for image formation. It has twice the resolving power of an ordinary light microscope and may be used for estimating the amount of nucleic acid in a sample.

**ultraviolet optics** ABSORPTION OPTICAL SYSTEM.

**ultraviolet spectrum** That part of the electromagnetic spectrum that covers the wavelength range of about  $1.3 \times 10^{-6}$  to  $4 \times 10^{-5}$  cm and that includes photons which are emitted or absorbed during electronic transitions; radiation of the shorter wavelengths is known as far ultraviolet, and that of the longer wavelengths is known as near ultraviolet. *Abbr* UV spectrum.

**umber codon** The codon UGA; one of the three termination codons. *Aka* opal codon.

**umber mutation** A mutation in which a codon is mutated to the umber codon, thereby causing the premature termination of the synthesis of a polypeptide chain.

**UMP** 1. Uridine monophosphate (uridylic acid). 2. Uridine-5'-monophosphate (5'-uridylic acid).

**unbalanced growth** The growth of cells such that not all of the cellular components increase by the same factor and, hence, the overall composition of the cells does not remain constant. A given increase in the concentration of protein, DNA, RNA, lipid, or some other macromolecule is not coincident with the same increase in the mass and number of cells.

**uncertainty principle** The principle, enunciated by Heisenberg, that it is impossible to know simultaneously, with absolute precision, both the position and the speed of a small particle, such as an electron. Specifically, the product of the uncertainty in position  $\Delta x$  and the uncertainty in momentum  $\Delta p$  can be no smaller than Planck's constant  $h$ . Thus,  $\Delta x \cdot \Delta p \geq h$ . Depending on the precise definition of  $\Delta x$  and  $\Delta p$ , the right side of this expression can be  $h$ ,  $h/2\pi$ , or  $h/4\pi$ . *Aka* Heisenberg uncertainty principle.

**uncharged polar amino acid** A polar amino acid that carries no charge in the intracellular pH range of about 6 to 7.

**uncharged tRNA** A transfer RNA molecule that does not have an amino acid covalently linked to it.

**uncoating** The removal of the protein coat from a virus that occurs extracellularly in the case of bacterial viruses and, apparently, intracellularly in the case of animal viruses.

**uncoating enzyme** An enzyme that functions in the removal of the protein coat from a virus.

**uncoded amino acid** An amino acid, such as hydroxyproline or hydroxylysine, for which no codon exists. Such an amino acid is derived by enzymatic modification of the parent amino acid (e.g., proline or lysine) after the parent amino acid has become incorporated into a polypeptide chain in response to its codon.

**uncompensated acidosis** An acidosis in which the blood pH falls due to insufficient compensatory mechanisms.

**uncompensated alkalosis** An alkalosis in which the blood pH rises due to insufficient compensatory mechanisms.

**uncompetitive inhibition** The inhibition of the activity of an enzyme that is characterized by a decrease in the maximum velocity compared to that of the uninhibited reaction and by a reciprocal plot (1/velocity versus 1/substrate concentration) which is parallel to that of the uninhibited reaction. *See also* degree of inhibition.

**uncompetitive inhibitor** An inhibitor that binds to the enzyme-substrate complex but does not bind to the free enzyme.

**uncoupler** Uncoupling agent.

**uncoupling** 1. The separation of the two processes that constitute oxidative phosphorylation such that ATP synthesis is dissociated from the electron transport system at one or more of the phosphorylation sites. As a result of uncoupling, ATP synthesis is inhibited but electron transport and respiration are allowed to proceed and may even be stimulated. 2. The decreased sensitivity of target cells to stimulation by a ligand that is due to the fact that specific receptors, while still present, are unable to activate a particular enzyme. The two processes of ligand binding to a receptor and enzyme activation by the ligand-receptor complex have been separated. *See also* desensitization (3).

**uncoupling agent** An inhibitor that brings about the uncoupling of ATP synthesis from the electron transport system at one or more of the phosphorylation sites.

**undecaprenol** A long-chain lipid, containing 11 isoprene units, that serves as a carrier (in the form of undecaprenol phosphate) of carbohydrates in the biosynthesis of peptidoglycan in bacteria. *See also* glycosylation.

**undecaprenol phosphate** *See* undecaprenol.

**undernutrition** Malnutrition resulting from the consumption of inadequate amounts of food so that one or more of the essential nutrients are lacking in the diet. *Aka* undernourishment.

**underwinding** Negative supercoiling; *see* superhelix.

**uneconomic species** An undesirable species; the species that is eliminated by another, desirable, species through the use of chemicals.

**uni-** 1. Referring to one kinetically important substrate and/or product of a reaction; thus a uni bi reaction is a reaction with one substrate and two products. 2. Prefix meaning one.

**unidirectional replication** DNA replication that

proceeds in one direction; one replicating fork moving in a given direction, as in the rolling circle model.

**uniformitarianism** See doctrine of uniformitarianism.

**uniformly labeled** Designating a compound that is labeled in all of the positions in the molecule in a statistically uniform or nearly uniform manner; generally refers to  $^{14}\text{C}$ -labeled compounds. *Sym* U.

**unifunctional feedback** A feedback mechanism that affords control in only one direction so that the input of a system is affected by either an increase or a decrease of the output; a system in which the pH will be adjusted if it rises above the normal value is an example.

**unilamellar vesicle** See vesicle.

**unimolecular reaction** A chemical reaction in which one molecule (or other entity) of a single reactant is transformed into products.

**unineme hypothesis** The hypothesis that a newly formed chromatid contains a single double-stranded DNA molecule.

**unionized calcium** The physiologically inactive form of calcium that cannot diffuse through a semipermeable membrane through which calcium ions ( $\text{Ca}^{2+}$ ) can pass; represents largely that fraction of calcium that is bound to plasma proteins, particularly albumin.

**uniport** The transport of a substance across a membrane that is not linked to the transport of another substance across the same membrane. See also antiport; symport.

**unique DNA** DNA sequences that occur only once in the haploid genome. Most structural genes and their introns are unique DNA. *Aka* nonrepetitive DNA. See also repetitive DNA.

**unitarian hypothesis** The hypothesis that the injection of an antigen results in the formation of a single type of antibody that has multiple functions and that can react with antigens under all conditions, such as those of agglutination, precipitation, and complement fixation.

**unitary rate** The rate constant of an elementary step.

**unit cell** The smallest portion of a crystal that embodies the structural characteristics of the crystal and that, when repeated indefinitely, will generate the entire structure.

**unit evolutionary period** The time required for the amino acid sequence of a protein from two species to change by 1% (that is, develop a difference of 1 amino acid residue per 100 residues) after the two species have diverged in the course of evolution. *Abbr* UEP.

**unit mass** The quantity  $m/z$ , used in mass spectrometry, where  $m$  and  $z$  are the mass and charge of the fragment, respectively.

**unit membrane hypothesis** The hypothesis that the structure of biological membranes can be described in terms of a unit membrane, about 90 Å thick. The unit membrane is considered to be a bilayer of polar lipids, such as phospholipids, surrounded on both sides by protein. The lipids are arranged with their nonpolar portions inward and their polar portions outward where they are coated with protein molecules that are in their beta configuration. *Aka* Danielli-Davson-Robertson model; Robertson model. See also Danielli-Davson model; fluid mosaic model.

**unit mitochondrion hypothesis** A controversial idea, proposed by some biologists, according to which there exists only one mitochondrion per cell in vivo. The hundreds and thousands of mitochondria seen in electron microscope preparations are considered to be artifacts, arising from disruption of massive in vivo mitochondria as the sample is prepared for electron microscopy.

**unit of complement** The amount of complement that lyses 50% of the sensitized erythrocytes. *Abbr*  $\text{C H}_{50}$  unit.

**unit of enzyme** See enzyme unit.

**unit of information** See bit.

**unit of transcription** See transcription unit.

**unity of biochemistry** The phenomenon that widely different microbial, plant, and animal cells show a high degree of similarity with respect to both the types of molecules that they contain and the metabolic reactions that these molecules undergo.

**universal buffer** A mixture of several buffers that can be used over a relatively wide pH range.

**universal code** A code in which the same codons code for the same amino acids in all types of organisms.

**universal donor** An individual of the O type in the ABO blood group system, who can donate blood to any recipient.

**universal recipient** An individual of the AB type in the ABO blood group system, who can receive blood from any donor.

**universal red shift** The phenomenon that the wavelength of maximum absorption for a compound in solution generally occurs at a longer wavelength than that for the compound in the gas phase.

**universe** The thermodynamic system plus its surroundings.

**unmasking** The conversion of an unreactive amino acid residue or an unreactive site on a protein molecule to a reactive one that is accessible to specific reagents and that can participate in specific binding or other reactions. The process may involve conformational changes in the molecule and/or proteolytic re-

removal of blocking groups.

**unmixing** 1. The sorting out of solute molecules from solvent molecules in a solution, a process that is accompanied by a decrease in entropy. 2. The formation of a single complex from separate particles, a process that is accompanied by a decrease in entropy.

**unpaired electron** A single electron, instead of the usual two, in an orbital.

**unresponsiveness** IMMUNOLOGICAL UNRESPONSIVENESS.

**unrestricted** Descriptive of a restricted mutant that has undergone the opposite modification. *See also* restricted virus.

**unsaponifiable lipid** The fraction of lipid in a sample that remains insoluble after saponification of the sample with alkali; it consists principally of steroids and terpenes.

**unsaturated fatty acid** A fatty acid that contains one or more double bonds in the alkyl chain. Unsaturated fatty acids have lower melting points than corresponding saturated fatty acids; all of the common unsaturated fatty acids are liquid at room temperature. Some unsaturated fatty acids are essential in animals but they are probably obtained in sufficient amounts in the typical human diet.

**unsaturated iron-binding capacity** The difference in the concentration of iron between the maximum potential concentration (transferrin fully saturated with iron) and the actual concentration (transferrin only about 25 to 30% saturated with iron); generally expressed in terms of micrograms per 100 mL of plasma. *Abbr* UIBC.

**unscheduled DNA synthesis** DNA synthesis that occurs during some stage of the cell cycle other than the S phase. *See also* cell cycle.

**unselective marker** A marker that does not affect the growth of the organism on a selective medium.

**unstable mutation** A mutation that has a high frequency of back mutation to the original, nonmutated state.

**unstable protein** TRIGGER PROTEIN.

**unstructured smectic** *See* liquid crystal.

**untargeted mutagenesis** The production of mutations that occur at locations other than the actual sites of damage in DNA. Mutations arising in ultraviolet irradiated DNA that do not occur at thymine dimer sites, are an example.

**untwistase** *See* topoisomerase.

**untwisting enzyme** *See* topoisomerase.

**unwindase** SINGLE-STRAND BINDING PROTEIN.

**unwinding protein** SINGLE-STRAND BINDING PROTEIN.

**unzippering** *See* zippering.

**u orientation** The sense of insertion of a DNA fragment into a vector such that the genetic

maps of the fragment and the vector have different orientations. *See also* n orientation.

**UP** Uroporphyrin.

**upfield** Describing a peak in nuclear magnetic resonance that is on the high magnetic field side of the spectrum. *See also* shielded nucleus.

**UPG** Uroporphyrinogen.

**uphill reaction** ENDERGONIC REACTION.

**up promoter mutation** *See* promoter up mutation.

**U protein** Unstable protein; *see* trigger protein.

**upstream** Describing a location or a sequence of units in the opposite direction to that in which a process occurs: (a) during transcription, the location or sequence of deoxyribonucleotides on the transcribed strand of DNA from the 5'- to the 3'-end; (b) during translation, the location or the sequence of ribonucleotides on the mRNA from the 3'- to the 5'-end; (c) during replication, the location in a direction that is opposite to that of the replicating fork movement; (d) in a polypeptide chain, the sequence of amino acids in which they are linked together, from the C- to the N-terminal; (e) in the electron transport system, the sequence of electron carriers in a direction opposite to the flow of electrons, from oxygen to metabolite. *See also* downstream.

**upstream activation sites** Sites in eukaryotic DNA that are usually 50–300 bp upstream from the promoter and that have a regulatory role in transcription; they are believed to be binding sites for transcription factors.

**upward flow** A column chromatographic technique, frequently used in gel filtration, in which the eluent is passed upward through the column. This minimizes compression of the gel bed and allows for finer control of the flow rate.

**UQ** Ubiquinone.

**UQH<sub>2</sub>** Dihydroubiquinone; reduced coenzyme Q.

**Ura** Uracil.

**uracil** The pyrimidine 2,4-dioxy pyrimidine that occurs in RNA. *Abbr* U; Ura.

**uracil-DNA glycosidase** *See* uracil-N-glycosylase.

**uracil fragments** Fragments that are excised during DNA replication as a result of the misincorporation of uracil in place of thymine. The fragments consists of uracil and nucleotides from which uracil has been removed. The fragments are formed by the combined action of several enzymes, including uracil-N-glycosylase and AP endonuclease.

**uracil-N-glycosylase** An enzyme that functions in DNA repair by removing a uracil that was either erroneously incorporated or formed by

- mutation. The action of this enzyme is then followed by that of AP endonuclease and DNA polymerase. *Aka* uracil-DNA glycosidase.
- uracil-rich code** An early version of the genetic code according to which the codons of all the amino acids contain at least one uracil nucleotide.
- urate** A salt of uric acid.
- urate oxidase** URICASE.
- Urd** Uridine.
- urea** A compound that is formed in the urea cycle during amino acid catabolism and that is one of the major forms in which nitrogen is excreted in the urine; urea is also the end product of purine catabolism in most fishes and amphibia. *Aka* carbamide.
- urea cycle** The cyclic set of reactions whereby two amino groups, derived from the catabolism of two amino acids, and a molecule of carbon dioxide are converted to urea which is then excreted.
- urease** An enzyme that appears to have an absolute specificity and that catalyzes only the single reaction whereby urea is hydrolyzed to carbon dioxide and ammonia.
- urenzyme** A rudimentary form of an enzyme in a primitive cell.
- ureotelic organism** An organism, such as a mammal, that excretes the nitrogen from amino acid and purine catabolism primarily in the form of urea.
- urethane** Ethyl carbamate; a carcinogenic agent.
- Urey equilibrium** The equilibrium established in the reaction in which the reactants are carbon dioxide and calcium silicate, and the products are calcium carbonate and silica. The reaction has been proposed by Urey to be the one by means of which the carbon dioxide pressure was maintained at low levels in the primitive atmosphere of the earth.
- ur genes** The genes coding for a "minimal" biological system that is essential for all organisms; the genes coding for rRNA, ribosomal proteins, and the enzymes and other proteins involved in DNA replication, DNA transcription, and RNA translation.
- uria** 1. Combining form meaning the presence of a substance in the urine. 2. Combining form meaning the presence of excessive amounts of a substance in the urine.
- uric acid** A purine that does not occur in nucleic acids but that is an intermediate of purine catabolism in some organisms, and an end product of purine catabolism in humans and other organisms.
- uricase** A copper-containing enzyme that catalyzes the oxidation of uric acid by molecular oxygen to allantoin and hydrogen peroxide.
- uricolysis** The reaction catalyzed by the enzyme uricase.
- uricosome** An early term for peroxisome; so coined, because of the presence of urate oxidase in these organelles.
- uricosuria** The presence of excessive amounts of uric acid in the urine.
- uricosuric drug** A drug that tends to promote the excretion of uric acid.
- uricotelic organism** An organism, such as a bird, that excretes the nitrogen from amino acid and purine catabolism primarily in the form of uric acid.
- uridine** The ribonucleoside of uracil. Uridine mono-, di-, and triphosphate are abbreviated, respectively, as UMP, UDP, and UTP. The abbreviations refer to the 5'-nucleoside phosphates unless otherwise indicated. *Abbr* Urd; U.
- uridine diphosphate glucose** See UDP-glucose.
- uridine nucleotide coenzyme** See nucleotide coenzyme.
- uridylic acid** The ribonucleotide of uracil.
- uridylylation** The transfer of a 5'-UMP group (5'-uridylyl group) from UTP; specifically, the transfer of a uridylyl group from UTP, catalyzed by the enzyme uridylyl-transferase. This reaction is part of the complex regulation of the activity of the enzyme glutamine synthetase in *E. coli*.
- urinalysis** The chemical and physical analysis of urine.
- urinometer** A hydrometer designed for measuring the specific gravity of urine.
- urkaryote** The original eukaryotic cell from which present day eukaryotes evolved.
- U1 RNA** See U1.
- urochrome** The principal pigment of urine that is composed of a peptide of unknown structure and either urobilin or urobilinogen.
- urogastrone** A gastrointestinal hormone that inhibits the secretion of HCl by the stomach; appears to be identical to human epidermal growth factor.
- urokinase** A serine protease, synthesized in the kidney and found, as its name implies, in the urine; a plasminogen activator that converts plasminogen to plasmin.
- uromodulin** A glycoprotein of 616 amino acids that has immunosuppressive properties in vitro. It contains about 30% carbohydrate and is synthesized by the kidney; it appears to be identical to the Tamm-Horsfall glycoprotein which is the most abundant protein of renal origin in normal human urine.
- uronic acid** A monocarboxylic sugar acid of an aldose in which the primary alcohol group has been oxidized to a carboxyl group.
- uroporphyrin** The urinary pigment derived

from uroporphyrinogen. *Abbr* UP. *See also* porphyrin.

**uroporphyrinogen** An intermediate in the biosynthesis of the porphyrins that is formed by the linking of four molecules of porphobilinogen. *Abbr* UPG.

**ursolic acid** An unsaturated, pentacyclic, triterpene carboxylic acid that occurs widely in plants as the free acid or as the aglycone of triterpene saponins.

**usnic acid** A antibiotic produced by some lichens that is active against many gram-positive bacteria (including *Mycobacterium tuberculosis*) and some fungi.

**USP** Unites States Pharmacopeia; denotes a chemical that meets specifications set out in the U.S. Pharmacopeia.

**USPHS** United States Public Health Service.

**Ussing chamber technique** A technique for evaluating active transport by mounting a piece of tissue in a Lucite chamber in such a way that both electrical and chemical gradients are eliminated.

**Ussing's short circuit** An experimental setup for the measurement of membrane potentials and of concentration gradients across a membrane.

**ustilagic acids** A group of extracellular glycolipids, produced by *Ustilago* species (fungi that

are plant parasites).

**utile cycle** A cyclic set of reactions that does accomplish something in metabolism and that, therefore, does not constitute a futile cycle.

**UTP** 1. Uridine triphosphate. 2. Uridine-5'-triphosphate.

**UV** Ultraviolet.

**UV endonuclease** An *E. coli* enzyme (composed of three subunits) that functions in the repair of DNA which contains thymine dimers that were produced by ultraviolet irradiation. The enzyme makes a cut at or near the 5'-end of the thymine dimer. *Aka* UVR<sup>+</sup> endonuclease.

**UV-induced dimer** A pyrimidine dimer that is formed in DNA by exposure of the DNA to ultraviolet light. *See also* pyrimidine dimer; thymine dimer.

**UV monitor** A monitor, the operation of which is based on the measurement of the absorption of ultraviolet light by a solution.

**UV reactivation** The phenomenon that the survival of UV-irradiated lambda phage particles is higher on an irradiated host than on an unirradiated host; represents a DNA repair mechanism that involves the SOS repair system. *Aka* Weigle reactivation; W reactivation.

**UVR<sup>+</sup> endonuclease** UV ENDONUCLEASE.

# V

- v** Reaction rate.
- v<sub>0</sub>** 1. Initial velocity. 2. Control velocity; initial velocity in the absence of an inhibitor.
- $\bar{v}$**  Partial specific volume.
- V** 1. Maximum velocity. 2. Volume. 3. Volt. 4. Valine. 5. Vanadium.
- vacant lattice point model** A model for the structure of water according to which the water structure is an essentially crystalline system that is closely related to an open, expanded, ice-like structure into which free and nonassociated water molecules can easily fit.
- vaccenic acid** An unsaturated fatty acid that contains 18 carbon atoms and one double bond; it is the major unsaturated fatty acid in *E. coli*.
- vaccination** An immunization in which a vaccine is administered to humans or to animals for the purpose of establishing resistance to an infectious disease.
- vaccine** A suspension of antigens that are derived from infectious bacteria or viruses and that, upon administration to humans or to animals, will produce active immunity and will provide protection against infection by these, or by related, bacteria or viruses.
- vaccinia virus** A virus of the poxvirus group that infects humans and many animals.
- vacuole** An intracellular structure, surrounded by a single membrane (tonoplast) and filled with fluid. Plant vacuoles are usually large and occupy a major portion of the cell volume. Animal vacuoles are much smaller and are also known as secretory vesicles or secretory granules.
- vacuolysosome** A lysosome that has fused with a vacuole.
- vacutainer** An evacuated tube used in the drawing of blood.
- vacuum evaporator** A vacuum chamber in which metal atoms are evaporated in the process of shadowcasting specimens for electron microscopy.
- vacuum ultraviolet** The range of the ultraviolet spectrum that encompasses wavelengths less than  $1.8 \times 10^{-5}$  cm.
- Val** 1. Valine. 2. Valyl.
- valence** 1. The number of electrons of an atom or a group of atoms that participate in the formation of chemical bonds. 2. ANTIGEN VALENCE. 3. ANTIBODY VALENCE.
- valence bond theory** The theory of chemical bonding that is developed by considering the atoms to have intact atomic orbitals, and then moving the atoms closer to each other with a resultant overlap of the atomic orbitals. According to this theory, a covalent bond is formed by the overlap of two orbitals, one from each bonding atom, and with each orbital holding one electron. A coordinate covalent bond is formed by the overlap of an orbital of one atom, holding two electrons, with an unoccupied orbital of a second atom.
- valence electron** An electron that is located in the outermost energy shell of an atom and that participates in the formation of chemical bonds.
- valency** Variant spelling of valence.
- valent** Combining form meaning valence; used either with mono, di, . . . , poly to indicate the chemical valence of atoms and ions, or with uni, bi, . . . , multi to indicate the immunological valence of antigens or antibodies.
- valine** An aliphatic, branched, nonpolar alpha amino acid that contains five carbon atoms. *Abbr* Val; V.
- valinemia** A genetically inherited metabolic defect in humans due to a deficiency of the enzyme valine aminotransferase.
- valinomycin** An ionophorous antibiotic, produced by *Streptomyces fulvissimus*, that acts as an uncoupler of oxidative phosphorylation; a depsipeptide antibiotic.
- vanadium** An element that is essential to humans and animals. Symbol, V; atomic number, 23; atomic weight, 50.942; oxidation states, +2, +3, +4, +5; most abundant isotope, <sup>51</sup>V; a radioactive isotope, <sup>48</sup>V, half-life, 16 days, radiation emitted, positrons and gamma rays.
- vancomycin** A glycopeptide antibiotic, produced by some species of *Actinomycetes*, that inhibits peptidoglycan biosynthesis.
- van Deemter equation** An equation that expresses the height equivalent of a theoretical plate in chromatography as the sum of three terms: an eddy diffusion term, a molecular diffusion term, and a mass transfer term.
- van Deemter plot** A plot of height equivalent of a theoretical plate as a function of average gas flow rate in a gas chromatographic column.
- van den Bergh reaction** A colorimetric reaction for bilirubin that is based on the formation of

- a diazo dye from bilirubin and diazotized sulfanilic acid. The direct van den Bergh reaction measures direct-acting bilirubin, and the indirect van den Bergh reaction measures indirect-acting bilirubin.
- van der Waals compound** A compound in which neutral atoms or molecules are held together by van der Waals interactions; the dimers formed from noble gas atoms are an example.
- van der Waals distance** The distance between two atoms at which the attractive van der Waals force is just balanced by the repulsive force due to the orbital electrons of the two atoms; the distance is equal to the sum of the van der Waals radii of the two atoms. *Aka* van der Waals contact distance; van der Waals separation.
- van der Waals forces** VAN DER WAALS INTERACTIONS.
- van der Waals interactions** The attractive and repulsive forces between atoms and molecules that involve various dipole-dipole interactions and that consist of three components: a dispersion effect, an induction effect, and an orientation effect. The three components are classified as weak interactions, since the energy of these interactions is proportional to  $r^{-6}$  where  $r$  is the distance between the interacting species. *See also* dispersion effect; induction effect; orientation effect; weak interactions.
- van der Waals radius** One-half of the van der Waals distance between two like atoms; one-half of the equilibrium internuclear distance between two non-bonded atoms when the attractive and repulsive forces between the two atoms are exactly balanced. *Aka* van der Waals contact radius.
- van der Waals repulsive force** A repulsive force that develops when noncovalently bonded atoms or molecules approach each other closer than their van der Waals distance; due to the repulsion of the overlapping electron clouds.
- van der Waals shell** The space surrounding the nucleus of an atom that is described by the van der Waals radius.
- van der Waals surface** The complex surface of a folded protein that results when each atom is depicted as a sphere of its van der Waals radius and overlapping spheres, where the atoms are covalently bonded, are truncated. This surface has a strictly defined area and encloses a definite volume.
- vanilmandelic acid** 3-Methoxy-4-hydroxy-mandelic acid; a compound that is quantitatively the most important metabolite of the catecholamines and that is used to assess the endogenous production of catecholamines. *Abbr* VMA.
- van Slyke method** A method in which a chemical reaction is measured by either the volume or the pressure of a gas released during the reaction.
- van't Hoff complex** A catalyst-reactant complex for which the conversion to free catalyst plus product proceeds at a much faster rate than the reversion to free catalyst plus reactant. *See also* Arrhenius complex.
- van't Hoff equation** An equation that describes the variation of the equilibrium constant  $K$  with the absolute temperature  $T$  at constant pressure; specifically,  $d \ln K / dt = \Delta H^0 / RT^2$ , where  $\Delta H^0$  is the standard enthalpy change and  $R$  is the gas constant.
- van't Hoff factor** A measure of the deviation of a solution from ideality; equal to the ratio of the measured value of a colligative property of the solution to the value calculated on a molar basis.
- van't Hoff isobar** VAN'T HOFF EQUATION.
- van't Hoff isochore** VAN'T HOFF EQUATION.
- van't Hoff limiting law** An expression for the limiting value of the osmotic pressure of an ideal solution; specifically,  $\lim_{c \rightarrow 0} \Pi = RT/M$ , where  $\Pi$  is the osmotic pressure,  $c$  is the concentration of the solute,  $M$  is the molecular weight of the solute,  $R$  is the gas constant, and  $T$  is the absolute temperature.
- van't Hoff plot** A plot of the logarithm of the equilibrium constant as a function of the reciprocal of the absolute temperature. *See also* van't Hoff equation.
- V antigen** A surface antigen of some viruses.
- vapor diffusion method** A method for the slow crystallization of a substance; used in the preparation of transfer RNA crystals.
- vapor-liquid partition chromatography** GAS CHROMATOGRAPHY (2).
- vapor phase chromatography** GAS CHROMATOGRAPHY.
- vapor pressure osmometer** An osmometer, the operation of which is based on the lowering of the vapor pressure of a solvent by the addition of a solute.
- variable** Generally, any quantity that varies. More precisely, a variable in the mathematical sense; that is, a quantity that may take on any one of a specified set of values. *See also* dependent variable; independent variable; variate.
- variable arm** *See* arm.
- variable genes** *See* V genes.
- variable of state** STATE FUNCTION.
- variable region** That part of the immunoglobulin molecule in which differences in amino acid sequences are found when immunoglobulins from different sources are compared. The region comprises portions of both the light and the heavy chains and includes the two antigen binding sites. Variable regions con-



sists of hypervariable regions, where the bulk of amino acid sequence variability occurs, and of framework regions, in which the amino acid sequence is relatively constant. *Aka* variable domain. *See also* constant region.

**variable substrate** The substrate the concentration of which is varied while the concentrations of other substrates are maintained at fixed values; used in kinetic studies of multisubstrate enzyme systems.

**variance** 1. The square of the standard deviation. 2. DEGREES OF FREEDOM (1).

**variance analysis** *See* analysis of variance.

**variance-ratio distribution** An *F* distribution; *See F* test.

**variance-ratio test** *F* TEST.

**variant** 1. *n* One of several forms of a protein, occurring within one species or distributed among several species, that differ from each other either in their state of aggregation, as in the case of isozymes, or in their amino acid sequence, as in the case of abnormal hemoglobins. *See also* multiple forms of an enzyme. 2. A strain that differs in some aspects from the given microorganism. 3. *adj* Dissimilar; showing variation. Said of nonidentical amino acid residues that occupy similar positions in the same polypeptide chain which is isolated from different sources.

**variant repetition** The occurrence of non-identical, but related, genes per nucleus; gives rise to a family of related proteins (variants).

**variate** A random variable; a variable that can take on any of the values of a specified set with specified relative frequency or probability. *Aka* random variable; chance variable; stochastic variable.

**varicella** The primary form of the disease produced by varicella virus in a host that was not previously infected by the virus.

**varicella virus** A virus of the herpesvirus group that leads to varicella in hosts without immunity to the disease and to herpes zoster in hosts with immunity. It is the causal agent of chicken pox and shingles. *Aka* varicella-zoster virus.

**variola virus** The virus of the poxvirus group that causes smallpox.

**varion** A variable codon; the number of codons for a pair of homologous proteins that have been free to fix mutations over some part of the period during which the two proteins have diverged from their common ancestor; it is a joint property of the pair of nucleotide sequences. *See also* covarion.

**vascular** Of, or pertaining to, vessels that conduct a biological fluid; such vessels include those that carry the blood and those that conduct the sap of plants.

**vasocative** Having an effect on blood vessels.

**vasoactive intestinal peptide** A peptide hormone of 28 amino acids that is found in the gastrointestinal tract and that possesses a wide variety of biological functions when infused into an animal. These functions include vasodilation, increase of cardiac output, increase of glycogenolysis, inhibition of gastric secretion, stimulation of intestinal secretion, and stimulation of lipolysis. *Abbr* VIP.

**vasoconstriction** A decrease in the diameter of the blood vessels.

**vasoconstrictor** An agent that causes vasoconstriction.

**vasodepressor** An agent that brings about a lowering of the blood pressure.

**vasodilation** An increase in the diameter of the blood vessels.

**vasodilator** An agent that causes vasodilation.

**vasopressin** A cyclic peptide hormone, consisting of nine amino acids, that increases the blood pressure and increases the absorption of water by the kidneys; it is secreted by the posterior lobe of the pituitary gland and occurs in mammals. *Abbr* VP.

**vasopressor principle** VASOPRESSIN.

**vasotocin** A cyclic peptide hormone, consisting of nine amino acids, that is related to vasopressin in its structure and in its function; it is secreted by the posterior lobe of the pituitary gland and occurs in birds, reptiles, and some amphibians.

**VCD** Vibrational circular dichroism.

**vector** 1. A directional quantity. 2. An organism that serves to transfer a parasite from one host to another. 3. A self-replicating DNA molecule that serves to transfer a DNA segment (passenger) into a host cell in recombinant DNA technology. The three most common types of vectors used are bacterial plasmids, phages, and other viruses.

**vectorial** Of, or pertaining to, a vector.

**vectorial discharge** Descriptive of the transmembrane insertion of proteins during protein synthesis according to the signal hypothesis; the term vectorial indicates directionality of transport from the cytosol to the lumen of the rough endoplasmic reticulum and directionality with respect to the protein (N-terminal end inserted into the membrane first); the term discharge emphasizes that this is an active, energy-requiring process. *See also* signal hypothesis.

**vectorial enzyme** An enzyme that is directional in its action, such as one that is fixed in a membrane.

**vectorial phosphorylation** The coupled processes of transport and phosphorylation of monosaccharides in the bacterial phosphotransferase system.

**vectorial reaction** A reaction that is directional

- and in which the components either are not free to move at random or are fixed in a nonrandom order; a reaction across a membrane is generally a vectorial reaction.
- vectorial thioesterification** The coupled processes of transport and thioesterification whereby a fatty acid is converted to fatty acyl coenzyme A in *E. coli*.
- vectorial transfer** CHANNELING.
- vegan** A strict vegetarian; an individual who eats only plant food products. *See also* lacto vegetarian; lacto-ovo vegetarian.
- vegetative** Pertaining to growth, particularly of plants, as opposed to reproduction.
- vegetative cell** An actively growing cell, as distinct from one forming spores.
- vegetative DNA** The pool of genetically competent DNA of a phage that is produced during the vegetative state of the phage but that has not yet been assembled into complete phage particles.
- vegetative map** The genetic map of a phage that is deduced from its vegetative replication.
- vegetative mycelium** That portion of the mycelium of a fungus that penetrates into the medium and absorbs nutrients.
- vegetative nucleus** 1. The macronucleus of a ciliate. 2. The tube nucleus of a pollen grain. 3. The nucleus of a cell during interphase.
- vegetative phage** A phage in its vegetative state.
- vegetative replication** The replication of vegetative DNA.
- vegetative reproduction** 1. Asexual reproduction. 2. The reproduction in plants without true seeds.
- vegetative state** The state of a phage during which it replicates actively and autonomously within the host cell; a noninfective state during which infective phage particles have not yet been assembled. During this state the phage controls the synthesis by the host of components that are necessary for the production of infective phage particles.
- vehicle** VECTOR (3).
- vein** A blood vessel that transports blood from the tissues to the heart.
- velocity** REACTION RATE.
- velocity constant** RATE CONSTANT.
- venom substrate** STUART FACTOR.
- venous** Of, or pertaining to, veins.
- ventilation** The process whereby oxygen is supplied to the lungs and to the blood in the capillaries of the lungs; aeration of the blood in the lungs.
- venule** A small vein or veinlet.
- verification** The deacylation of a misacylated transfer RNA molecule by its aminoacyl-tRNA synthetase, thereby regenerating the uncharged tRNA molecule.
- Verner-Morrison syndrome** PANCREATIC CHOLERA.
- vernier** A small, movable, auxiliary scale that is attached to a larger scale and that has divisions of slightly different width than those of the larger scale; used for increasing the accuracy of a measurement.
- Veronal** Trademark for barbital.
- Versene** Trademark for ethylene dinitrotetraacetic acid.
- vertebrate** 1. *n* An animal that has a backbone; includes fishes, amphibia, reptiles, birds, and mammals. 2. *Adj* Of, or pertaining to, an animal that has a backbone.
- vertical evolution** The process whereby a species changes over time, without splitting, and evolves into a new and distinct species.
- vertical transmission** The transmission of viruses from one generation of hosts to the next. *Aka* vertical infection.
- very early RNA** PREEARLY RNA.
- very high-density lipoprotein** A plasma lipoprotein that has a density above 1.21 g/mL. An increase in the concentration of very high-density lipoproteins (VHDL) is believed to be linked to a decrease in the incidence of atherosclerosis. VHDL contain about 57% protein, 21% phospholipid, 17% cholesterol and cholesterol esters, and 5% triacylglycerols (triglycerides). VHDL have molecular weights of about  $1.5-2.8 \times 10^5$ , a sedimentation coefficient of 2-10S, and are classified as the  $\alpha$ -fraction on the basis of electrophoresis. *Abbr* VHDL. *See also* lipoprotein.
- very high-lipid lipoprotein** VERY LOW-DENSITY LIPOPROTEIN.
- very long-chain fatty acids** *See* adrenoleukodystrophy.
- very low-density lipoprotein** A plasma lipoprotein that has a density of 0.95-1.006 g/mL. An increase in the concentration of very low-density lipoproteins (VLDL) is believed to be linked to an increase in the incidence of atherosclerosis. VLDL contain about 10% protein, 18% phospholipid, 22% cholesterol and cholesterol esters, and 50% triacylglycerols (triglycerides). VLDL have molecular weights of about  $5.0-20 \times 10^6$ , a flotation coefficient of 12-400S, and are classified as the pre-beta fraction on the basis of electrophoresis. *Abbr* VLDL. *See also* lipoprotein.
- very low-lipid lipoprotein** VERY HIGH-DENSITY LIPOPROTEIN.
- vesicle** 1. A small sac; a membranous cavity. 2. A closed bilayer structure. The structure may consist of a single bilayer (unilamellar vesicle) or of several bilayers (multilamellar vesicle). Unilamellar vesicles may be small (SUV; 0.02-0.05  $\mu\text{m}$ ), or large (LUV;  $\geq 0.06 \mu\text{m}$ ); multilamellar vesicles (MLV) range in size from 0.1 to 5.0  $\mu\text{m}$ . Vesicles formed from

- synthetic surfactants are called surfactant vesicles; those composed of phospholipids are called liposomes.
- vesicular stomatitis virus** A virus of the genus rhabdovirus that infects cattle, pigs, and horses, producing symptoms as in foot and mouth disease. *Abbr* VSV.
- vesiculine** A highly acidic, low molecular weight (10,000) protein in synaptosome vesicles.
- V genes** Genes that code for segments of the variable region of immunoglobulin molecules.
- $v_H$**  The variable region of the heavy chains of the immunoglobulins.
- VHDL** Very high-density lipoprotein.
- $v_i$**  Initial velocity in the presence of an inhibitor.
- viable** Describing a cell or an organism that is alive and capable of reproduction.
- viable count** The number of viable cells in a bacterial culture.
- $V_i$  antigen** A surface antigen of bacteria that is different from the O antigen.
- vibrating reed electrometer** A sensitive electrometer that is used for measuring the small currents produced in an ionization chamber.
- vibrational circular dichroism** A spectroscopic method in which one measures the difference in absorption of right- and left-circularly polarized light by chiral compounds. *Abbr* VCD.
- vibrational optical activity** A group of related spectroscopic methods which includes vibrational circular dichroism and Raman optical activity. *Abbr* VOA.
- vibrational transition** The transition of a molecule in which, as a result of the stretching or the bending of a bond, the molecule undergoes a vibration so that the atomic nuclei are temporarily displaced, but their equilibrium positions are not changed. Vibrational transitions require energies that are intermediate between those of electronic and those of rotational transitions, and they are induced by short wavelength infrared radiation.
- vibronic transition** A molecular transition in which the energy of vibration is added to that of the electronic transition; a transition in which both the electronic and the vibrational quantum numbers change.
- vic-** Combining form meaning vicinal.
- vicinal** Referring to two substituents on adjacent carbon atoms. *Abbr* vic.
- villi** Large, fringe-like projections of an epithelium. *See also* microvilli.
- villikinin** A gastrointestinal hormone that controls the movement of the villi.
- villin** A protein, isolated from intestinal microvilli, that binds to and fragments actin filaments.
- vimentin** A protein (MW 55,000) that is a component of intermediate filaments; vimentin filaments are found in fibroblasts.
- vinblastine** An indole alkaloid used as an anti-tumor agent in the treatment of Hodgkin's disease and other cancers. Vinblastine inhibits microtubule formation; it disrupts microtubules of the mitotic spindle and preferentially kills rapidly dividing cells.
- vinca alkaloids** A group of indole alkaloids that includes mitotic poisons, hypertensive agents, and anticancer compounds.
- vincal leukoblastine** VINBLASTINE.
- vincristine** An indole alkaloid, related to vinblastine and used in the treatment of leukemia and various other types of cancer.
- vinculin** A fibrous protein, believed to be involved in anchoring actin filaments to the inner side of the cell membrane. Vinculin is also present at patches on the cell surface, called adhesion plaques, believed to be responsible for intercellular adhesion. Cells infected with Rous sarcoma virus produce a kinase (src protein) that modifies vinculin, a reaction that may play a role in cytoskeletal changes following cell transformation by the virus.
- vinegar souring** ACETIFICATION.
- vinyl** The radical  $-\text{CH}=\text{CH}_2$  that is derived from ethylene.
- viologen** A 4,4'-bipyridinium salt. Compounds of this type can be polymerized to yield redox polymers (polyviologens or polymeric viologens) that can serve as electron donors for some dehydrogenases.
- viosterol** CALCIFEROL.
- VIP** Vasoactive intestinal peptide.
- viral** Of, or pertaining to, viruses.
- viral coat** CAPSID.
- viral hepatitis** *See* hepatitis.
- viral interference** The inhibition of viral multiplication that may occur upon multiple infection of cells with the same virus or upon mixed infection with two or more different viruses; due to a large extent to the action of interferon that is produced in response to the infecting viruses.
- viral multiplication cycle** *See* multiplication cycle.
- viral particle** VIRUS.
- viral-specific** VIRUS-SPECIFIC.
- viral yield** The average number of infectious viral particles obtained per productive cell.
- viremia** The presence of virus particles in the blood. Viremia is said to be primary or secondary depending on whether it is due to progeny virions produced principally at the site of the initial infection, or whether it is due to those produced in other organs.
- virgin cell** A lymphocyte in peripheral lymphoid tissue that has not yet encountered an antigen. When such a cell encounters an antigen, it may be stimulated to multiply and

to become an effector cell or a memory cell.

**virial coefficient** See virial expansion.

**virial expansion** A mathematical expansion of the general form  $Y = A + BX + CX^2 + \dots$ , where  $X$  is a variable and  $A, B, C$ , etc. are the first, second, third, etc., virial coefficients. *Aka* virial equation.

**viricide** A chemical or a physical agent that inactivates viruses.

**virion** A complete viral particle consisting of a nucleocapsid and any additional structural proteins and/or envelopes; a virus.

**virogene theory** ONCOGENE THEORY.

**viroid** A virus-like infectious particle that consists of a single-stranded, covalently closed, circular RNA molecule, does not have a protein coat, and has a molecular weight of about 100,000 (about 300 nucleotides). Viroids are the causal agents of some plant diseases, such as potato spindle tuber disease, and are resistant to a wide range of treatments to which viruses are usually sensitive. Viroids appear to be related structurally to some introns and are believed by some to represent escaped introns. *Aka* infectious RNA; pathogene; pathogenic RNA.

**virology** The science that deals with viruses and viral diseases.

**viroplasm** Electron-dense aggregates of viral particles or viral components that occur in the cytoplasm of some virus-infected cells.

**viroplast** One of a group of spherical or elongated bodies that occur in the cytoplasm of some virus-infected plant cells; consists of an accumulation of viral particles with or without cytoplasmic components.

**virosome** An artificial macromolecular complex that is formed when animal viral membrane proteins and lipid films (prepared from lecithin and diacetyl phosphate) are mixed and dialyzed free of nonionic detergents.

**virulence** 1. PATHOGENICITY. 2. The multiplication of virulent viruses.

**virulent** Of, or pertaining to, virulence.

**virulent virus** A virus that causes lysis of the host cell that it infects; such a virus multiplies in the host cell and forms progeny viral particles which are released into the medium when the cell bursts. In the case of bacteria, a virulent phage cannot become a prophage.

**virus** An infectious agent that consists of protein and either DNA or RNA, both of which are arranged in an ordered array and are sometimes surrounded by a membrane. A virus is generally smaller than a bacterium and is an obligate intracellular parasite at the genetic level; it uses the cell machinery to produce viral products specified by the viral nucleic acid. Viruses can be classified into 6 classes on the basis of the type of nucleic acid

that they contain and the mechanism involved in the production of viral mRNA ( $\pm$  represents double-stranded nucleic acid; +DNA has the same polarity as the mRNA; +RNA is identical to the mRNA; and -RNA is complementary to the mRNA):

Class I ( $\pm$ DNA)  $\rightarrow$  +mRNA  $\rightarrow$  Protein  
 Class II (+DNA)  $\rightarrow$   $\pm$ DNA  $\rightarrow$  +mRNA  $\rightarrow$  Protein

Class III ( $\pm$ RNA)  $\rightarrow$  +mRNA  $\rightarrow$  Protein  
 Class IV (+RNA)  $\rightarrow$  -RNA  $\rightarrow$  +mRNA  $\rightarrow$  Protein

Class V (-RNA)  $\rightarrow$  +mRNA  $\rightarrow$  Protein  
 Class VI (+RNA)  $\rightarrow$  -DNA  $\rightarrow$   $\pm$ DNA  $\rightarrow$  +mRNA  $\rightarrow$  Protein

See also plus strand.

**virus antigen** A surface antigen of some viruses.

**virusoid** Plant satellite RNA.

**virus receptor** A cell membrane receptor to which a virus attaches.

**virus-specific** Designating a protein or a nucleic acid molecule that is coded for by a viral gene rather than by a host cell gene, and that is produced in the host cell after its infection by the virus.

**virus theory of cancer** See oncogene theory.

**viscid** VISCIOUS.

**viscoelastic** Descriptive of a substance, such as a concentrated polymer solution, that exhibits properties of both liquids and solids.

**viscometer** An instrument for measuring the viscosity of a liquid.

**Visconti-Delbrueck hypothesis** The hypothesis according to which the types and frequencies of phage recombinants that are obtained upon phage infection of bacterial cells are due to the multiplication and the repeated mating of the phages in the host cells. Mating occurs in pairs and at random, and each mating produces phage recombinants as a result of the exchange of genetic material by one or more crossovers between the parental phages. The total intracellular collection of vegetative phage genomes is called a mating pool.

**viscose rayon** Fibers of regenerated cellulose.

**viscosimeter** VISCOMETER.

**viscosity** The resistance of a fluid to flow; the internal friction of a fluid. For Newtonian fluids, the viscosity is the force required to maintain unit velocity for a fluid flowing between two parallel plates of unit area each and a unit distance apart. *Sym*  $\eta$ . *Aka* coefficient of viscosity.

**viscosity-average molecular weight** An average molecular weight that is obtained from viscosity measurements. It is given by  $\bar{M}_v = (\sum n_i M_i^{\alpha+1} / \sum n_i M_i)^{1/\alpha}$  where  $n_i$  is the number of moles of component  $i$ ,  $M_i$  is the molecular weight of component  $i$ , and  $\alpha$  is a quantity

that varies with the system being studied. When  $\alpha = 1$ ,  $\bar{M}_v$  becomes equal to the weight-average molecular weight ( $\bar{M}_w$ ); when  $\alpha < 1$ ,  $\bar{M}_v$  falls between the number-average ( $\bar{M}_n$ ) and the weight-average molecular weight; and when  $\alpha > 1$ ,  $\bar{M}_v$  falls between the weight-average molecular weight and the z-average molecular weight ( $\bar{M}_z$ ). *Sym*  $\bar{M}_v$ .

**viscosity increment** A measure of the asymmetry of a solute molecule that is equal to the ratio of the intrinsic viscosity of the solution to the partial specific volume of the solute.

**viscosity number** REDUCED VISCOSITY.

**viscosity ratio** RELATIVE VISCOSITY.

**viscotoxins** A group of homologous proteins, containing 46 amino acid residues and 3 disulfide bonds; the viscotoxins are plant toxins (phytotoxins) that act as hypotensive agents, slowing the rate of heart beat.

**viscous** 1. Possessing viscosity. 2. Thick; sticky; glutinous.

**viscous drag** The frictional force that counteracts and balances either the electrical driving force in electrophoresis or the centrifugal force in sedimentation.

**visible dichroism** The dichroism that is produced when visible polarized light is absorbed by oriented samples.

**visible mutation** A mutation that results in some alteration of the morphology of an organism.

**visible spectrum** That part of the electromagnetic spectrum that covers the wavelength range of about  $4 \times 10^{-5}$  to  $7.5 \times 10^{-5}$  cm and that includes photons that are emitted or absorbed during electronic transitions.

**visual cycle** A cyclic set of reactions that occur in both the rods and the cones of the retina whereby (a) light leads to the isomerization of 11-*cis*-retinal to the all-*trans*-retinal and to its dissociation from the appropriate opsin, and (b) the all-*trans* isomer is reconverted enzymatically to the 11-*cis* isomer which recombines with the opsin.

**visual pigment** One of several conjugated proteins that consist of an opsin and a form of vitamin A aldehyde and that function in the biochemical reactions that pertain to vision.

**visual purple** RHODOPSIN.

**visual threshold** The minimum light intensity required to produce a visual sensation.

**vital capacity** The greatest volume of air that can be expired after a forced inspiration; includes the tidal, supplemental, and complementary airs.

**vitalism** The doctrine that life and its phenomena are not fully explicable in terms of the laws and processes of chemistry and physics, and that they require special vital forces that are found only in living organisms. *See*

*also* mechanistic philosophy.

**vital stain** A stain that can penetrate the cell membrane of a living cell and that can stain the contents without injury to the cell.

**vitamer** One of two or more forms of a vitamin; vitamins A<sub>1</sub> and A<sub>2</sub> are examples of vitamers.

**vitamin** An organic compound that (a) occurs in natural food in extremely small concentrations and is distinct from carbohydrates, lipids, proteins, and nucleic acids; (b) is required by the organism (generally restricted to animals) in minute amounts for normal health and growth, and generally functions as a component of a coenzyme; (c) when absent from the diet, or improperly absorbed from the food, leads to the development of a specific deficiency disease; (d) cannot be synthesized by the organism and must, therefore, be obtained exclusively through the diet.

**vitamin A** A generic descriptor of all  $\beta$ -ionone derivatives, other than provitamin A carotenoids, that exhibit qualitatively the biological activity of all-*trans*-retinol. Vitamin A is a fat-soluble vitamin that is structurally related to the carotenes and that is required for certain aspects of metabolism, particularly the biochemistry of vision. Vitamin A<sub>1</sub> (retinol<sub>1</sub>) predominates in higher animals and marine fish, and vitamin A<sub>2</sub> (retinol<sub>2</sub>) predominates in freshwater fish; the two forms differ by one double bond in the molecule. A deficiency of vitamin A causes night blindness and xerophthalmia. The recommended names for vitamin A derivatives are as follows: retinol (vitamin A<sub>1</sub> alcohol; axerophthol); retinal or retinaldehyde (vitamin A<sub>1</sub> aldehyde; retinene); retinoic acid (vitamin A<sub>1</sub> acid); and 3-dehydroretinol (vitamin A<sub>2</sub>). *See also* anti-promoter.

**vitamin A<sub>1</sub>** *See* vitamin A.

**vitamin A<sub>2</sub>** *See* vitamin A.

**vitamin A<sub>1</sub> acid** *See* vitamin A.

**vitamin A<sub>1</sub> alcohol** *See* vitamin A.

**vitamin A<sub>1</sub> aldehyde** *See* vitamin A.

**vitamin B** 1. VITAMIN B COMPLEX. 2. The original antiberiberi activity.

**vitamin B<sub>1</sub>** THIAMINE.

**vitamin B<sub>2</sub>** RIBOFLAVIN.

**vitamin B<sub>3</sub>** PANTOTHENIC ACID.

**vitamin B<sub>4</sub>** An activity, isolated from yeast or liver, that could alleviate muscular weakness in rats and chicks. The existence of vitamin B<sub>4</sub> has not been confirmed since all purported vitamin B<sub>4</sub> deficiency symptoms could be alleviated by known nutritional factors such as thiamine, glycine, arginine, and cystine.

**vitamin B<sub>5</sub>** A growth-stimulating activity in pigeons that is probably identical with nicotinic acid.

**vitamin B<sub>6</sub>** A generic descriptor for all 3-hydroxy-2-methyl pyridine derivatives that exhibit qualitatively the biological activity of pyridoxine. Major forms of the vitamin are pyridoxine, pyridoxamine, and pyridoxal. Vitamin B<sub>6</sub> is widely distributed in nature, and its phosphorylated forms function as coenzymes in amino acid metabolism, as in the transamination reaction.

**vitamin B<sub>7</sub>** CARNITINE.

**vitamin B<sub>8</sub>** The nucleotide adenylic acid that is no longer classified as a vitamin.

**vitamin B<sub>9</sub>** A designation that has not been used for a B vitamin.

**vitamin B<sub>10</sub>** An activity that promotes growth and feathering in the chick and that is a mixture of folic acid and vitamin B<sub>12</sub>.

**vitamin B<sub>11</sub>** An activity that promotes growth and feathering in the chick and that is a mixture of folic acid and vitamin B<sub>12</sub>.

**vitamin B<sub>12</sub>** A generic descriptor for all corrinoids that exhibit qualitatively the biological activity of cyanocobalamin. Vitamin B<sub>12</sub> is a cobalt-containing vitamin and its inadequate absorption from the intestine causes pernicious anemia. Coenzyme forms of vitamin B<sub>12</sub> are termed cobamides. Different forms of vitamin B<sub>12</sub> are named by reference to cobalamin, a derivative of cobamide. *See also* cobamide; cobalamin.

**vitamin B<sub>13</sub>** A compound, isolated from distillers dried solubles, that was provisionally called vitamin B<sub>13</sub> and later shown to be orotic acid, an intermediate in pyrimidine metabolism. Orotic acid is not recognized as a vitamin by United States and Canadian drug authorities.

**vitamin B<sub>14</sub>** An unconfirmed vitamin.

**vitamin B<sub>15</sub>** Preparations marketed in the United States as vitamin B<sub>15</sub> or pangamate (pangamic acid) have been shown to contain one or more of the following: calcium gluconate, glycine, *N,N*-dimethylglycine, and *N,N*-diisopropylamine dichloroacetate. Only the latter compound has pharmacological activity leading to decreased blood pressure and body temperature in rats. Since the compositions of these preparations are undefined, adequate clinical studies to test the claims for pangamate have not been made. At present, there is no scientific evidence that pangamate preparations have vitamin activity.

**vitamin B<sub>17</sub>** A term used to describe laetrile and/or amygdalin. Neither laetrile nor amygdalin (nor any similar cyanogenic glucosides) are recognized by United States or Canadian drug authorities as vitamins; nor is the term vitamin B<sub>17</sub> recognized by these authorities. *See also* laetrile; amygdalin.

**vitamin B<sub>c</sub>** An activity that prevents nutritional

anemia in the chick and that is known to be folic acid.

**vitamin B complex** A group of diverse water-soluble vitamins that are classified as a group primarily for historical reasons though, to some extent, they are found together in nature. The complex includes niacin, riboflavin, folic acid, thiamine, pyridoxine, pantothenic acid, biotin, and cobalamin. The compounds choline, lipoic acid, inositol, and *p*-aminobenzoic acid are usually also classified as B vitamins. Most, if not all, of the B vitamins function as components of coenzymes.

**vitamin B group** VITAMIN B COMPLEX.

**vitamin B<sub>p</sub>** An activity that prevents perosis in the chick and that is replaceable by a mixture of choline and manganese.

**vitamin B<sub>t</sub>** An activity that promotes insect growth and that contains carnitine as the active component.

**vitamin B<sub>w</sub>** BIOTIN.

**vitamin B<sub>x</sub>** *p*-AMINOBENZOIC ACID.

**vitamin C** A generic descriptor for all compounds that exhibit qualitatively the biological activity of ascorbic acid. Vitamin C is a water-soluble vitamin that occurs in fruits and vegetables. Vitamin C functions in the regulation of oxidation-reduction reactions in metabolism; a deficiency of vitamin C causes scurvy. *See also* antipromoter.

**vitamin C<sub>2</sub>** *See* bioflavonoids.

**vitamin D** A generic descriptor for all steroids that exhibit qualitatively the biological activity of cholecalciferol; a group of fat-soluble vitamins, structurally related to the sterols, that are active in the prevention and cure of rickets. Since they can be derived from sterols by ultraviolet irradiation, vitamin D is not required in the diet if the organism has adequate access to ultraviolet light (present in sunlight). Vitamin D affects the absorption and deposition of calcium phosphate. *See also* 1,25-dihydroxycholecalciferol.

**vitamin D<sub>1</sub>** Originally considered to be a pure vitamin but later shown to be a mixture of vitamin D<sub>2</sub> (ergocalciferol) and lumisterol.

**vitamin D<sub>2</sub>** ERGOCALCIFEROL.

**vitamin D<sub>3</sub>** CHOLECALCIFEROL.

**vitamin D-resistant rickets** A form of rickets that is indistinguishable in its symptoms from ordinary rickets but differs from the latter in being resistant to treatment with vitamin D. It can be due to a number of unrelated causes. The most common form is a genetically inherited metabolic defect involving the renal transport mechanism for phosphorus.

**vitamin E** A generic descriptor for all tocol and tocotrienol derivatives that exhibit qualitatively the biological activity of  $\alpha$ -tocopherol; a group of fat-soluble vitamins that

- are required for normal growth and fertility of animals. Tocopherols are widely distributed in nature and function primarily as antioxidants. *See also* antipromoter.
- vitamin F** 1. Obsolete designation for the activity of the essential fatty acids as reflected in the prevention of atherosclerosis in animals; confirmed to be the compound *cis,cis*-linoleic acid. 2. Obsolete designation for thiamine.
- vitamin G** Obsolete designation for riboflavin.
- vitamin GH<sub>3</sub>** *See* gerovital.
- vitamin H** Obsolete designation for biotin.
- vitamin H<sub>3</sub>** *See* gerovital.
- vitamin hypothesis** The hypothesis that certain compounds having the properties of vitamins constitute an essential dietary requirement of an organism.
- vitamin I** Obsolete designation for vitamin B<sub>7</sub>.
- vitamin J** Obsolete designation for vitamin C<sub>2</sub>.
- vitamin K** A generic descriptor for 2-methyl-1,4-naphthoquinone and all of its derivatives that exhibit an antihemorrhagic activity in animals fed a vitamin K-deficient diet. The compound 2-methyl-3-phytyl-1,4-naphthoquinone is generally called vitamin K or phyloquinone (phytylmenaquinone; phytonadione). The vitamin K derivatives represent a group of widely distributed fat-soluble vitamins that have quinone-type structures and that are required for the formation of prothrombin. A deficiency of vitamin K causes prolonged clotting times and hemorrhagic disease.
- vitamin L<sub>1</sub>** A liver filtrate activity believed to be necessary for lactation and shown to be anthranilic acid.
- vitamin L<sub>2</sub>** A yeast filtrate activity believed to be necessary for lactation and shown to be adenylythiomethylpentose.
- vitamin M** An activity that prevents nutritional anemia and leucopenia in the monkey; the compound is an active form of folic acid.
- vitamin N** Obsolete designation for a mixture obtained from either brain or stomach and believed to inhibit cancer.
- vitamin P** *See* bioflavonoids.
- vitamin PP** Obsolete designation for nicotinic acid.
- vitamin R** An activity that promotes bacterial growth and that is apparently related to folic acid.
- vitamin S** An activity that promotes the growth of chicks and that is related to the peptide streptogenin.
- vitamin T** A group of activities isolated from termites, yeasts, or molds and reported to increase growth rates, improve wound healing, alleviate skin disorders, and accelerate insect development; a varied mixture of folacin, vitamin B<sub>12</sub>, deoxyribosides, and amino acids.
- vitamin U** The methylsulfonium salts of methionine, which occur naturally in cabbage and other green vegetables, and which have been claimed to alleviate peptic ulcers in guinea pigs. These claims were not supported by later clinical trials and the compounds are not recognized as vitamins by United States and Canadian drug authorities.
- vitamin V** An activity from tissue that promotes bacterial growth and that has been shown to be a mixture of NAD<sup>+</sup> and NADH.
- vitellin** The lipid-free protein of lipovitellin.
- vitellin** The principal protein in hens' egg yolk; the lipid-free protein of lipovitellin. A glycoprotein that contains about 1% phosphate and that is derived from vitellogenin.
- vitelline membrane** A membrane that surrounds the ovum.
- vitellogenesis** The formation of egg yolk.
- vitellogenic hormone** ALLATUM HORMONE.
- vitellogenin** An egg yolk glycoprotein of amphibia and birds. It is the precursor of the proteins phosvitin and lipovitellin. The synthesis of vitellogenin is stimulated by female sex hormones.
- vitreous** Glass-like.
- vitreous humor** The gel-like material that fills the posterior cavity of the eye.
- vivisection** The cutting of, or operating on, a living animal for purposes of experimentation.
- v<sub>L</sub>** The variable region of the light chains of the immunoglobulins.
- VLCFA** Very long-chain fatty acids.
- VLDL** Very low-density lipoprotein.
- VMA** Vanilmandelic acid.
- V<sub>max</sub>** Maximum velocity.
- VOA** Vibrational optical activity.
- Voges-Proskauer test** A test for organisms that carry out butylene glycol fermentation; based on the production of a pink color by the reaction of acetoin, formed during the fermentation, with creatine in an alkaline solution.
- void volume** 1. The volume of solvent in column chromatography that is equal to the total bed volume of the column minus the volume occupied by the particles of the support; the volume of solvent that is external to the support particles. 2. OUTER VOLUME.
- vol** Volume.
- volatile buffer** A buffer that can be evaporated without leaving a residue, as one consisting of ammonium formate and ammonium hydroxide.
- volt** A unit of electrical potential which is equal to the potential required to make a current of 1 A flow through a resistance of 1 Ω.
- Sym V.*
- voltage clamp technique** A technique for study-

ing the effects of membrane potentials that are intermediate between the resting potential and the peak of the action potential; based on the production of a sudden displacement of the membrane potential from its resting value by means of a pair of electrodes, and on holding the potential across the membrane at this new level by means of a feedback amplifier. The current that flows through a definite area of the membrane, maintained by a space clamp, under the influence of this applied voltage (called command voltage) is then measured with a separate pair of electrodes and a separate amplifier.

**voltage-gated channel** See gated channel.

**voltammetry** The electroanalytical study of chemical reactions by the measurement of the currents produced by the electrolysis of oxidizable or reducible substances as a function of the applied voltage.

**voltammogram** See cyclic voltammetry.

**volume fraction** The fraction of the solution volume that is occupied by the solute.

**volume receptor** A receptor in the central nervous system that responds to changes in the volume of the blood.

**volumetric analysis** A method of chemical analysis that is based on the measurement of the volume of a standard solution which is required to react completely with a sample of the substance that is being determined.

**volumetric pipet** A pipet that is enlarged to a bulb in its center and that is used for the transfer of a fixed volume of liquid.

**volumetric technique** A gasometric technique

in which gas volumes are measured.

**volutin granule** A microbial storage granule of polymetaphosphate that stains metachromatically; found in cyanobacteria, yeast, and other microorganisms.

**von Gierke's disease** GLYCOGEN STORAGE DISEASE TYPE I.

**von Willebrand factor** FACTOR VIII.

**von Willebrand's disease** A genetically inherited metabolic defect in humans, characterized by blood coagulation disorder and slow aggregation of platelets, and due to a deficiency of Factor VIII.

**vortex stirrer** A device for mixing a solution in a test tube by forming a vortex in the solution.

**VP** Vasopressin.

**VPC** Vapor phase chromatography.

**VPg** Genome-linked viral protein; a small protein that is linked covalently to the 5'-end of the RNA of poliovirus. Its function is to prime viral replication.

**V region** Variable region.

**VSV** Vesicular stomatitis virus.

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

**vulcanization** The cross-linking of natural rubber chains by means of sulfur.

**v/v** The concentration of a solution that is expressed in terms of volume per unit volume.

**vWF** von Willebrand factor.



# W

- W** 1. Tryptophan. 2. Watt. 3. Wyosine. 4. Writhing number.
- Walden inversion** The alteration of the configuration of an asymmetric center in a molecule as a result of a bimolecular displacement reaction.
- walking** See chromosome walking.
- walking down the helix** The movement of the replisome along the DNA during replication.
- wall effect** The spreading and curving of a zone as it migrates downward in a chromatographic column as a result of the increased flow rate at the wall of the tube compared to that at the center.
- walling-off effect** AFFERENT INHIBITION.
- wandering spot procedure** A method for sequencing synthetic oligonucleotides. Involves labeling the oligonucleotide at the 5'-end with <sup>32</sup>P, using polynucleotide kinase, and subsequent partial digestion of the oligonucleotide, using snake venom phosphodiesterase. The resulting labeled fragments are fractionated, first by electrophoresis on cellulose acetate paper at pH 3.5, and then by homochromatography on DEAE-cellulose. The sequence is determined by the characteristic mobility shifts of the labeled fragments.
- Warburg apparatus** A manometer that is used for studying the cellular respiration of tissue slices or cells by measuring oxygen uptake and/or carbon dioxide evolution. *Aka* Warburg manometer; Warburg-Barcroft apparatus.
- Warburg coefficient** METABOLIC QUOTIENT.
- Warburg-Dickens-Horecker cycle** HEXOSE MONOPHOSPHATE SHUNT.
- Warburg-Dickens pathway** HEXOSE MONOPHOSPHATE SHUNT.
- Warburg effect** 1. The inhibition of photosynthesis by high concentrations of oxygen. 2. The overproduction of lactic acid that occurs in many tumors. *See also* Warburg theory.
- Warburg method** A manometric method for studying the cellular respiration of tissue slices or cells by means of a Warburg apparatus; the tissue slices or cells are maintained at a constant temperature and the changes in gas pressure are measured with a constant volume manometer. *See also* Warburg's direct method.
- Warburg's atmnungsferment** CYTOCHROME OXIDASE.
- Warburg's direct method** A manometric method for studying the cellular respiration of tissue slices or cells in which the only gases exchanged are oxygen and carbon dioxide, and in which respiration is measured by the absorption of carbon dioxide in alkali.
- Warburg's respiratory enzyme** CYTOCHROME OXIDASE.
- Warburg's yellow enzyme** OLD YELLOW ENZYME.
- Warburg theory** A theory of cancer that is based on the universal occurrence and importance of glycolysis in the metabolism of cells. According to this theory, cancer results from an irreversible injury to respiration, specifically to the electron transport system, which is followed by a changeover in the cell to an anaerobic, glycolytic, and fermentative-type metabolism for energy production; the main difference between a normal and a tumor cell is, therefore, a shift in metabolism toward that of an anaerobic state, in which glycolysis is emphasized.
- Warburg vessel** A receptacle for the tissue slices or the cells, the cellular respiration of which is being measured in a Warburg apparatus.
- warfarin** A synthetic compound, closely related to dicumarol, that is used as a rat poison; it blocks prothrombin activation in blood clotting.
- Waring Blender** Trademark for a blender used in the preparation of tissue homogenates.
- warm antibody** An antibody that has a higher titer at elevated temperatures.
- warm-blooded** HOMOIOTHERMIC.
- Wasserman test** A complement fixation test that is used in the diagnosis of syphilis and that is based on the reaction of cardiolipin with the Wasserman antibody; cardiolipin serves as an antigen and is mixed with lecithin and cholesterol to form micelle-like structures that enhance its reactivity.
- wasting disease** A disease that is characterized by a decrease in the amount of certain tissues or organs; a pathological condition in which there is atrophy.
- water balance** The reactions and factors involved in maintaining a constant internal environment in the body with respect to the distribution of water between the various fluid compartments and with respect to the establishment of an equilibrium between the intake

of water and its output.

**water bath** A water-filled container for maintaining immersed tubes, flasks, etc., at a constant temperature.

**water compartment** FLUID COMPARTMENT.

**waterfall sequence** CASCADE MECHANISM.

**water hydrate model** A model for the structure of water according to which the water structure results from the formation of clathrate-type structures which consist of ordered, but highly random, labile frameworks in which the cages are occupied by unbonded water molecules.

**water intoxication** An extreme case of hypotonic expansion that may lead to convulsions and death.

**water of hydration** Water that surrounds and binds to solute molecules and/or forms hydrates.

**water regain** The uptake of water by a dry gel expressed as grams of water taken up per gram of gel when the latter is suspended in water and allowed to swell.

**water softening** The conversion of hard to soft water by ion exchange chromatography or by some other method.

**water-soluble B** An early designation for a fraction of water-soluble vitamins prepared from egg yolk.

**water-soluble vitamin** One of a group of vitamins that are soluble in water and that include those of the vitamin B complex as well as some other vitamins such as vitamin C and vitamin P; most, if not all, of the water-soluble vitamins function by being components of coenzymes.

**water structure** See distorted bond model; flickering cluster model; vacant lattice point model; water hydrate model.

**Watson-Crick model** The model proposed by Watson and Crick in 1953 for the structure of DNA. According to this model, DNA consists of two right-handed helical polynucleotide chains coiled around the same axis to form a double helix. The chains are antiparallel, with the deoxyribose-phosphate backbone on the outside and the purines and pyrimidines stacked perpendicularly to the fiber axis on the inside. The bases are held together by hydrogen bonds and they are specifically paired: adenine and thymine by means of two hydrogen bonds, and guanine and cytosine by means of three hydrogen bonds; the two chains are, therefore, complementary.

**Watson-Crick-type DNA** A DNA molecule that can be described by the Watson-Crick model of DNA.

**Watson strand** The DNA strand of Watson-Crick-type DNA that is transcribed in vivo;

the sense strand. *Abbr* W strand.

**watt** A unit of power equal to 1 J/s. *Sym* W.

**wavelength** The distance, along the axis of propagation, between two identical points of a wave.

**wave mechanics** See quantum mechanics.

**wave number** The number of waves per unit length; the reciprocal of the wavelength.

**wave shifter** SECONDARY FLUOR.

**wax** A neutral lipid consisting of esters formed from fatty acids and long-chain alcohols other than glycerol.

**wax acids** Fatty acids that occur in waxes.

**wax alcohols** Long-chain, monohydroxy, aliphatic alcohols that form waxes by esterification to fatty acids.

**WBC** White blood cell.

**weak electrolyte** An electrolyte that is only partially dissociated into ions in water.

**weak interactions** The attractive and repulsive forces between atoms and molecules that are less strong than those of covalent bonds, ionic bonds, and ion-ion interactions. Weak interactions include the forces of hydrogen bonds, hydrophobic bonds, van der Waals interactions, and charge fluctuation interactions.

**weak promoter** LOW-LEVEL PROMOTER.

**weight-average molecular weight** An average molecular weight that is weighted toward the heavier molecules in a mixture of molecules; specifically,  $\bar{M}_w = \sum n_i M_i^2 / \sum n_i M_i$ , where  $n_i$  is the number of moles of component  $i$ , and  $M_i$  is the molecular weight of component  $i$ . *Sym*  $\bar{M}_w$ . See also average molecular weight.

**weighted average** The average of a set of numbers obtained by multiplying each number by a weight (factor) expressing its relative importance and then dividing the sum of these products by the sum of the weights.

**weighted mean** WEIGHTED AVERAGE.

**Weigle reactivation** UV REACTIVATION.

**Weinberg-Salam theory** A unified field theory of the weak and electromagnetic forces of particle physics. See also elementary particles.

**Welan gum** A water-soluble, heteropolysaccharide, produced by fermentation of some species of *Alcaligenes*, that yields solutions of high viscosity at low concentrations.

**western blotting** A variation of the Southern blotting technique in which proteins are separated electrophoretically, transferred to a special paper which binds them covalently, and are then located by reaction with a radioactive probe (for example, radioactive double-stranded DNA for DNA binding proteins or radioactive antibodies for protein antigens). *Aka* western transfer. See also blotting.

**wet application** A method of sample application in electrophoresis in which the sample is

applied to a previously wetted support (such as cellulose acetate, for example).

**wetting agent** A surface-active agent that enhances the spreading of a liquid on a solid surface.

**wet weight** The weight of a tissue, or of collected cells, from which water has not been removed.

**Wharton's jelly** A viscous solution from the umbilical cord that is frequently used as a starting material for the preparation of hyaluronic acid.

**Whatman** Trademark for a group of filter papers.

**wheal and erythema response** A local, cutaneous anaphylactic reaction in humans that is produced by the intracutaneous injection of an allergen. *Aka* wheal and flare response.

**wheat germ agglutinin** A lectin, isolated from wheat germ, that binds to *N*-acetylglucosamine on cell surfaces.

**whey proteins** The milk proteins that are obtained by acidifying skim milk to pH 4.7 and removing the precipitated casein. Whey proteins account for about 20% of the total milk proteins.

**white adipose tissue** WHITE FAT.

**white fat** 1. Ordinary adipose tissue as opposed to brown fat. 2. Adipose tissue in which the fat is present in a single droplet within the fat cell. *Aka* white adipose tissue. *See also* brown fat.

**white muscle** A pale skeletal muscle that has a relatively low content of myoglobin and cytochromes; it is nearly devoid of mitochondria and obtains almost all of its ATP from glycolysis. It is capable of short bursts of activity. *Aka* fast-twitch muscle.

**white plaque** A plaque that does not stain with neutral red in the plaque assay; the lack of staining is due to a destruction of lysosomes in the virus-infected cells.

**White's solution** A synthetic medium for the growth of plant cells.

**whole blood** Blood that has not been fractionated in any way.

**whole body counter** A large, external-sample-type liquid scintillation counter that is designed for the determination of total body radioactivity in humans or in animals.

**whole plasma** Plasma that has not been fractionated in any way.

**whole serum** Serum that has not been fractionated in any way.

**wiggle** SQUIGGLE.

**Wijfs iodine number** An iodine number determined by the use of a solution of iodine in glacial acetic acid, with iodine chloride serving as an accelerator of the reaction.

**wild-type** 1. The typical, most frequently encountered phenotype of an organism in nature. 2. The phenotype of an organism that is used as a standard of comparison for mutants of the same organism.

**wild-type allele** *See* wild-type gene.

**wild-type gene** 1. The normal, most frequently encountered allele of a given gene of an organism. 2. An allele of a given gene that is arbitrarily selected as a standard of comparison for mutant alleles of the same gene.

**Willebrand factor** *See* von Willebrand factor.

**Wilson chamber** CLOUD CHAMBER.

**Wilson's disease** A genetically inherited metabolic defect in humans that is due to a deficiency of ceruloplasmin, resulting in an increase in the level of copper in the brain and in the liver.

**Wilzbach method** A method for the random labeling of a compound with tritium by exposing the compound to tritium gas in a sealed container for several weeks. A modification of this method entails the exposure of the compound to tritium gas in the presence of a silent electric discharge. *Aka* Wilzbach gas exposure.

**winding number** LINKING NUMBER.

**window** CHANNEL.

**windowless counter** A radiation counter in which the sample is not separated from the ionization detector by either a window or a membrane.

**windowless gas flow counter** A radiation counter that incorporates the characteristics of both a gas flow and a windowless counter.

**wobble base** The third base (the 5'-end) in the anticodon of transfer RNA; the wobble base can bind with one of several possible bases at the 3'-end of the codon.

**wobble hypothesis** A hypothesis proposed by Crick to explain how one tRNA molecule can "recognize" more than one codon. According to this hypothesis, the first two bases (the 3'-end) of the anticodon in tRNA bind to the first two bases (the 5'-end) of a codon in regular base-pairing fashion. The third base, however, of the tRNA anticodon (the 5'-end), while hydrogen bonding, has a certain amount of play or wobble that permits it to bind to one of several possible bases at the 3'-end of the codon.

**wobble pairing** The base pairing that is allowed according to the wobble hypothesis.

**Wohl-Zemplen degradation** A degradative technique for aldoses whereby the carbon of the reducing group is removed by treatment with hydroxylamine, and the sugar is converted to the next lower aldose.

**Wolfson's method** An analytical procedure for determining gamma globulins in serum by

precipitating them with ammonium sulfate and sodium chloride.

**Wolman's disease** A genetically inherited metabolic defect in humans that is due to a deficiency of a lysosomal lipase (cholesterol ester hydrolase) that normally catalyzes the hydrolysis of cholesterol esters carried by low-density lipoproteins; one of the lysosomal diseases.

**wood alcohol** Methanol; methyl alcohol.

**wood sugar** D-XYLOSE.

**wool fat** LANOLIN.

**Woolf-Augustinsson plot** A single-reciprocal plot of the Michaelis-Menten equation; a plot of  $v$  as a function of  $v/[S]$ , where  $v$  is the velocity of the reaction and  $[S]$  is the substrate concentration. *Aka* Woolf-Augustinsson-Hofstee plot.

**wool wax** LANOLIN.

**word** CODON.

**working hypothesis** A hypothesis the formulation of which provides a basis for further experiments.

**wormlike coil model** A model that is frequently invoked to describe the DNA molecule in solution. The model is characterized by a contour length and a persistence length; the latter increases with increasing stiffness of the molecule but is independent of the former. According to this model, the DNA molecule is best approximated as a rod having a continuum of flexible distortions; such a structure is intermediate between that of a rigid rod and

that of a random coil. The wormlike coil model can be considered to be a limiting case of a freely jointed chain. *See also* freely jointed chain.

**wound tumor virus** A plant virus, containing double-stranded RNA, that infects a large number of unrelated plants.

**woven bone** Bone that consists of random, nonparallel collagen fibers; found in embryonic life and during bone repair in adults.

**W reactivation** Weigle reactivation; *see* UV reactivation.

**writhe** WRITHING NUMBER.

**writhing number** The number of superhelical turns in DNA; the number of turns that the axis of the double-stranded helix makes in space in the process of forming the superhelix. The writhing number ( $W$ ) is a measure of the extent of supercoiling of the DNA. It is related to the linking number ( $L$ ) as follows:  $L = W + T$ , where  $T$  is the twisting number. *Sym*  $W$ .

**W strand** Watson strand.

**wt** Weight.

**w/v** The concentration of a solution that is expressed in terms of weight per unit volume.

**w/w** The concentration of a solution that is expressed in terms of weight per unit weight.

**wyosine** A hypermodified nucleoside, related to guanosine, that is found in tRNA; the base consists of three nitrogen-containing, fused rings. *Abbr*  $W$ .

# X

- X** 1. Xanthine. 2. Xanthosine. 3. An unidentified amino acid in an amino acid sequence.
- Xan** Xanthine.
- xanthine** A purine that is formed in catabolism by the deamination of guanine, and that does not occur in nucleic acids. *Abbr* Xan; X.
- xanthine oxidase** An enzyme of purine catabolism that catalyzes the oxidation of xanthine to uric acid and the oxidation of hypoxanthine to xanthine; a molybdenum-containing flavo-protein that also catalyzes the oxidation of aldehydes. *Abbr* XO.
- xanthine oxidase factor** Obsolete designation for inorganic molybdate.
- xanthinuria** A genetically inherited metabolic defect in humans that is characterized by the presence of excessive amounts of xanthine in the urine and that is due to a deficiency of the enzyme xanthine oxidase.
- xanthoma** A deposit of lipid in the skin; usually yellow-orange in color due to the presence of lipid-soluble pigments such as carotenes.
- xanthophyll** An oxygenated carotenoid.
- xanthoproteic reaction** A reaction for the qualitative determination of proteins that is based on the successive production of a white, yellow, and orange precipitate upon treatment of the sample with nitric acid, followed by heating and the addition of alkali.
- xanthopterin** A pterin that functions as a pigment in insects.
- xanthosine** The ribonucleoside of xanthine. Xanthosine mono-, di-, and triphosphate are abbreviated, respectively, as XMP, XDP, and XTP. The abbreviations refer to the 5'-nucleoside phosphates unless otherwise indicated. *Abbr* Xao; X.
- xanthurenic aciduria** A genetically inherited metabolic defect in humans due to a deficiency of the enzyme kynureninase, an enzyme of tryptophan metabolism.
- xanthylic acid** The ribonucleotide of xanthine.
- Xao** Xanthosine.
- X body** VIROPLAST.
- X cell** See XYZ cell theory.
- X chromosome** A sex chromosome of which the female generally carries two and the male carries one per cell.
- XDP** 1. Xanthosine diphosphate. 2. Xanthosine-5'-diphosphate.
- xeno-** Prefix meaning foreign.
- xenobiotic** 1. *n* A synthetic compound that is foreign to living systems; drugs, insecticides, anesthetics, and petroleum products are some examples. 2. *adj* Of, or pertaining to, a compound that is foreign to living systems.
- xenogeneic** Referring to a transplant from one species to another.
- xenograft** HETEROGRAFT.
- xenoplastic** Referring to a transplant from one genus to another.
- xenosome** Proposed term for intracytoplasmic symbiotic bacteria found in the marine protozoan *Parauronema acutum*. These symbionts are obligate parasites that grow and divide in synchrony with the host and cannot be cultured outside the protozoan.
- xenotropic virus** An endogenous retrovirus that does not replicate in animal cells in which it is endogenous but can grow in cells of other species.
- xero-** Prefix meaning dry.
- xeroderma pigmentosum** A genetically inherited metabolic defect in humans that is due to a deficiency in the excision-repair of pyrimidine dimers in DNA. Patients with this disease are abnormally sensitive to sunlight and show a high incidence of skin cancer.
- xerogel** A gel in which the removal of the dispersing agent (the solvent) results in the structure shrinking to an unswollen state.
- xerophthalmia** A pathological change in the eye that results from a deficiency of vitamin A; involves an extreme dryness of the conjunctiva which loses its luster and becomes skin-like from a lack of intrinsic secretion.
- xerophthol** VITAMIN A.
- xerophyte** A plant growing in an arid environment; a drought-resisting plant. *Var sp* serophyte.
- Xis** Excisionase.
- X linkage** SEX LINKAGE.
- XMDIC** Xylylene-*m*-diisocyanate; a bifunctional reagent used to label antibodies with ferritin.
- XMP** 1. Xanthosine monophosphate (xanthylic acid). 2. Xanthosine-5'-monophosphate (5'-xanthylic acid).
- XO** Xanthine oxidase.
- x ray** An electromagnetic radiation that is produced when high-speed electrons are suddenly stopped by a metal target. The impinging electrons raise target electrons to higher energy levels, and when these electrons fall back to lower energy levels the excitation energy is given off in the form of x rays. The

wavelength of x rays extends from about  $10^{-10}$  to  $2.5 \times 10^{-6}$  cm; x rays are a form of ionizing radiation. *See also* hard x rays; soft x rays.

**x-ray analysis** X-RAY CRYSTALLOGRAPHY.

**x-ray crystallography** The study of the three-dimensional structure of molecules in a crystal by means of x-ray diffraction.

**x-ray diffraction** The diffraction patterns obtained when x rays are reflected from the atoms in a crystal; a useful method for determining the structure of macromolecules. The x rays are scattered by the extranuclear electrons of the atoms as opposed to neutrons which are scattered by the atomic nuclei. *Abbr* XRD. *Aka* x-ray scattering.

**x-ray diffraction pattern** The pattern of spots, arcs, and rings that is produced by x-ray diffraction.

**x-ray film** A photographic film that is coated with a sensitive emulsion on both sides and that is used in x-ray crystallography.

**x-ray microanalysis** A technique for determining the relative and absolute concentrations of elements within cells and tissues. Based on bombarding freeze-dried specimen sections with electrons (as in the electron microscope) and then analyzing the x rays produced by various metallic and nonmetallic elements in the specimen.

**x-ray structure** The structural arrangement of the atoms in a molecule or in a crystal as deduced from x-ray diffraction patterns.

**XRD** X-ray diffraction.

**XRF** X-ray fluorescence; a spectrophotometric method in which fluorescence is produced by means of x rays.

**X<sup>2</sup> test** Chi-square test.

**XTP** 1. Xanthosine triphosphate. 2. Xanthosine-5'-triphosphate.

**Xul** Xylulose.

**Xyl** Xylose.

**xylan** A homopolysaccharide of xylose that occurs in plants.

**xylem** A group of specialized plant cells that are dead and that have thickened cell walls. They are aligned to form tubes and function in the transport of water and inorganic ions in the plant. *See also* phloem.

**xylitol** A sugar alcohol derived from xylose that can be used as a sugar substitute in the treatment of human diabetes.

**xylose** A five-carbon aldose. *Abbr* Xyl. *Aka* wood sugar.

**xylulose** A five-carbon ketose that is an intermediate in the hexose monophosphate shunt. *Abbr* Xul.

**X-Y recorder** A recorder in which two signals are recorded simultaneously by one pen; the pen is driven in one direction, the X axis, in response to one signal, and it is driven in the other direction, the Y axis, in response to the second signal.

**XYZ cell theory** A theory according to which immunocytes are classified into three categories: X cells are immunologically competent cells that are not yet engaged in any specific immunological response; Y cells are immunologically activated, or primed, cells as a result of an interaction between X cells and antigen; and Z cells are antibody-producing cells, formed as a result of a second stimulation of the Y cells by antigen. *Aka* Sterzl theory.