Glossary

Abortive infection An incomplete infectious cycle; virions infect a susceptible cell or host but do not complete replication, usually because an essential viral or cellular gene is not expressed. *(Chapter 16)*

Absolute efficiency of plating The plaque titer divided by the number of virus particles in the sample. *(Chapter 2)*

Accessibility An attribute of tropism that describes the physical accessibility of cells to virions. *(Chapter 14)*

Acquired immune response *See* Adaptive response

Active immunization The process of inducing an immune response by exposure to a vaccine. *(Chapter 19)*

Active viremia The presence of newly synthesized virions in the blood. *(Chapter 14)*

Acute infections Common infections in which virions are produced rapidly, and the infection is resolved and cleared quickly by the immune system; survivors usually are immune to subsequent infection. *(Chapter 16)*

Acylated Containing saturated or unsaturated fatty acids added posttranslationally; said of a protein. *(Chapter 12)*

Adaptive response The action of antigen-specific white blood cells and antibodies in response to infection and the development of immune memory. Also called acquired immune response. *(Chapter 15)*

ADCC *See* Antibody-dependent cell-mediated cytotoxicity

Adjuvants Substances administered with antigen that stimulate early processes in immune recognition, particularly the inflammatory response. *(Chapter 19)*

Adoptive transfer The transfer of cells, usually lymphocytes, from an immunized donor to a nonimmune recipient. *(Chapters 15 and 19)*

Alternative pathway Complement pathway initiated by direct recognition of a microbial invader by C1q or by C3b proteins; the alternative pathway is not triggered by antibody, in contrast to the classical pathway of complement activation. *(Chapter 15)*

Alternative splicing Splicing of different combinations of exons in a pre-mRNA, generally leading to synthesis of mRNAs with different protein coding sequences. *(Chapter 10)*

Ambisense Term to describe a viral genome in which mRNAs are produced both from (–) strand genomic RNA and from complementary (+) strands. *(Chapters 1 and 6)*

Anchorage independent Describes the ability of cells to grow in the absence of a surface on which to adhere; often detected by the ability to form colonies in semisolid media. *(Chapter 18)*

Aneuploid Abnormal in chromosome morphology and number. *(Chapter 2)*

Antibody-dependent cell-mediated cytotoxicity The killing of antibody-coated target cells by cells carrying Fc receptors that bind to the constant region of bound antibody; natural killer (NK) cells carrying specific Fc receptors on their surfaces often mediate this reaction. Abbreviated ADCC. *(Chapter 15)*

Antigenic drift The appearance of virions with a slightly altered surface protein (antigen) structure caused by accumulation of point mutations following passage and immune selection in the natural host. *(Chapter 16)*

Antigenic shift A major change in the surface of a virion when completely new surface proteins are acquired during infection; this process occurs when viruses with segmented genomes exchange segments, or when nonsegmented viral genomes recombine after coinfection. *(Chapters 16 and 20)*

Antigenic variation The display on virions or infected cells of new protein sequences that are not recognized by antibodies or T cells that responded to previous infections. *(Chapter 16)*

Antiviral state A property of cells that bind and respond to interferon; interferon-stimulated cells produce many gene products that block the propagation of diverse viruses that may infect subsequently. *(Chapter 11)*

Apical surface The surface of a cell exposed to the environment. *(Chapters 5 and 12)*

Apoptosis A sequence of tightly regulated reactions that ensue in response to external or internal stimuli that signal DNA damage or other forms of stress; characterized by chromosome degradation, nuclear degeneration, and cell lysis; a natural process in development and the immune system, but also an intrinsic defense of cells to viral infection. Also called programmed cell death. *(Chapter 15)*

Attenuated Describes an outcome of infection in which normally severe symptoms or pathology is mild or inconsequential; having reduced virulence. *(Chapters 1 and 14)*

Attenuated mutants Viral mutants that give rise to an attenuated infection compared with the parental strain; virulence is reduced by mutation of the viral genome. *(Chapter 19)*

Autocrine growth stimulation Stimulation of cell growth by growth factors produced and sensed by the same cell. *(Chapter 18)*

Autophagy A process whereby cells are induced to degrade the bulk of their cellular contents by formation of specialized membrane compartments related to lysosomes. *(Chapter 15)*

Auxiliary proteins Nonstructural lentiviral proteins that perform regulatory (e.g., HIV Tat and Rev) or accessory (e.g., human immunodeficiency virus Nef, Vif, Vpr, and Vpu) functions; the latter may not be required for propagation in tissue culture. *(Chapter 17)*

Avirulent Causing no, or mild, disease. *(Chapter 14)*

Axonal transport Transport within neurons of vesicles, macromolecules, and viral components by molecular motors that move along microtubules in axons. *(Chapter 12)*

Bacteriophages Viruses that infect bacteria; derived from the Greek word for eating, "phage." *(Chapter 1)*

Basal lamina A thin layer of extracellular matrix bound tightly to the basolateral surface of cells; the basal lamina is linked to the basolateral membrane by integrins. *(Chapter 5)*

Base-pairing-dependent recombination Exchange of nucleotide sequences between molecules that have a high percentage of nucleotide identity. *(Chapter 6)*

Base-pairing-independent recombination Exchange of nucleotide sequences between molecules that are very different. *(Chapter 6)*

Basolateral surface The nonspecialized surface of a cell that contacts an internal basal lamina or adjacent or underlying cells in the tissue. *(Chapters 5 and 12)*

β-barrel jelly roll A wedge-shaped protein domain formed by an eight-stranded β-sheet. This domain is present in the capsid proteins of several RNA and DNA viruses. *(Chapter 4)*

Breakage-induced template exchange A mechanism of recombination in which breakage of the RNA template that is being copied promotes exchange of one template for another. *(Chapter 6)*

Bulge loops Short, single-stranded regions within a base-paired stem region of RNA secondary structure. *(Chapter 6)*

C3 convertase A central protease activity of the complement pathways; the C3 convertase of the classical pathway is formed from membrane-bound C4b protein and the C2b protease; the C3 convertase of the alternative pathway comprises membrane-bound C3b protein and the Bb protease. *(Chapter 15)*

Cap snatching Cleavage of cellular RNA polymerase II transcripts by a viral endonuclease to produce capped primers for viral mRNA synthesis. *(Chapter 6)*

Capping The addition of m^7G via a 5′–5′ phosphodiester bond to the 5′ ends of cellular and viral transcripts made in eukaryotic cells. *(Chapter 10)*

Capsid The outer shell of viral proteins that surrounds the genome in a virus particle. *(Chapters 1 and 3)*

Caspases A family of closely related cysteine proteases that cleave polypeptides after aspartate residues. They play important roles in apoptosis. *(Chapter 15)*

Caveolae Flask-shaped invaginations in the plasma membrane of many cell types that contain the protein caveolin and are rich in lipid rafts; caveolae internalize membrane components, extracellular ligands, bacterial toxins, and some animal viruses. *(Chapter 5)*

$CD4^+$ T cells T lymphocytes that carry the coreceptor protein CD4 on their surfaces. *(Chapter 15)*

$CD8^+$ T cells T lymphocytes that carry the coreceptor CD8 on their surfaces. *(Chapter 15)*

Cell cycle The orderly and reproducible sequence in which cells increase in size, duplicate the genome, segregate duplicated chromosomes, and divide. *(Chapter 18)*

Cell-mediated response The combined actions of specific helper and effector T lymphocytes; the lymphocyte-mediated response. Also called cell-mediated immunity. *(Chapter 15)*

Centrosome The major microtubule organizing center in mammalian cells, located near the nucleus; microtubules are organized with their (–) ends at the centrosome. *(Chapter 5)*

Chaperones Proteins that facilitate the folding of other polypeptide chains, the assembly of multimeric proteins, or the formation of macromolecular assemblies. *(Chapter 13)*

Chemokines Small proteins that attract and stimulate cells of the immune defense system; produced by many cells in response to infection. *(Chapter 5)*

Chronic infections Persistent infections that are eventually cleared. *(Chapter 16)*

Clades Subtypes of human immunodeficiency virus that are prevalent in different geographic areas. *(Chapter 17)*

Classical pathway A pathway of complement activation initiated by the binding of C1q to antibody-antigen complexes on the surface of an invader or an infected cell. *(Chapter 15)*

Clinical latency A state of persistent viral infection in which no clinical symptoms are manifested. *(Chapter 17)*

Coactivators Proteins that stimulate transcription by RNA polymerase II without binding to a specific DNA sequence; generally interact with sequence-specific transcriptional activators. *(Chapter 8)*

Codon Three contiguous bases in an mRNA template that specify the amino acids incorporated into protein. *(Chapter 11)*

Complement system A set of plasma proteins that act in a concerted fashion to destroy extracellular pathogens and infected cells; originally defined as a heat-labile activity that lysed bacteria in the presence of antibody (it "complemented" antibody action); the activated complement pathway also stimulates phagocytosis, chemotaxis, and inflammation. *(Chapter 15)*

c-Oncogenes The normal cellular genes that are the origin of v-oncogenes; their products can be oncogenic when altered or synthesized inappropriately. Also called proto-oncogenes. *(Chapter 18)*

Contact inhibition Cessation of cell division when cells make physical contact, as occurs at high density in a culture dish. *(Chapter 18)*

Continuous cell lines Cell cultures of a single cell type that can be propagated indefinitely in culture. *(Chapter 2)*

Copy choice A mechanism of recombination in which an RNA polymerase first copies the 3′ end of one parental strand and then exchanges one template for another at the corresponding position on a second parental strand. *(Chapters 6 and 7)*

Core promoters The minimal set of DNA sequences required for accurate initiation of transcription by RNA polymerase II. *(Chapter 8)*

Coreceptor A cell surface molecule that, in addition to the receptor, is required for entry of virus particles into cells. *(Chapter 5)*

CTL escape mutants Mutations in the viral coding sequences for immunodominant peptides that render infected cells invisible to the T-cell response. *(Chapter 16)*

Cutaneous immune system The unique collection of skin-specific lymphocytes and dendritic cells (Langerhans cells) that are important in the initial response and resolution of skin infections. Also called skin-associated lymphoid tissue, or SALT. *(Chapter 15)*

Cytokines Soluble proteins produced by cells in response to various stimuli, including virus infection; they affect the behavior of other cells both locally and at a distance, by binding to specific cytokine receptors. *(Chapter 15)*

Cytopathic effects The morphological changes induced in cells by viral infection. *(Chapter 2)*

Cytopathic viruses Viruses that kill a cell rapidly while producing a burst of new infectious particles. *(Chapter 16)*

Cytoskeleton The intracellular structural network composed of actin filaments, microtubules, and intermediate filaments. *(Chapter 5)*

Defective-interfering RNAs Subgenomic RNAs that replicate more rapidly than full-length RNA, and therefore compete for the components of the RNA synthesis machinery and interfere with the replication of full-length RNAs. *(Chapter 6)*

Delayed-type hypersensitivity Cell-mediated immunity caused by $CD4^+$ T cells that recognize antigens in the skin; the reaction typically occurs hours to days after antigen is injected, hence its name; it is partially responsible for characteristic local reactions to virus infection, such as a rash. *(Chapter 15)*

Deletion mutation Removal of nucleic acid sequences. *(Chapter 2)*

Dendritic cells Migratory, phagocytic cells; immature dendritic cells, which are found in the periphery of the body, around body cavities, and under mucosal surfaces, can synthesize copious quantities of cytokines, including interferon, and take up soluble proteins avidly. These proteins are retained in endosomes for hours or days until the dendritic cell matures; mature dendritic cells migrate to local lymph nodes, where their antigen cargo is scrutinized by lymphocytes of the adaptive immune system. *(Chapter 15)*

Dermis The layer of skin beneath the epidermis that supports the basement membrane or vascular network; it is composed of a dense connective tissue that provides support and elasticity to the skin. *(Chapter 14)*

Diapedesis The process by which viruses cross the vascular endothelium, while being carried within monocytes or lymphocytes. *(Chapter 14)*

Difference imaging The subtraction of density maps of related proteins or assemblies to reveal structural features of the more complex structure. *(Chapter 4)*

Diploid cell strains Homogeneous populations of a single type that can divide up to 100 times before dying. *(Chapter 2)*

Direct immunostaining A method for visualizing viral proteins in infected cells or tissues in which an antibody that

recognizes a viral antigen is coupled directly to an indicator, such as a fluorescent dye or an enzyme. *(Chapter 2)*

Disseminated Describes an infection that spreads beyond the primary site of infection; often includes a viremia and infection of major organs such as liver, lungs, and kidneys. *(Chapter 14)*

DNA microarrays Hundreds or thousands of unique DNA sequences fixed on a glass slide in aligned rows (a DNA microarray chip); by using differentially labeled hybridization probes made from uninfected and virus-infected cell mRNAs, it is possible to determine whether production of specific mRNAs is induced, repressed, or unchanged after virus infection. *(Chapter 2)*

DNA shuffling A technique that enables scientists to assemble and analyze new combinations of DNA fragments not found in nature. *(Chapter 19)*

DNA synthesis phase The phase of the cell cycle in which the cell's genome is duplicated. Also called S phase. *(Chapter 18)*

DNA vaccine A bacterial plasmid that encodes an antigenic protein; the protein is synthesized upon introduction of the plasmid DNA into cells, and an immune response is directed to this protein; a variation of the subunit vaccine. *(Chapter 19)*

Domains Parts of a protein than can fold independently of other segments into stable structures with specific functions, e.g., a DNA-binding domain. *(Chapter 4)*

Draining lymph nodes Small nodules found in many peripheral sites at which lymphatic vessels converge and the adaptive immune responses are initiated; lymph nodes have direct connections to the circulatory system. *(Chapter 15)*

Eclipse period The phase of viral infection during which the viral nucleic acid is uncoated from its protective shell and no infectious virus can be detected inside cells. *(Chapter 2)*

Elongation The stepwise incorporation of ribonucleoside or deoxyribonucleoside monophosphates (NMPs or dNMPs) into the 3′-OH end of a growing RNA or DNA chain. *(Chapters 6, 8, and 9)*

Emerging virus A viral population responsible for a marked increase in disease incidence, usually as a result of changed societal, environmental, or population factors. *(Chapter 20)*

Endemic Typical of a particular geographic area; persisting in a population for a long period without reintroduction of the causative virus from outside sources. *(Chapter 1)*

Endogenous pathway of antigen presentation The cellular process whereby viral proteins are degraded inside the infected cell and the resulting peptides are loaded onto major histocompatibility complex (MHC) class I molecules that move to the cell surface. *(Chapter 15)*

Endogenous proviruses Proviruses that enter the germ line at some point in the history of an organism and are thereafter inherited in normal Mendelian fashion by every cell in that organism and by its progeny. *(Chapter 7)*

Endogenous reactions Reverse transcription reactions that take place in purified virions (sometimes after permeabilization with detergents), using the viral RNA genome as a template. *(Chapter 7)*

Endosomes Vesicles that transport molecules from the plasma membrane to the cell interior. *(Chapter 5)*

Enhancer A DNA sequence containing multiple elements that can stimulate RNA polymerase II transcription over long distances, independently of orientation or location relative to the site of transcriptional initiation. *(Chapter 8)*

Enhancing antibodies Antibodies that can facilitate viral infection by allowing virions to which they bind to enter susceptible cells. *(Chapter 17)*

Enterotropic Describes a virus that replicates in tissues of the gastrointestinal tract. *(Chapter 14)*

Envelope The host cell-derived lipid bilayer carrying viral glycoproteins that forms the outer layer of many virus particles. *(Chapters 1, 4, 12, and 13)*

Epidemic A pattern of disease characterized by a rapid and sudden appearance of cases spreading over a wide area. *(Chapter 1)*

Epidermis The external surface of the skin, composed of a keratinized, stratified squamous epithelium. *(Chapter 14)*

Episome An exogenous genetic element not necessary for cell survival; often applied to viral genomes that can be maintained in cells by autonomous replication. *(Chapters 1 and 9)*

Epitope A short contiguous sequence or unique conformation of a macromolecule that can be recognized by the immune system; also called an antigenic determinant. A T-cell epitope is a short peptide recognized by a particular T-cell receptor; a B-cell epitope is recognized by the antigen-binding domain of antibody and is part of an intact protein. *(Chapter 2)*

ER lumen The interior of the membrane-bound compartment of the endoplasmic reticulum (ER); a distinctive chemical environment topologically equivalent to the exterior of the cell. *(Chapter 12)*

Error threshold The point at which accumulated mutations reduce fitness (replication competence); more precisely, a mathematical parameter that measures the complexity of the information to be maintained in the genome of an individual virus and the positive selective features of the resultant population. *(Chapter 20)*

Evolution The change of a population over time in response to selective processes. *(Chapter 20)*

Exogenous antigen presentation The cellular process whereby viral proteins are taken up from the outside of the cell and digested and the resulting peptides are loaded onto MHC class II molecules that move to the cell surface. *(Chapter 15)*

Exons Blocks of noncontiguous coding sequences (generally short) present in many cellular and viral pre-mRNAs. *(Chapter 10)*

Fitness The replicative adaptability of an organism to its environment. *(Chapter 20)*

Foci Clusters of cells that are derived from a single progenitor and share properties, such as unregulated growth, that cause them to pile up on one another. *(Chapters 18)*

Fomites Inanimate objects that may be contaminated with microorganisms and become vehicles for transmission. *(Chapter 14)*

Fusion peptide A short hydrophobic amino acid sequence (20 to 30 amino acids) that is believed to insert into target membranes to initiate fusion. *(Chapter 5)*

Fusion pore An opening between two lipid bilayers formed by the action of fusion proteins that allows exchange of material across membranes. *(Chapter 5)*

G proteins Membrane-associated guanine nucleotide-binding proteins with GTPase activity. *(Chapter 18)*

G_0 *See* Resting state

Gap phases The cell cycle phases before (G_1) or after (G_2) the phase in which DNA synthesis (S) takes place. *(Chapter 18)*

Genetic bottleneck Extreme selective pressures on small populations that result in loss of diversity, accumulation of nonselected mutations, or both. *(Chapter 20)*

Germ line transmission Transfer of viral genomes from an organism to its offspring as part of the host genome. *(Chapter 14)*

Glycoforms The total set of forms of a protein that differ in the number, location, and nature of oligosaccharide chains. *(Chapter 12)*

Glycoproteins Proteins carrying covalently linked sugar chains (oligosaccharides). *(Chapter 4)*

Hairpin loops The single-stranded regions of RNA that join stem regions of RNA secondary structure. *(Chapter 6)*

Half-life The time required for 50% of the cytoplasmic poof of an mRNA to be degraded, when synthesis of the mRNA is inhibited. *(Chapter 10)*

Helical symmetry The symmetry of regularly wound structures defined by the relationship $P = \mu \times \rho$, where P = pitch of the helix, μ = the number of structural units per turn, and ρ = the axial rise per unit. *(Chapter 4)*

Helper virus A virus that provides viral proteins needed for the replication of a coinfecting defective virus. *(Chapter 6)*

Hemagglutination Linking of multiple red blood cells by virus particles, resulting in a lattice. *(Chapter 2)*

Hematogenous spread Spread of virus particles through the bloodstream. *(Chapter 14)*

Hepatitis Inflammation and necrosis of the liver. *(Chapter 14)*

Herd immunity The immune status of a population, rather than an individual. *(Chapter 19)*

Heteromeric proteins Proteins comprising multiple different subunits. *(Chapter 4)*

Homomeric proteins Proteins comprising multiple copies of a single subunit. *(Chapter 4)*

Horizontal transmission Transfer of viral infections by means other than between parent and offspring. *(Chapter 14)*

Host range A listing of species (hosts) that are susceptible to and permissive for infection. *(Chapter 5)*

Humoral response The actions of antibodies; immunity can be transferred to nonimmunized recipients by purified antibody or by serum from immunized donors. Also called humoral immunity. *(Chapter 15)*

Iatrogenic Transmitted from a health care worker to a patient; said of an infectious disease. *(Chapter 14)*

Icosahedral symmetry The symmetry of the icosahedron, the solid with 20 faces and 12 vertices related by axes of two-, three- and fivefold rotational symmetry. *(Chapter 4)*

Immortality The capacity of cells to grow and divide indefinitely. *(Chapter 18)*

Immune response The highly coordinated interaction of cytokines and effector white blood cells; the sum total of host defense mechanisms. *(Chapter 15)*

Immunoblotting A method in which proteins are fractionated by electrophoresis in a polyacrylamide gel, transferred to a thin, synthetic membrane that has a strong affinity for proteins, and then detected by immunostaining. Also called Western blot analysis. *(Chapter 2)*

Immunodominant Describes the peptides and epitopes that are recognized most efficiently by cytotoxic T lymphocytes and antibodies. *(Chapter 16)*

Immunological synapse The focal collection of coreceptors around T-cell receptors and their respective binding partners in the target cell; this large structure is characterized by a rearrangement of the cytoskeleton and focused release of effector molecules at the site of contact with the target cell. *(Chapter 15)*

Immunotherapy A treatment that provides an infected host with exogenous antiviral cytokines, other immunoregulatory agents, antibodies, or lymphocytes in order to reduce viral pathogenesis. *(Chapter 19)*

Inapparent infections Asymptomatic acute infections that are recognized by the presence of virus-specific antibodies in individuals with no reported history of disease. *(Chapter 16)*

Inclusion bodies Intracellular granules that contain virions or unassembled viral components in the nucleus and/or cytoplasm. *(Chapters 2 and 6)*

Incubation period The period before the initial appearance of characteristic symptoms of a disease. *(Chapter 16)*

Indirect immunostaining A method for visualizing viral proteins in infected cells or tissues; an antibody that recognizes a viral antigen is bound by a second antibody that is coupled to an indicator, such as a fluorescent dye or an enzyme. *(Chapter 2)*

Indirectly anchored proteins Proteins that are indirectly bound to the plasma membrane by interacting with either integral membrane proteins or the charged sugars of membrane glycolipids. *(Chapter 5)*

Infectious mononucleosis A common disease caused by Epstein-Barr virus; infection of B cells in an individual with a normal immune system induces infected cells to divide, resulting in substantial immune and cytokine responses. *(Chapter 16)*

Inflammation A general term for the complex response that gives rise to local accumulation of white blood cells and fluid; initiated by local infection or damage; many different forms of this response, characterized by the degrees of tissue damage, capillary leakage, and cellular infiltration, occur after infection with pathogens. *(Chapter 15)*

Initiation of transcription All reactions necessary to complete synthesis of the first phosphodiester bond in an RNA transcript of a DNA template. *(Chapter 8)*

Initiator sequences Short DNA sequences that can direct accurate initiation of RNA polymerase II transcription in the absence of any other promoter sequences. *(Chapter 8)*

Innate response A coordinated, immediate response to infection, in part mediated by local sentinel cells (dendritic cells and macrophages) that respond to infected cells and release cytokines; by a complex collection of serum proteins termed complement, which when activated destroys infected cells and virus particles; and by cytolytic lymphocytes called NK cells, which recognize and destroy infected cells. *(Chapter 15)*

Insertion mutation Addition of nucleic acid sequences. *(Chapter 2)*

Insertional activation Mechanism of oncogenesis by nontransducing retroviruses; integration of a proviral promoter or enhancer in the vicinity of a c-oncogene results in inappropriate transcription of that gene. *(Chapter 18)*

Insertional mutagenesis Mutation in a genome caused by the integration of viral DNA or the DNA of a transposable element. *(Chapter 1)*

Instability elements *cis*-acting AU-rich sequences present in unspliced or singly spliced human immunodeficiency virus mRNA that impair gene expression by impeding RNA transport to the cytoplasm or decreasing RNA stability. *(Chapter 17)*

Integral membrane proteins Proteins embedded in a lipid bilayer, with external and internal domains connected by one or more membrane-spanning domains. *(Chapters 4 and 5)*

Interfering antibodies Antibodies that can bind to virions or infected cells and block interaction with neutralizing antibodies. *(Chapter 17)*

Interferons Specific cytokines that, when bound to their receptors, stimulate an antiviral state in the cell; interferons α and β are produced mainly by leukocytes and fibroblasts, whereas interferon γ is produced by T cells and NK cells. *(Chapter 15)*

Interior loops Unpaired sequences between stem regions of RNA secondary structure. *(Chapter 6)*

Intrinsic cellular defenses The conserved cellular programs that respond to various stresses, such as starvation, irradiation, and infection; intrinsic defenses include apoptosis, autophagy, and RNA interference. *(Chapter 15)*

Introns Noncoding sequences that separate coding sequences (exons) in many cellular and viral pre-mRNAs. *(Chapter 10)*

Koch's postulates Criteria developed by the German physician Robert Koch in the late 1800s to determine if a given agent is the cause of a specific disease. *(Chapter 1)*

Kupffer cells Mononuclear phagocytic cells in the liver. *(Chapter 14)*

Latency-associated transcripts RNAs produced during a latent infection by herpes simplex virus. Abbreviated LATs. *(Chapters 8 and 16)*

Latent infections Persistent infections that last the life of the host; few or no virions can be detected, despite continuous presence of the viral genome. *(Chapters 8 and 16)*

Latent period The phase of viral infection during which no extracellular virus can be detected. *(Chapter 2)*

Leaky scanning A mechanism for producing multiple proteins from a single mRNA, by initiation of translation at different in-frame initiation codons. *(Chapter 11)*

Lipid raft A microdomain of the plasma membrane that is enriched in cholesterol and saturated fatty acids, with a distinct protein composition; lipid rafts participate in such processes as cell movement, protein sorting, and signal transduction. *(Chapters 5 and 12)*

Long-latency virus Retrovirus that causes cancer in a host many years after infection; the viral genome does not encode cellular oncogenes, nor does it cause cancer by perturbing the expression of cellular oncogenes. *(Chapter 18)*

Lymphocytes A class of white blood cells that initiate immune responses and carry antigen-specific receptors on their surfaces; B cells, T cells, and NK cells are the primary classes of lymphocytes. *(Chapter 15)*

Lysogenic Describes a bacterium that carries the genetic information of a quiescent bacteriophage, which can be induced to reproduce and subsequently lyse the bacterium. *(Chapter 1)*

Lysogens Lysogenic bacteria. *(Chapter 1)*

Lysogeny The phenomenon by which the lysogenic state is established and maintained in bacteria. *(Chapter 1)*

Lysosomes Cellular vesicles containing enzymes that degrade carbohydrates, proteins, nucleic acids, and lipids. *(Chapter 5)*

M cell A specialized microfold or membranous epithelial cell of mucosal surfaces, found mainly in intestines, that is important in uptake of proteins and pathogens; these cells deliver ingested antigens to lymphoid cells in close proximity to their basal surfaces. *(Chapter 15)*

M phase *See* Mitosis

Macules Flat, colored skin lesions caused by virus replication in the dermis. *(Chapter 14)*

Mannan-binding pathway A mechanism that triggers complement action via the interaction of a mannan-binding lectin similar to C1q with mannose-containing carbohydrates on bacteria, virus particles, or virus-infected cells. *(Chapter 15)*

Marker rescue Replacement of all local nucleic acid, including a mutation, with wild-type nucleic acid. *(Chapter 2)*

Marker transfer Introduction of a mutation by replacement of a segment of viral nucleic acid with one containing the mutation. *(Chapter 2)*

Membrane-spanning domains Segments of integral membrane proteins spanning the lipid bilayer, typically α-helical. *(Chapters 4 and 5)*

Memory cells A subset of lymphocytes maintained after each encounter with a foreign antigen; these cells survive for years in the body and are ready to respond immediately to any subsequent encounter by rapid proliferation and efficient production of their defensive products. *(Chapter 15)*

Metastable structures Structures that are stable because they possess low (but not minimal) free energy; they are separated from the minimal free energy state by an energetic or kinetic barrier. *(Chapter 4)*

Metastases Secondary tumors, often at distant sites, that arise from the cells of a malignant tumor. *(Chapter 18)*

Missense mutation A change in a single nucleotide or codon that results in the production of a protein with a single amino acid substitution. *(Chapter 2)*

Mitosis The phase of the cell cycle in which newly duplicated chromosomes are distributed to two new daughter cells as a result of cell division. Abbreviated M phase. *(Chapter 18)*

Molecular chaperones Proteins that assist the folding and oligomerization of nascent proteins. *(Chapter 12)*

Monocistronic mRNA mRNA that encodes one polypeptide. *(Chapter 11)*

Monoclonal antibodies Antibodies of a single specificity made by a clone of antibody-producing cells. *(Chapter 2)*

Monoclonal antibody-resistant mutants Viral mutants selected to propagate in the presence of neutralizing monoclonal antibodies; these mutants often carry mutations in viral genes that encode virion proteins. *(Chapter 15)*

Monolayer A single layer of cultured cells growing in a cell culture dish. *(Chapter 2)*

Morphological units Surface structures of virus particles defined by electron microscopy. Also called capsomeres. *(Chapter 4)*

Motifs Combinations of a small number of protein secondary structure units in specific geometric arrangements. *(Chapter 4)*

Mucosal immune system The lymphoid tissues below the mucosa of the gastrointestinal and respiratory tracts. Also called mucosa-associated lymphoid tissue, or MALT. *(Chapter 15)*

Muller's ratchet The dictum that small, asexual populations decline in fitness over time if the mutation rate is high. *(Chapter 20)*

Multibranched loops Unpaired loops that are connected to multiple stem regions in RNA secondary structure. *(Chapter 6)*

Multiplicity of infection The number of virions added per cell. *(Chapter 2)*

Mutagen An agent that causes base changes in nucleic acids. *(Chapter 2)*

Myelomonocytes Monocytes, macrophages, dendritic cells, and a variety of granulocytes derived from myeloid progenitor cells in the bone marrow. *(Chapter 15)*

Naked Lacking an envelope derived from a host cell membrane; said of a virus particle. *(Chapter 1)*

Natural killer cells An abundant lymphocyte population that comprises large, granular lymphocytes; distinguished from others by the absence of B- and, in most cases, T-cell antigen receptors; NK cells are a component of the innate defense system. *(Chapter 15)*

Negative [(–)] strand The strand of DNA or RNA that is complementary in sequence to the (+) strand. *(Chapter 1)*

Neuroinvasive Able to spread to the central nervous system (brain and spinal cord) after infection of a peripheral site. *(Chapter 14)*

Neurotropic Describes a virus that replicates in neural tissue. *(Chapter 14)*

Neurovirulent Able to cause disease in the nervous system. *(Chapter 14)*

Neutralize Block the infectivity of virus particles; a term applied to appropriate antibodies. *(Chapter 2)*

NK cells *See* Natural killer cells

Noncytopathic viruses Viruses that infect cells and actively produce infectious particles without causing immediate host cell death. *(Chapter 16)*

Nonsense mutations Substitution mutations that produce a translation termination codon. *(Chapter 2)*

Nontransducing oncogenic retroviruses Retroviruses that do not encode cell-derived oncogene sequences, but can cause cancer (at low efficiency) when their DNA becomes integrated in the vicinity of a cellular oncogene, thereby perturbing its expression. *(Chapter 18)*

Northern blot hybridization A method in which RNA preparations are fractionated by gel electrophoresis, denatured within the gel, and transferred to a membrane to which they bind strongly; the bound RNAs are then detected by hybridization. *(Chapter 2)*

Nosocomial Describes transmission of an infectious disease in a hospital or health care facility. *(Chapter 14)*

Nuclear localization signals Amino acid sequences that are necessary and sufficient for protein import into the nucleus. *(Chapter 5)*

Nucleocapsid Nucleic acid-protein assembly packaged within the virion; used when this complex is a discrete substructure of a complex particle. *(Chapters 1 and 4)*

Obligate parasites Entities or organisms that are dependent on another living organism for reproduction. *(Chapter 1)*

Oligonucleotides Short DNA or RNA chains, typically 2 to 100 bases in length. *(Chapter 2)*

Oligosaccharides Short linear or branched chains of sugar residues (monosaccharides). *(Chapter 4)*

Oncogenes Genes encoding proteins that cause cellular transformation or tumorigenesis. *(Chapter 18)*

Oncogenesis The development of cancer. *(Chapter 18)*

One-hit kinetics The number of plaques or lesions is directly proportional to the first power of the concentration of the inoculum, i.e., if the concentration is doubled, the number of plaques or lesions is doubled; this property indicates that one infectious particle is sufficient to initiate infection. *(Chapter 2)*

Origin for plasmid maintenance The origin of Epstein-Barr virus DNA active in latently infected but not productively infected cells. *(Chapter 9)*

Origin of replication Site at which replication of a DNA genome, or a segment of a genome, begins. *(Chapter 9)*

Packaging Incorporation of a viral nucleic acid genome into a virus particle during assembly. *(Chapter 13)*

Packaging signals Nucleic acid sequences or structural features directing incorporation of a viral genome into a virus particle. *(Chapter 13)*

Pandemic Worldwide epidemic. *(Chapter 1)*

Pantropic Describes a virus that replicates in many tissues and cell types. *(Chapter 14)*

Papules Slightly raised skin lesions caused by virus replication in the dermis. *(Chapter 14)*

Particle-to-PFU ratio The inverse value of the absolute efficiency of plating (see above). *(Chapter 2)*

Passive immunization Direct administration of the products of the immune response (e.g., antibodies or stimulated immune cells) obtained from an appropriate donor(s) to a patient. *(Chapter 19)*

Passive viremia Introduction of virus particles into the blood without viral replication at the site of entry. *(Chapter 14)*

Pathogen Disease-causing virus or other microorganism. *(Chapter 1)*

Pattern recognition receptors Unique protein receptors of the innate immune system that bind common molecular structures on the surfaces of pathogens; some reside on the cell surfaces of sentinel cells, such as immature dendritic cells and macrophages, and others are soluble initiator proteins of the complement system. *(Chapter 15)*

PCR *See* Polymerase chain reaction

Permissive Describes a cell that can support viral replication, because it possesses the necessary intracellular components. *(Chapter 5)*

Permissivity Requirement of a virus for differentially expressed cellular gene products to complete the infection. *(Chapter 14)*

Persistent infections Infections in which infected cells or virions are not cleared efficiently by the adaptive immune response, and virus particles or viral gene products continue to be produced for long periods. *(Chapter 16)*

PFU/ml *See* Plaque-forming units per milliliter

Plaque A circular zone of infected cells that can be distinguished from the surrounding monolayer. *(Chapter 2)*

Plaque purified A virus stock prepared from a single plaque; when one infectious virus particle initiates a plaque, the viral progeny within the plaque are clones. *(Chapter 2)*

Plaque-forming units per milliliter A measure of infectivity. Abbreviated PFU/ml. *(Chapter 2)*

Polar Describes the differential distribution of proteins and lipids in the plasma membranes that creates apical and basolateral domains of certain cell types. *(Chapter 5)*

Polarized cells Differentiated cells with surfaces divided into functionally specialized regions. *(Chapter 12)*

Polyadenylation The addition of ~200 adenylate (A) residues to the 3′ ends of cellular and viral transcripts made in eukaryotic cells. *(Chapter 10)*

Polycistronic mRNA mRNA that encodes several polypeptides. *(Chapter 11)*

Polyclonal antibodies The antibody repertoire against the many epitopes of an antigen produced in an animal. *(Chapter 2)*

Polymerase chain reaction Amplification of viral (or of any) DNA sequences by using thermostable DNA polymerases and specific oligonucleotides. Abbreviated PCR. *(Chapter 2)*

Polymorphic Describes a gene with many allelic forms, as found in outbred populations. *(Chapter 15)*

Portal Site of entry of a viral genome into a preassembled protein shell. *(Chapter 4)*

Positive [(+)] strand The strand of DNA or RNA with the sequence corresponding to that of the mRNA. Also called the "sense" strand. *(Chapter 1)*

Pregenomic RNA The hepadnaviral mRNA that is reverse transcribed to produce the DNA genome. *(Chapter 7)*

Preinitiation complexes Promoter-bound complexes of an RNA polymerase and initiator proteins competent to initiate transcription. *(Chapter 8)*

Primary cell cultures Cell cultures prepared from animal tissues; these cultures include several cell types and have a limited life span, usually no more than 5 to 20 cell divisions. *(Chapter 2)*

Primary cells Cells that have been freshly derived from an organ or tissue. *(Chapter 1)*

Primary structure The amino acid sequence of a protein, listed from the N to the C terminus. *(Chapter 4)*

Primary viremia Progeny virions released into the blood after initial replication at the site of entry. *(Chapter 14)*

Primer Free 3′-OH group required for initiation of synthesis of DNA from DNA or RNA templates and for initiation of synthesis of some viral RNA genomes. *(Chapters 6 and 9)*

Prions Infectious agents comprising an abnormal isoform of a normal cellular protein and no nucleic acid; implicated as the causative agents of transmissible spongiform encephalopathies. *(Chapters 1 and 20)*

Procapsids Closed, protein-only structures into which viral genomes are inserted; precursors to capsids or nucleocapsids. *(Chapter 13)*

Processivity Ability of an enzyme to copy a nucleic acid template over long distances from a single site of initiation. *(Chapters 8 and 9)*

Professional antigen-presenting cells Cells that are specially equipped to initiate immediate immune defense by secreting interferon and to convey information of the attack to the adaptive immune system; the main classes are dendritic cells and B cells. *(Chapter 15)*

Programmed cell death *See* Apoptosis

Promoter Set of DNA sequences necessary for initiation of transcription by a DNA-dependent RNA polymerase. *(Chapter 8)*

Proofreading Correction of mistakes made during chain elongation by exonuclease activities of DNA-dependent DNA polymerases. *(Chapters 6 and 9)*

Prophage The genome of the quiescent bacteriophage in a lysogenic bacterium. *(Chapter 1)*

Proteasome Complex containing multiple proteases that is responsible for degradation of proteins tagged with polyubiquitin. *(Chapter 8)*

Proteoglycans Proteins linked to glycosaminoglycans, which are unbranched polysaccharides made of repeating disaccharides. *(Chapter 5)*

Proto-oncogenes *See* c-Oncogenes

Proviral DNA Retroviral DNA that is integrated into its host cell genome and is the template for formation of retroviral mRNAs and genomic RNA. Also termed a provirus. *(Chapter 7)*

Provirion Noninfectious precursor to a mature virion. *(Chapter 13)*

Pseudodiploid Having two RNA genomes per virion but giving rise to only one DNA copy, as is the case for retroviruses. *(Chapter 7)*

Pseudoreversion Phenotypic reversion caused by second-site mutation. Also called suppression. *(Chapter 2)*

Pustules Skin lesions derived from a vesicle in which secondary infiltration of leukocytes occurs. *(Chapter 14)*

Quality control Mechanisms that detect unfolded or misfolded proteins in the ER and promote folding of such proteins or target them for ER exit and degradation. *(Chapter 12)*

Quasiequivalence Arrangement of structural units in a virus particle that allows similar interactions among them. *(Chapter 4)*

Quasispecies Dynamic distribution of nonidentical but related viral replicons; a term often constrained to RNA virus populations. *(Chapters 6 and 20)*

Quaternary structure The number, arrangement, and interactions among the subunits (individual folded polypeptide chains) in a multimeric protein. *(Chapter 4)*

Reactivation Switch from a latent to a productive infection; usually applied to herpesviruses. *(Chapters 8 and 16)*

Reassortants Viral genomes that have exchanged segments after coinfection of cells with viruses with segmented genomes. *(Chapter 2)*

Reassortment The exchange of entire RNA molecules between genetically related viruses with segmented genomes. *(Chapters 2 and 6)*

Receptor The cellular molecule to which a virion attaches to initiate replication. *(Chapter 5)*

Receptor-mediated endocytosis The uptake of molecules into the cell from the extracellular fluid; in this process,

the molecule binds a cell surface receptor, and the complex is taken into the cell by invagination of the membrane and formation of a vesicle. *(Chapter 5)*

Relative efficiency of plating A ratio of viral titers obtained on two different cell types; this number may be more or less than 1, depending on how well the virus grows in the different host cells. *(Chapter 2)*

Replication forks The sites of synthesis of nascent DNA chains that move away from an origin as replication proceeds. *(Chapter 9)*

Replication intermediates Incompletely replicated DNA molecules containing newly synthesized DNA. *(Chapter 9)*

Replication licensing Mechanisms that ensure replication of cellular DNA is initiated at each origin once, and only once, per cell cycle. *(Chapter 9)*

Replicons Units of replication in large genomes, defined by discrete origin and termini. *(Chapter 9)*

Reservoir A host population in which a viral infection is maintained in the environment, and from which it is spread to other hosts. *(Chapter 14)*

Resolution The minimal size of an object that can be distinguished by microscopy or other methods of structural analysis. *(Chapter 4)*

Resting state A state in which the cell has ceased to grow and divide and has withdrawn from the cell cycle. Also called G_0. *(Chapter 18)*

Restriction point A point in the G_1 phase of the mammalian cell cycle beyond which cells will not respond to extracellular growth-regulating stimuli, but are committed to progress into DNA synthesis (S) phase. *(Chapter 18)*

Retroid viruses Viruses that replicate their genomes via reverse transcription. *(Chapter 7)*

Revert Change to the parental, or wild-type, genotype or phenotype. *(Chapter 2)*

Rev-responsive element A structural element in *env* RNA that is recognized by the human immunodeficiency virus Rev protein, which mediates its export from the nucleus. *(Chapter 17)*

Ribosome shunting A mechanism of translation initiation in which ribosomes physically bypass, or shunt over, parts of the 5′ untranslated region to reach the initiation codon. *(Chapter 11)*

Ribozyme An RNA molecule with catalytic activity. *(Chapter 10)*

RNA editing The introduction into an RNA molecule of nucleotides that are not specified by a cellular or viral gene. *(Chapter 10)*

RNA interference A sequence-specific mechanism of RNA degradation found in plants and animals; it may have evolved to protect against foreign nucleic acid. Abbreviated RNAi. *(Chapter 10)*

RNA processing The series of co-, or post-, transcriptional, covalent modifications that produce mature mRNAs from primary transcripts. *(Chapter 10)*

RNA pseudoknot RNA secondary structure formed when a single-stranded loop region base pairs with a complementary sequence outside the loop. *(Chapter 6)*

RNA-dependent RNA polymerase The protein assembly required to carry out RNA synthesis from an RNA template. *(Chapter 6)*

RNAi *See* RNA interference

Rough ER ER membranes to which polyribosomes synthesizing proteins destined to enter the secretory pathway are bound. *(Chapter 12)*

RRE *See* Rev-responsive element

Rule of six The requirement that the (–) strand RNA genome of paramyxoviruses is copied efficiently only when its length in nucleotides is a multiple of 6. *(Chapter 6)*

S phase *See* DNA synthesis phase

Satellite nucleic acids Small nucleic acids that require a helper virus for replication and are packaged by a capsid protein encoded in the helper virus genome. Also called virusoids. *(Chapter 20)*

Satellite virus A satellite with a genome that encodes one or two proteins. *(Chapters 1 and 20)*

Satellites Subviral agents that lack genes that encode proteins required for replication or propagation; satellite replication depends on coinfection of the host cell with a helper virus that can supply the missing proteins. *(Chapters 1 and 20)*

Scaffolding proteins Viral proteins required for assembly of an icosahedral protein shell, but absent from mature virions. *(Chapter 13)*

Second messengers Small molecules, such as cyclic nucleotides and lipids, that are synthesized by some membrane-bound proteins in a signal transduction cascade; they act as diffusible components in a signal relay. *(Chapter 18)*

Secondary structure Local, regular structure stabilized by hydrogen bonding, e.g., α-helix and β-sheet. *(Chapter 4)*

Secondary viremia Delayed appearance of a high concentration of infectious virus in the blood as a consequence of disseminated infections. *(Chapters 14 and 16)*

Secretory pathway The series of membrane-demarcated compartments (e.g., ER and Golgi), tubules, and vesicles through which secreted and membrane proteins travel to the cell surface. *(Chapter 12)*

Semiconservative replication Production of two daughter DNA molecules, each containing one strand of the

parental template and a newly synthesized complementary strand. *(Chapter 9)*

Sentinel cells Dendritic cells and macrophages; these migratory cells are found in the periphery of the body and can take up proteins and cell debris for presentation of peptides derived from them on MHC molecules; they also respond to recognition of a pathogen by synthesizing cytokines such as interferons. *(Chapter 15)*

Serology The study of the properties and reaction of sera; the use of antibodies in sera to study properties of antigens. *(Chapter 2)*

Serotypes Virus types as defined with neutralizing antibodies. *(Chapter 2)*

Shedding Release of virions from an infected host. *(Chapter 14)*

Signal peptidase The ER protease that removes signal peptides from many proteins as they are translocated into the ER. *(Chapter 12)*

Signal peptide A short sequence (generally hydrophobic) that directs nascent proteins to the ER. The signal may be removed, or retained as a transmembrane domain. *(Chapter 12)*

Signal recognition particle A complex containing a small RNA molecule and several proteins that binds to signal peptides of nascent proteins destined for the secretory pathway to halt translation and allow binding to the ER membrane. Abbreviated SRP. *(Chapter 12)*

Signal transduction cascade A chain of sequential physical interactions among, and biochemical modifications of, membrane-bound and cytoplasmic proteins. *(Chapter 18)*

Single-exon mRNAs mRNAs produced without splicing because their precursors lack introns and splice sites. *(Chapter 10)*

Sinusoids Small blood vessels characterized by a discontinuous basal lamina, with no significant barrier between the blood plasma and the membranes of surrounding cells. *(Chapter 14)*

Slow infections Extreme variants of the persistent pattern of infection; long incubation period (years) from the time of initial infection until the appearance of recognizable symptoms. *(Chapter 16)*

Slow viruses Viruses characterized by long incubation periods, typical for the genus *Lentivirus* in the family *Retroviridae*. *(Chapter 17)*

Snares Soluble Nsf attachment protein receptors; proteins present on membranes of compartments of the secretory pathway (target, or t-Snares) and transport vesicles (vesicle, or v-Snares); important determinants of the specificity of vesicular transports. *(Chapter 12)*

Southern blot hybridization A method in which DNA preparations are digested with a restriction endonuclease, fractionated by gel electrophoresis, denatured within the gel, and transferred to a membrane to which they bind strongly; the bound DNAs are then detected by hybridization. *(Chapter 2)*

Sphingolipid-cholesterol rafts *See* Lipid raft

Spliceosome The large complex that assembles on an intron-containing pre-mRNA prior to splicing. In mammalian cells, it comprises the small nuclear ribonucleoproteins containing U1, U2, U4, U5, and U6 small nuclear RNAs and ~150 proteins. *(Chapter 10)*

Splicing The precise ligation of blocks of noncontiguous coding sequences (exons) in cellular or viral pre-mRNAs with excision of the intervening noncoding sequences (introns). *(Chapter 10)*

SRP *See* Signal recognition particle

SSPE *See* Subacute sclerosing panencephalitis

Stem regions Regions of RNA secondary structure where complementary RNA sequences base pair. *(Chapter 6)*

Stop transfer signal A hydrophobic sequence that halts translocation of a nascent protein across the ER membrane; serves as a transmembrane domain. *(Chapter 12)*

Structural plasticity The resistance of the structure and function of proteins or virus particles to amino acid substitutions, such as those resulting from antigenic variation. *(Chapter 16)*

Structural units The units from which capsids or nucleocapsids of virus particles are built. Also called protomers or asymmetric units. *(Chapter 4)*

Subacute sclerosing panencephalitis A rare and often lethal brain disease caused by measles virus; a result of a slow infection that occurs when intracellular host proteins in cells of the central nervous system interfere with acute infection by inhibiting viral gene expression. Abbreviated SSPE. *(Chapter 16)*

Substitution mutation Replacement of one or more nucleotides in a nucleic acid. *(Chapter 2)*

Subunit vaccines Vaccines formulated with purified components of virus particles, rather than intact virions. *(Chapter 19)*

Subunits Single folded polypeptide chains. *(Chapter 4)*

Suppression Phenotypic reversion caused by second-site mutation. Also called pseudoreversion. *(Chapter 2)*

Susceptible Describes a cell that produces the receptor(s) required for virus entry. *(Chapter 5)*

Susceptibility The presence of cell receptors for virus entry. *(Chapter 14)*

Suspension cultures Cells propagated in suspension, in which a spinning magnet continuously stirs the cells. *(Chapter 2)*

Syncytia Fused cells with multiple nuclei. *(Chapter 2)*

Synergism Cooperative activity of two proteins that is greater than the product of their individual activities. *(Chapter 8)*

Systemic Describes an infection that results in spread to many organs of the body. *(Chapter 14)*

Systemic inflammatory response syndrome The large-scale production and systemic release of inflammatory cytokines and stress mediators that may overwhelm and kill an infected host; sometimes referred to as a "cytokine storm"; similar syndromes include toxic shock promoted by certain bacterial pathogens. *(Chapter 15)*

Tegument The layer interposed between the nucleocapsid and the envelope of herpesvirus particles. *(Chapter 4)*

Telomeres Specialized DNA structures comprising simple repeated sequences that are present at the ends of linear chromosomal DNA and copied by an RNA-templated mechanism. *(Chapter 9)*

Termini Sites at which DNA replication stops. *(Chapter 9)*

Tertiary structure The folded structure of a protein chain. *(Chapter 4)*

Tight junctions The area of contact between adjacent cells, circumscribing the cells at the apical edges of their lateral membranes. *(Chapter 5)*

Toll-like receptors Type I transmembrane proteins found on sentinel cells; these proteins are pattern recognition receptors and, when bound to particular microbial components, activate a signal transduction pathway to increase cytokine production and NF-κB activity. *(Chapter 15)*

Topology The geometrical arrangement of, and connections among, secondary structure units and motifs of a protein. *(Chapter 4)*

Topology diagram Two-dimensional representation of protein secondary structure units, and their orientations and connections, in a motif, domain, or protein. *(Chapter 4)*

Transcriptional control region Local and distant DNA sequences necessary for initiation of transcription and regulation of transcription. *(Chapter 8)*

Transcytosis A mechanism of transport in which material in the intestinal lumen is endocytosed by M cells, transported to the basolateral surface, and released to the underlying tissues. *(Chapters 5 and 14)*

Transducing oncogenic retroviruses Retroviruses that include oncogenic, cell-derived sequences in their genomes and carry these sequences to each newly infected cell; such viruses are, therefore, highly oncogenic. *(Chapter 18)*

Transduction The transfer of genes from one cell to another via viral vectors. *(Chapter 1)*

Transfection Introduction of viral nucleic acid into cells by transformation, resulting in the infection of cells. *(Chapter 2)*

Transformed Having changed growth properties and morphology as a consequence of infection with certain oncogenic viruses, introduction of oncogenes, or exposure to chemical carcinogens. *(Chapter 18)*

Transforming infection A class of persistent infection in which cells infected by certain DNA viruses or retroviruses may exhibit altered growth properties and proliferate more rapidly than uninfected cells. *(Chapter 16)*

Transmissible spongiform encephalopathies Fatal neurodegenerative disorders that are transmitted by prions. Abbreviated TSEs. *(Chapter 20)*

Transport vesicles Membrane-bound structures with external protein coats that bud from compartments of the secretory pathway and carry cargo in anterograde or retrograde directions. *(Chapter 12)*

Triangulation Division of the triangular face of a large icosahedral structure into smaller triangles. *(Chapter 4)*

Triangulation number The number of structural units per face of a capsid or nucleocapsid with icosahedral symmetry. Abbreviated *T*. *(Chapter 4)*

Tropism The predilection of a virus to invade, and replicate in, a particular cell type or tissue. *(Chapter 5)*

TSEs *See* Transmissible spongiform encephalopathies

Tumor A mass of cells originating from abnormal growth. *(Chapter 18)*

Tumor suppressor genes Cellular genes encoding proteins that negatively regulate cell proliferation; mutational inactivation of both copies of the genes is associated with tumor development. *(Chapter 18)*

Two-hit kinetics The number of plaques or lesions is directly proportional to the ½ power of the concentration of the inoculum, i.e., the number of plaques or lesions doubles when 4 times the concentration of virus particles is inoculated; this property indicates that two different types of virus particle must infect a cell to ensure replication. *(Chapter 2)*

Type-specific antigens Epitopes, defined by neutralizing antibodies, that define viral serotypes (e.g., poliovirus types 1, 2, and 3). *(Chapter 2)*

Uncoating The release of viral nucleic acid from its protective protein coat or lipid envelope; in some cases, the liberated nucleic acid remains bound to viral proteins. *(Chapter 5)*

Vaccination Inoculation of healthy individuals with attenuated or related microorganisms, or their antigenic products, in order to elicit an immune response that will protect against later infection by the corresponding pathogen. *(Chapters 1 and 19)*

Variolation Inoculation of healthy individuals with material from a smallpox pustule, or in modern times from an attenuated cowpox (vaccinia) virus preparation, through a scratch on the skin (called scarification). *(Chapters 1 and 19)*

Vertical transmission Transfer of viral genomes between parent and offspring. *(Chapter 14)*

Vesicles Focal necroses that occur when an infection spreads from the capillaries to the superficial layers of the skin

and replicates in the epidermis; a vesicle usually contains inflammatory fluids. *(Chapter 14)*

Viral pathogenesis The processes by which viral infections cause disease. *(Chapters 1, 2, and 14)*

Viremia The presence of infectious virions in the blood. *(Chapter 14)*

Virion An infectious virus particle. *(Chapters 1 and 4)*

Viroceptors Viral proteins that modulate cytokine signaling or cytokine production by mimicking host cytokine receptors. *(Chapters 14 and 15)*

Viroids Unencapsidated, small, circular, single-stranded RNAs that replicate autonomously when inoculated into plant cells; some are pathogenic and of economic importance. *(Chapters 1 and 20)*

Virokines Secreted viral proteins that mimic cytokines, growth factors, or similar extracellular immune regulators. *(Chapters 14 and 15)*

Virulence The relative capacity of a viral infection to cause disease. *(Chapter 14)*

Virulent Describes an infection that causes significant damage, in contrast to "attenuated." *(Chapter 14)*

Viruria Presence of virus particles in the urine. *(Chapter 14)*

Virus evolution The change of a viral population over time in response to selection processes. *(Chapter 20)*

v-Oncogenes Oncogenes that are encoded in viral genomes. *(Chapter 18)*

Western blot analysis *See* Immunoblotting

Wild type The original (often laboratory-adapted) virus from which mutants are selected, and which is used as the basis for comparison. *(Chapter 2)*

Zoonoses Diseases that are naturally transmitted between humans and other vertebrates. *(Chapter 14)*