

AFDC 11 (3018) DTZS ICS 07.080

DRAFT TANZANIA STANDARD

Biotechnology – Terminologies

TANZANIA BUREAU OF STANDARDS

0 Foreword

Biotechnology is a general term used to describe a very broad field of study.. According to the Convention on Biological Diversity, biotechnology means: "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use. The definition covers many of the tools, techniques and a range of different technologies, including gene manipulation, gene transfer, DNA typing and cloning of mammals that are commonplace in agriculture and food production.

This Tanzania Standard provides an up-to-date list of terms used in biotechnology, genetic engineering, and related fields, particularly in plant and animal genetic resources, food quality, and plant protection.

During the development of this Tanzania standard, the following documents were referenced:

• FAO, 2001 Glossary of biotechnology for food and agriculture, published by Food and Agriculture Organization, (FAO)

1 Scope

This Tanzania Standard provides terms and definitions used in the field of biotechnology.

2 Normative References

The following referenced documents are indispensable in the application of this Tanzania standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies:

There are no normative references.

3 Terms and definitions

For the purposes of this Tanzania Standard, the following terms and definitions shall apply:

3.1 abiotic stress

The effect of non-living factors which can harm living organisms. These non-living factors include drought, extreme temperatures, pollutants, etc.

3.2 abscisic acid

A plant growth regulator involved in abscission, dormancy, stomatal regulation, and inhibition of seed germination. It also influences somatic embryogenesis in some plant species.

3.3 acaricide

A pesticide used to kill or control mites or ticks.

3.4 acclimatization

The adaptation of a living organism (plant, animal or micro-organism) to a changed environment that subjects it to physiological stress. Acclimatization should not be confused with adaptation

3.5 acellular

Describing tissues or organisms that are not made up of separate cells but often have more than one nucleus.

3.6 acentric chromosome

Chromosome fragment lacking a centromere.

3.7 acetyl co-enzyme A; acetyl CoA

A compound formed in the mitochondria when an acetyl group (CH3CO-) – derived from breakdown of fats, proteins, or carbohydrates – combines with the thiol group (-SH) of co-enzyme A.

3.8 acquired

Developed in response to the environment, not inherited, such as a character trait (acquired characteristic) resulting from environmental effect(s).

3.9 acridine dyes

A class of positively charged polycyclic molecules that intercalate into DNA and induce frameshift mutations.

3.10 acrosome

An apical organelle in the head of a spermatozoon.

3.11 actin

One of the two contractile proteins in muscle (the other being myosin). Actin is also found in the microfilaments that form part of the cytoskeleton of all cells.

3.12 activated charcoal; activated carbon

Charcoal which has been treated to remove hydrocarbons and to increase its adsorptive properties.

3.13 activator

1. A substance or physical agent that stimulates transcription of a specific gene or operon. **2**. A compound that, by binding to an allosteric site on an enzyme, enables the active site of the enzyme to bind to the substrate.

3.14 active site

1. A site on the surface of a catalyst at which activity occurs. 2. The site on the surface of an enzyme molecule that binds the substrate molecule.

3.15 adaptation

Adjustment of a population to changed environment over generations, associated (at least in part) with genetic changes resulting from selection imposed by the changed environment.

3.16 adaptive radiation

The evolution of new forms, sub-species or species from one species of plant or animal in order to exploit new habitats or food sources. a.k.a. divergent evolution.

3.17 adaptor

1. A synthetic double-stranded oligonucleotide with one blunt end and one cohesive end, allowing ligation to a target DNA molecule and cloning into a vector. 2. A synthetic single-stranded oligonucleotide that

self-hybridizes to form cohesive ends and an internal restriction site, enabling insertion into a cloning vector.

3.18 addendum

In formulation of tissue culture media: an item or a constituent substance to be added.

3.18additive allelic effects

Effects of alleles at a locus, where the heterozygote is exactly intermediate between the two homozygotes.

3.19additive gene effects

Additive allelic effects summed across all the loci that contribute to genetic variation in a quantitative trait.

3.20adenilate cyclase

The enzyme that catalyses the formation of cyclic AMP.

3.21 adenine (symbol: A)

A white crystalline purine base. A constituent of DNA and RNA and nucleotides such as ADP and ATP.

3.22 adenovirus - A group of DNA viruses which cause diseases in animals. In man, they produce acute respiratory tract infections with symptoms resembling common cold. They are used in gene cloning, as vectors for expressing large amounts of recombinant proteins in animal cells. They are also used to make live-virus vaccines against more dangerous pathogens.

3.24 antibody-directed enzyme pro-drug therapy

A way to target a drug to a specific tissue. The drug is administered as an inactive pro-drug, and then converted into an active drug by an enzyme administered with a second injection.

3.25 adhesion

The attraction of dissimilar molecules for each other. A sticking together of unlike substances, such as soil and water.

3.26 adsorbent

A substance to which compounds adhere. In tissue culture, an adsorbent is added to the culture medium to adsorb compounds released by cultured cells or tissues, thus minimizing any adverse effect on the subsequent growth in culture. A common adsorbent in tissue culture is activated charcoal.

3.27 adult cloning

The creation of identical copies of an adult animal by nuclear transfer from differentiated adult tissue.

3.28 advanced

Applied to an organism or a part thereof, implying considerable development from the ancestral stage or from the explant stage.

3.29 adventitious

A structure arising at sites other than the usual ones, e.g., shoots from roots or leaves, and embryos from any cell other than a zygote.

3.30 aerate

To supply with or mix with air or gas. The process is aeration.

3.31 aerobe

A micro-organism that grows in the presence of oxygen. Note: Opposite: anaerobe.

3.32 aerobic bacteria

Bacteria that can live in the presence of oxygen. aerobic respiration A type of respiration in which foodstuffs are completely oxidized to carbon dioxide and water, with the release of chemical energy, in a process requiring atmospheric oxygen.

3.33 affinity chromatography

A method for separating molecules by exploiting their ability to bind specifically to other molecules.

3.34 affinity tag; purification tag

An amino acid sequence that has been engineered into a protein to make its purification easier.

3.35 aflatoxin

Toxic compounds, produced by moulds (fungi) of the Aspergillus flavus group, that bind to DNA and prevent replication and transcription

3.36 agar

A polysaccharide solidifying agent used in nutrient media preparations and obtained from certain types of red algae (Rhodophyta). Both the type of agar and its concentration can affect the growth and appearance of cultured explants.

3.37 agarose

The primary component of agar, a polysaccharide, responsible for solidifying media and used to create gels for electrophoresis.

3.38 agarose gel electrophoresis

A process in which a matrix composed of a highly purified form of agar is used to separate larger DNA and RNA molecules.

3.39 aggregate

1. A clump or mass formed by gathering or collecting units. 2. A body of loosely associated cells, such as a friable callus or cell suspension. 3. Coarse inert material, such as gravel, that is mixed with soil to increase its porosity. 4. A serological reaction (aggregation) in which the antibody and antigen react and precipitate out of solution.

3.40 agonist

A drug, hormone or transmitter substance that forms a complex with a receptor site that is capable of triggering an active response from a cell.

3.41 agrobacterium

A genus of bacteria that includes several plant pathogenic species, causing tumour-like symptoms.

3.42 agrobacterium tumefaciens

A bacterium that causes crown gall disease in some plants. Agrobacterium tumefaciens-mediated transformation A naturally occurring process of DNA transfer from the bacterium A. tumefaciens to plants.

3.43 agrobiodiversity; agricultural biological diversity

That component of biodiversity that is relevant to food and agriculture production. The term agrobiodiversity encompasses within- species, species and ecosystem diversity.

3.44 AIDS (acquired immunodeficiency syndrome)

The usually fatal human disease in which the immune system is destroyed by a retrovirus (Human Immunodeficiency Virus, HIV). The virus infects and destroys helper T-cells, which are essential for combating infections.

3.45 airlift fermenter

A cylindrical fermentation vessel in which the cells are mixed by air introduced at the base of the vessel and that rises through the column of culture medium. The cell suspension circulates around the column as a consequence of the gradient of air bubbles in different parts of the reactor.

3.46 albinism

Hereditary absence of pigment in an organism. Albino animals have no colour in their skin, hair and eyes. The term is also used for absence of chlorophyll in plants.

3.47 albino

1. An organism lacking pigmentation, due to genetic factors. 2. A conspicuous plastome (plastid) mutant involving loss of chlorophyll.

3.48 alkylating agents

Chemicals that transfer alkyl (methyl, ethyl, etc.) groups to the bases in DNA.

3.49 allele

One of a pair, or series, of variant forms of a gene that occur at a given locus in a chromosome. Alleles are symbolized with the same basic symbol (e.g., B for dominant and b for recessive);

3.50 allele frequency

The number of copies of an allele in a population, expressed as a proportion of the total number of copies of all alleles at a locus in a population.

3.51 allele-specific amplification (ASA)

The use of polymerase chain reaction (PCR) at a sufficiently high stringency that only a primer with exactly the same sequence as the target DNA will be amplified. A powerful means of genotyping for single-locus disorders that have been characterized at the molecular level.

3.52 allelic exclusion

A phenomenon whereby only one functional allele of an antibody gene can be assembled in a given B lymphocyte. The "allele" on the other homologous chromosome in a diploid mammalian cell cannot undergo a functional re-arrangement, which would result in the production of two different antibodies by a single plasma cell.

3.53 allelopathy

The phenomenon by which the secretion of chemicals, such as phenolic and terpenoid compounds, by a plant inhibits the growth or reproduction of other plant species with which it is competing.

3.54 allergen

An antigen that provokes an immune response.

3.55 allogamy

Cross fertilization in plants.

3.56 allometric

When the growth rate of one part of an organism differs from that of another part or of the rest of the body.

3.57 allopatric speciation

Speciation occurring at least in part because of geographic isolation.

3.58 allopolyploid

A polyploid organism (usually a plant) having multiple sets of chromosomes derived from different species. Hybrids are usually sterile, because they do not have sets of homologous chromosomes and therefore pairing cannot take place. However, if doubling of the chromosome number occurs in a hybrid derived from two diploid (2n) species, the resulting tetraploid (4n) is a fertile plant, since it contains two sets of homologous chromosome and pairing may occur; this tetraploid is an allotetraploid.

3.59 allosteric enzyme

An enzyme that has two structurally distinct forms, one of which is active and the other inactive. Active forms of allosteric enzymes tend to catalyse the initial step in a pathway leading to the synthesis of molecules. The end product of this synthesis can act as a feedback inhibitor, converting the enzyme to the inactive form, thus controlling the amount of product synthesized.

3.60 allosteric regulation

A catalysis-regulating process in which the binding of a small effector molecule to one site on an enzyme affects the activity at another site.

3.61 allosteric transition

A reversible interaction of a small molecule with a protein molecule, resulting in a change in the shape of the protein and a consequent alteration of the interaction of that protein with a third molecule.

3.62 allotetraploid

An organism with four genomes derived from hybridization of different species. Usually, in forms that become established, two of the four genomes are from one species and two are from another species. See allopolyploid.

3.61 allozygote

A diploid individual that is homozygous at a locus in which the two genes are not identical by descent from a common ancestor.

3.62 alphalactalbumin

Protein component of milk.

3.63 Alu sequences

A family of 300-bp sequences occurring nearly a million times in the human genome.

3.64 ambient temperature

Air temperature at a given time and place; not radiant temperature.

3.65 amino acid

An acid containing the group NH2. In particular, any of 20 basic building blocks of proteins with a free amino (NH2) and a free carboxyl (COOH) group, and having the basic formula NH2 – CR – COOH. According to the side group R, they are subdivided into: polar or hydrophilic (serine, threonine, tyrosine, asparagine and glutamine); non- polar or hydrophobic (glycine, alanine, valine, leucine, iso- leucine, proline, phenylalanine, tryptophan and cysteine); acidic (aspartic acid and glutamic acid) and basics (lysine, arginine, hystidine). The sequence of amino acids determines the shape, properties and the biological role of a protein. Plants and many micro-organisms can synthesize amino acids from simple inorganic compounds, but animals are unable to synthesize some of them, called essential amino acids, so they must be present in the diet.

3.66 aminoacyl site

A-site One of two sites on ribosomes to which the incoming aminoacyl tRNA binds.

3.67 aminoacyl tRNA synthetase

Enzyme that attaches each amino acid to its specific tRNA molecule.

3.68 amitosis

Cell division (cytokinesis), including nuclear division through constriction of the nucleus, without chromosome differentiation as in mitosis.

3.69 amniocentesis

A procedure for obtaining amniotic fluid from a pregnant mammal for the diagnosis of some diseases in the unborn foetus. Cells are cultured, and metaphase chromosomes are examined for irregularities (e.g., Down syndrome, spina bifida, etc., in humans).

3.70 amnion

The thin membrane that lines the fluid-filled sac in which the embryo develops in higher vertebrates, reptiles and birds.

3.71 amniotic fluid

Liquid contents of the amniotic sac of higher vertebrates, containing cells of the embryo (not of the mother). Both fluid and cells are used for diagnosis of genetic abnormalities in the embryo or foetus.

3.72 amorph; null mutation

A mutation that obliterates gene function.

3.73 amphimixis

True sexual reproduction involving the fusion of male and female gametes and the formation of a zygote.

3.74 ampicillin

A penicillin-derived antibiotic that prevents bacterial growth by interfering with synthesis of the cell wall.

3.75 amplification

1. Treatment (e.g., use of chloramphenicol) designed to increase the proportion of plasmid DNA relative to that of bacterial (host) DNA. 2. Replication of a gene library in bulk. 3. Duplication of gene(s) within a

chromosomal segment. 4. Creation of many copies of a segment of DNA by the polymerase chain reaction (PCR).

3.76 amplified fragment length polymorphism (AFLP)

A DNA marker technique involving genomic DNA digestion with two restriction enzymes, ligation of adaptors to fragment ends, PCR amplification with primers matching adaptor sequences and random base combinations, and visualization of fragments via gel electrophoresis.

3.77 amplify

To increase the number of copies of a DNA sequence, either in vivo by inserting into a cloning vector that replicates within a host cell, or in vitro by polymerase chain reaction (PCR).

3.78 amylase

A group of enzymes that degrade starch, glycogen and other polysaccharides, producing a mixture of glucose and maltose.

3.79 glucose molecules

The water-insoluble portion of starch.

3.80 amylose

A polysaccharide consisting of linear chains of 100 to 1000 glucose molecules. The water-soluble portion of starch.

3.81 anabolic pathway

A pathway by which a metabolite is synthesized; a biosynthetic pathway.

3.82 anaerobe

An organism that can grow in the absence of oxygen.

3.83 anaerobic

An environment or condition in which molecular oxygen is not available for chemical, physical or biological processes.

3.84 anaerobic digestion

Digestion of materials in the absence of oxygen.

3.85 anaerobic respiration

Respiration in which foodstuffs are partially oxidized, with the release of chemical energy, in a process not involving atmospheric oxygen, such as alcoholic fermentation, in which one of the end products is ethanol.

3.86 analogous

Features of organisms or molecules that are superficially or functionally similar but have evolved in a different way or contain different compounds.

3.87 anaphase

The stage of mitosis or meiosis during which the daughter chromosomes (sister chromatids) pass from the equatorial plate to opposite poles of the cell (toward the ends of the spindle). Anaphase follows metaphase and precedes telophase.

3.88 anchor gene

A gene that has been positioned on both the physical map and the linkage map of a chromosome.

3.89 androgen

Any hormone that stimulates the development of male secondary sexual characteristics, and contributes to the control of sexual activity in vertebrate animals. Usually synthesized by the testes.

3.90 androgenesis

(Male parthenogenesis, i.e., the development of a haploid embryo from a male nucleus.- The maternal nucleus is eliminated or inactivated subsequent to fertilization of the ovum, and the haploid

3.91 animal cell immobilization

Entrapment of animal cells in some solid material in order to produce some natural product or genetically engineered protein.

3.92 animal genetic resources databank

A databank that contains inventories of farm animal genetic resources and their immediate wild relatives, including any information that helps to characterize these resources.

3.93 animal genome (gene) bank

A planned and managed repository containing animal genetic resources. Repositories include the environment in which the genetic resource has developed, or is now normally found (in situ) or facilities elsewhere (ex situ - in vivo or in vitro).

3.94 anion

A negatively charged ion; opposite: cation.

3.95 Anneal

The pairing of complementary DNA or RNA sequences, via hydrogen bonding, to form a double-stranded polynucleotide. Most often used to describe the binding of a short primer or probe.

3.96 annealing

The process of heating (de-naturing step) and slowly cooling (re-naturing step) double-stranded DNA to allow the formation of hybrid DNA or complementary strands of DNA or of DNA and RNA.

3.97 annual

1. Taking one year, or occurring at intervals of one year. 2. Noun: In botany, a plant that completes its life cycle within one year. During this time the plant germinates, grows, flowers, produces seeds, and dies.

3.98 anonymous DNA marker

A DNA marker detectable by virtue of variation in its sequence, irrespective of whether or not it actually occurs in or near a coding sequence. Microsatellites are typical anonymous DNA markers.

3.99 Antagonism

An interaction between two organisms (e.g., moulds or bacteria) in which the growth of one is inhibited by the other.

3.100 antagonist

A compound that inhibits the effect of an agonist in such a way that the combined biological effect of the two becomes smaller than the sum of their individual effects.

3.101 anther culture

The aseptic culture of anthers for the production of haploid plants from microspores.

3.102 anthesis

The flowering period or efflorescence. Anthesis is the time of full bloom, which lasts till fruit set.

3.103 Antibiosis

The prevention of growth or development of an organism by a substance or another organism.

3.104 antibiotic

A class of natural and synthetic compounds that inhibit the growth of or kill some micro-organisms. antibiotic resistance The ability of a micro-organism to produce a protein that disables an antibiotic or prevents transport of the antibiotic into the cell.

3.105 antibody

An immunological protein (called an immunoglobulin, Ig) produced by certain white blood cells (lymphocytes) of the immune system of an organism in response to a contact with a foreign substance (antigen).

3.106 antibody class

The class to which an antibody belongs, depending on the type of heavy chain present. In mammals, there are five classes of antibodies: IgA, IgD, IgE, IgG, and IgM.

3.107 antibody-mediated (humoral) immune response

The synthesis of antibodies by B cells in response to an encounter of the cells of the immune system with a foreign immunogen.

3.108 anticoding strand

The strand of the DNA double helix that is actually transcribed. Also known as the antisense or template strand.

3.109 anticodon

A triplet of nucleotides in a tRNA molecule that pairs with a complementary triplet of nucleotides, or codon, in an mRNA molecule during translation. See codon; mRNA; RNA; tRNA.

3.110 antigen; immunogen

A compound that elicits an immune response by stimulating the production of antibodies.

3.111 antigenic switching

The altering of a micro-organism's surface antigens through genetic re-arrangement, to elude detection by the host's immune system.

3.112 antihaemophilic globulin

Blood globulin that reduces the clotting time of haemophilic blood.

3.113 anti-idiotype antibodies

Antibodies which recognize the binding sites of other antibodies.

3.114 antimicrobial agent

Any chemical or biological agent that harms the growth of micro-organisms.

3.115 Antinutrients

Compounds that inhibit normal uptake of nutrients.

3.116 anti-oncogene

A gene whose product prevents the normal growth of tissue.

3.117 antioxidant solution

Pre-treatment solution (e.g., Vitamin C; citric acid) that retards senescence and browning of tissue. It is employed to incubate explants prior to surface sterilization.

3.118 antioxidant

Compound that slows the rate of oxidation reactions.

3.119 Antiparallel orientation

The arrangement of two strands in a DNA or nucleic-acid duplex (DNA-RNA, RNA-RNA) where the strands run in opposite directions, with the 5' phosphate end of one strand aligned with the 3' hydroxyl end of the other strand.

3.120 antisense DNA

1. The strand of chromosomal DNA that is transcribed. 2. A DNA sequence that is complementary to all or part of an mRNA molecule.

3.121 antisense gene

A gene that produces a transcript (mRNA) that is complementary to the pre-mRNA or mRNA of a normal gene (usually constructed by inverting the coding region relative to the promoter).

3.122 antisense RNA

An RNA sequence that is complementary to all or part of a functional mRNA molecule, to which it binds, blocking its translation.

3.123 antisense therapy

The in vivo treatment of a genetic disease by blocking translation of a protein with a DNA or an RNA sequence that is complementary to a specific mRNA.

3.124 antiseptic

Any substance that kills or inhibits the growth of disease- causing micro-organism (a micro-organism capable of causing sepsis), but is essentially non-toxic to cells of the body.

3.125 antiserum

The fluid portion of the blood of an animal (after coagulation of the blood), containing antibodies

3.126 anti-terminator

A type of protein which enables RNA polymerase to ignore certain transcriptional stop or termination signals and read through them to produce longer mRNA transcripts.

3.127 Antitranspirant

A compound applied to leaves of newly transplanted plants, shrubs or vines or cuttings to reduce water loss. If applied too thickly, it may affect photosynthesis and respiration.

3.128 apex

The tip of a leaf; the portion of a root or shoot containing apical and primary meristems. Usually used to designate the apical tip of the meristem.

3.129 apical cell

A meristematic initial in the apical meristem of shoots or roots of plants. As this cell divides, new tissues are formed.

3.130 apical dominance

The phenomenon of inhibition of growth of lateral (axillary) buds in a plant by the presence of the terminal (apical) bud on the branch, due to auxins produced by the apical bud.

3.131 apical meristem

A region of the tip of each shoot and root of a plant in which cell division is continually occurring to produce new stem and root tissue, respectively.

3.132 apoenzyme

Inactive enzyme that has to be associated with a specific organic molecule called a co-enzyme in order to function. The apoenzyme/co-enzyme complex is called a holoenzyme.

3.133 apomixis

The asexual production of diploid offspring without the fusion of gametes. The embryo develops by mitotic division of the maternal or paternal gamete, or, in the case of plants, by mitotic division of a diploid cell of the ovule.

3.134 apoptosis

The process of cell death, which occurs naturally as a part of normal development, maintenance and renewal of tissue in an organism. Apoptosis differs from necrosis, in which cell death is caused by a toxic substance.

3.135 Aquaculture

The cultivation of water plants and animals in controlled environments, rather than harvesting them from natural bodies of water. When it involves seawater, it's called mariculture. It's related to biotechnology due to its commercial use and similarity to growing organisms in large water volumes or growing large volumes of yeast or bacteria.

3.136 Arabidopsis

A genus of flowering plants in the Cruciferae.

3.137 ARS (autonomous replicating sequence)

Any eukaryotic DNA sequence that initiates and supports chromosomal replication; they have been isolated in yeast cells. Also called autonomous(ly) replicating segment.

3.138 artificial inembryonation

Non-surgical transfer of embryo(s) to a recipient female. As in vitro embryo technology develops, artificial inembryonation will gradually replace artificial insemination.

3.139 artificial insemination

The deposition of semen, using a syringe, at the mouth of the uterus to make conception possible. It is used in the breeding of domestic animals.

3.140 artificial seed

Encapsulated or coated somatic embryos (embryoids) that are planted and treated like seed.

3.141 artificial selection

The practice of choosing individuals from a population for reproduction, usually because these individuals possess one or more desirable traits.

3.142 ascorbic acid; vitamin C

A water-soluble vitamin present naturally in some plants, and also synthetically produced. Aside from its role as a vitamin, it is used as an antioxidant in plant tissue culture; and included in disinfection solutions.

3.143 Ascospore

One of the spores contained in the ascus of certain fungi.

3.144 ascus (pl: asci)

Reproductive sac in the sexual stage of a type of fungi (Ascomycetes) in which ascospores are produced.

3.145 Aseptic (Asepsis or sterile)

The state of being free of contaminating organisms (bacteria, fungi, algae and all micro-organisms except viruses) but not necessarily free of internal symbionts.

3.146 asexual

Any type of reproduction not involving meiosis or the union of gametes.

3.147 asexual embryogenesis

The sequence of events whereby embryos develop from somatic cells. a.k.a. somatic cell embryogenesis.

3.148 asexual propagation

Vegetative, somatic, non-sexual reproduction of a plant without fertilization.

3.149 asexual reproduction

Reproduction that does not involve the formation and union of gametes from the different sexes or mating types. It occurs mainly in lower animals, micro- organisms and plants. In plants, asexual reproduction is by vegetative propagation (e.g., bulbs, tubers, corms) and by formation of spores.

3.150 asparagine

One of the 20 essential amino acids. It is occasionally included in plant tissue culture media as a source of reduced nitrogen.

3.151 aspartic acid

An amino acid necessary for nucleotide synthesis and occasionally included in plant tissue culture media.

3.152 Assay

1. To test or evaluate. 2. The procedure for measuring the quantity of a given substance in a sample (chemically or by other means). 3. The substance to be analysed.

3.153 assortative mating

Mating in which the partners are chosen on the basis of phenotypic similarity.

3.154 asynapsis

The failure or partial failure in the pairing of homologous chromosomes during the meiotic prophase.

3.155 ATP (adenosine triphosphate)

A nucleotide that carries chemical energy in all living organisms. It consists of adenosine with three phosphate groups linked together.ATP-ase - An enzyme that brings about the hydrolysis of ATP, by the cleavage of either one phosphate group with the formation of ADP and inorganic phosphate, or of two phosphate groups, with the formation of AMP and pyrophosphate.

3.156 attenuated vaccine

A virulent organism that has been modified to produce a less virulent form, but nevertheless retains the ability to elicit antibodies against the virulent form.

3.157 attenuation

A mechanism for controlling gene expression in prokaryotes that involves premature termination of transcription.

3.158 Attenuator

A nucleotide sequence in the 5 region of a prokaryotic gene (or in its RNA) that causes premature termination of transcription, possibly by forming a secondary structure.

3.159 authentic protein

A recombinant protein that has all the properties – including any post-translational modifications – of its naturally occurring counterpart.

3.160 autocatalysis

Catalysis in which one of the products of the reaction is a catalyst for the reaction. Usually the catalysis starts slowly and increases as the quantity of the catalyst increases, falling off as the product is used up.

3.161 autoclave

1. An enclosed chamber in which substances are heated under pressure to sterilize utensils, liquids, glassware, etc., usingsteam. 2. A pressure cooker used to sterilize growth medium and instruments for tissue culture work.

3.162 auto-immune disease

Disorder in which the immune systems of affected individuals produce antibodies against molecules that are normally produced by those individuals (called self antigens).

3.163 auto-immunity

A disorder in the body's defence mechanism in which an immune response is elicited against its own (self) tissues.

3.164 autologous cells

Cells that are taken from an individual, cultured (or stored), and, possibly, genetically manipulated before being infused back into the original donor.

3.165 autolysis

The process of self destruction of a cell, cell organelle, or tissue. It occurs by the action of lysosomic enzymes.

3.166 Autonomous

A term applied to any biological unit that can function on its own, i.e., without the help of another unit, such as a transposable element that encodes an enzyme for its own transposition.

3.167 autopolyploid

A polyploid that has multiple and identical or nearly identical sets of chromosomes (genomes) all derived from the same species. A polyploid species with genomes derived from the same original species.

3.168 autoradiograph

A picture prepared by labelling a substance such as DNA with a radioactive material such as tritiated thymidine and allowing the image produced by decay radiation to develop on a film over a period of time.

3.169 Autoradiography

A technique that captures images formed in a photographic emulsion as a result of the emission from light or radioactivity emitted by a labeled component placed next to unexposed film. It is used to detect the location of an isotope in tissues, cells, or molecules. In genetic engineering, it helps detect the binding of a radioactive DNA probe to denatured DNA in processes like Southern transfer or colony hybridization.

3.170 autosome

A chromosome that is not involved in sex determination.

3.171 autotrophic

Self-nourishing organisms capable of utilizing carbon dioxide or carbonates as the sole source of carbon and obtaining energy for life processes from radiant energy or from the oxidation of inorganic elements, or compounds such as iron, sulphur, hydrogen, ammonium and nitrites.

3.172 autotrophy

Autotrophy is the capacity of an organism to use light as the sole energy source in the synthesis of organic material from inorganic elements or compounds. Autotrophic organisms include green photosynthesizing plants and some photosynthetic bacteria.

3.173 auxin

A group of plant growth regulators (natural or synthetic) which stimulate cell division, enlargement, apical dominance, root initiation, and flowering. One naturally produced auxin is indole-acetic acid (IAA).

3.174 auxin-cytokinin ratio

The relative proportion of auxin to cytokinin present in plant-tissue-culture media. Varying the relative amounts of these two hormone groups in tissue culture formulae affects the proportional growth of shoots

and roots in vitro. As the ratio is increased (increased auxin or decreased cytokinin), roots are more likely to be produced, and as it is decreased root growth declines and shoot initiation and growth are promoted.

3.175 auxotroph

A mutant cell or micro-organism lacking the capacity to form an enzyme or metabolite present in the parental strain, and that consequently will not grow on a minimal medium, but requires the addition of some compound such as an amino acid or a vitamin for growth.

3.176 availability

A reflection of the form and location of nutritional elements and their suitability for absorption. In tissue culture media this is related to the abundance of each nutritional element, the osmotic concentration and pH of the medium, the stability and solubility of the item in question, the presence of absorbing agents in the media, and other factors.

3.177 axenic culture

Free of external contaminants and internal symbionts; generally not possible with surface sterilization alone, and incorrectly used to indicate aseptic culture.

3.178 axillary bud

A bud found at the axil of a leaf (synonymous with lateral bud).

3.179 axillary bud proliferation

Propagation in culture using protocols and media which promote axillary (lateral shoot) growth. This is a technique for mass production (micropropagation) of plantlets in culture, achieved primarily through hormonal inhibition of apical dominance and stimulation of lateral branching.

3.180 Bacillus

A rod-shaped bacterium.

3.181 Bacillus thuringiensis (Bt)

A bacterium that kills insects; a major component of the microbial pesticide industry.

3.182 back mutation

A second mutation at the same site in a gene as the original mutation. The second mutation restores the wild-type nucleotide sequence.

3.183 backcross

Crossing an organism with one of its parents or with the genetically equivalent organism. The offspring of such a cross are referred to as the backcross generation or backcross progeny.

3.184 bacterial toxin

A toxin produced by a bacterium, such as Bt toxin by *Bacillus thuringiensis*.

3.185 bacteriocide

A chemical or drug that kills bacterial cells.

3.186 bacteriocin

A protein produced by bacteria of one strain and active against those of a closely related strain.

3.187 bacteriophage

A virus that infects bacteria. Also called simply phage.

3.188 bacteriostat

A substance that inhibits or slows down growth and reproduction of bacteria.

3.189 bacterium

minute (0.5-5 mm), unicellular organisms, without a distinct nucleus. Bacteria are prokaryotes, and most of them are identified by means of Gram staining. They are classified on the basis of their oxygen requirement (aerobic vs anaerobic) and shape (spherical = coccus; rodlike = bacillus; spiral = spirillum; comma-shaped = vibrio; corkscrew-shaped = spirochaete; filamentous).

3.190 baculovirus

Baculoviruses are a class of insect virus which have been used to make DNA cloning vectors for gene expression in eukaryotic cells. In a vector cloning system, this gene is replaced by one that the biotechnologist wants expressed.

3.191 balanced lethal system

A system for maintaining a recessive lethal allele at each of two loci on the same pair of chromosomes. In a closed population with no crossing-over between the loci, only the double heterozygotes for the lethal mutations survive.

3.192 balanced polymorphism

Two or more types of individuals maintained in the same breeding population.

3.193 bar

A unit used for pressure of fluid. 1 bar = 105 Pa. 1 bar is approximately equivalent to 1 atmosphere.

3.194 barr body

A condensed mass of chromatin found in the nuclei of female mammals. It is a late-replicating, inactive X-chromosome. Named after its discoverer, Murray Barr (1908-).

3.195 basal

1. Located at the base of a plant or a plant organ. 2. A fundamental formulation of a tissue culture medium.

3.196 basal body

Small granule to which a cilium or flagellum is attached.

3.197 base

A cyclic, nitrogen-containing compound that is one of the essential components of nucleic acids.Exists in five main forms (adenine, A; guanine, G; thymine, T; cytosine, C; uracil, U).

3.198 base analogues

Unnatural purine or pyrimidine bases that differ slightly in structure from the normal bases, but can be incorporated into nucleic acids. They are often mutagenic.

3.199 base pair (bp)

The two strands that constitute DNA are held together by specific hydrogen bonding between purines and pyrimidines (A pairs with T; and G pairs with C). The size of a nucleic acid molecule is often described in terms of the number of base pairs (symbol: bp) or thousand base pairs (kilobase pairs; symbol: kb; a more convenient unit) it contains.

3.200 base substitution

Replacement of one base by another in a DNA molecule.

3.201 basophil

A type of white blood cell (leucocyte), produced by stem cells in the red bone marrow.

3.202 batch culture

A suspension culture in which cells grow in a finite volume of liquid nutrient medium and follow a sigmoid pattern of growth.

3.203 batch fermentation

A process in which cells or micro-organisms are grown for a limited time. At the beginning of the fermentation, an inoculum is introduced into fresh medium, with no addition or removal of medium for the duration of the process.

3.204 B cells

An important class of white blood cells that mature in bone marrow and produce antibodies. They are largely responsible for the antibody-mediated or humoral immune response; they give rise to the antibody-producing plasma cells and some other cells of the immune system.

3.205 β-DNA

The normal form of DNA found in biological systems. It exists as a right-handed helix.

3.206 bench-scale process

A small- or laboratory-scale process; commonly used in connection with fermentation.

3.207 β-galactosidase

An enzyme that catalyses the formation of glucose and galactose from lactose.

3.208 biennial (L. biennium, a period of two years)

In botany, a plant which completes its life cycle within two years and then dies. For most biennial plants, the two growing seasons have to be separated by a period of cold temperature sufficient to induce flowering and fruit formation.

3.209 binary vector system

A two-plasmid system in Agrobacterium tumefaciens for transferring into plant cells a segment of T-DNA that carries cloned genes.

3.210 binomial nomenclature

In biology, each species is generally identified by two terms: the first is the genus to which it belongs, and the second is the specific epithet that distinguishes it from others in that genus.

3.211 binomial expansion

The probability that an event will occur 0, 1, 2,..., n times out of n is given by the successive terms of the expression (p + q)n, where p is the probability of the event occurring, and q = 1 - p.

3.212 bio

A prefix derived from bios and used in scientific words to associate the concept of "living organisms."

3.213 Bio-accumulation

The buildup of non-essential materials, like metals or chemicals (e.g., DDT), in an organism. This can happen as a defense against toxins or due to cell wall chemistry. It plays a role in microbial mining, toxic metal removal from wastewater, and bioremediation.

3.214 Bio-assay

A method to test a substance's effect on living cells or organisms. Originally done with animals, it is now mainly performed using bacteria, plant, or animal cells, which are easier, cheaper, and avoid ethical concerns. It can detect tiny amounts of growth-related substances.

3.215 bio-augmentation

Increasing the activity of bacteria that decompose pollutants; a technique used in bioremediation.

3.216 biocatalysis

Use of enzymes to catalyse chemical reactions.

3.217 Biocontrol

The use of living organisms to manage pests or harmful organisms. This includes introducing predators, such as spider mites for cassava mealy bugs, or diseases like myxomatosis to control rabbits. It also applies to disease-resistant crop varieties. Biotechnology enhances biocontrol using fungi, viruses, or bacteria that target pests.

3.218 Bioconversion

The transformation of one chemical into another by living organisms, rather than by enzymes (biotransformation) or chemical processes. It is highly specific and operates under mild conditions. Bioconversion is useful for modifying complex molecules, such as in steroid production, where precise chemical changes are needed for drug development.

3.219 biodegradation

The breakdown by living organisms of a compound to its chemical constituents. Materials that can be easily biodegraded are colloquially termed biodegradable.

3.220 biodiversity

The variety of species (species diversity) or other taxa of animals, micro-organisms and plants in a natural community or habitat, or of communities in a particular environment (ecological diversity), or of genetic variation in a species (genetic diversity,.). bio-energetics - The study of the flow and the transformations of energy that occur in living organisms.

3.221 bio-engineering

The use of artificial tissues, organs and organ components to replace parts of the body that are damaged, lost or malfunctioning.

3.222 bio-enrichment

Adding nutrients or oxygen to increase microbial breakdown of pollutants.

3.223 bio-ethics

The branch of ethics that deals with the life sciences and their potential impact on society. biofuel - A gaseous, liquid or solid fuel that contains energy derived from a biological source. For example, rapeseed oil or fish liver oil can be used in place of diesel fuel in modified engines. biogas - A mixture of methane and carbon dioxide resulting from the anaerobic decomposition of waste such as domestic, industrial and agricultural sewage. a.k.a. gobar.

3.224 biogenesis

The principle that a living organism can only arise from other living organisms similar to itself and can never originate from non-living material.

3.225 Bioinformatics

The organization and analysis of biological data. It involves managing biomolecular databases, extracting useful information, using powerful computers for analysis, and integrating data from different biological sources.

3.226 Biolistics

A method for inserting DNA into cells by attaching it to tiny metal particles (gold or tungsten) and shooting them at high speed. This technique works on various cell types, including animal, plant, fungal cells, and even mitochondria. Also called microprojectile bombardment, it is more versatile than other gene transfer methods.

3.227 Biological containment

Preventing genetically engineered organisms from surviving outside the lab. This is done by altering them so they depend on lab-only nutrients or by using environments where they cannot grow. It can also involve using genetically disabled vectors and host organisms that survive only under controlled conditions.

3.228 biomass

1. The cell mass produced by a population of living organisms. 2. The organic mass that can be used either as a source of energy or for its chemical components. 3. All the organic matter that derives from the photosynthetic conversion of solar energy.

3.229 biomass concentration

The amount of biological material in a specific volume.

3.230 biome

A major ecological community or complex of communities, extending over a large geographical area and characterized by a dominant type of vegetation.

3.231 biometry

The application of statistical methods to the analysis of biological problems.

3.232 Biopesticide

A substance that kills pests through specific biological effects rather than general chemical toxicity. It includes bio-insecticides and bio-fungicides. Unlike biocontrol agents, which actively seek out pests, biopesticides work passively. Examples include Bacillus thuringiensis (Bt) toxin, which disrupts digestion in certain insects but is harmless to mammals. Biopesticides are designed to be biodegradable and target specific aspects of pest metabolism.Biopolymer: A large molecule (protein, nucleic acid, polysaccharide, lipid) made by a living organism.

3.233 Bioprocess

Any process that uses complete living cells or their components (e.g., enzymes, chloroplasts) to effect desired physical or chemical changes.

3.234 Bioreactor

A tank in which cells, cell extracts or enzymes carry out a biological reaction. Often refers to a growth chamber (fermenter, fermentation vessel) for cells or micro-organisms.

3.235 bioremediation

A process that uses living organisms to remove contaminants, pollutants or unwanted substances from soil or water.

3.236 biosensor

A self-contained, integrated device capable of providing specific quantitative analytical information using a biorecognition element (such as an enzyme, antibody, nucleotide, or whole cell) in direct contact awith transducer element.

3.237 Biosphere

The part of Earth and its atmosphere where living organisms exist.

3.238 Biosynthesis

The creation of compounds by living cells, essential for building up materials in the body.

3.239 Biotechnology

1. Using biological processes or organisms to make useful products. 2. The use of living organisms or their parts, especially at the molecular level, to create new products like hormones or vaccines.

3.240 Biotic Factor

Other living organisms in an environment that affect an organism in various ways.

3.241 Biotic Stress

Harm caused to plants by living organisms, like viruses or pests.

3.242 Biotin

A vitamin that helps with fat metabolism and the incorporation of carbon dioxide into other compounds, produced by intestinal bacteria in animals.

3.243 Biotin Labeling

1. Attaching biotin to another molecule. 2. Adding a biotin-containing nucleotide to a DNA molecule.

3.244 Biotinylated-DNA

DNA labeled with biotin, used in experiments to detect DNA through its interaction with streptavidin.

3.245 Biotransformation

The process of converting one substance into another using a biological catalyst, usually an enzyme.

3.246 Biotope

A small habitat within a larger community.

3.247 Biotoxin

A toxic substance produced by organisms that likely has an adaptive purpose.

3.248 Bivalent

A pair of chromosomes, one from each parent, that are joined together, each having two chromatids.

3.249 β-Lactamase

An enzyme associated with antibiotic resistance, specifically to ampicillin.

3.250 Blastocyst

Early stage of a mammalian embryo, a hollow ball of cells before implantation.

3.251 Blastomere

A cell formed during the early divisions of an embryo.

3.252 Blastula

Early embryo form that comes after the morula stage, consisting of a ball or sheet of cells.

3.253 B Lymphocytes

Immune cells that produce antibodies and are vital for the immune response.

3.254 Bleach

A chemical used for cleaning or whitening, often with chlorine.

3.255 Bleeding

Discoloration of media due to phenolic products from plant transfers

3.256 Blot

1. To transfer molecules like DNA, RNA, or protein onto a surface. 2. The image created during these transfer procedures.

3.257 Blunt End

The end of a DNA molecule where both strands are equal in length without extensions.

3.258 Blunt-End Cut

Cutting DNA so that both strands end at the same point.

3.259 Blunt-End Ligation

Joining two blunt-ended DNA molecules together.

3.260 Boring Platform

A sterile dish bottom used to prepare plant explants.

3.261 Bound Wate

Water inside cells that isn't released during freezing.

3.262 Bovine Somatotrophin (BST)

A hormone that promotes cattle growth and milk production, also used in agriculture.

3.263 Bovine Spongiform Encephalopathy (BSE)

A disease in cattle, also known as mad cow disease.

3.264 Bract

A leaf that supports a flower or cluster of flowers.

3.265 Breed

A group of domestic animals with distinct traits that set them apart from others of the same species.

3.266 Breed at Risk

A breed in danger of extinction due to low numbers or other factors.

3.267 Breeding

The process of reproducing offspring.

3.268 Breeding Value

The genetic contribution an individual makes to the traits of its offspring.

3.269 Breed Not at Risk

A breed with a stable or growing population, unlikely to become extinct.

3.270 Brewing

The process of making beer from barley, including malting, steeping, and fermentation.

3.271 Brewer's Yeast

Yeast used in beer production, often Saccharomyces cerevisiae.

3.272 Bridge

A material used to support plant tissue in culture when a liquid medium is present.

3.273 Broad-Host-Range Plasmid

A plasmid that can replicate in multiple bacterial species.

3.274 Broad-Sense Heritability

The proportion of total variation in a trait caused by genetic differences.

3.275 Browning

Discoloration caused by the oxidation of phenolic compounds in freshly cut plant tissue, which may later indicate problems like poor nutrition or disease.

3.276 Brucellosis

A disease caused by bacteria of the genus Brucella.

3.277 Bubble Column Fermenter

A bioreactor where cells or microorganisms are suspended in a liquid by rising air introduced at the bottom of the vessel.

3.278 Bud

A region of meristematic tissue that can develop into leaves, shoots, or flowers. It can be terminal (at the stem tip) or axillary (in the leaf axils).

3.279 Bud Scar

A scar left on a stem after a bud or its protective scales fall off.

3.280 Bud Sport

A mutation in a bud that leads to a genetically different shoot.

3.281 Budding

1. Asexual reproduction where a new individual grows from a bud. 2. In fungi, especially yeast, where new cells form from an outgrowth. 3. A form of grafting where a bud is inserted into another plant to grow into a new shoot.

3.282 Buffer

A solution that resists changes in pH when acids, bases, or dilutions are added.

3.283 Buoyant Density

The density of a molecule or particle when suspended in a solution like saltwater, which reflects its G=C base pair proportion.

3.284 C

Cytosine, a nucleotide in DNA or RNA.

3.285 CAAT Box

A conserved DNA sequence found in the promoter region of many eukaryotic genes that helps bind transcription factors.

3.286 Calf Scours

Watery diarrhea in calves.

3.287 Callus

1. A protective tissue that forms on cut plant surfaces. 2. A mass of undifferentiated plant cells grown in culture.

3.288 Callus Culture

A tissue culture technique where small plant explants are used to grow callus tissue, which can then develop into shoots or roots.

3.289 Calorie

The amount of heat needed to raise the temperature of 1 gram of water by 1°C.

3.290 Calyx

The collective term for all the sepals of a flower, forming its outermost layer.

3.291 Cambial Zone

The region in stems and roots where the cambium and its products are located.

3.292 Cambium

A layer of meristematic tissue between the xylem and phloem that creates secondary tissues, leading to an increase in diameter.

3.293 Cancer

Uncontrolled cell growth in a tissue or organ.

3.294 Candidate Gene

A gene thought to be involved in a specific trait based on its function.

3.295 Candidate-Gene Strategy

An approach where knowledge of a trait's biology is used to identify genes that may contribute to it.

3.296 Canola

A type of oilseed rape cultivated for its oil, rich in mono-unsaturated fatty acids.

3.297 Cap

A structure on the 5' end of eukaryotic mRNA made of a methylated guanosine.

3.298 Cap Site

The location in a gene where translation begins.

3.399 Capacitation

The final maturation process of sperm that occurs in the female genital tract before fertilization.

3.300 Capsid

The protein shell of a virus that often determines its shape.

3.301 Carbohydrate

Organic compounds like sugars and starches that serve as energy sources and structural components in living organisms.

3.302 Carbowax

A type of polyethylene glycol.

3.303 Carcinogen

A substance that can cause cancer.

3.304 Carcinoma

A cancerous tumor that originates in epithelial tissue.

3.305 Carotene

A reddish-orange pigment involved in photosynthesis, found in plants like carrots.

3.306 Carotenoid

A group of pigments that give plants their red, yellow, or orange color, involved in photosynthesis and protecting cells from light damage.

3.307 Carboxypeptidases

Enzymes that remove amino acids from the ends of peptides, used in peptide sequencing.

3.308 Carpe

The female reproductive part of a flower, made up of the stigma, style, and ovary.

3.309 Carrier

In genetics, an individual who carries one recessive allele for a genetic condition but does not show the symptoms.

3.310 Carrier DNA

DNA added to improve the efficiency of DNA transformation procedures.

3.311 Carrier Gas

The gas that transports a sample in gas chromatography.

3.312 Carrier Molecule

1. A molecule that helps transport electrons in the electron transport chain. 2. A lipid-soluble molecule that can bind to lipid-insoluble molecules and transport them across membranes. Carrier molecules have specific sites that interact with the molecules they transport. Efficiency of carrier molecules may be modified by modifying the interacting sites through genetic engineering.

3.313 Casein

A group of proteins found in milk.

3.314 Casein Hydrolysate

A mixture of amino acids and peptides made by breaking down casein with enzymes or acid.

3.315 Catabolic Pathway

A process where organic molecules are broken down to release energy for growth and other functions.

3.316 Catalysis

The process of speeding up a chemical reaction with a catalyst.

3.317 Catabolism

The breakdown of large molecules in living organisms, releasing energy.

3.318 Catabolite Repression

A decrease in transcription rates of genes for enzymes involved in breaking down molecules like glucose.

3.319 Catalyst

A substance that speeds up a chemical reaction without changing itself permanently.

3.320 Catalytic Antibody (Abzyme)

An antibody that can catalyze a chemical reaction by stabilizing the transition-state.

3.321 Catalytic RNA (Ribozyme)

An RNA molecule that cuts other RNA molecules.

3.322 Cation

A positively charged ion, opposite of an anion.

3.323 Caulogenesis

The process of shoot development from callus tissue.

3.324 CD Molecules (Cluster of Differentiation)

A group of molecules found on immune cells that help identify specific sub-populations of cells.

3.325 cDNA (Complementary DNA)

DNA synthesized from mRNA, used for cloning and studying genes.

3.326 cDNA Clone

A double-stranded DNA created from mRNA using reverse transcriptase and DNA polymerase.

3.327 cDNA Cloning

A method to clone a gene by first copying its mRNA into cDNA.

3.328 cDNA Library

A collection of cDNA clones made from mRNA samples of an organism or tissue.

3.329 CDR (Complementarity-Determining Regions

Regions of antibodies that make contact with antigens.

3.330 Cell

The smallest unit of life, capable of performing all functions of life, usually surrounded by a membrane.

3.331 Cell Culture

The growth of cells outside their natural environment, usually of a single cell type.

3.332 Cell Cycle

The stages a cell goes through from one division to the next, including mitosis and interphase (G, S, and G2 phases).

3.333 Cell Differentiation

The process where cells become specialized for specific functions.

3.334 Cell Division

The process of a cell splitting into two or more daughter cells.

3.335 Cell Fusion

The process where two cells from different species join to form a single hybrid cell.

3.336 Cell Generation Time

The time between one cell division and the next, or the time it takes for a population to double.

3.337 Cell Hybridization

The fusion of different cells to form a hybrid.

3.338 Cell Line

A population of cells that can be maintained in culture, often derived from a primary culture.

3.339 Cell-Mediated Immune Response

The activation of T cells to respond to foreign antigens.

3.340 Cell Membrane

The boundary of the cell that controls the flow of materials in and out.

3.341 Cell Number

The count of cells in a given volume of culture.

3.342 Cell Plate

The precursor to the cell wall that forms during cell division.

3.343 Cell Sap

Water and dissolved substances like sugars and amino acids in the plant cell vacuole.

3.344 Cell Selection

The process of selecting specific cells based on desired traits for further growth.

3.345 Cell Strain

A specific group of cells derived from a primary culture with particular traits.

3.346 Cell Suspension

Cells grown in a liquid medium that is shaken or stirred to keep them moving.

3.347 Cellular Immune Response

The immune system's response to pathogens, involving T cells.

3.348 Cellular Oncogene

A normal gene that can contribute to cancer if mutated or misexpressed.

3.349 Cellulase

An enzyme that breaks down cellulose.

3.350 Cellulose

A carbohydrate that forms the structural framework of plant cell walls.

Cellulosome

A protein complex in some cellulose-degrading microorganisms that contains all the enzymes needed to break down cellulose.

3.352 Cell Wall

A rigid outer layer surrounding plant cells, mostly made of cellulose.

3.353 CentiMorgan (cM)

A unit of recombination frequency, equal to 1% recombination between two loci.

3.354 Central Dogma

The concept that genetic information flows from DNA to RNA to protein, though some viruses can reverse this flow.

3.355 Central Mother Cell

A cell in a plant apical meristem with a large vacuole.

3.356 Centres of Origin

Areas where domesticated plants first originated, showing the greatest ge

3.357 Centrifugation

A method of separating molecules by size or density using spinning forces.

3.358 Centrifuge

A machine that separates particles of different densities by spinning them in a tube.

3.359 Centriole

An organelle in animal cells that helps form the spindle during cell division.

3.360 Centromere

The part of a chromosome where spindle fibers attach during cell division.

3.361 Centrosome

A region near the nucleus where microtubules are formed during cell division; it contains centrioles.

3.362 Cephem-type Antibiotic

An antibiotic with a similar structure to cephalosporins.

3.363 Chain Terminator

A codon signaling the end of protein synthesis or a chemical used to stop DNA strand synthesis in sequencing.

3.364 Character

A distinguishing feature of an organism.

3.365 Characterization

Describing and recording features of animal or plant genetic resources for better understanding and monitoring.

3.366 Charcoal

A porous form of carbon, often used to prevent browning in plant tissue culture.

3.367 Chelate

A complex molecule that can bind with cations to deliver micronutrients to plants, especially iron.

3.368 Chemically-defined Medium

A plant tissue culture medium where all chemical components are known.

3.369 Chemical Mutagen

A substance that can cause genetic mutations in living organisms.

3.370 Chemiluminescence

Light emitted from a chemical reaction.

3.371 Chemostat

A continuous culture system where growth rate and cell density are kept constant by adding a limiting nutrient at a fixed rate.

3.372 Chemotaxis

The movement of a cell or organism toward or away from a substance in increasing concentration.

3.373 Chemotherapy

The treatment of disease with chemicals, especially for infections or cancer.

3.374 Chiasma

A point where two chromatids from homologous chromosomes exchange genetic material during meiosis.

3.375 Chimera

An organism made up of cells from different zygotes or species.

3.376 Chimeric DNA

A recombinant DNA molecule containing genes from different organisms.

3.377 Chimeric Gene

A gene made from parts of different genes, often used in genetic transformation

3.378 Chimeric Protein

A protein made from parts of different proteins.

3.379 Chimeric Selectable Marker Gene

A gene constructed from parts of different genes that helps a cell survive under certain conditions.

3.380 Chi-squared Test

A statistical test to check how well observed data matches a prediction.

3.381 Chitin

A polysaccharide found in the exoskeletons of invertebrates and fungi.

3.382 Chitinase

An enzyme that breaks down chitin.

3.383 Chloramphenicol

An antibiotic that blocks protein synthesis.

3.384 Chlorenchyma

Plant tissue containing chloroplasts, such as in leaf mesophyll

3.385 Chlorophyll

The green pigment in plants that absorbs light for photosynthesis.

3.386 Chloroplast

An organelle in plant cells that contains chlorophyll and is involved in photosynthesis; it has its own DNA.

3.387 Chloroplastid

Another name for chloroplast.

3.388 Chlorosis

A condition where plants turn yellow due to lack of chlorophyll, often due to nutrient issues or infection.

3.389 Chromatid

One of two identical strands of a duplicated chromosome, still connected at the centromere. Once they separate during cell division, they are called chromosomes.

3.390 Chromatin

A substance in eukaryotic chromosomes made of DNA, proteins (mainly histones), and small amounts of RNA.

3.391 Chromatin Fibres

DNA and proteins organized into strands of 30 nm diameter in eukaryotic chromosomes.

3.392 Chromatography

A technique for separating and identifying molecules with similar properties, originally used to separate leaf pigments.

3.393 Chromocentre

A body formed by the fusion of heterochromatic regions in certain insect tissues.

3.394 Chromogenic Substrate

A compound that forms color when reacted.

3.395 Chromomeres

Small bodies along a chromosome, identified by their size and linear arrangement.

3.396 Chromonema

A thread-like structure inside each chromosome.

3.397 Chromoplast

A plastid that contains pigments like carotenoids, giving color to plants.

3.398 Chromosomal Aberration

A change in chromosome structure or number, often harmful.

3.399 Chromosomal Integration Site

A location in a chromosome where foreign DNA can be inserted without affecting the host's essential functions.

3.400 Chromosomal Polymorphism

The occurrence of different forms of chromosomes in a population due to mutations.

3.401 Chromosome

A tightly coiled strand of DNA in the cell nucleus that carries genetic information.

3.402 Chromosome Aberration

Abnormalities in chromosome structure or number, including mutations like duplication or deletion.

3.403 Chromosome Banding

A technique for staining chromosomes to create light and dark patterns, helping identify specific chromosomes.

3.404 Chromosome Mutation

A change in the structure of a chromosome that often has harmful effects.

3.405 Chromosome Jumping

A technique for cloning two DNA segments that are far apart on a chromosome, by linking them together.

3.406 Chromosome Theory of Inheritance

The idea that chromosomes carry genetic information and their behavior during meiosis explains inheritance patterns.

3.407 Chromosome Walking

A technique for identifying overlapping DNA fragments along a chromosome by using them as probes.

3.408 Chymosin

An enzyme that helps clot milk and is used in cheese-making.

3.409 Cilium

A hairlike structure on some cells that helps them move, especially in protozoa.

3.410 Circadian

Referring to biological activities that occur approximately every 24 hours.

3.411 Circularization

When the sticky ends of a DNA fragment are joined to form a covalently-closed circle.

3.412 Cis Heterozygote

A heterozygote with two mutations on the same chromosome.

3.413 Cis-acting Sequence

A DNA sequence that affects genes on the same chromosome.

3.414 Cistron

A gene or DNA sequence that codes for a specific protein.

3.415 Claims

The section of a patent that describes the uses and applications of the invention.

3.416 Class Switching

When a plasma cell changes the type of antibody it produces.

3.417 Cleave

To break DNA strands by cutting their phosphodiester bonds using a restriction enzyme.

3.418 Clonal Propagation

Asexual reproduction of plants, producing genetically identical offspring from one parent.

3.419 Clonal Selection

The process where a B lymphocyte interacts with an antigen and produces plasma cells that all make the same antibody.

3.420 Clone

A group of genetically identical cells or organisms created through asexual reproduction, inbreeding, or nuclear transplantation.

- A group of genetically identical plants produced by vegetative propagation.
- A group of cells with identical DNA inserted into them.
- The verb form: To insert a DNA segment into a vector or host chromosome

3.421 Cloned Strain or Line

A strain that directly descends from a single clone.

3.422 Cloning

- o The process of creating identical daughter cells from a single progenitor cell.
- Inserting a DNA molecule into a chromosomal site or vector.
- Animal cloning: Creating an animal from a single somatic cell using nuclear transfer.

3.423 Cloning Vector

A small DNA molecule that carries foreign DNA for cloning, like a plasmid or viral DNA.

3.424 Closed Continuous Culture

A culture system where fresh medium is added while an equal amount of spent medium is removed, and cells are recycled back into the culture.

3.425 Coat Protein

The protein surrounding the nucleic acid core of a virus.

3.426 Coccus

A spherical-shaped bacterium. They can appear singly, in pairs, or in clusters.

3.427 Coconut Milk

Liquid endosperm from a coconut, often used as a nutrient source in cell culture.

3.428 Cocoon

A protective covering made by some invertebrates, like silkworms, for their eggs or larvae.

3.429 Co-culture

The simultaneous culture of two different types of cells, like plant cells and microorganisms.

3.430 Coding

Refers to the process of specifying a peptide sequence through DNA.

3.431 Coding Sequence

The part of a gene that directly codes for the protein's amino acid sequence.

3.432 Coding Strand

The DNA strand that has the same sequence as the mRNA (with thymine replaced by uracil in RNA).

3.433 Co-dominance

When both alleles in a heterozygote are expressed equally, such as in roan cattle with both red and white hairs.

3.434 Co-dominant Alleles

Alleles that both show effects when present together in a heterozygote.

3.435 Codon

A set of three nucleotides in mRNA that codes for an amino acid in protein synthesis.

3.436 Codon Optimization

Changing rare codons in a gene to more common ones in a host organism without altering the protein.

3.437 Coefficient

A number that expresses the amount of change or effect in specific conditions.

3.438 Co-enzyme

A small organic molecule, usually a vitamin, that helps an enzyme function.

3.439 Co-evolution

The process where two species evolve together, influencing each other's adaptations.

3.440 Co-factor

An organic or inorganic molecule needed for an enzyme's activity.

3.441 Co-fermentation

When two microorganisms grow together in the same bioreaction.

3.442 Co-generation

The simultaneous production of electricity and steam in a plant.

3.443 Cohesion

The force that holds similar molecules together.

3.444 Cohesive Ends

DNA molecules with sticky ends that can bind together due to complementary sequences.

3.445 Coincidence

The ratio of observed to expected double crossovers during genetic recombination.

3.446 Co-integrate Vector System

A method for transferring cloned genes into plant cells, involving two plasmids.

3.447 Co-integrate

A DNA molecule formed by combining two different DNA molecules, often through transposable elements.

3.448 Colchicine

A compound that disrupts spindle formation during mitosis, leading to chromosome doubling.

3.449 Coleoptile

A protective sheath covering the shoot tip of monocot plants, helping it emerge from the soil.

3.450 Coleorhiza

A protective sheath around the radicle (embryonic root) of monocot plants.

3.451 Co-linearity

When the sequence of units in one molecule matches the sequence of units in another molecule, like the nucleotides in a gene matching the amino acids in the protein it encodes.

3.452 Collection

In plant genetic resources, refers to base collection or active collection.

3.453 Collenchyma

A tissue with living cells that supports young, non-woody parts of plants. The cell walls are thickened but not lignified.

3.454 Colony Hybridization

A technique that uses a DNA probe to find bacterial colonies with a specific cloned gene.

3.455 Colony

1. A group of identical cells from a single cell. 2 A group of interdependent cells or organisms.

3.456 Combinatorial Library

A collection of many different combinations of light and heavy antibody chains in separate vectors.

3.457 Commensalism

When two organisms interact, one benefits without harming the other.

3.458 Companion Cell

A cell in the phloem of plants that works with the sieve cell.

3.459 Comparative Gene Mapping

Comparing gene locations across species to identify similar gene blocks and predict gene positions in other species.

3.460 Comparative Positional Candidate Gene

A gene likely in the same location in one species as a known gene in another species, based on gene mapping comparisons.

3.461 Competence

A bacterium's ability to take up foreign DNA and become genetically transformed.
3.462 Competency

A temporary state where bacteria can take up foreign DNA.

3.463 Competent

A cell that can develop into a fully functional embryo.

3.464 Complement Proteins

Proteins that help break down antibody-antigen complexes.

3.465 Complementarity

The pairing of nucleotide bases in DNA, where adenine pairs with thymine and cytosine pairs with guanine.

3.466 Complementary Entity

- 1. A pair of nucleotide bases that bond together, like adenine with thymine.
- 2. Two DNA strands that can join through base pairing.

3.467 Complementary Genes

Genes that depend on each other to show a specific effect, either dominantly or recessively.

3.468 Complementary Homopolymeric Tailing

Adding complementary nucleotide extensions to DNA ends to help join different DNA molecules.

3.469 Complementary Nucleotides

Nucleotide pairs (adenine-thymine, guanine-cytosine) that can bond together.

3.470 Complementation

When two different mutations "cover" for each other and restore the normal phenotype.

3.471 Complementation Test (Trans Test)

Testing if two mutations are in the same gene by introducing them into the same cell.

3.472 Complete Digest

Treating DNA with an enzyme until all target sites are cut.

3.473 Composite Transposon

A transposable element formed when two transposons surround a non-transposable DNA segment.

3.474 Compound Chromosome

A chromosome formed by the joining of two chromosomes.

3.475 Concatermer

A DNA sequence made up of repeated parts linked end-to-end.

3.476 Concordance

When matched pairs or groups have the same trait.

3.477 Conditional Lethal Mutation

A mutation that causes death under certain conditions, but not under others, like temperature-sensitive mutations.

3.478 Conditioning

- 1. The effect of external factors on phenotypic traits during development.
- 2. The process that promotes the growth of individual cells or small clusters in culture

3.479 Conidium

An asexual spore formed by certain fungi.

3.480 Conjugation:

- 1. The joining of sex cells or organisms during reproduction.
- 2. The transfer of DNA (often plasmid) between bacteria through cell contact.

3.481 conjugative functions

Plasmid-based genes and their products that facilitate the transfer of a plasmid from one bacterium to another.

3.482 consensus sequence

The nucleotide sequence that is present in the majority of genetic signals or elements that perform a specific function.

3.483 conservation

Refers to all human activities, including strategies, plans, policies and actions, undertaken to ensure the diversity of farm animal genetic resources is being maintained to contribute to food and agricultural production and productivity; now and in the future

3.484 constant domains

Regions of antibody chains that have the same amino acid sequence in different members of a particular class of antibody molecules.

3.485 constitutive enzyme

An enzyme that is synthesized continually regardless of growth conditions.

3.486 constitutive gene

A gene that is continually expressed in all cells of an organism.

3.487 constitutive promoter

an unregulated promoter that allows for continual transcription of its associated gene.

3.488 constitutive synthesis

Continual production of RNA or protein by an organism.

3.489 constitutive

An organism to be constitutive for the production of an enzyme or other protein if that protein is always produced by the cells under all physiological conditions.

3.490 contaminant

Bacterial, fungal or algal micro-organism accidentally introduced into a culture or culture medium. Contaminant may overgrow the plant cells and consequently inhibit their growth.

3.491 contig

A set of overlapping clones that provide a physical map of a portion of a chromosome.

3.492 contiguous map; contig map

The alignment of sequence data from large, adjacent regions of the genome to produce a continuous nucleotide sequence across a chromosomal region.

3.493 continuous culture

A suspension culture continuously supplied with nutrients by the inflow of fresh medium.

3.494 continuous fermentation

A process in which cells or micro- organisms are maintained in culture in the exponential growth. Phenotypes grade into each other, and measurement data are required for analysis.

3.495 Conversion

The development of a somatic embryo into a plant.

3.496 co-polymers

Mixtures consisting of more than one monomer; for example, polymers of two kinds of organic bases, such as uracil and cytosine (poly-UC) have been combined for studies of the genetic code.

3.497 copy number

The average number of molecules of a plasmid or gene per genome contained in a cell.

3.498 co-repressor

An effector molecule that forms a complex with a repressor and turns off the expression of a gene or set of genes.

3.499 Corpus

is found below the tunica and is a part of the apical meristem. In the corpus, cells divide in all directions, giving them an increase in volume.

3.500 Correlation

A statistical association between variables.

3.501 co-segregation

When two genetic conditions appear to be inherited together.

3.502 cosmid

A plasmid vector which contains the two cos (cohesive) ends of phage lambda and one or more selectable markers such as an antibiotic resistance gene.

3.503 cot curve

A graph showing the proportion of re-natured DNA against cot.

3.504 co-transfection

the procedure by which the baculovirus and the transfer vector are simultaneously introduced into insect cells in culture.

3.505 co-transformation

it is often necessary to transform with a plasmid for which there is no selectable phenotype and then screen for the presence of that plasmid within the host cell.

3.506 Co-transformation

a technique in which host cells are incubated with two types of plasmids, one of which is selectable and the other not. If transformation has been carried out at high DNA concentration, then it is probable that these cells will also have been transformed with the second (non-selectable) plasmid.

3.507 coupling

The phase state in which either two dominant or two recessive alleles of two different genes occur on the same chromosome.

3.508 covalent bond

A bond in which an electron pair is equally shared by protons in two adjacent atoms.

3.509 covalently closed circle (CCC)

A double-stranded DNA molecule with no free ends. The two strands are interlinked and will remain together even after denaturation.

3.510 co-variance

A measure of the statistical association between variables; the extent to which two variables vary together.

3.511 critical breed

A breed where the total number of breeding females is less than 100 or the total number of breeding males is less than or equal to five; or the overall population size is close to, but slightly above 100 and decreasing, and the percentage of pure-bred females is below 80%.

3.512 cross in genetic studies

the mating of two individuals or populations. Also called mating.

3.513 cross-breeding

Mating between members of different populations (lines, breeds, races or species).

3.514 cross hybridization

The hydrogen bonding of a single-stranded DNA sequence that is partially but not entirely complementary to a single-stranded substrate. Often, this involves hybridizing a DNA probe for a specific DNA sequence to the homologous sequences of different species.

3.515 crossing over

A process in which homologous chromosomes exchange material through the breakage and reunion of two chromatids.

3.516 crossing-over unit

A measure of distance between two loci on genetic maps that is based on the average number of crossing- over events that take place in the interval between those two loci during meiosis.

3.517 cross pollination

Fertilization of a plant from a plant with a different genetic makeup.

3.518 cross pollination efficiency

Efficiency of pollen from one plant reaching the stigma of another plant.

3.519 crown gall

A bulbous growth that occurs at the base of certain plants as result of infection, especially by Agrobacterium tumefaciens; a bacterial gene carried by the Ti plasmid is transferred by the bacteria into a higher plant cell, where it causes a tumour-like growth. a.k.a. crown gall tumour.

3.520 Crown

The region at the base of the stem of cereals and forage species from which tillers or branches arise. In woody plants, the root-stem junction.

3.521 cryobiological preservation; cryopreservation; freeze preservation

The preservation of germplasm resources in a dormant state by cryogenic techniques, as currently applied to storage of plant seeds and pollen, micro-organisms, animal sperm, and tissue culture cell lines.

3.522 Cryoprotectant

Compound preventing cell damage during freezing and thawing processes.

3.523 Cryoprotectants

are agents with high water solubility and low toxicity. Two types of cryoprotectant agent are commonly used: permeating (glycerol and DMSO) and non-permeating (sugars, dextran, ethylene glycol, polyvinyl pyrolidone and hydroxyethyl starch).

3.524 cryptic

1. Structurally heterozygous individuals not identifiable on the basis of abnormal meiotic-chromosome pairing configurations ('cryptic structural hybrids'). 2. A form of polymorphism controlled by recessive genes ('cryptic polymorphism'). 3. Any mutation which is exposed by a sensitizing mutation and otherwise poorly detected (such mutations probably escape detection because of the plasticity of composition of the corresponding polypeptide). 4 Phenotypically very similar species (cryptic species) which do not hybridize under normal conditions 5. Cryptic genetic variation - refers to the existence of, for example, alleles conferring high performance for a trait, in a breed that has low performance for that trait.

3.525 cultivar

A category of plants that are, firstly, below the level of a sub-species taxonomically, and, secondly, found only in cultivation.

3.526 culture

A population of plant or animal cells or micro-organisms that is grown under controlled conditions.

3.527 culture alteration

A term used to indicate a persistent change in the properties of a culture's behaviour (e.g., altered morphology, chromosome constitution, virus susceptibility, nutritional requirements, proliferative capacity,

etc.). The term should always be qualified by a precise description of the change which has occurred in the culture.

3.528 culture medium

Any nutrient system for the cultivation of cells of plants, bacteria or other organisms; usually a complex mixture of organic and inorganic nutrients.

3.529 culture room

Room for maintaining cultures and often in a controlled environment of light, temperature and humidity.

3.530 Curing

The elimination of a plasmid from its host cell. Many agents which interfere with DNA replication, e.g., ethidium bromide, can cure plasmids from either bacterial or eukaryotic cells.

3.531 Cutting Noun

A detached plant part that under appropriate cultural conditions can regenerate the complete plant without a sexual process.

3.532 cybrid

A cytoplasmic hybrid, originating from the fusion of a cytoplast (the cytoplasm without nucleus) with a whole cell, as in nuclear transfer (although the term is not used in that context). Note that the nucleus and cytoplasm of the fused cell products are from different genetic sources.

3.533 cyclic AMP (cyclic adenosine monophosphate)

A "messenger" that regulates many intracellular reactions by transducing signals from extracellular growth factors to cellular metabolic pathways.

3.534 cytogenetics

Area of biology concerned with chromosomes and their implications in genetics, cellular activity and variability.

3.535 cytokine

In immunology - any of many soluble molecules that cells produce to control reactions between other cells.

3.536 cytokinesis

Cytoplasmic division and other changes exclusive of nuclear division that are a part of mitosis or meiosis.

3.537 cytokinin Plant growth regulators (hormones)

characterized as substances that induce cell division and cell differentiation (e.g., BA, kinetin, and 2-iP). In tissue culture, these substances are associated with enhanced callus and shoot development.

3.538 cytology

The study of the structure and function of cells.

3.539 cytolysis

Cell disintegration.

3.540 cytoplasm

The living material of the cell, exclusive of the nucleus, consisting of a complex protein matrix or gel. The part of the cell in which essential membranes and cellular organelles (mitochondria, plastids, etc.) reside.

3.541 cytoplasmic genes DNA

containing bodies in the cell but external to the nucleus.

3.542 cytoplasmic inheritance

Hereditary transmission dependent on the cytoplasm or structures in the cytoplasm rather than the nuclear genes; extrachromosomal inheritance. Thus, plastid characteristics in plants are inherited by a mechanism independent of nuclear genes.

3.543 cytoplasmic male sterility

Genetic defect due to defective functions of mitochondria in the pollen. Fertilization will not occur. Exploited in certain plant breeding strategies, such as F1-hybrid maize cultivars.

3.544 cytoplasmic organelles

Discrete sub-cellular structures located in the cytoplasm of cells; these allow division of labour within the cell.

3.545 Cytosine

A pyrimidine base found in DNA and RNA.

3.546 cytosol

The fluid portion of the cytoplasm, i.e., the cytoplasm minus its organelles.

3.547 Cytotype

A maternally inherited cellular condition in Drosophila that regulates the activity of transposable P elements.

3.548 dabs (single-domain antibodies)

Antibodies with only one (instead of two) protein chain derived from only one of the domains of the antibody structure. Dabs exploit the finding that, for some antibodies, half of the antibody molecule binds to its target antigen almost as well as the whole molecule.

3.549 dalton (symbol: Da)

A unit of atomic mass roughly equivalent to the mass of a hydrogen atom.

3.550 Darwinian cloning

Selection of a clone from a large number of essentially random starting points, rather than isolating a natural gene or making a carefully designed artificial one. Molecules which are more similar to those needed are selected, mutated to generate new variants, and re-selected. The cycle proceeds until the required molecule is found.

3.551 death phase

The final growth phase, during which nutrients have been depleted and cell number decreases.

3.552 deceleration phase

The phase of declining growth rate, following the linear phase and preceding the stationary phase in most batch-suspension cultures.

3.553 de-differentiation

The process by which cells lose their specialization and proliferate by cell division to form a mass of cells which, in response to appropriate stimuli, may later differentiate again to form either the same cell type or a different one. De-differentiation occurs in response to wounding and in tissue cultures.

3.554 deficiency

Insufficiency or absence of one or more usable forms of enzymatic, nutritional or environmental requirements, so that development, growth or physiological functions are affected.

3.555 defined

1. Fixed conditions of medium, environment and protocol for growth. 2. Precisely known and stated elments of a tissue culture medium.

3.556 degeneracy (of the genetic code) - The specification of one amino acid by more than one codon. It arises from the inevitable redundancy resulting from 64 triplets in a triplet code $(4 \times 4 \times 4 = 64)$ encoding only 20 amino acids.

3.557 degeneration

1. Changes in cells, tissues or organs due to disease. 2. The reduction in size or complete loss of organs during evolution.

3.558 Dehalogenation

The removal of halogen atoms (chlorine, iodine, bromine, fluorine) from molecules, usually during biodegradation.

3.559 Dehiscence

The spontaneous and often violent opening of a fruit, seed pod or anther to release and disperse the seeds or pollen.

3.560 dehydrogenase

An enzyme that catalyses the remove of hydrogen atoms in biological reactions.

3.561 dehydrogenation

A chemical reaction in which hydrogen is removed from a compound.

3.562 de-ionized water

Water which is free of most inorganic (not completely free, since Na is present in ample quantities) and most organic compounds.

3.563 deletion

A mutation involving the removal of one or more base pairs in DNA sequence. Large deletions are visible as the lack of chromosomal segments.

3.564 deliberate release

Putting something into the outside world; in biotechnology it means putting a genetically modified organism (GMO) into field trials.

3.565 Deme

A group of organisms in the same taxon.

3.566 de-mineralize

To remove the mineral content (salts, ions) from a substance, especially water. Removal methods include distillation and electrodialysis. The process is de-mineralization.

3.567 denaturation

Loss of native configuration of a macro-molecule (protein or nucleic acid) by physical or chemical means, usually accompanied by loss of biological activity. Denatured proteins often unfold their polypeptide chains and express changed properties of solubility.

3.568 denature

To induce structural alterations that disrupt the biological activity of a molecule. Often refers to breaking hydrogen bonds between base pairs in double-stranded nucleic acid molecules to produce single-stranded polynucleotides, or altering the secondary and tertiary structure of a protein, destroying its activity.

3.569 denitrification

A chemical process in which nitrates in the soil are reduced to molecular nitrogen, which is released to the atmosphere.

3.570 density gradient centrifugation

High-speed centrifugation in which molecules "float" at a point where their density equals that in a gradient of caesium chloride or sucrose. The density gradient may either be formed before centrifugation by mixing two solutions of different density (as in sucrose density gradients) or it can be formed by the process of centrifugation itself.

3.571 deoxyribonuclease (DNase)

Any enzyme that hydrolyses DNA.

3.572 de-repression

The process of "turning on" the expression of a gene or set of genes whose expression has been repressed (turned off). Displacement of a repressor protein from a promoter region of DNA. When attached to the DNA, the repressor protein prevents RNA polymerase from initiating transcription. The "turning on" of a gene.

3.573 derivative

1. Resulting from or derived from. 2. Term used to identify a variant during meristematic cell division.

3.574 desiccant

Any compound used to remove moisture or water.

3.575 desiccate

To dry, exhaust or deprive of water or moisture. Any chemical used for this purpose is called a desiccant. An apparatus for drying and preventing hygroscopic samples from rehydrating is a desiccator. The process is desiccation.

3.576 desiccator

Apparatus for drying or depriving of moisture.

3.577 desoxyribonucleic acid

Obsolete spelling of deoxyribonucleic acid (DNA).

3.578 desulphurization (USA: desulfurization)

Technology for removing sulphur from oil and coal by use of bacteria. Sulphur residues in fuels end up as sulphur dioxide when the fuel is burned, resulting in acid rain. Bacteria may oxidize sulphites (insoluble) into sulphates (soluble), which can be washed away with the bacteria.

3.579 Detergent

Substance which lowers the surface tension of a solution, improving its cleaning properties (e.g., Tween-20[™], a surfactant and wetting agent).

3.580 determinate growth

Growth determined and limited in time, as in most floral meristems and leaves. The differentiation process is irreversibly established. Determinate growth contrasts with the usual culture growth, which is infinite and indeterminate.

3.581 determination

Process by which undifferentiated cells in an embryo become committed to develop into specific cell types, such as neurons, fibroblasts or muscle cells.

3.582 Determined

Describing embryonic tissue at a stage when it can develop only as a certain kind of tissue.

3.583 development

The sum total of events that contribute to the progressive elaboration of an organism. The two major aspects of development are growth and differentiation.

3.584 deviation

1. In statistics - the difference between an actual observation and the mean of all observations. 2. An alteration from the typical form, function or behaviour - Mutation or stress are the common reasons behind deviation.

3.585 dextrin

An intermediate polysaccharide compound resulting from the hydrolysis of starch to maltose by amylase enzymes.

3.586 diabetes

A disease associated with the absence or reduced levels of insulin, which is a hormone essential for the transport of glucose to cells.

3.587 diagnostic procedure

A test or assay used to determine the presence of an organism, substance or nucleic acid sequence alteration.

3.588 diakinesis

A stage of meiosis just before metaphase I, in which the separation of homologous chromosomes is almost completed.

3.589 Diazotroph

An organism that can fix atmospheric nitrogen. dicentric chromosome A chromosome having two centromeres.

3.590 dichogamy

The condition in which the male and the female reproductive organs of a flower mature at different times, thereby making self-fertilization improbable or impossible.

3.591 dicotyledon (Gr. dis, twice + kotyledon, a cup-shaped hollow)

A plant with two cotyledons, or seed leaves. One of the two classes of plants in the Angiosperms (the other class is the monocoty- ledons). Colloquially called a dicot. Examples include many crop plants (potato, pea, beans), ornamentals (rose, ivy) and timber trees (oak, beech, lime).

3.592 di-deoxynucleotide (ddNTP)

A deoxynucleotide that lacks a 3-hydroxyl group, and is thus unable to form the 3 - 5 phospho- diester bond necessary for chain elongation. Di-deoxynucleo- tides are used in DNA sequencing and the treatment of viral diseases. Also sometimes referred to as didN.

3.593 differential centrifugation

A method of separating sub-cellular particles according to their sedimentation coefficients, which are roughly proportional to their size. Cell extracts are subjected to a succession of centrifuge runs at progressively faster rotation speeds. Large particles, such as nuclei or mitochondria, will be precipitated at relatively slow speeds; higher G forces will be required to sediment small particles, such as ribosomes.

3.594 differentially permeable

Referring to a membrane, through which different substances diffuse at different rates; some substances may be unable to diffuse through such a membrane.

3.595 differentiation (L. differre, to carry different ways)

A process in which unspecialized cells develop structures and functions characteristic of a particular type of cell. Development from one cell to many cells, accompanied by a modification of the new cells for the performance of particular functions. In tissue culture, the term is used to describe the formation of different cell types.

3.596 diffusion (L. diffusus, spread out)

The movement of molecules from a region of higher concentration to a region of lower concentration.

3.597 digest

To cut DNA molecules with one or more restriction endonucleases.

3.598 dihaploid

An individual which arises from a doubled haploid.

3.599 dihybrid

An individual that is heterozygous for two pairs of alleles; the progeny of a cross between homozygous parents differing at two loci.

3.600 Dimer

Association of two molecules.

3.601 dimethyl sulphoxide; dimethyl sulfoxide

A highly hygroscopic liquid and powerful solvent with little odour or colour. It is an organic co-solvent used in small quantities to dissolve neutral organic substances in tissue culture media preparation. DMSO also has uses as a cryoprotectant.

3.602 Dimorphism

The existence of two distinctly different types of individuals within a species. An obvious example is the sexual dimorphism in certain animals.

3.603 diploid (Gr. diploos, double + oides, like)

1. The status of having two complete sets of chromosomes, most commonly one set of paternal origin and the other of maternal origin. 2. An organism or cell with a double set (2n) of chromosomes (most commonly one of paternal origin, and the other of maternal origin), or referring to an individual containing a double set of chromosomes per cell. Somatic tissues of higher plants and animals are ordinarily diploid in chromosome constitution, in contrast with the haploid gametes.

3.604 diploid cell

A cell which contains two sets of chromosomes.

3.605 diplonema

Stage in prophase of meiosis I following the pachytene stage, but preceding diakinesis, in which one pair of sister chromatids begin to separate from the other pair, i.e., the centromeres begin to disjoin.

3.606 direct embryogenesis

Embryoids form directly in culture, without an intervening callus phase, on the surface of zygotic or somatic embryos or on explant tissues (leaf section, root tip, etc.).

3.607 direct organogenesis

Formation of organs directly on the surface of cultured intact explants. The process does not involve callus formation.

3.608 direct repeat

Two or more stretches of DNA within a single molecule which have the same nucleotide sequence in the same orientation. Direct repeats may be either adjacent to one another or far apart on the same molecule. For example, TATTA...TATTA ATAAT...ATAAT

3.609 directed mutagenesis

The process of generation of nucleotide changes in cloned genes by any one of several procedures, including site-specific and random mutagenesis. Also called in vitro mutagenesis.

3.610 directional cloning

The technique by which DNA insert and vector molecules are digested with two different restriction enzymes to create non-complementary sticky ends at either end of each restriction fragment, so allowing the insert to be ligated to the vector in a specific orientation and preventing the vector from recircularizing.

3.611 disarm

To delete from a plasmid or virus genes that are cytotoxic or tumour inducing.

3.612 discontinuous variation Phenotypic

variation involving distinct classes, such as red versus white, tall versus dwarf.

3.613 discordant

Members of a pair showing different, rather than similar, characteristics.

3.614 disease

The opposite of ease. Any alteration from the state of metabolism necessary for the normal development and functioning of an organism, usually associated with infection by a pathogen or the malfunction or absence of one or more genes.

3.615 disease resistance

The ability to remain healthy by resisting disease or the disease agent. Disease resistance or tolerance is a subject of intense interest in biotechnology.

3.616 disease-free

A plant or animal certified through specific tests as being free of specified pathogens. Disease-free should be interpreted to mean "free from any known diseases" as "new" diseases may yet be discovered to be present.

3.617 disease-indexing

Disease-indexed organisms have been assayed for the presence of known diseases according to standard testing procedures.

3.618 disinfestation

1 Full elimination of internal micro-organisms from a culture; 2 The elimination or inhibition of the activity of surface-adhering micro-organisms

3.619 Disjunction

Separation of homologous chromosomes during anaphase I of meiosis; separation of sister chromatids during anaphase of mitosis and anaphase II of meiosis. As soon as the sister chromatids have separated, they are each called a chromosome.

3.620 disomy

The presence of a pair of specific chromosomes. This is the normal condition, and abnormal occurrences are monosomy, trisomy and nullisomy (with respectively one chromosome of a pair, three or none).

3.621 Disaccharide

A carbohydrate consisting of two linked sugar units.

3.622 dissecting microscope

A microscope with a low magnifying power of about 50, used to examine or excise small plant or animal parts.

3.623 dissection (L. dissectio, a dissecting or being dissected) Separation of a tissue by cutting for analysis or observation.

3.624 Dissolve

Pass chemicals into solution.

3.625 distillation

The process of heating a mixture to separate the more volatile from the less volatile parts, and then cooling and condensing the resulting vapour so as to produce a more nearly pure or refined substance.

3.626 di-sulphide bond

A chemical bond that stabilizes the three- dimensional structure of proteins, and hence the protein's normal function.

3.627 diurnal

Term describing the occurrence of an event at least once every 24 hours.

3.628 DNA (deoxyribonucleic acid; formerly spelt desoxyribonucleic acid) - The long chain of molecules in most cells that carries the genetic message and controls all cellular functions in most forms of life.

3.629 DNA amplification

Multiplication of a piece of DNA in a test-tube into many thousands of millions of copies. The most commonly used process is the polymerase chain reaction (PCR) system, but other systems are being developed, including ligase chain reaction (LCR), nucleic acids sequence-dependent amplification, and the Q-system.

3.630 DNase (deoxyribonuclease)

An enzyme that catalyses the cleavage of DNA.

3.631 DNase I

a digestive enzyme secreted by the pancreas, that degrades DNA into shorter nucleotide fragments. Many other endonucleases and exonucleases are involved in DNA repair and replication.

3.632 DNA construct

A DNA molecule inserted into a cloning vector, usually a plasmid.

3.633 DNA diagnosis

The use of DNA polymorphisms to detect the presence of a specific allele (often associated with a disease or syndrome) or DNA sequence.

3.634 DNA fingerprint

The unique pattern of DNA fragments identified originally by Southern hybridization (using a probe that binds to a polymorphic region of DNA) or now by polymerase chain reaction (PCR) (using primers flanking the polymorphic region).

3.635 DNA helicase (gyrase)

An enzyme that catalyses the unwinding of the complementary strands of a DNA double helix.

3.636 DNA hybridization

The pairing of two DNA molecules, often from different sources, by hydrogen bonding between complementary nucleotides. This technique is frequently used to detect the presence of a specific nucleotide sequence in a DNA sample.

3.637 DNA ligase

An enzyme that catalyses a reaction that links two DNA molecules via the formation of a phospho-diester bond between the 3hydroxyl and 5phosphate of adjacent nucleotides. It plays an important role in DNA repair and replication. DNA ligase is one of the essential tools of recombinant DNA technology, enabling (among other things) the incorporation of foreign DNA into vectors.

3.638 DNA micro-array

A small glass surface to which has been fixed an array of DNA fragments, each with a defined location. A typical DNA chip would contain 10 000 discrete spots (each containing a different DNA fragment) in an area of just a few square centimetres. When a solution of fluorescently labelled DNA fragments is hybridized to the chip, spots to which hybridization occurs are visible as fluorescence.

3.639 DNA polymerase

An enzyme that catalyses the synthesis of double- stranded DNA, using single-stranded DNA as a template.

3.640 DNA polymorphism

The existence of two or more alternative forms (alleles) of a chromosomal locus that differ in nucleotide sequence or have variable numbers of repeated nucleotide units.

3.641 DNA primase

An enzyme that catalyses the synthesis of short strands of RNA that initiate the synthesis of DNA strands.

3.642 DNA probe

A labelled (tagged) segment of DNA that is able, after a DNA hybridization reaction, to detect a specific DNA sequence in a mixture of sequences. If the tagged sequence is complementary to any one in the mixture, the two sequences will form a double helix.

3.643 DNA repair

A variety of mechanisms that repair errors that occur during DNA replication.

3.644 DNA repair enzymes

Enzymes that catalyse the repair of DNA.

3.645 DNA replication

The process whereby DNA makes exact copies itself, under the action of and control of DNA polymerase.

3.646 DNA sequencing

Procedures for determining the nucleotide sequence of a DNA fragment. There are two common methods for doing this:

a) the Maxam and Gilbert technique (chemical degradation), that uses different chemicals to break the DNA into fragments at specific bases; or

b) the Sanger technique (called the di-deoxy or chain-terminating method) uses DNA polymerase to make new DNA chains, with di-deoxy nucleotides (chain terminators) to stop the chain randomly as it grows.

In both cases, the DNA fragments are separated according to length by polyacrylamide gel electrophoresis, enabling the sequence to be read directly from the gel.

3.647 DNA topo-isomerase

An enzyme that catalyses the introduction or removal of supercoils in DNA.

3.648 DNA delivery system

A generic term for any procedure that transports DNA into a recipient cell.

3.649 Dolly

The [name of the] first mammal to be created by cloning a cell from an adult animal. In this particular case, the cell came from the mammary tissue of an adult ewe. The creation of Dolly showed that the process of differentiation into adult tissue is not, as previously thought, irreversible. The result was achieved by nuclear transfer Dolly's birth was announced in 1997. Since then, cattle and mice have also been cloned from adult cells.

3.650 Domain

A segment of a protein that has a discrete function or conformation. At the protein level, a domain can be as small as a few amino acid residues or as large as half of the entire protein.

3.651 domestic animal diversity (DAD

The spectrum of genetic differences within each breed, and across all breeds within each domestic animal species, together with the species differences; all of which are available for the sustainable intensification of food and agriculture production.

3.652 dominance

The type of gene action exhibited by a dominant allele.

3.653 dominant

1. Describing an allele whose effect with respect to a particular trait is the same in heterozygotes as in homozygotes. The opposite is recessive. 2. Describing the most conspicuously abundant and characteristic species of a community. 3.Describing an animal that is allowed priority in access to food, mates, etc., by others of its species because of its success in previous aggressive encounters.

3.654 dominant marker selection

Selection of cells via a gene encoding a product that enables only the cells that carry the gene to grow under particular conditions.

3.655 dominant selectable marker gene

A gene that allows the host cell to survive under conditions where it would otherwise die.

3.656 dominant(-acting) oncogene

A gene that stimulates cell proliferation and contributes to oncogenesis when present in a single copy.

3.657 donor plant (mother plant)

An explant, graft or cutting used as a source of plant material for micro-propagation purposes.

3.658 dormancy

An inactive period in the life of an animal or plant during which growth slows or completely ceases. Physiological changes associated with dormancy help the organism survive adverse environmental conditions. Annual plants survive the winter as dormant seeds, while many perennial plants survive as dormant tubers, rhizomes, or bulbs. Hibernation and aestivation in animals help them survive extremes of cold and heat, respectively.

3.659 dosage compensation

A phenomenon whereby inactivation of all but one of the X chromosomes in female mammals results in males and females producing the same quantity of peptide from X-linked genes. double crossing-over Two simultaneous reciprocal breakage and reunion events between the same two chromatids.

3.660 double fertilization

A process, unique to flowering plants, in which two male nuclei, which have travelled down the pollen tube, separately fuse with different female nuclei in the embryo sac. The first male nucleus fuses with the egg cell to form the zygote; the second male nucleus fuses with the two polar nuclei to form a triploid nucleus that develops into the endosperm.

3.661 double recessive

An organism homozygous for a recessive allele at each of two loci.

3.662 double-stranded complementary DNA (dscDNA)

A double-strand DNA molecule created from a cDNA template.

3.663 downstream

1. In molecular biology, the stretch of nucleotides of DNA that lie in the $3 \square$ direction from the site of initiation of transcription, which is designated as +1 (remembering the convention that the sequence of a DNA molecule is written from the 5 end to the 3 end). Downstream nucleotides are marked with plus signs, e.g., +2, +10. Also, to the 3 side of a particular gene or sequence of nucleotides. 2. In chemical engineering, those phases of a manufacturing process that follow the biotransformation stage. Usually refers to the recovery and purification of the product of a fermentation process.

3.664 downstream processing

A general term for all the things which happen in a biotechnological process after the biology, be it fermentation of a micro-organism or growth of a plant. It is particularly relevant to fermentation processes, which produce a large quantity of a dilute mixture of substances, products and micro-organisms. These must be separated, and the product must be concentrated and purified, and converted into a form which is useful.

3.665 dry weight

The moisture-free weight of tissue obtained by drying at high (oven-drying) or low (freeze-drying) temperatures for an interval sufficient to remove all water.

3.666 dual culture

A culture made of a plant tissue and one organism (such as a nematode) or an obligate parasite/microorganism (such as a fungus). Dual culture techniques are used for a variety of purposes, including assessing host-parasite interactions and the production of axenic cultures.

3.667 Duplication

The occurrence of a segment more than once in the same chromosome or genome.

3.668 ecdysone

A steroid hormone in insects that stimulates moulting and metamorphosis. It acts on specific genes, stimulating the synthesis of proteins involved in these bodily changes.

3.669 eclosion

1. Emergence of an adult insect from the pupal stage. 2. Beginning of germination of fungal spores.

3.670 ecology

The study of the interactions between organisms and their natural environment, both living and non-living.

3.671 economic trait locus (ETL)

A locus influencing a trait that contributes to income. The plural form (economic trait loci) is also abbreviated as ETL.

3.672 Ecosystem

The complex of a living community and its environment, functioning as an ecological unit in nature.

3.673 ecotype

A population or a strain of an organism that is adapted to a particular habitat.

3.674 effector cells

Cells of the immune system that are responsible for cell-mediated cytotoxicity.

3.675 effector molecule

A molecule that influences the behaviour of a regulatory molecule, such as a repressor protein, thereby influencing gene expression.

3.676 egg

1. The fertilized ovum (zygote) in egg-laying animals after it emerges from the body. 2. The mature female reproductive cell in animals and plants.

3.677 Elastin

A fibrous protein that is the major constituent of the yellow elastic fibres of connective tissue.

3.678 electro-blotting

The electrophoretic transfer of macromolecules (DNA, RNA or protein) from a gel, in which they have been separated, to a support matrix, such as a nitrocellulose sheet. A transfer usually used in techniques such as Southern and northern blotting.

3.679 electrochemical sensor

Type of biosensor in which a biological process is harnessed to an electrical sensor system, such as an enzyme electrode. Other types couple a biological event to an electrical one via a range of mechanisms, such as those based on oxygen and pH. See enzyme electrode.

3.680 electromagnetic radiation

Electromagnetic waves, including ultraviolet (UV), X-rays, and gamma radiation (rays). Electromagnetic radiation is used to produce mutant cells or organisms, or, in the case of UV, disinfestation and sterilization, in tissue culture.

3.681 electromagnetic spectrum

The range of wavelengths or frequencies over which electromagnetic radiation extends.

3.682 electron microscope

A microscope that uses an electron beam focused by magnetic "lenses."

3.683 electrophoresis

A technique that separates charged molecules – such as DNA, RNA or protein – on the basis of relative migration in an appropriate matrix (such as agarose gel or polyacrylamide gel) subjected to an electric field. See agarose gel electrophoresis; polyacrylamide gel electrophoresis (PAGE); pulsed-field gel electrophoresis (PFGE).

3.684 electroporation

1. An electrical treatment of cells that induces transient pores, through which DNA can enter the cell. 2. The introduction of DNA or RNA into protoplasts or other cells by the momentary disruption of the cell membrane through exposure to an intense electric field.

3.685 ELISA (enzyme-linked immunosorbent assay) - A sensitive technique for accurately determining specific molecules in a mixed sample. The amount of protein or other antigen in a given sample is determined by means of an enzyme-catalysed colour change, avoiding both the hazards and expense of radioactive techniques. It takes various forms. In the most common form, two antibody preparations are used in ELISA.

3.686 embryo cloning

The creation of identical copies of an embryo by embryo splitting or by nuclear transfer from undifferentiated embryonic cells.

3.687 embryo culture

The culture of embryos on nutrient media.

3.688 embryogenesis

1. (General) Development of an embryo. 2. (In plants) In vitro formation of plants from plant tissues, through a pathway closely resembling normal embryogeny from the zygote; if this development in culture involves somatic cells and not the zygote, it can be indicated by using the term adventitious embryogenesis or somatic embryogenesis.

3.689 embryo multiplication and transfer (EMT)

The cloning of animal embryos and their subsequent transfer to recipients (via artificial inembryonation). The cloned embryos can be clones of an embryo or of an adult.

3.690 embryo sac

A large thin-walled space within the ovule of the seed plant in which the egg and, after fertilization, the embryo develop; the mature female gametophyte in angiosperms.

3.691 embryo sexing

The determination of the sex of an embryo, typically by means of PCR involving amplification from a small sample of embryonic tissue, using primers specific for a locus on the Y chromosome.

3.692 embryo splitting

The splitting of young embryos into several sections, each of which develops into an animal. A form of animal cloning, i.e., of producing animals that are genetically identical. In practice, the number of identical (identical organisms) that can be produced from a single embryo is less than 10.

3.693 embryo technology

Generic name for any modification of mammalian embryos. It encompasses embryo cloning, embryo splitting, in vitro fertilization, and embryo storage.

3.694 Embryoid

An embryo-like body developing in vitro. It forms a complete, self-contained platelet with no vascular connection with the callus. The term embryoid is no longer commonly used.

3.695 embryonic stem cells

Cells of the early embryo that can give rise to all differentiated cells, including germ line cells.

3.696 empirical

Relating to or based upon practical experience, trial and error, direct observation or observation alone, without benefit of scientific method, knowledge or theory.

3.697 encapsulation

The process by which a virus' nucleic acid is enclosed in a capsid.

3.698 encapsulating agents

Anything which forms a shell around an enzyme or bacterium, although the agents used are usually polysaccharides such as alginate or agar.

3.699 encode

To specify, after decoding by transcription and translation, the sequence of amino acids in a protein.

3.700 endangered species

A plant or animal species in immediate danger of extinction because its population numbers have reached a critical level or its habitats have been drastically reduced.

3.701 endemic

1. Describing a plant or animal species whose distribution is restricted to one or a few localities. 2. Describing a disease or a pest that is always present in an area.

3.702 end-labelling

The introduction of a radioactive atom at the end of a DNA or RNA molecule. A commonly used method is to use T4 polynucleotide kinase to introduce a 32P atom onto the end of a DNA molecule.

3.703 endocrine gland

Any gland in an animal that manufactures hormones and secretes them directly into the bloodstream to act at distant sites in the body, known as target organs or cells.

3.704 endocrine interference

Interference with the normal balance hormones.

3.705 Endocytosis

The process by which materials enter a cell without passing through the cell membrane. The membrane folds around material outside the cell, resulting in the formation of a saclike vesicle into which the material is incorporated. This vesicle is then pinched off from the cell surface so that it lies within the cell.

3.706 Endoderm

The internal layer of cells of the gastrula, which will develop into the alimentary canal (gut) and digestive glands of the adult.

3.707 endodermis (Gr. endon, within + derma, skin)

The layer of living cells, with various characteristically thickened walls and no intercellular spaces, which surrounds the vascular tissue of certain plants and occurs in nearly all roots and certain stems and leaves.

3.708 Endogamy

The fusion of reproductive cells from closely related parents, i.e., inbreeding.

3.709 Endogenote

The part of the bacterial chromosome that is homologous to a genome fragment (exogenote) transferred from the donor to the recipient cell in the formation of a merozygote.

3.710 endogenous (Gr. endon, within, + genos, race, kind)

Developed or added from within the cell or organism.

3.711 endomitosis

Duplication of chromosomes without division of the nucleus, resulting in increased chromosome number within a cell. Chromosome strands separate, but the cell does not divide.

3.712 endonuclease

An enzyme that breaks strands of DNA at internal positions; these enzymes are important tools in recombinant DNA technology.

3.713 Endophyte

An organism that lives inside a plant.

3.714 endoplasmic reticulum

A cytoplasmic net of membranes, adjacent to the nucleus, made visible by the electron microscope. Any system of paired membranes within the cytoplasm.

3.715 Endopolyploidy

The result of nuclear divisions without subsequent cytoplasmic division (cytokinesis); the polyploids so obtained are called endopolyploids.

3.716 endoprotease

An enzyme that cleaves the peptide bonds between amino acids within a protein. endoreduplication Chromosome reproduction during interphase.

3.717 endosperm

Nutritive tissue that develops in the embryo sac of most angiosperms. It usually forms after the fertilization of the two fused primary endosperm nuclei of the embryo sac with one of the two male gamete nuclei. In most diploid plants, e.g., cereals, the endosperm is triploid (3n), but in some (e.g., lily) it is often consumed as the seed matures.

3.718 endosperm mother cell

One of the seven cells of the mature embryo sac, containing the two polar nuclei and, after reception of a sperm cell, gives rise to the primary endosperm cell from which the endosperm develops.

3.719 Endotoxin

A component of the cell wall of Gram-negative bacteria that elicits, in mammals, an inflammatory response and fever.

3.720 5' end

The phosphate group attached to the 5' carbon of the terminal nucleotide's sugar (ribose or deoxyribose) in a nucleic acid molecule.

3.721 Endangered breed

A breed with a low population of breeding individuals, meeting specific criteria based on total numbers and trends in purebred females.

3.722 Endangered species

A species at immediate risk of extinction due to critically low population numbers or severe habitat loss.

3.723 Endemic

1 A species restricted to a specific geographic location. 2. Describing a disease or a pest that is always present in an area.

3.724 End-labelling

Adding a radioactive atom to the end of a DNA or RNA molecule, often using T4 polynucleotide kinase to attach a ³²P atom.

3.725 Endocrine gland

A hormone-producing gland that releases hormones directly into the bloodstream to act on distant target organs or cells.

3.726 Endocrine interference

Disruption of normal hormone balance

3.727 Endocytosis

A process where a cell engulfs material without it passing through the membrane, forming a vesicle. Includes phagocytosis and pinocytosis.

3.728 Endoderm

The innermost germ layer of the gastrula, developing into the digestive tract and associated glands.

3.729 Endodermis: A specialized plant cell layer surrounding vascular tissue, commonly found in roots, stems, and leaves.

3.730 Endogamy

Reproduction between closely related individuals (inbreeding), opposite of exogamy.

3.731 Endogenote

The bacterial chromosome segment homologous to a transferred genome fragment

3.732 Endogenous

Originating from within a cell or organism.

3.733 Endomitosis

Chromosome duplication without nuclear or cell division, increasing chromosome number.

3.734 Endonuclease

An enzyme that cleaves DNA at internal sites, essential in recombinant DNA technology

3.735 Endophyte

An organism living inside a plant.

3.736 Endoplasmic reticulum (ER

A network of membranes in the cytoplasm, involved in protein synthesis and found near the nucleus

3.737 Endopolyploidy

Increased chromosome number due to nuclear division without cytoplasmic division.

3.738 Endoprotease

An enzyme that breaks peptide bonds within proteins at specific sites

3.739 Endoreduplication

Chromosome replication during interphase, resulting in 4-chromatid chromosomes (diplochromosomes).

3.740 Endosperm

Nutritive tissue in angiosperm seeds, usually triploid (3n), formed after fertilization

3.741 Endosperm mother cell

A cell in the embryo sac containing two polar nuclei, which, after fertilization, gives rise to the endosperm.

3.742 Endotoxin

A component of Gram-negative bacterial cell walls that triggers inflammation and fever in mammals.

3.743 End-product inhibition

An enzyme regulation mechanism where the final product of a pathway inhibits an early enzyme (feedback inhibition).

3.744 Enhancer

A major or modifier gene enhances a physiological process.

3.745 enterotoxin

a bacterial protein that, when released in the intestine, induces cramps, diarrhea, and nausea.

3.746 enucleated ovum

an egg cell with its nucleus removed.

3.747 environment

encompasses all external factors influencing an organism's life and development.

3.748 enzyme

a protein that catalyzes specific chemical reactions without being consumed. Enzymes are categorized into six groups: oxidoreductases, transferases, hydrolases, lyases, isomerases, and ligases. Most enzyme names end in **-ase**, derived from their substrate (e.g., lactase breaks down lactose and is a hydrolase).

3.749 enzyme bioreactor

facilitates chemical conversions catalyzed by enzymes.

3.750 Enzyme Commission (EC) Number

a systematic classification assigned to enzymes, consisting of four numbers separated by dots, identifying them in technical literature.

3.751 Estimated Breeding Value (EBV)

Twice the expected progeny difference, as it accounts for all genes of an animal rather than just half inherited by progeny. Offspring performance is predicted by averaging the EBVs of both parents.

3.752 Ethanol (ethyl alcohol, C₂H₆O)

Used for disinfecting in tissue culture (70% for disinfection, 95% for flaming tools). Also dissolves waterinsoluble culture media additives.

3.753 Ethephon (C₂H₆ClO₃P)

A synthetic compound that degrades into ethylene, used to treat cultured cells or unripened fruit.

3.754 Ethidium bromide

A fluorescent dye for staining DNA and RNA, fluorescing under UV light.

3.755 Ethylene (C₂H₄)

A gaseous plant growth regulator affecting vegetative growth, fruit ripening, and abscission.

3.756 Ethylenediamine tetraacetic acid (EDTA)

A chelating agent in tissue culture that keeps nutrients like iron available to plants while preventing precipitation.

3.757 Etiolation

Excessive stem elongation with poor or absent leaf development, caused by low light or disease.

3.758 Euchromatin

Lightly stained genetic material in interphase, containing active genes (contrast with heterochromatin).

3.759 Eugenics

The application of genetics to human "improvement."

3.760 Eukaryote

Organisms with a membrane-bound nucleus and organelles, including animals, plants, fungi, and some algae (contrast with prokaryotes).

3.761 Euploid

An organism or cell with a chromosome number that is a multiple of the monoploid (n) number (e.g., diploid, triploid). Contrast with an euploid.

3.762 Evaluation

The measurement of production and adaptation traits in individual animals or populations, often for comparative assessment.

3.763 Evapotranspiration

The process of water loss from land surfaces and plant leaves as vapor over time.

3.764 Evolution

The ongoing process of species diversification over at least 3 billion years.

3.765 Excinuclease

A protein complex that removes damaged DNA segments during repair.

3.766 Excision

The removal of DNA, tissues, or adventitious shoots for various biological processes.

3.767 Excision Repair

A DNA repair mechanism that replaces damaged segments using a template strand.

3.768 Excrete

The process of transporting a compound out of a cell.

3.769 Exit Site (E site)

The ribosome site holding tRNA before release.

3.770 Exocrine Gland

A gland that secretes substances through ducts.

3.771 Exogamy

Reproduction involving genetically distinct organisms (outbreeding).

3.772 Exogenote

A chromosomal fragment transferred to a merozygote.

3.773 Exogenous

Originating from external sources.

3.774 Exogenous DNA

Foreign DNA introduced into a host cell via cloning.

3.775 Exon

A gene segment retained in mRNA after processing.

3.776 Exon Amplification

A technique to amplify exons.

3.777 Exonuclease

An enzyme that degrades DNA or RNA from strand ends. **3.778 Exonuclease III**

An enzyme that removes nucleotides from DNA's 3' end.

3.779 Exopolysaccharide

A sugar polymer secreted by microorganisms.

3.780 Exotoxin

A bacterial toxin released into its environment.

3.781 Expected Progeny Difference (EPD)

A genetic prediction of an animal's offspring traits.

3.782 Explant

A plant part removed for culture.

3.783 Explantation

The process of removing cells or tissues for culture.

3.784 Explant Donor

The source plant providing explants for culture.

3.785 Exponential Phase

The period of maximum cell division in growth.

3.786 Export

The process of transporting compounds out of a cell.

3.787 Express

The transcription and translation of a gene into a protein.

3.788 Expressed Sequence Tag (EST)

A short cDNA sequence marking an expressed gene.

3.789 Expression Library

A collection of DNA encoding peptides in an expression vector.

3.790 Expression System

A combination of host and vector enabling gene function.

3.791 Expression Vector

A cloning vector designed for gene expression.

3.792 Expressivity

The degree to which a gene is expressed in different individuals.

3.793 Ex Situ Conservation

The preservation of genetic material outside its natural habitat.

3.794 Ex Situ Conservation of Farm Animals

The preservation of farm animal genetics outside their native environment, including cryopreservation.

3.795 Extension

A single-stranded DNA sequence at the end of duplex DNA.

3.796 - 3'-Extension

A single-stranded sequence at the 3' end of DNA.

3.797 - 5'-Extension

A single-stranded sequence at the 5' end of DNA.

3.798 Extinct Breed

A breed that cannot be restored due to the loss of reproductive material.

3.799 Extinction

The irreversible loss of a species, either locally or globally.

3.800 Extrachromosomal

DNA elements outside chromosomes controlling cytoplasmic inheritance.

3.801 Extrachromosomal Inheritance

The transmission of genetic traits through non-chromosomal DNA.

3.802 Extrachromosomes

self-replicating genetic elements separate from a cell's main chromosome(s). In bacteria, plasmids serve this role, while in eukaryotes, extrachromosomes may be nuclear (e.g., yeast 2µm plasmid), cytosolic (e.g., dsRNA in fungi), or organelle-based (e.g., mitochondrial and chloroplast DNA). They can be identified genetically by their lack of segregation during meiosis.

3.803 Exude

refers to the slow discharge of liquid material, such as tannins or polyphenols, through pores or cuts, sometimes leading to browning in plant explants.

3.804 Ex vitro

describes organisms removed from tissue culture and transplanted, usually into soil or a potting mix.

3.805 Ex vivo gene therapy

involves delivering genes to isolated cells, culturing them, and then reintroducing them into an individual to treat genetic disorders.

3.806 F factor

A bacterial episome enabling conjugation.

3.807 F1 & F2

First and second filial generations from a given cross.

3.808 Factorial mating

A breeding scheme reducing inbreeding using in vitro embryo production.

3.809 FAD (Flavin Adenine Dinucleotide)

A coenzyme in biochemical reactions, crucial in ATP production via the electron transport chain.

3.810 False-negative & false-positive

Incorrect assay results.

3.811 Farm animal genetic resources

Genetic resources of animal species used in agriculture, classified into wild, feral, landraces, breeds, selected lines, and conserved material.

3.812 Fed-batch fermentation

A process where nutrients are periodically added to a bioreactor containing cells or microorganisms.

3.813 Feedback inhibition

A biochemical process where the accumulated end product of a pathway halts its own synthesis by regulating an earlier step.

3.814 Fermentation

The anaerobic breakdown of complex organic substances, mainly carbohydrates, by microorganisms to yield energy. Often misused to describe large-scale aerobic cell culture in bioreactors.

3.815 Fermentation substrates

Materials that serve as nutrients for microorganisms, forming the culture medium along with essential trace elements and additives.

3.816 Fertile

The ability of an organism to reproduce.

3.817 Fertilization

The fusion of gametes from opposite sexes to form a zygote, involving nuclear (karyogamy) and cytoplasmic (plasmogamy) fusion, resulting in a diploid chromosome set.

- a) **Self-fertilization (selfing)** Fusion of male and female gametes from the same euploid organism.
- b) **Cross-fertilization (crossing)** Fusion of male and female gametes from different euploid individuals.
- c) **Double fertilization** In angiosperms, one male gamete fuses with the ovum while another fuses with the female polar nuclei to form the endosperm.

3.818 Fertilizer

A substance added to soil to enhance productivity, either naturally (e.g., compost) or artificially (e.g., chemical fertilizers like nitrates and phosphates).

3.819 Feulgen's test

A histochemical test that detects DNA in dividing cell nuclei using hydrochloric acid and Schiff's reagent, producing a magenta color.

3.820 F factor

A bacterial episome that enables genetic donation during conjugation (fertility factor).

3.821 Fibres

Elongated, interlocking cells with pointed ends that form strong, rigid tissue, typically with narrow and sparse pits in their walls.

3.822 Fibril

A microscopic to sub-microscopic cellulose thread within the cellulose matrix of plant cell walls.

3.823 Fibrous root

A root system where primary and lateral roots have similar diameters, opposite of a taproot.

3.824 Filter bioreactor (mesh bioreactor)

Cells grow on an inert mesh, allowing culture medium to flow past while retaining cells, similar to membrane and hollow fiber reactors but easier to set up.

3.825 Filter sterilization

Sterilizing a liquid by passing it through a fine-pored filter that blocks microorganisms and spores.

3.826 Filtration

Separating solids from liquids using a porous material, allowing only smaller particles to pass, producing a filtrate.

3.827 Filtration & Cell Processing

Removal of cell aggregates to obtain a filtrate of single cells for plating inocula.

3.828 Fission

Asexual reproduction where a single cell splits into two equal individuals.

3.829 Fitness

The reproductive success of an individual compared to the population or specific genotypes.

3.830 Fixation

When only one allele remains at a genetic locus in a population.

3.831 Flagellum

A whip-like organelle for cell movement.

3.832 Flaming

Sterilizing instruments by igniting alcohol on them.

3.833 Flanking Region

DNA sequences surrounding a specific sequence.

3.834 Flocculant

An agent that causes small particles to aggregate.

3.835 Fluorescence in Situ Hybridization (FISH)

A technique using fluorescent-labeled DNA to map genes on chromosomes.

3.836 Fluorescence-Activated Cell Sorting (FACS)

Sorting cells based on fluorescence differences using laser technology.

3.837 Fluorescent Probe

A probe detecting fluorescence intensity in cells or components.

3.838 Flow Cytometry

A method for sorting cells using defined apertures or lasers.

3.839 Flower

The reproductive structure in angiosperms.

3.840 Foetus

The prenatal stage between embryonic development and birth.

3.841 Follicle

A cluster of cells protecting and nourishing a structure, such as an ovarian follicle.

3.842 Follicle Stimulating Hormone (FSH

A hormone that stimulates egg development in females and sperm production in males.

3.843 Food Processing Enzyme

Enzymes used to control food texture, flavor, and appearance.

3.844 Fog

Fine liquid particles suspended in air, used in plant acclimatization.

3.845 Fold-Back DNA

A structure formed by DNA strands with inverted repeats.

3.846 Folded Genome

The condensed intracellular state of bacterial DNA.

3.847 Forced Cloning

Inserting foreign DNA into a vector in a predetermined orientation.

3.848 Foreign DNA

Exogenous DNA incorporated into a vector or genome.

3.849 Fortify

Adding strengthening or beneficial ingredients to a medium.

3.850 Formulation

The method of delivering a therapeutic agent to its action site.

3.851 Foot-Candle

An obsolete light intensity unit, replaced by lux.

3.852 Fouling

The coating or clogging of equipment by materials or microorganisms, hindering its function.

3.853 Founder Animal

In transgenesis research, an organism carrying a transgene in its germ line, used to establish purebreeding transgenic lines or breeding stock.

3.854 Founder Principle

The genetic differences in a small, isolated population from its parent population due to the random genetic composition of the founding individuals.

3.855 Four-Base Cutter

A type II restriction enzyme that recognizes and cleaves four-base-pair sequences, cutting more frequently and producing smaller DNA fragments than six-base cutters.

3.856 Fractionation

Separation process.

3.857 Frameshift Mutation

A genetic mutation that shifts the mRNA reading frame by inserting or deleting nucleotides.

3.858 Free-Living Conditions

Natural or greenhouse environments where plantlets transition from in vitro to soil, requiring them to produce their own food. Related terms: acclimatization, hardening off.

3.859 Free Water

Water released from cells during freezing in intercellular spaces. Compare with bound water.

3.860 Freeze-Drying

Drying tissues or organs in a frozen state under vacuum to measure dry weight or preserve samples. Standard for long-term microorganism storage. Related term: lyophilization.

3.861 Frequency Distribution

A graph representing the relative or absolute occurrence of different classes in a population, based on discrete or continuous variables.

3.862 Fresh Weight

The weight of a plant or its parts at harvest, including water content. Compare with wet weight.

3.863 Friable

Describes a crumbling or fragmenting callus that can be easily dissected and dispersed into single cells or clumps in solution.

3.864 Fungicide

A chemical or agent that kills fungi.

3.865 Furfural (Furfuraldehyde)

An industrial solvent and raw material for synthetic resin production.

3.866 Fusion Biopharmaceuticals

Biopharmaceutical proteins formed from fusion proteins, offering synergistic activity, improved stability, and targeted delivery.

3.867 Fusion Gene

A hybrid gene formed by combining segments of two different genes or linking a gene to a new promoter, affecting protein production or gene regulation.

3.868 Fusion Protein

A polypeptide produced from a recombinant gene containing sequences from multiple genes, read as a single gene to create a combined protein. Also known as hybrid protein or chimeric protein.

3.869 G - Guanine

residue in either DNA or RNA.

3.870 G cap - The 5-terminal methylated guanine nucleoside that is present on many eukaryotic mRNAs; it is joined, after transcription, to the mRNA.

3.871 Gall

A tumorous growth in plants.

3.872 Gamete

A mature reproductive cell (sperm or egg in animals; pollen, spermatic nucleus, or ovum in plants) with a haploid chromosome content, capable of fusing with another gamete of the opposite sex to form a zygote.

3.873 Gamete and Embryo Storage

The preservation of ova, sperm, or fertilized embryos, typically through cryopreservation in liquid nitrogen.

3.874 Gametic (Phase) Disequilibrium

A condition where haplotypes occur at frequencies different from the expected product of their allele frequencies at two loci. See also gametic (phase) equilibrium.

3.875 Gametic (Phase) Equilibrium

The occurrence of haplotypes with frequencies equal to the product of their allele frequencies. Also called linkage equilibrium, though it applies to both linked and unlinked loci.

3.876 Gametoclone

A plant regenerated from tissue culture derived from gametic tissue.

3.877 Gametophyte

The haploid phase in a plant's life cycle that produces gametes. In angiosperms, the pollen grain is the male gametophyte, and the embryo sac is the female gametophyte.

3.878 Gametophytic Incompatibility

A self-incompatibility mechanism controlled by the S locus, where pollen cannot fertilize an ovule if they share the same S allele.

3.879 Gap

(1) The period between M and S phases in the cell cycle. (2) A missing section in one strand of doublestranded DNA, creating a single-stranded region.

3.880 Gapped DNA

A duplex DNA molecule with internal single-stranded regions.

3.881 Gastrula

An early embryonic stage following the blastula, consisting of two cell layers.

3.882 GC Island

A DNA segment rich in G=C base pairs, typically found before transcribed genes in vertebrates.

3.883 Gel

A lyophilic colloid that has solidified into a rigid or jelly-like form. Used in electrophoresis for nucleic acid or protein separation and encapsulation.

3.884 Gel electrophoresis

is an analytical technique used to separate molecules based on size. Samples are placed at one end of a polymer gel, and an electric field moves the molecules through it. Smaller molecules travel faster, reaching the other end more quickly, while larger ones move more slowly, resulting in size-based separation. Various gel materials are used, with common combinations available.

3.885 Gelatin is a proteinaceous gelling agent derived from boiling animal connective tissues, partially hydrolyzing collagen. It is used to solidify nutrient solutions in tissue culture, similar to agar.

3.886 Gelatinization refers to steam cooking milled grain, increasing starch surface area and creating a gel-like consistency.

3.887 Gelrite™

a refined polysaccharide from *Pseudomonas*, used as a gelling agent and agar substitute.

3.888 Gene

A hereditary unit passed from generation to generation during reproduction, influencing the inheritance of traits. At the molecular level, a gene is a segment of nucleic acid that encodes a peptide or RNA.

3.889 Gene addition

Introducing a functional gene copy into an organism's genome.

3.890 Gene amplification

The selective increase in copies of a specific gene without a proportional rise in others.

3.891 Gene bank

A facility for storing genetic material, such as seeds, tissues, or reproductive cells of plants and animals.

3.892 gene bank

is a facility for **ex situ** conservation of plant species using horticultural techniques, particularly for species with recalcitrant seeds or those propagated clonally, such as apple varieties. It can also refer to a collection of cloned DNA fragments representing an entire genome or a population of microorganisms carrying cloned DNA in vectors, collectively representing another organism's genome. This is also known as a **gene library, clone bank, or library** and may include vector molecules before their insertion into host cells.

3.893 gene bank

is a facility for ex situ conservation of plant species, using horticultural techniques to maintain individual plants, especially for recalcitrant seeds or clonally propagated crops like apples. It also refers to a collection of cloned DNA fragments representing an entire genome or a population of microorganisms carrying inserted DNA molecules in cloning vectors. Such collections, also called gene libraries or clone banks, ensure the preservation and study of genetic material.

3.894 Gene cloning

is the process of producing multiple copies of a specific DNA sequence using a host organism, often involving the insertion of a gene into a self-replicating DNA vector like a plasmid. This recombinant DNA is then amplified in a host cell, a key technique in genetic engineering.

3.895 Gene conservation (or genetic resources conservation)

involves preserving genetic diversity through in situ or ex situ methods to ensure availability for future generations.

3.896 Gene conversion

a recombination-related process where one allele is copied at the expense of another, leading to non-Mendelian segregation ratios.

3.897 Gene expression

refers to the process by which a gene produces RNA and protein, influencing an organism's phenotype.

3.898 Gene flow

is the transfer of genes between populations through migration, potentially altering allele frequencies.

3.899 Gene imprinting

is the differential expression of a gene depending on its parental origin.

3.900 Gene insertion

involves integrating one or more copies of a gene into a chromosome.

3.901 Gene interaction

occurs when a gene's function is modified by a non-allelic gene.

3.902 Gene Library

A collection of cloned DNA fragments representing an organism's genetic information. If derived from genomic DNA, it is a genomic library; if from cDNA copied from RNA, it is a cDNA library, reflecting expressed genes at the time of sampling. Also known as a gene bank or clone bank.

3.903 Gene Modification

A chemical change in a gene's DNA sequence.

3.904 Gene Pool

The complete set of genetic information within all genes of a breeding population at a specific time.

3.905 Gene Pools (Primary, Secondary, Tertiary):

- Primary (1°): Members are inter-fertile.
- Secondary (2°): Can cross with the primary gene pool under special conditions.
- Tertiary (3°): Requires extreme techniques for crossing.

3.906 Gene Probe

A labeled single-stranded DNA/RNA fragment used to locate a specific gene or sequence.

3.907 GRAS (Generally Regarded as Safe)

Designation for substances with a history of safe use despite limited toxicity testing.

3.908 Generate

To propagate or proliferate, also referred to as generation or regeneration.

3.909 Generative Nucleus

One of the two male gametes in the pollen tube of angiosperms.

3.910 Gene Recombination

The appearance of new gene combinations in offspring differing from parental combinations.

3.911 Gene Replacement

Substituting a gene at its natural location via homologous recombination.

3.912 Gene Sequencing

Determining a gene's nucleotide sequence (see DNA sequencing).

3.913 Gene Splicing

The removal of introns from pre-mRNA and joining of exons to form mature mRNA.

3.914 Gene Therapy

Introducing functional genes to treat inherited diseases.

3.915 Germ-line therapy

Affects reproductive cells, inheritable.

3.916 Somatic-cell therapy

Affects non-reproductive cells, non-inheritable.

3.917 GEO (Genetically Engineered Organism)

Sometimes used interchangeably with GMO (Genetically Modified Organism), an organism altered using recombinant DNA technology.

3.918 Genetic Assimilation

The gradual extinction of a species due to extensive gene flow from a related species.

3.919 Genetic Code

The set of 64 codons that encode 20 amino acids and termination signals (UAA, UAG, UGA).

3.920 Genetic Code

The relationship between nucleotide base-pair triplets (codons) in mRNA and the 20 amino acids that make up proteins.

3.921 Genetic Complementation

When two DNA molecules in the same cell together produce a function that neither can supply alone.

3.922 Genetic Disease

A disease caused by changes in genetic material, often inherited in a Mendelian fashion, though noninherited forms may also arise from DNA mutations.

3.923 Genetic Distance

A measure of genetic similarity between populations, based on phenotypic traits, allele frequencies, or DNA sequences.

3.924 Genetic Distancing

The process of collecting genetic data from multiple populations and estimating their genetic distances to determine relationships among them.

3.925 Genetic Diversity

The heritable variation within and among populations, influenced by evolutionary forces such as mutation, genetic drift, and recombination.

3.926 Genetic Drift

Random changes in allele frequencies from one generation to another, particularly significant in small populations, leading to allele loss and reduced genetic variation.

3.929 Genetic engineering

involves introducing or eliminating specific genes using modern molecular biology techniques. It utilizes vectors to transfer genetic information from a donor organism to a recipient that lacks it. A broader definition also includes selective breeding and artificial selection

NOTE: A broader definition - Genetic engineering is the direct manipulation of an organism's genes using biotechnology to introduce, remove, or modify specific traits. It may involve recombinant DNA technology, gene editing, or selective breeding.

3.930 Genetic Equilibrium

A state in a population where allele frequencies remain constant over time.

3.931 Genetic Fingerprinting

A technique for analyzing DNA to identify patterns of nucleotide sequence repetition.

3.932 Genetic Heterogeneity

Different genetic mutations resulting in the same phenotype.
3.933 Genetic Immunization

Introducing a cloned gene encoding an antigen to elicit an immune response.

3.934 Genetic Information

The nucleotide sequence in DNA or RNA that carries hereditary instructions.

3.935 Genetic Map

The ordered arrangement of genes on a chromosome, based on recombination or physical location.

3.936 Genetic Mapping

Determining the sequence of genes and DNA markers along a chromosome.

3.937 Genetic Marker

A DNA sequence used to identify a specific chromosome location.

3.938 Genetic Resources Conservation

The preservation of genetic diversity (see gene conservation).

3.939 Genetic Selection

The process of favoring certain genes or genotypes based on survival advantages.

3.940 Genetic Transformation

Introducing extracellular DNA into an organism via bacterial or viral vectors.

3.941 Genetic Variation

Differences in individuals due to genetic differences.

3.942 Gene Tracking

Monitoring the inheritance of a gene across generations.

3.943 Gene Translocation

The movement of a gene to a different chromosomal location.

3.944 Genome

The complete set of genetic material in an organism, virus, or organelle.

3.945 Genomic Library

A collection of DNA clones representing an organism's genome, used for gene isolation.

3.946 Genotype:

1. The genetic constitution (gene makeup) of an organism.

2. The pair of alleles at a particular locus, e.g., Aa or aa.

3. The sum total of all pairs of alleles at all loci that contribute to the expression of a quantitative trait.

3.947 Geotropism

Growth curvature induced by gravity, also called gravitropism.

3.948 Germ

(1) A plant embryo in botany. (2) A disease-causing microorganism.

3.949 Germ Cell

A reproductive cell in the germ line that produces gametes, found in the ovaries and testes of mammals.

3.950 Germ Cell Gene Therapy

The repair or replacement of defective genes in gamete-forming tissues, leading to heritable genetic changes.

3.951 Germicide

A chemical agent that kills or controls microorganisms, both pathogenic and non-pathogenic.

3.952 Germinal Epithelium

(1) The epithelial layer on the ovary's surface. (2) The epithelial layer in the seminiferous tubules of the testis, producing spermatogonia.

3.953 Germination

(1) The early growth stage of a seed into a seedling, using stored nutrients. (2) The growth of spores or pollen grains.

3.954 Germ Layers (Primary Germ Layers)

Layers of cells in the gastrula stage of an embryo that develop into body organs.

3.955 Germ Line Cells

Cells that produce gametes.

3.956 Germ Line Gene Therapy

The introduction of genes into a fertilized egg or early embryo, leading to inherited genetic modifications.

3.957 Germ Line

A lineage of cells set aside to form gametes, distinct from somatic cells, with species-specific formation patterns.

3.958 Germplasm

(1) Genetic material passed through germ cells. (2) A preserved individual or clone for agronomic, historic, or research purposes.

3.959 Gestation

The period from fertilization to birth in live-bearing animals, particularly mammals.

3.960 Gibberellins

Plant growth regulators involved in elongation, germination, vernalization, and the enhancement of flower, fruit, and leaf size.

3.961 Gland

A specialized structure in animals or plants that secretes substances. In animals, endocrine glands release directly into the bloodstream, while exocrine glands secrete through ducts. In plants, glands store or release secretions.

3.962 Glaucous

A surface covered with a removable waxy, white coating.

3.963 Globulins

Water-insoluble proteins found in blood, eggs, milk, and seeds, with gamma globulins playing a role in immunity.

3.964 Glucocorticoid

A steroid hormone that regulates gene expression in animals.

3.965 Glucose Invertase & Glucose Isomerase

Enzymes that convert glucose to fructose, widely used in the food industry, especially for producing high-fructose corn syrup.

3.966 Gluten

A protein mixture (gliadin and glutenin) in wheat that determines flour strength, essential for baking, but problematic in coeliac disease.

3.967 Glycolysis

A metabolic pathway converting glucose into pyruvate, generating ATP.

3.968 Glycosylation

The attachment of sugar molecules to proteins or polynucleotides.

3.969 GM Food

Food containing ingredients modified using recombinant DNA technology.

3.970 GMO (Genetically Modified Organism)

An organism whose genetic material has been altered through modern biotechnology.

3.971 Golgi Apparatus

A cell organelle that processes, stores, and transports secretory products, also aiding in cell wall formation in plants. Named after Camillo Golgi.

3.972 GLP (Good Laboratory Practice) and GMP (Good Manufacturing Practice)

codes of practice aimed at minimizing accidents in research and manufacturing through thorough documentation and use of established, trained procedures.

3.973 Gonad

A reproductive organ (testis in males, ovary in females) that produces gametes (sperm or ova) and hormones regulating secondary sexual characteristics.

3.974 G-proteins

Membrane-associated proteins that transmit extracellular signals via transmembrane receptors to adenylate cyclase, regulating cyclic AMP production. They bind guanine nucleotides (GTP/GDP) and are key in cellular signaling.

3.975 Graft (to)

The process of joining a detached plant scion to a rootstock, enabling them to grow as a single plant.

3.976 Graft inoculation test

A viral detection method where a suspected carrier is grafted onto an indicator plant; symptom development confirms infection.

3.977 Graft union

The junction where a scion is joined to a rootstock in grafting.

3.978 Gram-negative organism

A bacterium that does not retain crystal violet stain in Gram staining, appearing pink due to safranin O uptake, owing to its cell wall structure.

3.979 Gram-positive organism

A bacterium that retains crystal violet stain in Gram staining, appearing purple-black due to its cell wall structure.

3.980 Gram staining

A method for differentiating bacteria into Gram-positive (purple) and Gram-negative (pink) based on their cell wall composition.

3.981 Grana (singular: granum)

Stacked, disc-like structures in chloroplasts containing pigments essential for photosynthesis.

3.982 GRAS (Generally Recognized as Safe)

A classification for substances deemed safe for consumption based on expert consensus.

3.983 Gratuitous inducer:

A compound that triggers gene transcription without serving as a substrate for the resulting enzymes.

3.984 Green Revolution

A mid-20th-century agricultural transformation marked by advances in genetics, plant breeding, agronomy, and pest control, leading to increased crop yields.

3.985 Green Revolution

Named by William Goud, it refers to the significant rise in crop productivity in the mid-20th century due to advancements in genetics, plant breeding, agronomy, and pest control.

3.986 Gro-lux™

A broad-spectrum fluorescent lamp designed for plant growth.

3.987 Growth

The increase in cell size or number, leading to a rise in dry weight.

3.988 Growth Cabinet

A cupboard used for incubating cultures with controlled conditions of temperature, light, and humidity. Its precision depends on the cabinet's quality.

3.989 Growth Factor

Chemicals, especially polypeptides, that stimulate cell growth and maintenance by binding to cell surface receptors, leading to cell proliferation.

3.990 Growth Hormone (GH)

A hormone from the pituitary gland that promotes protein synthesis, bone growth, and fat breakdown. Its release is regulated by somatocrinin (stimulates) and somatostatin (inhibits).

3.991 Growth Inhibitor

Substances that inhibit organism growth, with effects ranging from retardation to toxicity. Ethylene and abscisic acid are examples.

3.992 Growth Phases/Curve

The stages of bacterial culture growth, including lag, logarithmic, stationary, and death phases, represented in a graph.

3.993 Growth Rate

The increase in mass over time.

3.994 Growth Regulator

Compounds that regulate growth at low concentrations, similar to hormones.

3.995 Growth

Chemicals that interfere with growth promotion without causing significant toxicity.

3.996 Growth ring

Rings in a cross-section of a woody stem, representing annual xylem formation due to vascular cambium activity.

3.997 Growth substance

Organic compounds made by plants that regulate growth and development, typically synthesized in specific regions and transported to others.

3.998 Guanine

A purine base that is a key component of nucleotides and nucleic acids in DNA and RNA.

3.999 Guanosine

A nucleoside composed of guanine and D-ribose, forming nucleotides like GMP, GDP, and GTP important in metabolism.

3.1000 Guard-cell

Specialized epidermal cells that regulate stomatal opening and closing through changes in turgor.

3.1001 Guide RNA

An RNA molecule used as a template in RNA editing.

3.1002 Guide sequence

An RNA molecule aiding in mRNA splicing, by hybridizing near splice junctions.

3.1003 Gymnosperm

Plants with exposed ovules and seeds, as opposed to flowering plants with enclosed seeds.

3.1004 Gynandromorph

An organism with both male and female characteristics, forming a sex mosaic.

3.1005 Gynogenesis

Female parthenogenesis where the male nucleus is eliminated after fertilization, producing haploid offspring with only maternal DNA.

3.1006 Habituation

Cells becoming independent of specific growth factors after several sub-cultures in tissue culture.

3.1007 Haemoglobin

An iron-containing protein in red blood cells that transports oxygen to body tissues.

3.1008 Haemolymph

The mixture of blood and other body fluids in invertebrates.

3.1009 Hair

A superficial outgrowth from epidermal cells, often involved in absorption or secretion.

3.1010 Hairy root culture

Plant culture technique where roots are induced to grow by Agrobacterium rhizogenes, producing useful secondary metabolites.

3.1011 Hairy root disease

Disease causing root-like tissue growth from the stem, induced by Agrobacterium rhizogenes.

3.1012 Halophyte

Plants that tolerate high salt concentrations in the growing medium.

3.1013 Halothane

A volatile anesthetic.

3.1014 Haploid

Cells or organisms with a single set of chromosomes, typical of gametes.

3.1015 Haploid cell

A cell with one set of chromosomes, half the usual diploid number.

3.1016 Haplotype

A group of alleles from different loci in the same chromosomal region.

3.1017 Haptoglobin

A protein that interacts with hemoglobin during iron recycling.

3.1018 Hardening off

Gradually acclimating plants to outdoor conditions or transitioning in vitro plants to natural environments.

3.1019 Hardy-Weinberg equilibrium

A principle that predicts genotype frequencies in a population under random mating.

3.1020 Harvesting

the process of gathering ripened crops or collecting cells from cultures or organs from donors for transplantation.

3.1021 Heat pump

A device extracting heat from marginally warmer fluids or gases, used in greenhouses and labs.

3.1022 Helix

A spiral-shaped structure, such as the double helix in the Watson-Crick DNA model.

3.1023 Helminths

Parasitic worms, especially those infecting humans and animals.

3.1024 Helper cells

T cells that stimulate B and T lymphocytes to produce antibodies or become killer T cells.

3.1025 Helper plasmid

A plasmid providing functions to another plasmid in the same cell.

3.1026 Helper virus

A virus providing functions to another virus in the same cell.

3.1027 Hemicellulase

An enzyme breaking down hemicellulose into galactose.

3.1028 Hemicellulose

A cellulose-like carbohydrate that, along with pectin and lignin, forms the cell wall matrix.

3.1029 Hemizygous

Having only one allele of a pair, typically in sex-linked traits or due to deletion of a chromosome.

3.1030 HEPA filter

A filter that removes particles larger than 0.3 µm, used in laminar air flow cabinets for sterile work.

3.1031 Herbicide

A substance toxic to plants, used to eliminate unwanted plants like weeds.

3.1032 Herbicide resistance

The ability of plants to survive herbicides, targeted by genetic engineering to control weeds. Concerns include increased herbicide use and resistant plants spreading.

3.1033 Heredity

The transmission of traits from parents to offspring.

3.1034 Heritability

in the narrow sense refers to: 1) the proportion of phenotypic superiority of parents passed to their offspring; and 2) the proportion of total phenotypic variation due to variation in breeding values. In the broad sense, it is the proportion of total phenotypic variation attributed to genetic variation, indicating the extent to which a trait is influenced by inheritance.

3.1035 Hermaphrodite

1. An animal with both male and female reproductive organs or a mix of male and female traits. 2. A plant with flowers that have both stamen and carpels.

3.1036 Heteroalleles

Mutations at different sites in a gene that affect the same function.

3.1037 Heterochromatin

Densely staining, genetically inactive chromosome regions.

3.1038 Heteroduplex

A DNA or DNA-RNA hybrid with strands from different sources, used for mapping similarities and differences in sequences.

3.1039 Heterogametic sex

Produces unlike sex chromosomes (e.g., male XY in mammals).

3.1040 Heterogeneous nuclear RNA (hnRNA)

Pre-mRNA found in the nucleus of eukaryotic cells.

3.1041 Heterokaryon

A cell with multiple nuclei from different sources.

3.1042 heterologous

From a different source, as in heterologous DNA.

3.1043 Heterologous probe

A DNA probe from one species used to find similar sequences in another species.

3.1044 Heteroplasmy

A condition where a cell contains different types of organelles.

3.1045 Heteroploid

Refers to a cell culture in which the cells have chromosome numbers different from the diploid number.

3.1046 Heteropyknosis (adj: heteropyknotic)

Describes chromosomes or parts of chromosomes that stay denser and stain more intensely than others during the cell cycle.

3.1047 Heterosis

A state where hybrid organisms show enhanced qualities.

3.1048 Heterozygote

An individual with different alleles at the same gene locus.

3.1049 Histocompatibility

refers to the extent to which tissue from one organism is accepted by the immune system of another.

3.1050 Histocompatibility complex, or histocompatibility system,

refers to a set of genes coding for peptides on the surface of nucleated cells. These peptides, initially called histocompatibility antigens and now known as histoglobulins due to their structural similarity to immunoglobulins, are responsible for differences between genetically non-identical individuals, leading to tissue graft rejection.

3.1051 Histology

the science that studies the microscopic structure of animal and plant tissues.

3.1052 Histones

water-soluble proteins rich in basic amino acids, closely associated with DNA in plant and animal chromatin. They play a role in DNA coiling within chromosomes and help regulate gene activity.

3.1053 HIV

Human immunodeficiency virus, the retrovirus that causes AIDS.

3.1054 Holometabolous

Insects that undergo complete metamorphosis from larvae to adults.

3.1055 Hollow fibre

a tube made of porous material with a very small internal diameter, offering a large surface area relative to its volume. It has two key uses: as a filter, due to its large surface area which takes longer to clog, and in hollow fibre bioreactors, where cells are contained inside the porous fibres while culture medium circulates outside. These bioreactors are ideal for maintaining mammalian cells because they provide a large surface area for cell growth and efficient nutrient delivery. They are particularly useful for producing cell products, like monoclonal antibodies, but are less effective when cell growth and removal are needed.

3.1056 Homeobox

A DNA sequence that controls organ development in animals.

3.1057 Homeotic mutation

A mutation that causes body parts to develop in incorrect locations.

3.1058 Homoalleles

Mutations at the same site in a gene.

3.1059 Homodimer

A protein made of two identical polypeptide chains.

3.1060 Homogametic sex

Produces identical gametes concerning sex chromosomes (e.g., XX females in mammals).

3.1061 Homogenotization

Replaces one gene copy in a genome with an altered version via recombination, often marked with antibiotic resistance.

3.1062 Homokaryon

A cell with identical nuclei post-fusion (opposite: heterokaryon).

3.1063 Homologous

Having the same source or structure due to evolutionary origin.

3.1064 Homologous chromosomes

Paired chromosomes similar in size and shape, one from each parent, containing the same gene array.

3.1064 Homologous recombination

DNA exchange between molecules or chromatids at identical nucleotide sequences during crossing over

3.1065 Homology

The degree of similarity between individuals or nucleotide/amino acid sequences.

3.1066 Homoplasmy

A condition where all copies of an organelle in a cell are genetically identical.

3.1067 Homopolymer

A nucleic acid strand made up of one type of nucleotide (e.g., GGGGG).

3.1068 Homozygote (homozygous)

An individual with two identical alleles at a specific locus on homologous chromosomes.

3.1069 Hormone

A substance produced in one body part that affects biological processes in another part at low concentrations.

3.1070 Host-specific toxin

A pathogen-produced toxin with the same host specificity as the pathogen.

3.1071 Host

An organism or vector that houses another organism.

3.1072 Humoral immune response

Antibody production by B cells in response to foreign antigens.

3.1073 hybrid (L. hybrida)

refers to: 1)The offspring of two genetically different parents. 2)A heteroduplex molecule of DNA or DNA-RNA.

3.1074 Hybrid arrested translation

Identifies proteins encoded by cloned DNA by hybridizing mRNA and comparing the translation products.

3.1075 Hybrid cell

A cell formed by the fusion of two different cells.

3.1076 Hybrid dysgenesis

Abnormal germ-line traits caused by transposable elements.

3.1077 Hybrid released translation

Detects proteins from cloned DNA by binding mRNA to cloned DNA, then translating retained mRNA.

3.1078 Hybrid seed

refers to seed produced by crossing genetically distinct parents. In plant breeding, it specifically denotes seed from selected pure-line crosses, where the F1 generation shows hybrid vigor. Since the F1 crop is heterozygous and doesn't breed true, new seed must be bought each season.

3.1079 Hybrid selection

Choosing individuals with desired traits from a hybrid population.

3.1080 Hybrid vigor (heterosis)

Enhanced performance of hybrids compared to parent populations.

3.1081 Hybridization

refers to: 1)The interbreeding of different species, races, or varieties in plants and animals, either through cross-pollination or mating. 2)The production of offspring from genetically diverse parents, through sexual or asexual reproduction (e.g., fusion of protoplasts or transformation). 3)The pairing of two polynucleotide strands from different sources via hydrogen bonding between complementary nucleotides, such as in northern or Southern hybridization.

3.1082 Hybridoma

A cell hybrid that produces antibodies indefinitely, formed by fusing a B cell with a tumor cell.

3.1083 Hydrate

A compound formed with water.

3.1084 Hydrogen bond

a weak interaction between a hydrogen atom (covalently bonded to a nitrogen or oxygen atom) and another nitrogen or oxygen atom with an unshared electron pair. It occurs between electro-negative atoms and hydrogen atoms linked to other electro-negative atoms.

3.1085 Hydrogen-uptake positive (Hup+)

Microorganisms that can take up hydrogen gas.

3.1086 Hydrolysis

A reaction where water is added, splitting a molecule into two.

3.1087 Hydrophobic interactions

Non-polar groups associating in water due to their insolubility.

3.1088 Hydroponics: Growing plants in nutrient-rich water without soil.

3.1089 - 3' hydroxyl end

The hydroxyl group attached to the 3' carbon of the terminal nucleotide in nucleic acids.

3.1090 Hyperploid

A genetic condition with over-represented chromosomes or segments (opposite: hypoploid)

3.1091 Hypersensitive sites

DNA regions highly susceptible to endonuclease digestion.

3.1092 Hypertonic

A solution with higher osmotic potential than cells, causing cell shrinkage (opposite: hypotonic).

3.1093 Hypervariable region

refers to parts of the heavy and light chains of an antibody that allow it to bind to a specific antigen site.

3.1094 Hypervariable segment

A protein region that varies significantly between strains or individuals.

3.1095 Hypochlorite

A term for aqueous solutions of sodium, potassium, or calcium hypochlorite, used as disinfectants, surface sterilizers, and bleaching agents.

3.1096 Hypocotyl

The part of an embryo or seedling beneath the cotyledons, serving as a transition between stem and root.

3.1097 Hypomorph

A mutation that reduces but does not eliminate gene expression.

3.1098 Hypoplastic

A reduction in plant growth or development due to disease or nutritional stress.

3.1099 Hypoploid

is a genetic condition where a chromosome or part of it is underrepresented in the genotype. It is the opposite of hyperploid.

3.1100 Hypothalamic peptides

Peptides in the vertebrate forebrain that regulate physiological functions.

3.1101 Hypothesis

A tentative explanation or theory used to explore certain facts; becomes a theory or law when proven.

3.1102 Hypotonic

A solution with lower osmotic potential than cells, causing them to swell and become turgid.

3.1103 inactivation

partial or full destruction of a given activity up to destruction of the microbiological system

3.1104 Illuminate

To provide light, essential for tissue cultures, often using fluorescent lights.

3.1105 Imaginal disc

Cell masses in insect larvae that develop into adult organs, such as wings or eyes.

3.1106 Imbibition

the absorption of liquids or vapors into microscopic spaces or pores in materials and refers to the initial water uptake by seeds during germination.

3.1107 Immediate early gene

A viral gene expressed soon after infection.

3.1108 Immobilized cells

Cells trapped in matrices used in membrane and filter bioreactors.

3.1109 Immortalization

The genetic transformation of cells into lines that can proliferate indefinitely.

3.1110 Immortalizing oncogene

A gene that enables primary cells to grow indefinitely in culture.

3.1111 Immune response

The process by which vertebrates respond to foreign antigens, involving antibody production.

3.1112 Immunity

The ability of an organism to resist infection or harmful effects of toxins.

3.1113 Immunization

The artificial induction of immunity, typically through the introduction of treated bacteria or viruses.

3.1114 Immuno-affinity chromatography

A purification technique using antibodies to bind and separate proteins from mixtures.

3.1115 Immunoglobulin

Antibody proteins produced by B lymphocytes, present in blood serum and body fluids.

3.1116 Immunosuppression

Suppression of immune response, necessary after organ transplants to prevent rejection.

3.1117 Immunoassay (immunodiagnostics)

a system that detects proteins using an antibody specific to the target protein. A positive result is indicated by the formation of an antibody-protein complex, often visualized through a precipitate. The antibody may be linked to a radioactive atom or an enzyme that triggers a detectable reaction, such as a color change.

3.1118 Immunochemical control

The use of immune agents to combat infections.

3.1119 Immunogenicity

The ability to elicit an immune response.

3.1120 Immunosensor

A biosensor that uses antibodies as the biological component.

3.1121 Immunosuppressor

A substance or condition that reduces the immune response.

3.1122 Immunotherapy

The use of antibodies or antibody-containing proteins to treat disease or enhance well-being.

3.1123 Immunotoxin

Protein drugs consisting of an antibody linked to a toxin, used to target and kill specific cells.

3.1124 Impeller

A device used to mix contents in a bioreactor.

3.1125 Inactivated agent

An organism treated to prevent it from causing disease.

3.1126 Inbred line

A population resulting from inbreeding, often homozygous after several generations.

3.1127 Inbreeding

Mating between individuals with common ancestors, often leading to genetic uniformity.

3.1128 Inbreeding depression

Reduced vigor or yield in a population due to increased inbreeding.

3.1129 Inclusion body

Overproduced protein in a recombinant bacterium that forms a crystalline structure.

3.1130 Incompatibility

refers to: 1) Selectively-restricted mating competence, limiting fertilization due to factors affecting pollen or pistil function. 2) A physiological interaction leading to graft rejection or failure. 3) A characteristic of related plasmids where closely related plasmids with similar replication functions exclude one another when in the same cell, leading to incompatibility. Plasmids are categorized into incompatibility groups based on this reaction, with those in the same group being closely related.

3.1131 Incompatibility Group A

A classification system for plasmids indicating which ones can coexist in a single cell. Plasmids in the same group cannot coexist due to instability.

3.1132 Incomplete Dominance

Gene action where heterozygotes show a phenotype that is intermediate between the homozygous phenotypes.

3.1133 Incomplete Penetrance

A condition where individuals with a specific genotype may not display the associated abnormality.

3.1134 Incubation

refers to: 1)The hatching of eggs through natural or artificial heat. 2)The time between infection and the onset of symptoms caused by parasites. 3)The cultivation of cells and organisms.

3.1135 Incubator

A device that controls environmental conditions for hatching, culturing, or growing organisms.

3.1136 Indehiscent

Describes a fruit that does not release its seeds when ripe.

3.1137 Independent Assortment

refers to the random distribution of alleles from different loci to gametes, occurring when genes are on different chromosomes or far apart on large chromosomes. The distribution of alleles at one locus is independent of the distribution at another. Compare with linkage.

3.1138 Indeterminate Growth

refers to unlimited growth potential for a defined or undefined period. In some cases, apical meristems can continuously produce lateral organs. In legumes, it describes plant architecture.

3.1139 Indirect Embryogenesis

Formation of embryos on callus tissue derived from various sources in culture.

3.1140 Indirect Organogenesis

Organ formation on callus tissue derived from explants.

3.1141 Inducer

A compound or agent that binds to a repressor, preventing it from blocking gene expression.

3.1142 Inducible

A gene or gene product whose transcription or synthesis increases when exposed to an effector, typically a small molecule specific to certain operons or genes.

3.1143 Inducible enzyme

An enzyme produced only when its substrate (the inducer) is present.

3.1144 Inducible gene

A gene that is expressed only when a specific inducer is present.

3.1145 Induction

the process of causing something to occur, where a cell or tissue influences its neighbors, or triggers the transcription of a specific gene or operon. It can also involve stimulating an organism to produce a protein in response to a stimulus.

3.1146 Induction Media

refers to substances that either stimulate the formation of organs or structures or cause variation or mutation in the tissues exposed to them.

3.1147 Inert

A support structure that does not chemically interact, only serving as a physical support.

3.1148 Infection

The invasion of an organism by pathogens that establish, multiply, and cause symptoms.

3.1149 Infectious Agent

A virus, bacterium, or parasite that causes disease.

3.1150 Infiltrate

To force liquid into tissue pores, often using a vacuum in disinfection.

3.1151 Inflorescence

1) The arrangement of flowers on a plant's stalk. 2) The collective flowers of a plant. 3) The process of flowering or blooming.

3.1152 Inhibitor

A substance that slows or stops a chemical reaction or gene expression.

3.1153 Inheritance

The transmission of traits or genes from one generation to the next.

3.1154 Initial

Cells in a meristem that remain meristematic, forming specific tissues.

3.1155 Initiation

refers to the early stages of a tissue culture process (such as culture growth, organogenesis, or embryogenesis) or the initial stages of biosynthesis.

3.1156 Initiation Codon

The AUG codon (or GUG in rare bacterial cases) that starts protein synthesis.

3.1157 Initiation Factors

Proteins required for initiating translation.

3.1158 Inoculate

means to deliberately introduce something into a medium or environment. In bacteriology or tissue culture, it refers to placing an inoculum into a medium to start a culture. In immunology, it refers to the process of immunization. This process is called inoculation and is distinct from contamination.

3.1159 Inoculation cabinet

a small room or cabinet used for inoculating tissue or microorganism cultures, typically equipped with sterile air flow to prevent contamination.

3.1160 Inoculum

A small piece of tissue or cell material used to initiate or continue a culture.

3.1161 Inorganic Compound

Chemical compounds not typically derived from living processes, lacking carbon.

3.1162 Inositol

A water-soluble nutrient important for cell growth in plants, animals, and microorganisms.

3.1163 Inositol Lipid

A phospholipid involved in transducing hormonal signals by releasing chemical messengers.

3.1164 Insecticide

A substance that kills insects.

3.1165 Insert

DNA incorporated into a cloning vector.

3.1166 Insertion Element

DNA sequences in bacteria capable of inserting into genomes, responsible for integration events.

3.1167 Insertion Mutations

Changes in DNA sequences due to random integration of foreign DNA.

3.1168 Insertion Site

The specific location in DNA where foreign DNA is inserted or where transposons integrate.

3.1169 In situ

Refers to something being in its natural or original place. It can apply to experimental treatments on cells or tissues, assays performed on intact tissues, or procedures like in situ hybridization and conservation.

3.1170 In situ conservation

Preserving genetic resources within their natural ecosystems, such as conserving farm animal genetic diversity in their original habitats.

3.1171 Instability

Refers to random variations or loss of cell line characteristics due to genetic instability.

3.1172 Insulin

A hormone produced by the pancreas that regulates blood sugar levels.

3.1173 Integrating vector

A vector designed to incorporate cloned DNA into the host's chromosomal DNA.

3.1174 Integration

The process where small DNA molecules recombine into larger ones, often involving homologous recombination.

3.1175 Integration-excision region

The DNA region in bacteriophage lambda (λ) that enables DNA insertion into or removal from the E. coli genome.

3.1176 Integument

A layer that surrounds the ovule, later becoming the seed coat.

3.1177 Intensifying screen

A plastic sheet used in radiography to enhance sensitivity by capturing emissions that blacken X-ray film.

3.1178 Interaction

In statistics, when the effect of contributing factors deviates from simple additivity.

3.1179 Intercalary

Refers to growth not limited to the apex of an organ, typical in nodes and stem elongation of grasses.

3.1180 Intercalating agent

A chemical that inserts itself between DNA base pairs.

3.1181 Intercellular space

The spaces between cells, commonly found in leaf tissues.

3.1182 Interfascicular cambium

Cambium that forms between vascular bundles.

3.1183 Interference

Alteration of crossing-over chances in nearby chromosomal regions.

3.1184 Interferon

Proteins that promote viral resistance in cells.

3.1185 Intergeneric Crosses between two different genera.

3.1186 Intergenic regions

DNA sequences located between genes, often with no known function.

3.1187 Interleukin

Proteins that transmit signals between immune cells.

3.1188 Internode

The stem region between two nodes.

3.1189 Interphase

A stage in the cell cycle where DNA replication occurs, between cell divisions.

3.1190 Intersex

An organism showing both male and female characteristics.

3.1191 Interspecific

Refers to crosses between different species.

3.1192 Intracellular

Occurring inside a cell.

3.1193 Intracytoplasmic sperm injection (ICSI)

Injection of sperm into an egg using micromanipulation.

3.1194 Intrageneric

Crosses between species within the same genus.

3.1195 Intragenic complementation

Complementation between two mutant alleles of a gene.

3.1196 Intraspecific

Refers to variation or crosses within a species.

3.1197 Introgression

Introduction of new genes into a population by crossing and backcrossing.

3.1198 Intron

Non-coding DNA segments removed before mRNA translation; spliced out during intron splicing.

3.1199 Invariant

Refers to something that remains constant across species.

3.1200 Invasiveness

A plant's ability to spread and establish in new environments, potentially harming existing organisms.

3.1201 Inversion

A chromosome rearrangement that reverses the gene order.

3.1202 Inverted repeat

Two regions of a nucleic acid with identical sequences in reverse orientations, forming palindromes.

3.1203 In vitro

Refers to processes done in a laboratory environment, such as culturing cells or tissues outside the organism.

3.1204 In vitro embryo production (IVEP

Techniques that combine ovum pickup, in vitro maturation, and fertilization to enhance embryo production in transfer programs.

3.1205 In vitro fertilization (IVF)

A technique where eggs are fertilized with sperm outside the body, followed by a few days of culture before implantation into a female.

3.1206 In vitro maturation (IVM)

Culturing immature eggs in the lab until they are ready for IVF.

3.1207 In vitro transcription

RNA synthesis in a test tube using purified DNA as a template, with separate systems required for eukaryotic cells.

3.1208 In vitro translation

Protein synthesis from mRNA in a test tube using cell extracts containing ribosomes and necessary factors. Systems differ between prokaryotes and eukaryotes.

3.1209 In vivo

Refers to biological processes that occur within a living organism under natural conditions.

3.1210 In vivo gene therapy

Delivering genes to specific tissues or organs to treat genetic disorders.

3.1211 lon

A charged particle.

3.1212 Ion channel

A protein in the cell membrane that allows selective ion transport.

3.1213 Ionic bonds

Attractions between oppositely charged chemical groups.

3.1214 Ionizing radiation

Part of the electromagnetic spectrum that creates ion pairs in molecules, like X-rays and gamma rays.

3.1215 IPTG

A compound used to induce gene expression under the lac operon system in DNA technology.

3.1216 Irradiation

Exposure to radiation, often used in food technology for sterilization or disinfestation.

3.1217 IS element

A short DNA sequence in bacteria that can move to a new genomic location.

3.1218 Isoalleles

Different forms of a gene that produce the same or very similar phenotypes.

3.1219 Isochromosome

A chromosome with two identical arms.

3.1220 Isodiametric

Describes cells with equal diameters.

3.1221 Iso-electric focusing gels

A technique that separates molecules based on their iso-electric point.

3.1222 Isoform

A closely related protein in a family with similar but not identical sequences.

3.1223 Isogamy

Sexual reproduction where gametes are similar in size and structure.

3.1224 Isogenic stocks

Organisms that are genetically identical.

3.1225 Isolating mechanism

Biological features that prevent interbreeding between species.

3.1226 Isolation medium

A medium that supports the survival and growth of explants.

3.1227 Isoleucine

An amino acid.

3.1228 Isomerase

An enzyme that rearranges atoms within a molecule.

3.1229 Iso-osmotic (Isotonic)

Solutions with the same osmotic potential.

3.1230 Isotope

Variants of an element with the same atomic number but different mass numbers, used in DNA probes and metabolic tracers.

3.1231 Isozyme

Variants of an enzyme with the same function but different amino acid sequences.

3.1232 Jiffy pot™

Pots made from wood pulp and peat for transplanting plants.

3.1233 J/m²

A unit of light measurement.

3.1234 Joining segment (J

A small DNA segment that links genes to form a functional immunoglobulin gene.

3.1235 Joule

The energy needed to apply a force of 1 newton over 1 meter.

3.1236 Juvenility

The early, non-reproductive phase of development.

3.1237 Juvenile hormone

An insect hormone that prevents metamorphosis and maintains larval features.

3.1238 Juvenile in vitro embryo technology (JIVT/JIVET)

A method involving immature ova collection, in vitro maturation, fertilization, and embryo transfer for rapid generation turnover

3.1239 kanamycin

An aminoglycoside antibiotic that binds ribosomes, inhibiting translation.

3.1240 kappa chain

One of two antibody light chain classes.

3.1241 karyogamy

Fusion of nuclei during sexual reproduction.

3.1242 karyogram

Diagram showing chromosome characteristics of a species.

3.1243 karyokinesis

Division of the cell nucleus (mitosis/meiosis)

3.1244 karyotype

Chromosome constitution of a cell or individual, arranged by length and centromere position (e.g., 47, XX + 21 in Down syndrome).

3.1245 kb (Kilobase pairs)

Unit of DNA length (1,000 base pairs)

3.1246 kcat

Catalytic rate constant of an enzyme-catalyzed reaction. Higher *kcat* means faster substrate conversion.

3.1247 kcat /Km

Enzyme catalytic efficiency. Higher *kcat/Km* indicates more efficient substrate conversion.

3.1248 killer T cells

T cells that recognize and kill antigen-displaying cells.

3.1249 kilobase (kb)

1,000 base pairs of double-stranded nucleic acid (~660 kDa).

3.1250 kilocalorie (kcal)

1,000 calories.

3.1251 kilodalton (kDa)

1,000 daltons (mass unit).

3.1252 kilojoule (kJ)

1,000 joules; 1 kcal = 4.184 kJ.

3.1253 kinase

Enzyme that transfers a phosphate from ATP to an organic molecule.

3.1254 kinetics

Processes involving motion.

3.1255 kinetin

A cytokinin promoting plant cell division.

3.1256 kinetochores

Filaments in the centromere of a chromosome.

3.1257 kinetosome

Cytoplasmic structure at the base of a cilium or flagellum.

3.1258 kinin

Cell division-promoting substance. In plants, called cytokinin.

3.1259 Klenow fragment

DNA polymerase I fragment from *E. coli* with polymerase and 3' exonuclease activity but lacking 5' exonuclease activity.

3.1260Km

Enzyme-substrate binding constant (Michaelis constant). Lower Km indicates tighter binding.

3.1261 knockout

Organism with a non-functional gene replacement, often used in mice to study gene function.

3.1262 label

Compound or atom used to detect a molecule. Also called tag.

3.1263 labelling

Replacing stable atoms with detectable isotopes (e.g., radioactive, fluorescent) to trace a compound's path.

3.1264 lac repressor-lac promoter system

Regulatory system controlling lactose metabolism in bacteria.

3.1265 lactose

Milk sugar, a disaccharide of glucose and galactose.

3.1266 lag phase

- 1. Delay before a response (latent phase).
- 2. Initial growth phase with little cell division.
- 3. First phase of batch cell culture growth.

3.1267 lagging strand

DNA strand synthesized discontinuously during replication (5' to 3' direction).

3.1268 lambda chain

One of two antibody light chain classes.

3.1269 lamella

Double-membrane structure formed by parallel membranes.

3.1270 lamina

Leaf blade or expanded part.

3.1271 laminar air-flow cabinet (hood)

Sterile workspace with filtered air..

3.1272 laminarin

Storage polysaccharide in brown algae.

3.1273 Lampbrush Chromosomes

Large diplotene chromosomes in oocytes, especially in amphibians, with transcriptionally active loops.

3.1274 Landrace

Early cultivated crop species evolved from wild populations.

3.1275 Latent Agent

A virus or other entity present in a host without causing symptoms.

3.1276 Latent Bud

Inactive bud that can grow when stimulated.

3.1277 Lateral Bud

Bud at the base of a leaf petiole (see axillary bud).

3.1278 Lateral Meristem

Meristem producing secondary plant tissues like vascular and cork cambia.

3.1279Lawn

Uniform bacterial growth without visible colonies.

3.1280 Layering

Vegetative propagation technique where plants form roots before being separated from the parent.

3.1281 LCR (Ligase Chain Reaction)

Technique to detect specific nucleotide pairs in DNA.

3.1282 LD50 (Lethal Dose 50%): Chemical dose required to kill 50% of a test population (higher LD50 = lower toxicity).

3.1283 Leader Peptide/Sequence mRNA sequence at the 5' end, untranslated into protein.

3.1284 Leading Strand

DNA strand synthesized continuously during replication.

3.1285 Leaf Blade Flattened part of a leaf.

3.1286 Leaf Bud Cutting Stem cutting with an attached leaf for propagation.

3.1287 Leaf Margin

Edge of a leaf.

3.1288 Leaf Primordium

Early lateral outgrowth from the apical meristem that develops into a leaf.

3.1289 Leaf Roll Virus-induced leaf curling.

3.1290 Leaf Scar Mark left on a stem after leaf abscission.

3.1291 Leaflet

Part of a compound leaf.

3.1292 Lectin

Plant-derived protein binding to cell surface oligosaccharides, causing clumping.

3.1293 Leptonema (Leptotene Stage)

Meiotic stage before synapsis, with fine threadlike chromosome structures.

3.1294 Lethal Allele/Gene

Mutant gene leading to organismal death if expressed.

3.1295 Library (Gene Library)

Collection of transformed cells containing DNA inserts from a species (e.g., cDNA library, genomic library).

3.1296 Life Cycle

Complete sequence of events from gamete fusion to the same stage in the next generation.

3.1297 Ligand

Molecule binding to another molecule in or on cells.

3.1298 Ligase Chain Reaction (LCR)

DNA detection technique.

3.1299 Ligate/Ligation

Joining of DNA fragments by forming phosphodiester bonds, often using T4 DNA ligase.

3.1300 Lignification

Cell wall impregnation with lignin.

3.1301 Lignin

Structural polymer giving strength to plant tissues.

3.1302 Lignocellulose

Structural plant cell wall component (lignin + hemicellulose + cellulose).

3.1303 Lineage

Individuals from a common ancestor, such as cell lines from a single cell.

3.1304 Linear Phase

Growth phase between exponential and deceleration stages.

3.1305 LINEs (Long Interspersed Nuclear Elements)

Moderately repetitive (~10,000 copies), long (~6,500 bp) cDNA sequences in genomes.

3.1306 Linkage

Genes inherited together due to close proximity on a chromosome.

3.1307 Linkage Map

Diagram showing gene positions based on recombination frequency.

3.1308 Linked Genes/Markers

Genes or markers that show linkage.

3.1309 Linker:

Synthetic double-stranded oligonucleotide with restriction enzyme sites.

3.1310 Lipases

Enzymes breaking down lipids into fatty acids and head groups, used in biotechnology.

3.1311 Lipid

Water-insoluble fats or fat-like compounds.

3.1312 Lipofection

DNA/RNA delivery into eukaryotic cells via artificial lipid vesicles.

3.1313 Lipopolysaccharide (LPS)

Lipid-polysaccharide compound in microbial cell walls.

3.1314 Liposome

Phospholipid bilayer vesicle used for drug or DNA delivery into cells.

3.1315 Liquefaction

Enzymatic digestion of gelatinized starch into polysaccharides.

3.1316 Liquid Media

Growth media without solidifying agents.

3.1317 Liquid Membranes

Stable thin liquid films within another liquid, typically water.

3.1318 Liquid Nitrogen

-196°C nitrogen used in cryopreservation of genetic material.

3.1319 Litmus

pH indicator paper turning red (acidic) or blue (alkaline).

3.1320 Live Vaccine

Non-virulent microorganism inducing immunity or expressing foreign antigens.

3.1321 Locus (Loci)

Specific chromosomal site.

3.1322 LOD Score

Logarithm of odds for linkage between loci; scores \geq 3 indicate linkage.

3.1323 Log Phase

Rapid cell growth phase where numbers double every 20–30 minutes.

3.1324 Long-Day Plant

Requires short nights to initiate flowering.

3.1325 Long Template

PCR DNA strand extended beyond the second primer binding site.

3.1326 Long Terminal Repeat (LTR)

Retroviral sequences aiding genome integration.

3.1327 Loop Bioreactors

Fermenters cycling material for mixing, aeration, and light exposure.

3.1328 Lux (lx)

Illuminance unit, replacing the foot-candle.

3.1329Luxury Consumption

Nutrient uptake exceeding growth and productivity needs.

3.1330 Luteinizing Hormone

Pituitary hormone stimulating ovarian and testicular activity.

3.1331 Lymphocyte

White blood cell crucial for vertebrate immunity.

3.1332 Lymphokine

Proteins released by lymphocytes to regulate immune responses (e.g., interleukins, interferons).

3.1333 Lymphoma

Cancer of the lymph nodes and lymphatic system.

3.1334 Lyase

Enzymes catalyzing bond cleavage/addition or double bond formation.

3.1335 Lyophilization

Freeze-drying via rapid freezing and vacuum dehydration.

3.1336 Lysis

Cell destruction by viruses, chemicals, or physical treatment.

3.1337 Lysogen

Bacterial cell with integrated viral DNA.

3.1338 Lysogenic

Virus phase where it integrates into the host genome and remains dormant.

3.1339 Lysogenic Bacteria

Bacteria carrying temperate (non-virulent) bacteriophages.

3.1340 Lysogeny

Condition where a bacteriophage genome persists in a host without triggering lysis.

3.1341 Lytic

Viral phase where replication leads to host cell destruction.

3.1342 Lytic Cycle

Virus replication process ending in host cell lysis.

3.1343 Lysosome

Organelle in animal cells containing enzymes for digestion and cell breakdown.

3.1344 M13

Single-stranded DNA bacteriophage used as a DNA sequencing vector.

3.1345 M13 Strand

Single-stranded DNA in the infective form of M13 bacteriophage.

3.1346 Macerate

Tissue disintegration to obtain isolated cells using cutting, soaking, or enzymes.

3.1347 Macromolecule

Large molecules like proteins, nucleic acids, and polysaccharides.

3.1348 Macronutrient

Essential element needed in concentrations >0.5 millimole/l in growth media.

3.1349 Macrophages

Large immune cells that engulf foreign substances and present antigens.

3.1350 Macropropagation

Cloning of plants from growing parts.

3.1351 Major Histocompatibility Antigen

Cell-surface protein distinguishing self from non-self in immunity.

3.1352 Major Histocompatibility Complex (MHC)

Gene cluster encoding histocompatibility antigens.

3.1353 Malignant

Cancerous growth properties.

3.1354 Malt Extract

Organic mix from malt, used in culture media.

3.1355 Malting

Starch-degrading enzyme production in germinating grain, used in brewing.

3.1356 Mammary Glands

Milk-producing organs in female mammals.

3.1357 Mammary Tumors

Tumors affecting mammary glands.

3.1358 Mannitol

Plant sugar alcohol used as a nutrient and osmotic agent in protoplast media.

3.1359 Mannose

Hexose sugar found in polysaccharides, sometimes used in plant tissue culture.

3.1360 Map (Verb)

Determining locus positions on DNA by recombination frequency.

3.1361 Map (Noun)

Diagram showing relative locus positions and distances.

3.1362 Map Distance

Gene distance in centiMorgans (cM), estimated from recombination frequency.

3.1363 Mapping

Locating genes or markers on a chromosome.

3.1364 Mapping Function

Mathematical relationship between recombination fraction and genetic distance.

3.1365 Map Unit

1% recombination = 1 cM.

3.1366 Marker

DNA sequence used for tracking gene inheritance, useful in genetic mapping.

3.1367 Marker-Assisted Introgression

Using DNA markers to speed up gene transfer into a population.

3.1368 Marker-Assisted Selection (MAS)

Using DNA markers to improve selection efficiency for desirable traits.

3.1369 Marker Gene

A gene with a known function and chromosomal location.

3.1370 Marker Peptide

A protein fragment aiding in identification or purification of fusion proteins.

3.1371 Mass Selection

Selecting individuals for reproduction based on their phenotype.

3.1372 Maternal Effect

Influence of the mother's traits on offspring performance.

3.1373 Maternal Inheritance

Transmission of genetic material through the egg, not the nucleus.

3.1374 Matric Potential

Water potential affected by capillary and adsorptive forces.

3.1375 Maturation

Formation of gametes or spores.

3.1376 Mean

The average of a data set.

3.1377 Median

The middle value in a sorted data set.

3.1378 Medium

The substrate (liquid or solid) for plant cell growth in tissue culture.

3.1379 Medium Formulation

The specific composition of a plant culture medium, including nutrients and hormones.

3.1380 Megabase (Mb)

A unit of DNA length, equal to 1 million base pairs.

3.1381 Megabase Cloning

Cloning of very large DNA fragments.

3.1382 Megadalton (MDa)

A unit of molecular weight equal to 1 million daltons.

3.1393 Megaspore (Macrospore)

A haploid spore developing into a female gametophyte in plants.

3.1384 Meiosis

A cell division process reducing chromosome number by half, creating genetic diversity.

3.1385 Meiotic Analysis

Studying chromosome pairing during meiosis.

3.1386 Meiotic Drive

A process causing unequal allele inheritance in heterozygotes.

3.1387 Melanin

A pigment produced by melanocytes.

3.13888 Melting Temperature (Tm)

The temperature at which DNA strands separate, indicating base composition.

3.1389 Membrane Bioreactors

Bioreactors using permeable membranes to retain cells while allowing nutrient flow.

3.1390 Memory Cells

Long-lived immune cells enabling rapid response to previously encountered antigens.

3.1391 Mendelian Population

A naturally interbreeding group sharing a gene pool.

3.1392 Mendelism

Classical genetics theory based on Mendel's inheritance laws.

3.1393 Mendel's Laws:

- Law of Segregation: Each trait is controlled by two alleles, which separate during reproduction.
- Law of Independent Assortment: Different gene pairs segregate independently.

3.1394 Mericlinal

A chimera with one genotype partially surrounded by another.

3.1395 Mericloning

A tissue culture method for mass propagation of plant shoots.

3.1396 Meristem

Undifferentiated plant tissue capable of dividing and forming new organs.

3.1397 Meristem Culture

A tissue culture containing only meristematic dome tissue, used for plant propagation.

3.1398 Meristem Tip

An explant containing the meristematic dome and usually one pair of leaf primordia.

3.1399 Meristem Tip Culture

Culture from meristem tip explants, mainly for virus elimination or shoot proliferation.

3.1400 Meristemoid

A cluster of cells in callus tissue that can develop into shoots or roots.

3.1401 Merozygote

A partial zygote formed through partial genetic exchange.

3.1402 Mesoderm

The middle embryonic germ layer that forms bones, connective tissue, and muscles.

3.1403 Mesophile

A microorganism that thrives in moderate temperatures (20–50°C), often optimally at 37°C.

3.1404 Metabolic Cell

A non-dividing but metabolically active cell.

3.1405 Metabolism

The biochemical processes that build and break down substances in an organism.

3.1406 Metabolite

A biological compound essential for metabolism.

3.1407 Metacentric Chromosome

A chromosome with a centrally located centromere, resulting in two equal arms.

3.1418 Metallothionein

A protein that binds and detoxifies heavy metals.

3.1409 Metaphase

A mitosis stage where chromosomes align in the central plane of the spindle.

3.1410 Metastasis

The spread of cancer cells to other parts of the body.

3.1411 Methionine

A sulfur-containing amino acid.

3.1412 Methylation

The addition of a methyl group to a molecule, often modifying DNA activity.

3.1413 Microalgal Culture

The cultivation of microalgae, including seaweeds, in bioreactors.

3.1414 Microbe

A general term for microorganisms.

3.1415 Microbial Mats

Layered communities of microorganisms.

3.1416 Microbody

A membrane-bound organelle containing enzymes, 20-60 nm in diameter.

3.1417 Micro-Carriers

Small particles that support fragile mammalian cells in large-scale cultures.

3.1418 Microdroplet Array

A technique for testing media modifications with small cell samples in liquid droplets.

3.1419 Micro-Element

A trace element required in very small amounts.

3.1420 Micro-Encapsulation

Enclosing substances in tiny capsules for controlled release.

3.1421 Micro-Environment

The environment immediately surrounding an object that influences it.

3.1422 Microfibrils

Extremely small fibers visible under an electron microscope.

3.1423 Micrograft

A technique similar to shoot-tip grafting.

3.1424 Micro-Injection

The precise insertion of small amounts of material into a cell using a microscopic needle.

3.1425 Micro-Isolating System

A method for mechanically separating single cells or protoplasts for individual growth.

3.1426 Micron/Micrometre (µm)

A unit of length equal to 10^{-6} meters (0.001 mm).

3.1427: 2-Micron Plasmid

A small circular DNA molecule found in yeast.

3.1428 Micronutrient

An essential nutrient required in very small concentrations (<0.5 mmol/L).

3.1429 Micro-organism

An organism visible only under a microscope.

3.1430 Microplasts

Vesicles from the fragmentation of protoplasts or thin-walled cells.

3.1431 Micropyle:

A small opening in plant ovules for pollen tube entry; also found in some animal cells.

3.1432 Microprojectile Bombardment

A method of introducing DNA into cells using DNA-coated metal particles.

3.1433 Micropropagation

In vitro plant multiplication under aseptic conditions, following four stages:

- 1. Aseptic culture establishment
- 2. Multiplication of propagules
- 3. Preparation for soil transfer
- 4. Establishment in soil

3.1434 Microsatellite

A short, repetitive DNA sequence with variable copy numbers.

3.1435 Microspore

The smaller meiospore in heterosporous plants, leading to pollen grain formation.

3.1436 Microtuber

Cultured tissue capable of growing into a tuberous plant.

3.1437 Microtubules

Tubulin-based cell structures involved in shape maintenance and division.

3.1438 Middle Lamella

The thin layer that cements adjacent plant cells together.

3.1439 Mid-Parent Value

The average phenotype of two parents in quantitative genetics.

3.1440 Minimum Effective Cell Density

The lowest cell density required for consistent culture growth.

3.1441 Minimum Inoculum Size

The smallest viable inoculum required for culture growth.

3.1442 Mini-Prep:

A small-scale method for extracting plasmid or phage DNA.

3.1443 Minisatellite

A DNA sequence with repeat units (10-100 bases), used in DNA fingerprinting.

3.1444 Minitubers

Small tubers (5-15 mm) formed in vitro from tuber-forming crops like potatoes.

3.1445 Mismatch

An incorrect base pairing in DNA, e.g., A:C or G:T.

3.1446 Mismatch Repair

A DNA repair process that fixes mismatched base pairs.

3.1447 Missense Mutation

A mutation that changes a codon for one amino acid into another.

3.1458 Mist Propagation

Spraying fine water droplets on cuttings to reduce transpiration.

3.1449 Mites

Small arachnids, some of which are parasitic.

3.1450 Mitochondrial DNA (mtDNA)

Circular DNA found in mitochondria, coding for some essential proteins.

3.1451 Mitosis

Cell division producing two genetically identical daughter cells, occurring in five stages (interphase, prophase, metaphase, anaphase, telophase).

3.1452 Mixoploid

Cells with varying chromosome numbers due to mitotic irregularities.

3.1453 Mobilization

The plasmid-facilitated transfer of genes between bacteria.

3.1454 Mobilizing Functions

Plasmid genes that enable gene transfer between bacteria.

3.1455 Modal Class (Mode)

The most frequently occurring class in a distribution.

3.1456 Modification

Enzymatic methylation or nucleotide changes in DNA/RNA.

3.1457 Modifier Gene

A gene that influences the expression of another gene.

3.1458 Molality

Moles of solute per liter of solvent or Moles of solute per kilogram of solution.

3.1459 Mole (M)

The amount of a substance in grams numerically equal to its molecular weight.

3.1460 Molecular Biology

The study of the molecular aspects of organisms and cells.

3.1461 Molecular Cloning

The amplification of specific DNA sequences through mitotic division.

3.1462 Molecular Genetics

The study of genetic aspects of molecular biology, focusing on DNA, RNA, and proteins.

3.1473 Molecule

The smallest unit of an element or compound that retains its chemical identity.

3.1464 Monoclonal Antibody (mAB)

A single-type antibody produced by a single clone of B cells or hybridoma cells, targeting a specific antigen.

3.1465 Monocotyledon (Monocot)

A plant with one seed leaf (cotyledon), e.g., corn, wheat, rice.

3.1466 Monoculture

The cultivation of a single crop over a large area.

3.1467 Monoecious

A plant with separate male and female flowers on the same individual (e.g., maize).

3.1468 Monogastric Animals

Animals with a simple, non-ruminating stomach.

3.1469 Monophyletic

A group of organisms that share a common ancestor.

3.1470 Monogenic

A trait controlled by a single gene.

3.1471 Monohybrid

Offspring of parents differing at only one genetic locus.

3.1472 Monohybrid Cross

A cross considering only one trait.

3.1473 Monolayer

A single layer of cells grown on a surface.

3.1474 Monomer

A single molecule that can bond to others to form polymers.

3.1475 Monosaccharide

A single sugar unit, e.g., glucose.

3.1476 Monosomic (Monosomy)

A diploid organism missing one chromosome (2n -1).

3.1477 Monozygotic Twins

Identical twins from a single fertilized egg.

3.1478 Morphogen

A substance influencing the development of form in an organism.

3.1479 Morphogenesis

The development of an organism's shape and structure.

3.1480 Morphogenic Response

Changes in a plant's development due to environmental conditions.

3.1481 Morphology

The study of form and structure in organisms.

3.1482 Mosaic

An organism or tissue with genetically different cells.

3.1483 mRNA (Messenger RNA)

The RNA transcript that carries genetic information from DNA to ribosomes for protein synthesis.

3.1484 Multigene Family

A group of similar genes or those coding for similar proteins.

3.1485 Multigenic

Controlled by multiple genes.

3.1486 Multi-Locus Probe

A DNA probe that binds to multiple locations in the genome.

3.1487 Multimer (Multimeric)

A protein composed of multiple peptide chains.

3.1488 Multiple Alleles

More than two allele variants at a genetic locus within a population.

3.1489 Multiple Ovulation and Embryo Transfer (MOET)

A reproductive technology to produce multiple offspring from a single female.

3.1490 Multivalent Vaccine

A vaccine targeting multiple infectious agents or different epitopes of a molecule.

3.1491 Mutable Genes

Genes with a high mutation rate.

3.1492 Mutagen

An agent that induces mutations, e.g., UV light.

3.1493 Mutagenesis

The process of inducing genetic changes in DNA.

3.1494 Mutant

An organism or gene with genetic alterations different from the wild type.

3.1495 Mutation

A heritable change in DNA structure, chromosome composition, or chromosome number, contributing to genetic diversity.

3.1496 Mutation Pressure

The constant introduction of mutations into a population.

3.1497 Mycelium

Threadlike filaments forming the vegetative structure of fungi.

3.1498 Mycoprotein

Protein derived from fungi.

3.1499 Mycotoxin

A toxic substance produced by fungi (e.g., aflatoxin).

3.1500 Mycorrhiza

A symbiotic association between fungi and plant roots.

3.1501 Myeloma

A cancer of plasma cells.

3.1502 Naked Bud

A bud without protective bud scales

3.1503 Nanometre (nm)

One millionth of a millimeter (10 angstroms).

3.1504 Narrow-Host-Range Plasmid

A plasmid that replicates in only a few bacterial species.

3.1505 Narrow-Sense Heritability

The proportion of phenotypic variance due to genetic variation in breeding values.

3.1506 Native Protein

A protein in its natural, functional form.

3.1507 Natural Selection

The process where organisms with advantageous traits survive and reproduce.

3.1508 Necrosis

Cell or tissue death, often causing discoloration and dehydration.

3.1509 Negative Autogenous Regulation

Gene expression inhibition by its own product.

3.1510 Negative Control System

A regulatory system where proteins turn off gene expression.

3.1511 Negative Selection

A process to identify cells lacking a specific trait or DNA insert.

3.1512 Nematodes

Slender, unsegmented worms, some of which are plant parasites (eelworms).

3.1513 Neo-formation

The development of new tissues or organs.

3.1514 Neoplasm:

Abnormal cell growth forming a tumor.

3.1515 Neoteny

The retention of juvenile features in adult organisms.

3.1516 Net Photosynthesis

Photosynthesis minus respiration, measured by CO₂ exchange.
3.1517 Neutral Mutation

A genetic mutation with no significant effect on fitness.

3.1518 Neutral Theory

The hypothesis that most evolutionary changes result from neutral mutations and genetic drift.

3.1519 Nick

A break in one strand of a DNA duplex.

3.1520 Nicked Circle (Relaxed Circle)

A plasmid DNA form where one strand is nicked, relieving supercoiling.

3.1521 Nick Translation

A technique for labeling DNA by introducing nicks and filling them with labeled nucleotides.

3.1522 Nitrification

The oxidation of nitrogen compounds into nitrites and nitrates.

3.1523 Nitrocellulose (Cellulose Nitrate)

A material used in molecular biology for immobilizing DNA, RNA, or proteins.

3.1524 Nitrogen Assimilation

The incorporation of nitrogen into organic molecules by living organisms.

3.1535 Nitrogen Fixation

The conversion of atmospheric nitrogen (N₂) into usable forms by bacteria (e.g., *Rhizobium*, *Azotobacter*).

3.1526 Nitrogenous Bases

The purines (adenine, guanine) and pyrimidines (thymine, cytosine, uracil) in DNA/RNA.

3.1527 Nod Box

A DNA sequence regulating *Rhizobium* nodulation genes.

3.1528 Nodal Culture

The culture of lateral buds and adjacent stem tissue.

3.1529 Node

An enlarged stem region where leaves, buds, and branches emerge.

3.1530 Nodular

A rough, pebbly callus texture.

3.1531 Nodulation

The formation of nitrogen-fixing nodules on plant roots by symbiotic bacteria.

3.1532 Nodule

A root swelling in nitrogen-fixing plants containing symbiotic bacteria.

3.1533 Non-Autonomous

Biological units that cannot function independently and need a "helper" unit.

3.1534 Non-Disjunction

Failure of chromosomes or chromatids to separate properly in mitosis or meiosis, leading to abnormal chromosome numbers.

3.1535 Non-Histone Chromosomal Proteins

Chromosomal proteins excluding histones.

3.1536 Nonsense Mutation: A mutation converting an amino acid codon into a stop codon, leading to premature polypeptide termination.

3.1537 Non-Target Organism:

An organism affected unintentionally in an interaction.

3.1538 Non-Template Strand:

The DNA strand not transcribed during transcription (also called the sense or coding strand).

3.1539 Northern Blot:

A technique for detecting specific RNA sequences on a membrane using DNA probes.

3.1540 Northern Blotting:

A method for analyzing RNA by transferring it onto a membrane and probing with DNA.

3.1541 Northern Hybridization:

Hybridization of a DNA probe to RNA fragments on a nitrocellulose filter.

3.1542 Nucellar Embryo:

An embryo developing vegetatively from somatic tissue surrounding the embryo sac instead of fertilization.

3.1543 Nucellus:

The tissue in an ovule where the embryo sac forms (megaspore-producing tissue).

3.1544 Nuclear Transfer:

A cloning technique where a diploid somatic cell is inserted into an enucleated ovum, leading to embryo development.

3.1545 Nuclease:

An enzyme that degrades DNA or RNA by cleaving phosphodiester bonds.

3.1546 Nucleic Acid:

A macromolecule (DNA or RNA) made of nucleotides.

3.1547 Nuclein:

The historical name for DNA, first discovered by Friedrich Miescher in 1869.

3.1548 Nucleo-Cytoplasmic Ratio:

The ratio of nuclear to cytoplasmic volume, high in dividing cells and low in differentiated cells.

3.1549 Nucleolar Organizer (NOR):

A chromosomal region encoding ribosomal RNA genes.

3.1550 Nucleolar Zone:

Any chromosome region linked to nucleolus formation during telophase.

3.1551 Nucleolus:

An organelle within the nucleus responsible for ribosomal RNA production and ribosome assembly.

3.1552 Nucleoplasm:

The semi-liquid substance in the nucleus, surrounding chromosomes and nucleoli.

3.1553 Nucleoprotein:

A complex of nucleic acid and protein, forming chromosomal material.

3.1554 Nucleoside:

A molecule consisting of a nitrogenous base (purine/pyrimidine) and a pentose sugar, lacking phosphate groups.

3.1565 Nucleoside Analogue:

A synthetic nucleoside resembling a natural one but lacking the ability to form nucleotide chains.

3.1556 Nucleosome:

A chromatin subunit composed of DNA wrapped around a histone protein core.

3.1557 Nucleotide:

A nucleoside with one or more phosphate groups, forming DNA and RNA building blocks.

3.1558 nullisomy

A diploid cell or organism missing both chromosomes of a pair (2n - 2).

3.1559 nurse culture:

A cell is planted on filter paper above callus tissue to allow nutrient flow but prevent tissue union.

3.1560 nutrient cycle:

The movement and transformation of a nutrient through an ecosystem.

3.1561 nutrient deficiency:

Lack or insufficiency of a factor required for growth and development.

3.1562 nutrient film technique (NFT):

A hydroponic method where plants are grown with a continuous or cyclic nutrient film.

3.1563 nutrient gradient:

A gradient of nutrients and gases formed in tissues where only part is in contact with the medium.

3.1564 nutrient medium:

A combination of salts, energy sources, vitamins, and growth regulators, used for plant tissue culture.

3.1565 octoploid:

A cell or organism with eight sets of chromosomes (2n = 8x).

3.1566 oestrogen; estrogen:

Female sex hormones controlling sexual characteristics and oestrus.

3.1567 oestrous cycle:

The reproductive cycle in non-pregnant, sexually mature female mammals.

3.1568 oestrus

The period in female mammals when they are sexually receptive.

3.1569 offset:

A young plant produced at the base of a mature plant.

3.1570 offshoot:

A short, usually horizontal, stem near the plant's crown.

3.1571 offspring; progeny:

New individuals produced through sexual or asexual reproduction.

3.1572 okazaki fragment:

Small DNA segments formed during the replication of one DNA strand, joined by ligase.

3.1573 oligomer:

A molecule made from a few monomers.

3.1574 oligonucleotide:

A short DNA molecule (6 to 100 nucleotides) of single-stranded DNA.

3.1575 oligonucleotide ligation assay (OLA):

A diagnostic method to detect specific nucleotide pairs in a target gene.

3.1576 oligonucleotide-directed mutagenesis:

A method for inducing site-specific mutations in genes.

3.1577 oligosaccharide:

A carbohydrate made of several sugar units.

3.1578 oncogene:

A gene that causes uncontrolled cell growth, leading to cancer activated at inappropriate times and places by retroviral promoters, thereby becoming oncogenes

3.1579 Oncogenesis:

The series of cytological, genetic, and cellular changes leading to tumor formation.

3.1580 Oncogenic:

Genes responsible for transforming normal cells into tumor cells.

3.1581 onco-mouse:

A genetically modified mouse with an oncogene that causes cancerous transformation of cells.

3.1582 ontogeny:

The developmental life history of an organism.

3.1583 oocyte:

The egg mother cell that undergoes meiosis to form an egg cell.

3.1584 oogenesis:

The formation and development of eggs in an animal ovary.

3.1585 oogonium (pl: oogonia):

A female germ cell that divides mitotically to form oocytes.

3.1586 oosphere:

The non-motile female gamete in plants and some algae.

3.1587 oospore:

A resistant spore formed from a zygote in algae and fungi.

3.1588 open continuous culture:

A culture system where fresh medium is continuously added, and cells are washed out at the same rate.

3.1589 open pollination:

Pollination by natural mechanisms like wind or insects.

3.1590 open reading frame (ORF):

A DNA sequence that could potentially encode a protein, starting with a start triplet (ATG) and ending with a stop triplet.

3.1591 operational definition:

A procedure used to define or delimit something.

3.1592 operator:

The DNA region that binds regulatory proteins to control gene expression.

3.1593 operon:

A genetic unit in bacteria that controls gene expression, consisting of genes and the adjacent promoter and operator.

3.1594 opine:

A product of amino acid and keto-acid or sugar condensation, found in tumour cells.

3.1595 ordinate:

The vertical axis on a graph, opposite the abscissa.

3.1596 organ:

A tissue or group of tissues forming a distinct part of an organism.

3.1597 organ culture:

The culture of whole organs outside the body in a suitable medium.

3.1598 organellar genes:

Genes located on organelles outside the nucleus.

3.1599 organelle:

A membrane-bound cell structure that performs a specific function.

3.1600 organic:

Compounds containing carbon, often associated with living organisms.

3.1601 organic complex:

An undefined compound added to media to promote growth (e.g., coconut milk, yeast extract).

3.1602 organic co-solvent:

A compound used to dissolve organic substances in media preparation (e.g., ethanol, acetone).

3.1603 organic evolution:

The process by which genetic composition changes in response to environmental changes.

3.1604 organized growth

Development of explants (e.g., meristem or shoot tips) under tissue culture conditions.

3.1605 organized tissue

Tissue made up of regularly differentiated cells.

3.1606 organizer:

A substance that determines the developmental fate of certain cells.

3.1607 organogenesis:

The formation of adventitious shoots or roots from cultures.

3.1608 organoid:

An organ-like structure produced in culture (e.g., leaves, roots).

3.1609 organoleptic:

Affecting one of the senses (e.g., taste or smell).

3.1610 organism:

A living system capable of reproduction, growth, and maintenance.

3.1611 origin of replication:

The DNA sequence where replication begins.

3.1612 ortet:

The original plant from which a clone is derived.

3.1613 osmic acid (osmium tetroxide):

A fixing agent used in electron microscopy.

3.1614 osmolarity:

The total concentration of solutes, affecting osmotic potential.

3.1615 osmosis:

The diffusion of solvent from high to low concentration through a semipermeable membrane.

3.1616 osmotic potential:

The potential created by dissolving a substance, especially in water.

3.1617 osmoticum:

An agent used to maintain osmotic balance in culture media (e.g., PEG, sucrose).

3.1618 outbreeding:

Mating of genetically unrelated individuals to increase diversity and fitness.

3.1619 outflow:

The volume of cells removed from a bioreactor in continuous culture.

3.1620 oxygen-electrode-based sensor:

A sensor measuring oxygen in a solution, using a biological material to change oxygen levels.

3.1621 ovary:

The reproductive organ in plants (where ovules are contained) and animals (where eggs are produced).

3.1622 overdominance:

A condition where heterozygotes are superior to both homozygotes.

3.1623 overlapping reading frames:

Different polypeptides generated from the same DNA sequence by different start triplets.

3.1624 ovulation:

The release of an egg from the ovary in mammals.

3.1625 ovule:

The reproductive part in seed plants that contains the embryo sac and integuments.

3.1626 ovum:

A female animal gamete, or the oosphere in plants.

3.1627 ovum pickup (OPU):

Non-surgical collection of eggs from a female.

3.1628 p1:

Symbol for the parental generation or parents of a given individual.

3.1629 pachynema:

A stage in meiosis where chromosomes appear as long paired threads.

3.1640 packaging cell line:

A cell line that produces viral particles without nucleic acid, forming fully infective viral particles after transfection.

3.1631 packed cell volume (PCV):

The percentage of cells in a culture volume after centrifugation.

3.1632 pairing; synapsis:

The pairing of homologous chromosomes during prophase I of meiosis.

3.1633 pair-rule gene:

A gene influencing body segment formation in Drosophila.

3.1634 palaeontology:

The study of fossils and the evolutionary relationships between extinct and living species.

3.1635 palindrome:

A DNA sequence that reads the same in both directions.

3.1636 palindromic sequence:

A DNA segment whose 5'-to-3' sequence is the same on both strands, often a recognition site for restriction enzymes.

3.1637 palisade parenchyma:

Elongated cells beneath the upper epidermis of leaves, containing chloroplasts.

3.1638 pAMP:

A plasmid that carries a gene providing resistance to ampicillin, commonly used in molecular biology experiments to select for bacteria that have successfully taken up the plasmid.

3.1639 panicle:

A branched inflorescence with loose flower clusters.

3.1640 panicle culture:

Aseptic culture of grain panicle segments to induce microspore germination.

3.1641 panmictic population:

A population with random mating, without any restrictions based on genetic traits, geographic location, or social structures, ensuring that every individual has an equal chance of mating with any other individual.

3.1642 panmixis:

A form of random mating within a population where all individuals have an equal opportunity to mate with any other individual, leading to no selective breeding or geographical, genetic, or social restrictions on mate choice.

3.1643 paracentric inversion:

An inversion in one chromosome arm, excluding the centromere.

3.1644 paraffin (wax):

A hydrocarbon used for embedding tissue in light microscopy.

3.1645 parallel evolution: Development of organisms along similar paths due to similar selection pressures.

3.1646 parafilm™:

Stretchable film used to seal tubes and dishes.

3.1647 parahormone:

A substance with hormone-like effects, not secreted (e.g., ethylene, CO₂).

3.1648 parameter:

A value or constant relating to an entire population.

3.1649 parasexual cycle:

A sexual cycle involving changes in chromosome number, differing from the usual cycle.

3.1650 parasite:

An organism that derives its food from a host.

3.1651 parasitism:

Harmful association between two organisms.

3.1652 parasporal crystal: Insecticidal pro-toxins produced by *Bacillus thuringiensis* during spore formation.

3.1653 parenchyma:

Undifferentiated plant tissue, often with air spaces; also loose connective tissue in animals.

3.1654 parenchymatous:

Describing spherical, undifferentiated cells capable of division and differentiation.

3.1655 par gene:

A gene involved in plasmid partition in bacteria and plants.

3.1656 parthenocarpy:

Fruit development without fertilization.

3.1657 parthenogenesis:

Production of an embryo from an unfertilized egg.

3.1658 partial digest:

Cleaving DNA with a restriction enzyme for a limited time to generate overlapping fragments.

3.1659 particle radiation:

Radiation from particles like gamma, beta, electrons, protons, or neutrons, used for inducing mutations.

3.1660 parts per million (ppm):

Concentration of a substance in one million equivalent units.

3.1661 parturition:

The process of giving birth.

3.1662 passage:

The transfer of cells from one culture vessel to another.

3.1663 passage number:

The number of times cells have been sub-cultured.

3.1664 passage time:

The interval between sub-cultures.

3.1665 passive immunity:

Temporary immunity through natural (e.g., mother to foetus) or artificial (e.g., antibody injection) means.

3.1666 patent:

A government-issued document granting exclusive rights to manufacture, use, or sell an invention.

3.1668 paternal:

Relating to the father.

3.1669 pathogen:

An organism that causes disease in another.

3.1670 pathogen-free:

Freedom from disease-causing organisms.

3.1671 pathotoxin:

A substance released by a pathogen that interacts with the host metabolism.

3.1672 pathovar:

A strain of bacteria that causes disease in specific plant cultivars.

3.1673 pBR322:

A widely used plasmid vector for cloning DNA in E. coli.

3.1674 pectin:

A substance that forms gels when combined with acid and sugar, found in the middle lamella.

3.1675 pectinase:

An enzyme that breaks down pectin.

3.1676 pedicel:

The stalk of an individual flower in an inflorescence.

3.1677 pedigree:

A chart recording an individual's ancestry.

3.1678 peduncle:

The stem of a single flower or inflorescence.

3.1679 penetrance:

The percentage of individuals showing a particular phenotype within a population that can express it.

3.1680 peptide:

A short chain of amino acids linked by peptide bonds.

3.1681 peptide bond:

The bond holding amino acids together in proteins.

3.1682 peptide vaccine:

A vaccine made of short peptide chains to induce immunity against a specific pathogen.

3.1683 peptidyl-tRNA binding site (P-site):

The ribosome site where tRNA carries an amino acid for the growing polypeptide chain.

3.1684 peptidyl transferase:

An enzyme that forms peptide bonds during protein translation.

3.1685 perennial:

A plant that lives for more than two years and usually produces seed annually once mature.

3.1686 pericentric inversion:

An inversion that includes the centromere, involving both chromosome arms.

3.1687 periclinal:

Cell division or wall orientation parallel to the surface of an organ.

3.1689 periclinal chimera:

A structure with concentric layers of genetically or cytoplasmically different tissues.

3.1690 pericycle:

A plant tissue located between the endodermis and phloem, from which roots originate.

3.1691 periplasm:

The space between a bacterium's cytoplasmic membrane and outer membrane or cell wall.

3.1692 permanent wilting point (PWP):

The soil moisture content at which plants wilt permanently and can't recover, even in humid conditions.

3.1693 permeable:

Describes a membrane or system through which substances can diffuse.

3.1694 persistence:

The ability of an organism to remain in a specific environment after introduction.

3.1695 persistent:

1. Continuing to exist or remain attached. 2. Chemicals, like some pesticides, that persist for a long time and may accumulate in the food chain.

3.1696 pesticide:

A toxic substance used to kill harmful organisms (e.g., insecticides, fungicides).

3.1697 petal:

One of the parts of a flower that makes up the corolla.

3.1698 petiole:

The stalk of a leaf, connecting it to the plant stem.

3.1699 petite mutant:

A yeast mutant deficient in respiration, producing small colonies on glucose-containing media.

3.1700 petri dish:

A shallow, flat dish used for culturing organisms.

3.1701 pH:

A measure of acidity or alkalinity; pH of 7 is neutral.

3.1702 phagemids:

Cloning vectors containing components from both phage chromosomes and plasmids.

3.1703 phagocytes:

Immune cells that ingest and destroy foreign substances or cells.

3.1704 phagocytosis:

The process of engulfing and breaking down food or foreign particles by certain cells.

3.1705 phase state:

The interaction of two linked genes, either coupling or repulsion.

3.1706 pH-electrode-based sensor:

A sensor that uses an electrochemical pH electrode to detect changes in pH levels.

3.1707 phenocopy:

An organism whose phenotype is altered by the environment to resemble a mutant's phenotype.

3.1708 phenolic oxidation:

The process where phenolic compounds oxidize, often after wounding, leading to discoloration or tissue damage.

3.1709 phenols; phenolics:

Compounds with hydroxyl groups attached to a benzene ring, often forming coloured compounds in plant tissues.

3.1710 phenotype:

The visible traits of an organism resulting from genotype and environmental interactions.

3.1711 pheromone:

A hormone-like substance secreted by an organism to send signals to others of the same species.

3.1712 phloem:

Plant tissue responsible for transporting food, including sieve tubes and companion cells.

3.1713 phosphatase:

An enzyme that removes phosphate groups from compounds.

3.1714 phospho-diester bond:

A bond between adjacent nucleotides in DNA or RNA, connecting the 3' and 5' carbons.

3.1715 phospholipase A2:

An enzyme that breaks down type A2 phospholipids.

3.1716 phospholipid:

A lipid containing a phosphate group, a major component of biological membranes.

3.1717 phosphorolysis: ⊤

he cleavage of a bond by orthophosphate, similar to hydrolysis.

3.1718 phosphorylation:

The addition of a phosphate group to a compound.

3.1719 photo-bioreactor:

A bioreactor that uses sunlight, often for cultivating algae.

3.1720 Photon:

A quantum of light, with energy proportional to its frequency.

3.1721 Photoperiod:

The length of daylight required by plants to reach the reproductive stage.

3.1722 photoperiodism:

The response of organisms to changes in day length.

3.1723 photophosphorylation:

The formation of ATP using light energy during photosynthesis.

3.1724 photoreactivation:

A light-dependent DNA repair process.

3.1725 photosynthate:

Carbohydrates and other compounds produced during photosynthesis.

3.1726 photosynthesis:

The process by which plants convert CO₂ and water into organic compounds using sunlight.

3.17327 photosynthetic:

Able to use sunlight to produce organic compounds from CO₂.

3.1728 photosynthetic efficiency:

The effectiveness of converting light energy into organic compounds.

3.1729 photosynthetically active radiation (PAR):

Light energy used in photosynthesis, typically between 400-700 nm.

3.1730 phototropism:

Growth curvature in response to light.

3.1731 phylogeny:

A diagram depicting the evolutionary history of related organisms.

3.1732 physical map:

A map showing physical locations of DNA sequence features like restriction sites.

3.1733 phytochrome:

A light-absorbing pigment in plants affecting growth and development, unrelated to photosynthesis.

3.1734 phytohormone:

A substance that regulates plant growth, including auxins, cytokinins, gibberellins, and ethylene.

3.1735 phytoparasite:

A plant parasite; an organism causing disease in plants.

3.1736 phytostat:

An apparatus for semi-continuous chemostat culture of plant cells.

3.1737 pigments:

Molecules that absorb light and give colour to organisms.

3.1738 pinocytosis:

The process by which a cell engulfs liquid droplets.

3.1739 pipette:

A slender tube used for measuring and transferring liquids.

3.1740 pistil:

The female reproductive organ of a flower, consisting of ovary, style, and stigma.

3.1741 plantlet:

A small rooted shoot from seed or cultured cells.

3.1742 plant cell culture:

The growth of plant cells or tissues in bioreactors.

3.1743 plant cell immobilization:

Entrapping plant cells in gel matrices for growth.

3.1744 plant genetic resources (PGR):

Genetic material from cultivated and wild plant species, including landraces and special stocks.

3.1745 plaque:

A clear spot on a culture plate where viral infection has lysed bacterial cells.

3.1746 Plasma cells:

Antibody-producing white blood cells from B lymphocytes.

3.1747 plasmalemma:

A double membrane on the outside of the protoplast, adjacent to the cell wall.

3.1748 plasmid:

A small, autonomous circular DNA in some bacteria that replicates independently.

3.1749 plasmodesma:

A protoplasmic thread passing through plant cell walls connecting protoplasts.

3.1750 plasmolysis:

Separation of cytoplasm from the cell wall due to water loss.

3.1751 plastid:

Cytoplasmic bodies in plants that can produce chlorophyll for photosynthesis.

3.1752 plastoquinone:

A compound involved in electron transport in photosynthesis.

3.1753 plate:

To distribute cells onto a surface; a segment of a Petri dish.

3.1754 plating efficiency:

The percentage of cells forming colonies after plating.

3.1755 pleiotropy:

A gene influencing multiple traits.

3.1756 ploidy:

The number of chromosome sets per cell (haploid, diploid, polyploid).

3.1757 plumule:

The first bud or portion of a young shoot above the cotyledons.

3.1758 point mutation:

A change in DNA at a specific site, including substitutions and insertions.

3.1759 polar bodies:

Female meiotic products that do not develop into ova.

3.1760 polar mutation:

A mutation affecting downstream genes in the same transcription unit.

3.1761 polar nuclei:

Nuclei in the embryo sac that unite in triple fusion to form endosperm.

3.1762 polar transport:

The directed movement of compounds in plants, mostly in one direction.

3.1763 polarity:

Differentiation into parts with opposed or contrasted properties.

3.1764 pole cells:

Cells in Drosophila embryos that form the germ line.

3.1765 pollen:

The male gametophyte of seed plants.

3.1766 pollen culture:

In vitro germination of pollen grains.

3.1767 pollen grain:

A microspore produced in the pollen sac of plants.

3.1768 pollination:

Transfer of pollen for fertilization in plants.

3.1769 poly (A) polymerase:

Enzyme that adds adenine residues to mRNA to form the poly-A tail.

3.1770 polyacrylamide gel electrophoresis (PAGE):

Method for separating DNA/protein by size through an electric field.

3.1771 polyacrylamide gels:

Gels for separating molecules in electrophoresis.

3.1772 polyadenylation:

Addition of a poly-A tail to eukaryotic mRNAs post-transcription.

3.1773 polyclonal antibody:

A serum containing antibodies from different epitopes against a specific antigen.

3.1774 polyembryony:

Development of more than one embryo from a single fertilized ovule.

3.1775 polyethylene glycol (PEG):

A polymer used for cell fusion and DNA uptake.

3.1776 polygene:

A gene with a small effect influencing a quantitative trait.

3.1777 polygenic:

Traits controlled by multiple genes of small effect.

3.1778 polylinker:

A DNA segment with multiple restriction sites, used in cloning.

3.1779 polymer:

A compound made of many identical smaller subunits.

3.1780 polymerase chain reaction (PCR):

A method to amplify specific DNA sequences through cycles of denaturation, annealing, and extension.

3.1781 polymerase:

Enzyme that synthesizes polymers like DNA or RNA from monomers.

3.1782 polymerization:

The process of forming a polymer from smaller molecules.

3.1783 polymery:

Multiple genes acting together to produce a single effect.

3.1784 polymorphism:

The occurrence of multiple alleles at a locus in a population.

3.1785 polynucleotide:

A chain of nucleotides linked by phosphodiester bonds.

3.1786 polypeptide:

A molecule of linked amino acids; the building block of proteins.

3.1787 polyploid:

Cells with more than two complete sets of chromosomes (e.g., triploid, tetraploid).

3.1788 polysaccharide:

Long-chain molecules made of repeating sugar units (e.g., starch, cellulose).

3.1789 Polysaccharide capsules:

Carbohydrate coverings with antigenic specificity found on certain bacteria.

3.17900 polytene chromosomes:

Large chromosomes formed by repeated DNA replication without cell division, creating multiple chromatids.

3.1791 polyunsaturates:

Oils containing polyunsaturated fatty acids.

3.1792 polyspermy:

Entry of multiple sperm into an egg during fertilization, though only one sperm fuses with the egg nucleus.

3.1793 polyvalent vaccine:

Vaccine containing cloned antigenic determinants from multiple pathogens.

3.1794 polyvinylpyrrolidone (PVP):

A polymer used in plant tissue culture media to prevent oxidative browning.

3.1795 population density:

Number of cells or individuals per unit area or volume.

3.1796 population genetics:

Study of allele and genotype frequencies in breeding populations.

3.1797 population:

Group of organisms of the same species that interbreed.

3.1798 porcine endogenous retrovirus (PERV):

Retrovirus in pigs that could potentially infect humans after organ transplantation.

3.1799 positional candidate gene:

Gene located near a DNA marker linked to a trait, potentially responsible for genetic variation.

3.1800 positional cloning:

Method to locate genes linked to inherited traits using markers.

3.1801 position effect:

Phenotypic change due to the movement of a gene or genes.

3.1802 positive control system:

Mechanism where regulatory proteins are needed to activate gene expression.

3.1803 positive selection:

Method to select cells with specific DNA inserts at chromosomal locations.

3.1804 post-replication repair:

Mechanism to repair damaged DNA using recombination.

3.1805 post-translational modification:

Addition of groups like phosphates or sugars to proteins after synthesis.

3.1806 precocious germination:

Premature germination of the embryo before embryogenesis is complete.

3.1807 pre-filter:

Coarse filter used to remove large particles before fine filtration.

3.1808 pressure potential:

Pressure within a cell that results from osmotic potential differences.

3.1809 pre-transplant:

Hardening stage in tissue culture before plants are transferred to soil.

3.1810 preventive immunization (vaccination):

Infection with antigens to provoke an antibody response for future protection.

3.1811 pribnow box:

Sequence near the start of prokaryotic genes where RNA polymerase binds.

3.1812 primary:

First in order or development.

3.1813 primary antibody:

Antibody that binds to a target molecule in assays like ELISA.

3.1814 primary cell:

Cell directly taken from a living organism, not immortalized.

3.1815 primary cell wall:

Initial layer of plant cell wall formed during cell expansion.

3.1816 primary culture:

Culture started from cells, tissues, or organs taken directly from an organism.

3.1817 primary growth:

Growth from apical meristems or initial callus culture.

3.1818 primary immune response:

Immune reaction during the first encounter with an antigen.

3.1819 primary meristem:

Meristem that gives rise to the primary plant body.

3.1820 primary tissue:

Tissue that develops from a primary meristem.

3.1821 primary transcript:

RNA molecule produced by transcription before modifications.

3.1822 Primer:

Short DNA/RNA fragment that helps initiate DNA synthesis.

3.1823 primer DNA polymerase:

Enzyme that provides primers for DNA synthesis.

3.1824 primer walking:

Method of sequencing long cloned DNA using successive primers.

3.1825 primordium:

Group of cells that develop into an organ.

3.1826 primosome:

Protein complex involved in initiating Okazaki fragment synthesis during DNA replication.

3.1827 prion:

Protein-based infectious particle.

3.1828 probability:

Likelihood of an event occurring.

3.1829 proband:

Individual in a family with a newly identified inherited trait.

3.1830 probe:

Agent used to detect specific molecules, often labelled with isotopes for hybridization.

3.1831 probe DNA:

Labelled DNA used to find complementary sequences by hybridization.

3.1832 procambium:

Primary meristem that gives rise to vascular tissues.

3.1833 processed pseudo-gene:

Non-functional gene copy with no promoter or introns, often derived from cDNA.

3.1834 production environment:

Input-output relationships in a specific location.

3.1835 production traits:

Traits like milk or meat yield, contributing to animal value.

3.1836 productivity:

Rate of product produced per unit of resource.

3.1837 pro-embryo:

Group of cells arising from the fertilized egg before the embryo is recognizable.

3.1838 progeny testing:

Method to assess the genotype of an individual based on offspring performance.

3.1839 progesterone:

Hormone that prepares the uterus for egg implantation.

3.1840 prokaryote:

Organism without a membrane-bound nucleus, e.g., bacteria and blue-green algae.

3.1841 proliferation:

Growth through repeated cell division.

3.1842 pro-meristem:

Embryonic meristem that forms organ initials.

3.1843 promoter:

DNA sequence where RNA polymerase binds to initiate transcription.

3.1844 promoter sequence:

Regulatory DNA sequence that initiates gene expression.

3.1845 pro-nuclear micro-injection:

Transgenesis method where a gene is injected into a fertilized egg's pronucleus.

3.1846 pro-nucleus:

The two haploid gamete nuclei just before fusion in the fertilized ovum.

3.1847 proofreading:

The process by which DNA polymerase scans newly-synthesized DNA for mismatched base pairs.

3.1848 propagation:

The multiplication of plants through vegetative material or in vitro culture.

3.1849 propagule:

A structure capable of forming a new plant through asexual or sexual reproduction.

3.1850 pro-phage:

A temperate bacteriophage genome integrated into a lysogenic bacterium's chromosome.

3.1851 prophase:

The early stage of nuclear division when chromosomes thicken and move to the metaphase plate.

3.1852 protamines:

Small basic proteins replacing histones in sperm cell chromosomes.

3.1853 protease:

An enzyme that breaks down proteins by hydrolysing peptide bonds.

3.1854 protein:

A macromolecule made of one or more polypeptides, essential for cellular functions.

3.1855 protein crystallization:

The process of making protein crystals to determine their three-dimensional structure.

3.1856 protein engineering:

The modification of protein structures for improved properties.

3.1857 protein kinase:

An enzyme that adds phosphate groups to proteins at serine, threonine, or tyrosine residues.

3.1858 protein metabolic step:

A single step in the biochemical processes dictating an organism's composition.

3.1859 protein sequencing:

The process of determining a protein's amino-acid sequence.

3.1860 protein synthesis:

The creation of proteins from amino acids based on DNA instructions.

3.1861 prion:

An abnormal protein without nucleic acid responsible for spongiform encephalopathies.

3.1862 proteolysis:

The breakdown of proteins by enzymes.

3.1863 proteolytic:

The ability to break down proteins.

3.1864 protoclone:

A plant regenerated from protoplast culture or a single protoplast colony.

3.1865 protocol:

A detailed procedure or series of steps for solving a scientific problem.

3.1866 protocorm:

A tuberous structure in orchids that develops into a complete plant.

3.1867 protoderm:

A tissue that develops into the epidermis.

3.1868 protogyny:

A condition where female reproductive organs mature before male ones, preventing self-fertilization.

3.1869 protomeristem:

Another term for promeristem.

3.1870 proto-oncogene:

A normal gene that can become an oncogene through mutation or retrovirus incorporation.

3.1871 protoplasm:

The living substance in cells necessary for their functions.

3.1872 protoplast:

A cell with its wall removed, leaving only the cytoplasm and membrane.

3.1873 protoplast culture:

The isolation and culture of plant protoplasts for various purposes.

3.1874 protoplast fusion:

The merging of the membranes and cytoplasm of two protoplasts.

3.1875 prototroph:

An organism that grows on minimal medium.

3.1876 protozoan:

A single-celled microscopic organism.

3.1877 pro-toxin:

A latent, non-active precursor of a toxin.

3.1878 provirus:

A retrovirus whose RNA has been converted into DNA and integrated into a host genome.

3.1879 pseudo-autosomal region:

A section of the X and Y chromosomes that pair during meiosis I.

3.1881 pseudo-gene:

A gene copy that cannot function due to mutations.

3.1882 pseudocarp:

A fruit that includes parts of the flower beyond the ovary wall, such as the receptacle.

3.1883 Pseudomonas spp.

A common Gram-negative bacterial genus that is widely distributed. Many of the soil forms produce a pigment that fluoresces under ultraviolet light, hence the descriptive term fluorescent pseudomonas.

3.1884 psychrophile

A micro-organism that can grow at temperatures below 30°C and as low as 0°C.

3.1885 PUC

A widely used expression plasmid, containing a galactosidase gene.

3.1886 pulsed-field gel electrophoresis (PFGE)

A procedure used to separate very large DNA molecules by alternating the direction of electric current in a pulsed manner across a semisolid gel.

3.1887 punctuated equilibrium

The occurrence of speciation events in bursts, separated by long intervals of species stability.

3.1888 pure culture

Axenic culture.

3.1889 pure line

A strain in which all members have descended by self- fertilization or close inbreeding . A pure line is genetically uniform.

3.1890 purine

A double-ring, nitrogen-containing base present in nucleic acids; adenine (A) and guanine (G) are the two purines present in most DNA and RNA molecules.

3.1891 pyrethrins

Active constituents of pyrethrum (Tanacetum cinerariifolium) flowers, used as insecticides.

3.1892 pyrimidine A single-ring, nitrogen-containing base present in nucleic acids; cytosine (C) and thymine (T) are commonly present in DNA, whereas uracil usually replaces thymine in RNA.

3.1893 pyrogen

Bacterial substance that causes fever in mammals.

3.1894 quantitative genetics

The area of genetics concerned with the inheritance of continuously-varying traits. Most practical improvement programs involve the application of quantitative genetics.

3.1895 quantitative inheritance

Inheritance of measurable traits (height, weight, colour intensity, etc.) that depend on the cumulative action of many genes.

3.1896 quantitative trait

A measurable trait that shows continuous variation; a trait that can not be classified into a few discrete classes.

3.1897 quantitative trait locus (QTL)

A locus that affects a quantitative trait. The plural form (quantitative trait loci) is also abbreviated as QTL.

3.1898 quantum (L. quantum, how much)

An elemental unit of energy.

3.1899 quantum speciation

The rapid formation of new species, primarily by genetic drift.

3.1900 quarantine (It. quarantina, from quaranta, forty)

Originally, keeping a person or living organism in isolation for a period (originally 40 days) after arrival to allow disease symptoms to appear, if there was any disease present. Now used for regulations restricting the sale or shipment of living organisms, usually to prevent disease or pest invasion of an area.

3.1901 quiescent

Quiet, at rest, but not necessarily dormant, and having the potential for resumed activity; can apply to non-meristematic cells.

3.1902 race

A distinguishable group of organisms of a particular species, that are geographically, ecologically, physiologically, physically and/or chromosomically distinct from other members of the species.

3.1902 raceme

An inflorescence in which the main axis is elongated but the flowers are borne on pedicels that are about equal in length.

3.1903 rachilla (Gr. rhachis, a backbone + L. diminutive suffix -illa) Shortened axis of a spikelet.

3.1904 rachis (Gr. rhachis, a backbone)

Main axis of a spike; axis of fern leaf (frond) from which pinnae arise; in compound leaves, the extension of the petiole corresponding to the midrib of an entire leaf.

3.1905 radicle (L. radix, root)

That portion of the plant embryo which develops into the primary or seed root.

3.1906 radioactive isotope;

radioisotope An unstable isotope that emits ionizing radiation.

3.1907 ramet

An individual member of a clone.

3.1908 random amplified polymorphic DNA (RAPD; pronounced 'rapid')

A technique using single, short (usually 10-mer) synthetic oligonucleotide primers for PCR. The primer, whose sequence has been chosen at random, initiates replication at its complementary sites on the DNA, producing fragments up to about 2 kb long, which can be separated by electrophoresis and stained with

ethidium bromide. A primer can exhibit polymorphism between individuals, and polymorphic fragments can be used as markers.

3.1909 random mutagenesis

A non-directed change of one or more nucleotide pairs in a DNA molecule.

3.1910 random primer method

A DNA labeling technique that uses random oligonucleotides (6- or 14-mers with all possible sequence combinations) to hybridize to a DNA probe. DNA polymerase extends these primers from their 3' hydroxyl ends, incorporating labeled deoxyribonucleotides (dNTPs) and synthesizing complementary strands. This generates fragmented, labeled copies of the probe DNA, suitable for detection or hybridization assays.

3.1911 reading frame

A sequence of nucleotides read in consecutive triplets starting from a specific initiation codon (e.g., AUG). Each triplet (codon) corresponds to an amino acid during protein synthesis. The reading frame determines how nucleotides are grouped into codons in mRNA, dictated by the starting point of translation.

AUGGCAAAAUUUCCC would read as AUG/GCA/AAA/UUU/CCC/ and not as A/UGC/CAA/AAU/UUC/CC.

Depending on where one begins, each DNA strand contains three different reading frames.

3.1912 read-through

Transcription or translation that proceeds beyond the normal stopping point because of the absence of the transcription or translation termination signal of a gene.

3.1913 reca

A protein in most bacteria, and that is essential for DNA repair and DNA recombination.

3.1914 recalcitrant of seeds:

unable to survive drying and subsequent storage at low temperature. receptacle (L. receptaculum, a reservoir) Enlarged end of the pedicel or peduncle, to which other flower parts are attached.

3.1915 receptor

A molecule that can accept the binding of a ligand.

3.1916 receptor-binding screening

One of the biotechnology-based methods for discovering conventional drugs. The method relies on the fact that many drugs act by binding to specific proteins (receptors) on or in cells: these proteins usually bind to hormones or to other cells, and control the cell's behaviour, although they may be enzymes or structural elements of the cell. The drug interferes with the normal role of the protein.

3.1917 recessive

Describing an allele whose effect with respect to a particular trait is not evident in heterozygotes. Opposite to dominant.

3.1918 recessive oncogene; recessive-acting oncogene; anti-oncogene

A single copy of this gene is sufficient to suppress cell proliferation; the loss of both copies of the gene contributes to cancer formation. See oncogene.

3.1919 reciprocal crosses

Crosses between the same two strains, but with the sexes reversed; e.g., female A male B and male A female B.

3.1920 reciprocating shaker

A platform shaker used for agitating culture flasks, with a back and forth action at variable speeds.

3.1921 recognition site A nucleotide sequence

composed typically of 4, 6 or 8 nucleotides – that is recognized by and to which a restriction endonuclease (restriction enzyme) binds. For type II restriction enzymes (those used in gene-cloning experiments) it is also the sequence within which the enzyme specifically cuts (and their corresponding enzymes methylate) the DNA, i.e., for type II enzymes, the recognition site and the target site are the same sequence. Type I enzymes bind to their recognition site and then cleave the DNA at some more or less random position outside that recognition site.

3.1922 recombinant

A term used in both classical and molecular genetics.

1. In classical genetics: An organism or cell that is the result of recombination (crossing-over), e.g., Parents: AB/ab and ab/ab; recombinant offspring: Ab/ab.

2. In molecular genetics: A molecule containing DNA from different sources. The word is typically used as an adjective, e.g., recombinant DNA.

3.1923 recombinant DNA

The result of combining DNA fragments from different sources.

3.1924 recombinant DNA technology

A set of techniques which enable one to manipulate DNA.

3.1925 recombinant toxin

A single multifunctional toxic protein that has been created by combining the coding regions of various genes.

3.1926 recombinant vaccine

A vaccine produced from a cloned gene.

3.1927 recombination

The process of crossing over, which occurs during meiosis I. It involves breakage in the same position of each of a pair of non-sister chromatids from homologous chromosomes, followed by joining of non-sister fragments, resulting in a reciprocal exchange of DNA between non-sister chromatids within an homologous pair of chromosomes.

3.1928 recombination fraction; recombination frequency

The proportion of gametes that have arisen from recombination between two loci. It is estimated as the number of recombinant individuals among a set of offspring of a particular mating, divided by the total number of offspring from that mating. Represented by the Greek letter theta. Linkage maps are created from estimates of recombination fraction between all pair-wise combinations of loci.

3.1929 reconstructed cell

A viable transformed cell resulting from genetic engineering.

3.1930 re-differentiation

Cell or tissue reversal from one differentiated type to another differentiated type of cell or tissue. See dedifferentiation.

3.1931 reduction division

Phase of meiosis in which the maternal and paternal chromosomes of the bivalent separate. See equational division.

3.1932 regeneration (L. re, again + generate, to beget)

The growth of new tissues or organs to replace those injured or lost. In tissue culture, regeneration is used to define the development of organs or plantlets from a tissue, callus culture or from a bud. See conversion; micropropagation; organogenesis.

3.1933 regulator

Substance regulating growth and development of cells, organs, etc.

3.1934 regulatory gene

A gene whose protein controls the activity of other genes or metabolic pathways.

3.1935 rejuvenation

Reversion from adult to juvenile stage.

3.1936 relaxed plasmid

A plasmid that replicates independently of the main bacterial chromosome and is present in 10-500 copies per cell.

3.1937 release factors

1. Soluble protein that recognizes termination codons in mRNAs and terminate translation in response to these codons.

2. A hormone that is produced by the hypothalamus and stimulates the release of a hormone from the anterior pituitary gland into the bloodstream.

3.1938 re-naturation

The re-association of two nucleic acid strands after denaturation. The restoration of a molecule to its native form. In nucleic acid biochemistry, this term usually refers to the formation of a double-stranded helix from complementary single-stranded molecules. Some simple proteins can also be re- natured and regain their function.

3.1939 rennin

An enzyme secreted by cells lining the stomach in mammals, and that is responsible for clotting milk.

3.1940 repeat unit

A sequence of bases that occurs repeatedly in the genome, often end-on-end, i.e., tandemly.

3.1941 repetitive DNA

DNA sequences that are present in a genome in multiple copies, sometimes a million times or more.

3.1942 replacement; gene replacement

A method of substituting a cloned gene, or part of a gene, which may have been mutated in vitro, for the wild-type copy of the gene within the host's chromosome.

3.1943 replacement therapy

The administration of metabolites, co-factors or hormones that are deficient as the result of a genetic disease.

3.1944 replica plating

A procedure for duplicating the bacterial colonies growing on agar medium in one Petri plate to agar medium in another Petri plate.

3.1945 replication

The synthesis of duplex (double-stranded) DNA by copying from a single-stranded template.

3.1946 replicative form (RF)

The molecular configuration of viral nucleic acid that is the template for replication in the host cell.

3.1947 replicon

A segment of DNA capable of replication from a single origin. In prokaryotes (e.g., bacterial chromosomes, plasmids, phages) and some viruses, the entire DNA molecule typically functions as a single replicon due to one origin. Eukaryotic chromosomes, however, contain multiple origins, dividing the DNA into several replicons. The term also describes DNA molecules that replicate autonomously, such as shuttle vectors (e.g., "pJDB219 replicates independently in yeast and E. coli").

3.1948 replisome

The complete replication apparatus present at a replication fork that carries out the semi-conservative replication of DNA.

3.1949 reporter gene

A gene that encodes a product that can readily be assayed. Thus reporter genes are used to determinate whether a particular DNA construct has been successfully introduced into a cell, organ or tissue.

3.1950 repressible enzyme

An enzyme whose synthesis is diminished by a regulatory molecule.

3.1951 repression

Inhibition of transcription by preventing RNA polymerase from binding to the transcription initiation site: a repressed gene is "turned off."

3.1952 repressor

A DNA-binding protein that inhibits transcription by attaching to a specific operator sequence upstream of a gene or operon. It blocks RNA polymerase from initiating mRNA synthesis. Examples include the C1 protein in bacteriophage and the lacl protein (lac repressor) regulating the lac operon.

3.1953 reproduction

The production of an organism, cell or organelle like itself (self propagation).

1. Sexual reproduction: the regular alternation (in the life-cycle of haplontic, diplontic and diplohaplontic organisms) of meiosis and fertilization (karyogamy) which provides for the production of offspring. The main biological significance of sexual reproduction lies in the fact that it achieves genetic recombination.

2. Asexual or agamic reproduction: the development of a new individual from either a single cell (agamospermy) or from a group of cells (vegetative reproduction) in the absence of any sexual process.

3.1954 repulsion

The phase state in which a dominant (or wild-type) allele at one locus and a recessive (or mutant) allele at a second locus occur on the same chromosome. Also called trans configuration. residues The components of macromolecules, e.g., amino acids, nucleotides.

3.1955 resistance

Term commonly used to describe the ability of an organism to withstand a stress, a force or an effect of a disease, or its agent or a toxic substance.

3.1956 resistance factor

A plasmid that confers antibiotic resistance to a bacterium.

3.1957 rest period

An endogenous physiological condition of viable seeds, buds or bulbs that prevents growth even in the presence of otherwise favourable environmental conditions. By some seed physiologists, this is referred to as dormancy.

3.1958 restitution nucleus

A nucleus with unreduced or doubled chromosome number that results from the failure of a meiotic or mitotic division.

3.1959 restriction endonuclease [enzyme]

A class of endonucleases that cleaves DNA after recognizing a specific sequence, e.g., BamH1 (5GGATCC3), EcoRI (5GAATTC3), and Hin Diii (5AAGCTT3). There are three types of restriction endonuclease enzymes:

Type I: Cuts non-specifically a distance greater than 1000 bp from its recognition sequence and contains both restriction and methylation activities.

Type II: Cuts at or near a short, and often palindromic (q.v.), recognition sequence. A separate enzyme methylates the same recognition sequence. They may make the cuts in the two DNA strands exactly opposite one another and generate blunt ends, or they may make staggered cuts to generate sticky ends. The type II restriction enzymes are the ones commonly exploited in recombinant DNA technology.

Type III: Cuts 24-26 bp downstream from a short, asymmetrical recognition sequence. Requires ATP and contains both restriction and methylation activities.

3.1960 restriction exonuclease [enzyme]

A class of nucleases that degrades DNA or RNA, starting from an end either 5 or 3.

3.1961 restriction fragment

A fragment of DNA produced by cleaving (digesting, cutting) a DNA molecule with one or more restriction endonucleases.

3.1962 restriction fragment length polymorphism (RFLP)

The occurrence of variation in the length of DNA fragments that are produced after cleavage with a type II restriction endonuclease. The differences in DNA lengths are due to the presence or absence of recognition site(s) for that particular restriction enzyme. RFLPs were initially detected using hybridization with DNA probes after separation of digested genomic DNA by gel electrophoresis (Southern analysis). Now they are typically detected by electrophoresis of digested PCR product.

3.1963 restriction map

The linear array of restriction endonuclease sites on a DNA molecule.

3.1964restriction nuclease

A bacterial enzyme that cuts DNA at a specific site.

3.1965 restriction site

The specific nucleotide sequence in DNA that is recognized by a type II restriction endonuclease and within which it makes a double-stranded cut. Restriction sites usually comprise four or six base pairs that typically are palindromic e.g., 5GGCC3 3CCGG5. The two strands may be cut either opposite to one another, to create blunt ends, or in a staggered manner, giving sticky ends, depending on the enzyme involved. See restriction endonuclease.

3.1966 reticulocyte

A young red blood cell.

3.1967retro-element

Any of the integrated retroviruses or the transposable elements that resemble them.

3.1968 retro-poson; retro-transposon

A transposable element that moves via reverse transcription (i.e., from DNA to RNA to DNA) but lacks the long terminal repeat sequences.

3.1969 retroviral vectors

Gene transfer systems based on viruses that have RNA as their genetic material.

3.1970 retrovirus

A class of eukaryotic RNA viruses that can form double- stranded DNA copies of their genomes by using reverse transcription; the double-stranded forms integrate into chromosomes of an infected cell. Many naturally occurring cancers of vertebrate animals are caused by retroviruses. Also, the AIDS virus is a retrovirus.

3.1971 reversal transfer

Transfer of a culture from a callus-supporting medium to a shoot-inducing medium.

3.1972 reverse transcriptase;

RNA-dependent DNA polymerase An enzyme that uses RNA molecule as a template for the synthesis of a complementary DNA strand.

3.1973 reverse transcription

The synthesis of DNA on a template of RNA, accomplished by reverse transcriptase.

3.1974 reversion; reverse mutation

Restitution of a mutant gene to the wild-type condition, or at least to a form that gives the wild phenotype; more generally, the appearance of a trait expressed by a remote ancestor.

3.1975 rhizobacterium

A micro-organism whose natural habitat is near, on or in plant roots.

3.1976 Rhizobium (pl: rhizobia)

Prokaryote able to establish symbiotic relationship with leguminous plants, as a result of which elemental nitrogen is fixed or converted to ammonia.

3.1977 rhizosphere

The soil region in the immediate vicinity of growing plant roots.

3.1978 ribose

A monosaccharide (C5H10O5) rarely occurring free in nature, but important as a component of RNA.

3.1979 ribonuclease

Any enzyme that hydrolyses RNA.

3.1980 ribosomal binding site

A sequence of nucleotides near the 5 end of a bacterial mRNA molecule that facilitates the binding of the mRNA to the small ribosomal sub-unit. Also called the Shine- Delgarno sequence.

3.1981 ribosome (ribo, from RNA + Gr. soma, body) ⊤

he sub-cellular structure that contains both RNA and protein molecules and mediates the translation of mRNA into protein. Ribosomes comprise large and small sub-units.

3.1982 ribozyme; gene shears

RNA molecule that can catalyse chemical reactions, often cutting other RNAs.

3.1983 ribulose

A keto-pentose sugar (C5H11O5) that is involved in carbon dioxide fixation in photosynthesis.

3.1984 ribulose biphosphate (RuBP)

A five-carbon sugar that is combined with carbon dioxide to form a six-carbon intermediate in the first stage of the dark reaction of photosynthesis.

3.1985 rinderpest

Cattle plague; a viral infection of cattle, sheep and goats.

3.1986 Ri plasmid

A class of large conjugative plasmids found in the soil bacterium Agrobacterium rhizogenes. Ri plasmids are responsible for hairy root disease of certain plants. A segment of the Ri plasmid is found in the genome of tumour tissue from plants with hairy root disease.

3.1987 R-loops

Single-stranded DNA regions in RNA-DNA hybrids formed in vitro under conditions where RNA-DNA duplexes are more stable than DNA-DNA duplexes.

3.1988 RNA Ribonucleic acid.

An organic acid composed of repeating nucleotide units of adenine, guanine, cytosine and uracil, whose ribose components are linked by phospho-diester bonds. The information-carrying material in some viruses. More generally, a molecule derived from DNA by transcription that may carry information (messenger RNA (mRNA)), provide sub-cellular structure (ribosomal RNA (rRNA)), transport amino acids (transfer RNA (tRNA)) or facilitate the biochemical modification of itself or other RNA molecules. See antigen RNA; gene splicing; heterogeneous nuclear RNA (hnRNA); mRNA; ribosomal RNA; RNA polymerase; small nuclear RNA; transfer RNA.

3.1989 RNA editing

Post-trancriptional processes that alter the information encoded in gene transcripts (RNAs).

3.1990 RNA polymerase

An enzyme that catalyses the synthesis of RNA from a DNA template.

3.1991 RNase Ribonuclease.

A group of enzymes that catalyse the cleavage of nucleotides in RNA.

3.1992 Roentgen (symbol: r)

Obsolete unit of ionizing radiation. The SI unit is the sievert

3.1993 root culture

The culture of isolated root tips of apical or lateral origin to produce in vitro root systems with indeterminate growth habits. Root culture was among the first kinds of plant tissue cultures, and is still largely used in the study of developmental phenomena, and mycorrhizal, symbiotic and plant-parasitic relationships.

3.1994 root cutting

Cutting made from sections of roots alone.

3.1995 root hairs

Outgrowths from epidermal cell walls of the root specialized for water and nutrient absorption.

3.1996 root nodule

A small round mass of cells that is located on the roots of plants and contains nitrogen-fixing bacteria.

3.1997 root tuber

Thickened root that stores carbohydrates.

3.1998 root zone

The volume of soil or growing medium containing the roots of a plant. In soil science, the depth of the soil profile in which roots are normally found.

3.1999 rootstock

The trunk or root material to which buds or scions are inserted in grafting.

3.2000 rotary shaker

Rotating apparatus with a platform on which, containers can be shaken, such as Erlenmeyer flasks containing cells in liquid nutrient medium.

3.2001 rRNA (Ribosomal RNA)

RNA molecules that form the structural and functional core of ribosomes, essential for protein synthesis. In E. coli:

- Small subunit: Contains 16S rRNA (1,541 nucleotides).
- Large subunit: Contains 23S rRNA (2,904 nucleotides) and 5S rRNA (120 nucleotides).

These rRNAs are transcribed as a single precursor molecule alongside tRNA sequences, later cleaved by enzymes into functional units.

3.2002 Ruminants

Animals (e.g., cattle, sheep) with a specialized four-chambered stomach:

- 1. Rumen: Hosts microbial fermentation to break down fibrous plant material.
- 2. Reticulum and Omasum: Assist in further digestion and nutrient absorption.
- 3. Abomasum: Functions as the "true" stomach, akin to monogastric animals.

This system enables efficient digestion of cellulose-rich diets via symbiotic microbes.

3.2003 runner

A lateral stem that grows horizontally along the ground surface and gives rise to new plants either from axillary or terminal buds.

3.2004 rust

A generic descriptor for various plant diseases, especially those caused by a group of parasitic fungi of the phylum Basidiomycota , that attack the leaves and stems of crops.

3.2005 S phase

The phase in the cell cycle during which DNA synthesis occurs.

3.2006 S1 nuclease

An enzyme that specifically degrades RNA or single- stranded DNA to 5mononucleotides. Purified from the filamentous fungus Aspergillus oryzae, S1 nuclease is used in assessing the extent of a hybridization reaction by removing unpaired regions. It is also used to remove the sticky ends of restriction fragments. In S1 mapping, the coding region of a gene is detected by performing mRNA-DNA hybridization and removing unpaired DNA with S1 nuclease.

3.2007 saccharifaction

Following liquefaction, the hydrolysis of poly- saccharides by glucoamylase to maltose and glucose.

3.2008 salmonella

A genus of rod-shaped, Gram-negative bacteria that are a common cause of food poisoning.

3.2009 salt tolerance; saline resistance

The ability to withstand a concentration of sodium (Na+ ion), or of any other salt, in the soil (or in culture), which is damaging or lethal to other plants. Breeding and selection for increased tolerance and resistance in crop plants is of great current interest.

3.2010 sap Fluid

content of the xylem and phloem cells of plants. Fluid contents of the vacuole are referred to as cell sap.

3.2011 saprophyte

A vegetable organism that derives its nutriment from decaying organic matter.

3.2012 satellite DNA

That portion of the DNA in plant and animal cells consisting of highly repetitious sequences (millions of copies) typically in the range from 5 to 500 bases. Thousands of copies occur tandemly (end-on-end) at each of many sites. It can be isolated from the rest of the DNA by density gradient centrifugation.

3.2013 satellite RNA

A small, self-splicing RNA molecule that accompanies several plant viruses, including tobacco ringspot virus. a.k.a. viroid.

3.2014 saturates Noun:

Oils containing saturated fatty acids.

3.2015 SCA (single chain antigen)

Antibody-binding domains in which the two chains are produced by a gene and linked by a short peptide.

3.2016 scaffold

The central core structure of condensed chromosomes. The scaffold is composed of non-histone chromosomal proteins.

3.2017 scale up

Conversion of a process, such as fermentation of a micro- organism, from a small scale to a larger scale.

3.2018 scanning electron microscope (SEM)

An electron-beam-based microscope used to examine, in a three dimensional screen image, the surface structure of prepared specimens.

3.2019 scarification

Chemical or physical treatments applied to seeds with hard coats or germination inhibitors to break or weaken the seed coat, enabling germination.

3.2020 scientific name

A unique identifier consisting of a genus and a species name (the specific epithet) in Latin, assigned to each recognized and described species of organism. Based on the Linnean system of classification. Susceptible to considerable blurring at the edges because, as Darwin came to realize, nature has not packaged living things into neatly discrete entities.

3.2021 scion

The twig or bud to be grafted onto another plant, the root stock, in a budding or grafting operation.

3.2022 scion-stock interaction

The effect of a rootstock on a scion (and vice versa) in which a scion on one kind of rootstock performs differently than it would on its own roots or on a different rootstock.

3.2023 sclerenchyma (Gr. skleros, hard + echyma, a suffix denoting tissue)

A strengthening tissue in plants, composed of cells with heavily lignified cell walls.

3.2024 screen

To separate by exclusion or collection on the basis of a set of criteria (biochemical, anatomical, physiological, etc.). Screening is often applied to the process of selection for specific purposes, such as disease resistance or improved agronomic qualities in plants, improved performance in animals, specific enzyme properties in micro-organisms, etc.

3.2025 secondary antibody

In an ELISA or other immunological assay system, the antibody that binds to the primary antibody. The secondary antibody is often conjugated with an enzyme such as alkaline phosphatase.

3.2026 secondary cell wall

The innermost layer of cell wall, with a highly organized microfibrillar structure, which is formed in certain cells after cell elongation has ceased. It gives rigidity to the cells.

3.2027 secondary growth

Type of growth characterized by an increase in thickness of stem and root and resulting from formation of secondary vascular tissues by the vascular cambium.

3.2028 secondary immune response

The rapid immune response that occurs during the second (and subsequent) encounters of the immune system of a mammal with a specific antigen. cf primary immune response.

3.2029 secondary metabolite

A compound that is not necessary for growth or maintenance of cellular functions but is synthesized, generally, for the protection of a cell or micro-organism, during the stationary phase of the growth cycle.

3.2030 secondary phloem

Phloem tissue formed by the vascular cambium during secondary growth in a vascular plant.

3.2031 secondary plant products

Metabolic products not having a known functional or structural use in plant cells. They have been extracted from plant tissue cultures for pharmaceutical and food processing purposes (e.g., essential oils, food additives, flavours).

3.2032 secondary messenger

A chemical compound within a cell that is responsible for initiating the response to a signal from a chemical messenger (such as a hormone) that cannot enter the target cell itself.

3.2033 secondary root

A branch or lateral root.

3.2034 secondary thickening

Deposition of secondary cell wall materials which result in an increase in thickness in stems and roots.

3.2035 secondary vascular tissue

Vascular tissue (xylem and phloem) formed by the vascular cambium during secondary growth in a vascular plant.

3.2036 secondary xylem

Xylem tissue formed by the vascular cambium during secondary growth in a vascular plant.

3.2037 secretion

The passage of a molecule from the inside of a cell through a membrane into the periplasmic space, or the extracellular medium.

3.2038 seed

the matured ovule without accessory parts. Colloquially, a seed is anything which may be sown; i.e., seed potatoes (which are vegetative tubers); seed of corn, sunflower, etc.

3.2039 seed storage proteins

Proteins accumulated in large amounts in seeds not because of their enzymatic or structural properties but simply as a convenient source of amino acid for use when the seed germinates. They are of interest to biotechnologists:

1. As a source of protein. Much of the world's food comes from plant seeds or fruits, and much of the protein in those seeds is storage protein. Thus a substantial amount of the world's food protein comes from plant storage protein. Any improvement of the nutritional content of those proteins could correspondingly improve human diet.

2. As expression systems. Storage proteins are produced in very large amounts relative to other proteins, and are stored in stable, compact bodies in the plant seed. Several workers are seeking to make the plants produce other proteins in similarly large amounts and in as convenient a form, by splicing the gene for a desired protein into the middle of a plant storage protein gene.

3.2040 segment-polarity gene

A gene that functions to define the anterior and posterior components of body segments in Drosophila .

3.2041 segregant

A hybrid resulting from the crossing of two genetically unlike individuals.

3.2042 segregation

The separation of the two members of a chromosome pair from each other at meiosis; the result is seen as the separation of alleles from each other in the gametes of heterozygotes; the occurrence of different phenotypes among offspring, resulting from chromosome or allele separation in their heterozygous parents. Mendel's first principle of inheritance (the Law of Segregation) predicts that heterozygotes will produce equal numbers of gametes containing each allele.

3.2043 selectable

Having a gene product that, when present, enables a researcher to identify and preferentially propagate a particular organism or cell type.

3.2044 selectable marker

A gene whose expression allows the identification of:

- 1. A specific trait or gene in an organism.
- 2. Cells that have been transformed or transfected with a vector containing the marker gene.

3.2045 selection

1. Differential survival and reproduction phenotypes. 2. A system for either isolating or identifying specific organisms in a mixed culture.

3.2046 selection coefficient,

s The proportion by which the fitness of a genotype is less than the fitness of a starndard genotype, which is usually the genotype with the highest fitness. In general, relative fitness = 1 - s.

3.2047 selection culture

A selection based on difference(s) in environmental conditions or in culture medium composition, such that preferred variant cells or cell lines (presumptive or putative mutants) are favoured over other variants or the wild- type.

3.2048 selection differential,

S The difference between the mean of the individuals selected to be parents and the mean of the overall population.

3.2049 selection pressure

The intensity of selection acting on a population of organisms or cells in culture. Its effectiveness is measured in terms of differential survival and reproduction, and consequently in change in the frequency of alleles in a population.

3.2050 selection response

The difference between the mean of the individuals selected to be parents and the mean of their offspring. Predicted response = heritability (narrow-sense) \Box selection differential.

3.2051 selection unit

The minimum number of organisms or cells effective in the screening process.

3.2052 selective agent

An environmental or chemical agent characterized by its lethal or sub-lethal stress on growing plants, or portion thereof in culture. A selective agent is mainly used when selection of resistant or tolerant individuals is the research aim.

3.2053 self-fertilization

The process by which pollen of a given plant fertilizes the ovules of the same plant. Plants fertilized in this way are said to have been selfed. An analogous process occurs in some animals, such as nematodes and molluscs.

3.2054 self-incompatibility

In plants, the inability of the pollen to fertilize ovules (female gametes) of the same plant.

3.2055 self-pollination

Pollen of a plant is transferred to the female part of the same plant or another plant with the same genetic makeup. Opposite: cross-pollination.

3.2056 self-replicating elements

Extrachromosomal DNA elements that have origins of replication for the initiation of their own DNA synthesis.

3.2057 semi-conservative replication

During DNA duplication, each strand of a parent DNA molecule is a template for the synthesis of its new complementary strand. Thus, one half of a pre-existing DNA molecule is conserved during each round of replication.

3.2058 semi-continuous culture

Cells in an actively dividing state are maintained in culture by periodically draining off the medium and replenishing it with fresh medium.

3.2059 semi-permeable membrane

A cell or plasma membrane that is partially permeable; certain ions or molecules (water, solvents) can pass through it but others cannot (such as certain solutes).

3.2060 semi-solid

Gelled but not firmly so; small amounts of a gelling agent are used to obtain a semi-solid medium; called also semi-liquid.

3.2061 semi-sterility

A condition of only partial fertility in plant zygotes; usually associated with translocations.

3.2062 senescence

The last stage in the post-embryonic development of multicellular organisms, during which loss of functions and degradation of biological components occur. A physiological ageing process in which cells and tissues deteriorate and finally die.

3.2063 sense RNA

A primary transcript (RNA) that contains a coding region (contiguous sequence of codons) that is translated to produce a polypeptide.

3.2064 sensitivity

For diagnostic tests, the smallest amount of the target molecule that the assay can detect.

3.2065 sepsis

Destruction of tissue by pathogenic micro-organisms or their toxins, especially through infection of a wound.

3.2066 septate (L. septum, fence)

Divided by cross walls into cells or compartments or Any dividing wall or partition; frequently a cross wall in a fungal or algal filament.

3.2067 sequence-tagged site (STS)

Short, unique DNA sequence (usually 200 to 500 bp) that, by being able to be amplified by PCR, is uniquely "tagged" to the site on the chromosome from which it was amplified.

3.2068 sequencing

The determination of the order of nucleotides in a DNA or RNA molecule, or that of amino acids in a polypeptide chain.

3.2069 serial divisions

Splitting at about monthly intervals of excised shoot- tip material growing on culture medium, in order to induce additional plantlets.

3.2060 serial float culture

A technique of floating anthers on liquid medium developed by Sunderland. Anther dehiscence, pollen release and development occur at intervals of several days, and in different nutrient media.

3.2071 serology (adj: serological)

The study of serum reactions between an antigen and its antibody. Serology is mainly used to identify and distinguish between antigens, such as those specific to micro- organisms or viruses. Serology is also employed as an indicator technique to assay plants suspected of being virus-infected.

3.2072 serum albumin

A globular protein obtained from blood and body fluids.

3.2073 sewage treatment

Sewage treatment is one of the most widespread biotechnological processes in Western societies, to deal with the huge amounts of human and animal waste that such societies produce. Sewage treatment methods vary widely, but all have a biological basis to break down the organic material in sewage and convert it into something that can be safely discharged into the environment (usually rivers or seas).

3.2074 sex chromosomes

Chromosomes that are connected with the determination of sex: X and Y chromosomes in mammals; W and Z chromosomes in birds.

3.2075 sex determination

The method by which the distinction between males and females is established in a species.

3.2076 sexduction

The incorporation of bacterial genes into F factors and their subsequent transfer, by conjugation, to a recipient cell.

3.2077 sex linkage

The location of a gene on a sex chromosome, typically on the X chromosome.

3.2078 sexed embryos

Embryos separated according to sex.

3.2079 sex factor
A bacterial episome (e.g., the F plasmid in E. coli) that enables the cell to be a donor of genetic material. The sex factor may be propagated in the cytoplasm, or it may be integrated into the bacterial chromosome.

3.2080 sex hormones

Steroid hormones that control sexual development.

3.2081 sex-influenced dominance

The tendency for the type of gene action to vary between the sexes within a species. Thus the presence of horns in some breeds of sheep appears to be dominant in males and recessive in females.

3.2082 sex-limited

Expression of a trait in only one sex; e.g., milk production in mammals; egg production in chickens.

3.2082 sexual reproduction

The process where two cells (gametes) fuse to form one fertilized cell or zygote. cf asexual reproduction; gamete; hybrid.

3.2083 shake culture

An agitated suspension in culture providing adequate aeration for cells in the liquid medium. Usually an Erlenmeyer flask containing the culture is attached to a horizontal or platform shaker, or agitated with a magnetic stirrer.

3.2084 shaker; platform shaker

A platform fitted with clips for grasping Erlenmeyer flasks, with set or variable speed control. Shaking speed must be adjusted for gentle and even agitation of suspension cultures. cf reciprocating shaker.

3.2085 shear

1. The sliding of one layer across another, with deformation and fracturing in the direction parallel to the movement. This term usually refers to the forces that cells are subjected to in a bioreactor or a mechanical device used for cell breakage.

2. To fragment DNA molecules into smaller pieces. DNA, as a very long and fairly stiff molecule, is very susceptible to hydrodynamic shear forces. Forcing a DNA solution through a hypodermic needle will fragment it into small pieces. The size of the fragments obtained is inversely proportional to the diameter of the needle's bore. The actual sites at which the shear force breaks a DNA molecule are approximately random. Therefore DNA fragments may be generated by random shear and then cloned (by either tailing their ends or using linkers) so as to create a complete gene library of an organism. This method is little used now, having been replaced by the use of partial digests with four-base-pair cutters, such as Sau3A, as a means of generating random DNA fragments.

3.2086 Shine

Dalgarno sequence A conserved sequence in prokaryotic mRNAs that is complementary to a sequence near the 5 terminus of the 16S ribosomal RNA and is involved in the initiation of translation.

3.2087 shoot

A young branch that grows out from the main stock of a tree, or the young main portion of a plant growing above ground.

3.2088 shoot differentiation

The development of growing points, leaf primordia and finally shoots from a shoot tip, axial bud, or even a callus surface.

3.2089 shoot-tip graft; micrograft.

A shoot tip or meristem tip is grafted onto a prepared seedling or micropropagated rootstock in culture. Meristem tip grafting is mainly used for in vitro virus elimination with Citrus spp. and other plants.

3.2090 shoot tip; shoot apex

The terminal bud (0.1 - 1.0 mm) of a plant, which consists of the apical meristem (0.05 - 0.1 mm) and the immediate surrounding leaf primordia and developing leaves and adjacent stem tissue.

3.2091 short template

A DNA strand that is synthesized during the polymerase chain reaction and has a primer sequence at one end and a sequence complementary to the second primer at the other end.

3.2092 short-day plant

Plant that requires a night (or dark period) longer than its critical dark period to induce flower formation

3.2093 shuttle vector; bifunctional vector

A plasmid capable of replicating in two different host organisms because it carries two different origins of replication and can therefore be used to 'shuttle' genes from one to the other. For example, the YEp, pJDB219, is a shuttle vector able to replicate in E. coli from its pMB9 origin and in Saccaromyces cerevisiae from its 2 µm-plasmid origin.

3.2094 Sib-mating

Crossing of siblings. Matings involving two individuals of the same parentage; brother-sister matings.

3.2095 siderophore

A low molecular weight substance that binds very tightly to iron. Siderophores are synthesized by a variety of soil micro-organisms to ensure that the organism is able to obtain sufficient amounts of iron from the environment.

3.2096 sievert (symbol: Sv)

The SI unit of ionizing radiation.

3.2097 sieve tube

A tube within the phloem tissue of a plant, and composed of joined sieve elements.

3.2098 sigma factor

The sub-unit of prokaryotic RNA polymerases that is responsible for the initiation of transcription at specific initiation sequences.

3.2099 signal sequence

A segment of about 15 to 30 amino acids at the N terminus of a protein, that enables the protein to be secreted (pass through a cell membrane). The signal sequence is removed as the protein is secreted. Also called signal peptide, leader peptide.

3.2100 signal transduction

The biochemical events that conduct the signal of a hormone or growth factor from the cell exterior, through the cell membrane, and into the cytoplasm. This involves a number of molecules, including receptors, ligands and messengers.

3.2101 signal-to-noise ratio

A specifically produced response compared to the response level when no specific stimulus (activity) is present.

3.2102 silencer

A DNA sequence that helps to reduce or shut off the expression of a nearby gene.

3.2103 simplicity

For diagnostic tests, the ease with which an assay can be implemented.

3.2104 SINEs

Short interspersed nuclear elements. Families of short (150 to 300 bp), moderately repetitive elements of eukaryotes, occurring about 100,000 times in a genome. SINES appear to be DNA copies of certain tRNA molecules, created presumably by the unintended action of reverse transcriptase during retroviral infection.

3.2105 single-cell line; cell strain

A culture initiated from a single cell, usually from suspension cultures of single cells or small aggregates plated on solidified medium. The latter may incorporate a selective agent, from which tolerant or resistant individual cell lines or cell clones can be selected. See selective agent.

3.2106 single-cell protein (SCP)

Protein produced by micro-organisms. The dried mass of a pure sample of a protein-rich-micro-organism, which may be used either as feed (for animals) or as a food (for humans).

3.2107 single copy

A gene or DNA sequence which occurs only once per (haploid) genome. Most structural genes, those encoding functional proteins, are single-copy genes.

3.2108 single-node culture

Culture of separate lateral buds with each carrying a piece of stem tissue.

3.2109 single-nucleotide polymorphism (SNP; pronounced "snip")

A polymorphism at a particular base site in a coding sequence, e.g., at base 306 in a particular gene, one individual could be heterozygous for A and G: the maternal allele could have an A at this site, while the paternal allele has a G at this site. This type of polymorphism is extensive throughout the genome, and has the great advantage of being detectable without the need for gel electrophoresis, which opens the way for large- scale automation of genotyping.

3.2110 single-strand-DNA-binding protein

A protein that coats DNA single strands, keeping them in an extended state.

3.2111 single-stranded

A term used to describe nucleic acid molecules consisting of only one polynucleotide chain. The genomes of certain phages, e.g., MI3, are single-stranded DNA molecules; rRNA, mRNA and tRNA are all single-stranded nucleic acids, but they all contain double-stranded regions formed by the intra- strand base-pairing of self-complementary sequences.

3.2112 sires

Male animals used for breeding.

3.2113 site-directed mutagenesis

The introduction of base changes – mutations – into a piece of DNA at a specific site, using recombinant DNA methods.

3.2114 site-specific

A term used to describe any process or enzyme which acts at a defined sequence within a DNA or RNA molecule. Type II restriction enzymes are site-specific endonucleases and the recombination systems

encoded by some transposons are site-specific, such as is the integration of phage into the E. coli chromosome

3.2115 site-specific mutagenesis

A technique to change one or more specific nucleotides within a cloned gene in order to create an altered form of a protein with one or more specific amino acid changes. a.k.a. oligonucleotide-directed mutagenesis; oligonucleotide-directed site-specific mutagenesis.

3.2116 six-base cutter

A type II restriction endonuclease that binds (and subsequently cleaves) DNA at sites that contain a sequence of six nucleotide pairs that is uniquely recognized by that enzyme. Because any sequence of six bases occurs less frequently by chance than any sequence of four bases, six-base cutters cleave less frequently than do four-base cutters. Thus, six-base cutters create larger fragments than four-base cutters.

3.2117 small nuclear ribonucleoprotein (snRNP; pronounced snurp(s))

A compound comprising small nuclear RNA and nuclear protein, that is heavily involved in the posttranscriptional processing of mRNA, especially the removal of introns. snRNPs are a major component of spliceosomes

3.2118 small nuclear RNA (snRNA)

Short RNA transcripts of 100-300 bp that associate with proteins to form small nuclear ribonucleo- protein particles (snRNPs) most snRNAs are components of the spliceosomes that excise introns from premRNAs in RNA processing.

3.2119 soil amelioration

The improvement of poor soils, usually using bacteria or fungi. This contrasts with bioremediation, which is the cleaning up of toxins, usually in soils. Amelioration includes breaking down organic matter; forming humus; by solubilizing them, making minerals – such as phosphates – in the soil available to plants; fixing nitrogen; and sometimes an element of bioremediation as well.

3.2120 soilless culture;

soil-free culture Tissue culture and hydroponics.

3.2121 solid media

Nutrient media that has been solidified, such as by addition of agar.

3.2122 somaclonal variation

Epigenetic or genetic changes, sometimes expressed as a new trait, resulting from in vitro culture of higher plants.

3.2123 somatic

Referring to vegetative or non-sexual stages of a life-cycle.

3.2124 somatic cell

Any cell of a multicellular organism that composes the body of that organism but does not produce gametes. cf gamete; somatic cell gene therapy.

3.2125 somatic cell embryogenesis

Embryos are produced either from somatic cells of explants (direct embryogenesis) or by induction on callus formed by explants (indirect embryogenesis). a.k.a. asexual embryogenesis.

3.2126 somatic cell gene therapy

The delivery of a gene or genes to a tissue other than reproductive cells of an individual, with the aim of correcting a genetic defect. cf somatic cell.

3.2127 somatic cell variant

A somatic cell with unique characters not present in the other cells, such as might be selected for in a screening trial that following a mutation event.

3.2128 somatic embryo; somatic embryoid

An organized embryonic structure morphologically similar to a zygotic embryo but initiated from somatic (non-zygotic) cells. Under in vitro conditions, somatic embryos go through developmental processes similar to embryos of zygotic origin.

3.2129 somatic hybridization

1. Asexual fusion of protoplasts from somatic cells of genetically different parents.

2. Hybridization by induced fusion of cells (protoplasts) from two contrasting genotypes for production of hybrids or cybrids which contain various mixtures of nuclear and/or cytoplasmic genomes, respectively. a.k.a. parasexual hybridization.

3.2130 somatic hypermutation

A high frequency of mutation that occurs in the gene segments encoding the variable regions of antibodies during the differentiation of B lymphocytes into antibody producing plasma cells.

3.2131 somatic reduction

Halving of the chromosomal number of somatic cells; a possible method of producing "haploids" from somatic cells and calluses by artificial means.

3.2132 sonication

Disruption of cells or DNA molecules by high frequency sound waves. a.k.a. ultrasonication.

3.2133 SOS response

The synthesis of a whole set of DNA repair, recombination and replication proteins in bacteria containing severely damaged DNA (e.g., following exposure to UV light).

3.2134 source DNA T

he DNA from an organism that contains a target gene; this DNA is used as starting material in a cloning experiment.

3.2135 source organism

A bacterium, plant or animal from which DNA is purified and used in a cloning experiment.

3.2136 Southern blot

A cellulose or nylon membrane to which DNA fragments previously separated by gel electrophoresis have been transferred by capillary action. Named after Ed Southern.

3.2137 Southern blotting

A technique for transferring denatured DNA molecules that have been separated electrophoretically, from a gel to a matrix (such as a nitrocellulose membrane) on which a hybridization assay can be performed.

3.2138 Southern hybridization

A procedure in which a cloned, labelled segment of DNA is hybridized to DNA restriction fragments on a Southern blot.

3.2139 speciation

The development of one or more species from an existing species.

3.2140 sparger

A device that introduces into a bioreactor air in the form of separate fine streams.

3.2141 specialized

Anatomically or physiologically adapted for particular functions or habitats.

3.2142 species (L. species, appearance, form, kind)

A class of potentially interbreeding individuals that are reproductively isolated from other such groups having many characteristics in common. A somewhat arbitrary and sometimes blurred classification; but still quite useful in many situations.

3.2143 specificity

For diagnostic tests, the ability of a probe to react precisely with a specific target molecule.

3.2144 spent medium

After each sub-culture, the medium is discarded because it has been depleted of nutrients, dehydrated or accumulated toxic metabolic products.

3.2145 spermatid

One of the four cells formed by the meiotic divisions in spermatogenesis. Spermatids become mature spermatozoa (sperm).

3.2146 spermatocyte Sperm mother cell.

The cell that undergoes two meiotic divisions (spermatogenesis) to form four spermatids; the primary spermatocyte before completion of the first meiotic division; the secondary spermatocyte after completion of the first meiotic division.

3.2147 spermatogenesis

The series of cell divisions in the testis by which maturation of the gametes (sperm) of the male takes place.

3.2148 spermatogonium (pl: spermatogonia)

Primordial male germ cell that may divide by mitosis to produce more spermatogonia. A spermatogonium may enter a growth phase and give rise to a primary spermatocyte.

3.2149 spermatozoon (pl: spermatozoa; abbr: sperm)

The mature, mobile reproductive cell of male animals, produced by the testis.

3.2150 sperm competition

Competition between different spermatozoa to reach and fertilize the egg cell of a single female.

3.2151 sperm sexing

The separation of sperm into those bearing an X chromosome and those bearing a Y chromosome, in order to be able to produce, via artificial insemination or in vitro fertilization, animals of a specified sex. Achieved by means of inactivation of X-bearing or Y-bearing sperm via antibodies directed against sex-specific peptides on the surface of sperm cells, or fluorescence-activated cell sorting (FACS), in which sperm that have been pre-treated with a fluorescent dye that binds to DNA are separated according to the quantity of fluorescence detected by a laser beam, based on the principle that X-bearing sperm contain more DNA than Y-bearing sperm.

3.2152 spharoblast

Nodule of wood which can give rise to adventitious shoots with juvenile characteristics.

3.2153 spheroplast (formerly also sphaeroplast)

A microbial or plant cell from which most of the cell wall has been removed, usually by enzymic treatment. Strictly, in a spheroplast, some of the wall remains, while in a protoplast the wall has been completely removed. In practice, the two words are often used interchangeably. See protoplast.

3.2154 spike (L. spica, an ear of grain)

An inflorescence in which the main axis is elongated and the flowers are sessile.

3.2155 spikelet (L. spica, an ear of grain + diminutive ending -let)

The unit of inflorescence in grasses; a small group of grass flowers.

3.2156 spindle (A.S. spinel, a tool for spinning thread by hand)

In mitosis and meiosis, refers to the spindle-shaped intracellular structure in which the chromosomes move.

3.2157 spine

Hard, sharp structure on the surface of a plant; usually a modified leaf.

3.2158 spliceosomes

Organelles responsible for the removal of introns from mRNA by means of splicing.

3.2159 splicing

During the maturation of eukaryotic mRNA, the process that eliminates intervening intron sequences and covalently joins exon sequences of RNA.

3.2160 split gene; exon; guide sequence.

In recombinant DNA technology, the term refers to the latter of the two processes just described, namely joining fragments of DNA together.

3.2161 split genes

In eukaryotes, structural genes are typically divided up (split) by a number of non-coding regions called introns.

3.2162 spore

1. A reproductive cell that develops into an individual without union with other cells; some spores such as meiospores occur at a critical stage in the sexual cycle, but others are asexual in nature. 2. A small, protected reproductive form of a micro-organism, often synthesized when nutrient levels are low.

3.2163 spririllum

A rigid, spiral-shaped bacterium.

3.2164 spirochaete

A non-rigid, corkscrew-shaped bacterium that moves by means of muscular flexions of the cell.

3.2165 sporocyte

A diploid cell that gives rise to four haploid spores by meiosis.

3.2166 sporophyte

The diploid generation in the life cycle of a plant, and that produces haploid spores by meiosis.

3.2167 sport

An individual or portion thereof distinguished by a spontaneous mutation. Sports are sometimes of great agricultural worth, but alternatively, they may be disadvantageous and may be rogued during agricultural production.

3.2168 staggered cuts

Symmetrically cleaved phospho-diester bonds that lie on both strands of duplex DNA but are not opposite one another.

3.2169 stamen (L. stamen, the standing-up things or a tuft of thready things)

Flower structure made up of an anther (pollen-bearing portion) and a stalk or filament. The stamen is the male part of the flower.

3.2170 standard deviation

A statistical measure of variability in a population of individuals or in a set of data; the square root of the variance.

3.2171 standard error

A statistical measure of variation in a population of means, used to indicate how well sample estimates represent population parameters.

3.2172 starch (M.E. strechen, to stiffen)

A complex insoluble carbohydrate, consisting of various proportions of two glucose polymers, amylose and amylopectin; the chief food storage substance of plants, which is composed of several hundred hexose sugar units and which easily breaks down on hydrolysis into these separate units.

3.2173 sporophyll

A leaf that bears spore producing structures (sporangia).

3.2174 start codon; initiator codon

The set of three nucleotides in an mRNA molecule with which the ribosome starts the process of translation. The start codon sets the reading frame for translation. The most commonly used start codon is AUG, which is decoded as methionine in eukaryotes and as N-formylmethionine in prokaryotes. AUG appears to be the only start codon used by eukaryotes, while in bacteria, GUG (valine) may sometimes be employed. See initiation codon; initiator.

3.2175 stationary culture

A culture maintained in the growth chamber with no agitation movement. The antonym is shake culture.

3.2176 stationary phase

The plateau of the growth curve after log growth, during which cell number remains constant. New cells are produced at the same rate as older cells die.

3.2177 Statistic:

An estimate based on a sample or samples of a population, providing an indication of the true population parameter.

3.2178 Steady State:

In continuous fermentation, the balance between cells removed and newly synthesized cells.

3.2179 Stem Cell:

An undifferentiated active somatic cell that undergoes division and gives rise to other stem cells or to cells that differentiate to form specialized cells.

3.2180 Sterile:

1. Medium or object with no perceptibleor viable microorganisms. 2. Incapable of fertilization or being infertile.

3.2181 Sterile Room:

A room used for inoculations under aseptic conditions, typically replaced by laminar air-flow cabinets in which filtered air is blown from the inside to the outside.

3.2182 Sterility:

The inability to produce offspring.

3.2183 Sterilize:

1. The process of eliminating microorganisms through chemicals, heat, or other methods. 2. Making an animal incapable of reproduction.

3.2184 Steward Bottle:

A flask designed for growing cells and tissues in a liquid medium, which can be periodically submerged during rotation.

3.2185 Sticky Ends:

cohesive ends: The single-stranded nucleotide sequence left on a restriction fragment by type II restriction enzymes that cut each strand at a separate location. These unpaired regions are available for hybridization with complementary ends on other fragments during the creation of recombinant DNA. a.k.a. protruding end; overhang; cohesive end.

3.2186 Stigma:

The receptive part of the style where pollen adheres.

3.2187 Stirred-Tank Fermenter:

A vessel in which cells or microorganisms are mixed by mechanically-driven impellers.

3.2188 Stock:

The lower portion of a graft.

3.2189 Stock Plant:

The source plant from which cuttings or explants are taken, maintained in optimal conditions for use.Stock Solutions: Pre-prepared solutions of individual components used to create various media. Some substances, like Ca and Mg sulfates and phosphates, must be combined during medium preparation to avoid precipitation.

3.2190 Stolon:

A lateral stem that grows horizontally along the ground, such as the runners of clover, strawberry, and bermuda grass.

3.2191 Stoma:

1. A small opening or pore in the body of some animals. 2. A pore in plant leaves or stems that allows gas and water vapor exchange, formed between two guard cells.

3.2192 Stomatal Complex:

The stoma along with its guard cells and, if present, subsidiary cells.

3.2193 Stomatal Index:

A measure used to compare leaves of different sizes, calculated by the formula: (number of stomata per $mm^2 \times 100$) / (number of stomata per mm^2 + number of epidermal cells per mm^2).

3.2194 Stop Codon: A set of three nucleotides that signal the termination of protein synthesis, releasing the completed polypeptide. Three stop codons are UAA, UAG, and UGA.

3.2195 Strain:

A group of individuals within a species with a common origin.

3.2196 Strain Isolation:

The process of isolating a bacterium, animal, or plant from the environment.

3.2197 Stratification:

The process of treating moist seeds at low temperatures (2°C to 4°C) to break dormancy.

3.2198 Stringency:

Conditions (temperature, salt concentration, pH) that affect DNA/DNA, DNA/RNA, or RNA/RNA hybridization. High stringency requires perfect complementarity, while lower stringency allows some mismatch.

3.2199 Stringent Plasmid:

A plasmid that replicates only with the bacterial chromosome and exists as a single or few copies per cell.

3.2200 Stroma:

Tissue that provides the framework for an organ.

3.2201 Structural Gene:

A DNA sequence that serves as a template for polypeptide synthesis.

3.2202 Structure-Functionalism:

A scientific tradition emphasizing the relationship between physical structures and their functions, such as in anatomy and physiology.

3.2203 Style:

A slender tissue column from the top of the ovary through which the pollen tube grows.Sub-clone: A method in which smaller DNA fragments are cloned from a large insert which has already been cloned in a vector.

3.2204 Sub-cloning:

1. Splicing a part of a cloned DNA into a different vector. 2. The process of transferring a cloned DNA fragment between vectors.

3.2205 Sub-culture:

Division and transfer of a portion or inoculum of a culture to fresh medium. Sometimes used to denote the adding of fresh liquid to a suspension culture.

3.2206 Sub-culture Interval:

The time between sub-cultures; unrelated to cell generation time. The time between subsequent subcultures of cells. Sub-culture interval has no relationship to the term cell generation time

3.2207 Sub-culture Number:

The number of times cells have been transferred to a new culture. The number of times cells, have been sub- cultured, i.e., transplanted by inoculation from one culture vessel to anotherSubspecies: Population(s) of organisms sharing certain characteristics that are not present in other populations of the same species.

3.2208 Sub-strain:

A group of cells from a strain, isolated based on distinct properties or markers.

3.2209 Substrate:

1. A compound altered by an enzyme. 2. A food source for growing cells or microorganisms. 3. Material supporting a sedentary organism to live and grow.

3.2210 Sub-unit Vaccine:

One or more immunogenic proteins either purified from the disease-causing organism or produced from a cloned gene. A vaccine composed of a purified antigenic determinant that is separated from the virulent organism.

3.2211 Sucker:

A shoot arising from an underground root or stem, growing at the expense of the parent plant.

3.2212 Suckering:

Type of vegetative propagation where lateral buds grow out to produce an individual that is a clone of the parent. Sucrose Density Gradient Centrifugation: A method to separate mRNAs or DNA fragments by size.

3.2213 Substitution:

A point mutation where one base pair in the DNA sequence is replaced by another.

3.2214 Superbug:

A genetically engineered strain of Pseudomonas with combined hydrocarbon-degrading genes, a landmark example in genetic engineering.

3.2215 Supercoil:

A DNA molecule that contains extra twists as a result of overwinding (positive supercoils) or underwinding (negative supercoils).Supercoiled Plasmid: The predominant form of plasmid in vivo, coiled around histone-like proteins, which supercoil in vitro after extraction.

3.2216 Supergene:

A group of neighboring genes on a chromosome, inherited together and often functionally related.

3.2217 Supernatant:

The liquid fraction remaining after centrifugation or precipitation of insoluble solids.

3.2218 Suppressor:

A mutation in a suppressor gene that can counteract the effects of mutations in other genes.

3.2219 Suppressor Mutation:

A mutation that reverses or reduces the phenotypic effect of another mutation.

3.2220 Suppressor-sensitive Mutant:

An organism that can grow when a second genetic factor – a suppressor – is present, but not in the absence of this factor Surfactant: A surface-active agent like Tween 20^{TM} or Tween 80^{TM} , TeepolTM, Lissapol FTM, AlconoxTM, etc, that lowers surface tension tension and are common addenda to solutions used to surface sterilize materials prior to aseptic excision of explants,

3.2221 Susceptible:

A host organism's inability to suppress or resist a harmful pathogen.

3.2222 Suspension Culture:

A type of culture in which (single) cells and/or clumps of cells grow and multiply while suspended in a liquid medium.

3.2223 Symbiont:

An organism living in symbiosis with another dissimilar organism.Symbiosis: The close association of two different kinds of living organisms where there is benefit to both or where both receive an advantage from the association. An example is the association of the mycelium of mycorrhizal fungi with roots of seed plants.

3.2224 Symbiotic Association:

An intimate partnership between organisms where mutual advantages usually outweigh the disadvantages.

3.2225 Sympatric Speciation:

The formation of new species from populations in the same or overlapping geographic areas.Sympodial: A type of plant development in which the terminal bud of the stem stops growing due to either its abortion or its development into a flower or an inflorescence, and the uppermost lateral bud takes over the further axial growth of the stem.

3.2226 Symplast: T

he system of protoplasts in plants, that are interconnected by plasmodesmata.

3.2227 Synaptonemal Complex:

A ribbonlike protein structure formed between synapsed homologues at the end of the first meiotic prophase, binding the chromatids along their length and facilitating chromatid exchange.

3.2228 Synchronous Culture:

A culture where most cells divide at the same time or are in the same cell cycle phase.

3.2229 Syncytium:

A group of cells with maintained cytoplasmic continuity.

3.2230 Syndrome:

A group of symptoms that occur together and represent a particular disease.

3.2231 Synergids:

The two nuclei within the embryo sac at the upper end in the ovule of the flower, which, with the third (the egg), constitute the egg apparatus.Synkaryon: A nucleus formed by the fusion of nuclei from two different somatic cells during somatic-cell hybridization

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3.2232 Synteny:

The occurrence of two or more loci on the same chromosome, regardless of distance between them.

3.2233 T: Thymine,

a nucleotide in DNA.

3.2234 Tag:

A label or marker.

3.2235 Tailing:

The addition of the same nucleotide by terminal transferase to the 3' end of duplex DNA molecules (also known as homopolymeric trailing).

3.2236 Tandem Array:

The existence of two or more identical DNA sequences in series, i.e., end -to-end Identical DNA sequences arranged end-to-end in series.

3.2237 Tank Bioreactor:

Vessel in which fermentation takes place. A tank bioreactor is a vessel in which a micro-organism is grown in a large volume of liquid. This contrasts with fibre or membrane bioreactors and immobilized cell reactors. The large majority of bioreactors used in biotechnology are tank bioreactors, and most tank bioreactors are stirred-tank bioreactors, because stirring helps to distribute effectively gas and nutrients to the growing organism.

3.2238 Tap Root:

A root system with a primary root larger than lateral roots, as opposed to a fibrous root system.

3.2239 Taq Polymerase:

A heat-stable DNA polymerase isolated from the thermophilic bacterium Thermus aquaticus, used in PCR.

3.2240 Target:

The molecule or nucleic acid sequence sought in diagnostic tests.

3.2241 Target Site Duplication:

DNA sequence duplication at each end when a transposable element inserts into a genome.

3.2242 Targeted Drug Delivery:

Direct delivery of drugs to specific sites in the body, minimizing unwanted effects.

3.2243 Targeting Vector:

A cloning vector designed to insert a DNA sequence into a specific chromosomal location.

3.2244 TATA Box:

A conserved adenine- and thymine-rich sequence upstream of a gene, essential for RNA polymerase binding and transcription initiation.

3.2245 Tautomeric Shift:

A shift in hydrogen atom placement within an organic molecule.

3.2246 Tautomerism:

A type of isomerism where two isomers are in equilibrium.

3.2247 T Cells (T Lymphocytes):

Lymphocytes that mature in the thymus and are vital in cellular immune responses.

3.2248 T Cell Receptor:

An antigen-binding protein on T cells, essential for the cellular immune response.

3.2249 T-cell-mediated Immune Response:

The immune response involving T cell receptors and the activation of killer T cells.

3.2250 T-DNA:

DNA from the Ti plasmid of Agrobacterium tumefaciens, transferred to plant cells and integrated into their chromosomes

3.2251 T4 DNA Ligase:

An enzyme that joins DNA molecules and repairs nicks, requiring specific ends on the molecules.

3.2252 tRNA (Transfer RNA):

RNA molecules that carry amino acids to the ribosome during protein synthesis, with an anticodon complementary to the mRNA codon.

3.2253 Telomerase:

An enzyme that adds telomeric sequences to the ends of eukaryotic chromosomes.

3.2254 Telemeter:

Specialized DNA sequence at the ends of chromosomes that ensures DNA replication is completed.

3.2255 Telophase:

The final stage of mitosis or meiosis where chromosomes are gathered at opposite poles.

3.2256 Temperate Phage:

A phage that invades a host but may not lyse it, instead entering a latent state.

3.2257 Temperature-Sensitive Mutant:

An organism that can grow at one temperature but not at another.

3.2258 Temperature-Sensitive Protein:

A protein that is active at one temperature but inactive at another, typically higher, temperature.

3.2259 Template:

A molecule (RNA or single-stranded DNA) that guides the synthesis of a complementary nucleotide strand.

3.2260 Template Strand:

The DNA strand used by RNA polymerase or a polymerase for nucleotide sequence determination.

3.2261 Term Finalization:

The movement of centromeres in meiotic prophase toward the ends of bivalents, placing chiasmata near chromosome ends.

3.2262 Terminal Bud:

The tip of a branch or shoot containing undeveloped floral buds or leaves, protected by bud scales.

3.2263 Terminal Transferase:

An enzyme that adds nucleotides to the 3' end of DNA.

3.2264 Termination Signal:

A sequence that signals the termination of RNA synthesis during transcription.

3.2265 Terminator (of Transcription):

A DNA sequence signaling the end of transcription in RNA polymerase.

3.2266 Terminator Region:

A DNA sequence that marks the end of transcription.

3.2267 Test-Tube Fertilization:

In vitro fertilization, where fertilization occurs outside the body in a controlled environment.

3.2268 Test Tube:

A small glass tube used for culturing cells or tissues.

3.2269 Testcross:

A cross between a genetically unknown individual and a recessive tester to determine if the individual is homozygous or heterozygous.

3.2270 Tetracycline:

An antibiotic that inhibits protein synthesis in prokaryotes.

3.2271 Tetrad:

1. A group of four cells from the second meiotic division. 2. A group of four chromatids formed during meiosis I.

3.2272 Tetraploid:

An organism with four sets of chromosomes (4x).

3.2273 Tetrasomic:

An organism with four copies of one chromosome but diploid for the rest.

3.2274 Tetratype:

A tetrad containing four different spore types (e.g., AB, aB, Ab, ab) in fungi.

3.2275 Therapeutic Agent:

A compound used for treating disease or improving an organism's well-being.

3.2276 Thermic Shock:

Exposure to extreme temperature changes for a period.

3.2277 Thermolabile:

A substance that is unstable or disintegrates when heated.

3.2278 Thermophile:

An organism that thrives at higher temperatures, typically above 50°C.

3.2279 Thermosensitivity:

Loss of protein activity at high temperatures.

3.2280 Thermostability:

Retention of protein activity at high temperatures.

3.2281 Thermotherapy:

A technique using elevated temperatures to eliminate viruses or mycoplasmas in plants, often combined with meristem culture.

3.2282 Thinning:

1. Removing older stems to encourage new growth. 2. Removing excess fruits to enhance the size and quality of the remaining ones. Thinning (in plants): The removal of seedlings that are spaced too closely together to allow optimal growth.

3.2283 Thymidine:

A nucleoside found in DNA, but absent in RNA.

3.2284 Thymidine Kinase (tk):

An enzyme that allows cells to incorporate thymidine into DNA through an alternate metabolic pathway, often used as a selectable marker in transfected eukaryotic cells.

3.2285 Thymine:

A pyrimidine base in DNA, replacing uracil in RNA.

3.2286 Ti Plasmid:

A large plasmid in Agrobacterium tumefaciens that causes tumor formation in plants. It is also used as a vector for introducing foreign DNA into plant cells.

3.2287 Tissue:

A group of similar cells working together to perform a specific function.

3.2288 Tissue Culture:

The process of growing cells, tissues, or organs in a controlled, nutrient-rich medium under sterile conditions.

3.2289 Tolerance:

A form of genetic resistance where an organism shows less reduction in performance when affected by pathogens or pests compared to other cultivars or breeds.

3.2290 Tonoplast:

The membrane surrounding the vacuole in plant cells, regulating the pressure of the cell sap.

3.2291 Topo-isomerase:

An enzyme that introduces or removes supercoils in DNA to alleviate tension during replication or transcription.

3.2292 Torr:

A unit of pressure, equal to 1 mm of mercury (1mm Hg), historically used in vacuum and pressure measurements.

3.2293 Totipotency:

The ability of a cell to develop into all cell types in an organism. A zygote is considered totipotent as it can give rise to all cell types in the body.

3.2294 Totipotent Cell:

An undifferentiated cell, like a blastomere, capable of developing into a complete organism when isolated or transplanted.

3.2295 Toxicity:

The harmful effects of a compound, evidenced by changes in cell growth, morphology, or physiology.

3.2296 Toxin:

A poisonous substance produced by an organism, toxic to plants or animals.

3.2297 Tracer:

A substance (like radioactive isotopes or dyes) used to track a reaction or process within an organism.

3.2298 Tracheid:

A type of elongated, lignified xylem cell found in plants, particularly in conifers, that functions in water conduction and structural support.

3.2299 Trans-acting:

Refers to substances that can diffuse and affect different, spatially separated components within cells.

3.2300 Transcapsidation:

The process where the nucleic acid of one virus is encapsulated in the protein coat of another virus.

3.2301 Transcript:

An RNA molecule synthesized from a DNA template. In eukaryotes, this is often a precursor (primary transcript) that requires modification before becoming functional mRNA, rRNA, or tRNA.

3.2302 Transcription:

The process of synthesizing RNA from a DNA template, catalyzed by RNA polymerase.

3.2303 Transcription Factor:

A protein that regulates the initiation of transcription by binding to specific DNA sequences.

3.2304 Transcription Unit:

A segment of DNA that is transcribed into RNA, containing both initiation and termination signals.

3.2305 Transcription Vector:

A cloning vector used to transcribe foreign DNA into RNA in vitro.

3.2306 Transcriptional Anti-terminator:

A protein that prevents premature termination of transcription by RNA polymerase.

3.2307 Transduction:

The transfer of DNA from one bacterium to another via a bacteriophage, typically leading to genetic recombination.

3.2308 Transfection:

The process of introducing foreign DNA into eukaryotic cells.

3.2309 Transfer:

The process of moving cultured tissue or cells to a fresh medium for growth or expansion.

3.2310 Transferase:

An enzyme that catalyzes the transfer of a functional group (such as a phosphate group) from one molecule to another.

3.2311 Transfer RNA (tRNA):

RNA molecules that transport specific amino acids to the ribosome for protein synthesis.

3.2312 Transformant:

A cell, particularly in prokaryotes, that has been genetically altered through the uptake of foreign DNA, or in eukaryotes, a cell that has acquired a malignant phenotype.

3.2313 Transformation:

1. The process of introducing foreign DNA into a cell, resulting in a phenotypic change. 2. The process by which animal cells in culture become cancerous through viral infection or introduction of oncogenes.

3.2314 Transformation Efficiency:

The number of cells that take up foreign DNA, typically expressed as transformants per microgram of DNA.

3.2315 Transformation Frequency:

The proportion of a cell population that takes up foreign DNA, measured by the number of transformed cells per total number of cells.

3.2316 Transforming Oncogene:

A gene introduced into a cell that causes it to adopt a malignant phenotype, contributing to cancer formation.

3.2317 Transgene:

A gene from one organism that has been incorporated into the genome of another organism.

3.2318 Transgenesis:

The introduction of foreign genes into an organism's cells, leading to the transmission of the introduced gene to future generations.

3.2319 Transgenic:

An organism that has had foreign DNA incorporated into its genome and can pass this DNA to its offspring.

3.2320 Transgressive Variation:

The occurrence of more extreme expressions of a trait in offspring (often in the F2 generation) compared to either parent.

3.2321 Trans Heterozygote:

A heterozygote that contains two different mutations on opposite (trans) homologous chromosomes.

3.2322 Transient:

Describing a phenomenon or condition that is temporary or short-lived.

3.2323 Transition:

The substitution of one purine for another purine or one pyrimidine for another pyrimidine in DNA or RNA.

3.2324 Transition Stage:

The phase of growth that represents the change from juvenile to reproductive stage of growth.

3.2325 Transition-State Intermediate:

A high-energy, unstable intermediate state in a chemical reaction that enzymes stabilize, lowering the activation energy.

3.2326 Translation:

The process of synthesizing a polypeptide (protein) from mRNA, where tRNA molecules bring the corresponding amino acids to the ribosome.

3.2327 Translational Initiation Signal:

The start codon on mRNA that signals the beginning of translation.

3.2328 Translational Stop Signal:

The codon that signals the end of translation and releases the synthesized polypeptide.

3.2329 Translocation:

1. The movement of nutrients or metabolic products within an organism. 2. A chromosomal rearrangement where a segment is transferred to a non-homologous chromosome.

3.2320 Transmission Electron Microscope (TEM):

A microscope that uses electron beams to view objects with much greater resolution than light microscopes.

3.2331 Transplant:

1. A plant grown in culture for later transplantation. 2. To move and replant an organism or tissue to a new location.

3.2332 Transposable Genetic Element:

A DNA sequence that can move to different locations within a genome, also known as a transposon.

3.2333 Transposase:

An enzyme encoded by a transposon that facilitates the movement of a transposon within the genome.Transposition: The process in which a transposon or insertion sequence inserts itself into a new site on the same or another DNA molecule. The exact mechanism is not fully understood, and different transposons may transpose by different methods. In bacteria, this does not require extensive DNA homology, described as illegitimate recombination.

3.2334 Transposon:

A small mobile genetic element that can move from one chromosomal position to another. For example, Tn5 is a bacterial transposon carrying genes for antibiotic resistance and genetic information for insertion and excision.

3.2335 Transposon Tagging:

Inserting a transposable element into or near a gene to mark it with a known DNA sequence.

3.2336 Transversion:

The substitution of a purine for a pyrimidine, or vice versa.

3.2337 Tribrid Protein:

A fusion protein made up of three segments, each encoded by parts of different genes.

3.2338 Trichome:

A short filament of cells (hair-like growth) on plants.

3.2339 Tri-Hybrid:

Offspring from homozygous parents differing in three gene pairs.

3.2340 Tri-Nucleotide Repeats:

Tandem repeats of three nucleotides present in many genes, which can expand and result in inherited diseases.

3.2341 Tripartite Mating:

A process where conjugation transfers a plasmid vector to a target cell when the plasmid is not selfmobilizable, involving three sets of cells: those with conjugative and mobilizing plasmids, those with plasmid vectors, and target cells.

3.2342 Triplet:

A sequence of three nucleotides in DNA that specifies an amino acid.

3.2343 Triploid:

A cell or organism with three times the haploid number of chromosomes.

3.2344 Trisomy:

A condition where a cell or organism has an extra chromosome of one pair (2n + 1).

3.2345 Triticale:

A species created by crossing wheat and rye.

3.2346 Tropism:

A plant's involuntary response to a stimulus, causing bending, turning, or growth, like phototropism or geotropism. Can be positive (towards) or negative (away).

3.2347 True-to-Type:

Refers to a plant or propagation source with accurate cultivar identification and consistent productivity or performance.

3.2348 Trypsin:

A proteolytic enzyme that breaks down proteins at arginine and lysine.

3.2349 Trypsin Inhibitors:

Substances that inactivate trypsin, which is important for digesting proteins.

3.2350 Tuber:

A modified food-storing root, like in potatoes.

3.2351 Tubulin:

The main protein component of microtubules in eukaryotic cells.

3.2352 Tumble Tube:

A glass tube used to agitate and aerate suspension cultures.

3.2353 Tumor Virus:

A virus capable of transforming a cell into a malignant state.

3.2354 Tumor-Inducing Plasmid:

A plasmid that induces tumors in host cells.

3.2355 Tunica:

A layered outer region of the apical meristem where cell division is perpendicular to the surface.

3.2356 Turbidostat:

A continuous culture system where biomass density is automatically maintained by removing excess cells as turbidity increases.

3.2357 Turgid:

Describes a cell that is swollen and firm due to water uptake.

3.2358 Turgor Pressure:

The pressure inside a cell resulting from water absorption by the vacuole and protoplasm.

3.2359 Turion:

An underground bud or shoot that produces an aerial stem.

3.2360 Twins:

Two individuals originating from the same zygote.

3.2361 U: Uracil,

a pyrimidine base found in RNA.

3.2362 Ultraviolet Light (UV):

Electromagnetic radiation with wavelengths between 100 to 400 nm, absorbed by DNA, mutagenic to organisms, and used in tissue culture for mutagenic and bactericidal properties.

3.2363 Undefined:

A medium or substance in which not all components or concentrations are chemically defined, such as coconut milk or casein hydrolysate.

3.2364 Understock:

The host plant for a grafted scion.

3.2365 Undifferentiated:

A state resembling a meristem, lacking specialized gene expression of differentiated cells.

3.2366 Unequal Crossing Over:

Crossing over between DNA sequences that do not align correctly, creating duplicated and deficient products.

3.2367 Unicellular:

Organisms or tissues consisting of a single cell.

3.2368 Unisexual:

Organisms that possess either male or female reproductive organs, but not both.

3.2369 Univalent:

An unpaired chromosome during meiosis.

3.2370 Universal Donor Cells:

Cells that do not induce an immune response upon introduction into a recipient.

3.2371 Universality:

Refers to the genetic code where codons have the same meaning across species, with few exceptions.

3.2372 Unorganized Growth:

In vitro tissue growth with few differentiated cell types and no recognizable structure.

3.2373 Upstream:

In molecular biology, DNA regions in the 5' direction from the transcription initiation site. In chemical engineering, refers to stages before biotransformation in manufacturing processes.

3.2374 Uracil:

A pyrimidine base in RNA, replaced by thymine in DNA.

3.2375 v/v:

On a volume per volume basis, indicating the percentage of a constituent in 100 units of volume (e.g., ml/100 ml) × 100.

3.2376 Vaccine:

A preparation of dead or weakened pathogens, or antigenic determinants, used to stimulate the formation of antibodies or immunity against the pathogen.

3.2377 Vaccinia:

The cowpox virus used for smallpox vaccination and as a gene carrier for antigenic determinants from other pathogens.

3.2378 Vacuole:

A membrane-bound cavity in a plant cell used for storing various plant products and by-products.

3.2379 Vacuum:

A space with reduced pressure, created using a vacuum pump or aspirator, for biological preparations, such as disinfection or culture material.

3.2380 Variable Domains:

Regions of antibody chains with different amino acid sequences in different antibodies, responsible for antigen-binding specificity.

3.2381 Variable Expressivity:

Variation in phenotype caused by different alleles of the same gene, other genes, or non-genetic factors.

3.2382 Variable Surface Glycoprotein (VSG):

Antigenic determinants expressed by microorganisms to evade immune detection.

3.2383 Variance:

A statistical measure of variation, calculated as the sum of squared deviations divided by one less than the number of observations.

3.2384 Variant:

An organism genetically different from the wild type, also known as a mutant.

3.2385 Variation:

Differences between individuals or populations.

3.2386 Variegated:

Plants with both green and albino tissues, which may result from viral infections, nutritional deficiencies, or genetic/physiological control.

3.2387 Variety:

A naturally occurring subdivision of a species with distinct morphological traits and a Latin name, according to the International Code of Nomenclature.

3.2388 Vascular:

Referring to plant tissues or regions involved in or giving rise to conducting tissue (e.g., bundle, cambium).

3.2389 Vascular Bundle/Fascicle:

A strand of tissue containing primary xylem and primary phloem, often surrounded by a bundle sheath.

3.2390 Vascular Cambium:

A cambium in biennials and perennials that produces secondary phloem and xylem.

3.2391 Vascular Plants:

Plants with organized vascular tissues.

3.2392 Vascular System:

1) A network of vessels in animals for fluid circulation. 2) The system of vascular tissue in plants.

3.2393 Vascular Tissue:

Tissue responsible for conducting water and nutrients throughout a plant body.

3.2394 Vector:

1) An organism, usually an insect, that transmits disease-causing organisms. 2) A plasmid or phage used to deliver foreign DNA in cloning or gene transfer.

3.2395 Vegetative Propagation:

A form of asexual or non-sexual reproduction.

3.2396 Vehicle:

The host organism used for the replication or expression of a cloned gene, often confused with vector.

3.2397 Velocity Density Gradient Centrifugation:

A method used to separate macromolecules based on their rate of movement through a density gradient.

3.2398 Velogenetics:

A method combining marker-assisted selection and embryo technologies to improve the genetic progress of animal populations.

3.2399 Vermiculite:

A coarse material made from expanded mica, with high cation exchange and water-holding capacity, used as a rooting medium and soil additive.

3.2400 Vernalization:

A process where floral induction in some plants is promoted by exposure to cold for a certain period.

3.2401 Vessel:

1) A series of xylem elements that conduct water and nutrients in plants. 2) A container, like a Petri dish or test tube, used for tissue culture.

3.2402 Vessel Element:

A cell type in the xylem of flowering plants, many of which are water-conducting.

3.2403 Viability:

The ability to live and develop normally.

3.2404 Viability Test:

An assay to determine the number or percentage of living cells or plants in a population after a specific treatment.

3.2405 Viable:

Capable of germinating, living, growing, and developing.

3.2406 Vibrio:

A comma-shaped bacterium.

3.2407 Viral Vaccines:

Vaccines consisting of live viruses that are genetically engineered to elicit an immune response without causing the disease itself.

3.2408 Vir Genes:

A set of genes on a Ti plasmid that prepare the T-DNA segment for transfer into a plant cell.

3.2409 Viral Coat Protein:

Protein present in the outer layer of a virus.

3.2410 Viral Oncogene:

A gene in a virus that contributes to malignancies in vertebrate hosts.

3.2421 Viral Pathogen:

A virus that causes disease.

3.2412 Virion:

An infectious virus particle.

3.2413 Viroid:

An infectious entity similar to a virus but smaller, consisting only of a nucleic acid strand without a protein coat.

3.2414 Virulence:

The ability of an organism to cause disease; the relative infectiousness or ability to overcome host resistance.

3.2415 Virulent Phage:

A phage (virus) that destroys the host bacterium.

3.2416 Virus:

An infectious particle made of a protein coat and nucleic acid core (DNA or RNA), dependent on a host for replication.

3.2417 Virus-Free:

A plant, animal, or cell that shows no viral symptoms or contains no identifiable virus particles.

3.2418 Virus-Tested:

An organism or cell stock certified to be free of specific viruses following recognized diagnostic procedures.

3.2429 Visible Light:

The portion of the electromagnetic spectrum with wavelengths between 380 nm and 750 nm, perceivable by the human eye.

3.2420 Vitamin B Complex:

A group of water-soluble vitamins acting as coenzymes, including B1 (thiamine), B2 (riboflavin), B3 (niacin), B5 (pantothenic acid), B6 (pyridoxine), B12 (cyanocobalamin), biotin, folic acid, inositol, and choline.

3.2421 Vitamins:

Naturally occurring organic substances required in small amounts for normal health and often added to tissue culture media to enhance growth.

3.2422 Vitrified;

Water Soaked: Cultured tissue with a glassy, transparent, or wet appearance, often swollen due to physiological disorders.

3.2423 Vivipary:

1) In animals, reproduction where the embryo nourishes directly from the mother via a placenta. 2) In plants, a form of asexual reproduction where a flower develops into a bud-like structure that forms a new plant upon detachment.

3.2424 Vmax:

Maximum enzyme reaction rate, calculated by multiplying the total enzyme (Eo) by the catalytic rate constant (Keat).

3.2425 VNTR:

Short DNA sequences in tandem repeats with varying copy numbers.

3.2426 Volatilization:

Conversion of a solid or liquid to a gas or vapor.

3.2427 w/v:

Weight of a substance per 100 cm³ of solution, expressed as a percentage.

3.2428 Walking:

Method for cloning large chromosome regions by screening a gene library with DNA probes from previous clones.

3.2429 Wall Pressure:

Pressure exerted by the cell wall against turgor, equal to turgor potential.

3.2430 Wash-out:

Loss of a slower-growing microorganism when two organisms are cultured together.

3.2431 Water Potential:

Difference in water molecule activity between pure water at standard conditions and other systems.

3.2432 Water Stress:

Condition where plants can't absorb enough water, leading to wilting, growth cessation, or death.

3.2433 Wavelength:

Distance between corresponding points on consecutive waves, typically measured in nanometers for light.

3.2434 Wax:

Esters of alcohol, forming waterproof protective layers on plants and animals.

3.2435 Weed:

A plant growing where it's unwanted, often competing with cultivated species.

3.2436 Weediness:

A plant's ability to colonize disturbed habitats and outcompete cultivated species.

3.2437 Western Blot:

Technique for transferring proteins from a gel to a membrane, identifying specific proteins with labeled antibodies.

3.2438 Wet Weight:

Weight of a product with full water content or hydrated tissue.

3.2439 Wetting Agent:

Substance that reduces liquid surface tension, improving surface contact.

3.2440 Wild Type:

Naturally occurring form of an organism, from which mutations produce new alleles.

3.2441 Wilt:

Drooping of stems and foliage due to water loss and decreased turgidity, often from water stress or disease.

3.2442 Wilting Point (WP):

Soil moisture content where plants begin to wilt but recover in a humid atmosphere.

3.2443 Wobble Hypothesis:

Explanation for how one tRNA can recognize multiple codons, due to flexibility in the third base pairing.

3.2444 Xanthophyll:

Yellow chloroplast pigment.

3.2455 X-Chromosome:

Chromosome associated with sex determination; females have two, males one.

3.2446 Xenia:

Effect of pollen on certain endosperm traits.Xenobiotic: Chemical compound not produced by living organisms, a manufactured chemical compound.

3.2447 Xenotransplantation:

Transplantation of tissue from one species to another, often from non-human mammals to humans.

3.2448 Xerophyte:

Plant resistant to drought or living in dry environments.

3.2449 X-Linked:

The presence of a gene on the X chromosome. a.k.a. X- linkage.

3.2450 X-Linked Disease:

Genetic disorder caused by an X chromosome allele, affecting males more.

3.2451 X-Ray Crystallography:

The deduction of crystal structure from analysis of the diffraction pattern of X-rays passing through a pure crystal of a substance Xylem: A complex tissue specialized for efficient conduction of water and mineral nutrients in solution. Xylem may also function as a supporting tissue, particularly secondary xylem.

3.2452 Y-Chromosome:

The partner of the X-chromosome in the male of many animal species..

3.2453 YAC: Yeast artificial chromosome,

used as a vector system for cloning DNA fragments that can be hundreds of kilobases long. Linear cloning vectors constructed from essential elements of yeast chromosomes. They can accommodate foreign DNA inserts of 200 to 500 kb

3.2454 Yeast Episomal Vector (YEp):

A cloning vector for the yeast Saccaromyces cerevisiae that uses 2 m plasmid as origin of replication and is maintained as an extrachromosomal nuclear DNA molecule.Yeast Extract: Substances derived from yeast, used in tissue culture.

3.2455 Yeast:

Unicellular fungus, often contaminating plant tissue culture.

3.2456 Yeast Cloning Vectors:

Vectors used to clone and express DNA in yeast, capable of removing introns in eukaryotic genes.Z-DNA: zig-zag DNA A form of DNA duplex in which the double helix is wound in a left-hand, instead of a right-hand, manner. DNA adopts the Z configuration when purines and pyrimidines alternate on a single strand, e.g.,5CGCGCGCG3 or 5CACACACA3

3.2457 Zone of Elongation:

Region in roots or shoots where cells rapidly elongate.

3.2458 Zoo Blot:

Hybridization of cloned DNA from one species to DNA from another to study evolutionary conservation.

3.2559 Zoo FISH:

Fluorescent in situ hybridization of DNA from one species to chromosomes of another to study chromosomal homology.

3.2460 Zoospore:

Motile spore with flagella.

3.2461 Zygonema:

Stage in meiosis during which synapsis occurs; coming after the leptotene stage and before the pachytene stage in the meiotic prophase.

3.2462 Zygospore:

A thick-walled resistant spore developing from a zygote resulting from the fusion of isogametes.in algae and fungi.

3.2463 Zygote:

A diploid cell formed by the fusion of two haploid gametes during fertilization in eukaryotic organisms with sexual reproduction. It is the first cell of the new individual..Zymogen: Inactive enzyme precursor that after secretion is chemically altered to the active form of the enzyme.

4.0 ABBREVIATIONS

The following editorial abbreviations are used in the text:

- abbr: abbreviation
- a.k.a. also known as
- bp base pair
- f.w. formula weight
- kb Kilobase [pairs]
- m.w. molecular weight
- pl: plural