Biotechnology Key Terms

A

absorbance the amount of light absorbed by a sample (the amount of light that does not pass through or reflect off a sample)
absorbance unit (au) a unit of light absorbance determined by the decrease in the amount of light in a light beam
acetylsalicylic acid aspirin
acid a solution that has a pH less than 7
agarose a carbohydrate from seaweed that is widely used as a medium for horizontal gel electrophoresis
agglutination clumping together, as in the binding and clumping of antigens with their corresponding antibodies
Agrobacterium tumefaciens (A. tumefaciens) a bacterium that transfers the Ti plasmid to certain plant species, resulting in a plant disease called crown gall; used in plant genetic engineering
aldehyde a chemical compound with a C=O group at the end of a carbon chain
allergen an antigen that causes an inflammatory response (redness, swelling, itchiness) or allergic reaction
ampicillin an antibiotic that prevents bacterial cell division by inhibiting cell wall synthesis
amylase an enzyme that functions to break down the polysaccharide amylase (plant starch) to the disaccharide maltose
anion exchange a form of ion-exchange chromatography in which negatively charged ions (anions) are removed by a positively charged resin
antibiotic molecular agent derived from fungi and/or bacteria that impedes the growth and survival of some other microorganisms
antibody protein developed by the immune system that recognizes specific molecules (antigens)
antigen foreign protein or molecule that is the target of binding by antibodies
antimicrobial a substance that kills or slows the growth of one or more microorganisms
antiseptic antimicrobial solution, such as alcohol or iodine, that is used to clean surfaces
Arabidopsis thaliana (A. thaliana) an herbaceous plant, related to radishes, that serves as a model organism for many plant genetic engineering studies
asexual plant propagation a process by which identical offspring are produced by a single parent; methods include taking cuttings of leaves and stems, and plant tissue culture, etc.
assay a test
autoclave an instrument that creates high temperature and high pressure to sterilize equipment and media
auxin a plant hormone produced primarily in shoot tips that regulates cell elongation and leaf development

B

bacteria single-celled organisms characterized by a rather simple structure with no membrane-bound organelles
balance an instrument that measures mass **base** a solution that has a pH greater than 7
best-fit straight-line standard curve a graphical plot of data, as an average straight line, to show the linear relationship of data points
beta-D-glucuronidase (GUS) an enzyme that cleaves X-gluc (a white carbohydrate) causing a color change to a blue product
bioinformatics the use of computers and databases to analyze and relate large amounts of biological data
blank in using a spectrophotometer, a sample that includes everything except the molecule of interest; used to calibrate a spectrophotometer to measure the molecule of interest in a mixture
broth culture the growth of cells in a liquid medium

buffers a solution that acts to resist a change in pH when the hydrogen ion concentration is changed

C

carbohydrates one of the four classes of macromolecules; organic compounds consisting of carbon, hydrogen, and oxygen, generally in a 1:2:1 ratio
cation exchange a form of ion-exchange chromatography in which positively charged ions (cations) are removed by a negatively charged resin
centrifuge a rotating instrument that uses centrifugal force to separate substances of varying densities
chelating agent a compound that binds specific ions or molecules and removes them from solution
chromatography separation of molecules by size, charge, solubility, or affinity through an immobile phase or matrix
chromogenic agents compounds that exhibit color or color change due to some reaction or process

clone cell or organism that is genetically identical to another
colony a group of cells produced by a series of cell divisions originating from a single parent cell
column chromatography a separation technique in which a sample is passed through a column packed with a resin (beads); the resin beads are selected based on their ability to separate molecules based on size, shape, charge, or chemical nature
combinatorial chemistry the synthesis of larger organic molecules from smaller ones **competent** describing the ability of a cell to take up DNA
complete flowers flowers that contain all four parts (sepals, petals, stamen, and pistil)
contrast (sharpness) the ability to distinguish the difference between two images, colors, or shades of color
cross-linking chemical linking of molecules; as in DNA cross-linking to nylon membranes
cross-pollinated flowers that produce pollen that fertilize the ovules of other plants of the same species
cuttings plant propagation using portions of stems, leaves, or roots that are encouraged to produce the remaining plant parts to create a whole plant

D

denature to unwind
dialysis in biotech, the process by which solutions are exchanged by diffusion through a semi-permeable membrane
DNA sequencing pertaining to all the techniques that lead to determining the order of nucleotides (A, G, C, T) in a DNA fragment
DNA synthesis the production of DNA polymers from nucleotide monomers

E

embryo a plant or animal in its initial stage of development
endosperm the nutritive triploid cell filling of seeds
enzyme a protein that functions to speed up chemical reactions
enzyme-linked immunospecific assay (ELISA) a technique that measures the amount of protein or antibody in a solution
eukaryote a cell that contains membrane-bound organelles
exponential growth the growth rate that bacteria maintain when they double in population size every cellcycle

F

fermentation a process by which, in an oxygen-deprived environment, a cell converts sugar into lactic acid or ethanol to create energy
field of vision the area that is viewed for study
fluorometer an instrument that measures the amount or type of light emitted
fractionation separation into layers or groups

G

genetic engineering directed alteration of the genetic code of an organism usually involving the addition, removal, or modification of genes
genetically modified organism (GMO) an organism produced by genetic engineering that contains DNA from another organism and produces new proteins encoded on the acquired DNA
genomic DNA (gDNA) the chromosomal DNA of a cell
genotype the genetic makeup of an organism; the particular form of a gene present for a specific trait
gentamycin an antibiotic that kills bacteria by inhibiting cell wall synthesis
germination the initial growth phase of a plant; also called sprouting

H

harvesting extracting protein from a cell culture
high-performance liquid chromatography (HPLC) a type of column chromatography that uses metal columns that can withstand high pressures; used mainly for identification or quantification of a molecule
*Hin***dIII restriction enzyme** an enzyme isolated from the bacterium, *Haemophilus influenzae,* that cuts a DNA sequence wherever the sequence “”AAGCTT”” is found
horseradish peroxidase (HRP) a peroxidase produced by the cells of a horseradish plant
hydroponics the practice of growing plants in a soilless, water-based medium
hypocotyl the part of an embryonic stem directly below the epicotyl (which is below the cotyledons); in dicots, the bent hypocotyl pushes up through the soil

I

immunoglobulin E (IgE) a type of antibody that specifically recognizes allergenic antigens and initiates an inflammatory response
immunoglobulin G (IgG) the most common antibody circulating in the blood and tissues; also called gamma globulin
indicators chemicals that change color when other compounds are present
ion-exchange chromatography a separation technique that separates molecules based on their overall charge at a given pH

K

kanamycin an antibiotic that kills bacteria by inhibiting protein synthesis; some plant cells are sensitive to kanamycin
ketone a chemical compound with a C=O group at the middle of a carbon chain
kilodalton (kD) 1000 daltons, the unit used to report the size of a protein

L

lambda bacteriophage a virus that infects *E. coli* cells
lambda phage DNA the genetic material of the lambda virus
lambda/*Hin*dIII sizing standards lambda DNA that has been cut with the restriction enzyme *Hin*dIII to produce pieces of known length; used to determine the size of other DNA fragments on a gel
Luria Bertani (LB) agar a mixture of protein, nutrients, and agar specifically formulated for *E. coli* growth

M

magnification the amount to which an object's image is enlarged
Material Safety Data Sheet (MSDS) information on the properties, safe handling, and emergency procedures for use of a compound
melting point the temperature at which a solid becomes a liquid
microarray a small glass slide or silicon chip with thousands of samples on it that can be used to assess the presence of a DNA sequence related to the expression of certain proteins
microcentrifuge a centrifuge that separates components in small volumes (usually microliter amounts) of sample
microliter (µl) a unit measure for volume; equivalent to one thousandth of a milliliter (or one millionth of a liter, 0.000001 liter), about the size of the tiniest teardrop
micrometer (µm) one millionth of a meter, 0.000001 meter; also called a "micron"
micron (µm) one millionth of a meter, 0.000001 meter; also called a "micrometer"
micropipet an instrument used to measure very tiny volumes, usually less than a milliliter
model organism a species that is commonly used in experimental studies to discover or understand basic and underlying biological processes, representative of a larger group of organisms
molarity a measure of concentration that represents the number of moles of a solute in a liter of solution (or some fraction of that unit)
mole the mass, in grams, of 6×10^{23} atoms or molecules of a given substance; one mole is equivalent to the molecular weight of a given substance, reported as grams

N

nanometer (nm) 10^{9} meters; the standard unit used for measuring light
negative control a group of data lacking what is being tested so as to give expected results
negative results the results of a test that show no change or a result that indicates no reaction
neomycin phosphotransferase (NPT II) gene a gene that codes for the production of the enzyme, neomoycin phosphotransferase, which gives a cell resistance to the antibiotic kanamycin
NMR Nuclear Magnetic Resonance; a technique used to determine the three-dimensional structure of a molecule in solution by measuring the position of atoms using magnetic properties
node the spot on a stem where buds, leaves, or branches attached

O

oil immersion lens a high power, microscope objective lens that is uses a drop of a special type of oil to increase the ability to gather light and visualize an object
oligonucleotides segments of nucleic acid that are 50 nucleotides or less in length
optical density (OD) the absorbance of a sample at a given wavelength
Ouchterlony test a test, conducted in agar, that shows the presence of an antibody to an antigen

P

pDNA short for plasmid DNA
peptide bond the C-N bond between two amino acids
peroxidase an enzyme that decomposes hydrogen peroxide to water and oxygen gas

petals modified leaves that are often an attractant to pollinators
pH hydrogen ion concentration, or a measure of the acidity
phenotype the characteristics observed from the expression of the genes, or genotype
pipet pump a pipetting aide that controls the uptake and dispensing of a volume of liquid in a pipet
pistil the female portion of a flower; produces ovules
plant breeding sexual reproduction of plants
plant growth regulators another name for plant hormones
plant hormone signaling molecule that, in certain concentrations, regulates growth and development, often by altering the expression of genes that trigger certain cell specialization and organ formation
plant tissue culture (PTC) the process of growing small pieces of plants into small plantlets in or on sterile plant tissue culture media; plant tissue culture media have all of the required nutrients, chemicals, and hormones to promote cell division and specialization
plate culture the growth of cells, on a solid medium, in Petri dishes
polyacrylamide gel electrophoresis (PAGE) a process in which proteins and small DNA molecules are separated by electrophoresis on vertical gels made of the synthetic polymer polyacrylamide
polymerase an enzyme that connects monomer units, such as nucleotides, into polymers, such as nucleic acids; as in DNA polymerase
polymerase chain reaction (PCR) a technique that involves copying short pieces of DNA and then making millions of copies in a short time
precipitation the separation of a solute from a solution by centrifugation
primer a short piece of DNA or RNA (15-35 bases) that is complementary to a section of template strand and acts as an attachment and starting point for the synthesis strand during DNA replication
probe a DNA or RNA molecule that is complementary to the DNA sequence being investigated, often bound to some kind of "reporter" molecule, used when looking for a gene or nucleic acid sequence; a fluorescently labeled DNA or RNA sequence (oligonucleotide) that is used for gene identification
prokaryote a cell that lacks membrane-bound organelles
proteases enzymes that cleave proteins, such as casein, into smaller fragments that will also fall out of solution **protein (x-ray) crystallography** a technique that uses x-ray wave diffraction patterns to visualize the positions of atoms in a protein molecule to reveal its three-dimensional structure

protein purification isolation of a protein from other proteins and molecules in a mixture

protein sequencing method used to determine the order of amino acids in a polypeptide

Punnett Square a chart that shows the possible gene combinations that could result when crossing specific genotypes

purification the process of eliminating impurities from a sample; in protein purification, it is the separation of other proteins from the desired protein

R

radicle an embryonic root-tip

rapid-cycling *Brassica rapa (B.rapa)* **seeds** a variety of *Brassica* developed to have a short generation time

Rbr an abbreviation for *Brassica rapa*

recombinant DNA (rDNA) DNA created by combining

DNA from two or more sources

resin the separation matrix, often beads, through which a column chromatography is run

resolution the ability to clearly see two points

resolving power a measure of the ability to clearly distin

guish points in a sample

rotor the rotating part of a centrifuge where sample tubes are placed

runner long, vine-like stem that grows along the soil surface

S

salicylic acid a white, crystalline precursor compound of aspirin

satellite colonies non-transformed cells that grow within a halo of influence by a transformed colony

scale-up the process of increasing the size or volume of the production of a particular product

selection medium agar or broth with ingredients added that allows the growth of specific transformed cells only

self-pollinators flowers that produce pollen that fertilize the ovules in the same plant

sepals modified leaves that protect the developing flower bud

serial dilution a series of dilutions of samples with the same ratio of sample to diluent solvent

serological pipets long, narrow, graduated instruments used for measuring and dispensing milliliter volumes

Southern blot a process in which DNA fragments on a gel are transferred to a positively charged membrane (a blot) to be probed by labeled RNA or cDNA fragments

spectrophotometer an instrument that measures the amount of light that passes through (is transmitted through) a sample

stamen the male portion of a flower; produces pollen

standard solution a solution used in a standard test

standard test a test of a known compound to determine the appearance of a positive or negative test result

stationary phase the latter period of a culture in which growth is limited due to the depletion of nutrients
sterile technique a collection of methods for preventing the introduction of unwanted microorganisms into a sample
stock solution a concentrated form of a reagent that is often diluted to form a "working soloution"
supernatant the (usually) clear liquid left behind after a precipitate has been spun down to the bottom of a vessel by centrifugation

T

Taq polymerase a DNA synthesis enzyme that can withstand the high temperatures used in PCR
TE buffer a buffer used for storing DNA; contains TRIS and EDTA
tetramethylbenzidine (TMB) a compound oxidized from clear to blue when peroxidase transfers an electron to it from hydrogen peroxide
thermal cycler an instrument used to complete PCR reactions; automatically cycles through different temperatures
Ti plasmid a plasmid found in *Agrobacterium tumefaciens* that is used to carry genes into plants, with the goal that the recipient plants will gain new phenotypes
TMB *see* tetramethylbenzidine
transformant a cell or organism that has been genetically engineered and demonstrates expression of the newly-acquired genes
transformation efficiency a measure of how well cells are transformed to a new phenotype
transformation the uptake and expression of foreign DNA by a cell
transmittance the passing of light through a sample

U

UV spectrophotometer a spectrophotometer containing a deuterium lamp that is used to measure the absorbance of UV light by a sample

V

vector a piece of DNA that carries one or more genes into a cell, usually circular as in plasmid vectors
visible light spectrum the range of wavelengths of light that humans can see, from approximately 350 to 700 nm; also called white light
Western blot a process in which a gel with protein is transferred to a positively charged membrane (a blot) to be probed with antibodies
Wisconsin Fast Plants (WFP) the common name for *Brassica rapa*
working solution the solution that is used; the working solution is often designated a concentration value of 1X