Glossary

A

activation energy energy required to bring about a reaction. The activation energy is lowered by the presence of *enzymes*.

active immunity resistance to disease resulting from the activities of an individual's own immune system whereby an *antigen* induces plasma cells to produce *antibodies*.

active site a group of amino acids that makes up the region of an *enzyme* into which the *substrate* fits in order to catalyse a reaction.

active transport movement of a substance from a region where it is in a low concentration to a region where it is in a high concentration. The process requires the expenditure of *metabolic* energy.

aerobic connected with the presence of free oxygen. Aerobic respiration requires free oxygen to release energy from glucose. See also *anaerobic*.

allele one of a number of alternative forms of a *gene*. For example, the gene for the shape of pea seeds has two alleles: one for 'round' and one for 'wrinkled'.

allergen a normally harmless substance that causes the immune system to produce an immune response. See also *allergy*.

allergy the response of the immune system to an *allergen*. Examples include hay fever and *asthma*.

antibiotic a substance produced by living organisms that can destroy or inhibit the growth of microorganisms.

antibiotic resistance the development in microorganisms of mechanisms that prevent *antibiotics* from killing them.

antibody a protein produced by *lymphocytes* in response to the presence of the appropriate antigen.

anticodon a sequence of three adjacent *nucleotides* on a molecule of transfer RNA that is complementary to a particular *codon* on a messenger RNA molecule.

antigen a molecule that triggers an immune response by *lymphocytes*.

antioxidant chemical which reduces or prevents *oxidation*. Often used as an additive to prolong the shelf-life of certain foods.

apoplastic pathway route through the cell walls and intercellular spaces of plants by which water and dissolved substances are transported. See also *symplastic pathway*.

artificial selection breeding of organisms by human selection of parents/gametes in order to perpetuate certain characteristics and/or to eliminate others.

asthma a chronic illness in which there is resistance to air flow to the alveoli of the lungs as a result of the airways becoming inflamed due to an allergic response to an *allergen*.

atheroma fatty deposits in the walls of arteries, often associated with high cholesterol levels in the blood.

ATP (adenosine triphosphate) *nucleotide* found in all living organisms, which is produced during respiration and is important in the transfer of energy.

autosomes a chromosome which is not a sex chromosome.

B

B cell (B lymphocyte) type of white blood cell that is produced and matures within the bone marrow. B lymphocytes produce *antibodies* as part of their role in immunity. See also *T cell*.

Benedict's test a simple biochemical reaction to detect the presence of reducing sugars.

biodiversity the range and variety of genes, species and habitats within a particular region.

biomass the total mass of living material, normally measured in a specific area over a given period of time.

Biuret test a simple biochemical reaction to detect the presence of protein.

body mass index (BMI) a person's body mass in kilograms divided by the square of their height in metres.

C

cancer a disease, resulting from cells that break away from an original tumour to form secondary tumours elsewhere in the body.

carcinogen a chemical, a form of radiation, or other agent that causes *cancer*.

cardiac cycle a continuous series of events which make up a single heart beat.

cardiac output the total volume of blood that the heart can pump each minute. It is calculated as the volume of blood pumped at each beat (*stroke volume*) multiplied by the number of heart beats per minute (heart rate).

carrier molecule (carrier protein) a protein on the surface of a cell that helps to transport molecules and ions across plasma membranes.

Casparian strip a distinctive band of suberin around the endodermal cells of a plant root that prevents water passing into xylem via the cell walls. The water is forced through the living part (*protoplast*) of the endodermal cells.

centrifugation process of separating out particles of different sizes and densities by spinning them at high speed in a centrifuge.

cholesterol lipid that is an important component of cell-surface membranes. Excess in the blood can lead to *atheroma*.

chromatid one of the two strands of a *chromosome* that are joined together by a single centromere prior to cell division.

chromatin the material that makes up chromosomes. It consists of DNA and the protein histone.

chromosome a thread-like structure made of protein and DNA by which hereditary information is physically passed from one generation to the next.

clone a group of genetically identical cells or organisms formed from a single parent as the result of asexual reproduction or by artificial means.

codon a sequence of three adjacent *nucleotides* in mRNA that codes for one amino acid.

cohesion attraction between molecules of the same type. It is important in the movement of water up a plant.

collagen fibrous protein that is the main constituent of connective tissues such as tendons, cartilage and bone.

community all the living organisms present in an *ecosystem* at a given time.

complementary DNA DNA that is made from messenger RNA in a process that is the reverse of normal transcription.

condensation chemical process in which two molecules combine to form a more complex one with the elimination of a simple substance, usually water. Many biological *polymers*, such as polysaccharides and polypeptides, are formed by condensation. See also *hydrolysis*.

continuous variation variation in which organisms do not fall into distinct categories but show gradations from one extreme to the other.

coronary arteries arteries that supply blood to the cardiac muscle of the heart.

coronary heart disease (CHD) any condition, for example, *atheroma* and *thrombosis*, affecting the *coronary arteries* that supply heart muscle.

correlation when a change in one variable is reflected by a change in the second variable.

co-transport the transport of one substance coupled with the transport of another substance across a plasma membrane in the same direction through the same protein carrier.

countercurrent system a mechanism by which the efficiency of exchange between two substances is increased by having them flowing in opposite directions.

covalent bond type of chemical bond in which two atoms share a pair of *electrons*, one from each atom.

crossing over the process whereby a *chromatid* breaks during *meiosis* and rejoins to the chromatid of its *homologous chromosome* so that their *alleles* are exchanged.

D

denaturation permanent changes due to the unravelling of the three-dimensional structure of a protein as a result of factors such as changes in temperature or pH.

diastole the stage in the *cardiac cycle* when the heart muscle relaxes. See also *systole*.

differentiation the process by which cells become specialised for different functions.

diffusion the movement of molecules or ions from a region where they are in high concentration to one where their concentration is lower.

diploid a term applied to cells in which the nucleus contains two sets of *chromosomes*. See also *haploid*.

dipolar having a pair of equal and opposite electrical charges.

E

ecological niche describes how an organism fits into its environment. It describes what a species is like, where it occurs, how it behaves, its interactions with other species and how it responds to its environment.

ecosystem all the living and non-living components of a particular area.

electron negatively charged subatomic particle that orbits the positively charged nucleus of all atoms.

emphysema a disease in which the walls of the alveoli break down, reducing the surface area for gaseous exchange, thereby causing breathlessness in the patient.

endocytosis the inward transport of large molecules through the cell-surface membrane.

enzyme a protein or RNA that acts as a catalyst and so alters the speed of a biochemical reaction.

epidemiology the study of the spread of disease and the factors that affect this spread.

eukaryotic cell a cell that has a membrane-bound nucleus and chromosomes. The cell also possesses a variety of other membranous organelles, such as mitochondria and endoplasmic reticulum. See also *prokaryotic cell*.

exocytosis the outward bulk transport of materials through the cell-surface membrane.

F

facilitated diffusion diffusion involving the presence of protein *carrier molecules* to allow the passive movement of substances across plasma membranes.

G

gamete reproductive (sex) cell that fuses with another gamete during fertilisation.

gene section of DNA on a *chromosome* coding for one or more polypeptides.

gene pool the total number of *alleles* in a particular population at a specific time.

glycolysis first part of cellular respiration in which glucose is broken down anaerobically in the cytoplasm to two molecules of pyruvate.

H

habitat the place where an organism normally lives and which is characterised by physical conditions and the types of other organisms present.

haemoglobin globular protein in blood that readily combines with oxygen to transport it around the body. It comprises four polypeptide chains around an iron-containing haem group.

haploid term referring to cells that contain only a single copy of each *chromosome*, e.g. the sex cells (gametes).

homologous chromosomes a pair of *chromosomes*, one maternal and one paternal, that have the same gene *loci* and therefore determine the same features. They are not necessarily

identical, however, as individual *alleles* of the same *gene* may vary, e.g. one chromosome may carry the allele for blue eyes, the other the allele for brown eyes. Homologous chromosomes are capable of pairing during *meiosis*.

human genome the totality of the DNA sequences on the *chromosomes* of a single human cell.

hydrogen bond chemical bond formed between the positive charge on a hydrogen atom and the negative charge on another atom of an adjacent molecule, e.g. between the hydrogen atom of one water molecule and the oxygen atom of an adjacent water molecule.

hydrolysis the breaking down of large molecules into smaller ones by the addition of water molecules. See also *condensation*.

I

immunity the means by which the body protects itself from infection.

intercropping the practice of growing two or more crops in close proximity usually to produce a greater yield on a piece of land.

interspecific variation differences between organisms of different species.

ion an atom or group of atoms that has lost or gained one or more *electrons*. Ions therefore have either a positive or negative charge.

ion channel a passage across a cell-surface membrane made up of a protein that spans the membrane and opens and closes to allow *ions* to pass in and out of the cell.

isotope variations of a chemical element that have the same number of protons and *electrons* but different numbers of neutrons. While their chemical properties are similar they differ in mass. One example is carbon which has a relative atomic mass of 12 and an isotope with a relative atomic mass of 14.

K

kinetic energy energy that an object possesses due to its motion.

L

latent heat of vaporisation heat taken in by a liquid in order to transform it into a vapour.

locus the position of a gene on a *chromosome*/DNA molecule.

lumen the hollow cavity inside a tubular structure such as the gut or a *xylem vessel*.

lymph a slightly milky fluid found in lymph vessels and made up of *tissue fluid*, fats and *lymphocytes*.

lymphocytes types of white blood cell responsible for the immune response. They become activated in the presence of antigens. There are two types: *B lymphocytes* and *T lymphocytes*.

M

meiosis the type of nuclear division in which the number of *chromosomes* is halved. See also *mitosis*.

mesophyll tissue found between the two layers of epidermis in a plant leaf comprising an upper layer of *palisade cells* and a lower layer of spongy cells.

metabolism all the chemical processes that take place in living organisms.

microvilli tiny finger-like projections from the cell-surface membrane of some animal cells.

middle lamella layer made up of pectins and other substances found between the walls of adjacent plant cells.

mitosis the type of nuclear division in which the daughter cells have the same number of *chromosomes* as the parent cell. See also *meiosis*.

monoclonal antibody an antibody produced by a single clone of *cells*.

monomer one of many small molecules that combine to form a larger one known as a *polymer*.

mono-unsaturated fatty acid fatty acid that possesses a carbon chain with a single double bond. See also *polyunsaturated fatty acid*.

mutation a sudden change in the amount or the arrangement of the genetic material in the cell.

myocardial infarction otherwise known as a heart attack, results from the interruption of the blood supply to the heart muscle, causing damage to an area of the heart with consequent disruption to its function.

N

nitrogen fixation the incorporation of atmospheric nitrogen gas into organic nitrogen-containing compounds.

normal distribution a bell-shaped curve produced when a certain distribution is plotted on a graph.

nucleotides complex chemicals made up of an organic base, a sugar and a phosphate. They are the basic units of which the nucleic acids DNA and RNA are made.

O

oral rehydration solution (ORS) means of treating dehydration involving giving, by mouth, a balanced solution of salts and glucose that stimulates the gut to reabsorb water.

osmosis the passage of water from a region of high *water potential* to a region where its *water potential* is lower, through a selectively permeable membrane.

oxidation chemical reaction involving the loss of *electrons*.

P

palisade cells long, narrow cells, packed with chloroplasts, that are found in the upper region of a leaf and which carry out photosynthesis.

passive immunity resistance to disease that is acquired from the introduction of *antibodies* from another individual, rather than an individual's own immune system, e.g. across the placenta or in the mother's milk. It is usually short-lived.

pathogen any microorganism that causes disease.

pentose sugar a sugar that possesses five carbon atoms. Two examples are ribose and deoxyribose.

peptide bond the chemical bond formed between two amino acids during *condensation*.

phagocytosis mechanism by which cells engulf particles to form a vesicle or a vacuole.

phospholipid triglyceride in which one of the three fatty acid molecules is replaced by a phosphate molecule. Phospholipids are important in the structure and functioning of plasma membranes.

photomicrograph photograph of an image produced by a microscope.

plasmid a small circular piece of DNA found in bacterial cells.

plasmodesmata fine strands of cytoplasm that extend through pores in adjacent plant cell walls and connect the cytoplasm of one cell with another.

plasmolysis the shrinkage of cytoplasm away from the cell wall that occurs as a plant cell loses water by *osmosis*.

polymer large molecule made up of repeating smaller molecules (*monomers*).

polymerases group of enzymes that catalyse the formation of long-chain molecules (*polymers*) from similar basic units (*monomers*).

polyunsaturated fatty acid (PUFA) fatty acid that possesses carbon chains with many double bonds. See also *mono-unsaturated fatty acid*.

primary structure of a protein the sequence of amino acids that makes up the polypeptides of a protein.

prokaryotic cell a cell of an organism belonging to the kingdom Prokaryotae that is characterised by lacking a nucleus and membrane-bound organelles. Examples include bacteria. See also *eukaryotic cell*.

protoplast the living portion of a plant cell, that is, the nucleus and cytoplasm along with the organelles it contains.

Q

quaternary structure of a protein a number of polypeptide chains linked together, and sometimes associated with non-protein groups, to form a protein.

R

reduction chemical process involving the gain of electrons.

S

saturated fatty acid a fatty acid in which there are no double bonds between the carbon atoms.

secondary structure of a protein the way in which the chain of amino acids of the polypeptides of a protein is folded.

selective breeding see *artificial selection*.

semi-conservative replication the means by which DNA makes exact copies of itself by unwinding the double helix so that each chain acts as a template for the next. The new copies therefore possess one original and one new strand of DNA.

serum clear liquid that is left after blood has clotted and the clot has been removed. It is therefore blood plasma without the clotting factors.

sinoatrial node (SAN) an area of heart muscle in the right atrium that controls and coordinates the contraction of the heart. Also known as the pacemaker.

species a group of similar organisms that can breed together to produce fertile offspring.

stoma (plural stomata) apore, mostly found in the lower epidermis of a leaf, through which gases diffuse in and out of the leaf.

stroke volume the volume of blood pumped at each ventricular contraction of the heart.

substrate a substance that is acted on or used by another substance or process. In microbiology, the nutrient medium used to grow microorganisms.

supernatant liquid the liquid portion of a mixture left at the top of the tube when suspended particles have been separated out at the bottom during *centrifugation*.

symplastic pathway route through the cytoplasm and *plasmodesmata* of plant cells by which water and dissolved substances are transported. See also *apoplastic pathway*.

systole the stage in the *cardiac cycle* in which the heart muscle contracts. It occurs in two stages: atrial systole when the atria contract and ventricular systole when the ventricles contact. See also *diastole*.

T

tertiary structure of a protein the folding of a whole polypeptide chain in a precise way, as determined by the amino acids of which it is composed.

thrombosis formation of a blood clot within a blood vessel that may lead to a blockage.

tidal volume the volume of air breathed in and out during a single breath when at rest.

tissue a group of similar cells organised into a structural unit that serves a particular function.

tissue fluid fluid that surrounds the cells of the body. Its composition is similar to that of blood plasma except that it lacks proteins. It supplies nutrients to the cells and removes waste products.

T cell (T lymphocyte) type of white blood cell that is produced in the bone marrow but matures in the thymus gland. T lymphocytes coordinate the immune response and kill infected cells. See also *B cell*.

transpiration evaporation of water from a plant.

triglyceride an individual lipid molecule made up of a glycerol molecule and three fatty acids.

tumour a swelling in an organism that is made up of cells that continue to divide in an abnormal way.

turgid a plant cell that contains the maximum volume of water it can. Additional entry of water is prevented by the cell wall stopping further expansion of the cell.

U

ultrafiltration filtration assisted by blood pressure, e.g. in the formation of *tissue fluid*.

unsaturated fatty acid a fatty acid in which there are one or more double bonds between the carbon atoms.

V

vaccination the introduction of a vaccine containing appropriate disease *antigens* into the body, by injection or mouth, in order to induce artificial *immunity*.

W

water potential the pressure created by water molecules. It is the measure of the extent to which a solution gives out water. The greater the number of water molecules present, the higher (less negative) the water potential. Pure water has a water potential of zero.

X

xerophyte a plant adapted to living in dry conditions.

xylem vessels dead, hollow, elongated tubes, with lignified side walls and no end walls, that transport water in most plants.