

# Glossary

- Entries printed in **red** are **IB command terms**.
- Entries are *aides-mémoire*, rather than formal definitions.

## A

**abiotic factor** a non-biological factor (e.g. temperature) that is part of the environment of an organism

**abscisic acid** a plant growth substance tending to inhibit growth

**absorption spectrum** range of a pigment's ability to absorb various wavelengths of light

**acetylcholine** a neurotransmitter, liberated at synapses in the CNS

**acid rain** the cocktail of chemical pollutants that may occur in the atmosphere

**action potential** rapid change (depolarization) in membrane potential of an excitable cell (e.g. a neuron)

**action spectrum** range of wavelengths of light within which a process like photosynthesis takes place

**activation energy** energy required by a substrate molecule before it can undergo a chemical change

**active site** region of enzyme molecule where substrate molecule binds

**active transport** movement of substances across a membrane involving a carrier protein and energy from respiration

**adenine** a purine organic base, found in the coenzymes ATP and NADP, and in nucleic acids (DNA and RNA) in which it pairs with thymine

**adenosine diphosphate (ADP)** a nucleotide, present in every living cell, made of adenosine and two phosphate groups linked in series, and important in energy transfer reactions of metabolism

**adenosine triphosphate (ATP)** a nucleotide, present in every living cell, formed in photosynthesis and respiration from ADP and  $P_i$ , and functioning in metabolism as a common intermediate between energy-requiring and energy-yielding reactions

**adrenaline (also called epinephrine)** a hormone secreted by the adrenal medulla (and a neurotransmitter secreted by nerve endings of the sympathetic nervous system), having many effects, including speeding of heartbeat, and the breakdown of glycogen to glucose in muscle and liver

**aerobic respiration** respiration requiring oxygen, involving oxidation of glucose to carbon dioxide and water

**alimentary canal** the gut; a tube running from mouth to anus in vertebrates, where complex food substances are digested and the products of digestion selectively absorbed into the body

**allele** an alternative form of a gene, occupying a specific locus on a chromosome

**allele frequency** the commonness of the occurrence of any particular allele in a population

**alpha cell (pancreas)** glucagon-secreting cell of the islets of Langerhans in the pancreas

**alveolus** air sac in the lung

**amino acid** building block of proteins, of general formula  $R.CH(NH_2).COOH$

**amphipathic** having hydrophobic and hydrophilic parts on the same molecule

**anabolism** the building up of complex molecules from smaller ones

**anaerobic respiration** respiration in the absence of oxygen, involving breakdown of glucose to lactic acid or ethanol

**analogous structure** similar in structure but of different evolutionary origin

**analyse break down in order to bring out the essential elements or structure**

**anion** negatively charged ion

**annotate add brief notes to a diagram or graph**

**anther** part of the stamen in flowers, consisting of pollen sacs enclosed in walls that eventually split open, releasing pollen

**antibiotics** organic compounds produced by some microorganisms which selectively inhibit or kill other microorganisms

**antibody** a protein produced by blood plasma cells derived from B lymphocytes when in the presence of a specific antigen, which then binds with the antigen, aiding its destruction

**anticodon** three consecutive bases in tRNA, complementary to a codon on RNA

**antidiuretic hormone (ADH)** hormone secreted by the pituitary gland that controls the permeability of the walls of the collecting ducts of the kidney

**antigen** a substance capable of binding specifically to an antibody

**apoplast** collective name for the cell walls of a tissue or plant

**aquaporin** a water channel pore (protein) in a membrane

**aqueous humour** fluid between lens and cornea of the eye

**arteriole** a very small artery

**artificial classification** classifying organisms on the basis of few, self-evident features

**artificial selection** selection in breeding exercises, carried out deliberately, by humans

**asexual reproduction** reproduction not involving gametes and fertilization

**assimilation** uptake of nutrients into cells and tissues

**atherosclerosis** deposition of plaque (cholesterol derivative) on inner wall of blood vessels

**atrioventricular node** mass of tissue in the wall of the right atrium, functionally part of the pacemaker mechanism

**atrioventricular valve** tricuspid or bicuspid valve  
**atrium** (plural, **atria**) one of the two upper chambers of the mammalian four-chambered heart  
**autolysis** self-digestion  
**autonomic** the involuntary nervous system  
**autotrophic (organism)** self-feeding – able to make its own elaborated foods from simpler substances  
**auxin** plant growth substance, indoleacetic acid  
**axon** fibre carrying impulses away from the cell body of a neuron

**B**

**bacillus** a rod-shaped bacterium  
**bacteriophage** a virus that parasitizes bacteria (also known as a phage)  
**baroreceptor** a sensory receptor responding to stretch, in the walls of blood vessels  
**basement membrane** the thin fibrous layer separating an epithelium from underlying tissues  
**beta cell (pancreas)** insulin-secreting cells of the islets of Langerhans in the pancreas  
**bicuspid valve** valve between atrium and ventricle on the left side of the mammalian heart  
**bile** an alkaline secretion of liver cells which collects in the gall bladder in humans, and which is discharged into the duodenum periodically  
**binary fission** when a cell divides into two daughter cells, typically in reproduction of prokaryotes  
**binomial system** double names for organisms, in Latin, the generic preceding the specific name  
**bioinformatics** interdisciplinary science of storage, retrieval, organization and analysis of biological data  
**biomass** total mass of living organisms in a given area (e.g. a quadrat)  
**biome** a major life-zone over an area of the Earth, characterized by the dominant plant life present  
**bioremediation** waste management techniques that involve the use of organisms to neutralize pollutants at contaminated sites  
**biosphere** the inhabited part of the Earth  
**biotechnology** the industrial and commercial applications of biology, particularly of microorganisms, enzymology and genetic engineering  
**biotic factor** the influence of living things on the environment of other living things  
**bivalent** a pair of duplicated chromosomes, held together by chiasmata during meiosis  
**blastocyst** embryo as hollow ball of cells, at the stage of implantation  
**blind spot** region of the retina where the optic nerve leaves  
**body mass index (BMI)** body mass in kg/(height in m)<sup>2</sup>  
**bone marrow tissue** special connective tissue filling the cavity of certain bones  
**boreal forest** northern coniferous forests (example of a biome)  
**brain** the coordinating centre of the nervous system  
**breed (animal)** the animal equivalent of a plant variety

**bronchiole** small terminal branch of a bronchus  
**bronchus** a tube connecting the trachea with the lungs  
**brush border** tiny, finger-like projections (microvilli) on the surface of epithelial cells of the small intestine  
**buffer** a solution which minimizes change in pH when acid or alkali are added  
**bundle of His** bundles of long muscle fibres that transmit myogenic excitation throughout the ventricle walls

**C**

**C<sub>3</sub> pathway** the light-independent reaction in photosynthesis, producing as its first product a 3-carbon compound, glycerate 3-phosphate  
**calculate** obtain a numerical answer showing the relevant stages in the working (unless instructed not to do so)  
**Calvin cycle** a cycle of reactions in the stroma of the chloroplast by which some of the product of the dark reaction is reformed as the acceptor molecule for carbon dioxide (ribulose biphosphate)  
**carcinogen** any substance or radiation directly involved in causing cancer  
**cardiac cycle** the stages of the heartbeat, by which the atrial and then the ventricular walls alternately contract (systole) and relax (diastole)  
**carnivore** flesh-eating animal  
**carrier** an individual that has one copy of a recessive allele that causes a genetic disease in individuals that are homozygous for this allele  
**carrier protein** one of the types of protein in plasma membranes, responsible for active transport across the membranes  
**cartilage** firm but plastic skeletal material (e.g. cartilage over bones at joints)  
**Casparian strip** band of cells with impervious walls, found in plant roots  
**catabolism** the breaking down of complex molecules in the biochemistry of cells  
**catalyst** a substance that alters the rate of a chemical reaction, but remains unchanged at the end  
**cellular respiration** controlled release (transfer) of energy from organic compounds in cells to form ATP  
**cellulase** enzyme capable of hydrolysing cellulose  
**cellulose** an unbranched polymer of 2000–3000 glucose residues, the major ingredient of most plant walls  
**central dogma** the idea that transfer of genetic information from DNA of the chromosome to mRNA to protein (amino acid sequence) is irreversible  
**centromere** constriction of the chromosome, the region that becomes attached to the spindle fibres in division  
**centrosome** organelle situated near the nucleus in animal cells, involved in the formation of the spindle prior to nuclear division  
**cephalization** development of a head at the anterior of an animal  
**cerebellum** part of hindbrain, concerned with muscle tone, posture and movement

- cerebral cortex** superficial layer of grey matter on extension of forebrain, much enlarged in humans and other apes
- cerebral hemispheres (cerebrum)** the bulk of the human brain, formed during development by the outgrowth of part of the forebrain, consisting of densely packed neurons and myelinated nerve fibres
- chemiosmosis** movement of ions down an electrochemical gradient, linked to the generation of ATP
- chemoautotroph** an organism that uses energy from chemical reactions to generate ATP and produce organic compounds from inorganic substances
- chemoheterotroph** an organism that uses energy from chemical reactions to generate ATP and obtains organic compounds from other organisms
- chemoreceptor** a sense organ receiving chemical stimuli
- chemosynthesis** use of chemical energy from oxidation of inorganic compounds to synthesize organic compounds, typically from carbon dioxide and water
- chiasma** (plural, **chiasmata**) site of crossing over (exchange) of segments of DNA between homologous chromosomes
- chlorophyll** the main photosynthetic pigment of green plants, occurs in the grana membranes (thylakoid membranes) of the chloroplasts
- chloroplast** organelle that is the site of photosynthesis and contains chlorophyll
- cholesterol** a lipid of animal plasma membranes; a precursor of the steroid hormones, in humans, formed in the liver and transported in the blood as lipoprotein
- choroid** layer of blood vessels lying below the retina
- chromatid** one of two copies of a chromosome after it has replicated
- chromatin** a nuclear protein material in the nucleus of eukaryotic cells at interphase; forms into chromosomes during mitosis and meiosis
- chromosome** visible in appropriately stained cells at nuclear division, each chromosome consists of a long thread of DNA packaged with protein; chromosomes replicate prior to division, into chromatids. Contents of nucleus appears as granular chromatin between divisions
- chyme** partly digested food as it leaves the stomach
- cilium** (plural, **cilia**) motile, hair-like outgrowth from surface of certain eukaryotic cells
- citric acid cycle** see *Krebs cycle*
- clade** the branch of a phylogenetic tree containing the set of all organisms descended from a particular common ancestor which is not an ancestor of any non-member of the group
- cladistics** method of classifying living organisms that makes use of lines of descent only (rather than phenotypic similarities)
- climax community** the mature (stable) stage of a succession of communities
- clone** a group of genetically identical individuals (or cells)
- CNS** see *nervous system*
- codominant alleles** pairs of alleles that both affect the phenotype when present in a heterozygous state
- codon** three consecutive bases in DNA (or RNA) which specify an amino acid
- coleoptile** protective sheath around emerging leaves of germinating grass seeds
- colon** part of the gut, preceding the rectum
- colostrum** first milk secreted by the mother, after birth of young
- commensalism** a mutually beneficial association between two organisms of different species
- comment** give a judgment based on a given statement or result of a calculation
- community** a group of populations of organisms living and interacting with each other in a habitat
- compare** give an account of similarities between two (or more) items or situations, referring to both (all) of them throughout
- compare and contrast** give an account of similarities and differences between two (or more) items or situations, referring to both (all) of them throughout
- compensation point** the point where respiration and photosynthesis are balanced
- condensation reaction** formation of larger molecules involving the removal of water from smaller component molecules
- cone (retinal cell)** a light-sensitive cell in the retina, responsible for colour vision
- conjugate protein** protein combined with a non-protein part
- connective tissue** tissues that support and bind tissues together
- conservation** applying the principles of ecology to manage the environment
- contractile vacuole** a small vesicle in the cytoplasm of many fresh water protozoa that expels excess water
- construct** display information in a diagrammatic or logical form
- cornea** transparent covering at the front of the eye
- corpus luteum** glandular mass that develops from an ovarian follicle in mammals, after the ovum is discharged
- cotyledon** the first leaf (leaves) of a seed plant, found in the embryo
- covalent bond** bond between atoms in which electrons are shared
- crisetae** folds in the inner membrane of mitochondria
- crossing over** exchange of genetic material between homologous chromosomes during meiosis
- crypt of Lieberkühn** endocrine cells within the pancreas
- cuticle** layer of waxy material on outer wall of epidermis
- cyanobacteria** photosynthetic prokaryotes
- cytokinesis** division of cytoplasm after nucleus has divided into two
- cytology** study of cell structure
- cytoplasm** living part of the cell bound by the plasma membrane, excluding the nucleus
- cytosol** what remains of cytoplasm when the organelles have been removed

**D**

**data** recorded products of observations and measurements

**qualitative data** observations not involving measurements

**quantitative data** precise observations involving measurements

**deamination** the removal of  $\text{NH}_2$  from an amino acid

**decomposer** organisms (typically microorganisms) that feed on dead plant and animal material, causing matter to be recycled by other living things

**deduce** reach a conclusion from the information given

**define** give the precise meaning of a word, phrase, concept or physical quantity

**degenerate code** the triplet code contains more codons than there are amino acids to be coded, so most amino acids are coded for by more than one codon

**denaturation** a structural change in a protein that results in a loss (usually permanent) of its biological properties

**dendrite** a fine fibrous process on a neuron that receives impulses from other neurons

**depolarization (of axon)** a temporary and local reversal of the resting potential difference of the membrane that occurs when an impulse is transmitted along the axon

**describe** give a detailed account

**desertification** the conversion of marginal cultivated land into desert, caused by climate change or by over-grazing or inferior cultivation

**design** produce a plan, simulation or model

**determine** obtain the only possible answer

**detrital chain** a food chain based on dead plant matter

**detritivore** an organism that feeds on detritus (dead organic matter)

**dialysis** separation of large and small molecules in solution by the inability of the former to pass through a selectively permeable membrane

**diaphragm** a sheet of tissues, largely muscle, separating thorax from abdomen in mammals

**diastole** relaxation phase in the cardiac cycle

**dichotomous key** one in which a group of organisms is progressively divided into two groups of smaller size

**dicotyledon** class of Angiospermophyta having an embryo with two seed leaves (cotyledons)

**diffusion** passive movement of particles from a region of high concentration to a region of low concentration

**dihybrid cross** one in which the inheritance of two pairs of contrasting characters (controlled by genes on separate chromosomes) is observed

**diploid condition** organisms whose cells have nuclei containing two sets of chromosomes

**disaccharide** a sugar that is a condensation product of two monosaccharides (e.g. maltose)

**discuss** offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence

**distinguish** make clear the differences between two or more concepts or items

**disulfide bond** S—S bond between two S-containing amino acid residues in a polypeptide or protein chain

**diuresis** increased secretion of urine

**division of labour** the carrying out of specialized functions by different types of cell in a multicellular organism

**DNA** a form of nucleic acid found in the nucleus, consisting of two complementary chains of deoxyribonucleotide subunits, and containing the bases adenine, thymine, guanine and cytosine

**dominant allele** an allele that has the same effect on the phenotype whether it is present in the homozygous or heterozygous state

**double bond** a covalent bond involving the sharing of two pairs of electrons (rather than one)

**double circulation** in which the blood passes twice through the heart (pulmonary circulation, then systemic circulation) in any one complete circuit of the body

**double fertilization** a feature of flowering plants in which two male nuclei enter the embryo sac, and one fuses with the egg cell and one with the endosperm nucleus

**draw** represent by means of a labelled, accurate diagram or graph, using a pencil. A ruler (straight edge) should be used for straight lines. Diagrams should be drawn to scale. Graphs should have points correctly plotted (if appropriate) and joined in a straight line or smooth curve

**duodenum** the first part of the intestine after the stomach

**E**

**ecology** the study of relationships between living organisms and between organisms and their environment – a community and its abiotic environment

**ecosystem** a natural unit of living (biotic) components and non-living (abiotic) components (e.g. temperate deciduous forest)

**edaphic factor** factor influenced by the soil

**effector** an organ or cell that responds to a stimulus by doing something (e.g. a muscle contracting, a gland secreting)

**egestion** disposal of waste from the body (e.g. defecation)

**egg cell** an alternative names for an ovum

**electron microscope (EM)** microscope in which a beam of electrons replaces light, and the powers of magnification and resolution are correspondingly much greater

**electron-transport system** carriers that transfer electrons along a redox chain, permitting ATP to be synthesized in the process

**embolism** a blood clot blocking a blood vessel

**embryo** the earliest stages in development of a new animal or plant, from a fertilized ovum, entirely dependent on nutrients supplied by the parent



- embryo sac** occurs in the ovule of flowering plants, and contains the egg cell and endosperm nucleus
- emulsify** to break fats and oils into very tiny droplets
- endemic species** restricted to a particular region
- endergonic reaction** metabolic reaction requiring energy input
- endocrine glands** the hormone-producing glands that release secretions directly into the body fluids
- endocytosis** uptake of fluid or tiny particles into vacuoles in the cytoplasm, carried out at the plasma membrane
- endoplasmic reticulum** system of branching membranes in the cytoplasm of eukaryotic cells, existing as rough ER (with ribosomes) or as smooth ER (without ribosomes)
- endoskeleton** an internal skeleton system
- endosperm** the stored food reserves within the seeds of flowering plants
- endothelium** a single layer of cells lining blood vessels and other fluid-filled cavities
- endothermic** generation of body heat metabolically
- enzyme** mainly proteins (a very few are RNA) that function as biological catalysts
- epidemiology** the study of the occurrence, distribution and control of disease
- epidermis** outer layer(s) of cells
- epigenetics** study of heritable changes in gene activity not caused by changes in DNA
- epiglottis** flap of cartilage that closes off the trachea when food is swallowed
- epiphyte** plant living on the surface of other plants
- epithelium** sheet of cells bound strongly together, covering internal or external surfaces of multicellular organisms
- epitope** part of an antigen that is recognized by the immune system
- erythrocyte** red blood cell
- estimate** obtain an approximate value
- estrous** period of fertility (immediately after ovulation) during the estrous cycle
- estrous cycle** reproductive cycle in female mammal in the absence of pregnancy
- etiolation** the condition of plants when grown in the dark
- eukaryotic (cells)** cells with a 'good nucleus' (e.g. animal, plant, fungi and protoctista cells)
- evaluate** make an appraisal by weighing up the strengths and limitations
- evolution** cumulative change in the heritable characteristics of a population
- ex situ** not in its original or natural position or habitat
- excretion** removal from the body of the waste products of metabolic pathways
- exergonic reaction** metabolic reaction releasing energy
- exocrine gland** gland whose secretion is released via a duct
- exocytosis** secretion of liquids and suspensions of very fine particles across the membrane of eukaryotic cells
- exoskeleton** skeleton secreted external to the epidermis of the body
- exothermic** chemical reaction that releases energy as heat (an endothermic reaction requires heat energy)
- expiratory** emitting air during breathing
- explain** give a detailed account including reasons or causes
- extensor muscle** a muscle that extends or straightens a limb
- F**
- F<sub>1</sub> generation** first filial generation – arises by crossing parents (P) and, when selfed or crossed via sibling crosses, produces the F<sub>2</sub> generation
- facilitated diffusion** diffusion across a membrane facilitated by molecules in the membrane (without the expenditure of metabolic energy)
- fermentation** anaerobic breakdown of glucose, with end-products ethanol and carbon dioxide or lactic acid
- fertilization** the fusion of male and female gametes to form a zygote
- fetus** a mammalian embryo when it becomes recognizable (e.g. the human embryo from 7 weeks after fertilization)
- field layer** the layer of herbaceous plants in a forest or wood
- filter-feeding** feeding on tiny organisms which are strained from the surrounding medium
- fimbria** (singular, **fimbrium**) thin, short filaments protruding from some bacteria, involved in attachment
- flaccid** state of a tissue with insufficient water, as in wilting leaves
- flagellum** (plural, **flagella**) a long thin structure, occurring singly or in groups on some cells and tissues, and used to propel unicellular organisms, and to move liquids past anchored cells (flagella of prokaryotes and eukaryotes are of different internal structure)
- flexor muscle** a muscle that on contraction bends a limb (or part of a limb)
- flower** develops from the tip of a shoot, with outer parts (e.g. sepals, petals) surrounding the male and female reproductive organs
- fluid mosaic model** the accepted view of the structure of the plasma membrane, comprising a phospholipid bilayer with proteins embedded but free to move about
- food chain** a sequence of organisms within a habitat in which each is the food of the next, starting with a producer, which is photosynthetic
- food web** interconnected food chains
- founder effect** genetic differences that develop between an original breeding population and a small isolated interbreeding group of these organisms
- fovea** point on a retina of greatest acuity of vision
- free energy** part of the potential chemical energy in molecules that is available to do useful work when the molecules are broken
- freeze etching** preparation of specimens for electron microscope examination by freezing, fracturing along natural structural lines and preparing a replica
- frequency** commonness of an occurrence

**fruit** forms from the ovary after fertilization, as the ovules develop into seeds

**functional group** the chemically active part of a member of a series of organic molecules

**fungus** heterotrophic, non-motile, multicellular (usually) eukaryotic organism with 'plant' body – a mycelium of hyphae with cell walls of chitin; the fungi constitute a separate kingdom

## G

**gall bladder** sac beside the liver that stores bile, present in some mammals (e.g. humans)

**gamete** sex cell (e.g. ovum, sperm)

**ganglion** part of a nervous system, consisting of nerve cell bodies

**gaseous exchange** exchange of respiratory gases (oxygen, carbon dioxide) between cells/organism and the environment

**gastric** relating to the stomach

**gene** a heritable factor that controls a specific characteristic

**gene mutation** change in the chemical structure (base sequence) of a gene resulting in change in the characteristics of an organism or individual cell

**gene pool** all the genes (and their alleles) present in a breeding population

**gene probe** an artificially prepared sequence of DNA made radioactive with  $^{14}\text{C}$ , coding for a particular amino acid residue sequence

**gene therapy** various mechanisms by which corrected copies of genes are introduced into a patient with a genetic disease

**generator potential** localized depolarization of a membrane of a sensory cell

**genetic code** the order of bases in DNA (of a chromosome) that determines the sequence of amino acids in a protein

**genetic counselling** genetic advice to potential parents on the risks of having children with an inherited disease

**genetic engineering** change to the genetic constitution of individuals or populations by artificial selection

**genome** the whole of the genetic information of an organism

**genotype** the genetic constitution of an organism – the alleles of an organism

**genus** a group of similar and closely related species

**germination** the resumption of growth by an embryonic plant in seed or fruit, at the expense of stored food

**gland** cells or tissues adapted for secretion

**global warming** the hypothesis that the world climate is warming due to rising levels of atmospheric carbon dioxide, a greenhouse gas

**glomerulus** network of capillaries which are surrounded by the renal capsule

**glycocalyx** long carbohydrate molecules attached to membrane proteins and membrane lipids

**glycogen** a much-branched polymer of glucose, the storage carbohydrate of many animals

**glycogenesis** the synthesis of glycogen from glucose (the reverse is glycogenolysis)

**glycolysis** the first stage of tissue respiration in which glucose is broken down to pyruvic acid, without use of oxygen

**glycoprotein** membrane protein with a glycocalyx attached

**glycosidic bond** a type of chemical linkage between monosaccharide residues in polysaccharides

**goblet cell** mucus-secreting cell of an epithelium

**Golgi apparatus** a stack of flattened membranes in the cytoplasm, the site of synthesis of biochemicals

**gonad** an organ in which gametes are formed

**gonadotrophic hormone** follicle-stimulating hormone (FSH) and luteinizing hormone (LH), secreted by the anterior pituitary, which stimulate gonad function

**granum** (plural, **grana**) stacked discs of membranes found within the chloroplast, containing the photosynthetic pigments, and the site of the light-dependent reaction of photosynthesis

**grey matter** regions of the brain and spinal cord consisting largely of nerve cell bodies

**growth** more or less irreversible increase in size and amount of dry matter

**gut** the alimentary canal

## H

**habitat** the locality or surroundings in which an organism normally lives or the location of a living organism

**halophyte** a plant adapted to survive at abnormally high salt levels (e.g. seashore or salt marsh plant)

**haploid (cells)** cells having one set of chromosomes, the basic set

**heart rate** number of contractions of the heart per minute

**helicase** an enzyme that unwinds the DNA double helix

**hemoglobin** a conjugated protein, found in red cells, effective at carrying oxygen from regions of high partial pressure (e.g. lungs) to regions of low partial pressure of oxygen (e.g. respiring tissues)

**hepatic** associated with the liver

**herb layer** layer of herbaceous plants (mainly perennials) growing in woodland

**herbaceous** non-woody

**herbicide** pesticide toxic to plants

**herbivore** an animal that feeds (holozoically) exclusively on plants

**hermaphrodite** organism with both male and female reproductive systems

**heterotroph** an organism incapable of synthesizing its own elaborated nutrients

**heterozygous** having two different alleles of a gene

**hexose** a monosaccharide containing six carbon atoms (e.g. glucose, fructose)

**hibernation** passing the unfavourable season in a resting state of sleep

- histology** the study of the structure of tissues
- histone** basic proteins (rich in the amino acids arginine and lysine) that form the scaffolding of chromosomes
- holozoic** ingesting complex food material and digesting it
- homeostasis** maintenance of a constant internal environment
- homeotherm** organism that maintains a constant body temperature
- homologous chromosomes** chromosomes in a diploid cell which contain the same sequence of genes, but are derived from different parents
- homologous structures** similar due to common ancestry
- homozygous** having two identical alleles of a gene
- hormone** a substance, formed by an endocrine gland and transported in the blood all over the body, but triggering a specific physiological response in one type of organ or tissue
- host** an organism in or on which a parasite spends all or part of its lifecycle
- humus** complex organic matter, the end-product of the breakdown of the remains of plants and animals, which covers the mineral particles of soil
- hybrid** an individual produced from a cross between two genetically unlike parents
- hybridoma** an artificially produced hybrid cell culture, used to produce monoclonal antibodies
- hydrocarbon chain** a linear arrangement of carbon atoms combined together and with hydrogen atoms, forming a hydrophobic tail to many large organic molecules
- hydrogen bond** a weak bond caused by electrostatic attraction between a positively charged part of one molecule and a negatively charged part of another
- hydrolysis** a reaction in which hydrogen and hydroxide ions from water are added to a large molecule causing it to split into smaller molecules
- hydrophilic** water loving
- hydrophobic** water hating
- hydrophyte** an aquatic plant
- hydrosere** a plant succession that originated from open water
- hydrostatic pressure** mechanical pressure exerted on or by liquid (e.g. water) also known as pressure potential
- hyperglycemia** excess glucose in the blood
- hypertonic solution** a more concentrated solution (one with a less negative water potential) than the cell solution
- hypha** the tubular filament 'plant' body of a fungus, which in certain species is divided by cross walls into either multicellular or unicellular compartments
- hypoglycemia** very low levels of blood glucose
- hypothalamus** part of floor of the rear of the forebrain, a control centre for the autonomic nervous system, and source of releasing factors for pituitary hormones
- hypothesis** a tentative (and testable) explanation of an observed phenomenon or event
- hypotonic solution** a less concentrated solution (one with a more negative water potential) than the cell solution
- I**
- identify** provide an answer from a number of possibilities
- immunity** resistance to the onset of a disease after infection by the causative agent
- active immunity** immunity due to the production of antibodies by the organism itself after the body's defence mechanisms have been stimulated by antigens
- passive immunity** immunity due to the acquisition of antibodies from another organism in which active immunity has been stimulated, including via the placenta, colostrum, or by injection of antibodies
- immunization** (e.g. inoculation/vaccination) the injection of a specific antigen, derived from a pathogen, to confer immunity against a disease
- immunoglobulin** proteins synthesized by the B lymphocytes of the immune system
- immunology** study of the immune system
- immunosuppressant** a substance causing temporary suppression of the immune response
- implantation** embedding of the blastocyst (developed from the fertilized ovum) in the uterus wall
- imprinting** process occurring soon after birth, causing young birds to follow their mother
- impulse** see *action potential*
- in situ** in the original place (in the body or organism)
- in vitro** biological processes occurring in cell extracts (literally 'in glass')
- in vivo** biological process occurring in a living organism (literally 'in life')
- inbreeding** when gametes of closely related individuals fuse leading to progeny that is homozygous for some or many alleles
- incubation period** period between infection by a causative agent and the appearance of the symptoms of a disease
- incus** tiny, anvil-shaped bone, the middle ossicle of the middle ear in mammals
- industrial melanism** increasing proportion of a darkened (melanic) form of an organism, in place of the light-coloured form, associated with industrial pollution by soot
- infectious disease** disease capable of being transmitted from one organism to another
- inhibitor (enzyme)** a substance which slows or blocks enzyme action (a competitive inhibitor binds to the active site; a non-competitive inhibitor binds to another part of the enzyme)
- inhibitory synapse** synapse at which arrival of an impulse blocks forward transmissions of impulses in the post-synaptic membrane
- innate behaviour** behaviour that does not need to be learned
- innervation** nerve supply

**inspiratory capacity** amount of air that can be drawn into the lungs

**intelligence** the ability to learn by reasoning and to solve problems not yet experienced

**interferon** proteins formed by vertebrate cells in response to virus infections

**intermediates** metabolites formed as components of a metabolic pathway

**interphase** the period between nuclear divisions when the nucleus controls and directs the activity of the cell

**interspecific competition** competition between organisms of different species

**intestine** the gut

**intracellular enzymes** enzymes operating inside the cell

**intraspecific competition** competition between organisms of the same species

**intron** a non-coding nucleotide sequence of the DNA of chromosomes, present in eukaryotic chromosomes

**invagination** the intucking of a surface or wall

**ion** charged particle formed by the transfer of electron(s) from one atom to another

**ionic bonding** strong electrostatic attraction between oppositely charged ions

**iris** circular disc of tissue, in front of the lens of the eye, containing circular and radial muscles

**irreversible inhibition** inhibition by inhibitors that bind tightly and permanently to an enzyme, destroying its catalytic properties

**islets of Langerhans** groups of endocrine cells scattered through the pancreas

**isomers** chemical compounds of the same chemical formula but different structural formulae

**isotonic** being of the same osmotic concentration and therefore of the same water potential

**isotopes** different forms of an element, chemically identical but with slightly different physical properties, based on differences in atomic mass (due to different numbers of neutrons in the nucleus)

**J**

**joule** the SI unit of energy

**K**

**karyogram** the chromosomes of an organism in homologous pairs of decreasing length

**karyotype** the number and type of chromosomes present in an organism

**keratin** a fibrous protein found in horn, hair, nails and the upper layer of skin

**keystone species** species that have a key role in an ecosystem

**kinesis** random movements maintained by motile organisms until more favourable conditions are reached

**kinetic energy** energy in movement

**kingdom** the largest and most inclusive group in taxonomy

**Krebs cycle** part of tissue respiration

**L**

**label add labels to a diagram**

**lactation** secretion of milk in mammary glands

**leaching** washing out of soluble ions and nutrients by water drainage through soil

**learnt behaviour** in animals, behaviour that is consistently modified as a result of experiences

**leucocyte** white blood cell

**lichens** permanent, mutualistic associations between certain fungi and algae, forming organisms found encrusting walls, tree trunks and rocks

**ligament** strong fibrous cord or capsule of slightly elastic fibres, connecting movable bones

**light-dependent step** part of photosynthesis occurring in grana of the chloroplasts, in which water is split and ATP and NADPH<sub>2</sub> are regenerated

**light-independent step** part of photosynthesis occurring in the stroma of the chloroplasts and using the products of the light-dependent step to reduce carbon dioxide to carbohydrate

**lignin** complex chemical impregnating the cellulose of the walls of xylem vessels, fibres and tracheids, imparting great strength and rigidity

**linkage group** the genes carried on any one chromosome

**lipid** diverse group of organic chemicals essential to living things, insoluble in water but soluble in organic solvents such as ether and alcohol (e.g. lipid of the plasma membrane)

**lipoprotein** a complex of lipid and protein of various types which are classified according to density (e.g. LDL, HDL)

**list give a sequence of brief answers with no explanation**

**liver lobule** polygonal block of liver cells, a functional unit within the liver structure

**locus** the particular position on homologous chromosomes of a gene

**loop of Henle** loop of mammalian kidney tubule, passing from cortex to medulla and back, important in the process of concentration of urine

**lumen** internal space of a tube (e.g. gut, artery) or sac-shaped structure

**lymph** fluid derived from plasma of blood, bathing all tissue spaces and draining back into the lymphatic system

**lymph node** tiny glands in the lymphatic system, part of the body's defences against disease

**lymphatic system** network of fine capillaries throughout the body of vertebrates, which drain lymph and return it to the blood circulation

**lymphocyte** type of white blood cell

**lysis** breakdown, typically of cells

**lysosome** membrane-bound vesicles, common in the cytoplasm, containing digestive enzymes

**M**

**macromolecule** very large organic molecule – relative molecular mass 10 000+ (e.g. protein, nucleic acid or polysaccharide)



- macronutrients** ions required in relatively large amounts by organisms
- macrophage** phagocytic cells of the immune system found throughout the body
- Malpighian body** glomerulus and renal capsule of mammalian nephron
- mandibles** the lower jaw of vertebrates; in arthropods paired, biting mouthparts
- matrix** ground substance of connective tissue, and the innermost part of a mitochondrion
- measure** obtain a value for a quantity
- mechanoreceptors** a sensory receptor sensitive to mechanical stimulus
- meiosis** nuclear division with daughter cells containing half the number of chromosomes of the parent cell
- melanic** pigmented
- menstrual cycle** monthly cycle of ovulation and menstruation in human females
- meristem** plant tissue capable of giving rise to new cells and tissues
- mesentery** connective tissue holding body organs (e.g. gut) in position
- mesophyll** parenchyma cells containing chloroplasts
- mesosome** an invagination of the plasma membrane of a bacterium
- metabolic pathway** sequence of enzyme-catalysed biochemical reactions in cells and tissues
- metabolic water** water released within the body by oxidation, typically of dietary lipids
- metabolism** integrated network of all the biochemical reactions of life
- metabolite** a chemical substance involved in metabolism
- metaphase** stage in nuclear division (mitosis and meiosis) in which chromosomes become arranged at the equator of the spindle
- metastasis** spread of cancer from one organ to another within the body
- methylation** addition of a methyl group to a molecule by enzyme action
- microarray** a collection of microscopic DNA spots attached to a solid surface
- microhabitat** the environment immediately surrounding an organism, particularly applied to tiny organisms
- micronutrient** ions required in relatively small (trace) amounts by organisms
- microtubule** tiny, hollow protein tube in cytoplasm (e.g. a component of the spindle)
- microvillus** one of many tiny infoldings of the plasma membrane, making up a brush border
- middle lamella** a layer of pectins between the walls of adjacent cells
- mitochondrion** (plural, **mitochondria**) organelle in eukaryotic cells, site of Krebs cycle and the electron-transport pathway
- mitosis** nuclear division in which the daughter nuclei have the same number of chromosomes as the parent cell
- mitral valve** left atrioventricular valve
- mode** the most frequently occurring value in a distribution
- monoclonal antibody** antibody produced by a single clone of B lymphocytes; it consists of a population of identical antibody molecules
- monocotyledon** class of angiosperms having an embryo with a single cotyledon
- monohybrid cross** a cross (breeding experiment) involving one pair of contrasting characters exhibited by homozygous parents
- monomer** a molecule that chemically combines with other monomers to form a polymer
- monosaccharide** simple carbohydrate (all are reducing sugars)
- morphology** form and structure of an organism
- motile** capable of moving about
- motor area** area of the brain where muscular activity is coordinated
- motor end plate** the point of termination of an axon in a voluntary muscle fibre
- motor neuron** nerve cell that carries impulses away from the central nervous system to an effector (e.g. muscle, gland)
- mRNA** single-stranded ribonucleic acid formed by the process of transcription of the genetic code in the nucleus, that then moves to ribosomes in the cytoplasm
- MRSA** a bacterial infection that is resistant to a number of widely used antibiotics
- mucilage** mixture of various polysaccharides that become slippery when wet
- mucosa** the inner lining of the gut
- mucus** a watery solution of glycoprotein with protective and lubrication functions
- muscle spindle** sensory receptor in muscle, responding to stretch stimuli
- mutagen** an agent that causes mutation
- mutant** organism with altered genetic material (abruptly altered by a mutation)
- mutation** a change in the amount or the chemical structure (i.e. base sequence) of DNA of a chromosome
- mutualism** a case of symbiosis in which both organisms benefit from the association
- mycelium** a mass or network of hyphae
- mycology** the study of fungi
- mycorrhiza** a mutualistic association between plant roots and fungi, with the mycelium restricted to the exterior of the root and its cells (ectotrophic), or involving a closer association between hyphae and root cell contents (endotrophic)
- myelin sheath** an insulating sheath of axons of nerve fibres, formed by the wrapping around of Schwann cells
- myelinated nerve fibre** nerve fibre insulated by a lipid sheath formed from membranes of Schwann cells
- myocardial infarction** heart attack

**myofibril** contractile protein filament from which muscle is composed

**myogenic** originating in heart muscle cells themselves, as in generation of the basic heartbeat

## N

**natural classification** organisms grouped by as many common features as possible, and therefore likely to reflect evolutionary relationships

**nectary** group of cells secreting nectar (dilute sugar solution) in a flower

**nematocyst** stinging cell of cnidarians (coelenterates) (e.g. *Hydra*)

**Neolithic revolution** the period of human development involving the first establishment of settled agriculture practices, and including the breeding and cultivation of crop plants and herd animals

**nephron** the functional unit of a vertebrate kidney

**nerve** bundle of many nerve fibres (axons), connecting the central nervous system with parts of the body

**nerve cord** in non-vertebrates, a bundle of nerve fibres and/or nerve ganglia running along the length of the body

**nervous system** organized system of neurons which generate and conduct impulses

**autonomic nervous system (ANS)** the involuntary nervous system

**central nervous system (CNS)** in vertebrates, the brain and spinal cord

**parasympathetic nervous system** part of the involuntary nervous system, antagonistic in effect to the sympathetic nervous system

**peripheral nervous system (PNS)** in vertebrates, neurons that convey sensory information to the CNS, and neurons that convey impulses to muscles and glands (effector organs)

**sympathetic nervous system** part of the involuntary nervous system, antagonistic in effect to the parasympathetic nervous system

**neuron** nerve cell

**neurotransmitter substance** chemical released at the pre-synaptic membrane of an axon, on arrival of an action potential, which transmits the action potential across the synapse

**neutrophil** a type of white blood cell

**niche** both the habitat an organism occupies and the mode of nutrition employed

**node of Ranvier** junction in the myelin sheaths around a myelinated nerve fibre

**noradrenaline (also called norepinephrine)** neurotransmitter substance in the sympathetic nervous system

**nuclear division** first step in the division of a cell, when the contents of the nucleus are subdivided by mitosis or meiosis

**nuclear membrane** double membrane surrounding the eukaryotic nucleus

**nuclear pores** organized gaps in the nuclear membrane, exit points for mRNA

**nucleic acid** polynucleotide chain of one of two types, deoxyribonucleic acid (DNA) or ribonucleic acid (RNA)

**nucleolus** compact region of nucleus where RNA is synthesized

**nucleoside** organic base (adenine, guanine, cytosine, thymine) combined with a pentose sugar (ribose or deoxyribose)

**nucleosome** a sequence of DNA wound around eight histone protein cores – a repeating unit of eukaryotic chromatin

**nucleotide** phosphate ester of a nucleoside – an organic base combined with pentose sugar and phosphate ( $P_i$ )

**nucleus** largest organelle of eukaryotic cells; controls and directs the activity of the cell

**nutrient** a chemical substance found in foods that is used in the human body – any substance used or required by an organism as food

**nutrition** the process by which an organism acquires the matter and energy it requires from its environment

## O

**obesity** condition of being seriously over-weight (BMI of 30+)

**olfactory** relating to the sense of smell

**omnivore** an animal that eats both plant and animal food

**oncogene** a cancer-initiating gene

**oocyte** a female sex cell in the process of a meiotic division to become an ovum

**oogamy** union of unlike gametes (e.g. large ovum and tiny sperm)

**open reading frame (ORF)** in molecular genetics – part of a reading frame that contains no ‘stop’ codons

**opsonin** type of antibody that attacks bacteria and viruses, facilitating their ingestion by phagocytic cells

**order** a group of related families

**organ** a part of an organism, consisting of a collection of tissues, having a definite form and structure, and performing one or more specialized functions

**organelle** a unit of cell substructure

**organic** compounds of carbon (except carbon dioxide and carbonates)

**organism** a living thing

**osmolarity** the osmotic concentration of a solution

**osmoreceptor** sense cells or organ stimulated by changes in water potential

**osmoregulation** control of the water balance of the blood, tissue or cytoplasm of a living organism

**osmosis** diffusion of free water molecules from a region where they are more concentrated (low solute concentration) to a region where they are less concentrated (high solute concentration) across a partially permeable membrane

**outline** give a brief account or summary

**ovarian cycle** the monthly changes that occur to ovarian follicles leading to ovulation and the formation of a corpus luteum

**ovarian follicle** spherical structures found in the mammalian ovary, containing a developing ovum with liquid surrounded by numerous follicle cells, and from which a secondary oocyte is released at ovulation

**ovary** female reproductive organ in which the female gametes are formed

**ovulation** shedding of ova from the ovary

**ovule** in the flowering plant flower, the structure in an ovary which, after fertilization, grows into the seed

**ovum** (plural, **ova**) a female gamete

**oxygen dissociation curve** a graph of % saturation (with oxygen) of hemoglobin against concentration of available oxygen

**oxyntic cells** cells in the gastric glands that secrete hydrochloric acid

## P

**pacemaker** structure that is the origin of the myogenic heartbeat, known as the sinoatrial node

**Pacinian corpuscles** sensory receptors in joints

**pancreas** an exocrine gland discharging pancreatic juice into the duodenum, combined with endocrine glands (islets of Langerhans)

**parasite** an organism that lives on or in another organism (its host) for most of its lifecycle, deriving nutrients from its host

**parenchyma** living cells, forming the greater part of cortex and pith in primary plant growth

**partial pressure** the pressure exerted by each component of a gas mixture, proportional to how much of the gas is present in the mixture; the partial pressure of oxygen in air is represented by the symbol  $pO_2$  and is expressed in kilopascals (kPa)

**pathogen** an organism or virus that causes a disease

**pentadactyl** having all four limbs (typically) terminating in five digits

**pentose** a 5-carbon monosaccharide sugar

**peptide** a chain of up to 20 amino acid residues, linked by peptide linkages

**peptide linkage** a covalent bonding of the amino group of one amino acid to the carboxyl group of another (with the loss of a molecule of water)

**perception** the mental interpretation of sense data (i.e. occurring in the brain)

**pericardium** a tough membrane surrounding and containing the heart

**peristalsis** wave of muscular contractions passing down the gut wall

**pesticide** a chemical that is used to kill pests

**petal** modified leaf, often brightly coloured, found in flowers

**phagocytic cells** cells that ingest bacteria, etc. (e.g. certain leucocytes, *Amoeba*)

**phenotype** the characteristics or appearance (structural, biochemical, etc.) of an organism

**pheromone** volatile chemical signal released into the air

**phloem** tissue that conducts elaborated food in plant stems

**phosphate (P<sub>i</sub>)** phosphate ions, as involved in metabolism

**phospholipid** formed from a triacylglycerol in which one of the fatty acid groups is replaced by an ionized phosphate group

**photoautotroph** an organism that uses light energy to generate ATP and to produce organic compounds from inorganic substances

**photoheterotroph** an organism that uses light energy to generate ATP and obtains organic compounds from other organisms

**photomorphogenesis** effects on plant growth of light

**photoperiodism** day-length control of flowering in plants

**photophosphorylation** the formation of ATP, using light energy (in the light-dependent step of photosynthesis in the grana)

**photosynthesis** the production of sugar from carbon dioxide and water, occurring in chloroplasts and using light energy, and producing oxygen as a waste product

**phototropism** a tropic response of plants to light

**phylogenetic classification** a classification based on evolutionary relationships (rather than on appearances)

**phylum** a group of organisms constructed on a similar general plan, usually thought to be evolutionarily related

**physiology** the study of the functioning of organisms

**phytoplankton** photosynthetic plankton, including unicellular algae and cyanobacteria

**pinocytosis** uptake of a droplet of liquid into a cell involving invagination of the plasma membrane

**pituitary gland** the master endocrine gland, attached to the underside of the brain

**placenta** maternal and fetal tissue in the wall of the uterus, site of all exchanges of metabolites and waste products between fetal and maternal blood systems

**plankton** very small, aquatic (marine or fresh water) plants and animals, many of them unicellular, that live at or near the water's surface

**plant growth substance** substances produced by plants in relatively small amounts, that interact to control growth and development

**plasma** the liquid part of blood

**plasma membrane** the membrane of lipid and protein that forms the surface of cells (constructed as a fluid mosaic membrane)

**plasmid** small circular DNA that is independent of the chromosome in bacteria (R plasmids contain genes for resistance to antibiotics)

**plasmolysis** withdrawal of water from a plant cell by osmosis (incipient plasmolysis is established when about 50% of cells show some shrinkage of cytoplasm away from the walls)

**plastid** an organelle containing pigments (e.g. chloroplast)

- platelets** tiny cell fragments that lack a nucleus, found in the blood and involved in the blood clotting mechanism
- pleural membrane** lines lungs and thorax cavity and contains the pleural fluid
- pneumocyte** epithelial cell type lining the air spaces of the lungs
- polarize** the setting up of an electrical potential difference across a membrane
- polarized light** light in which rays vibrate in one plane only
- pollen** microspore produced in anthers (and male cones), containing male gamete(s)
- pollen tube** grows out of a pollen grain attached to a stigma, and down through the style tissue to the embryo sac
- polygenic inheritance** inheritance of phenotypic characters (such as height, eye colour in humans) that are determined by the collective effects of several different genes
- polymer** large organic molecules made up of repeating subunits (monomers)
- polymerase chain reaction** a technology in molecular biology used to amplify a single or very few pieces of DNA, generating many thousands of copies
- polynucleotide** a long, unbranched chain of nucleotides, as found in DNA and RNA
- polypeptide** a chain of amino acid residues linked by peptide linkages
- polyploidy** having more than two sets of chromosomes per cell
- polysaccharides** very high molecular mass carbohydrates, formed by condensation of vast numbers of monosaccharide units, with the removal of water
- polysome** an aggregation of ribosomes along a molecule of mRNA strand
- population** a group of organisms of the same species which live in the same area (habitat) at the same time
- portal vein** vein beginning and ending in a capillary network (rather than at the heart)
- post-synaptic neuron** neuron 'downstream' of a synapse
- potential difference** separation of electrical charge within or across a structure (e.g. a membrane)
- potential energy** stored energy
- predator** an organism that catches and kills other animals to eat
- predict give an expected result**
- pre-synaptic membrane** membrane of the tip of an axon at the point of the synapse
- pre-synaptic neuron** neuron 'upstream' of a synapse
- prey–predator relationship** the inter-relationship of population sizes due to predation of one species (the predator) on another (the prey)
- probe** a defined, labelled fragment of DNA or RNA used to identify corresponding sequences in nucleic acids
- proboscis** a projection from the head, used for feeding
- producer** an autotrophic organism
- productivity** the amount of biomass fixed by producers (photosynthetically)
- gross productivity** total amount of organic matter produced
- net productivity** the organic matter of organisms less the amount needed to fuel respiration
- prokaryote** tiny unicellular organism without a true nucleus; they have a ring of RNA or DNA as a chromosome (e.g. bacteria and cyanobacteria)
- promoter region** a region of DNA that initiates transcription of a particular gene
- prophase** first stage in nuclear division, mitotic or meiotic
- proprioceptor** an internal sensory receptor
- prosthetic group** a non-protein substance, bound to a protein as part of an enzyme, often forming part of the active site, and able to bind to other proteins
- protein** a long sequence of amino acid residues combined together (primary structure), and taking up a particular shape (secondary and tertiary structure)
- proteome** the entire set of proteins expressed by a genome
- Protoctista** kingdom of the eukaryotes consisting of single-celled organisms and multicellular organisms related to them (e.g. protozoa and algae)
- protoplast** the living contents of a plant cell, contained by the cell wall
- protozoan** a single-celled animal-like organism, belonging to a sub-kingdom, the Protozoa, of the kingdom Protoctista
- pseudopodium** a temporary extension of the body of an amoeboid cell, by which movement or feeding may occur
- pulmonary circulation** the circulation to the lungs in vertebrates having a double circulation
- pulmonary ventilation rate** breathing rate
- pulse** a wave of increased pressure in the arterial circulation, generated by the heartbeat
- pumps** proteins in plasma membranes that use energy directly to carry substances across (primary pump) or work indirectly from metabolic energy (secondary pump)
- pupil** central aperture in the eye through which light enters
- pure breeding** homozygous, at least for the gene(s) specified
- Purkinje fibres** fibres of the bundle of His that conduct impulses between the atria and ventricles of the heart
- pyloric sphincter** circular muscle at the opening of the stomach to the duodenum
- pyruvic acid** a 3-carbon organic acid,  $\text{CH}_3\text{CO.COOH}$ ; product of glycolysis
- Q**
- quadrat** a sampling area enclosed within a frame
- R**
- radical** a short-lived, intermediate product of a reaction, formed when a covalent bond breaks, with one of the two bonding electrons going to each atom
- radioactive dating** using the proportions of different isotopes in fossilized biological material to estimate when the original organism was alive



- reaction centres** protein–pigment complexes in the grana of chloroplasts, sites of the photochemical reactions of photosynthesis
- receptor** a cell which responds to stimuli
- recessive allele** an allele that has an effect on the phenotype only when present in the homozygous state
- reciprocal cross** a cross between the same pair of genotypes in which the sources of the gametes (male and female) are reversed
- recombinant** a chromosome (or cell or organism) in which the genetic information has been rearranged
- recombinant DNA** DNA which has been artificially changed, involving joining together genes from different sources, typically from different species
- recycling of nutrients** the process by which materials from dead organisms are broken down and made available for re-use in the biosphere
- redox reaction** reaction in which reduction and oxidation happen simultaneously
- reductive division** meiosis, in which the chromosome number of a diploid cell is halved
- reflex** a rapid unconscious response
- reflex action** a response automatically elicited by a stimulus
- reflex arc** a functional unit in the nervous system, consisting of sensory receptor, sensory neuron, (possibly relay neurons), motor neuron and effector (e.g. muscle or gland)
- refractory period** the period after excitation of a neuron, when a repetition of the stimulus fails to induce the same response, divided into periods known as absolute and relative
- relative atomic mass** the ratio of the mass of an atom of an element to the mass of a carbon atom
- renal capsule** the cup-shaped closed end of a nephron which, with the glomerulus, constitutes a Malpighian body
- renewable energy** energy that comes from exploiting wave power, wind power, tidal power, solar energy, hydroelectric power or biological sources such as biomass
- replication** duplication of DNA by making a copy of an existing molecule
- semi-conservative replication** each strand of an existing DNA double helix acts as the template for the synthesis of a new strand
- reproduction** formation of new individual by sexual or asexual means
- respiration** the cellular process by which sugars and other substances are broken down to release chemical energy for other cellular processes
- respiratory centre** region of the medulla of the brain concerned with the involuntary control of breathing
- respiratory pigment** substance such as hemoglobin, which associates with oxygen
- respiratory quotient** ratio of the volume of carbon dioxide produced to the oxygen used in respiration
- respiratory surface** a surface adapted for gaseous exchange
- respirometer** apparatus for the measurement of respiratory gaseous exchange
- response** the outcome when a stimulus is detected by a receptor
- resting potential** the potential difference across the membrane of a neuron when it is not being stimulated (repolarized)
- restriction enzymes** enzymes, also known as endonucleases, that cut lengths of nucleic acid at specific sequences of bases
- retina** the light-sensitive layer at the back of the eye
- retroviruses** viruses which, on arrival in a host cell, have their own RNA copied into DNA which then attaches to the host DNA for a period
- ribonucleic acid (RNA)** a form of nucleic acid containing the pentose sugar ribose, found in nucleus and cytoplasm of eukaryotic cells (and commonly the only nucleic acid of prokaryotes), and containing the organic bases adenine, guanine, uracil and cytosine
- ribosome** non-membranous organelle, site of protein synthesis
- ribulose biphosphate (RuBisCo)** the 5-carbon acceptor molecule for carbon dioxide, in the light-independent step of photosynthesis
- rod cell** one of two types of light-sensitive cell in the retina, responsible for non-colour vision
- roughage** indigestible matter (such as cellulose fibres) in our diet
- S**
- saliva** secretion produced by salivary glands
- saltatory conduction** impulse conduction ‘in jumps’, between nodes of Ranvier
- saprotroph** organism that feeds on dead organic matter (saprotrophic nutrition)
- sarcolemma** membranous sheath around a muscle fibre
- sarcomere** a unit of a skeletal (voluntary) muscle fibre, between two Z-discs
- sarcoplasm** cytoplasm around the myofibril of a muscle fibre
- sarcoplasmic reticulum** network of membranes around the myofibrils of a muscle fibre
- saturated fat** fat with a fully hydrogenated carbon backbone (i.e. no double bonds present)
- Schwann cell** cell which forms the sheath around nerve fibres
- sclera** the opaque, fibrous coat of the eyeball
- secondary sexual characteristic** sexual characteristic that develops under the influence of sex hormones (androgens and estrogens)
- secondary succession** a plant succession on soil already formed, from which the community had been abruptly removed

- secretion** material produced and released from glandular cells
- sedentary** organism living attached to the substratum (e.g. rock or other surface)
- seed** formed from a fertilized ovule, containing an embryonic plant and food store
- segmentation** body plan built on a repeating series of similar segments (e.g. as in annelids)
- selection** differential survivability or reproductive potential of different organisms of a breeding population
- self-pollination** transfer of pollen from the anther to the stigma of the same plant (normally the same flower)
- selfing** self-pollination or self-fertilization
- semilunar valve** half-moon shaped valves, preventing backflow in a tube (e.g. a vein)
- seminiferous tubule** elongated tubes in the testes, the site of sperm production
- sense organ** an organ of cells sensitive to external stimuli
- sensory area** an area of the cerebral cortex of the brain receiving impulses from the sense organs of the body
- sensory neuron** nerve cell carrying impulses from a sense organ or receptor to the central nervous system
- sensory receptor** a cell specialized to respond to stimulation by the production of an action potential (impulse)
- sepal** the protective outermost parts of a flower, usually green
- seral stage/sere** stages in a seral succession, the whole succession being known as a sere
- sex chromosome** a chromosome which determines sex rather than other body (soma) characteristics
- sex linkage** genes carried on only one of the sex chromosomes and which therefore show a different pattern of inheritance in crosses where the male carries the gene from those where the female carries the gene
- sexual reproduction** involves the production and fusion of gametes
- shrub layer** the low-level (below trees) woody perennials growing in a forest or wood, normally most numerous in clearings (e.g. where a full-grown tree has died)
- sibling** offspring of the same parent
- sieve tube** a phloem element, accompanied by a companion cell, and having perforated end walls known as sieve plates
- simple sugar** monosaccharide sugar such as a triose sugar (3C), pentose sugar (5C) or hexose sugar (6C)
- single access key** contrasting or mutually exclusive characteristics are used to divide the group of organisms into progressively smaller groupings until individual organisms (species) can be identified
- sinoatrial node** cells in the wall of the right atrium in which the heartbeat is initiated, also known as the pacemaker
- sinus** a cavity or space
- sketch** represent by means of a diagram or graph (labelled as appropriate). The sketch should give a general idea of the required shape or relationship, and should include relevant features
- solar energy** electromagnetic radiation derived from the fusion of hydrogen atoms of the Sun, reaching Earth from space
- somatic cell (soma)** body cell – not a cell producing gametes (sex cell)
- specialization** adaptation for a particular mode of life or function
- speciation** the evolution of new species
- species** a group of individuals of common ancestry that closely resemble each other and that are normally capable of interbreeding to produce fertile offspring
- spermatogonia** male germ cells (stem cells) which make up the inner layer of the lining of the seminiferous tubules, and give rise to spermatocytes
- spermocyte** cell formed in seminiferous tubules of testes; develops into sperm
- sperms** motile male gametes of animals
- spindle** structure formed from microtubules, associated with the movements of chromosomes in mitosis and meiosis
- spiracle** hole in the side of an insect (thorax and abdomen) by which the tracheal respiratory system connects with the atmosphere
- spiral vessel** protoxylem vessel with spirally arranged lignin thickening in lateral walls
- spirometer** apparatus for measurements of lung capacity and breathing rates
- spore** a small, usually unicellular reproductive structure from which a new organism arises
- stamen** male reproductive organ of the flower, consisting of filament and anther, containing pollen sacs where pollen is formed and released
- standing crop** the biomass of a particular area under study
- state** give a specific name, value or other brief answer without explanation or calculation
- stem cell** undifferentiated cell in embryo or adult that can undergo unlimited division and can give rise to one of many different cell types
- steroid** organic molecule formed from a complex ring of carbon atoms, of which cholesterol is a typical example
- stigma** part of the carpel receptive to pollen
- stimulus** a change in the environment (internal or external) that is detected by a receptor and leads to a response
- stoma** (plural, **stomata**) pore in the epidermis of a leaf, surrounded by two guard cells
- stretch receptor** sensory receptor in muscles
- stroke volume** volume of blood pumped out by the heart per minute
- stroma** colourless fluid contents of the chloroplast, site of the light-independent reaction in photosynthesis

**style** found in the female part of the flower (carpel), linking stigma to ovary

**substrate** a molecule that is the starting point for a biochemical reaction and that forms a complex with a specific enzyme

**subthreshold stimulus** a stimulus not strong enough to trigger an action potential

**succession** the sequences of different communities developing in a given habitat over a period of time

**sugars** compounds of a general formula  $C_x(H_2O)_y$ , where  $x$  is approximately equal to  $y$ , and containing an aldehyde or a ketone group

**suggest** propose a solution, hypothesis or other possible answer

**summation** combined effect of many nerve impulses

**spatial summation** many impulses arriving from different axons

**temporal summation** many impulses arriving via a single axon

**surfactant** compound that lowers the surface tension between liquids and a solid

**suspensory ligament** attaches lens to ciliary body in the vertebrate eye

**symbiosis** literally 'living together'; covering parasitism, commensalism and mutualism

**symplast** the pathway (e.g. of water) through the living contents of cells

**synapse** the connection between two nerve cells; functionally a tiny gap, the synaptic cleft, traversed by transmitter substances

**synaptic knob** the terminal swelling of a pre-synaptic neuron

**synergism** acting together and producing a larger effect than when acting separately

**synovial fluid** secreted by the synovial membrane at joints, having lubricating role

**systematics** the study of the diversity of living things

**systemic circulation** the blood circulation to the body (not the pulmonary circulation)

**systemic pesticide** pesticide that is absorbed and carried throughout the body

**systole** contraction phases in the cardiac cycle

## T

**target organ** organ on which a hormone acts (although broadcast to all organs)

**taste bud** sense organ found chiefly on the upper surface of the tongue

**taxis** response by a motile organism (or gamete) where the direction of the response is determined by the direction of the stimulus

**taxon** a classificatory grouping

**taxonomy** the science of classification

**telophase** a phase in nuclear division, when the daughter nuclei form

**template (DNA)** the DNA of the chromosome, copied to make mRNA

**tendon** fibrous connective tissue connecting a muscle to bone

**terminal bud** bud at the apex of the stem

**test cross** testing a suspected heterozygote by crossing it with a known homozygous recessive

**testa** seed coat

**testis** male reproductive gland, producing sperms

**testosterone** a steroid hormone, the main sex hormone of male mammals

**thermogenesis** generation of heat by metabolism

**thorax** in mammals, the upper part of the body separated from the abdomen; in insects, the region between head and abdomen

**threshold of stimulation** the level of stimulation required to trigger an action potential (impulse)

**thrombosis** blood clot formation, leading to blockage of a blood vessel

**thylakoid** membrane system of chloroplast

**thyroid gland** an endocrine gland found in the neck of vertebrates, site of production of thyroxin and other hormones influencing the rate of metabolism

**tidal volume** volume of air normally exchanged in breathing

**tight junction** point where plasma membranes of adjacent cells are sealed together

**tissue** collection of cells of similar structure and function

**tissue fluid** the liquid bathing cells, formed from blood minus cells and plasma proteins

**tonoplast** membrane around the plant cell vacuole

**total lung capacity** volume of air in the lungs after maximum inhalation

**toxic** poisonous

**toxin** poison

**toxoid** inactivated poison

**trachea** windpipe

**tracheal system** system of tubes by which air is passed to tissues in insects

**tracheole** branch of the trachea in insects

**trait** a tendency or characteristic

**transcription** when the DNA sequence of bases is converted into mRNA

**transcription factor** a protein that binds to specific DNA sequences to control the transcription of mRNA

**transect** arbitrary line through a habitat, selected to sample the community

**transfer RNA (tRNA)** short lengths of specific RNA that combine with specific amino acids prior to protein synthesis

**translation** the information of mRNA is decoded into protein (amino acid sequence)

**translocation** transport of elaborated food via the phloem

- transmitter substances** substances released into the synaptic cleft on arrival of an impulse at the pre-synaptic membrane to conduct the signal across the synapse
- transpiration** loss of water vapour from the aerial parts of plants (leaves and stem)
- tricarboxylic acid (TCA) cycle** the stage in tissue respiration in which pyruvate is broken down to carbon dioxide, and hydrogen is removed for subsequent oxidation
- tricuspid valve** right atrioventricular valve
- triglyceride** fatty acid ester of the 3-carbon alcohol, glycerol – forms into globules because of its hydrophobic properties
- triose** a 3-carbon monosaccharide
- tripeptide** a peptide of three amino acid residues
- trophic level** a level in a food chain defined by the method of obtaining food and in which all organisms are the same number of energy transfers away from the original source of the energy (photosynthesis)
- tropism** a growth response of plants in which the direction of growth is determined by the direction of the stimulus
- tumour** abnormal proliferation of cells, either benign (if self-limiting) or malignant (if invasive)
- turgid** having high internal pressure
- U**
- ultrafiltration** occurs through the tiny pores in the capillaries of the glomerulus
- ultrastructure** fine structure of cells, determined by electron microscopy
- unisexual** of one or other sex
- unsaturated fat** lipid with double bond(s) in the hydrocarbon chain
- urea**  $\text{NH}_2\text{CONH}_2$ , formed from amino groups deaminated from excess amino acid
- ureter** tube from kidney to bladder
- urethra** tube from bladder to exterior
- uric acid** an insoluble purine, formed from the breakdown of nucleic acids and proteins
- urine** an excretory fluid produced by the kidneys, consisting largely of a dilute solution of urea
- uterine cycle** cycle of changes to the wall of the uterus (approximately 28 days)
- uterus** the organ in which the embryo develops in female mammals
- V**
- vaccination** conferring immunity from a disease by injecting an antigen (of attenuated microorganisms or inactivated component) so that the body acquires antibodies prior to potential infection
- vacuole** fluid-filled space in the cytoplasm, especially large and permanent in plant cells
- vagus nerve** 10th cranial nerve; supplies many internal organs, including the heart
- variety** a taxonomic group below the species level
- vasa recta** capillary loop supplying the loop of Henle
- vascular bundle** strands of xylem and phloem (often with fibres) separated by cambium; the site of water and elaborated food movements up and down the stem
- vascular tissue** xylem and phloem of plants
- vasoconstriction** constriction of blood supply to capillaries (of skin)
- vasodilation** dilation of blood supply to capillaries (of skin)
- vector** an organism that transmits a disease-causing organism, or a device for transferring genes during genetic engineering
- vein** vessel that returns blood to the heart
- venous return** volume of blood returning to the heart via the veins per minute
- ventilation rate** number of inhalations or exhalations per minute
- ventral** the underside
- ventricle** chamber, either of the centre of the brain, or of the heart
- venule** branch of a vein
- vertebrate** animal with a vertebral column
- vesicle** membrane-bound sac
- vestibular apparatus** the semicircular canals of the inner ear, concerned with balance
- vestibular canal** upper compartment of the cochlea
- vestigial** small, imperfectly developed structure
- virus** minute, intracellular parasite, formed of protein and nucleic acid
- vitalism theory** early idea that organic compounds could only be produced in living cells
- vitreous humour** clear jelly of inner eye
- W**
- water table** level of ground water in the Earth
- wax** complex form of lipid
- weathering** breakdown of rock
- white matter** nerve fibres wrapped in their myelin sheaths
- X**
- xeromorphic** modified to withstand drought
- xerophyte** plant showing modifications to withstand drought
- xerosere** succession of plants starting from dry terrain
- xylem** water-conducting vessels of plants
- Y**
- yolk** food stores of egg cells, rich in proteins and lipids
- yolk sac** membranous sac with numerous blood vessels, developed by vertebrate embryos around the yolk (e.g. in birds and reptiles) or as a component of the placenta (in mammals)
- Z**
- zonation** naturally occurring distribution of organisms in zones
- zygote** product of the fusion of gametes
- zymogenic cells** cells of gastric glands, secreting pepsinogen