

# Glossary

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## A

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- abiotic factor** physical or non-living conditions that affect the distribution of a population in an ecosystem, such as light, temperature, soil pH
- absorption** the process by which soluble products of digestion move into the blood from the small intestine
- abstinence** method of contraception whereby the couple refrains from intercourse, particularly when an egg might be in the oviduct
- accommodation** ability of the eyes to change focus
- acid rain** rain water which is made more acidic by pollutant gases
- active site** the place on an enzyme where the substrate molecule binds
- active transport** in active transport, cells use energy to transport substances through cell membranes against a concentration gradient
- adaptation** features that organisms have to help them survive in their environment
- ADH (antidiuretic hormone)** a hormone released by the pituitary gland, which acts on the kidney in response to changes in the concentration of the blood plasma
- adrenaline** a hormone released quickly from the adrenal glands during a 'flight or fight' situation
- adrenal medulla** part of the adrenal gland that produces the hormone adrenaline
- adult cell cloning** a form of cloning where an embryo is produced from an adult body cell. The embryo is then implanted into a female animal or used for therapeutic reasons, (e.g. this process was used to create Dolly the sheep)
- adult stem cells** rare, un specialised cells found in some tissues in adults that can differentiate only into the cell type where they are found, e.g. blood cells
- aerobic respiration** respiration that involves the use of oxygen
- agar plate** plastic dish, with a lid, containing a nutrient gel upon which bacteria are grown in a lab
- alleles** inherited characteristics are carried as pairs of alleles on pairs of chromosomes. Different forms of a gene are different alleles
- alveolus** (plural: alveoli) air sacs; the site of gaseous exchange in the lungs
- amino acids** small molecules from which proteins are built
- amylase** a digestive enzyme (carbohydrase) that breaks down starch
- anaerobic respiration** respiration without using oxygen
- antibacterial chemicals** chemicals produced by plants as a defence mechanism; the amount produced will increase if the plant is under attack
- antibiotic** e.g. penicillin; medicines that work inside the body to kill bacterial pathogens
- antibody** protein normally present in the body or produced in response to an antigen, which it neutralises, thus producing an immune response
- antimicrobial resistance (AMR)** an increasing problem in the twenty-first century whereby bacteria have evolved to develop resistance against antibiotics due to their overuse
- antiretroviral drugs** drugs used to treat HIV infections; they stop the virus entering the lymph nodes
- antiseptic** substance that prevents the growth of bacteria
- antitoxins** chemicals produced by white blood cells (lymphocytes) that neutralise toxins to make a safe chemical
- antivirals** drugs used to treat viral infections; they are specific to the virus but can only slow down viral development
- aorta** artery that carries oxygenated blood from the left ventricle to tissues around the body
- apex predator** carnivores with no predators, they are at the top of the food chain
- aphids (greenfly)** disease-causing small insects that reproduce rapidly; aphid infestation causes reduced growth, yellow leaves, wilting and death
- archaea** primitive bacteria that usually live in extreme conditions
- artificial heart** a temporary heart used to keep patients alive while they are waiting for a transplant
- artificial pacemaker** a device fitted under the skin that sends out electrical impulses to control the heartbeat

**arteries** blood vessels with thick elastic walls that carry oxygenated blood away from the heart under high pressure

**aseptic technique** measures taken to reduce contamination when preparing bacterial cultures, e.g. working with a flame

**asexual reproduction** reproduction involving only one parent

**aspirin** painkiller derived from willow bark

**ATP** molecule used to store energy in the body

**atrium (plural: atria)** the upper chambers of the heart that receive blood from the body or lungs

**autoclave** hot oven in which contaminated materials used in cell culture are sterilised

**auxin** a type of plant hormone produced at the tips of plant shoots and roots

## B

**bacteria** single-celled microorganisms which can either be free-living organisms or parasites (they sometimes invade the body and cause disease)

**bacterial growth curve** bell-shaped curve that shows how bacteria in culture increase in number exponentially until a build-up of toxins in the culture causes them to die off

**barrier methods** of contraception; where a condom or diaphragm is used to prevent sperm reaching an egg

**basal metabolic rate** the level at which chemical reactions take place in the body at rest

**behaviour** animals adapt their movement and feeding patterns according to the conditions of their environment

**Benedict's test** a test for sugar in which Benedict's reagent turns orange-red in the presence of sugar

**benign tumour** slow-growing, harmless mass of cells that can usually be easily removed

**bias** when a data set is inaccurate or unrepresentative; it contains systematic errors

**bile** an alkaline substance made by the liver and stored in the gall bladder, which emulsifies fat to aid digestion

**biotic factor** factors caused by living organisms, such as food availability and competition between species

**binary fission** the process by which a bacterium divides and doubles its numbers, approximately every 20 minutes

**binomial system** the scientific way of naming an organism whereby each organism has a genus name and a species name; e.g. *Homo sapiens*

**biodiversity** range of different plant and animal species living in an ecosystem

**biogas** energy released when bacteria break down biomass, which can be used as a cheap fuel source

**biomass** the dry mass of organisms

**Biuret reagent** chemical indicator used to test for the presence of protein in a sample

**blood sugar level** the amount of glucose in the blood (controlled by the hormones, insulin and glucagon)

**biological catalysts** enzymes – molecules in the body that speed up chemical reactions

**biotechnology** using living organisms to make products to improve quality of life

**body mass index (BMI)** measure of someone's weight in relation to their height

**breed** new form of animal created with particular characteristics, created through selective breeding

**bronchus (plural: bronchi)** branches of the trachea – one going to each lung

## C

**calibrate** the process of checking the accuracy a piece of equipment using standard data

**camouflage** a method of avoiding detection used by prey to avoid predators and by predators to surprise prey

**capillaries** small blood vessels that are one cell thick and permeable for diffusion of gases; join arteries to veins

**capillary network** tree of capillaries surrounding alveoli that are adapted for efficient gaseous exchange

**carbohydrase** enzyme that breaks down carbohydrates into simple sugars

**carbohydrates** one of the main groups of nutrients; e.g. glucose, starch

**carbon cycle** a natural cycle through which carbon moves by respiration, photosynthesis and combustion, in the form of carbon dioxide

**carbon sink** 'stores' of carbon dioxide in oceans or forests

**carcinogen** substance or virus that increases the risk of cancer, e.g. ionising radiation

**carrier** someone who is heterozygous for a disease-causing gene so that they do not have the condition but 'carry' the defective allele, which they could pass on to their children

**causal mechanism** where a direct link has been made between a risk factor and a disease; e.g. smoking and lung cancer

**cell lines** cells grown in a lab that are used to study a certain condition

**cell membrane** layer around a cell which helps to control substances entering and leaving the cell

**cell cycle** a series of three stages during which a cell divides

**cellulose** polymer of glucose; strengthening component of plant cell walls

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

**cerebellum** area at the base of the brain that coordinates muscular activity

**cerebral cortex** highly folded outer layer of the brain that controls consciousness, intelligence, memory and language

**cervix** the neck of the womb

**Charles Darwin** scientist who proposed the theory of evolution by natural selection

**chlorophyll** pigment found in plants which is used in photosynthesis (gives green plants their colour)

**chloroplast** a cell structure found in green plants that contains chlorophyll

**chlorosis** when a plant develops yellow leaves due to a lack of magnesium

**chromosomes** thread-like structures in the cell nucleus that contain DNA

**cilia** tiny hair-like structures found throughout the respiratory system that beat together to move mucus out of the lungs

**classify** to organise and present data in a logical order, e.g. in a table

**clinical trial** process during which a new drug is tested on patients and healthy individuals

**clone** in asexual reproduction, the offspring produced are identical to the parent (clones)

**collision theory** an explanation of enzyme action; enzymes cause more collisions between reactants thereby increasing the rate of reaction until reactants are used up

**colony** a spot containing millions of bacteria growing on an agar plate

**combined contraceptive pill** a hormonal method of contraception, taken orally, which contains synthetic forms of oestrogen and progesterone

**communicable disease** infectious condition caused by a virus, protist, bacteria or fungi; e.g. measles, HIV

**community** all the plants and animals living in an ecosystem, e.g. a garden

**companion cells** found next to phloem cells, companion cells control the activities of the phloem

**compare** to examine your data set next to a known set of results

**competition** when different species in an ecosystem compete for the same resources

**complementary** describes how each DNA strand in a double helix pairs with the opposite strand through base pairs (A-T and G-C)

**complex diseases** conditions that are caused by a combination of genetic and environmental factors

**compost** dead and decaying plant material

**condom** rubber sheath that covers the erect penis and prevents sperm reaching the egg; a barrier form of contraception

**cones** light-sensitive receptor cells in the retina that allow us to see in colour

**conservation** a way of protecting a species or environment

**cooling** the body loses heat through sweating

**coordination** centre region of the body that receives and processes information from receptors, e.g. brain, pancreas

**cornea** transparent region at the front of the eye through which light refracts when it enters the eye

**coronary artery** vessel that provides the heart muscle with oxygen and glucose for respiration

**coronary heart disease** a condition caused by build-up of fatty deposits in the coronary artery, leading to reduced blood flow and less oxygen and glucose reaching the heart tissue, which can cause a heart attack

**correlation** relationship between two sets of results

**culture** the growing of cells in a lab

**culture** medium the liquid (nutrient broth) or gel (agar) in which bacteria are grown in a lab

**culture solutions** liquids with known amounts of specific minerals in which plants are grown to investigate mineral deficiencies

**cycle** predator-prey relationships follow a cyclical pattern whereby the numbers of prey rise and fall

over a period of years, and the numbers of predators follow the same pattern

**cystic fibrosis** disorder of cell membranes that is caused by a recessive allele

## D

**daughter cells** cells produced during mitosis that are identical to the parent cell

**deamination** the removal of amino groups, as ammonia, from excess amino acids, in the liver

**decomposer** an organism that breaks down carbon in dead animals and plants

**deforestation** removal of large areas of trees to provide land for cattle or growing crops

**dehydration** result of the body losing too much water

**demographic** describes the structure of a population

**denatured** an enzyme is denatured if its shape changes so that the substrate cannot fit into the active site

**depression** a mental health condition

**dialysis** process by which the blood is filtered by a dialysis machine, in someone with kidney failure

**diarrhoea** a symptom of food poisoning; frequent passing of liquid stools

**differentiation** when cells gain certain features needed for their function; they become specialised

**digitalis** a heart drug extracted from foxgloves

**directly proportional** describes a relationship between two variables on a graph where the line of best fit goes through 0,0

**disc-diffusion** technique used to test effectiveness of antibiotics or disinfectants on plates of cultured bacteria using paper discs soaked in the test substance and measuring the size of clear area around the discs

**disease resistance** crop plants that are not affected by certain diseases and can therefore be cloned in large numbers for farmers

**distribution** how living organisms are dispersed/spread out over an ecosystem

**DNA** (deoxyribonucleic acid) found as chromosomes in the nucleus – its sequence determines how our bodies are made, and gives each one of us a unique genetic code

**DNA bases** four chemicals that are found in DNA, they make up the base sequence and are given the letters A, T, G and C

**domain** the level of classification group above kingdom, first suggested by Carl Woese

**dominant** an allele that is expressed when one or two copies are present; represented by a capital letter

**dominant hand** the hand a person uses most often for single-handed tasks, e.g. writing

**donor** refers to the person or organism where donated cells or tissue come from

**dormant** describes seeds that have not germinated; they can be sprayed with the plant hormone gibberellins, which induces them to germinate

**dose** amount of a drug given to a patient

**double-blind trial** a drugs trial where neither doctors nor patients know whether the patient has received the test drug or the placebo

**double circulatory system** where the blood is pumped to the lungs then returned to the heart before being pumped round the body

**double helix** the shape of DNA – two strands of nucleotides that wind around each other like a twisted ladder

**dredging** the process of digging up sea beds; an example of environmental change induced by humans

**dual bar chart** bar graph on which two data sets are plotted at each point

## E

**Ebola** a deadly virus that kills 50–90% of people infected

**ecosystem** the interaction of a community of living organisms with the non-living parts of their surroundings

**effector** muscle or gland that brings about a response to a stimulus

**efficacy** how effective a drug is at preventing or curing the disease

**embryonic stem cells** unspecialised cells found in the early embryo that can differentiate into almost any cell type in the body

**embryo screening** the process whereby a few cells are taken from an embryo produced by IVF are checked for any defective genes

**embryo transplants** form of cloning where cells are taken from a developing embryo from a pregnant animal, separated and grown in culture then implanted into host mothers

**emulsify** the process by which fats are broken into smaller droplets by bile

**endocrine gland** part of the body that releases chemical messengers, or hormones, directly into the bloodstream

**endocrine system** a control system in the body that communicates using chemical messengers, or hormones, to produce slow but long-lasting responses

**endothermic reaction** chemical reaction which takes in heat

**environmental change** a shift in the external conditions caused by human activity or a natural event

**environmental variation** differences between individuals that arise during development; e.g. wearing glasses

**enzymes** biological catalysts that increase the speed of a chemical reaction

**epidemic** an outbreak of a disease that spreads quickly to many people

**epidermal tissues** layers of cells that cover the top surface of a leaf; they let light penetrate

**epiphyte** rainforest plant that is adapted to grow above ground level (e.g. on trees)

**estimate** a guess based on prior knowledge

**ethanol** product of anaerobic respiration in plant and yeast cells; used in the manufacture of alcoholic drinks

**ethene** a plant hormone released as a gas that speeds up fruit ripening

**ethical** whether a process is considered to be right or wrong, based on moral considerations

**eugenics** refers to the notion of improving a population by selecting certain desirable characteristics

**eukaryotic cells** cells that contain a true nucleus in the cytoplasm; e.g. plant and animal cells

**eutrophication** when waterways become too rich with nutrients (from fertilisers), allowing algae to grow wildly and subsequently decay, resulting in the oxygen being used up

**evaporation** the process by which the body loses heat through sweating

**evolution** the gradual change in organisms over millions of years caused by random mutations and natural selection

**evolutionary tree** a diagram created by scientists that shows how animals are believed to have evolved from common ancestors

**exchange surfaces** specialised areas with large surface area to volume ratios for efficient diffusion

**exothermic reaction** chemical reaction in which heat is given out

**extinction** the elimination of all members of a species; there have been five mass extinctions over geological time

**extracellular digestion** referring to when food is broken down outside an organism, e.g. bacteria secrete enzymes to breakdown dead material

**extremophile** organisms that can survive very extreme environments, e.g. high temperature or high salt

## F

**factory farming** a form of intensive farming where animals are reared in sheds or cages under controlled conditions

**family tree** a diagram used to show how a condition is passed down through a family

**fermentation** anaerobic respiration in yeast cells; produces ethanol and carbon dioxide

**fertiliser** chemical containing minerals (nitrates, phosphates, potassium and magnesium) put on soil to improve plant growth

**fertility drug** combination of hormones given to a woman with low FSH levels to stimulate egg production

**field of view** the area of a sample visible under a microscope

**filtrate** dissolved substances that cross into the kidney after the blood has been filtered

**flaccid** floppy

**follicle** the sac left once an egg is released in the ovary; it produces the hormone progesterone

**food security** when all people have access to a consistent supply of food to meet their needs

**fossil** the remains of organisms that lived millions of years ago

**fossil record** an incomplete account of organisms that lived millions of years ago

**fraction** (in genetics) the number of people affected by a recessive condition expressed as a fraction could be  $\frac{1}{4}$

**FSH** (follicle stimulating hormone) a reproductive hormone that causes eggs to mature in the ovaries

**functional adaptation** an adaptation involving how the body operates, e.g. camels don't sweat to avoid water loss

**fungicide** chemical used to kill fungi

## G

- gametes** the male and female sex cells (sperm and eggs)
- gel** derived from silicone, the material that contact lenses are made from
- gene** section of DNA that contains the instructions for a particular characteristic
- gene expression** whether genes are switched on or off, which is regulated by non-coding DNA
- generator** large tanks full of rotting organic matter, used for biogas production
- gene theory** dogma developed in the twentieth century that brought together the work of many scientists on inheritance, DNA structure and the genetic code
- gene therapy** medical procedure where a virus is used to 'carry' a gene into the nucleus of a cell (this is a new treatment for genetic diseases)
- genetic code** a sequence of three DNA bases that codes for a single amino acid
- genetic cross** a way of working out the probability of the genotype of the offspring produced from the parents' genotype for a particular characteristic, e.g. using a Punnett square
- genetic engineering** transfer of specific genes from one organism to another
- genetic marker gene** a gene inserted into a modified organism alongside the required gene; the marker gene is often resistant to an antibiotic, so that when cultures of cells are treated with that antibiotic, cells that do not contain the marker gene will be killed
- genetic variation** the product of meiosis, mutations and sexual reproduction, which all lead to changes in our genome
- genome** the entire genetic material of an organism
- genome editing** an experimental method of detecting and correcting defective genes in an individual
- genomics** the science of studying the human genome to increase our understanding of human DNA
- genotype** the alleles present for a particular gene make up the organism's genotype
- geotropism** a plant's growth response to gravity (also called gravitropism)
- gibberellins** plant hormones that speed up seed germination
- gills** a gas exchange surface found in fish and tadpoles

- global warming** the increase in the Earth's temperature due to increases in carbon dioxide levels
- glucagon** hormone released by the pancreas that, along with insulin, controls blood glucose levels
- glucose tolerance test** a way of testing for diabetes by measuring how the body responds to glucose
- GM crops** varieties of crops that have had their genomes modified by the insertion of genes from a plant or other organism
- goblet cells** cells in the epithelium that produce mucus to trap dust particles
- golden rice** rice that has been genetically modified to contain  $\beta$  - carotene, which converts to vitamin A
- gonorrhoea** a sexually transmitted disease caused by bacteria, resulting in pain when urinating and a thick discharge from the vagina or penis
- gradient** the steepness of a line plotted on a graph
- graticule** piece of glass or plastic onto which a scale has been drawn, which is used with a microscope
- Gregor Mendel** Austrian monk who established the science of genetics through his work on pea plants
- guard cells** cells surrounding the stomata that open and close the pore to control the exchange of gases and water loss

## H

- habitat** the place where an organism lives in an ecosystem; e.g. the worm's habitat is the soil
- haemocytometer** device used for counting the number of cells, e.g. under a microscope
- haemodialysis** filtering of the blood by a machine in patients with kidney failure; takes four hours, three times a week
- haemoglobin** chemical found in red blood cells which binds to oxygen to transport it around the body
- health** a state of complete mental and physical wellbeing
- heterozygous** a person who has two different alleles for a characteristic, e.g. someone with blond hair may also carry the allele for red hair
- HIV** (human immunodeficiency virus) virus transmitted through sexual contact that attacks the immune system
- homeostasis** the regulation of internal conditions, such as temperature, in the body
- homozygous** a person who has two alleles that are the same for a characteristic, e.g. a blue-eyed person will have two 'blue' alleles for eye colour

**hormone** chemical messenger that acts on target organs in the body

**hybrid** infertile organism created through interbreeding organisms from two different species

**hybridoma cells** cells made from combining tumour cells with lymphocytes, to give cells that can produce antibodies and divide (for the production of monoclonal antibodies)

**hydrocarbon** a compound composed of the elements hydrogen and carbon

**hydroponics** growing plants in mineral solutions without the need for soil

**hyperopia** long-sightedness; where people can see objects far away but not close up

**hypothesis** a scientific explanation formed based on prior knowledge that can be tested in an experiment

## I

**immune system** the body's defence against pathogens

**immunity** when the body is protected from a pathogen as it has already encountered it and can therefore produce antibodies against it, rapidly

**inbreeding** breeding closely related animals

**incubation** period of time a culture of bacteria is left at a certain temperature in order for the bacteria to grow

**indicator species** organisms used to measure the level of pollution in water or the air

**inoculating** loop length of wire with a ring at the end used for transferring bacteria to an agar plate

**insulin** hormone made by the pancreas that controls the level of glucose in the blood

**interbreeding** organisms of the same species can interbreed to give fertile offspring

**intercept** the point where the line on a graph crosses the y-axis

**interdependence** plants need animals for carbon dioxide and seed dispersal; animals need plants for food and oxygen; i.e. they depend on each other for survival

**interspecific competition** competition between two different species of organism

**intraspecific competition** competition among organisms from the same species

**invasive species** a cause of extinction as a result of a new species of organism being introduced into a population, which may bring disease, be a predator or compete with native organisms

**inverse square law** (in terms of light intensity and photosynthesis) the intensity of light is proportional to  $1/d^2$  (where  $d$  = distance from the light source); for example, if the distance is doubled, the light intensity is quartered

**in-vitro fertilisation (IVF)** a fertility treatment, whereby an egg is fertilised with sperm outside the body, in a laboratory

**iodine solution** an orange solution used to test for starch (turns blue-black when starch is present)

**iris** part of the eye that has sets of muscles that control the size of the pupil and regulate the light reaching the retina

**IUD** (intrauterine device) a device containing hormones that is placed in the uterus to prevent a fertilised egg from implanting; a hormonal method of contraception

**IVF cycle** the process of IVF from stimulation of the ovaries to implantation of an embryo; if unsuccessful, another cycle can be attempted after about two months

## K

**kingdom** the level of classification above phylum and below domain of living organisms

## L

**lactic acid** product of anaerobic respiration in muscles

**larva** immature but active form of an insect that's created from an egg and turns into a pupa

**laser surgery** a technique used to correct eye defects by changing the shape of the cornea

**LH** (luteinising hormone) a menstrual cycle hormone that stimulates an egg to be released from an ovary

**lichen** slow-growing plant that grows up trees

**lignin** substance found in some plant cell walls that gives them strength and rigidity

**limiting factor** factors such as light, temperature and carbon dioxide, which affect the rate of photosynthesis

**lipases** enzymes that digest fats into fatty acids and glycerol

**lock and key** theory to explain how enzymes work; the substrate is the 'key' and the active site is the 'lock'

**lumen** the central part of a vessel

**lymphatic system** network of vessels containing a colourless fluid into which fatty acids and glycerol are absorbed

**lymphocytes** white blood cells that produce antibodies and antitoxins to destroy pathogens

## M

**magnetic resonance imaging (MRI)** scanning technique that uses strong magnetic fields to produce detailed images of the body; used to diagnose nervous system disorders

**magnification** the factor by which an object is enlarged by a microscope; calculated as: size of image/size of real object

**malaria** condition characterised by recurring fever, which is spread by mosquitoes and can be fatal

**malignant tumour** abnormal cancerous mass of cells that grows quickly and can spread to other parts of the body

**mathematical model** an independent method used to show that Mendelian genetics is consistent with evolution

**median** the middle number in a set of values when they are arranged in order from lowest to highest

**medulla** region at the base of the brain that controls unconscious activities, such as breathing

**mean** average value calculated by adding up all the values in a data set then dividing by the number of values

**meiosis** cell division that results in gametes being produced, with half the number of chromosomes as the parent cell

**melanism** darkening of appearance – a form of colour variation in animals, e.g. melanic moths

**Mendelian inheritance** name given to single-gene disorders, such as cystic fibrosis

**menstrual cycle** monthly cycle in females which is controlled by reproductive hormones

**mental health** a feeling of well-being, having a positive frame of mind

**meristem** regions at tips of roots and shoots where cell division takes place

**metabolism** the sum of all reactions in a cell or the body

**micrograph** image captured using a microscope

**microorganisms** tiny organisms that can only be viewed with a microscope – also known as microbes

**migration patterns** historical movements of humans across the world, which have been deduced through studying genomes

**mimicry** mechanical defence mechanism where a plant uses features to trick animals into not feeding or not laying eggs

**mineral deficiency** when a plant cannot get enough of an essential mineral from the soil

**mineral ions** substances found in the soil that are essential for a plant's survival; e.g. plants need magnesium ions to make chlorophyll

**missing links** evidence for evolution found as intermediate forms between different organisms, as they evolved

**mitochondria** structures in a cell where respiration takes place

**mitosis** cell division that results in genetically identical diploid cells

**mixed population** plants bred from two different varieties for their desirable traits

**mode** the most frequently occurring number in a set of values

**monoclonal antibodies** antibodies made from cells that are cloned from one cell that are specific to one binding site on an antigen. They are used in medicine to treat cancer, and in research

**monocultures** where only one crop is grown in an area

**motor neurone** nerve cell carrying information from the central nervous system to muscles

**MRSA** bacteria that are resistant to the antibiotic, methicillin

**mulch** compost or decaying leaves put around rose bushes in the spring to prevent rose black spot spores reaching the stems

**mutation** where the DNA within cells has been altered (this happens in cancer)

**mycoprotein** a protein-rich food made from microorganisms in fermentation vats

**myelin sheath** a fatty insulating layer that surrounds neurones and speeds up nerve transmission

**myopia** short-sightedness; when people can see objects at short distances but not far away

## N

**natural selection** process by which advantageous characteristics that can be passed on in genes become more common in a population over many generations

**negative feedback** a regulatory process in the body whereby changes in the body can be reversed once they have happened

**nervous system** a control system in the body that uses electrical impulses to communicate rapidly and precisely



**neurone** a nerve cell that is specialised to transmit electrical signals

**nitrate** nutrients found in fertilisers and the soil that plants need for protein synthesis, and therefore growth

**non-coding DNA** sections of DNA that do not code for genes but turn genes on or off instead; they regulate gene expression

**non-communicable disease** conditions caused by environmental or genetic factors that are not spread among people; e.g. cancer, cardiovascular disease

**non-invasive** describes brain mapping techniques, such as MRI scans, that can be carried out without the need for surgery

**nuclear transfer** type of cloning that involves taking a nucleus from a body cell and placing it into an egg cell

**nucleic acid** group of complex molecules found in living organisms including DNA and various types of RNA

**nucleotide** a sugar and phosphate group with a chemical base (A, T, C, G) attached to the sugar

**nutrient broth** liquid used for growing bacteria

## O

**oestrogen** the main female reproductive hormone produced by the ovaries

**opiates** a group of painkillers found in poppies

**optic nerve** nerve found at the back of the eye that carries impulses from the retina to the brain

**optimum** the conditions, in terms of temperature and pH, at which an enzyme works best

**optimum dose** the amount of a new drug needed to be effective, determined in a trial by starting at low doses

**order** a level of classification below class but above family; e.g. butterflies and moths are orders of the insect family

**order of magnitude** in microscopy, the difference between sizes of cells, calculated in factors of 10

**organ** group of tissues that carries out a specific function

**organ system** arrangement of organs in the body according to function; e.g. respiratory system

**osmosis** the diffusion of water molecules through a partially permeable membrane, from a dilute solution to a concentrated solution

**out of phase** refers to the cycle of a predator lagging behind that of its prey

**ovulation** release of an egg from the ovary

**oxygen debt** the amount of oxygen that the body needs to breakdown lactic acid after muscles undergo anaerobic respiration

**oxyhaemoglobin** bright red substance formed when oxygen binds to haemoglobin in red blood cells; this is how oxygen is transported to tissues

## P

**pacemaker** a group of cells in the right atrium that controls the heart rate

**palaeontologists** scientists who study fossils

**palisade mesophyll** tightly packed together cells found on the upper side of a leaf that carry out photosynthesis

**pandemic** when an outbreak of a disease becomes global

**parasitism** a relationship between two organisms where one benefits and the other is harmed, e.g. tapeworms in humans

**partially permeable membrane** a membrane that allows some small molecules to pass through but not larger molecules

**pathogen** harmful microorganism that invades the body and causes infectious disease

**peatlands** areas of peat bog formed in marshlands; peat is partially decomposed leaf matter that is used as fuel and cheap compost

**peer review** scientific findings are scrutinised by independent experts before they can be published

**penicillin** an antibiotic, isolated from *Penicillium* mould, which was discovered by Alexander Flemming

**percentage** a number or amount expressed per hundred

**peripheral nervous system (PNS)** network of nerves leading to and from the spinal cord

**peristalsis** the movement of food through the digestive system by muscle contraction

**peritoneal dialysis** a type of dialysis where fluid is pumped into the abdomen and waste products diffuse into it across a membrane in the body called the peritoneum

**Petri dish** plate, with a lid, used for growing bacteria in a lab

**phagocyte** a type of white blood cell that enters tissues and engulfs pathogens then ingests them

**phagocytosis** process by which a white blood cell (phagocyte) engulfs a pathogen

**phenolphthalein indicator** a pink solution (at pH 10) that turns colourless when fatty acids are added

**phenotype** the characteristic that is shown or expressed

**phloem** specialised transporting cells which form tubules in plants to carry sugars from leaves to other parts of the plant

**phosphates** nutrients found in soil and fertilisers that plants need for respiration and growth

**photosynthesis** process carried out by green plants where sunlight, carbon dioxide and water are used to produce glucose and oxygen

**phototropism** a plant's growth response to light

**pituitary gland** known as the 'master gland' as it controls other endocrine glands, such as the thyroid gland

**placebo** a treatment that does not contain a drug

**placenta** organ that forms during pregnancy that provides the foetus with oxygen and nutrients

**plant cuttings** in plant cloning, a leaf and stem are cut off a plant and then dipped in hormone powder to encourage rooting, a new plant then grows

**plant organ system** roots, stems and leaves, which collectively form a plant's transport system

**plasma** straw-coloured liquid part of blood

**plasmid** small ring of DNA found in prokaryotic cells

**plasmolysis/plasmolysed** the shrinking of a plant cell due to loss of water, the cell membrane pulls away from the cell wall

**platelets** cell fragments which help in blood clotting

**polydactyl** condition caused by a dominant allele in which the sufferer has extra fingers or toes

**polymer** a molecule, such as DNA, made up of repeating units

**population** the total number of one species in an ecosystem

**potometer** piece of equipment used to measure water uptake by plants

**preclinical testing** testing of a new drug in a lab using cells, tissues or live animals

**prey** animals that are eaten by a predator

**primary consumer** organism in a food chain that gets its energy from eating food (producers)

**probability** the likelihood of an event happening; e.g. there is a 1 in 4 chance of a couple who are both heterozygous for cystic fibrosis having a child with cystic fibrosis

**producers** organisms in a food chain that make food using sunlight

**progesterone** reproductive hormone that causes the lining of the uterus to be maintained

**progestogen-only pill** (or mini pill or POP) contraceptive pill that only contains progesterone (not oestrogen), which may be more suitable (than the combined pill) for women who are older or have high blood pressure

**Prokaryota** group of single-celled organisms including bacteria and Archaeans

**prokaryotic cells** single cells of bacteria and Archaeans with DNA found in a loop not enclosed in a nucleus

**proportion** (in genetics) the number of people affected by a condition expressed in relation to the total population

**proteases** digestive enzymes that break down proteins into amino acids

**protist** a type of single-celled organism, for example the pathogen that causes malaria

**pruning** snipping the tops off plant shoots in the spring, a treatment for rose black spot

**pulmonary artery** vessel that carries deoxygenated blood from the right ventricle to the lungs

**pulmonary vein** vessel that carries oxygenated blood from the lungs to the left atrium

**Punnett square** a grid used to determine possible outcomes of a genetic cross

**pyramid of biomass** table of dry weight of organisms at different trophic levels in an ecosystem, which forms a pyramid shape

## Q

**qualitative reagents** chemicals used to test for the presence of a substance in a sample

## R

**radiometric dating** method of determining the absolute age of rocks

**range** a measure of spread; the difference between the biggest and smallest values in a set

**range bar** line drawn on a graph to show the range of a set of values

**rate** the speed at which an event is occurring over time; can be calculated using the gradient on a graph

**rate of photosynthesis** is affected by temperature, light intensity, carbon dioxide concentration and amount of chlorophyll

**ratio** the relationship between two variables, expressed as 1:4, for example

**reaction time** the time it takes the body to respond to an event

**receptors** cells in the body that detect changes in the environment

**recessive** two copies of a recessive allele must be present for the characteristic to be expressed; represented by lowercase letters

**red blood cells** blood cells with a concave shape which are adapted to carry oxygen from the lungs to body cells

**reflex action** rapid automatic responses to a stimulus

**reflex arc** pathway taken by nerve impulses through the spinal cord during a reflex action

**refraction** the bending of light rays as they travel from one medium to another, e.g. as they enter the eye

**regeneration** restoration (of a habitat)

**relay neurone** neurone found in the spinal cord that transmits impulses from the sensory to the motor neurone

**repeatability** consistent data with a narrow range has a high repeatability; it is likely that the conclusions drawn from such a data set are valid

**resolving power** the ability of a microscope to distinguish between two points; the resolving power of electron microscopes is higher than that of light microscopes

**respiration** the process used by all organisms to release the energy they need from food

**retina** area at the back of the eye where light-sensitive receptor cells are found

**ribosome** structures in a cell where protein synthesis takes place

**risk factor** a lifestyle or genetic factor that increases the chance of developing a disease

**rods** light-sensitive receptor cells in the retina that allow us to see in dim light

**root hair cells** specialised cells in plant roots that are adapted for efficient uptake of water by osmosis and mineral ions by active transport

**rose black spot** fungal disease that affects plant growth; can be treated with fungicide or by destroying the leaves

**run-off** when fertilisers from a farmer's field are washed off into rivers or lakes (can lead to eutrophication)

**rusts** type of plant disease caused by fungi

## S

**Salmonella** a type of bacteria that causes food poisoning

**sampling techniques** methods used to choose a small, representative number of individuals from a large population

**scale bar** a line drawn on a micrograph used to measure the actual size of the object

**scanning electron microscope (SEM)** works by bouncing electrons off the surface of a specimen that has had an ultrathin coating of a heavy metal, usually gold, applied. Used to view surface shape of cells or small organisms

**sclera** tough outer layer of the eye

**secondary consumer** organism in a food chain that gets its energy from eating primary consumers

**secondary sex characteristics** features that develop during puberty, as a result of sex hormones being released, such as a deep voice and hair growth in boys, and breast development in girls

**secondary tumour** abnormal growth of cells that forms from a malignant tumour elsewhere in the body

**secrete** to produce a substance; e.g. decomposers secrete enzymes to help break down food

**selective breeding** process of breeding organisms with the desired characteristics (also known as artificial selection)

**selective reabsorption** in the kidney, useful substances, such as glucose and amino acids, are absorbed back into the blood after filtration

**selective weedkiller** preparations of synthetic plant hormones that only kill weeds with broad leaves, for example, and leave grasses and crops unharmed

**self-supporting ecosystem** all ecosystems can support themselves; i.e. everything organisms need for growth and survival is present

**sensory neurone** nerve cell carrying information from receptors to central nervous system

**sewage** waste water and excrement, a form of pollution

**sex chromosomes** a pair of chromosomes that determines gender; XX in females, XY in males

**sex determination** whether a fertilised egg develops into a male (XY) or female (XX) depends on the 23rd pair of chromosomes

**sexual reproduction** form of reproduction involving two parents, which introduces variation

**sexually transmitted disease (STD)** disease spread through sexual contact; e.g. HIV

**sieve plates** the end walls of phloem cells that contain many small pores

**species** basic category of biological classification, composed of individuals that resemble one another, can breed among themselves, but cannot breed with members of another species

**specialised** when cells or tissues become adapted to carry out their specific function

**speciation** formation of a new species over a long period of time, through separation of a population

**spermicide** a cream that is toxic to sperm; it is used alongside other contraceptive techniques, e.g. condoms

**sphere** shape that has the smallest surface area compared with its volume

**spiracles** tiny holes along the side of an insect's body used in gas exchange

**spongy mesophyll** layer of cells found in the middle of a leaf with an irregular shape and large air spaces between them for diffusion of gases

**spores** small seed-like particles released by a fungus to help it spread

**stacked bar chart** bar graph where two data sets are stacked on top of each other for each group/bar

**standard form** way of writing very large or small numbers using powers of ten; e.g.  $1.0 \times 10^{-3}$

**starch** a complex carbohydrate found in animals and plants

**statins** drugs that stop the liver producing so much cholesterol

**stem cells** unspecialised body cells (found in bone marrow) that can develop into other, specialised, cells that the body needs, e.g. blood cells

**stents** a treatment for heart disease; a catheter with a balloon attached is inserted to open up a narrowed coronary artery

**sterilise** the process of removing contaminated material (e.g. from an agar plate)

**stomata (singular stoma)** small holes in the surface of leaves which allow gases in and out of leaves

**structural adaptation** a physical adaptation to a body part of an animal, e.g. elephants have larger ears to maximise heat loss

**surface area to volume ratio** the relationship between the surface area of an organism or structure and its volume; SA:V ratios are large in single-celled organisms for efficient diffusion

**suspensory ligaments** ligaments in the eye that are attached to the ciliary muscle and hold the lens in place

**sustainable** long-lasting; something that can be maintained for future generations

**sustainable fisheries** measures to improve fish stocks, which were declining due to over-fishing, to include controls on net size and fishing quotas

**synapse** the gap between two neurones

**systematic error** mistakes made during data collection that give false outcomes

## T

**target organ** the site where a hormone has its effect

**testosterone** male sex hormone produced by the testes that stimulates sperm production

**therapeutic cloning** the process of creating stem cells with the same genes as the patient, through nuclear transfer

**thermoregulatory centre** a region in the brain that detects changes in body temperature

**three-domain system** developed by Carl Woese, a classification system where organisms are divided into Archaea, Bacteria and Eukaryota (animals, fungi and plants)

**thyroid gland** gland at the base of the neck that makes the hormone thyroxine

**thyroxine** hormone produced by the thyroid gland that increases the body's metabolism

**tissue** group of cells that work together, with a particular function

**tissue culture** process that uses small sections of tissue to clone plants

**tobacco mosaic virus (TMV)** pathogen that causes mosaic pattern of discolouration on leaves and affects growth of plant

**trachea (lungs)** windpipe, through which air travels to the lungs

**trachea (insects)** small tubes in insects containing water, through which gases diffuse into body cells

**transect** line across an area to sample organisms

**translocation** the movement of sugars through a plant

**transmission electron microscope (TEM)** uses an electron beam to view thin sections of cells at high resolution

**transpiration** the movement of water up through a plant and its loss from the leaves

**trend** a pattern in a data set

**trophic level** feeding positions in a food chain

**tropism** the response of a plant by growing towards or away from a stimulus

**tundra** regions in the Arctic where few plants grow as the subsoil is permanently frozen

**turgid** plant cells which are full of water with their walls bowed out and pushing against neighbouring cells

**type 1** diabetes a condition where the pancreas cannot produce enough, or any, insulin

**type 2** diabetes a condition where the body cells no longer respond to insulin produced by the pancreas

## U

**umbilical cord** joins the foetus to the mother during pregnancy and is a source of stem cells

**uncertainty** a measure of the range about the mean, calculated by the range divided by two

**urea** waste products formed by breakdown of excess proteins, excreted in urine

## V

**vaccination** injection of a small quantity of inactive pathogen to protect us from developing the disease caused by the pathogen

**vaccine** preparation of an inactive or dead form of a pathogen given by injection or nasal spray

**valid** refers to results that are accurate, representative and repeatable

**valves** flaps of tissue that prevent the backflow of blood in the heart and in veins

**variation** the differences between individuals brought about by both genetic and environmental influences

**vascular bundle (veins)** group of xylem and phloem cells that transport water and glucose around the plant

**vasoconstriction** in cold conditions, the diameter of small blood vessels near the surface of the body decreases, which reduces blood flow

**vasodilation** in warm conditions, the diameter of small blood vessels near the surface of the body increases, which increases blood flow

**vector** a carrier, usually a plasmid, used to transfer a gene into an organism to be genetically modified; also, mosquitoes are vectors – they spread malaria but don't cause it themselves

**veins** blood vessels with thin walls and valves to prevent backflow, that carry blood at low pressure back to the heart

**vena cava** vein that carries deoxygenated blood from the body to the right atrium

**ventilate** the movement of air into and out of the lungs

**ventricles** the lower chambers of the heart that pump blood around the body (left) or back to the lungs (right)

## W

**Wallace (Alfred Russel)** scientist that proposed the theory of evolution through natural selection, independently from Darwin

**warning colouration** bright colours or patterns found on animals, used to deter predators

## X

**X-chromosomes** sex chromosome present in males (XY) and females (XX)

**xylem** cells specialised for transporting water through a plant; xylem cells have thick walls, no cytoplasm and are dead, their end walls break down and they form a continuous tube

## Y

**Y-chromosomes** sex chromosome found only in males

**yield** the amount (of crop) produced

## Z

**zones of inhibition** areas of no bacterial growth on an agar plate around an antibiotic disc

**zygote** a fertilised egg cell