

## Glossary

**ACCOMMODATION:** The changing of the shape and therefore the focal length of the lens in the eye in order to focus on objects at different distances.

**ACID RAIN:** A dilute solution of acids that falls to earth when mainly oxides of nitrogen and sulphur in the atmosphere dissolve in rain.

**ACTIVE SITE:** Section on the surface of an enzyme where a substrate molecule fits exactly and is split into product molecules. The 'lock' in the 'lock and key hypothesis'.

**ACTIVE TRANSPORT:** An energy-consuming process where substances are transported through living membranes against a concentration gradient.

**ADRENAL GLAND:** Gland situated above the kidneys. Produces the hormone adrenaline.

**ADRENALINE:** Hormone produced by the adrenal glands that produces the body's response in times of fear or anger.

**AEROBIC RESPIRATION:** The release of relatively large amounts of energy by using oxygen to break down foodstuffs. Usually takes the form of the oxidation of glucose in the cytoplasm of living cells.

**AIDS:** Acquired immune deficiency syndrome. Caused by HIV, a virus that affects the body's ability to fight infection.

**ALLELES:** A pair of matching genes.

**ALVEOLI (SINGULAR: ALVEOLUS):** Air sacs of the lungs.

**AMINO ACIDS:** Simple, soluble units. A few linked together form a polypeptide; many linked together form a protein. Used in cells for building up proteins as the cells grow, and for making special proteins such as enzymes.

**AMNION:** Membrane that surrounds a developing fetus. It forms the amniotic sac, enclosing the fetus in amniotic fluid.

**AMNIOTIC FLUID:** A water bath that encloses a developing fetus.

**AMYLASE:** An enzyme that digests starch to sugars.

**ANAEMIA:** A lack of haemoglobin, often caused by low levels of iron in a person's diet.

**ANAEROBIC RESPIRATION:** The release of relatively small amounts of energy by the breakdown of food substances. Occurs in the absence of oxygen.

**ANTAGONISTIC MUSCLES:** Two muscles that provide opposing forces for movement. One of the pair contracts while, at the same time, the other relaxes.

**ANTIBIOTICS:** Drugs (e.g. penicillin) used to treat diseases caused by bacteria.

**ANTIBODIES:** Chemicals, produced by lymphocytes, that 'stick' to bacteria and clump them together, ready for ingestion by phagocytes.

- ANTITOXINS:** Types of antibodies produced by lymphocytes. They neutralise toxins in the blood.
- ARTERY:** Vessels with thick, muscular walls that carry blood, under high pressure, away from the heart. A large artery is called an aorta; a small one is called an arteriole.
- ARTIFICIAL SELECTION:** The deliberate breeding of organisms with particular characteristics.
- ASEXUAL REPRODUCTION:** The production of genetically identical offspring from one parent.
- ATHEROMA:** Fatty deposits that form on the walls of arteries, produced by a combination of saturated (animal) fats and cholesterol.
- ATRIA (SINGULAR: ATRIUM):** Two upper chambers of the heart that receive blood from the body and the lungs.
- AUTOTROPHIC:** Describes organisms (e.g. plants) able to produce their own food by using small molecules in the environment to build large organic molecules.
- BACTERIA (SINGULAR: BACTERIUM):** Unicellular organisms.
- BALANCED DIET:** Food and drink consumed by a person which has the correct amount of each constituent (e.g. proteins, carbohydrates) to enable them to be healthy.
- BALL AND SOCKET JOINT:** Type of joint which allows free movement in many planes (e.g. at the shoulder).
- BENEDICT'S SOLUTION:** Used to test for the presence of certain sugars including maltose and glucose (i.e. 'reducing' sugars).
- BIRTH CONTROL:** Methods of preventing pregnancy (e.g. through the use of contraceptives).
- BIURET SOLUTIONS:** Used to test for the presence of proteins.
- BLASTOCYST:** A stage in embryonic development after the zygote has divided to form a hollow ball of cells.
- BLIND SPOT:** The point in the eye where the retina is joined to the optic nerve. There are no rods or cones, so images formed here are not converted into impulses and relayed to the brain.
- CAPILLARIES:** Microscopic blood vessels that carry blood from arterioles to venules.
- CAPILLARITY:** The movement of liquids upward through very narrow tubes.
- CARBOHYDRATE:** Organic chemicals containing only the elements carbon, hydrogen and oxygen. Ratio of hydrogen atoms to oxygen atoms is always 2:1.
- CARNIVORES:** All consumers above the level of herbivore, i.e. all meat eaters.
- CARPELS:** The female parts of a flower – a stigma, connected by a style to the ovary, in which lie the ovules which contain the female gametes.
- CATALYSTS:** Particular chemicals that can affect how quickly chemical reactions occur (usually speed up reactions).

**CELL MEMBRANE:** Outer covering of the cell that controls the passage of substances into and out of the cell.

**CELL WALL:** A 'box' made of cellulose that encloses the plant cell - *not* present around animal cells.

**CENTRAL NERVOUS SYSTEM (CNS):** The body's coordinating centre, made up of the brain and the spinal cord. Receives information about the environment from receptors and directs a response to effectors (muscles or glands).

**CHLOROPHYLL:** A green pigment found within the chloroplasts of plant cells. Traps sunlight for use in the process of photosynthesis. Contains magnesium.

**CHLOROPLASTS:** Small bodies lying in the cytoplasm of those plant cells involved in photosynthesis. Green in colour because they contain chlorophyll.

**CHROMOSOME:** Possesses genes which are responsible for programming the cytoplasm to manufacture particular proteins.

**CLONES:** A population of organisms produced by asexual reproduction, and all genetically identical.

**CLOT:** A clump of blood cells trapped in a mesh of fibrin. It prevents the entry of bacteria at a wound. On the skin surface it dries and hardens to form a scab.

**CNS:** Central Nervous System.

**CODOMINANCE:** A type of monohybrid inheritance, when both alleles have an equal effect on the phenotype of the offspring.

**COMPLETE DOMINANCE:** When the presence of a single allele will have the same effect on the phenotype of an individual as the presence of an identical pair of alleles.

**CONCENTRATION GRADIENT:** When a region of (relatively) high concentration of molecules or particles is next to a region of (relatively) low concentration. Must be present for diffusion to occur.

**CONES:** Light-sensitive cells in the retina of the eye that provide a picture with greater detail and in colour. They convert light energy into electrical energy.

**CONSUMER:** Any organism which relies on the energy supplied by the producer in its food chain.

**CONTINUOUS VARIATION:** Where both inherited and environmental factors determine the characteristics of an individual (e.g. body mass, height).

**CONTROL:** Apparatus and materials identical to those in an experiment but lacking in the one feature being investigated. Used to make a comparison with the experiment in order to make the results of the experiment valid.

**CORNEA:** Transparent part of the eye that allows light rays to enter and refracts them towards each other.

**CORONARY ARTERY:** Vessel that supplies oxygenated blood to the heart muscle.

**COTYLEDONS:** Organs in seeds, often used for storing starch and protein.

**CYTOPLASM:** A jelly-like substance in which the chemical reactions of the cell take place.

- DEAMINATION:** Process by which excess amino acids are broken down in the liver to produce the excretory chemical urea.
- DECOMPOSERS:** Organisms which release enzymes to break down large molecules in dead organic matter into smaller ones which can then be recycled.
- DEFICIENCY DISEASE:** Conditions caused by a lack of a constituent (e.g. vitamin C, vitamin D, calcium or iron) in a person's diet.
- DERMIS:** Lower layer of skin containing most of the skin structures (e.g. sweat glands, venules, arterioles).
- DETOXIFICATION:** The removal and breakdown of toxins (e.g. alcohol) from the blood. A major function of the liver.
- DIFFUSION:** The movement of molecules from a region of higher concentration to a region of lower concentration, down a concentration gradient.
- DISCONTINUOUS VARIATION:** Where inheritance alone determines the characteristics of an individual (e.g. blood group).
- DISSOLVE:** Mix a substance into a liquid so that it is absorbed into the liquid.
- DRUGS:** Externally administered substances which modify or affect chemical reactions in the body.
- ECOSYSTEM:** A community of organisms living together in a habitat and connected through food webs.
- ENZYMES:** Biological catalysts that control chemical reactions in living organisms. Each has a specific shape and works most effectively at a particular temperature and pH.
- ETHANOL:** Alcohol used to test for the presence of fats. A waste product of anaerobic respiration in yeast.
- EUTROPHICATION:** The abundant growth of water plants. Accelerated when nitrate levels increase in waterways.
- EVOLUTION:** Gradual change in the characters of a species through natural selection. Takes place over many generations.
- EXCRETION:** The removal of waste products of metabolism from organisms.
- EXPIRATION:** The breathing out of air into the atmosphere.
- EXTENSOR:** One muscle in an antagonistic pair that contracts to straighten a limb at a joint. As it does so, the antagonistic flexor muscle relaxes.
- EXTERNAL DIGESTION:** Method of nutrition, characteristic of saprotrophs, by the release of enzymes onto an organic substrate ('food').
- FATS:** Insoluble organic molecules containing the elements carbon, hydrogen and oxygen only. Ratio of hydrogen to oxygen is much higher than 2 : 1. Formed by the joining of a glycerol molecule with fatty acid molecules.
- FATTY ACIDS:** Soluble molecules that, when joined with glycerol, form fat.

**FERMENTATION:** The anaerobic decomposition of some organic substances (e.g. of sugar to alcohol). Carbon dioxide is a waste product.

**FETUS:** A developing embryo in its mother's uterus.

**FIBRIN:** An insoluble, stringy protein formed by fibrinogen and enzymes released by damaged cells. It forms a mesh which traps blood cells and becomes a clot.

**FIBRINOGEN:** A soluble protein found in blood that plays a part in blood clotting.

**FLACCID:** Used to describe cells, tissues or organs when they lose their shape and firmness (turgor).

**FLEXOR:** One muscle in an antagonistic pair that contracts to bend a limb at the joint. At the same time, the extensor muscle relaxes.

**FOLLICLE STIMULATING HORMONE (FSH):** A hormone released by the pituitary gland that stimulates the ovaries to produce and release ova (eggs).

**FOOD CHAIN:** A sequence of organisms, starting with a photosynthesising organism (usually a green plant), through which energy is passed as one organism is eaten by the next in the sequence.

**FOOD WEB:** Interlinked food chains involving organisms within the same ecosystem.

**FOVEA:** A very sensitive part of the retina that has far more cones than rods. Also called the yellow spot.

**FUNGI (SINGULAR: 'FUNGUS'):** Parasitic or saprotrophic multicellular organisms that feed on organic matter by digesting and absorbing it. They do not photosynthesise.

**GAMETES:** Male or female sex cells.

**GASEOUS EXCHANGE:** The simultaneous absorption and release of gases by an organism. E.g. mesophyll cells in plants absorb carbon dioxide and release oxygen during photosynthesis; cells of the alveoli pass oxygen from the lungs into the blood and carbon dioxide in the opposite direction.

**GENE:** A unit of inheritance, part of a chromosome.

**GENETIC ENGINEERING:** Artificially changing the genetic make-up of cells.

**GENOTYPE:** Genetic combination of an individual. Three possibilities are: homozygous dominant, homozygous recessive, heterozygous.

**GLYCEROL:** Molecule that, when joined with fatty acids, forms fat.

**GLYCOGEN:** A carbohydrate with large, insoluble molecules. It is stored in the cells of the liver and muscles and in fungal cells. The conversion of glucose to glycogen takes place in the liver of mammals. This process is controlled by the hormone insulin, secreted by the pancreas.

**GONADS:** The organs which produce gametes (reproductive cells): the testes in males; ovaries in females.

**HAEMOGLOBIN:** Iron-containing pigment found in the cytoplasm of red blood cells. It carries oxygen around the body by combining with it in the lungs to become oxyhaemoglobin.

**HERBIVORES:** Consumers which feed directly on the producer in their food chain.

**HETEROTROPHIC:** Obtaining food requirements 'second-hand' either by eating plants, or by eating other animals which have eaten plants.

**HETEROZYGOUS:** Having a pair of dissimilar alleles for a particular character.

**HIGH WATER POTENTIAL:** Dilute solutions with a relatively large number of water molecules.

**HINGE JOINT:** Joint which allows movement in one plane only (e.g. at the elbow).

**HIV:** Human immunodeficiency virus.

**HOMEOSTASIS:** The maintenance of a constant internal environment in the body. Performed by organs of homeostasis (e.g. the skin).

**HOMOZYGOUS:** Having a pair of similar alleles for a particular character (e.g. both dominant, or both recessive).

**HORMONE:** A chemical substance, produced by a gland and carried by the blood, which alters the activity of one or more specific target organs. It is then destroyed in the liver.

**HUMUS:** Formed when dead organic matter decomposes in the soil. Humus provides a steady supply of ions. It acts as a sponge, soaking up and holding water in the soil, and helps to bind the soil together, preventing soil erosion.

**HYDROLYSIS:** Enzyme-controlled chemical reaction that involves the introduction of a water molecule in order to split a substrate molecule. The newly exposed ends of product molecules are 'sealed' so they will not re-join after being split, common in digestion.

**HYPOTHALAMUS:** The part of the brain responsible for monitoring changes in the blood.

**INDUSTRIAL BIOTECHNOLOGY:** The use of microorganisms in industrial processes.

**INSOLUBLE:** Unable to be mixed into and absorbed by a liquid (dissolved).

**INSPIRATION:** The taking in, or breathing in, of air from the atmosphere.

**INSULIN:** Hormone produced by the islets of Langerhans in the pancreas, involved in the uptake of glucose by cells and its conversion into glycogen.

**IODINE SOLUTION:** Used to show the presence of starch (by turning blue/black), also as a temporary stain for plant cells.

**ION:** A charged atom or group of atoms formed when a molecule dissolves in water (e.g. potassium nitrate dissolves to form potassium<sup>+</sup> and nitrate<sup>-</sup> ions).

**IRIS:** Part of the eye that controls the intensity of light falling on the retina. It has an antagonistic arrangement of circular and radial muscles.

**IRON DEFICIENCY:** Low levels of iron in a person's diet. Leads to a lack of haemoglobin, which is necessary for carrying oxygen around the body.

**ISLETS OF LANGERHANS:** Cells in the pancreas that produce insulin.

**KIDNEY DIALYSIS:** The use of a machine to perform the functions of a kidney. It removes chemicals with small molecules (urea, toxins and ions) from blood but does not allow larger molecules (e.g. plasma proteins) to leave.

**LENS:** Transparent, elastic part of the eye responsible for focusing an image on the retina.

**LIGNIN:** Chemical that helps to strengthen the walls of xylem vessels in plants.

**LIMITING FACTORS:** Particular factors that limit the rate of photosynthesis in plants, even when all other factors may be optimum. Examples are light, carbon dioxide, water and temperature.

**LIPASE:** An enzyme that digests fats to fatty acids and glycerol.

**LIPIDS:** Organic chemicals including fats and oils. Stored in special storage cells in the skin and around the kidneys.

**LOW WATER POTENTIAL:** Concentrated solutions with fewer water molecules.

**LUTEINISING HORMONE (LH):** A hormone released by the pituitary gland that stimulates the ovaries to produce ova. After the release of an ovum, it then stimulates the follicle cells in the ovary to produce the hormone progesterone. (Follicle cells were the cells that nourished the ovum during its development in the ovary.)

**LYMPHATIC SYSTEM:** A system of vessels for returning lymph (tissue fluid plus fats absorbed by the lacteals of the villi) to the blood system.

**LYMPHOCYTES:** A type of white blood cell, made in the lymph glands. They produce antitoxins and other antibodies which 'stick' to bacteria and clump them together for ingestion by phagocytes.

**MAGNESIUM IONS:** A form of magnesium absorbed by plants from the soil through the root hair.

**MENOPAUSE:** When a female stops ovulating and can no longer become pregnant. Usually occurs at around 50 years of age.

**MENSTRUATION:** Stage in the menstrual cycle when blood and the lining of the uterus are passed out of the vagina and vulva.

**MESOPHYLL CELLS:** Palisade and spongy cells in a leaf, involved in photosynthesis.

**METABOLISM:** All the chemical reactions occurring in cells.

**MEIOSIS:** (Also known as 'reduction division'). It is a form of cell division that occurs during gamete production, in which the chromosome number is halved (is changed from the diploid number to the haploid number). It also produces gametes that are all genetically unique.

**MICROORGANISMS:** Organisms so small that they can be studied only by using a microscope (e.g. viruses, bacteria and some fungi).

**MILK TEETH:** A person's first set of teeth that last for around 10-12 years, then are pushed out by the permanent teeth.

**MITOSIS:** A process of cell division when each chromosome forms an exact replica of itself. The two cells formed are identical to each other, and to the original cell.

**MOLECULAR COHESION:** The tendency for molecules to attract one another and thus stick together - particularly the case with water molecules.

**MONOHYBRID INHERITANCE:** Inheritance involving only one pair of contrasting alleles.

**MULTICELLULAR:** Living organisms that have many cells.

**MUTATION:** A spontaneous change in the structure of a gene or chromosome.

**NATURAL SELECTION:** The survival of those organisms most effectively adapted to their environment.

**NEGATIVE FEEDBACK:** A system which automatically brings about a correction in the body's internal environment (e.g. temperature), regardless which side of the optimum the change has occurred.

**NEURONES:** Individual nerve cells with their own cytoplasm, cell membrane and nucleus.

**NITRATE ION:** A form of nitrogen that plants absorb from the soil through root hairs.

**NITROGEN FIXATION:** Conversion of atmospheric (gaseous) nitrogen into nitrogen compounds which can be used by living organisms.

**NUCLEUS:** The part of the cell that controls its growth and development. It contains a number of chromosomes made of the chemical DNA.

**OESTROGEN:** A hormone released by the ovaries that is responsible for the development and maintenance of the female secondary sexual characteristics.

**OPTIMUM:** The best; particularly refers to a state (e.g. temperature, pH level) when processes can take place most efficiently.

**ORGAN:** Several tissues working together to produce a particular function.

**ORGAN SYSTEM:** A collection of different organs working together to perform a particular function.

**ORGANISM:** A collection of organ systems working together.

**OSMOREGULATION:** The maintenance of a constant concentration (e.g. of blood plasma, performed by the kidneys).

**OSMOSIS:** The passage of water molecules from a region of high water potential, to a region of lower water potential, through a partially permeable membrane.

**OVA (SINGULAR: 'OVUM'):** Female gametes produced in the ovaries.

**OXYHAEMOGLOBIN:** Constituent of red blood cells, formed by the combination of oxygen and haemoglobin.

**PARASITE:** An organism which obtains its food from another, usually larger living organism ('host'), the host always suffering in the relationship.

**PATHOGEN:** A disease-causing organism (e.g. virus, bacterium).



**PENIS:** Male organ for introducing sperms into the female.

**PERICARP:** Ovary wall that protects a fertilised plant seed. A pericarp with a seed(s) inside is a fruit.

**PERISTALSIS:** Waves of muscle contractions. Occurs in the oesophagus (pushing bolus towards the stomach), and through the duodenum, ileum and colon (pushing food towards the rectum).

**PHAGOCYTE:** A type of white blood cell, made in the bone marrow. It has a lobed nucleus and is capable of movement. Its function is to ingest bacteria.

**PHAGOCYTOSIS:** The ingestion of potentially harmful bacteria by phagocytes. Prevents or helps to overcome infection.

**PHENOTYPE:** Inherited feature in an individual's appearance.

**PHLOEM:** Tissue for transporting sugars and amino acids within a plant.

**PHOTOSYNTHESIS:** A process performed by green plants, in which light energy is converted into chemical energy.

**PLACENTA:** A special structure which carries out the exchange between the mother and fetus of the chemicals involved in the fetus's nutrition, respiration and excretion.

**PLASMA:** Watery component of blood that carries dissolved chemicals, blood cells and heat.

**PLASMID:** A separate strand of DNA, often circular in shape, that occurs naturally in bacteria.

**PLASMOBIUM:** A single-celled organism, parasitic in human blood, which causes malaria.

**PLASMOLYSIS:** When a cell's cytoplasm is pulled away from the cell wall as a result of osmosis. Occurs when the cell is placed in a solution of lower water potential, and water is drawn from the vacuole.

**PLATELETS:** Fragments of cells made in the bone marrow. They play a part in blood clotting and help to block holes in damaged capillary walls.

**POLLEN TUBE:** Structure produced by a germinating pollen grain. The pollen tube grows down the style towards the ovary by releasing enzymes at its tip to digest the cells of the style beneath.

**POLLINATION:** The transfer of pollen from an anther to a stigma.

**POLYPEPTIDES:** Formed by a few amino acids linked together. Enzymes in the body break down proteins to polypeptides, and polypeptides to amino acids.

**PRIMARY CONSUMER:** (also 'herbivore') A consumer which feeds directly on the producer in its food chain.

**PRODUCERS:** Organisms which manufacture and supply energy-rich foods, made by photosynthesis, to all organisms in their food chain.

**PRODUCT:** The molecules produced as a result of enzyme action on substrate molecules.

**PROGESTERONE:** A hormone produced by the follicle cells, after the release of an ovum, that maintains the spongy lining of the uterus and stops the pituitary gland producing FSH.

- PROTEASE:** An enzyme that digests proteins to amino acids.
- PROTEINS:** Contain the elements carbon, hydrogen, oxygen and nitrogen. Often contain other elements such as sulphur and phosphorus. Built up from amino acids.
- PROTOPLASM:** The cytoplasm and the nucleus of a cell.
- PUBERTY:** A stage in life when the release of hormones activates the reproductive organs. In humans, this occurs around the age of 12 years.
- PYRAMID OF BIOMASS:** A diagram constructed using the dry mass of organisms at each trophic level in a food web, with the producer at the base of the pyramid and the top consumer at the apex (top).
- PYRAMID OF NUMBERS:** A pyramid-shaped diagram composed of blocks similar to a pyramid of biomass but, this time, the width of each block indicates the number of organisms at each trophic level.
- RBC:** Red blood cell.
- RECESSIVE GENES:** Characters determined by these genes will not appear in an individual unless two recessive (i.e. no dominant) alleles are present.
- RED BLOOD CELLS:** Small, biconcave and flexible cells that carry oxygen around the body.
- REDUCING SUGARS:** A group of sugars, including maltose and glucose, that, when reacting with Benedict's solution, act as chemicals known as 'reducing agents'.
- REFLEX:** A fast, coordinated, automatic response to a specific stimulus.
- RESPIRATION:** The release of energy from food substances, that takes place in all living cells to perform all their functions.
- RETINA:** The innermost, light-sensitive layer of the eye.
- RICKETS:** A deficiency disease of bones caused by a lack of vitamin D in a person's diet.
- RODS:** Light-sensitive cells found in the retina of the eye. Important when light intensity is low. They convert light energy into electrical energy.
- ROOT HAIR CELL:** Plant cell specially adapted to absorb water and mineral ions (salts) from the soil.
- ROOT PRESSURE:** Created by the process of osmosis carrying water across the root to the vascular bundle of the stem. The pressure forces water into the xylem, and pushes it along the root towards the stem.
- SAPROTROPH:** Organism that feeds on dead organic matter through external digestion.
- SCAB:** A dried and hardened clot which covers a wound until the skin beneath has repaired.
- SCURVY:** A deficiency disease of the gums and skin caused by a lack of vitamin C in a person's diet.
- SECONDARY CONSUMER:** A consumer which feeds directly on the herbivore in its food chain.
- SEMEN:** Sperms and seminal fluid.
- SEMINAL FLUID:** A nutrient fluid in which sperms are able to swim.

- SEX CHROMOSOMES:** One pair of chromosomes that determine the sex of an offspring.
- SEXUAL REPRODUCTION:** The fusion of male and female nuclei to form a zygote. Zygotes develop into offspring genetically different from each other, and from their parents.
- SPERM:** An abbreviation for 'spermatozoon' - the male gamete (or sex cell).
- STAMEN:** The anther and filament of a flower, involved in the production of pollen grains.
- STARCH:** Insoluble carbohydrate produced by plant cells from glucose. Stored in the chloroplasts of photosynthesising cells and many storage organs of plants.
- STOMATA (SINGULAR: STOMA):** Pores through which gases diffuse into and out of a leaf.
- SUBSTRATE:** Molecule on which a catalyst works, changing it into product molecules. The 'key' in the 'lock and key hypothesis'. Also, the food on which organisms such as bacteria and fungi grow.
- SYNAPSE:** The gap between the dendrites (nerve endings) of neighbouring neurones.
- TEMPERATURE REGULATION:** Function performed by the skin to maintain body temperature, in humans, at 37°C. Includes sweating, dilation or constriction of arterioles, and the control of blood flow to the skin.
- TENDON:** A cord of connective tissue that attaches muscle to bone.
- TERTIARY CONSUMER:** A consumer which feeds directly on the secondary consumer in its food chain.
- TESTOSTERONE:** A hormone produced by the testes in males from the age of puberty. It controls the development and maintenance of secondary sexual characteristics.
- TEST CROSS:** A genetic cross involving one homozygous recessive parent.
- TISSUE:** Many similar cells working together and performing the same function.
- TISSUE CULTURE:** Commercial application of asexual reproduction in plants, in which pieces of tissue are removed from an organism and grown in an artificial medium in sterile conditions.
- TISSUE FLUID:** Blood without red blood cells, plasma proteins and some white blood cells. It bathes the body's cells.
- TISSUE REJECTION:** When the body's immune system fails to accept a transplanted organ (e.g. heart or kidney) and attempts to destroy it as a harmful protein.
- TOLERANCE:** The ability of an organism to take progressively increased dosages of a drug.
- TOXINS:** Poisons.
- TRANSLOCATION:** The movement of chemicals around a plant.
- TRANSPIRATION:** The evaporation of water from the mesophyll cells of a leaf, and the removal of that vapour through the stomata of the leaf.
- TRANSPIRATION PULL:** A force created by transpiration, where water is drawn up to the leaf to replace the water that has been lost.

**TRANSPIRATION STREAM:** A continuous stream of water and ions that travels up a plant.

**TURGOR:** The pressure created as water enters a plant cell, causing the cytoplasmic lining of the cell to press against the cell wall. Helps to make plant cells firm (turgid).

**UMBILICAL CORD:** Connection between placenta and fetus. The fetal blood vessels run within it.

**UNICELLULAR:** Made up of one cell only, as in the simplest living organisms.

**UREA:** A nitrogenous waste product which passes in the blood from the liver to the kidneys for excretion in urine.

**URINE:** Waste solution containing urea, ions, toxins and water.

**VACUOLE:** A large, central space in plant cells that contains cell sap, a solution made up mostly of sugars. Also called the 'sap vacuole'.

**VASCULAR BUNDLES:** Contain the tissues for transport within a plant - xylem (for carrying water and ions) and phloem (for carrying sugar and amino acids).

**VEIN:** Vessel which carries blood under low pressure towards the heart - thinner walls than arteries. A large vein is a vena cava; a small one is a venule.

**VENTRICLES:** Two lower chambers of the heart that pump blood out of the heart.

**VILLI:** Microscopic finger-like projections found on the walls of the ileum. Designed to maximize surface area to allow food absorption.

**VIRUSES:** Very small, parasitic organisms that cause disease. They cannot be treated with antibiotics. They do not possess all the characteristics of living organisms.

**WILT:** When a plant loses its rigidity as a result of a loss of turgidity in its cells. Occurs when the transpiration rate exceeds the rate that water can be absorbed from the soil, and water starts to be lost from the plant's cells.

**WITHDRAWAL SYMPTOMS:** Unpleasant effects that result when someone stops taking a drug to which they are addicted (e.g. heroin).

**XYLEM VESSELS:** Tube-like structures in plants specially adapted to conduct water and ions from the roots to the stem, leaves, flowers and fruits. Also provide support for the parts of the plant above the ground.

**ZYGOTE:** Formed by the fusion of male and female nuclei during sexual reproduction. Zygotes develop into offspring genetically different from each other, and from their parents.



## Handout 25

*misspell → mark is not deducted*

### Candidates' common biological errors

Assessing the work of a large number of candidates' (several thousand scripts per session) in examinations often illustrates a number of common biological errors which students make. These errors are often seen in the work of candidates from centres across the world. An appreciation of some of these common errors can enable teachers to better prepare their students for the examination by guiding their initial teaching certain syllabus topics and by reinforcing to their students the precise expectations of the examiners who will mark their scripts. Below is a list of twenty common biological errors made by students which have been identified in a number of recent examination sessions.

Students should be taught that:

1. Enzymes do not become denatured immediately after the optimum temperature, but rather at high temperatures – above 60°C for those working in the human body. *60°C*
2. The products of fat digestion are absorbed into the lymph in a lacteal. They are not absorbed into blood in a blood vessel.
3. Urine is the fluid carried from the kidney to the bladder for storage and then through the urethra out of the body. It is common for candidates to mistake urea for urine and to confuse the terms ureter and urethra.
4. When referring to the roles of specialised cells, reference should be made to the specific features they have and to how each of these features adapts the cell to its particular function.
5. A comparison of the components of inspired and expired air is needed – where a correct answer will refer to both types of air. Statements such as 'oxygen' or 'inspired air contains oxygen' will not gain credit. 'Inspired air contains more oxygen than expired air' includes a comparison and will therefore gain credit.
6. It is the process of cellular respiration producing CO<sub>2</sub> and water and using O<sub>2</sub> which brings about the changes in CO<sub>2</sub>, water vapour and O<sub>2</sub> content of the air inspired and expired.
7. Care is needed when naming the blood vessels entering and leaving the heart, lungs, liver and kidney and leaving the small intestine – all as specified in the syllabus. It is common for candidates to confuse the names and locations of these blood vessels.
8. Senses are experienced when nerve impulses reach the brain and do not require the impulse to be returned to the sense-organ in a reflex-like pathway.
9. To avoid confusion between the role of sensory receptors and sensory neurones. A receptor detects a stimulus, following which an impulse is transmitted along a sensory neurone. The sensory neurone does not detect the stimulus itself.
10. It is electrical impulses (not messages or signals) are transmitted by neurones.
11. Bacteria cause matter to decay - they do not feed on decaying matter.
12. The processes of cellular respiration and combustion (e.g. of fuels) release (not produce) energy. The same terminology should also be used when comparing the amount of energy released by aerobic and anaerobic respiration. *→ produce → wrong release / liberated*
13. Use of heroin and the sharing of needles do not cause AIDS. It is the HIV virus which causes HIV. Sharing of needles may lead to the increased spread of the virus.
14. Artificial selection is when one characteristic is shown in both parents initially selected. These parents are then bred together and the best examples over many generations are selected. Artificial selection is not the selection of two parents each with a different characteristic to produce offspring showing both of these characteristics together in one individual.

*comparison in detail  
Reference of %  
more/less*



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15. During thermoregulation capillaries do not constrict or dilate. Neither do they move closer to or further away from the surface of the skin. It is the blood vessels supplying these capillaries which vasodilate and vasoconstrict to allow either more or less blood through the capillaries near the skin surface.
16. Air, which is a good insulator of heat, is trapped near the surface of the skin when hairs become erect. Heat itself is not trapped by the hairs.
- \* 17. During the process of transpiration, evaporation of water occurs at the surface of leaf cells and generates water vapour in the leaf's air spaces. This evaporation of water has a cooling effect on the leaf. Evaporation of water does not occur at the stomata.
- \* 18. It is the stomata which open and close to allow entry and exit of gases – not the guard cells.
- \* 19. When labelling a component on a diagram ensure that the label line terminates on the structure intending to be labelled. Lines which fall short of the intended structure may in fact label an alternative, incorrect, component of the diagram.
- \* 20. When a 'range' is asked for in a question candidates are expected to quote two values between which they think the answer will lie – including correct units where appropriate. For example, 25 – 35°C. A single value is insufficient and will not gain credit.

### 7.3 Glossary of terms used in science papers

It is hoped that the glossary (which is relevant only to chemistry subjects) will prove helpful to candidates as a guide, i.e. it is neither exhaustive nor definitive. The glossary has been deliberately kept brief not only with respect to the number of terms included but also to the descriptions of their meanings. Candidates should appreciate that the meaning of a term must depend in part on its context.

1. *Define (the term(s)...) is intended liberally, only a formal statement or equivalent paraphrase being required.*
2. *What do you understand by/What is meant by (the term(s)...) normally implies that a definition should be given, together with some relevant comment on the significance or context of the term(s) concerned, especially where two or more terms are included in the question. The amount of supplementary comment intended should be interpreted in the light of the indicated mark value.*
3. *State implies a concise answer with little or no supporting argument, e.g. a numerical answer that can be obtained 'by inspection'.*
4. *List requires a number of points, generally each of one word, with no elaboration. Where a given number of points is specified, this should not be exceeded.*
5. *Explain may imply reasoning or some reference to theory, depending on the context.*
6. *Describe requires candidates to state in words (using diagrams where appropriate) the main points of the topic. It is often used with reference either to particular phenomena or to particular experiments. In the former instance, the term usually implies that the answer should include reference to (visual) observations associated with the phenomena. In other contexts, describe and give an account of should be interpreted more generally, i.e. the candidate has greater discretion about the nature and the organisation of the material to be included in the answer. Describe and explain may be coupled in a similar way to state and explain.*
7. *Discuss requires candidates to give a critical account of the points involved in the topic.*
8. *Outline implies brevity, i.e. restricting the answer to giving essentials.*
9. *Predict or deduce implies that the candidate is not expected to produce the required answer by recall but by making a logical connection between other pieces of information. Such information may be wholly given in the question or may depend on answers extracted in an early part of the question.*
10. *Comment is intended as an open-ended instruction, inviting candidates to recall or infer points of interest relevant to the context of the question, taking account of the number of marks available.*
11. *Suggest is used in two main contexts, i.e. either to imply that there is no unique answer (e.g. in chemistry, two or more substances may satisfy the given conditions describing an 'unknown'), or to imply that candidates are expected to apply their general knowledge to a 'novel' situation, one that may be formally 'not in the syllabus'.*
12. *Find is a general term that may variously be interpreted as calculate, measure, determine, etc.*
13. *Calculate is used when a numerical answer is required. In general, working should be shown, especially where two or more steps are involved.*
14. *Measure implies that the quantity concerned can be directly obtained from a suitable measuring instrument, e.g. length, using a rule, or angle, using a protractor.*
15. *Determine often implies that the quantity concerned cannot be measured directly but is obtained by calculation, substituting measured or known values of other quantities into a standard formula, e.g. relative molecular mass.*
16. *Estimate implies a reasoned order of magnitude statement or calculation of the quantity concerned, making such simplifying assumptions as may be necessary about points of principle and about the values of quantities not otherwise included in the question.*
17. *Sketch, when applied to graph work, implies that the shape and/or position of the curve need only be qualitatively correct, but candidates should be aware that, depending on the context, some quantitative aspects may be looked for, e.g. passing through the origin, having an intercept, asymptote or discontinuity at a particular value. In diagrams, sketch implies that a simple, freehand drawing is acceptable: nevertheless, care should be taken over proportions and the clear exposition of important details.*
18. *Construct is often used in relation to chemical equations where a candidate is expected to write a balanced equation, not by factual recall but by analogy or by using information in the question.*

#### Special Note

*Units, significant figures.* Candidates should be aware that misuse of units and/or significant figures, e.g. failure to quote units where necessary, the inclusion of units in quantities defined as ratios or quoting answers to an inappropriate number of significant figures, is liable to be penalised.