Knowledge Organiser

Biology Separate

GCSE Biology Separate AQA

Biology Separate

GCSE AQA

YEAR 10 & 11

2023-2025

NAME: _____

TUTOR GROUP: _____

1.1	Cell Structure and Function	What are the differences between a prokaryote and a eukaryote?	Prokaryotes do not contain a nucleus, whereas eukaryotes do. Prokaryotes have a cell wall, whereas eukaryotes do not.
1.2		Name the 5 common features of a plant and animal cell.	Cell membrane, cytoplasm, nucleus, mitochondria, ribosomes.
1.3		State the 3 features/structures that a plant cell contains, and an animal cell does not.	Chloroplasts, cell wall, vacuole.
1.4		What is the function of the nucleus?	Contains genetic material and controls the activities of the cell.
1.5		What is the function of the cell membrane?	To control the substances that move in and out of the cell.
1.6		What is the function of the cytoplasm?	Contains all the organelles and is the site of many chemical reactions.
1.7		What is the function of mitochondria?	The site of respiration where energy is released.
1.8		What is the function of ribosomes?	The site of protein synthesis, where new proteins are made.
1.9		What is the function of a permanent vacuole?	It contains cell sap and enzymes. It can also store excess water.
1.10		What is the function of a chloroplast?	It is filled with chlorophyll, absorbs light and is where photosynthesis happens.
1.11		What material makes up cell walls in plants?	Cellulose.
1.12		State why prokaryotes do not contain membrane bound organelles.	Membrane bound organelles are too large to fit in a prokaryote.
2.1	Specialised Cells	What is a specialised cell?	A cell that has specific features or adaptations to perform a particular job.
2.2		Describe how a sperm cell is adapted.	Tail/flagellum – for locomotion/ movement. Acrosome – to digest the egg surface. Many mitochondria – for respiration to release energy to swim to the egg.
2.3		Describe how a muscle cell is adapted.	Many mitochondria for respiration to release energy to the muscle for contraction.
2.4		Describe how a root hair cell is adapted.	Hairs/projections – to increase the surface area to absorb more water/ nutrients. No chloroplasts – not needed to photosynthesise.
2.5		Describe how a nerve cell is adapted.	Long axon – to carry messages long distances. Many dendrites to make many connections.
2.6		Describe how a xylem cell is adapted.	Dead, hollow cells that form a tube lignin for strength and to withstand water pressure.
2.7		Describe how a phloem cell is adapted.	Live cell, contains sieve plates to distribute sugar evenly throughout the plant.
2.8	Speci alised	Describe how a red blood cell is adapted.	No nucleus and a biconcave dip to carry more haemoglobin which binds to oxygen.

2.9		What is cell differentiation?	When a cell becomes a specialised cell.
2.10		When do most cells differentiate in an animal cell?	Foetal stage.
2.11		When do cells differentiate in a plant?	They can differentiate at any time.
2.12		In mature animals what is cell differentiation used for?	Repair of damaged tissues or cells.
3.1	Microscopes and Magnification	Name 2 types of microscopes.	Light/optical microscope. Electron microscope.
3.2		State 2 advantages and disadvantages of a light/optical microscope.	Advantages – portable, easy to use, see colour, inexpensive, live specimens. Disadvantages – 2D, low resolution, low magnification.
3.3		State 2 advantages and disadvantages of an electron microscope.	Advantages – 3D images, high magnification, high resolution. Disadvantages – expensive, black and white images only, specimen must be dead.
3.4		What is meant by resolution or resolving power?	The fineness of detail that can be seen in an image. The higher the resolution of an image, the more detail it holds. The ability to distinguish between 2 points.
3.5		What is an order of magnitude?	A number to the base of 10, often used to make comparisons.
3.6		How do you calculate magnification?	Magnification = Image size / Actual size
3.7		How do you rearrange the equation to calculate the actual size of an image?	Actual size = Image size / Magnification
3.8		What is 1260000nm in standard form?	1.26×10^{6} nm
3.9		What is 0.0000001µm in standard form?	1×10^{-7} µm
3.10		What is a stage micrometre?	A glass slide with a scale on it used to calibrate the eyepiece.
3.11		What is a graticule?	A glass or plastic disc fitted into the eyepiece of a microscope used to estimate the size of a specimen.
3.12		How do you rearrange the equation to calculate the image size?	Image size = Magnification x Actual size
4.1	Cell Division	What are genes?	A section of DNA that codes for a particular protein.
4.2		In what arrangement do we usually find chromosomes?	In pairs.
4.3		How many chromosomes does a human adult cell have?	46, or 23 pairs.
4.4		What happens to the cell before it divides?	The nucleus disappears, chromosomes become short, fat and they double.
4.5		What is produced during mitosis?	Genetically identical daughter cells.
4.6		What is produced during meiosis?	Gametes.
4.7	Cell Division	What type of cell division can be called 'double division'?	Meiosis.
4.8		Why is mitosis important?	Growth, repair and maintaining the chromosome number.

4.9		What do we call a cell with 2 sets of chromosomes?	Diploid.
4.10		What do we call a cell with 1 set of chromosomes?	Haploid.
4.11		What type of cell is produced during meiosis in males and females?	Males – sperm. Females – egg.
4.12		If a cell with a diploid number 24 undergoes meiosis, how many chromosomes would be in each daughter cell?	12.
5.1	Transport Across Membranes	What is diffusion?	The movement of particles from an area of high concentration to an area of low concentration, down a concentration gradient.
5.2		What is osmosis?	The movement of water particles from a high water potential to a low water potential, down a concentration gradient, through a partially permeable membrane.
5.3		What is active transport?	The movement of particles against a concentration gradient, from a low concentration to a high concentration, requiring energy.
5.4		State 3 substances that can move by diffusion in animal cells.	Oxygen, carbon dioxide and glucose.
5.5		How can we increase the rate of diffusion?	Increase the concentration gradient, decrease the diffusion distance/ thickness of surface, increase the surface area.
5.6		How is a root hair cell adapted for osmosis?	Lots of hairs/projections that increase the surface area so more water can be absorbed.
5.7		How are cells in the small intestine adapted for active transport?	Many mitochondria to release energy for active transport.
5.8		What is required for active transport?	Energy.
5.9		What is a concentration gradient?	The difference between two concentrations.
5.10		Define the terms solute and solvent.	Solute – soluble solid/substance that dissolves. Solvent – a liquid that dissolves the solute.
5.11		What does it mean when the net movement of water is 0?	Water will not move.
5.12		What are the differences between hypertonic, hypotonic and isotonic?	Hypertonic – less solute inside the cell, more outside. Hypotonic – more solute inside the cell, less outside. Isotonic – same amount of solute inside/outside cell.
6.1	Organisation (Animals)	What is a tissue?	A group of specialised cells working together.
6.2		What is an organ?	A group of tissues working together.
6.3		What is a system?	A group of organs working together.
6.4		State 3 examples of tissues in the digestive system and what each of them do.	Glandular – releases enzymes and digestive juices.

			Muscular – contract the stomach walls to churn food. Epithelial – to line stomach.
6.5		What is an enzyme?	A biological catalyst (which is a protein).
6.6		Name 2 environmental conditions that cause an enzymes active site to change.	Temperature increase. Increase or decrease in pH.
6.7		Name 3 digestive enzymes and what they break down.	Lipase – breaks down lipids/fats. Amylase – breaks down starch. Protease – breaks down protein. Carbohydrase – breaks down carbohydrates.
6.8		State 2 functions of bile.	Emulsify fat. Neutralise stomach acid before food moves into the small intestine.
6.9		What are the products when protein, fat and starch is broken down?	Protein – amino acids. Fat – fatty acid and glycerol. Starch – glucose.
6.10		What is the lock and key model?	The shape of the active site matches the shape of its substrate molecules. This makes enzymes highly specific.
6.11		What does denatured mean?	When the shape of the enzymes active site changes and the substrate no longer fits.
6.12		Where is bile produced and where is it stored?	Produced in the liver. Stored in the gall bladder.
7.1	Circulatory and Respiratory System	What substance transports substances around the body?	The blood.
7.2		Name the 4 components that you mentioned in 7.1.	Red blood cells, white blood cells, plasma and platelets.
7.3		Name the upper and lower chambers of the heart.	Upper – atria. Lower – ventricles.
7.4		What is the function of the coronary arteries?	To provide heart tissue with oxygen for respiration, which releases energy for the heart muscle to contract.
7.5		State an adaptation of each blood vessel.	Capillary – 1 cell thick, covers larger surface area. Artery – elastic walls for vasoconstriction/vasodilation. Veins – contain valves to prevent back flow, large lumen.
7.6		What structure protects the lungs?	Rib cage.
7.7		State the pathway of air from the atmosphere to the blood.	Nose/mouth, trachea, bronchi, bronchioles, alveoli, blood.
7.8		What are the structures called where gas exchange happens?	Alveoli.
7.9	Circulatory and Respiratory System	State the red pigment that blood cells contain.	Haemoglobin.
7.10		What is the function of the red pigment in blood?	Bind with oxygen and transport it to the respiring cells.

7.11		Name the substances that are exchanged in gas exchange at the alveoli.	Oxygen moves into the blood stream and carbon dioxide moves into the alveoli.
7.12		State the risks involved with surgical intervention in the treatment of heart disease.	Death, rejection of organ transplant, clotting problems, thrombosis, infection.
8.1	Organisation (Plants)	What is the function of the waxy cuticle?	To cover, protect and provide a waterproof layer.
8.2		What is the function of the palisade mesophyll layer?	Where the majority of photosynthesis takes place.
8.3		What is the function of the spongy mesophyll layer?	Where the majority of gas exchange takes place.
8.4		What is the role of guard cells?	To control the opening and closing of the stomata, which control water loss and gas exchange.
8.5		How are palisade cells adapted for their function?	Large, tall cells to absorb more light. Lots of chloroplasts for photosynthesis.
8.6		What is the role of the xylem?	Carry water from the roots around the plant.
8.7		How is the xylem adapted to its function?	Hollow tubes strengthened by lignin.
8.8		What is transpiration?	The movement of water from the roots to the leaves, eventually leaving the leaves via evaporation.
8.9		What is the role of the phloem?	To carry sugars from the leaves around the plant.
8.10		How is the phloem adapted to its function?	Elongated cells with pores in the end cell walls to aid the movement of dissolved sugars.
8.11		What is translocation?	The movement of sugars from the leaves to the rest of the plant.
8.12		How are plants adapted for gas exchange?	The structure of the leaf is adapted for gas exchange. The cells in the spongy mesophyll (lower layer) are loosely packed and covered by a thin film of water. There are tiny pores, called stomata, in the surface of the leaf.
9.1	Communicable Diseases	What is meant by the term communicable disease?	A communicable disease is one that is spread from one person to another.
9.2		Name 4 ways that a pathogen can be transmitted and then prevented.	Through air, through water, direct contact (e.g. STDs), vectors. Hand-washing, safer sex practices, vaccination, eradication of vectors.
9.3		State 4 types of pathogen.	Viruses, bacteria, protists, fungi.

9.4		How do bacteria make you ill?	Bacteria may produce poisons (toxins) that damage tissues and make us feel ill.
9.5		Why might viruses cause you more damage?	Viruses live and reproduce inside cells, causing cell damage.
9.6		What is the role of the immune system?	If a pathogen enters the body, the immune system tries to destroy the pathogen.
9.7		What does a vaccine contain and how does it work?	A small quantity of dead or inactive forms of a pathogen. It stimulates the white blood cells to produce antibodies. If the same pathogen re-enters the body the white blood cells respond quickly to produce more of the correct antibodies, preventing infection.
9.8		What is herd immunity?	The majority of the population is vaccinated against serious diseases, which can reduce the chance of people coming into contact with specific pathogens.
9.9		How do antibiotics work?	Killing infective bacteria inside the body through many different ways e.g. preventing the cell wall from forming or preventing DNA from being replicated.
9.10		Describe the stages involved in drug trials.	Preclinical testing is done in a laboratory using cells, tissues and live animals. Clinical trials use small numbers of healthy volunteers and patients. Very low doses of the drug are given at the start of the clinical trial. If the drug is found to be safe, further clinical trials on larger groups of healthy volunteers and patients are carried out to find the optimum dose for the drug.
9.11		What is meant by a double-blind trial?	In double blind trials, some patients are given a placebo. Neither the doctor nor the patient knows whether they have been given a placebo in order to reduce potential bias.
9.12		What is a placebo?	A substance that has no therapeutic effect, used as a control in testing new drugs.
10.1	Non-communicable Diseases	What are non-communicable diseases?	Diseases that develop and are not transferred between people or other organisms.
10.2		Name 3 examples of non-communicable diseases.	Cancer, diabetes, genetic diseases and conditions, heart disease, neurological disorders.
10.3		What is a risk factor?	It is something that can increase the chances of developing a non-communicable disease.

10.4		State 3 risk factors.	Diet, lifestyle, stress, situations that may occur in a person's life (trauma).
10.5		What is cancer?	A disease caused by normal cells changing so they grow and divide in an uncontrollable way that causes a tumour to develop.
10.6		Name 2 types of tumours.	Benign and malignant.
10.7		What is a correlation?	A relationship between 2 sets of data, such that when one changes you would expect the other to change.
10.8		State 3 effects of smoking.	Cancers, heart disease, COPD/pulmonary disease, diabetes, increased chances of blood clot or stroke, addiction, narrowing of arteries, pneumonia, emphysema, discolouration of skin.
10.9		State the long term effects of alcohol abuse.	High blood pressure, stroke, pancreatitis, liver disease, liver cancer, mouth cancer, depression, dementia, sexual problems, infertility.
10.10		What are the short term effects of alcohol?	Increased heart rate, dilation of blood vessels, affects the brain (judgement, co-ordination and decision making), blurred vision, slower reaction time, slurred speech, dehydration, vomiting.
10.11		State the potential effects of obesity.	Type II diabetes, coronary heart disease, cancer, stroke, depression and low self-esteem.
10.12		What are the differences between type I and type II diabetes?	Type I – usually develops during childhood, pancreas stops making insulin, controlled by injections and good diet. Type II – usually develops in adults who have poor lifestyles and are overweight, the body no longer responds to insulin due to damaged beta cells, controlled with exercise and good diet.
11.1	Bioenergetics	Write a word and balanced symbol equation for photosynthesis.	W: carbon dioxide + water ⇌ glucose + oxygen S: $6CO_2 + 6H_2O \rightleftharpoons C_6H_{12}O_6 + 6O_2$
11.2		Where does photosynthesis take place in a cell?	Chloroplast.
11.3		What type of reaction is photosynthesis and why?	Endothermic because the leaf absorbs energy from sunlight to turn carbon dioxide and water into oxygen and glucose.
11.4		Name 4 limiting factors of photosynthesis.	Light intensity, carbon dioxide concentration, amount of chlorophyll and temperature.

11.5		State 3 ways that glucose is used in a plant.	Respiration. Making new proteins. Making cellulose for plant cell walls. Stored as starch. Active transport.
11.6		What minerals are absorbed from the soil to help a plant?	Magnesium and nitrate (for chlorophyll production and growth).
11.7		What is respiration and where in a cell does it happen?	Respiration is the process by which organisms break down glucose (from sugars and carbohydrates in their food) in order to release energy. It occurs in the mitochondria.
11.8		Write a word and balanced symbol equation for respiration.	W: glucose + oxygen → carbon dioxide + water S: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
11.9		State the word equation for anaerobic respiration in a) plants and b) animals.	glucose → ethanol + carbon dioxide glucose → lactic acid
11.10		Why is respiration important?	Mammals and birds need energy to maintain a constant body temperature. Energy is also needed for the following life processes: growth, cell division, muscle contraction, protein synthesis, active transport, nerve impulses and building new molecules.
11.11		What is oxygen debt?	The amount of extra oxygen the body needs after exercise to react with the accumulated lactic acid and remove it from the cells.
11.12		What is metabolism?	The sum of all the reactions in a cell or the body.
12.1	Nervous System	What is the role of the human nervous system?	The nervous system detects stimuli from the internal or external environment and uses electrical impulses to bring about fast, but short-lived, responses.
12.2		Describe 2 ways of measuring reaction time.	Dropping a ruler and catching it, computerised tests involving pressing a button in response to seeing something on the screen – time recorded by the computer.
12.3	Nervous System	Summarise the order of how the nervous system works.	Stimuli, receptor, sensory neurone, CNS, motor neurone, effector, response.
12.4		Name 3 types of neurones.	Sensory, motor and relay.
12.5		What is a synapse and how does it work?	The method by which a nervous impulse crosses the gap between neurones. Impulse arrives at the end of neurone A. Neurotransmitter is released into the synaptic gap. Neurotransmitter diffuses across the synaptic gap. Neurotransmitter binds to receptors on neurone B.

			A new electrical impulse is generated in neurone B.
12.6		What neurone is involved in a reflex?	Relay.
12.7		Why are reflexes important?	Reactions to remove your body from danger.
12.8		Why are reflexes faster?	They do not involve the brain, therefore no conscious thought.
12.9		What is a receptor? State 3 examples.	Cells that detect stimuli (changes in the internal or external environment). Eyes, ears, skin, thermoreceptors, pressure receptors, tongue, nose.
12.10		What is a stimulus?	A change in the environment (internal/external).
12.11		What carries out a response? Give 3 examples.	Effectors – muscle, gland or organ.
12.12		How is a nerve cell adapted?	The cell body contains the cytoplasm and nucleus (the control centre of the cell). The axon is a long extension of the cytoplasm (can be up to 1m). This means nerve impulses can be transmitted to the extremities by one cell. The myelin sheath is a fatty layer that surrounds the axon. The sheath acts as an insulator and speeds up nerve impulses. The branched ends of the axon and the smaller branches coming from the cell body allow the neurone to make connections with many other neurones.
13.1	Endocrine System	What is the endocrine system made of?	Glands and hormones.
13.2		How are chemical messages transported around the body?	Glands release hormones into the bloodstream, which then travel to the target organ to produce an effect.
13.3		What is produced if blood glucose is a) too high or b) too low?	Insulin. Glucagon.
13.4	Endocrine System	Name 2 places in the body where glycogen is stored.	Muscles and liver.
13.5		What is the process called that restores the body back to normal levels?	Negative feedback.
13.6		How is water lost from the body?	Urine, respiration, sweating, breathing.
13.7		What is the function of the kidneys?	To filter the blood and remove waste materials such as toxins and urea.
13.8		Name the hormones involved in reproduction (male and female).	Testosterone. Oestrogen. Follicle stimulating hormone. Luteinising hormone.
13.9		State the names and functions of the hormones in the menstrual cycle.	FSH – matures the egg. Oestrogen – causes uterus lining to thicken and stop FSH production. LH – releases the mature egg.

13.10		What are the 2 main categories of contraception?	Physical barriers and chemical methods.
13.11		Summarise the stages of IVF.	Mother given FSH and LH to mature several eggs. Eggs collected and fertilised in a laboratory. Fertilised eggs develop into embryos. Some embryos are inserted into the mother's uterus.
13.12		State 2 advantages and 2 disadvantages of fertility treatment.	Disadvantages – emotionally draining, physically stressful, low success rate, multiple births. Advantages – allows pregnancy when not possible, embryo screened for genetic disorders.
14.1	Reproduction	What are gametes?	Sex cells.
14.2		What is the difference between sexual and asexual reproduction?	Sexual reproduction involves 2 parents and produces genetically different offspring, asexual involves one parent and produces genetically identical offspring.
14.3		Give 2 advantages and 2 disadvantages of sexual reproduction.	Advantages – variation, increases diversity, species can adapt to new environments, disease is less likely to have an impact. Disadvantages – long time, energy is needed, not possible for an isolated individual.
14.4		Give 2 advantages and 2 disadvantages of asexual reproduction.	Advantages – produce large quantities of identical offspring, quick, easy, no variation. Disadvantages – genetic disorders are passed on, no variation.
14.5		What organism uses both sexual and asexual reproduction?	Plants.
14.6		What type of cell division forms gametes?	Meiosis.
14.7		Name the gametes in animals.	Sperm and egg.
14.8	Reproduction	Name the gametes in plants.	Ovule and pollen.
14.9		What does sexual reproduction lead to that asexual does not?	Variation.
14.10		What effect does meiosis have on the chromosome number?	Halves it.
14.11		When a new cell is formed by fertilisation, what type of cell division takes place?	Mitosis.
14.12		What is the process by which cells develop into specific types?	Differentiation.
15.1	Genetics	Where is genetic material found?	Nucleus.
15.2		Describe the structure of DNA.	Double helix.
15.3		What is a gene and what is its function?	A section of DNA that codes for a particular protein.

15.4		What is the Human Genome Project?	Mapping of all the genes in a human.
15.5		State 3 ways in which understanding the Human Genome Project is important.	To search for genes linked to different types of disease. To understand and treat inherited disorders. To trace early human migration patterns.
15.6		Where does protein synthesis happen in a cell?	Ribosome.
15.7		What is a change in the sequence of DNA called?	Mutation.
15.8		What is an allele?	A version of a gene.
15.9		What is the difference between a dominant and recessive allele?	Dominant – the individual only needs one copy of this allele for its phenotype to be seen. Recessive – the individual needs two copies of this allele for its phenotype to be seen.
15.10		What is the difference between heterozygous and homozygous?	Homozygous – the individual has two identical alleles for this gene. Heterozygous - the individual has two different alleles for this gene.
15.11		What is the difference between genotype and phenotype?	Genotype – the genetic makeup of an organism for a particular gene (e.g. RR). Phenotype – the displayed characteristic due to the interactions between alleles (e.g. red flowers).
15.12		What are the genotypes for a a) male and b) female?	Male XY, female XX.
16.1	Variation and Evolution	What is variation?	Variation is differences between organisms within the same species or between different species.
16.2		State 3 causes of variation.	Environmental, genetic, combination of both.
16.3		What is evolution?	The gradual development/changing of an organism from an earlier form.
16.4		What is a species?	Organisms that can interbreed to produce fertile offspring.
16.5		What is natural selection?	The process by which evolution takes place – those with favourable characteristics (best suited to environment) are more likely to survive and reproduce, passing on their genes.

16.6		What is selective breeding?	The process by which humans breed plants and animals for particular genetic characteristics.
16.7		State 2 advantages and 2 disadvantages of selective breeding.	Advantages – desired characteristics can be inherited, increased profit for items that you can increase yield. Disadvantages – inbreeding (some breeds are prone to disease or inherited defects), may not get the characteristics you desire.
16.8		What is genetic engineering?	The process which involves modifying the genome of an organism by introducing a gene from another organism to give a desired characteristic.
16.9		What structures present in a prokaryote are used in genetic engineering?	Plasmids.
16.10		What are used to 'cut out' and 'stick' an inserted section of DNA?	Cut – restriction enzymes. Stick – ligase enzymes.
16.11		State 2 advantages and 2 disadvantages of genetic engineering.	Advantages – improved growth rates, increased yield, increased food quality, produce human proteins, enzymes as medicine Disadvantages – unknown effects on populations of wildflowers, unknown effects on populations of insects, some people feel the effects of eating GM crops on human health have not been fully explored
16.12		State 3 uses of genetic engineering.	Insulin production, disease-resistant crops, monoclonal antibodies.
17.1	Inheritance and Classification	Who is credited with the theory of natural selection and evolution?	Charles Darwin.
17.2		State the 3 stages of natural selection.	Individual organisms within a particular species show a wide range of variation for a characteristic. Individuals with characteristics most suited to the environment are more likely to survive to breed successfully. The characteristics that have enabled these individuals to survive are then passed on to the next generation.
17.3		What is speciation?	The formation of new and distinct species in the course of evolution.
17.4		What are fossils?	The remains of organisms from millions of years ago, found in rocks.
17.5		Why are fossils important?	Can be used to determine how much or how little organisms have changed as life developed on Earth.

17.6		What is an evolutionary tree?	Evolutionary trees are used to represent the relationships between organisms.
17.7		What do the junctions between the lines on an evolutionary tree mean?	A common ancestor of two species.
17.8		What is extinction?	When there are no remaining individuals of a species still alive.
17.9		State 3 ways that extinction could occur.	Changes to the environment over geological time, lack of food/prey, new predators, new diseases, new more successful competitors, a single catastrophic event/natural disaster.
17.10		State the title at each classification level.	Domain, Kingdom, Phylum, Class, Order, Family, Genus, Species.
17.11		Which 2 levels are used in the binomial naming system?	Genus and species.
17.12		What are the 3 domains?	Archaea, Bacteria, Eukarya.

18.1	**Adaptation and Organisation in an Ecosystem**	What is an ecosystem?	The interaction of a community with the abiotic parts of the environment.
18.2		What do organisms need to survive and reproduce?	Water, food, light, space, oxygen, carbon dioxide, mates.
18.3		State 4 things that a plant competes for.	Water, space, light, carbon dioxide, oxygen.
18.4		State 4 things that an animal competes for.	Food, sexual mates, hierarchy, territory.
18.5		Describe the differences between biotic and abiotic factors (give an example of each).	Abiotic is a non-living factor such as temperature or carbon dioxide. Biotic is a living factor such as a predator or disease.
18.6		What is an extremophile? Give an example.	(Micro)organisms that live in environments that are very extreme (e.g. high temperature, pressure, salt concentration).
18.7		Write a 4-stage food chain and label the producer, secondary consumer, primary consumer, tertiary consumer, herbivore, carnivore and omnivore.	Example must start with a plant (producer), followed by an organism that eats the plant (primary consumer), followed by a secondary consumer then a tertiary consumer.
18.8		Describe the difference between a predator and its prey.	Predator is an animal that eats prey. Prey is the animal that gets eaten.

18.9		What is biodiversity?	A measure of the variety of all the different species of organisms within an ecosystem.
18.10		Why does having greater biodiversity ensure stability in an ecosystem?	Each species becomes less dependent on specific species for food/shelter → less pressure on certain species which could've led to extinction → all species populations are balanced.
18.11		State 2 methods to determine the distribution and abundance of species in an ecosystem.	Random sampling using a quadrat. Systemic sampling using a transect.
18.12		What are the differences between random and systemic sampling?	Random sampling can be used to measure the distribution of one organism over a large area, systemic sampling can be used to see how the distribution of organisms change across one or more habitats.
19.1	**Cycles**	Name 3 substances that can be recycled in our atmosphere.	Carbon, nitrogen and water.
19.2		State 3 process that return carbon dioxide to the atmosphere.	Respiration, combustion, decomposition.
19.3		What uses carbon dioxide from the atmosphere?	Plants.
19.4		Where does fresh water for plants and animals come from?	Ice sheets, ice caps, glaciers, bogs, ponds, lakes, rivers, streams and underground.
19.5		State 3 factors that affect the rate of decay of biological material.	Availability of oxygen, temperature and moisture levels.
19.6		How do humans affect the amount of land for animals and plants?	Reduce the amount of land by deforestation for farming, agriculture or building.
19.7	**Cycles**	What is a peat bog?	Very wet areas of land without trees and where many types of moss grow. They are acidic and often have very low levels of nutrients. Lots of partially decayed organic material.
19.8		Why are peat bogs being destroyed? What is the impact of this?	To use as fuels or for agriculture. The impact is that when they are destroyed, they no longer taking in and store large amounts of carbon. This contributes to the greenhouse effect and increases carbon dioxide levels.
19.9		As population increases what is happening to: a) resources, and b) amount of pollution?	Resources are decreasing. Pollution is increasing.
19.10		How is water, air and land polluted?	Water - litter, fertiliser, chemicals, pesticides. Air – greenhouse gases, carbon dioxide, particulates. Land – litter, chemicals.
19.11		What is the impact of pollution on biodiversity?	Reduces biodiversity.
19.12		Why is a reduction in biodiversity concerning?	Reduced genetic diversity in organisms, can lead to extinction of species.
20.1	**Bio**	Give 3 causes of deforestation.	1. Provide land for cattle or rice fields.

			2. Grow crops for biofuels. 3. To clear space for building.
20.2		Which 2 gases are increasing in the atmosphere that are contributing to global warming?	1. Carbon dioxide. 2. Methane.
20.3		State 3 consequences of global warming.	1. Increased spread of pathogens. 2. Affecting migration patterns of animals. 3. Melting of polar ice caps, causing flooding. 4. Reduced habitats in polar regions. 5. Reduced biodiversity.
20.4		State 3 positives and 3 negatives about human interaction in an ecosystem.	POSITIVE 1. Breeding programmes for endangered species. 2. Protection and regeneration of rare habitats. 3. Reintroduction of field margins and hedgerows in agricultural areas where farmers grow only one type of crop. 4. Reduction of deforestation and carbon dioxide emissions by some governments. 5. Recycling resources rather than dumping waste in landfill. NEGATIVE 1. Clearing of land for agriculture, buildings and/or transport. 2. Hunting of rare species. 3. Mining from the land.
20.5	**Biodiversity**	What is a trophic level?	The position a species occupies in a food chain.
20.6		What type of organisms are found in trophic level 1?	Plants and algae.
20.7		What group of organisms break down dead, organic material?	Decomposers (microorganisms).
20.8		What do pyramids of biomass represent?	The relative amount of biomass in each level of a food chain.
20.9		Approximately how much light is absorbed by plants?	1% - 2%
20.10		State 2 ways in which biomass is lost through a food chain.	1. Not all the ingested material is absorbed, some is egested as faeces. 2. Some absorbed material is lost as waste, such as carbon dioxide and water in respiration and water and urea in urine.
20.11		Approximately how much energy is transferred between each trophic level?	10%
20.12		What is global dimming?	Global dimming is defined as the decrease in the amounts of solar radiation reaching the surface of the Earth.
21.1	**Immunity**	What is an antigen?	Proteins on cell surface for cell recognition.

21.2		What is a toxin?	A chemical or antigen that causes illness.
21.3		What drugs must patients who receive a transplant take? Why?	Immunosuppressant drugs to prevent rejection.
21.4		What is phagocytosis?	When a phagocyte is attracted to a pathogen, binds to it, then engulfs it. Enzymes then break down the pathogen.
21.5		Describe the role of T Cells.	Some can destroy cells and others stimulate an immune response.
21.6		Describe the roles of B Cells.	Release antibodies.
21.7		What is the purpose of a memory cell?	Remember the same pathogen for faster antibody production in future infections.
21.8		What are the differences between active and passive immunity?	Active immunity is when the person is exposed to a live pathogen, develops the disease and produces antibodies. Passive immunity is when antibodies are transferred.
21.9		Why is the secondary response quicker than the primary immune response?	Memory cells already know what antibodies to make to destroy the pathogen. This is done in a much quicker time than when you first encounter the pathogen.
21.10		What are antibodies?	A protein produced in response to a specific antigen.
21.11		What pathogen do antibiotics treat?	Bacteria.
21.12		How might an antibiotic be useless against a bacteria?	The bacteria may be resistant to the antibiotic.
22.1	**Stem Cells**	What is a stem cell?	An undifferentiated cell that has the potential to specialise.
22.2		Define adult stem cell.	Stem cells that can only differentiate into a specific type of cell.
22.3		Name another type of stem cell found in animals.	Embryonic stem cells.
22.4		Where is the answer from 22.3 found?	Embryos, umbilical cord.
22.5		Where are adult stem cells found?	Bone marrow.
22.6		Which type of stem cells would scientists prefer to use and why?	Embryonic stem cells as they can differentiate into many types of cell.
22.7		What is a plant stem cell called?	Meristem.
22.8		Where would you find plant stem cells?	Meristem.
22.9		How are plant stem cells different to adult stem cells or embryonic stem cells?	They can differentiate at any time.
22.10		What are the advantages of using adult stem cells?	Easier to obtain, effective, no ethical issues, abundant supply, little or no problems with immune rejection.
22.11		What are the advantages of using embryonic stem cells?	Can differentiate into any type of cell, potential to cure diseases such as blindness, diabetes and cancers.
22.12		Why might people be against the use of stem cells?	Ethical reasons surrounding the use of embryos, may not know the side effects, potential rejection.
23.1	**C ul**	What is binary fission?	Bacterial reproduction by mitosis.

23.2		What is a culture medium?	Liquid/gel with specific nutrients to support microorganism growth.
23.3		What is agar gel?	A solid gel culture medium used for growing microorganisms.
23.4		How can an uncontaminated culture be used?	To investigate effects of disinfectants and antibiotics.
23.5		What must be done to an inoculating loop before transferring the microorganism to the agar?	Sterilise/pass through a flame.
23.6		Why can't a petri dish be completely sealed when growing bacteria?	To allow oxygen in, preventing harmful anaerobic bacteria from growing.
23.7		Why must we not incubate cultures above 25 degrees?	Prevent harmful bacterial growth.
23.8		How long does it take bacteria to multiply in the optimum conditions?	20 minutes.
23.9		What are aseptic techniques?	Procedures in microbiology practicals to avoid contamination.
23.10		What is a zone of inhibition?	An area on the nutrient agar plate where there is no bacterial growth due to presence of antibiotics/disinfectants.
23.11		How do you calculate the zone of inhibition?	πr^2
23.12		What does the zone of inhibition tell us?	How effective an antibiotic, antiseptic or disinfectant is.

24.1	**Monoclonal Antibodies**	How are monoclonal antibodies made?	From a single clone of B-lymphocyte (B-cell) cell.
24.2		What do antibodies recognise?	Antigens - part of a specific chemical or cell in the body.
24.3		What is the name given to the section of antibody that does this?	The antigen binding site.
24.4		What is a hybridoma?	The combination of a lymphocyte and a tumour cell.
24 5		Why are hybridoma cells created?	They are able to create the required antibody and divide rapidly.
24.6		Once a hybridoma is made, what is then done with it?	Cloned to create many identical cells.
24.7		State 4 uses of monoclonal antibodies?	1. For pregnancy tests/diagnosis. 2. Measurement of hormone/chemical/pathogen levels in the blood. 3. Research to identify specific molecules in cells or tissues by binding with fluorescent dyes. 4. Treatment of some diseases Like cancer.
24.8		How can antibodies be used to treat conditions such as cancer?	Bind radioactive/toxic substances that are able to stop cells growing and dividing. The antibody will bind specifically to the cancer cells and

			deliver the substances without harming the other body cells.
24.9		Why is using monoclonal antibodies good in cancer treatment?	Bind specifically to the cancer cells and deliver the substances without harming the other body cells.
24.10		What do monoclonal antibodies target in a pregnancy test?	The hormone HGC produced in early pregnancy.
24.11		State an advantage of using monoclonal antibodies.	Cheaper to develop than conventional drugs, side effects can be treated and reduced, used in different ways, bind to specific cell.
24.12		State a disadvantage of using monoclonal antibodies.	More side effects than expected, expensive, difficult to get the right antibodies to attach.
25.1	**Plant Disease and Defence**	Name 3 ways of visually detecting plant disease.	Stunted growth, spots on leaves, areas of decay (rot), growths on part of the plant, malformed stems or leaves, discolouration, the presence of pests.
25.2		Name 3 ways to identify plant disease.	Look symptoms up in a gardening manual or website. Taking the infected plant to a laboratory. Using a testing kit that contains monoclonal antibodies.
25.3		Name 4 causes of plant disease.	Viruses, bacteria, fungi, insects.
25.4		How do aphids damage plants?	Pierce stems with their mouthparts to drink sugary liquid in phloem, introduce pathogens and deprive plants of sugars.
25.5	**Plant Disease and Defence**	Name 2 problems caused by a lack of ions.	Stunted growth caused by nitrate deficiency AND chlorosis caused by magnesium deficiency.
25.6		Why does a lack of nitrate ions affect plant growth?	Nitrate ions are used to make proteins.
25.7		Why does a lack of magnesium ions affect plant growth?	Magnesium ions are used to make chlorophyll so plants cannot photosynthesise to build up glucose to be used in respiration that releases energy to build new molecules for growth.
25.8		Name 3 physical defences of plants.	Cellulose cell walls, tough waxy cuticle on leaves, layers of dead cells around stems (bark on trees) which fall off.
25.9		Name 2 chemical defences of plants.	Antibacterial chemicals, poisons to deter herbivores.
25.10		Name 3 mechanical defences of plants.	Thorns and hairs deter animals, leaves which droop or curl when touched, mimicry to trick animals.
25.11		How are magnesium ions used in a plant?	To help produce chlorophyll.
25.12		What is a symptom of magnesium deficiency in a plant?	Yellow leaves.
26.1	**The Brain**	What is the brain made up of?	Billions of interconnected neurons.
26.2		Name the 3 main parts of the brain.	Cerebral cortex, cerebellum, medulla.

26.3		Why is investigating the function of the brain difficult?	It is a complex and delicate organ.
26.4		Name 2 ways scientists can investigate brain function.	Electrically stimulating areas in a conscious patient and recording their response OR Magnetic Resonance Imaging (MRI) scans
26.5		Name the 2 main stimuli that the eye is sensitive to.	Light intensity and colour.
26.6		Name the muscle that changes the shape of the lens in the eye.	Ciliary muscle.
26.7		Name the part of the eye which controls how much light enters through the pupil.	Iris.
26.8		Name the ligaments in the eye which help change the shape of the lens.	Suspensory ligaments.
26.9		Name the part of the eye that allows light to enter through.	Pupil.
26.10		Which part of the eye gathers information and takes it to the brain?	Optic nerve.
26.11		What happens to the suspensory ligaments and ciliary muscles when the eye focuses on a) a near object or b) a far object?	Near - Suspensory ligaments loosen, ciliary muscles contract. Far - Suspensory ligaments tighten, ciliary muscles relax.
26.12		Name the 2 types of lenses and how they are used to treat myopia and hyperopia.	Concave lens corrects myopia. Convex lens corrects hyperopia.

27.1	**Thermoregulation and Osmoregulation**	What monitors and controls body temperature?	Thermoregulatory center.
27.2		Name 2 ways the body responds if the temperature is too high.	Sweating, vasodilation, hairs lie flat.
27.3		How do these responses lower body temperature?	Sweating causes evaporation from the skin to cool. Vasodilation allows more heat to be lost by radiation. Hairs lie flat as not to trap an insulating layer of air
27.4		Name 3 ways the body responds if the temperature is too low.	Vasoconstriction, shivering, and hairs stand up.
27.5		How do these responses increase temperature?	Shivering - rapid contraction of muscles, which require energy through exothermic reaction respiration. Vasoconstriction - limits heat loss by radiation. Hairs stand up- trap an insulating layer of air.
27.6		What happens to an animal cell if it a) gains or b) loses too much water?	a) Burst/lysis. b) Shrivel/shrink/crenation.
27.7		What is removed from the body by the kidneys in the urine?	Urea.
27.8		Excess amino acids are broken down into what?	Ammonia.

27.9		Which hormone controls the water balance and where is it made?	ADH made in the hypothalamus in the brain.
27.10		How does this hormone affect the walls of the kidney tubules?	Increases the number of aquaporin channels, increasing the volume of water reabsorbed into the blood.
27.11		State 2 methods of treating kidney failure.	Dialysis and kidney transplant.
27.12		What is the effect on urine concentration and volume if a) ADH is released or b) ADH is not released?	a) Higher concentration, lower volume. b) Lower concentration, higher volume.
28.1	**Plant Hormones**	What is the plant response to light called?	Phototropism.
28.2		What is the plant response to water called?	Hydrotropism.
28.3		What is the plant response to chemicals called?	Chemotropism.
28.4		What is gravitropism or geotropism?	The response of a plant to gravity.
28.5		What is the role of gibberellins in plants?	Initiates seed germination.
28.6		Which plant hormone controls cell division?	Ethene.
28.7		Which plant hormone controls the ripening of fruit?	Ethene.
28.8		In which industries are plant hormones used regularly?	Agriculture and horticulture.
28.9		State 3 ways auxin is used.	Weed killers. Rooting powders (to stimulate the development of roots). Promoting growth of plant tissue cultures.
28.10		How is ethene used in the food industry?	To control fruit ripening during storage and transport.
28.11	**Plant Hormones**	How are gibberellins used in industry?	To end seed dormancy. To promote flowering. To increase fruit size.
28.12		What effect do auxins have on plants?	Auxins control the growth of plants by promoting cell division and causing elongation in plant cells. Cells in stems grow more, cells in roots grow less.
29.1	**DNA**	Name the 3 parts of DNA.	A phosphate group, a sugar molecule, and a nucleotide base.
29.2		Name the 4 nucleotides found in DNA.	Adenine, Thymine, Cytosine and Guanine.
29.3		How many bases code for an amino acid?	Three.
29.4		What is a set of 3 nucleotide bases called?	A codon.
29.5		Which organelle synthesises new proteins?	Ribosomes.
29.6		How is the protein sequence correctly assembled?	Using a template molecule from DNA.
29.7		What brings specific amino acids to the ribosome?	Carrier molecules.
29.8		When a protein chain is complete, what process aids it to form its unique shape?	Folding.
29.9		Name 3 uses of protein in the body.	Enzymes, hormones, structural proteins such as collagen, antibodies.
29.10		What is the change in the DNA sequence called?	Mutation.

29.11		Name 3 potential consequences for a protein mutation?	No change, slight change - so no effect on protein. Altered protein so it may not function. Mutation with non-coding region that may stop the expression of a gene.
29.12		Name 2 examples of proteins in the body and where you may find them.	Hormones – glands. Antibodies – produced by white blood cells. Enzymes – produced by organs.
30.1	**Cloning**	What is a plant tissue culture?	Using small groups of cells from part of a plant to grow identical new plants.
30.2		What are plant cuttings?	An older, but simple, method used by gardeners to produce many identical new plants from a parent plant.
30.3		Why is plant cloning useful?	Horticulture and agriculture. To produce lots of plants with the same desirable characteristics and increase yield for profit.
30.4		Describe the stages in embryo transplant.	Splitting apart cells from a developing animal embryo before they become specialised transplanting the identical embryos into host mothers.
30.5	**Cloning**	Describe the stages in adult cell cloning.	The nucleus is removed from an unfertilised egg cell. The nucleus from an adult body cell, such as a skin cell, is inserted into the egg cell. An electric shock stimulates the egg cell to divide to form an embryo. These embryo cells contain the same genetic information as the adult skin cell. When the embryo has developed into a ball of cells, it is inserted into the womb of an adult female to continue its development.
30.6		State 2 advantages of cloning in plants and animals.	Organisms have the desired characteristics; slow breeding organisms can be produced quickly.
30.7		State 2 disadvantages of cloning in plants and animals.	Reduces genetic variation, so makes populations more susceptible to disease, ethical concerns.
30.8		Compare the offspring as a result of embryo transplants.	All are genetically identical to each other - but not to parents.
30.9		In adult cell cloning what is removed from the cloning target cell?	Nucleus.

30.10		What type of cell is taken from the target clone in adult cell cloning?	Any adult cell with a nucleus containing all chromosomes. (Not a gamete.)
30.11		What has to be done to the egg in adult cell cloning?	Remove the nucleus.
30.12		What has to be done to stimulate the new egg to start dividing in adult cell cloning?	Electric shock.
31.1	**Theories of Evolution**	Who is deemed the founder of modern genetics?	Gregor Mendel.
31.2		Who contributed to the theory of natural selection but is often forgotten?	Alfred Russell Wallace.
31.3		State 3 reasons why Darwin's ideas were slowly accepted.	Conflict with the belief that God made all things. Insufficient evidence. No mechanism to explain variation.
31.4		What theory did Jean-Baptiste Lamarck propose?	The idea that changes that occur in an organism during its lifetime can be inherited.
31.5		Whose studies lent most evidence to the idea of speciation?	Alfred Russell Wallace.
31.6		What is a species?	A group of organisms with similar characteristics with the ability to produce fertile offspring.
31.7	**Theories of Evolution**	Give the 6 stages of speciation.	Geographical isolation (e.g. a flood divides an island in two). Different selection. pressures/conditions in the new environments. Genetic variation (due to mutations) within the groups. Best adapted individuals to the new conditions survive, reproduce and pass on these alleles. No interbreeding over time, groups become more different to each other. After a large amount of time, unable to interbreed successfully. They are now separate species.
31.8		What does survival of the fittest mean?	Organisms with adaptations best suited to their environment can survive, reproduce and pass on their genes to their offspring.
31.9		What did Mendel theorise was transferred from parent to offspring?	Heritable units/traits.
31.10		What do we now call Mendel's inheritable traits or units?	Genes.
31.11		In the late 19th century scientists observed large structures in the nucleus. What were these?	Chromosomes.

31.12		What has to occur first for evolution to take place?	Random mutation.
32.1	**Food Production and Farming**	What is compost?	Decayed organic material used as a fertilizer for growing plants.
32.2		Why is compost used?	Builds good soil structure, enables soil to retain nutrients, water, and air, protects against drought, helps maintain a neutral pH and protects plants from many diseases commonly found in the garden. It also feeds earthworms and other microbial life in the soil.
32.3		What does anaerobic decay release?	Methane and carbon dioxide.
32.4		What is food security?	The state of having reliable access to enough affordable, nutritious food.
32.5		What biological factors affect food security?	Lack of land/space. Increase in human population. Pests/pathogens.
32.6		How can the efficiency of food production in animals be increased?	Prevent animals from moving too much, provide food containing supplements to help growth and resistance to disease, optimum temperatures.
32.7		How can the efficiency of food production in plants be increased?	Crop rotation, pesticides, herbicides, fertilizers.
32.8	**Food Production and Farming**	How can we maintain fish stocks?	Setting fishing quotas, restrictions of types of fish to catch, limit mesh size of nets.
32.9		What is fusarium used for?	Producing protein rich foods (meat alternative).
32.10		What is eutrophication?	Hyper-nutrition resulting from fertilizer pollution of aquatic ecosystems.
32.11		What is intensive farming?	Methods of farming which maximise food production despite negative impacts.
32.12		Why might people be against intensive farming?	Reduces biodiversity, harmful to humans, harmful to organisms, build-up of poisons in a food chain, increased risk of disease, lower quality product.

Knowledge Organiser

Biology Separate

GCSE Biology Separate AQA