

Revision checklist – Homeostasis GCSE Separate Biology

Use this checklist to highlight your confidence and revision preparedness for upcoming exams. R – None. A – Some. G – Ready!

An electronic version can be available to you if required.

Specification	Statement	Additional details	R	A	G
4.5.1 Homeostasis	I can define and explain what homeostasis is	Regulation of internal conditions in a cell or organism Maintaining optimum conditions for function Response to internal and external changes			
	I can identify what optimal conditions are needed for enzyme action	Blood glucose concentration Body temperature Water levels			
	I can describe the automatic control systems that lead to responses	Nervous system Chemical – endocrine system			
	I can recognise and describe the structures in the control systems for nervous and chemical responses	Receptors (cells) Coordination centres (brain, spinal cord, pancreas) Effectors (muscles, glands)			
	I can describe the function of a receptor cell	Detect specific stimuli e.g., temperature, pressure, chemical, light intensity/wavelength			
	I can identify and describe the roles of different co-ordination centres	E.g., brain, spinal cord, pancreas, receive and process information from receptors			
	I can describe the responses of specific effectors and explain their importance	E.g., muscles or glands; respond to restore optimum levels			
	4.5.2.1 Structure and function (The human nervous system)	I can explain how the structure of the nervous system is adapted to its functions	Receptor (detects specific stimulus) Co-ordinator Effector (response)		
I understand the role of the nervous system for a person's health and survival		React to surroundings Co-ordinate behaviour			
I can describe the signal and response mechanism of a nervous impulse		Receptors detect stimuli and generate an electrical impulse Neurones (nerve cells) transmit electrical impulses			

		CNS (Central Nervous System) is the brain and spinal cord CNS receives, co-ordinates and sends response to specific effectors Effectors – muscle, gland functionality			
	I can identify the cell / tissue / organ structures in the reflex arc	Receptor Sensory neurone Synapse (gap between neurones) Central Nervous System (Spinal cord only) Relay Neurone Motor neurone Effector			
	I can describe the functional properties of effectors in response to a stimulus	Muscle – contraction (movement) Endocrine gland – secretion (of a specific hormone)			
	I can explain the importance of reflex actions				
	I know reflex actions are automatic and rapid	Do not involve a conscious decision (involuntary)			
4.5.2.2 (Bio) The Brain	I understand that the brain controls complex behaviour				
	I know the brain is constructed of neurones that connect different regions				
	I can identify and describe different regions of the brain and their function	Cerebral cortex Cerebellum Medulla			
	I can describe how neuroscientists came to understand brain mapping (H)	Electrical stimulation MRI scanning			
	I can explain some difficulties of investigating brain function (H)	Complexity and delicacy of brain cells/tissue			
	I can explain some treatment options for brain damage and disease (H)				
	I can evaluate the benefits and risks of procedures carried out on the brain and nervous system (H)				

4.5.2.3 (Bio) The eye	I can relate the structures of the eye to their function	Accommodation (focus on near/distant objects) Adaptation to dim light (and bright)			
	I know the eye is a sense organ that contains receptors sensitive to light intensity and colour (wavelength)				
	I can identify the structures of the eye on a diagram and relate their structure to their function	Retina Optic nerve Sclera Cornea Iris Ciliary muscles Suspensory ligaments			
	I can define accommodation (of the eye)	Changing lens shape to focus			
	I understand that when light is refracted more, the light bends towards the normal line more	(Physics specification link)			
	I understand that when light is refracted less, the light bends towards the normal line less	(Physics specification link)			
	I can describe the effect and consequence of accommodation on a near object	Ciliary muscles contract Suspensory ligaments loosen Lens becomes thicker – more refraction of light			
	I can describe the effect and consequence of accommodation on a distant object	Ciliary muscles relax Suspensory ligaments pulled Lens becomes thinner – less refraction of light rays			
	I can identify common defects of the eye	Myopia (short sightedness) Hyperopia (long sightedness)			
	I can describe the impact of myopia and hyperopia on light not focusing on the retina	Lens and cornea interaction in refracting light impaired			
	I can describe treatment options to correct defects of myopia and hyperopia	Spectacle lenses refract rays to focus on the retina Contact lenses (hard and soft) Laser surgery to change cornea shape Intra-ocular lenses surgically added behind the cornea			

4.5.2.4 (Bio) Control of body temperature	I can identify the function of the thermoregulatory centre in the brain	Contains receptors sensitive to blood temperature			
	I can describe the function of temperature receptors in the skin				
	I know the temperature receptors in the skin send nervous impulses to the thermoregulatory centre				
	I can describe and explain the body's response to body temperature being too high	Blood vessels dilate (vasodilation) Sweat production from sweat glands			
	I can describe the consequence of blood vessel dilation and sweat production	Transfer thermal energy the environment at a faster rate, cooling effect			
	I can describe and explain the body's response to body temperature being too low	Blood vessels constrict (vasoconstriction) Sweating stops Skeletal muscles contract (shiver)			
	I can explain the mechanisms of body temperature control given a specific context (H)	To raise or lower body temperature			
4.5.3.1 Human endocrine system	I can describe the principles of hormonal co-ordination and control by the human endocrine system				
	I know the endocrine system is composed of glands which secrete hormones into the bloodstream				
	I know a hormone is a chemical made from protein that has a specific shape	For a specific function / receptor / target organ			
	I know a response from the endocrine system is slower and acts longer than a response from the nervous system	Nervous system faster and shorter effect time			
	I know the pituitary gland is a 'master gland'	Controls many endocrine responses			
	I can identify some hormones the pituitary gland secretes into the blood that each control specific body conditions	E.g., ADH – increases water reabsorption into blood (kidney)			
	I understand that the presence of one hormone can lead to other glands to secrete other hormones	The original hormone secreted is the stimulus for a secondary response on another target organ			
	I can identify the position of the endocrine glands	Pituitary gland Pancreas Thyroid			

		Adrenal gland			
		Ovary / ovaries			
		Testes			
4.5.3.2 Control of blood glucose concentration	I know that blood glucose concentration is monitored and controlled by the pancreas				
	I understand that if blood glucose concentration is too high, the pancreas produces and secretes the hormone insulin into the blood.				
	I know that insulin is needed for all cells to absorb glucose				
	I can describe the effect of insulin on liver and muscle cells	To store excess glucose in the polymer glycogen			
	I can explain how insulin controls blood glucose (sugar) levels in the body	Decrease concentration of glucose in blood			
	I understand that when blood glucose concentration is too low, the pancreas produces the hormone glucagon				
	I can describe the effect of glucagon on glycogen and ultimately, blood glucose concentration	High glucagon levels. Glycogen broken down into glucose in cytoplasm Glucose released into blood from storage cells Blood glucose concentration increases			
	I know that diabetes is a condition where the person cannot internally control their blood glucose level				
	I know that there are two types of diabetes	Type 1 and Type 2			
	I can describe the cause of Type 1 diabetes and treatment options	Pancreas cannot produce (enough) insulin Uncontrolled high blood glucose levels Treated with insulin injections			
	I can describe the cause of Type 2 diabetes and treatment options	Cells no longer respond to insulin hormone Treated with a sugar / carbohydrate-controlled diet Treated with an exercise regime to increase respiration of glucose (and therefore removal from blood) Obesity is a risk factor			

	I can compare treatment options for Type 1 and Type 2 diabetes.				
	I can evaluate information about the relationship between obesity and diabetes				
	I can make informed recommendations considering social and ethical issues				
	I can describe the negative feedback cycle to control blood glucose involving glucagon and insulin	High concentrations of one hormone inhibit the other hormone's production.			
4.5.3.3 (Bio) Maintaining water and nitrogen balance in the body	I can define osmosis				
	I can identify how water can leave the body	Lungs during exhalation Skin - sweat Faeces (large intestine reabsorption) Urine – excess water			
	I know that the amount of water, ions or urea lost by the skin and lungs is not controlled.				
	I know sweat contains water, ions and urea				
	I understand that excess water, ions and urea are removed by the kidneys in the urine	To the bladder / Urethra			
	I know that if body cells gain or lose too much water, they do not function effectively	Too high water – by osmosis – lysis of cells Too low water – by osmosis – crenation of cells			
	I can describe how excess amino acids in the diet are excreted safely	Excess amino acids in the liver are deaminated to form ammonia Ammonia is immediately converted to urea Urea is removed from the blood into the kidney nephron for safe excretion			
	I can describe how the kidneys regulate water balance in the body	Urine is produced by filtration of the blood			
	I can use particle movement theory to describe how filtered blood in the nephron is reabsorbed	Glucose reabsorbed by active transport Some ions reabsorbed Water volume reabsorbed due to osmosis			
	I know that the 'nephron' / 'kidney tubule' is the vessel that the filtered fluid moves through, within the kidney				
	I can describe the effect of ADH on the permeability of the kidney tubules (H)	More ADH → increased permeability Less ADH → decreased permeability			

	I know that if ADH is present, more water is reabsorbed into the blood (H)	The person is dehydrated			
	I know that ADH is secreted from the pituitary gland when blood is more concentrated (H)	Low water concentration			
	I can describe the negative feedback system of blood water control because of ADH (H)				
	I can describe the procedural treatment options for kidney failure	Organ transplant Kidney dialysis			
	I can evaluate the advantages and disadvantages of treating organ failure	Mechanical devices Transplanted organ from donor			
4.5.3.4 Hormones in human reproduction	I know that during puberty, reproductive hormones cause secondary sex characteristics to develop				
	I can describe what testosterone is and its effect on the male reproductive system	Testosterone is a hormone Produces in the testes Stimulates sperm production			
	I can describe what oestrogen is and its effect on the female reproductive system	Oestrogen is a hormone Produced in the ovary Develops and maintains the uterus lining			
	I know that ovulation occurs approximately every 28 days	When a female reaches puberty			
	I know that a follicle matures into an egg (ovum) during the menstrual cycle				
	I can describe the hormones in the menstrual cycle and their effect	FSH – Follicle stimulating hormone – maturation of an egg in the ovary LH – Luteinising hormone – stimulates ovulation Oestrogen develops and maintains the uterus When progesterone levels drop, the uterus lining is shed (period – no fertilisation)			
	I can describe the interactions between the four menstrual cycle hormones	More FSH stimulates more oestrogen production More oestrogen stimulates more LH production LH production inhibits FSH production (negative feedback) More LH stimulates progesterone production Progesterone inhibits FSH and LH production			

4.5.3.5 Contraception	I can describe the different hormonal and non-hormonal methods of contraception	Oral contraceptives inhibit FSH Injection / Implant / Patch contain progesterone Barrier methods e.g., condoms, diaphragms Intrauterine devices (IUD) Spermicidal agents Abstinence Sterilisation via surgery e.g., vasectomy				
	I can explain and evaluate the use of different methods of contraception	Inhibiting FSH production Inhibit maturation and release of eggs over months/years Prevention of the egg reaching the sperm Prevent implantation of embryo Kill or disable sperm Not having sex				
	I can evaluate the personal, social, economic and environmental implications for the use of contraceptives					
	I can make decisions based on evaluating evidence and arguments for and against the use of contraceptive methods					
	4.5.3.6 (H) The use of hormones to treat fertility	I can explain the use of hormones in modern reproductive technologies to treat infertility	FSH and LH fertility drug administered to women IVF – In Vitro Fertilisation treatment			
		I can describe the benefits of fertility drugs	A woman can become pregnant the normal way after treatment			
		I can describe the process of IVF	A woman is treated with FSH and LH to produce and mature several eggs Eggs are collected from ovary and fertilised by sperm in a laboratory from father Fertilised eggs develop into embryos One or two embryos inserted into mother's uterus (womb)			
I can evaluate social, ethical, and procedural methods associated with the treatment of infertility		Emotional and physical stress Not high success rates Can lead to multiple births – increased risk for babies and mother				

4.5.3.7 (H) Negative feedback	I can explain the role of thyroxine in the body	Thyroid produces thyroxine			
		Stimulates basal metabolic rate			
		Important for growth and development			
		Controlled by negative feedback			
	I can explain the role of adrenaline in the body	Adrenal glands produce adrenaline			
	Fear or stress stimulus				
	Increases heart rate				
	I can describe the effect of increased heart rate on the rate of aerobic respiration	E.g., increased oxygen provision			
		E.g., increased glucose provision			
	I can interpret and explain diagrams of negative feedback control systems	E.g., Menstrual cycle hormones			
		E.g., Thyroxine			
		E.g., Blood glucose control insulin and glucagon			
4.5.4.1 (Bio) Plant hormones control and coordination	I know that plants produce chemical 'hormones' that control and coordinate growth.				
	I understand that tropisms lead to plant growth occurring directionally	E.g., phototropism (light stimulus) E.g., gravitropism / geotropism (gravity)			
	I can describe the effect of auxin on cell growth and elongation				
	I can explain why the uneven distribution of auxin leads to directional growth	E.g., auxin breaks down in lit areas of plant shoot – preventing growth E.g., even distribution of auxin in roots causes downward growth (towards water)			
	I know that gibberellins are important to initiate seed germination (H)				
	I know that ethene controls cell division and ripening of fruits (H)				
4.5.4.2 (Bio) (H) The use of plant hormones	I can describe the effects of some plant hormones that people use to control plant growth.	Auxin			
		Ethene			
		Gibberellins			
	I can describe how auxin is used in agriculture and horticulture	Weed killer Rooting powder (for cuttings) Promoting growth in tissue culture			
	I know ethene is used in the food industry	Control ripening of fruit during storage / transport			
	End seed dormancy				

	I can describe how gibberellins are used to control plant growth	Promote flowering Increase fruit size			
Practical requirements	Required Practical 7 – Investigation into the effect of a factor on human reaction time	E.g., practice, drug involvement (e.g., caffeine / alcohol / glucose)			
	Required practical 8 – Investigation into the effect of light or gravity on growth of newly germinated seedlings				
Mathematical requirements	I can calculate a mean	E.g., Reaction times in ms			
	I can convert values of orders of magnitude	I understand 1ms (millisecond) is 1/1000 th of a second			
	I can extract and interpret information from graphs, charts, and tables	E.g., the functionality of the nervous system E.g. Effect of insulin in blood glucose - diabetes E.g. Hormone levels during the menstrual cycle			
	I can translate information about reaction times between numerical and graphical form				
	I understand that the speed in which an impulse travels is limited				
	I can substitute values of speed, distance or time into a given equation	E.g., Calculating response time from a distance			
	I can interpret ray diagrams	E.g., refraction of light defects with myopia and hyperopia E.g., Correction using spectacle lenses for myopia and hyperopia			
	I can translate tables and bar charts	E.g., glucose, ions and urea concentration in the blood before and after filtration			

Revision checklist – Genetics GCSE Separate Biology

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4.6.1.1 Sexual and asexual reproduction	I know that meiosis leads to non-identical cells being formed.	I can spell meiosis			
	I know that mitosis leads to identical cells being formed	I can spell mitosis			
	I understand that sexual reproduction involves the joining (fusion) of male and female gametes	Sperm and egg in animals Pollen and egg in flowering plants			
	I can describe in sexual reproduction there is a mixing of genetic information which leads to variation (variety) in the offspring.				
	I know that gametes are formed as a result of meiosis				
	I know that in asexual reproduction, only one parent is needed	There is no fusion of gametes. There is no mixing of genetic information Genetically identical offspring Clones Only mitosis involved			
4.6.1.2 Meiosis	I know that meiosis results in the chromosome number to halve.				
	I know that the fertilisation of gametes restores the full number of chromosomes.	Found in adult body cells			
	I know that cells that divide by meiosis happens in the reproductive organs	Ovaries (female) Testes (male)			
	I can describe cell division by meiosis	Copies of the genetic information are made Cells divides twice Four gametes are produced Each gamete has a single set of chromosomes All gametes are genetically different to each other			

	I know that after fertilisation, cells divide by mitosis.	Increasing the total number of cells				
	I can describe what happens to cells when they divide in the embryo by mitosis.	Embryonic stem cells Replicate to make more stem cells Differentiate (specialise)				
4.6.1.3 Advantages and disadvantages of sexual and asexual reproduction (BIO)	I can describe the advantages of sexual reproduction	Produces variation in offspring If the environment changes, variation gives a survival advantage by natural selection Natural selection can be speeded up by humans in selective breeding to increase food production				
	I can describe the advantages of asexual reproduction	Only one parent is needed More time and energy efficient as they do not require a mate (need to find one) Faster than sexual reproduction Produces many identical offspring when conditions are favourable				
	I know that some organisms reproduce by both methods depending on the circumstances.	Malaria parasites reproduce asexually in the blood of the human host but asexually in the digestive tract of the mosquito Advances in technology have developed understanding of causes and prevention of malaria Many fungi reproduce asexually by spores but also reproduce sexually to give variation Many plants produce seeds sexually but also reproduce asexually (like strawberries) growing a runner from the parent plant, (like daffodils) that bud off new bulbs from the parent plant.				
	4.6.1.4 DNA and the genome	I can describe the structure of DNA	Double helix Two chains of nucleotides (polynucleotide) Complementary base pairs Phosphate Deoxyribose sugar Base (Adenine / Thymine / Cytosine / Guanine)			
		I can describe the term genome	The entire genetic material of an organism			

	I know that DNA is contained in chromosomes				
	I know that a gene is a small section of DNA	On a chromosome			
	I can describe how genes code for a sequence of amino acids	A gene codes for a specific protein			
	I know that the human genome project finished in 2003				
	I know that the human genome project was studied to help identify links between genes for different people	Useful for medical screening Useful for medical diagnosis Useful for medical treatment			
	I know the importance of the human genome project	To search for genes linked to different diseases Understanding and treatment of inherited disorders Use in tracing human migration patterns from the past (ancestry / evolutionary links)			
4.6.1.5 DNA structure (BIO)	I know that DNA is a polymer	Made from four different nucleotides			
	Each nucleotide is made of a sugar, phosphate group and a base.				
	Bases pair with complementary base pairs	Adenine and Thymine (A-T) Guanine and Cytosine (G-C)			
	I know that every three bases is the code for one specific amino acid.				
	I can describe how the order of bases controls the order of amino acids	In a protein			
	I know that the amino acid sequence (order) produces a specific protein				
	I can describe the 'backbone' of DNA as a connection between the sugar and phosphate of two adjacent nucleotides	Attached to each sugar is one base			
	I can observe a picture of a nucleotide or DNA and can label the structures within it				
4.6.1.5 DNA Structure (H)	I can recall a simple description of protein synthesis				
	I can explain simply how the structure of DNA affects the protein made				
	I can describe how genetic variants may influence phenotype	In coding sections of DNA – altering the activity of a protein			

		In non-coding sections of DNA – altering if / how a gene is expressed			
	I know that in the complementary strands of DNA bases are 'paired'	C with G T with A			
	I know that proteins are synthesised on ribosomes				
	I know that a template molecule is used to take the code from DNA to the ribosome				
	I know that carrier molecules bring specific amino acids to the ribosome	Amino acids are bonded in sequence to make a protein The correct order of amino acids will have the correct protein being produced			
	I can describe that when a protein chain is complete, it folds up to form a unique shape.				
	I know that a protein with a unique shape has a specific function	Receptor protein – detecting a stimulus Hormone – acts on target cells for the specific effect of the hormone Enzyme – active site shape is specific to the substrate it binds to (forms an enzyme-substrate complex) Structural proteins – collagen, for strength in tendons (muscle to bone)			
	I know that mutations occur continuously	Insertion mutation adds one or more bases Deletion mutation removes base			
	I know that if an insertion or deletion mutation occurs, it can cause a frame shift	The rest of the DNA code is 'positioned' in the wrong location The order of amino acids can / may drastically change making it ineffective			
	I know that most mutations do not alter the protein (or causes a minimal change so that the function of the protein still remains).				
	I know that a few mutations alters the code for a protein with different shape.	E.g. an enzyme active site can no longer fit the substrate (so no enzyme-substrate complex can form) E.g. A structural protein may lose its strength			
	I know that there are sections of DNA that are non-coding	Non-coding sections do not code for proteins			

	I know that non-coding sections of DNA control when a gene is switched on / off.	Controlling if and when gene expression occurs			
	I know that variation in DNA can affect how genes are expressed	Alleles / mutations can affect gene expression			
4.6.1.6 Genetic inheritance	I can explain genetic inheritance terms	Gamete			
		Chromosome			
		Gene			
		Allele			
		Dominant			
		Recessive			
		Homozygous			
		Heterozygous			
		Genotype			
	Phenotype				
	I know that some characteristics are controlled by one single gene	Fur colour in mice			
		Red-green colour blindness in humans			
	I can define different versions of a gene are called 'alleles'				
I know that the allele / alleles present are given a letter code called the 'genotype'					
I know that the genotype codes for a phenotype	Phenotype – expression of the characteristic (what is observed)				
I know how alleles are expressed given their genotype	Dominant – always expressed if one or two copies present				
	Recessive -only expressed if two copies present				
	Homozygous – both alleles present are the same				
	Heterozygous – both alleles present are different				
I know that it is usually combinations of multiple genes interact rather than one single gene that influences a phenotype					
I understand that probability is used to predict the results of a single gene cross	Using a genetic diagram to predict offspring phenotype				
I can complete a punnet square diagram	Genetic cross diagram				

	I can extract and interpret information from a genetic cross diagram to link to family trees	Pedigree diagrams used			
(H)	I can construct a genetic diagram				
4.6.1.7 Inherited disorders	I know that genetic disorders are inherited				
	I know that genetic disorders are caused by the inheritance of specific alleles				
	I know the symptoms of polydactyly	Having extra fingers / toes (digits)			
	I know that polydactyly is caused by a dominant allele	A person only needs one of the affected alleles to cause the symptoms			
	I know the symptoms of cystic fibrosis	Cell membrane disorder – over production of mucus			
		Mucus build up in lungs prevents effective gas exchange			
		Mucus build up in pancreas prevents enzymes acting on substrates for digestion (growth inhibition)			
	I know that cystic fibrosis is caused by a recessive gene	A person needs to have two recessive alleles (homozygous recessive) for the condition to cause the symptoms			
I can make informed judgements about issues concerning embryo screening given information	Economic – related to money and prosperity				
	Social – jobs, health, quality of living				
I appreciate that embryo screening and gene therapy may limit suffering	Ethical – decision making for another yes/no				
	Ethical issues arise – e.g. abortion kills the foetus (they did not have the choice to live or die)				
4.6.1.8 Sex determination	I know that ordinary human body cells contain 23 pairs of chromosomes				
	I know that of the 23 pairs, there are 22 pairs of chromosomes that only code for characteristics				
	I know that one pair of chromosomes determines secondary sexual characteristic development	Female – XX			
		Male – XY			
I can draw a genetic cross / punnet square diagram to show sex inheritance					
4.6.2.1 Variation	I can describe what the genome is	The range of all genes in a cell / organism / species			

	I know that the genome can interact with the environment to influence the development of an organism	E.g. a person genetically has a fair skin colour, which darkens due to sunlight causing them to 'tan'			
	I know that variation means the differences in the characteristics of individuals of the same species	(or population) Caused by genes inherited (genetic) Caused by developed conditions (environmental) Caused by a combination of genetic and environmental influence			
	I can state that there is usually extensive genetic variation within a species				
	I can recall that all variants of a gene or characteristic arise from mutations	Most mutations have no effect on phenotype Some influence phenotype Very few determine phenotype			
	I know that mutations occur continuously				
	I understand that if a new phenotype is suited to the environmental change, it can lead to a relatively rapid change in the species	Increase in number of the variant with the beneficial characteristic Leading to new species being formed			
4.6.2.2 Evolution	I can describe evolution	A change in the inherited characteristics of a population over time Through a process of natural selection This may result in the formation of a new species			
	I know that the theory of evolution by natural selection states that all species have evolved from simple lifeforms that first developed more than three billion years ago				
	I can explain how evolution occurs through natural selection of variants	Giving rise to phenotypes best suited to their environment			
	I know the definition of a species	Individuals can no longer interbreed No longer produce fertile offspring New species formed			
	I know that new species can occur through natural selection if two populations of the same species become so different in phenotype to each other	<i>Reproductive isolation</i>			

4.6.2.3 Selective breeding	I can explain the impact of selective breeding in different applications	Food crops from wild plants Domesticated animals from wild animals			
	I know that selective breeding is an artificial selection mechanism	Humans decide which organisms breed together			
	I know that selective breeding is a process by which humans breed plants and animals for particular genetic characteristics	This has occurred for thousands of years			
	I can describe the process of selective breeding	Choosing parents with the desired characteristics From a mixed population Breed together the parents Continue over many generations Until the offspring show the desired characteristics			
	I can identify examples of particular desired characteristics	Disease resistance in food crops Animals which produce more meat or milk Domestic dogs with a gentle nature Large or unusual flowers			
4.6.2.4 Genetic engineering	I understand there are issues with selective breeding	'Inbreeding' where some breeds are more prone to disease or inherited disorders Ethical challenge of deciding the fate or offspring due to the choices made by humans			
	I can describe genetic engineering as a process	Involves the modifying of a genome of an organism Introducing a gene from another organism To give a desired characteristic			
4.6.2.4 Genetic engineering	I know that plant crops have been genetically engineered	To produce bigger, better fruits To be resistant to disease(s)			
	I know how bacterial cells can be genetically engineered to produce useful substances	E.g. human insulin Genes from the chromosomes of humans (and other organisms) Are cut out from the host cell DNA Then transferred to the (vector) DNA of another organism			
	I can explain the potential benefits and risks of genetic engineering	In agriculture In medicine			

	I understand that people can object to genetic engineering				
	I know that GM crops are called 'genetically modified' if they have their DNA changed				
	I can describe benefits of GM crops	Resistant to insect attack			
		Resistant to herbicides			
		Increased yield (typical result)			
	I can describe concerns of GM crops	Effect on populations of wild flowers and insects			
		Human health when eating GM crops			
		Effects have not been fully explored			
	I know that modern medical research is exploring the possibility of genetic modification to overcome inherited disorders				
(H)	I can describe the main steps in the process of genetic engineering	Enzymes are used to isolate the required gene			
		This gene is inserted into a vector			
		The vector is usually a bacterial plasmid or a virus			
		The vector is used to insert the gene into the required cells			
		Genes are transferred to the cells of animals, plants or microorganisms at an early stage in their development			
		The organism develops with desired characteristics			
	I can interpret information about genetic engineering techniques				
	I can make informed judgements about issues concerning genetic engineering and GM crops	(and cloning)			
4.6.2.5 Cloning (BIO)	I know that tissue culture is a cloning process	Small groups of cells from part of a plant			
		Grow identical new plants			
		Preserves rare plant species			
		Commercial use in nurseries			
	I know how making cuttings is a cloning process	Older, simpler method			
		Gardeners cut parts of the parent plant			

	I can describe the process of embryo transplant	Splitting cells apart from a developing animal embryo			
		Occurs before cell specialisation			
		Transplanting the identical embryos into the host mother			
	I can describe the process of adult cell cloning	Nucleus removed from an unfertilised egg cell			
		A nucleus is removed from an adult body cell is inserted into the egg cell (e.g. skin cell)			
		An electric shock stimulates the egg 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			
4.6.3.1 Theory of Evolution (BIO)	I know that Charles Darwin proposed the theory of evolution by natural selection	Observations from an around the world expedition			
		Years of experimentation and discussion			
		Development of geology and fossils			
	I know that individual organisms within a particular species show a wide range of variation for a characteristic				
	I know that individuals with characteristics most suited to the environment are more likely to survive and breed successfully				
	I can justify why characteristics that enable survival are passed on to the next generation				
	I know that Darwin published his ideas in <i>On the Origin of Species</i> (1859)				
	I understand that people did not accept the new revolutionary ideas	Controversy			
	I know why the theory of evolution by natural selection was eventually accepted	Challenged the idea that God made all the animals and plants that live on Earth			
		There was insufficient evidence at the time the theory was published to convince many scientists			

		The mechanism of inheritance and variation was not known until 50 years after the theory was published			
	I understand that other theories are based mainly on the idea that changes occur in an organism during its lifetime can be inherited	Jean-Baptiste Lamarck			
	I understand that Jean-Baptiste Lamarck's theory in the vast majority of cases cannot occur				
4.6.3.2 Speciation (BIO)	I can describe the work of Darwin and Wallace in the development of the theory of evolution by natural selection	Alfred Russel Wallace Charles Darwin			
	I can explain the impact of the ideas of Darwin and Wallace on Biology	Alfred Russel Wallace published joint literature in 1858 with Charles Darwin Charles Darwin published on the Origin of Species in 1859			
	I know Alfred Russel-Wallace worked worldwide collecting evidence for evolutionary theory				
	I know that Alfred Russel-Wallace work focused on speciation	He also worked on warning colouration in animals More evidence on speciation has occurred over time			
	I can describe the steps which give rise to a new species	Mutation Natural selection advantage Survival and reproduction Allele inheritance in next generation Reproductive isolation (prevents breeding with original species)			
4.6.3.3 The understanding of genetics (BIO)	I can describe how Gregor Mendel developed modern day understanding of genetics	Breeding experiments on plants Inheritance of each characteristic is determined by 'units' passed on to descendants Late 19 th Century, chromosomes were observed (during cell division)			
	I understand the importance of Mendel's discovery was not recognised until after his death	Early 20 th Century – chromosomes and units behaved in similar ways 'Units' are called genes			

		Genes are located on chromosomes Structure of DNA determined Gene function mechanism identified			
	I understand that the scientific work by many scientists led to the gene theory being developed				
4.6.3.4 Evidence for evolution	I can describe the evidence for evolution	Fossils Antibiotic resistance			
	I know that the theory of evolution by natural selection is now widely accepted	Evidence for Darwin's theory is now available Characteristics are passed on to offspring in genes Further evidence in the fossil record Antibiotic resistance development (evolution) in bacteria			
4.6.3.5 Fossils	I know that fossils are the 'remains' of organisms from millions of years ago	Found in rocks			
	I can describe the ways that fossils are formed				
	Parts of organisms that do not decay because those conditions are absent	Water Microorganisms Warmth Oxygen			
	Parts of the organism are replaced by minerals as they decay				
	Preserved traces of organisms	Footprints Burrows Rootlet traces			
	I know that many forms of life were soft-bodied	Leave few traces behind Traces left destroyed by geological activity			
	I understand that scientists cannot be certain about how life began on Earth				
	I can extract and interpret information from evolutionary trees	Common ancestor Relatedness between species			
4.6.3.6 Extinction	I know that extinction occurs when there are no living individuals of a species still alive				
	I can describe factors which may contribute to the extinction of a species				

4.6.3.7 Resistant bacteria	I know that bacteria evolve rapidly because they reproduce at a fast rate				
	I can describe how mutations of bacterial pathogens produce new strains	Strains may be resistant to antibiotics			
		Resistant strains are not killed by antibiotics			
		Antibiotic resistant strains survive and reproduce			
		Population of the resistant strain rises			
		People are not immune so resistant strain can spread quicker			
		No effective treatments available for antibiotic resistance			
	I know that MRSA is resistant to antibiotics	Methicillin Resistant <i>Staphylococcus aureus</i>			
	I know that it is possible to reduce the rate of development of antibiotic resistant strains of bacteria	Doctors limit supply / prescription of antibiotics to non-serious / viral infections			
		Patients complete the course of antibiotics killing all the bacteria (less bacteria, less chance of mutations)			
Agricultural use of antibiotics restricted					
I know that the development of new antibiotics is costly and slow	Unlikely to keep up with the emergence of new resistant strains				
4.6.4 Classification of living organisms	I know that traditionally, living things are classified into groups because of structure and characteristics				
	I can identify Carl Linnaeus' classification system used today	Kingdom			
		Phylum			
		Class			
		Order			
		Family			
		Genus			
	species				
I can name organisms using the binomial system	Genus species				
I can describe the impact of developments in biology on classification systems	E.g. the (electron) microscope				
	E.g. genetic fingerprinting				
I can describe the impact of developments in biology on classification systems					

	I know that evidence of internal structures became more developed due to the improvement of different microscopes				
	I know that biochemical processes, when understood, progressed the models of classification				
	I know that chemical analysis data gave rise to the 'three domain system'				
	I know that the 'three domain system' is developed by Carl Woese	Archaea (primitive bacteria, extremophiles)			
		Bacteria (true bacteria)			
		Eukaryota (protists, fungi, plants, animals)			
I know that evolutionary trees are a method to show how organisms are related					
I know that classification data is used for evolutionary trees	Fossil data				
Mathematical skills	I can use direct proportion and simple ratios to express the outcome of a genetic cross				

Revision checklist – Ecology GCSE Separate Biology

Use this checklist to highlight your confidence and revision preparedness for upcoming exams. R – None. A – Some. G – Ready!

An electronic version can be available to you if required.

Specification	Statement	Additional details	R	A	G
4.7.1.1 Communities	I can describe the levels of organisation of an ecosystem	Individual organism			
		Population			
		Community			
		Ecosystem			
	I can describe the importance of interdependence and competition in a community				
	Given information, I can suggest factors for which organisms are competing for in a given habitat				
	I can suggest how organisms are adapted to the conditions in which they live				
	I can define ecosystem	The interaction of a community of living organisms (biotic)			
		With non-living (abiotic) parts of their environment			
	I can describe how, in order to survive and reproduce, organisms need a supply of materials from their surroundings and from other living organisms living there				
	I know plants in a community or habitat often compete with other	Light			
		Space			
		Water			
Mineral ions					
I know animals in a community or habitat often compete with other	Food				
	Mates				
	Territory				
I understand that in a community, different species depend on each other for resources	Food				
	Shelter				
	Pollination				

		Seed dispersal			
	I can define interdependence	Different species rely on each other for resources			
	I know that if one species is removed from a habitat, this can affect the whole community				
	I know that a stable community is one where all the species and environment factors are in balance				
	I know that a stable community the population sizes of different species remain fairly constant				
4.7.2 Abiotic factors	I can explain how a change in an abiotic factor can affect a community	Given data or context			
		Light intensity			
		Temperature			
		Moisture levels (humidity, water in soil)			
		Soil pH and mineral content			
		Wind intensity and direction			
4.7.1.3 Biotic factors	I can explain how a change in a biotic factor might affect a community	Given data or context			
		Availability of food			
		New predators arriving			
		New pathogens			
		One species outcompeting another			
		I know that when numbers of a population fall too low then they are no longer sufficient to breed			
4.7.1.4 Adaptations	I can explain how an organism is adapted to live in their natural environment	Given information			
		I know that organisms have adaptations that allow them to survive in the conditions they normally live in			
		I know different types of adaptation	Structural		
Behavioural					
Functional					

	I understand that extremophiles are organisms that live in environments that are very extreme	High temperature High pressure High salt concentration			
	I know that bacteria that live-in deep-sea vents are extremophiles				
4.7.2.1 Levels of organisation	I know that organisms that photosynthesise are producers				
	I understand that biomass is produced because of photosynthesis	Glucose can be used to make other molecules in the plant / producer			
	I know that feeding relationships within a community can be represented by a food chain				
	I know that all food chains begin with a producer	Producers synthesise molecules for the food chain			
	I can identify producers in a food chain	Green plants Algae			
	I can describe different methods that are used to determine the distribution and abundance of species in an ecosystem	Transects Random co-ordinates Using a quadrat			
	I can explain why producers are eaten by primary consumers				
	I understand that primary consumers are consumed by secondary consumers				
	I know that secondary consumers are consumed by tertiary consumers				
	I can define the term consumer	Consumers kill and eat other animals Digest and absorb the nutrients consumed			
	I can define the term predator	An organism that kills and eats another animal			
	I can define the term prey	An organism that is killed by a predator and eaten			
	I understand that the rise and fall of a population occurs in cycles	More prey need to be available for numbers of predators to increase over time			
		I understand that in a stable community, population sizes with rise and fall			
4.7.2.2 How materials are cycled	I can recall that many different materials cycle through the abiotic and biotic components of an ecosystem				

	I understand the importance of the carbon cycle to living organisms				
	I understand the importance of the water cycle to living organisms				
	I know that all materials in the living world are recycled	This provides the building blocks for future organisms			
	I can explain the importance of the carbon cycle	Returns carbon from organisms to the atmosphere as carbon dioxide Plants photosynthesise using carbon dioxide			
	I can describe each process within the carbon cycle and how it affects where the carbon is transferred to	Photosynthesis Respiration (aerobic in animals) Consuming (Eating/digesting) Decomposition Fossilisation Combustion (fossil fuels)			
	I can explain the importance of the water cycle for plants and animals on land	Water drains from the land into the seas Water continuously evaporates Water continuously undergoes precipitation (rain, snow etc)			
	I can describe the role of a microorganism in cycling materials through an ecosystem	Microorganisms return carbon to the atmosphere as carbon dioxide CO ₂ is returned during decomposition Mineral ions are returned to the soil			
4.7.2.3 Decomposition	I can explain how factors affect the rate of decay of biological material	Temperature Water Oxygen availability			
	I know that gardeners and farmers try to provide optimum conditions for rapid decay of waste biological material	Compost Natural fertiliser Growing garden plants or crops			
	I know that anaerobic decay produces methane gas				
	I know that biogas generators can be used to produce methane gas as a fuel				
4.7.2.4 Impact of	I can evaluate the impact of environmental changes on the distribution of species in an ecosystem	Given information			

environmental change (H)	I know the environmental changes that affect the distribution of species in an ecosystem	Temperature			
		Availability of water			
		Composition of atmospheric gases			
	I know that changes occur in an environment	Seasonal			
		Geographic			
		Human interaction			
4.7.3.1 Biodiversity	I understand that biodiversity is the variety of all the different species of organism in a location	On earth			
		Within an ecosystem			
	I know that great biodiversity ensures the stability of ecosystems				
	I know that biodiversity reduces the dependence of one species on another	Food			
		Shelter			
		Maintaining the physical environment			
	I can describe how the future of the human species on Earth, relies on us maintaining a good level of biodiversity				
	I know that many human activities are reducing biodiversity	Waste production			
		Deforestation			
		Global warming			
	I know that it is under human control to try and stop the reduction of biodiversity				
4.7.3.2 Waste management	I know that there is an increasing requirement for resources	Rapid growth in the human population			
		Increase in the standard of living			
	I know that with an increased use of resources, there is an increased consequence of waste production				
	I understand that increased waste production leads to pollution	In water – sewage, fertiliser, toxic chemicals			
		In air – smoke, acidic gases			
		On land – from landfill, toxic chemicals			
	I know that pollution kills plants and animals which reduces biodiversity				
4.7.3.3 Land use	I know that humans reduce the amount of land available for other animals and plants	Building			
		Quarrying			
		Farming			
		Dumping waste			

	I know that peat bogs are destroyed to produce garden compost				
	I know that destroying peat bogs reduces the area of that habitat	Reduces biodiversity (plant, animal and microorganism variety)			
	I know that peat can also be burned which releases carbon dioxide into the atmosphere	Or can decay			
	I understand that there is a conflict between the need for cheap available compost	To increase food production			
	I understand that there is a need to conserve peat bogs and peatlands	As habitats for diversity			
		Reduce carbon dioxide emissions			
4.7.3.4 Deforestation	I can describe why large-scale deforestation in tropical areas occurs	Provide land for cattle fields			
		Provide land for rice fields			
		Grow crops for biofuels			
	I can evaluate the environmental implications of deforestation	E.g. The impact on carbon dioxide emissions with reduced photosynthesis			
		E.g. The impact of carbon dioxide and methane emissions on global atmospheric temperatures			
		E.g. The impact of carbon dioxide and methane emissions on global warming leading to habitat destruction / change			
4.7.3.5 Global warming	I can describe some of the biological consequences of global warming	E.g. Habitat destruction			
		E.g. Coastal flooding			
		E.g. Climate change – more extreme climate / weather			
		E.g. Ocean acidification			
	I know that levels of carbon dioxide and methane in the atmosphere contribute to global warming				
	I know that global warming and climate change has the scientific consensus (agreement) that is understood from peer reviews of thousands of publications	Peer review increases validity and trust of evidence			
	I understand that incomplete evidence brings uncertainty to justify results	In complex contexts			
		Breeding programmes for endangered species			

4.7.3.6 Maintaining biodiversity	I can describe and explain the positive human interactions in an ecosystem	Protection and regeneration of rare habitats			
		Reintroduction of field margins and hedgerows in agricultural areas (where farmers grow one type of crop)			
		Reduction of deforestation and carbon dioxide emissions by some governments			
		Recycling resources rather than dumping waste in landfill			
	I can describe and explain the negative human interactions in an ecosystem	E.g. Poaching			
		E.g. Illegal pet trade			
		E.g. Land use clearance / change			
		E.g. Use of fertiliser, pesticides and herbicides in farming			
	I can evaluate information about methods used to tackle negative human impacts on the environment	Given information			
	I can explain and evaluate the conflicting pressures on maintaining biodiversity	Given appropriate information			
4.7.4.1 Trophic levels	I can describe the differences between trophic levels organisms within an ecosystem	Level 1 Plants and algae are producers			
		Level 2 Herbivores consume plants / algae – the primary consumers			
		Level 3 – Carnivores that eat herbivores are secondary consumers			
		Level 4 Carnivores that eat other carnivores are tertiary consumers			
		Apex predators have no consumer and are carnivores			
	I understand that some carnivores are omnivores and also eat vegetation as well as animal matter				
	I know that trophic levels can be represented by numbers	The number level positions them in the specific food chain for that organism			
I can describe how decomposers break down dead plant and animal matter	Secreting enzymes into the environment				
	Absorb the small, soluble molecules by diffusion into the microorganism				

4.7.4.2 Pyramids of biomass	I know that a pyramid of biomass shows the relative amount of biomass in each level of a food chain	Looks like a pyramid shape			
		Level 1 is at the bottom of the pyramid			
	I can construct / draw a pyramid of biomass	Given data			
4.7.4.3 Transfer of biomass	I can describe a pyramid of biomass	I can explain how biomass is lost between different trophic levels	Respiration (movement)		
			Respiration (constant body temperature)		
			Waste products - egestion (faeces)		
			Waste products – urea and water (urine)		
		Indigestible			
	I know that producers are mostly plants and algae that transfer about 1% of the energy from light for photosynthesis				
	I know that ~10% of the biomass from each trophic level is transferred to the level above it				
	I can explain how the loss of biomass affects the number of organisms at each trophic level				
4.7.5.1 Factors affecting food security	I can describe the biological factors that affect food security	Increase in birth rate -threatened in some countries			
		Changing diets in developed countries – more scarce resources are transported around the world			
		New pests and pathogens affect farming			
		Environmental changes that affect food production e.g. famine in areas with failed rainfall			
		Cost of agricultural inputs (running a farm)			
		Conflict (political / war) affecting water and food availability			
	I know that sustainable methods must be found to feed all people on earth				
I can evaluate food security from population and food production statistics					
4.7.5.2 Farming techniques		Limiting movement			
		Controlling temperature of their surroundings			

	I know that the efficiency of food production can be improved by restricting energy transfer from food animals to the environment	High protein foods to increase growth			
	I understand that there are ethical objections to modern intensive farming methods	Ethical – the animal cannot choose their quality of life / living standards / lifespan			
	I can evaluate the advantages and disadvantages of modern farming techniques	Battery chickens			
		Cattle crates			
		Pig pens			
		Fisheries			
4.7.5.3 Sustainable fisheries	I know that fish stocks in the oceans are declining				
	I understand that it is important to maintain fish stocks at a level where breeding continues				
	I know that if levels are not maintained, the species may disappear altogether in some areas				
	I know the ways that are used to control the fish stock supplies	Net size			
		Fishing quotas			
		Conservation status			
	I understand that there are different methods of fishing	E.g. Trawl nets			
		E.g. Fish nets			
		E.g. Line caught			
		E.g. Cages (crustaceans)			
		E.g. Artificial reefs (bivalves)			
4.7.5.4 Role of biotechnology	I can describe possible biotechnical and agricultural solutions to food security	GM foods (genetically modified)			
		Mycoprotein production			
	I know that modern biotechnology techniques enable large quantities of microorganisms to be cultured for food				
	I know that the fungus <i>Fusarium</i> is useful for producing mycoprotein	Mycoprotein is a protein-rich food suitable for vegetarians			
	I know how mycoprotein is produced	Fungus grown on glucose syrup			
		Aerobic conditions (with oxygen)			
		Biomass is harvested			
		Harvested biomass is purified			
	I understand that a genetically modified bacterium can be used to produce human insulin	Harvest and purify after genetic modification			

	I can justify the use of GM crops	Provides more food			
		Provides improved nutritional value in food e.g. golden rice (vitamin A)			
Practical skills	Required Practical – Measure the population size of a common species in a habitat	Using sampling techniques to investigate the effect of a factor on the distribution of a species			
	Required Practical Investigate the effect of temperature on the rate of decay of fresh milk	Measuring pH change			
Mathematical skills	I can extract information from charts, graphs and tables	Relating to the interaction of organisms within a community			
		The effect of abiotic factors on organisms			
		The effect of biotic factors on organisms			
		Predator – prey cycles			
	I can calculate an arithmetic mean	In context of abundance of organisms			
	I can identify the mean, mode and median in a set of data				
	I can plot and draw graphs	Choice of graph			
		Selecting appropriate scale for each axes			
	I can calculate the rate changes	Decay of biological material			
	I can translate data between numbers and graphs	Rate of decay			
	I can draw a pyramid of biomass				
	I can calculate percentage efficiency	Biomass transfers from one trophic level to another			
		% efficiency = Change / Original x 100			
	I can convert fractions and percentages				