

Year 11: Curriculum Intent

Year 11 Biology Essential Knowledge Summary

Schemata 1: B5 Homeostasis and Response

Composite Knowledge: Pupils will gain an understanding of both the endocrine and nervous system. With a particular focus on glucose control and the negative feedback systems involved in thyroxine release and the female menstrual cycle.

Component Knowledge:

Foundational Knowledge:

Declarative Knowledge:

- Recall what homeostasis is and why it is important.
- Recall examples of conditions that need to be controlled.
- Recall the roles of the nervous system and the endocrine system in homeostasis.
- Recall the main components of a control system and their functions.
- Recall the functions of the main structures in the nervous system.
- Recall the differences between voluntary and reflex actions.
- Recall the stages of a reflex action
- Describe the endocrine system
- Recall the term hormone.
- Recall the locations of organs in the endocrine system.
- Recall why the pituitary gland is often called the master gland.
- Recall how blood glucose concentration is monitored and controlled.
- Recall when insulin is produced and how it helps to control blood glucose levels.
- Recall glycogen as a stored carbohydrate.
- Recall the cause, treatment and problems associated with Type 2 diabetes.
- Recall the terms hormonal and non-hormonal methods of contraception.
- Recall the use of fertility drugs in women with low FSH levels.
- Recall where and when adrenaline is released and its target organs.
- Recall the effects of adrenaline on the body.
- Recall where thyroxine is produced and its effects on the body.

Biology Only

- Identify the cerebral cortex, cerebellum and medulla on a diagram and recall the function of each.
- Label a diagram of the eye and describe the function of each structure.
- Define the term 'accommodation'.
- Recall different methods to measure body temperature.
- Recall how body temperature is monitored and controlled.
- Describe where water, ions and urea are lost from the body.
- Label a diagram of the excretory system.
- Recall the advantages and disadvantages of a kidney transplant.
- Recall how a kidney machine works.
- Recall how plant shoots and roots respond to light and gravity.
- Recall the role of auxin in plant responses in terms of unequal distribution in shoots and roots.

Schemata 2: B6: Inheritance, Variation and Evolution

Composite Knowledge: Pupils will gain an understanding of how the information in your genetic code controls the chemicals that make up your cells, tissues and organs. Students will consider some of the new gene technologies that scientists are using. Students will gain an understanding of how knowledge of the genome allows us to classify organisms in different ways and make sense of global diversity.

Component Knowledge:

Foundational Knowledge:

Declarative Knowledge:

- Recall sexual reproduction produces variation in the offspring, but asexual reproduction does not.
- Recall sexual reproduction in animals and plants.
- Recall the term clone.
- Recall cuttings as clones of plants.
- Define meiosis.
- Describe the process of meiosis to include the number of chromosomes at each stage.
- Define fertilisation.
- Describe using a Punnett square and genetic diagram how sex is determined in humans.
- Define the term gametes and describe their genetic material.
- Draw diagrams to explain how gametes are formed in meiosis.
- Recall the number of chromosomes in the gametes during meiosis and fertilisation.
- Recall that plants can reproduce sexually to produce seeds and asexually by runners.
- Recall the structure of chromosomes, DNA and genes.
- Recall that a gene is a small section of DNA that codes for a particular sequence of amino acids to make a specific protein.
- Define the term genome.
- Recall what a mutation is.
- Give examples of characteristics controlled by a single gene and describe their alleles.
- Give examples of characteristics controlled by multiple genes.
- Define and use the terms: gametes, genotype, phenotype, dominant recessive, homozygous and heterozygous.
- Describe the inherited disorders polydactyly and cystic fibrosis.
- Define the term genetic engineering.
- Recall the process of genetic engineering and its advantages.
- Recall plant cloning techniques to include:
 - taking plant cuttings
 - tissue culture.
- Explain why identical twins are clones.
- Describe animal cloning techniques to include:
 - embryo transplants
 - adult cell cloning.

<p>Recall how auxins are used as weedkillers and rooting powders, and to promote growth in tissue culture.</p> <p>Procedural Knowledge:</p> <p>Explain the importance of being able to respond to environmental changes and coordinate behaviour.</p> <p>Explain how the nervous system is adapted for its functions.</p> <p>Explain the role of chemicals at synapses.</p> <p>Describe and use different methods to measure reaction time.</p> <p>Explain the importance of reflex actions and give examples.</p> <p>Compare the actions of the nervous and endocrine systems.</p> <p>Compare the causes, and treatments of Type 1 and Type 2 diabetes.</p> <p>Recall secondary sexual characteristics of boys and girls.</p> <p>Recall the cause of these changes in boys and girls and their relevance in reproduction.</p> <p>Describe the menstrual cycle and fertility including the role of hormones.</p> <p>Explain how hormonal and non-hormonal contraceptives work.</p> <p>Explain the process of In Vitro Fertilisation (IVF).</p> <p>Explain how levels of adrenaline are controlled by a negative feedback system.</p> <p>Explain how its release is stimulated by thyroid stimulating hormone and the levels of these two hormones are controlled by a negative feedback system.</p> <p>Biology Only</p> <p>Describe how the eye changes to focus on near and distant objects.</p> <p>Complete simple ray diagrams to show normal vision, long-sightedness and short-sightedness</p> <p>Describe and explain the changes that happen when body temperature is too high or too low.</p> <p>Explain why we drink more fluid during hot weather.</p> <p>Explain why there is no control over water, ion and urea loss by the lungs and skin.</p> <p>Explain when cells might gain or lose too much water, in terms of osmosis (links to B1)).</p> <p>Describe the effect of too much or too little water on cells.</p> <p>Explain how the body responds to different temperature and osmotic challenges in terms of sweat and urine release.</p> <p>Describe how urine is produced.</p> <p>Describe the absorption of glucose and ions by diffusion and active transport (link to B1).</p> <p>Explain why dialysis fluid contains sugar and ions at the same concentration as normal blood, but no urea.</p> <p>Evaluate the use of kidney transplants and dialysis to treat kidney failure.</p> <p>Explain the role of auxin in plant responses in terms of unequal distribution in shoots and roots.</p> <p>Describe the use of ethene to control the ripening of fruit during storage and transport.</p> <p>Describe the use of gibberellins to end seed dormancy, promote flowering and to increase fruit size.</p> <p>Upper Hierarchical Knowledge</p> <p>Explain when glucagon is produced by the pancreas and its effect on blood glucose levels.</p>	<p>Recall classification of characteristics as being due to genetic, environmental or a combination of these causes.</p> <p>Recall examples of continuous and discontinuous variation.</p> <p>Recall why humans selectively breed plants and animals.</p> <p>Recall selective breeding as a type of sexual reproduction.</p> <p>Describe the process of selective breeding and give examples.</p> <p>Describe evolution by Darwin's theory of natural selection, recalling the main stages of natural selection.</p> <p>Recall why mutation may lead to more rapid change in a species.</p> <p>Define the term species.</p> <p>Identify organisms that are of different species.</p> <p>Recall the work of Alfred Russel Wallace on natural selection.</p> <p>Recall the work of Jean-Baptiste Lamarck.</p> <p>Define the terms inherited and acquired characteristics.</p> <p>Recall types of evidence for the theory of evolution by natural selection.</p> <p>Define the term 'fossil'.</p> <p>Recall how fossils may be formed.</p> <p>Define the term extinction.</p> <p>Explain how extinction may be caused.</p> <p>Biology Only</p> <p>Recall advantages and disadvantages of asexual and sexual reproduction.</p> <p>Explain the structure of DNA using diagrams and models.</p> <p>Recall how the bases on the two strands link together.</p> <p>Describe some of the experiments carried out by Mendel using pea plants.</p> <p>Recall a timeline showing the main developments in the understanding of inheritance</p> <p>Recall the work of Wallace.</p> <p>Procedural Knowledge:</p> <p>Explain why sexual reproduction produces variation in the offspring, but asexual reproduction does not.</p> <p>Explain why sexual reproduction results in variety.</p> <p>Compare mitosis and meiosis</p> <p>Describe advantages and disadvantages of sexual and asexual reproduction.</p> <p>Describe some organisms that can reproduce by both methods (Malarial parasite and types of fungi).</p> <p>Explain using a Punnett square and genetic diagram how sex is determined in humans.</p> <p>Explain the probability of having a child that is a boy or a girl.</p> <p>Explain how knowledge of the human genome will help medicine in the future.</p> <p>Explain the ethical issues related to DNA sequencing.</p> <p>Use genetic cross diagrams to explain inheritance and carriers.</p>
---	--

<p>Explain how insulin and glucagon work together to control blood glucose levels.</p> <p>Explain the cause, effects, treatment and problems associated with Type 1 diabetes.</p> <p>Evaluate modern methods of treating diabetes.</p> <p>Explain the interaction between these hormones in the control of the menstrual cycle.</p> <p>Evaluate hormonal and non-hormonal contraceptives.</p> <p>Evaluate the use of fertility treatments.</p> <p>Biology Only</p> <ul style="list-style-type: none"> Describe the techniques used to map areas of the brain to their functions. Evaluate the benefits and risks of procedures carried out on the brain and nervous system. Describe how amino acids are deaminated in the liver to form ammonia, which is converted to urea for excretion. Recall the site of production and target organs for ADH. Describe the effects of ADH on kidney tubules. Explain, with the aid of a diagram, how ADH controls the concentration of the blood using a negative feedback mechanism. Explain the interaction between these hormones in the control of the menstrual cycle. Describe the functions of gibberellins and ethene in plants. <p>Working Scientifically</p> <p>Testing samples of urine for glucose:</p> <ul style="list-style-type: none"> WSAN 1 make and record observations and measurements and present data using appropriate methods including tables with repeat measurements <p>Required practical- Plan and carry out an investigation into the effect of a factor on human reaction time:</p> <ul style="list-style-type: none"> WS8 make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements. <p>Biology Only:</p> <p>Eye Dissection:</p> <ul style="list-style-type: none"> WSAN 1 make and record observations and measurements and present data using appropriate methods including tables with repeat measurements. <p>Plot cooling curves:</p> <ul style="list-style-type: none"> WSAN 2 use basic data analysis to calculate means, plot graphs with line of best fit and use this data to draw conclusions <p>Kidney Dissection:</p> <ul style="list-style-type: none"> WSAN 1 make and record observations and measurements and present data using appropriate methods including tables with repeat measurements. <p>Required practical-Plan and carry out an investigation into the effect of light on plant shoots:</p> <ul style="list-style-type: none"> WS6 select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate. 	<p>Make informed judgements about the economic, social and ethical issues concerning embryo screening.</p> <p>Describe the use of genetic modification to treat genetic disorders.</p> <p>Explain why Mendel proposed the idea of separately inherited factors and why the importance of this discovery was not recognised until after his death.</p> <p>Predict and explain the outcome of crosses using genetic diagrams based on Mendel's experiments and using unfamiliar information.</p> <p>Evaluate the use of genetic engineering in medicine, eg in gene therapy and production of hormones and some vaccines.</p> <p>Interpret information about genetic engineering techniques.</p> <p>Make informed judgements about the economic, social and ethical issues concerning genetic engineering and GM crops.</p> <p>Explain the importance of cloning to plant growers.</p> <p>Interpret information about plant cloning techniques.</p> <p>Explain advantages and disadvantages of plant cloning techniques.</p> <p>Evaluate arguments for and against human cloning.</p> <p>Make informed judgements about the economic, social and ethical issues concerning cloning.</p> <p>Explain the benefits and risks of selective breeding in plants and animals.</p> <p>Interpret evolutionary trees</p> <p>Identify differences between Darwin's theory of evolution and conflicting theories.</p> <p>Suggest reasons for the different theories.</p> <p>Explain why scientists cannot be certain how life began on Earth.</p> <p>Explain how fossils provide evidence for evolution.</p> <p>Explain what we should do to slow down the rate of development of resistant strains of bacteria (Link to B3).</p> <p>Explain that organisms become extinct because something changes and the species cannot adapt quickly enough to the new circumstances.</p> <p>Biology Only</p> <p>Describe in simple terms how a protein is synthesised.</p> <p>Describe how a mutation could affect the formation of a protein, including enzymes and how the shape of the protein links to enzyme action (link to B2).</p> <p>Explain how new species arise using the terms:</p> <ul style="list-style-type: none"> isolation genetic variation natural selection speciation. <p>Upper Hierarchical Knowledge</p> <p>Describe how an embryo is formed.</p> <p>Describe the function of non-coding parts of DNA and the possible effect of a mutation in a non-coding section of DNA.</p> <p>Construct genetic cross diagrams.</p> <p>Describe in detail the process of genetic engineering.</p> <p>Describe the impact of antibiotic resistance.</p> <p>Working Scientifically</p> <p>Observing under slides under a microscope- Observe mitosis and meiosis slides. Making observational drawings.</p>
--	---

- **WSAN 1** make and record observations and measurements and present data using appropriate methods including tables with repeat measurements.

DNA Extraction: The extraction of DNA from a kiwi:

- **WSAT 2** identify hazards and risks and suggest appropriate ways to reduce the risks.

Appreciate how scientific developments can be used to control reproduction:

WSAT 1 explain how scientific methods and theories have developed, as new evidence and ideas are taken into account by the scientific community (e.g. the development of the periodic table)

Appreciate the power and limitations of science and consider any ethical issues:

- **WS2** understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review

Model DNA structure.

Produce cauliflower clones using aseptic technique. Evaluate the method and results:

- **WSAN 1** make and record observations and measurements and present data using appropriate methods including tables with repeat measurements

Model how a fossil can be formed.

Year 10 (biology) Final Composite Knowledge End Point

Schemata 1 B5 Homeostasis and Response

- Recall what homeostasis is and why it is important.
- Recall examples of conditions that need to be controlled.
- Recall the roles of the nervous system and the endocrine system in homeostasis.
- Recall the main components of a control system and their functions.
- Recall the functions of the main structures in the nervous system.
- Recall the differences between voluntary and reflex actions.
- Recall the stages of a reflex action
- Describe the endocrine system
- Recall the term hormone.
- Recall the locations of organs in the endocrine system.
- Recall why the pituitary gland is often called the master gland.
- Recall how blood glucose concentration is monitored and controlled.
- Recall when insulin is produced and how it helps to control blood glucose levels.
- Define what glycogen is.
- Recall the cause, treatment and problems associated with Type 2 diabetes.
- Recall the terms hormonal and non-hormonal methods of contraception.
- Recall where and when adrenaline is released and its target organs.
- Recall the effects of adrenaline on the body.
- Recall where thyroxine is produced and its effects on the body.

Biology only:

- Describe how the eye changes to focus on near and distant objects.

- Draw simple ray diagrams to show normal vision, long-sightedness and short-sightedness
- Describe and explain the changes that happen when body temperature is too high or too low.
- Explain why we drink more fluid during hot weather.
- Explain why there is no control over water, ion and urea loss by the lungs and skin.
- Explain when cells might gain or lose too much water, in terms of osmosis (links to B1).
- Describe the effect of too much or too little water on cells.
- Explain how the body responds to different temperature and osmotic challenges in terms of sweat and urine release.
- Describe how urine is produced.
- Describe the absorption of glucose and ions by diffusion and active transport (link to B1).
- Explain why dialysis fluid contains sugar and ions at the same concentration as normal blood, but no urea.
- Evaluate the use of kidney transplants and dialysis to treat kidney failure.
- Explain the role of auxin in plant responses in terms of unequal distribution in shoots and roots.
- Describe the use of ethene to control the ripening of fruit during storage and transport.
- Describe the use of gibberellins to end seed dormancy, promote flowering and to increase fruit size.

Schemata 2 B6 Inheritance, Variation and Evolution

- Recall sexual and asexual reproduction in animals and plants.
- Recall the term clone.
- Define a cutting from a plant.
- Define meiosis.
- Describe the process of meiosis.
- Define fertilisation.
- Define the term gametes.
- Recall the number of chromosomes in the gametes during meiosis and fertilisation.
- Recall the structure of chromosomes, DNA and genes.
- Define the term genome.
- Recall what a mutation is.
- Give examples of characteristics controlled by a single gene and describe their alleles.
- Give examples of characteristics controlled by multiple genes.
- Define and use the terms: gametes, genotype, phenotype, dominant recessive, homozygous and heterozygous.
- Describe the inherited disorders polydactyly and cystic fibrosis.
- Define the term genetic engineering.
- Recall the process of genetic engineering and its advantages.
- Recall plant cloning techniques to include:
- Explain why identical twins are clones.
- Describe animal cloning techniques.
- Recall examples of continuous and discontinuous variation.
- Recall why humans selectively breed plants and animals.
- Describe the process of selective breeding and give examples.
- Recall the main stages of Darwin's theory of natural selection.
- Define the term species.
- Recall the work of Alfred Russel Wallace on natural selection.

- Recall the work of Jean-Baptiste Lamarck.
- Define the terms inherited and acquired characteristics.
- Recall types of evidence for the theory of evolution by natural selection.
- Define the term 'fossil'.
- Define the term extinction.
- Explain how extinction may be caused.

Biology Only

- Recall advantages and disadvantages of asexual and sexual reproduction.
- Recall the structure of DNA and how the bases on the two strands link together.
- Describe some of the experiments carried out by Mendel using pea plants.
- Recall a timeline showing the main developments in the understanding of inheritance
- Recall the work of Wallace.