YEAR 10 SCIENCE: Biological Science

Year 10 Australian Curriculum Achievement Standard:

Science Understanding:
By the end of Year 10, students analyse how the periodic table organises elements and use it to make predictions about the properties of elements. They explain how chemical reactions are used to produce particular products and how different factors influence the rate of reactions. They explain the concept of energy conservation and represent energy transfer and transformation within systems. They apply relationships between force, mass and acceleration to predict changes in the motion of objects. Students describe and analyse interactions and cycles within and between Earth's spheres. **They evaluate the evidence for scientific theories that explain** the origin of the universe and **the diversity of life on Earth. They explain the processes that underpin heredity and evolution.**

Science as Human Endeavour:
Students analyse how the models and theories they use have developed over time and discuss the factors that prompted their review.

Science Inquiry Skills:
Students develop questions and hypotheses and independently design and improve appropriate methods of investigation, including field work and laboratory experimentation. They explain how they have considered reliability, safety, fairness and ethical actions in their methods and identify where digital technologies can be used to enhance the quality of data. **When analysing data, selecting evidence and developing and justifying conclusions**, they identify alternative explanations for findings and explain any sources of uncertainty. Students **evaluate the validity and reliability of claims made in secondary sources with reference to currently held scientific views**, the quality of the methodology and the evidence cited. **They construct evidence-based arguments and select appropriate representations and text types to communicate science ideas for specific purposes.**

Unit Specific Information

Students will understand the structure of DNA & how DNA enables the inheritance of traits from parents to offspring. Students will explore how the inheritance of traits enables living things to adapt to their environment over time, which is necessary for the survival of the population. Students will develop an understanding of the processes that underpins heredity and evolution through natural selection.

Assessment Details:

Mode	Assignment 1 (IA3)	Assignment 2 (IA3)
Duration	3 x 70 min lessons	3 x 70 min lessons
Conditions	Individual 1500 words maximum Access to library resources Multi-modal, digital poster	Individual 1500 words maximum Access to library resources Multi-modal, oral/ video presentation
Dates	Term 1, Week 5	Term 1, Week 9

READING / VIEWING/ LISTENING:	COMPREHENSION SKILL FOCUS:	THINKING (cognitive words):	WRITTEN / SPOKEN / MULTI-MODAL TEXT	HIGHLY VALUED LANGUAGE FEATURE FOCUS:
• Core Text: OBI 10, 4-5 • Science Ways 2, 6-7 • Jacaranda 3, 11 • Buehl, Comprehension strategies • NewASOT	• Different Perspectives for Reading (Buehl, p 91-93) • Power Notes (Buehl, p155-157) • Text Coding (Buehl, p210 -213) • Magnet summary/ words	• Analyse • Explain • Evaluate • Identify • Interpret • Justify	• Extended response (IA3-like), multi-modal assignments	• Assessing validity of scientific information (data & sources) • Reading & interpreting graphs • Explaining, justifying and evaluating concepts using scientific evidence

PRIORITY STANDARDS (Do, know, think proficiency scales)		
	Thinking Routines : Comprehension and Cognitive	**Communication**
4	Interpret Justify	
3	Explain Analyse	
2	Calculate Describe Partial skills of Level 3	

Learning Goals:

Strands and Sub-Strands	Australian Curriculum Content Descriptors	Kirwan High Learning Goals
Science Understanding		
Biological sciences	Content Descriptors: • Transmission of heritable characteristics from one generation to the next involves DNA and genes (ACSSU184) • The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence (ACSSU185) Standard Elaborations: QCAA: **explain** the processes that underpin heredity and evolution	• **Explain** the structure of DNA and its relationship between genes, chromosomes and proteins. • **Calculate** the genotype and phenotype of an individual using monohybrid crosses. • **Interpret** pedigrees to explain inheritance patterns of traits in families. • **Describe** Earth's biodiversity as a function of evolution by natural selection. • **Interpret** and **evaluate** evidence for evolution, including the fossil record, biochemical and anatomical evidence.
Science as a Human Endeavour:		
Nature and development of science	Content Descriptors: • Scientific understanding, including models and theories, is contestable and is refined over time through a process of review by the scientific community (ACSHE191) Standard Elaborations: • Students **analyse** how the models and theories they use have developed over time and **discuss** the factors that prompted their review.	• **Analyse** models and theories of heritable patterns • **Evaluate** how patterns of inheritance can be used to predict phenotype and genotypes • **Analyse** models and theories of evolutionary patterns • **Evaluate** how models and theories of evolution have been refined over time
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Science Inquiry Skills:		
Processing & Analysing Data and Information	• Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS203) • Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS204)	• Apply understanding of theories underpinning inheritance and evolution to **draw conclusions** based on evidence.
Communicating	• Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS208)	• Construct concise and well **justified** evidenced-based scientific arguments

Possible Habit of Mind:				
Exploring Meaning of the HOM By the end of this unit students will be able to: Applying past knowledge to new situations.	**Expanding Capacity for using the HOM** By the end of this unit students will be able to: Accessing prior knowledge.	**Increasing Alertness for the HOM** By the end of this unit students will be able to: Transfer their knowledge to new or different scenarios than was learned.	**Extending Values of the HOM** By the end of this unit students will be able to: Independently evaluate data using their scientific knowledge.	**Building Commitment towards the HOM** By the end of this unit students will be able to: Understand the importance of developing effective study techniques and revising regularly.

General Capabilities: This unit provides opportunities for students to engage in following capabilities:

Literacy ✓ Comprehending texts through listening, reading and viewing ✓ Composing texts through speaking, writing and creating ✓ Text knowledge ☐ Grammar knowledge ✓ Word knowledge ✓ Visual knowledge **Numeracy** ☐ Estimating and calculating with whole numbers ✓ Recognising and using patterns and relationships ✓ Using fractions, decimals, percentages, ratios and rates ☐ Using spatial reasoning ✓ Interpreting statistical information ☐ Using measurement	**ICT** ☐ Applying social and ethical protocols and practices when using ICT ✓ Investigating with ICT ✓ Creating with ICT ✓ Communicating with ICT ✓ Managing and operating ICT **Critical and creative thinking** ✓ Inquiring - identifying, exploring and organising information and ideas ✓ Generating ideas, possibilities and actions ✓ Reflecting on thinking and processes ✓ Analysing, synthesising and evaluating reasoning and procedures	**Personal and social capability** ☐ Self-awareness ☐ Self-management ☐ Social awareness ☐ Social management **Ethical understanding** ✓ Understanding ethical concepts and issues ✓ Reasoning in decision making and actions ✓ Exploring values, rights and responsibilities **Intercultural understanding** ✓ Recognising culture and developing respect ☐ Interacting and empathising with others ☐ Reflecting on intercultural experiences and taking responsibility

Cross Curriculum Priorities:

✓ Aboriginal and Torres Strait Islander histories and cultures	✓ Asia and Australia's engagement with Asia	✓ Sustainability

Differentiation [for small groups or individuals]:

1. Collect and analyse student profiles for literacy and numeracy needs
2. Attend to any individual work plan requirements
3. Individualise formative assessment tools provided with Oxford Big Ideas 10
4. Include increased scaffolding around assigned formative assessment task where needed
5. Plan open-ended lesson tasks that require higher order thinking skills from more capable students
6. Make use of heterogeneous collaborative groups to gain different perspectives
7. Make use of homogeneous collaborative groups to tailor tiered questions
8. Embed links to indigenous perspectives

Lesson Sequence: Science 10 – Term 1, Biology 2020

Week	Lesson 1	Lesson 2	Lesson 3	Homework/ Quiz
1		**Introduction** Students can - Explain the expectations for a successful year 10 Science student - Access prior knowledge, and bring forward possible misconceptions **Resources** SusieS will provide Powerpoint • Y10 structure • High expectations – especially notebooks • Homework and assessment – policy and structure • Revision strategies • Students set up notebooks • Term 1 outline • Access of prior knowledge – post-it notes: what do you know/ remember/ are unsure about	**Cognitive verbs** Students can - Explain the response required by each cognitive verb **Resources** SusieS will provide PowerPoint and printouts for activities. • Each student will have a reference in the front of their book about cognitive verbs after this activity. • Discussion of why cognitive verbs are so important across all senior subjects, and which ones are likely to be used a lot in Science • Students group similar cognitive verbs and match the type of stimulus to the relevant verb • Students match example answers with questions to see differences between cognitive verb instructions	Set term-long homework: Mapping own characteristics
2	**What are living things made of?** **Cells: Practical** Students can: - Explain that cells are the basic units of all life - Explain that DNA, the blueprint of the cell, is located in the Nucleus of cells Practise and Application of skills: - Individual written explanation (Captain's log) Engagement & Extension Ideas: - Prac looking at cells under a microscope	**What makes a cat, a tree and a virus different?** **DNA** Students can: - Explain that DNA carries instructions for growth, reproduction and function of living things (pg 137-8). - Explain the relationship between DNA, chromosomes, genes and alleles (pg 136). - Explain that DNA exists in a double-helix structure comprised of nucleotides (pg132) Engagement & Extension Ideas: - Hands-on DNA model - DNA codes for proteins - Explore GenBank database	**DNA – what can we see, and how can we see it?** **DNA: Practical** Students can: - Extract and see DNA as a macromolecule - Explain why they can't see chromosomes→ individual base pairs - Explain how we know these smaller scale structures exist and work as they do. Practise and Application of skills: - Individual written explanation of DNA - Individual/ pair evaluation of success of experiment Engagement & Extension Ideas: - Extract pea/ strawberry DNA practical	Quiz 1 Cells and DNA structure
3 Swimming Carnival	**How does DNA pass from parents to create offspring?** **Meiosis (and mitosis)**	**Why do offspring get some characteristics from one parent, and some from the other, rather than a blend of the two?** **Inheritance**	**How can we predict the inherited characteristics of offspring?** **Monohybrid Crosses**	Quiz 2 Meiosis and inheritance patterns

Senior (Tue – all day)	Students can: - Explain that meiosis is the cellular process by which organisms produce gametes in order to reproduce sexually - Link chromosomes to reproduction Pg139-141 Practise and Application of skills: - Content through reading - Summary of information - Graphical presentation of new information Engagement & Extension Ideas:	Students can: - Explain that inheritance is determined by dominant and recessive alleles. - Explain that homozygous or heterozygous genotypes determine the phenotype of an individual Pg144-147 Engagement & Extension Ideas:	Students can: - Understand how autosomal traits are inherited - Understand how to predict the inheritance of dominant and recessive traits - Predict the genotype & phenotype of an individual, using monohybrid crosses Pg147-149 Practise and Application of skills: - Individual written explanation of inheritance/ monohybrid cross - Practise of monohybrid crosses - Evaluate claims (prediction of phenotype outcome) Engagement & Extension Ideas: Sex- linked characteristics (Pg149-151)	
4	Catch-up/ Revision lesson	**Summative Assessment 1** – Research of a genetic inheritable disease - Lesson 1 (Hand out) Students can: 1. **Select** a genetically inherited disease. 2. **Research** how the disease is inherited (e.g. sex-linked, recessive/dominant) **interpreting and evaluating** the information found. 4. **Explain** the effects of the disease, how it is inherited, and any treatments that exist.	**How can we predict the inherited characteristics of offspring?** **Pedigrees** Students can: - Predict the genotype & phenotype of an individual, using monohybrid crosses - Predict the genotypes and phenotypes of family members across multiple generations Pg152-154 Engagement & Extension Ideas: Sex- linked characteristics	Quiz 3 Pedigree/ Family characteristics
5	**Use of ICT to create digital posters/ presentations** • Discussion of why presentation of research findings are important to the progression of science knowledge • Students explore diverse software suites **LG:** I can utilise diverse software programs to create a digital poster. Practise and Application of skills: - Explain the inheritance pattern of your chosen disease to another student (do now activity) **Resources**	**Summative Assessment 1** – Research of a genetic inheritable disease - Lesson 2 Students can: 2. **Create** an example pedigree that includes at least 10 females, 10 males and covers 4 generations. This pedigree needs to use correct scientific notations and should be annotated with possible genotypes. 4. **Justify** whether people affected by the disease should be able to access reproductive technologies that test whether a foetus is affected by the disease, allowing parents with the option to terminate the pregnancy. 5. **Create** a digital A3 poster that communicates your findings using ICT to support your presentation.	**Summative Assessment 1** – Research of a genetic inheritable disease - Lesson 3 (Final lesson) → Due Date, start of next lesson Students can 5. **Create** a digital A3 poster that communicates your findings using ICT to support your presentation.	

	SusieS will provide PowerPoint and printouts for activities Computers required			
6	Catch-up/ Revision lesson	**How are there so many species? Why are there so many more animal species than plants?** **Evolution** Students can: - Explain the importance of biodiversity & that it is a function of evolution - Relate genetic characteristics to reproduction & the survival of a species (Adaptations) Pg179-185 Engagement & Extension Ideas: - Create class evolution timeline of different groups of living things on Earth - Overlay timeline with scientific discoveries	**Why were early organisms so simple, but modern species can be so complex?** **Natural Selection** Students can: - Explain the processes of natural selection - Camouflage beetle predation simulation Pg189-197 Practise and Application of skills: - Content through reading - Summary of information - Graphical presentation of new information Engagement & Extension Ideas: - Galapagos Island Finch Beak Activity - Fossil Evidence - Is evolution still occurring?	Quiz 4 Evolution
7	**How does natural selection on one characteristic drive new species to form?** **Natural Selection: Prac** Students can: - Explain the processes of natural selection Practise and Application of skills: - Individual written explanation of natural selection (do now activity) Engagement & Extension Ideas: - Galapagos Island Finch Beak Activity - Fossil Evidence; - Is evolution still occurring?	Catch-up / Revision lesson	**How can we tell evolution has occurred if it takes many generations to happen?** **Types of Evidence for Evolution** Students can: - Explain how evidence for evolution has accrued over time - Explain the different types of evidence supporting the theory of natural selection (anatomical, fossils record, biochemical) - Interpret graphs - Apply their knowledge of inheritance/ evolution to draw conclusions Pg 200-218 Practise and Application of skills: - Summary of information - Individual written explanation of evidence for evolution (captain's log) Engagement & Extension Ideas:	Quiz 5 Natural selection – Game design using concepts of genetics, inheritance and natural selection

8	**How can we tell evolution has occurred if it takes many generations to happen?** **Types of Evidence for Evolution** Students can: - Explain how evidence for evolution has accrued over time - Explain the different types of evidence supporting the theory of natural selection (anatomical, fossils record, biochemical) - **Interpret graphs** - Apply their knowledge of inheritance/ evolution to draw conclusions Practise and Application of skills: - Analyse and interpret graphs Engagement & Extension Ideas:	**How can we tell evolution has occurred if it takes many generations to happen?** **Types of Evidence for Evolution** Students can: - Explain how evidence for evolution has accrued over time - Explain the different types of evidence supporting the theory of natural selection (anatomical, fossils record, biochemical) - Interpret graphs - Apply their knowledge of inheritance/ evolution to draw conclusions Practise and Application of skills: - Mindmap – connecting all concepts … - Generating questions (what else is there to investigate/ learn/ know) - Evaluating information Engagement & Extension Ideas:	**Summative Assessment 2** – Research of a species' inheritance - Lesson 1 (Hand out) Students can: 1. **Select** a non-domesticated species of plant or animal (can be extinct or extant) 2. **Research** the evolutionary history of that species, through time to its ancestral species, **interpreting and evaluating** the information found.	Quiz 6 Evidence for evolution
9	**Summative Assessment 2** – Research of a species' inheritance - Lesson 2 Students can: 3. **Explain** the selective pressures, and justify why different adaptations led to increased fitness, decline or extinction. 4. **Create** a 4-6 minute talk/ video that communicates the species' biological history	**Use of ICT to create video** • Discussion of why oral communication/ video of research findings are important to the progression of science knowledge • Students explore diverse media options **LG:** I can utilise diverse media options to create a video communicating research findings. **Resources** SusieS will provide PowerPoint and printouts for activities Computers, digital camera/ mobile phones required	**Summative Assessment 2** – Research of a species' inheritance - Lesson 3 (Final lesson) → Due Date, start of next lesson Students can 5. **Create** a talk/ video that communicates your findings using ICT to support your presentation	
10	Catch-up/ Revision lesson	**Super-Humans – possibility or dream? Is genetic manipulation of humans ethical?** Students can: - Discuss and evaluate to use of genetic manipulation to enhance humans Engagement & Extension Ideas: - GATTACA (1997) movie	**Super-Humans – possibility or dream? Is genetic manipulation of humans ethical?** Students can: - Discuss and evaluate to use of genetic manipulation to enhance humans Engagement & Extension Ideas: - GATTACA (1997) movie	

		- 3-parent baby - CRISPR technology -> Chinese gene-edited babies	- 3-parent baby - CRISPR technology -> Chinese gene-edited babies	