

COURSE OUTLINE
INTEGRATED SCIENCE GENERAL YEAR 11: 2022
UNIT 1: MICROBIOLOGY AND BIOTECHNOLOGY

Term	Week	Topic and key teaching points	Syllabus content	Assessment
1	1	<p>Science Inquiry Skills/3 Domains of life</p> <ol style="list-style-type: none"> Distribute programs, syllabus, assessment outline, discuss expectations, etc. Define Microbiology and Biotechnology Review Scientific Method including Hypothesis, Variables, Graphing and Interpretation Describe the features and differences between each of the three domains of life (Archaea, Bacteria and Eukarya). Compare prokaryotic and Eukaryotic Cells. Describe the features and give examples of each of the 5 Kingdoms of classification (Animal, Plants, Monera, Protista and Fungi) Define the variety of microorganisms (microbes) that exist on Earth to include, Bacteria, viruses, fungi, algae, protozoa and archaea. 	<p>Science Inquiry Skills</p> <ul style="list-style-type: none"> construct questions for investigation; propose hypotheses; and predict possible outcomes plan, select and use appropriate investigation methods, to collect reliable data; assess risk and address ethical issues associated with these methods conduct investigations safely, competently and methodically for the collection of valid and reliable data represent data in meaningful and useful ways; organise and analyse data to identify trends and patterns; qualitatively describe sources of measurement error and use evidence to make and justify conclusions <p>Structure and function of biological systems</p> <ul style="list-style-type: none"> the cell is the simplest form of organisation that can perform activities required for life forms of organisation of multicellular organisms include tissues, organs and systems 	
1	2	<p>Extended Answer Research Task</p> <ol style="list-style-type: none"> Research a currently used biotechnology which involves the use of a microorganism. 	<p>Science as a Human Endeavour</p> <ul style="list-style-type: none"> the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations the use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences scientific knowledge can enable scientists to offer valid explanations and make reliable predictions scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts, and to design action for sustainability 	<p>Task 1: Extended Response Biotechnology Research Task (15%)</p>

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INTEGRATED SCIENCE GENERAL YEAR 11: 2022
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1	3	<p><u>Water / Carbon / Nitrogen Cycles</u></p> <ol style="list-style-type: none"> 1. Describe the formation of the Universe and the Earth with particular emphasis on how the Earth has changed over its history. (include the presence of water and the composition of the atmosphere). 2. Emphasize the significance of recycling with reference to the biogeochemical cycles from an atomic perspective. 3. Create a diagram to illustrate the Water, Carbon and Nitrogen Cycle. 4. Discuss & describe the above cycles in sufficient detail that students can see the cycling of matter through nature. 5. Discuss the importance of the presence of life in these cycles particularly in relation to photosynthesis, respiration oxygen and carbon dioxide. 	<p>Earth systems/cycles in nature</p> <ul style="list-style-type: none"> ● interaction between the hydrosphere, lithosphere and atmosphere are represented by biogeochemical cycles ● conservation of matter occurs in cycles in nature ● natural resources are important in everyday life ● human activities and natural processes impact on cycles in nature 	
1	4	<p><u>Cells / Microscopes</u></p> <ol style="list-style-type: none"> 1. Compare eukaryotic and prokaryotic cells. 2. View eukaryotic and prokaryotic cells under a compound light microscope 3. Explore and discuss how electron microscopes work and how they are integral to humans developing an understanding of microbiology. 4. View virtual electron microscopes and compare them to light microscopes. 	<p>Structure and function of biological systems</p> <ul style="list-style-type: none"> ● the cell is the simplest form of organisation that can perform activities required for life ● forms of organisation of multicellular organisms include tissues, organs and systems <p>Science as a Human Endeavour</p> <ul style="list-style-type: none"> ● scientific knowledge can enable scientists to offer valid explanations and make reliable predictions ● scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts, and to design action for sustainability 	<p>Task 2: Microscope Practical Assessment (7.5%)</p>

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1	5	<p><u>Archaea and the History of Life</u></p> <ol style="list-style-type: none"> Describe the difference between aerobic and anaerobic respiration in relation to how life is believed to have evolved from archaea. Connect respiration and photosynthesis to the evolution of the Earth's atmosphere and to the evolution of life on Earth to result in the diversity of life we see today. Brainstorm the variety of microbiological life that exists and suggest ways as to how they have evolved. Describe the endosymbiosis theory as to how life was able to develop photosynthetic and respiratory systems. Explore the different ways organisms make energy through the processes of respiration, fermentation and photosynthesis and show how enzymes act as biological catalysts in some of these processes. 	<p>Structure and function of biological systems</p> <ul style="list-style-type: none"> the cell is the simplest form of organisation that can perform activities required for life forms of organisation of multicellular organisms include tissues, organs and systems changes in a system can affect the survival of organisms; variation assists survival of individuals <p>Ecosystems and sustainability</p> <ul style="list-style-type: none"> interrelationship between systems assist cellular activity to sustain life biological communities interact with each other and their physical environment 	
1	6	<p><u>Types of Microbes - Bacteria</u></p> <ol style="list-style-type: none"> Define Bacteria as a type of microorganism and show how the classification of Bacteria is expressed through binomial nomenclature. Explore a variety of contexts where bacteria are both harmful and beneficial to human society. Explore the different ways bacteria can act as pathogens and how antibiotics were developed as a treatment for bacterial infections. Define bacterial resistance and show how bacteria have become resistant to antibiotics using examples such as MRSA. 	<p>Structure and function of biological systems</p> <ul style="list-style-type: none"> the cell is the simplest form of organisation that can perform activities required for life forms of organisation of multicellular organisms include tissues, organs and systems changes in a system can affect the survival of organisms; variation assists survival of individuals <p>Ecosystems and sustainability</p> <ul style="list-style-type: none"> interrelationship between systems assist cellular activity to sustain life biological communities interact with each other and their physical environment 	

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INTEGRATED SCIENCE GENERAL YEAR 11: 2022
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1	7	<p><u>Types of Microbes - Bacteria</u></p> <ol style="list-style-type: none"> 1. Demonstrate how processes such as respiration and fermentation allow humans to use bacteria in biotechnology for such things as insulin production, bioremediation, plastic/waste removal, sewage treatment and yoghurt and cheese production. 2. Plan and conduct an investigation to determine the affect bacteria and enzymes have in the production of yoghurt. 	<p>Science Inquiry Skills</p> <ul style="list-style-type: none"> ● construct questions for investigation; propose hypotheses; and predict possible outcomes ● plan, select and use appropriate investigation methods, to collect reliable data; assess risk and address ethical issues associated with these methods ● conduct investigations safely, competently and methodically for the collection of valid and reliable data ● represent data in meaningful and useful ways; organise and analyse data to identify trends and patterns; qualitatively describe sources of measurement error and use evidence to make and justify conclusions ● interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence • use appropriate representations, to communicate conceptual understanding, solve problems and make predictions ● communicate scientific ideas and information for a particular purpose, using appropriate scientific language, conventions and representations 	<p>Task 3: Factors Affecting Yoghurt Production Investigation (10%)</p>
1	8	<p><u>Types of Microbes - Fungi</u></p> <ol style="list-style-type: none"> 1. Define fungi as a type of microorganism, explore the different types of fungi which exist and show the processes and products related to the existence of fungi. 2. Define the process of fermentation and discuss the different reactants and products from this process. 3. Demonstrate how processes such as fermentation allow humans to use fungi in biotechnology for such things as baking, brewing, and the production of antibiotics, alcohols, enzymes, organic acids, and numerous pharmaceuticals. 4. Define enzymes as biological catalysts which aid in the production of many products by increasing the rate in which they can be produced. 	<p>Species continuity and change</p> <ul style="list-style-type: none"> ● reproduction and inheritance play an important role in the continuity of species ● change in physical environment leads to eventual change in biological characteristics of a species <p>Ecosystems and sustainability</p> <ul style="list-style-type: none"> ● interrelationship between systems assist cellular activity to sustain life ● biological communities interact with each other and their physical environment 	

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INTEGRATED SCIENCE GENERAL YEAR 11: 2022
UNIT 1: MICROBIOLOGY AND BIOTECHNOLOGY

		5. Use yeast to plan and conduct an investigation to determine the optimal conditions for which they can grow.		
1	9	<p>Types of Microbes - Fungi</p> <p>1. Use yeast to plan and conduct an investigation to determine the optimal conditions for which they grow.</p>	<p>Science Inquiry Skills</p> <ul style="list-style-type: none"> ● construct questions for investigation; propose hypotheses; and predict possible outcomes ● plan, select and use appropriate investigation methods, to collect reliable data; assess risk and address ethical issues associated with these methods ● conduct investigations safely, competently and methodically for the collection of valid and reliable data ● represent data in meaningful and useful ways; organise and analyse data to identify trends and patterns; qualitatively describe sources of measurement error and use evidence to make and justify conclusions ● interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence ● use appropriate representations, to communicate conceptual understanding, solve problems and make predictions ● communicate scientific ideas and information for a particular purpose, using appropriate scientific language, conventions and representations 	<p>Task 4: Factors Affecting Fermentation in Yeast Investigation (7.5%)</p>
1	10	<p>Viruses</p> <ol style="list-style-type: none"> 1. Define a virus as a non-living parasite which requires a host to survive. 2. Explore how viruses act as pathogens which cause harm to humans and all living things. 3. Explore how the use of vaccination has aided human survival. 4. Discuss the SARS COVID 2 Virus 	<p>Species continuity and change</p> <ul style="list-style-type: none"> ● reproduction and inheritance play an important role in the continuity of species ● change in physical environment leads to eventual change in biological characteristics of a species <p>Ecosystems and sustainability</p> <ul style="list-style-type: none"> ● interrelationship between systems assist cellular activity to sustain life ● biological communities interact with each other and their physical environment 	

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INTEGRATED SCIENCE GENERAL YEAR 11: 2022
UNIT 1: MICROBIOLOGY AND BIOTECHNOLOGY

2	1	<p><u>Viruses</u></p> <ol style="list-style-type: none"> 1. Demonstrate how the use of viruses are used in biotechnology for such things as vectors in gene therapy, gene and genome editing, vaccines and CRISPR. 2. Explore how an understanding of viruses has been beneficial to such industries as the Medical, Pharmaceutical, Agricultural and Materials industries 	<p>Species continuity and change</p> <ul style="list-style-type: none"> • reproduction and inheritance play an important role in the continuity of species • change in physical environment leads to eventual change in biological characteristics of a species <p>Ecosystems and sustainability</p> <ul style="list-style-type: none"> • interrelationship between systems assist cellular activity to sustain life • biological communities interact with each other and their physical environment 	
2	2	<p><u>Applications of Biotechnology - Reproduction</u></p> <ol style="list-style-type: none"> 1. IVF 2. Cloning 3. Organ Transplants 	<p>Ecosystems and sustainability</p> <ul style="list-style-type: none"> • interrelationship between systems assist cellular activity to sustain life • biological communities interact with each other and their physical environment <p>Species continuity and change</p> <ul style="list-style-type: none"> • reproduction and inheritance play an important role in the continuity of species • change in physical environment leads to eventual change in biological characteristics of a species 	
2	3	<p><u>Applications of Biotechnology - Health</u></p> <ol style="list-style-type: none"> 4. Gene Therapy 5. Stem cells 6. Microbiome 	<p>Ecosystems and sustainability</p> <ul style="list-style-type: none"> • interrelationship between systems assist cellular activity to sustain life • biological communities interact with each other and their physical environment <p>Species continuity and change</p> <ul style="list-style-type: none"> • reproduction and inheritance play an important role in the continuity of species • change in physical environment leads to eventual change in biological characteristics of a species 	

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2	4	<p><u>Applications of Biotechnology - Feeding the Future</u></p> <ol style="list-style-type: none"> 1. Golden Rice 2. Pesticide Resistant Crops 3. Farming and agriculture 	<p>Ecosystems and sustainability</p> <ul style="list-style-type: none"> ● interrelationship between systems assist cellular activity to sustain life ● biological communities interact with each other and their physical environment <p>Species continuity and change</p> <ul style="list-style-type: none"> ● reproduction and inheritance play an important role in the continuity of species ● change in physical environment leads to eventual change in biological characteristics of a species 	
2	5	<p><u>Summary, Revision and Final Topic Test</u></p>		<p>Task 5: Microbiology and Biotechnology Test (10%)</p>

COURSE OUTLINE
INTEGRATED SCIENCE GENERAL YEAR 11: 2022
UNIT 2: VEHICLES AND FUELS

Term	Week	Topic and key teaching points	Syllabus content	Assessment
2	6-7	<p><u>Revision of Scientific Method</u></p> <ul style="list-style-type: none"> Controlling variables Hypotheses Graphing <p><u>Motor vehicle accidents and their causes in Australia</u></p> <ul style="list-style-type: none"> accident statistics e.g. time of day/week, age of fatalities, location, wearing of seatbelts, road design major trends in the causes and outcomes of motor vehicle accidents 	<ul style="list-style-type: none"> represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error and use evidence to make and justify conclusions interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence 	<p>EXAM WEEKS 7 & 8 ATAR</p> <p>AFW6</p>
2	7-8	<p><u>Speed and Acceleration</u></p> <ul style="list-style-type: none"> definitions of speed, velocity and acceleration formulae used to calculate velocity and acceleration 	<ul style="list-style-type: none"> linear motion of an object is unidirectional and can be determined mathematically the Laws of Motion can assist in predicting the motion of objects. 	
2	9-10	<p><u>Reaction Time & Stopping Distance</u></p> <ul style="list-style-type: none"> definitions of reaction distance, braking distance and stopping distance relate speed/stopping distance to variable speed zones such as school zones, built up areas and highways. 	<ul style="list-style-type: none"> scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts, and to design action for sustainability 	

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3	1	<p><u>Types of Friction - Factors affecting braking distance</u></p> <ul style="list-style-type: none"> ● tyres ● road surfaces ● weather conditions, types and condition of brakes 	<ul style="list-style-type: none"> ● forces can be exerted by one object on another by direct contact or from a distance. ● construct questions for investigation; propose hypotheses; and predict possible outcomes ● plan, select and use appropriate investigation methods, to collect reliable data; assess risk and address ethical issues associated with these methods ● conduct investigations safely, competently and methodically for the collection of valid and reliable data ● communicate scientific ideas and information for a particular purpose, using appropriate scientific language, conventions and representations 	<p>Task 6: Friction Practical (8%)</p>
3	2	<p><u>Inertia and Momentum</u></p> <ul style="list-style-type: none"> ● Newton's laws of motion ● inertia ● momentum 	<ul style="list-style-type: none"> ● the Laws of Motion can assist in predicting the motion of objects ● interpret and manipulate mathematical relationships to calculate and predict values 	

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UNIT 2: VEHICLES AND FUELS

3	3-6	<p><u>Vehicle safety design</u></p> <ul style="list-style-type: none"> ● crumple zones ● airbags ● seatbelts ● Reversing cameras ● Window glass ● break away pedals, steering column ● ABS, EBD, ESP <p><u>Plan an Investigation – vehicle Safety</u></p>	<ul style="list-style-type: none"> ● the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations ● the use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences ● interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence ● use appropriate representations, to communicate conceptual understanding, solve problems and make predictions ● plan, select and use appropriate investigation methods, to collect reliable data; assess risk and address ethical issues associated with these methods ● communicate scientific ideas and information for a particular purpose, using appropriate scientific language, conventions and representation ● scientific knowledge can enable scientists to offer valid explanations and make reliable predictions 	Task 7: Vehicle Safety Practical (9%)
3	7	<p><u>Chemistry Fundamentals</u></p> <ul style="list-style-type: none"> ● Atomic structure ● elements, compounds & mixtures 	<ul style="list-style-type: none"> ● atoms consist of a nucleus of protons and neutrons and are surrounded by electrons ● the properties of elements, compounds and mixtures determine the use of substances 	
3	8	<p><u>Fuels and energy</u></p> <ul style="list-style-type: none"> ● Origin of Petroleum ● Fossil Fuels v's alternative sources of energy 	<ul style="list-style-type: none"> ● energy has different forms: kinetic, potential and heat, which can cause change 	Task 8: Energy Content of Fuels Practical (8%)

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3	9-10	Alternative fuels – Biodiesel, Ethanol, electric cars	<ul style="list-style-type: none"> ● mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques ● rearrangement of matter occurs during chemical reactions to form new substances ● chemical reactions involve energy; different types of reactions are used to produce a variety of products 	Task 9: SHE Research Reducing Road deaths (15%)
4	1-3	<p><u>The chemistry of vehicles</u></p> <ul style="list-style-type: none"> ● Metal alloys in modern cars ● Chemical reaction of airbags ● Paint pigments that reduce internal temperatures ● Synthetic lubricants 	<ul style="list-style-type: none"> ● interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence ● use appropriate representations, to communicate conceptual understanding, solve problems and make predictions ● communicate scientific ideas and information for a particular purpose, using appropriate scientific language, conventions and representations ● scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts, and to design action for sustainability 	
4	4	<u>Summary & Revision and Test</u>		Task 10: End of Topic Test (5%)
4	5			AFW 5