



**EDUCATIONAL QUALITY AND
ASSESSMENT PROGRAMME**



B

***Scoring
Rubric
2021***

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**South Pacific
Form
Seven
Certificate**

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Item #	Skill score	Evidence	Skill Level			
			1	2	3	4
STRAND I ANIMAL BEHAVIOUR						
1.1	1	Feature of homing: <ul style="list-style-type: none"> Navigation through earth's magnetic field as compass Using smell of chemicals in the water for direction Returning to home base, place of original 	One correct idea stated			
1.2	1	Circadian rhythm <ul style="list-style-type: none"> is a natural, internal process that regulates the sleep-wake cycle and repeats roughly every 24 hours repeat of cycle every 24hours physical, mental, and behavioral changes that follow a 24-hour cycle 	Correct definition stated			
1.3a	1	Interspecific Competition Competition between organisms of different species for the same resource	Correct definition stated			
1.3b	4	Redistribution of species <ul style="list-style-type: none"> Studies show that intraspecific competition can regulate population dynamics (changes in population size over time). This occurs because individuals become crowded as a population grows. Since individuals within a population require the same resources, crowding causes resources to become more limited Population numbers <ul style="list-style-type: none"> Increase or decrease according to whether they are dominant over or out competed Fluctuating numbers as resources are limited and used up Niche differentiation <ul style="list-style-type: none"> No two species can occupy the same exact niche in a habitat and coexist together, at least in a stable manner.[3] When two species 	One correct idea stated	Two or more ideas stated independently	Two or more ideas provided with linkage between ideas, i.e. how interspecific competition contributes to species redistribution, population numbers and niche differentiation	Two or more ideas provided with linkage between ideas, i.e. how interspecific competition contributes to species redistribution, population numbers and niche differentiation. Uses examples to justify.

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		<p>differentiate their niches, they tend to compete less strongly, and are thus more likely to coexist. Species can differentiate their niches in many ways, such as by consuming different foods, or using different areas of the environment.</p> <p>Interspecific competition often leads to extinction. The species that is less well adapted may get fewer of the resources that both species need. As a result, members of that species are less likely to survive, and the species may go extinct.</p>														
1.4a	1	<p>Feature of social organisation</p> <ul style="list-style-type: none"> • sexual composition, • spatiotemporal cohesion, • leadership, structure, • division of labor, • communication 	One correct idea stated													
1.4b	2	<p>Advantages and Disadvantages of Group living</p> <table border="1"> <thead> <tr> <th>Advantage</th> <th>Disadvantage</th> </tr> </thead> <tbody> <tr> <td>• Young are better cared for</td> <td>• Less food per individual</td> </tr> <tr> <td>• Protection in numbers</td> <td>• More competition more injury and death</td> </tr> <tr> <td>• Hunting in numbers, more food is gathered, efficient</td> <td>• Increased disease, sickness instance</td> </tr> <tr> <td>• Reproduction rate more as more access to potential mates</td> <td>• Increased vulnerability to predators</td> </tr> </tbody> </table>	Advantage	Disadvantage	• Young are better cared for	• Less food per individual	• Protection in numbers	• More competition more injury and death	• Hunting in numbers, more food is gathered, efficient	• Increased disease, sickness instance	• Reproduction rate more as more access to potential mates	• Increased vulnerability to predators	<p>One correct idea stated</p> <p>(Either an advantage or disadvantage stated)</p>	<p>Two or more correct ideas stated without linkage</p> <p>(Both advantage and disadvantage stated)</p>		
Advantage	Disadvantage															
• Young are better cared for	• Less food per individual															
• Protection in numbers	• More competition more injury and death															
• Hunting in numbers, more food is gathered, efficient	• Increased disease, sickness instance															
• Reproduction rate more as more access to potential mates	• Increased vulnerability to predators															
STRAND 2 GENE EXPRESSION																
2.1	1	Semi conservative nature of replication	One correct idea stated													

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2.2	2	Problems in replication: <ul style="list-style-type: none"> • DNA polymerase insert the incorrect base resulting in different amino acid and protein being produced • Repair enzymes are mutated and defective • Mismatching of bases A with a G due to the flexible nature of DNA (wobble) • Insertions or deletions of nucleotide bases (strand slippage) 	One correct idea stated	Two or more correct ideas/processes are stated without linkage		
2.3a	1	Protein synthesis is the process in which cells make proteins. It occurs in two stages: transcription and translation.	Correct definition stated			
2.3b	1	X is transcription	X			
2.3c	3	Relationship between transcription and translation <ul style="list-style-type: none"> • Transcription and translation take the information in DNA and use it to produce proteins. • Transcription uses a strand of DNA as a template to build a molecule called RNA. • The main role of ribosome is its ability to catalyse the formation of peptide bonds between amino acids, so that the amino acids are incorporated into proteins. • During translation, the RNA molecule created in the transcription process delivers information from the DNA to the protein-building machines • Amino acids are identified from the codons and redundancy covers up small changes/mutations in the sequences 	One correct idea stated	Two or more correct ideas are stated without linkage	Two or more correct ideas on are stated. Relationship between transcription and translation is clearly mentioned.	
2.4	2	Features of mutations <ul style="list-style-type: none"> • Can be dominant or recessive (both mutant alleles are present) • Involve large (whole sections) or small DNA (one gene or gene pair) alterations • Spontaneous or induced 	One correct idea stated	Two or more correct ideas are stated without linkage		

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2.5a	1	Aneuploidy presence of an abnormal number of chromosomes in a cell, for example a human cell having 45 or 47 chromosomes instead of the usual 46.	One correct idea stated			
2.5b	3	Aneuploidy affects the genome: <ul style="list-style-type: none"> • acute response to chromosome mis-segregation, such as proteotoxic stress, growth defects, energetic stress and DNA damage, can activate cell-cycle arrest or cell death. • Imbalance for meiosis • Mis-segregation Changes in the copy numbers of chromosomes or large chromosomal regions significantly alter the expression of several hundreds of genes that are gained or lost. At the same time, aneuploidy by itself affects the transcription of many genes throughout the entire genome, as several pathways are activated or inhibited in response to changes in chromosome copy number. As an example, the human somatic cell usually has a chromosomal number of 46. In aneuploidy, the chromosomal number may become 45(monosomy) or 47(trisomy).	One correct idea stated	Two or more correct ideas stated without linkage	Two or more ideas are linked to predict an outcome/ result of the aneuploidy	
2.6a	1	Metabolic pathway <ul style="list-style-type: none"> • a series of chemical reactions in a cell that build and breakdown molecules for cellular processes 	Correct definition stated			
2.6b	2	Features/Characteristics of PKU <ul style="list-style-type: none"> • A musty odor in the breath, skin or urine, caused by too much phenylalanine in the body. • Neurological problems that may include seizures. • Skin rashes (eczema) • Fair skin and blue eyes, because phenylalanine can't transform into melanin — the pigment responsible for hair and skin tone • Abnormally small head (microcephaly) • Hyperactivity 	One correct idea stated	Two or more correct ideas stated without linkage		

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		<ul style="list-style-type: none"> Intellectual disability Delayed development Behavioral, emotional and social problems Psychiatric disorders 				
2.7	1	Feature of heterozygous gene pair <ul style="list-style-type: none"> The two alleles in the pair are different When alleles are heterozygous, one allele is dominant, and the other is recessive 	One correct idea stated			
2.8	2	Genotypes for the test cross <ul style="list-style-type: none"> One parent will have the homozygous dominant genotype while the other has homozygous recessive genotype, or Both parents have heterozygous genotypes 	One correct idea stated	Two or more correct ideas stated without linkage		
STRAND 3 BIOTECHNOLOGY APPLICATIONS						
3.1	1	Short tandem repeats <ul style="list-style-type: none"> 5-6 repeats in a row of the same codon/triplet of bases <div style="text-align: center;"> <p>short tandem repeats</p> <p>Participant 1 CTAGAGATAGATAGATAGATAGATAGATAGATAGATACTAGACTAGACTAG</p> <p>Participant 2 CTAGAGATAGATAGATAGATAGATAGATAGATAGATAGATAGATACTAGACTAG</p> <p>Participant 3 CTAGAGATAGATAGATAGATAGATAGATAGATAGATAGATAGATACTAGACTAG</p> <p>Participant 4 CTAGAGATAGATAGATAGATAGATAGATAGATAGATAGATAGATACTAGACTAG</p> <p>8 repeats</p> <p>9 repeats</p> <p>10 repeats</p> </div> <p>A short tandem repeat is a microsatellite with repeat units that are 2 to 7 base pairs in length, with the number of repeats varying among individuals, making STRs effective for human identification purposes</p>	Correct definition stated			
3.2a	1	DNA profiling	One correct idea stated Or			

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			DNA profiling			
3.2b	3	<p>DNA profiling and medicine (positive impacts)</p> <ul style="list-style-type: none"> • diagnosis of hereditary diseases, in investigations of malignant processes • for detection of infectious pathogens. • For a lot of disorders, DNA profiling is the only way to make an accurate diagnosis and help avoid additional unnecessary clinical investigations. • Can guide the clinician in choosing the most suitable therapy and support for the patient. • A definite diagnosis can be a great relief to patients and families, especially if they have been searching for the answer for long time. • In some genetic diseases good surveillance and early intervention can save the patient's life (e.g. early diagnosis of hereditary cancer). • The results of genetic testing may be useful for future family planning. 	One correct idea stated	Two or more correct ideas stated without linkage	States two or more correct ideas relating to how DNA profiling had impacted medical service	
STRAND 4 PROCESSES AND PATTERNS OF EVOLUTION						
4.1	1	Mitosis	Mitosis			
4.2a	1	Evolution: the change in the characteristics of a species over several generations and relies on the process of natural selection	Correct definition stated			
4.2b	4	<p>Impact of evolution on survival of the species (also referred to as natural selection), importance of variation:</p> <ul style="list-style-type: none"> • In the process of natural selection, individuals in a population who are well-adapted to a particular set of environmental conditions have an advantage over those who are not so well adapted. • The advantage comes in the form of survival and reproductive 	One correct idea stated	Two or more correct ideas stated without linkage	Two or more correct ideas stated and linked	Two or more linked ideas and the impact of evolution is thoroughly discussed and predicted for future populations. Uses examples to justify.

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		<p>success. For example, those individuals who are better able to find and use a food resource will, on average, live longer and produce more offspring than those who are less successful at finding food. Inherited traits that increase individual's fitness are then passed to their offspring, thus giving the offspring the same advantages.</p> <ul style="list-style-type: none"> • The mechanism for evolution is natural selection. Because resources are limited in nature, organisms with heritable traits that favor survival and reproduction will tend to leave more offspring than their peers, causing the traits to increase in frequency over generations. • Variation allows some individuals within a population to adapt to the changing environment. Because natural selection acts directly only on phenotypes, more genetic variation within a population usually enables more phenotypic variation. 				
4.3	3	<p>Impact of selective breeding on variations</p> <ul style="list-style-type: none"> • reduced genetic variation can lead to attack by specific pathogens and diseases which could be extremely destructive • rare disease genes can be unknowingly selected as part of a positive trait, leading to problems with specific organisms, e.g. a high percentage of Dalmatian dogs are deaf • can create physical problems in specific organisms, e.g. large dogs can have faulty hips due to not being formed correctly • new varieties may be economically important, by producing more or better-quality food • animals can be selected that cannot cause harm, for example cattle without horns <p>The artificial selection decreases the genetic diversity in a population as most fit species are bred with each other, increasing the homozygous genotypes.</p>	One correct idea stated	Two or more correct ideas stated without linkage	Two or more correct ideas stated showing linkage between the ideas. Relationship between selective breeding and its impact is clearly explained.	

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		<p>Future generations of selectively bred plants and animals will all share very similar genes.</p> <p>This could make some diseases more dangerous as all the organisms would be affected.</p> <p>Also, there is an increased risk of genetic disease caused by recessive alleles.</p> <p>All the genes and their different alleles within a population is its gene pool. Inbreeding can lead to the loss of alleles from the gene pool, making it more difficult to produce new varieties in the future.</p>				
4.4a	1	<p>Founder Effect is the loss of genetic variation that occurs when a new population is established by a very small number of individuals</p>	Correct definition stated			
4.4b	2	<p>Founder effect is special case of genetic drift (features):</p> <ul style="list-style-type: none"> - population is established by a small number of founding individuals from a much larger ancestral population. - could lead to an immediate evolutionary divergence from the ancestral population. 	One correct idea stated	Two or more correct ideas stated without linkage		
4.5	1	Allopatric speciation	One correct idea stated Or Allopatric speciation			
4.6	3	<p>Behavioural isolation resulting in reproductive isolation due to:</p> <ul style="list-style-type: none"> • no recognition of behaviour showing readiness for mating • leads to the lack of cross-attraction between opposite sexes of different species, 	One correct idea stated	Two or more correct ideas stated without linkage	Two or more correct ideas stated showing linkage between the ideas. Relationship	

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		<ul style="list-style-type: none"> Mating dances, the songs of males to attract females or the mutual grooming of pairs, are all examples of typical courtship behavior that allows both recognition and reproductive isolation. 			between behavioural isolation and reproductive isolation is clearly and explained.	
4.7	1	Feature of hybrid sterility <ul style="list-style-type: none"> Adults fail to develop functional gametes Failure of chromosome separation Having odd diploid number Serves as an isolation mechanism 	One correct idea stated			
4.8a	1	Analogous structures Have the same function but structure is different, different ancestors	Correct definition stated			
4.8b	2	Feature of convergent evolution <ul style="list-style-type: none"> two species, lacking a common ancestor, undergo independent evolution that results in similar body forms or similar useful traits. Having different original Evolving towards a point these organisms developing features for one purpose 	One correct idea stated	Two or more correct ideas stated without linkage		
5.1	2	Effects of Climate Change on coral reefs <ul style="list-style-type: none"> Corals are bleached Inhabitants need to find new habitats Severe storms cause physical damage to coral polyps causes thermal stress that contributes to coral bleaching and infectious disease. Sea level rise: may lead to increases in sedimentation for reefs located near land-based sources of sediment. 	One correct idea stated	Two or more correct ideas stated without linkage		

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		<ul style="list-style-type: none"> • Sedimentation runoff can lead to the smothering of coral. • Severe storms 				
5.2a	1	<p>Conservation practices</p> <ul style="list-style-type: none"> • Having marine protected areas • Afforestation/reforestation • 3 Rs • Use of renewable energy sources 	One correct idea stated			
5.2b	2	<p>Describe a renewable energy source</p> <ul style="list-style-type: none"> • Solar – use of solar panels to capture sun’s energy and channel to homes and residential areas • Hydro - By building a dam or barrier, a large reservoir can be used to create a controlled flow of water that will drive a turbine, generating electricity. • Wind - To harness electricity from wind energy, turbines are used to drive generators which then feed electricity into the National Grid • Biomass - organic material that has been transformed over long periods of time by geological processes into substances such as coal or petroleum. • Tidal - a form of hydropower that converts energy obtained from tides into useful forms of power, such as electricity • Geothermal - energy can be captured from the heat stored beneath the earth’s surface or from the absorbed heat in the atmosphere and oceans. In the first instance, geothermal energy can be captured from naturally occurring underground steam and be used to produce electricity. In the second instance, heating and cooling can be achieved by taking advantage of the temperature differential between outside air and the ground or groundwater. 	One correct idea stated	Two or more correct ideas on one renewable energy source stated without linkage		