EDUCATIONAL QUALITY AND ASSESSMENT PROGRAMME

No. 102/2

BIOLOGY

Assessment Schedule 2017

South Pacific Form Seven Certificate

3 Luke Street, Nabua, Private Mail Bag, Suva, Fiji.
Telephone: (679) 3370733 Fax: (679) 3370021

Item #	Skill Level	Evidence	Student Response Level			
			1	2	3	4
STRAND 1						
1.1a	1	Innate behaviour is developmentally fixed and under strong genetic control. It is exhibited in virtually the same forms throughout their lifetime in all populations despite differences in both external and internal environment	Correctly defines innate behaviour			
1.1b	2	The monarch's migration is driven by seasonal changes. Day length and temperature and humidity changes influence the movement of monarchs Temperature changes come about as the summer ends and winter approaches. Also comes with it are the shorter days and longer nights as light hours become shorter. These usually will bring about hormonal changes such as reduction of organ size or total loss to reduce weight as they prepare for flight.	Names only the environment cue without description	Names the environmental cue and give a description of what it is		
1.2	3	Migration in animals is driven by the fluctuation in earth's resources. Warm summers followed by cold winters. Plants, other meals may become abundant but only for a short time. The best place for reproduction may not be the best place to find food. Biological clocks are *sense time and regulate circadian rhythms *control the timing of major periodic functions such as migration * basically time keepers that help to keep populations together	One idea given but partly explained	Explains the biological clock but does not relate the concepts to long distance navigation 2-3 ideas given	Explains biological clocks as an internal function inside the body of living things that controls biological rhythms or patterns such as migration and other changes. Relates Biological clock as a timekeeper and also sense direction through use of compass such as the sun compass magnetic field etc. and that animals also need to prepare for migration	

		*genetically acquired that is necessary to allow animals to synchronise their behaviour with the changing seasons *direction and distance must be encoded in the genes because even the young and newborn migrate *directional orientation means travelling in a specific direction *Animal body clocks direct the endocrine system to produce hormones controlling physiological function *navigation requires both compass sense and map sense which is an awareness of location *when migration happens animal must integrate information about distance and time as well as direction. *animal must prepare for navigation therefore needs to feed continuously for fuel reserves * biological clock allows animal to be in the right place at the right time			Explanations supported with examples	
1.3	2	Calculation of the free running period: Example: Shift in activity in constant darkness over 10 days = 3.5 hrs. In 1 day this is .35hr. .35 x 60 mins = 21 mins. Free running period is 24hr and 21 mins long.	A reasonable attempt at the free running calculation is made	Calculation attempted and shows result based on the phase shift under the dark regime. Accept results in the range of 18 to 30 mins, provided a calculation based on the phase shift is shown. Accept result left as a decimal (.35).		.
1.4 a	1	Territory-an area defended by an individual from intrusion from other members especially those of the same species	Term is correctly defined			
1.4b	2	Living in a group provides quite a few benefits. Group members can cooperate in finding food. Group hunters can catch	One correct idea is given	An advantages and a disadvantage are correctly listed		

		larger prey than individual animals can, and animals foraging might find spots where food is plentiful and all members of the group benefit rather than wasting time fighting over it. Groups can defend territories more efficiently than individuals can, and living in a group also provides better access to mates. There are also drawbacks to living in a group. Groups may attract predators or attacks by other animals because of scents or noises. Animals living in groups also spread disease more easily than animals living on their own.				
1.5	4	Oysters *r-strategy many offsprings with no parental care *riks-no parental care with high mortality rate *benefit adults can reproduce frequently, low intraspecific competition thus better reproductive outcome Whale k-strategy 1-2 live young produced *risk of complete loss high High level of parental care-protection thus high chances of surviving to adulthood Adult females use energy caring for young so cannot reproduce often	May discuss one idea with or without lack clarity or detail One idea	2-3 ideas given with or without clarity and detail	At least 3 ideas given from the 4 expected The ideas are clear, detailed and related to one another.	correctly discusses by referring to both oyster and whale • identifying correct reproductive strategy • risks and benefits outcome explained • effect on population • why each result in similar outcomes All 4 parts discussed

STRAND 2						
2.1a	1	Enzyme A is helicase Enzyme B is ligase/DNA ligase	One is correct or both are correct			
2.1b	1	Semi conservative replication refers to the type of DNA replication in which the replicated double helix consists of one old strand derived from the old molecule and one newly made strand.	Defines semi conservative correctly			
2.2a	1	Protein synthesis is the process by which the genetic code from DNA allows for amino acids to be connected in a specific sequence to build a specific protein	Correctly defines protein synthesis	.		.
2.2b	3	Transcription occurs followed by translation. Transcription occurs in the nucleus where the sense strand from DNA is copied onto a template on mRNA .Base pairing remains the same except A is transcribed into U on mRNA. Code triplets from DNA are now carried as codons on mRNA as it moves into the cytoplasm to attach to the ribosome. tRNA carry anticodons to ribosome where the codons are translated to amino acids and joined by phosphor-diester bonds to form a polypeptide which eventually becomes a protein	Some basic ideas e.g. definitions are correct but confused	Either fully explains transcription or translation or attempts to explain both processes which lack sufficient detail despite showing understanding	3 ideas that explain transcription DNA unwinds/mRNA copies DNA section coding for protein/mRNA carries codons for protein to be synthesised 3 ideas that explain translation mRNA-ribosome tRNA –anticodon tRNA-specific amino acid formation-polypeptide chain formation	
2.3a	1	Mutation is a change in the DNA of a gene ultimately creating genetic diversity	Correctly defines the term mutation with the main concept that it involves a change in DNA structure /base sequence is changed or sections of DNA are lost or replaced etc.			
2.3b	2	Mutation 1 is insertion/addition. An extra G has been added/inserted after the 4th nucleotide	Correctly names one type of mutation	Correctly names and describes one type of mutation		

		Mutation 3 is substitution. The G nucleotide at the 4th locus has been lost and replaced with a T nucleotide				
2.3c	3	A gene mutation is a permanent alteration in the DNA sequence/ nucleotides which may affect a single nucleotide/pair, that make up a gene. Two main causes: • Environmental – due to chemicals/ radiation/UV from the sun – they alter DNA by changing nucleotide bases and can even change the shape of DNA. These changes result in errors in DNA replication and transcription. • Errors due to mitosis/meiosis Point or frameshift which lead to replication errors which can result in deletion of genes, translocation of portions of chromosomes missing chromosomes, extra copies e.g. sickle cell anaemia/cystic fibrosis etc.	Mention of one or 2 causes only without explanation	Mention of at least one cause with explanation	Both causes mentioned and well explained	
2.4	2	1-GUG-Val 2-CAC-His	One correct idea	Two correct ideas		
2.5a	1	Co-dominant is when the phenotypes of both alleles are expressed in the heterozygote because they both exist as dominant…e.g. AB blood grouping in human	Definition is correct			
2.5b	1	**"Some female cats have ginger and black patches of fur"**…the sentence describes the fur having ginger and black patches. This means they are separately exhibited not blended	Sentence correctly identified			
2.5c	1	(ii)Genotype of tortoiseshell female cat will be $X^B X^G$	Genotype is correct			
2.5d	3	The chromosomal condition is a trisomy or aneuploidy. This is similar or				

<table>
<tr><td></td><td></td><td>comparable to Klinefelters Syndrome in humans.
The condition has occurred due to non-disjunction. This is because chromosomes fail to separate correctly during meiosis, i.e.in Anaphase 1 of meiosis both of chromosome 23 go to the pole instead of one chromosome 23 to each pole. This happens more in females giving eggs with two of chromosome 23XX or a male with 2 chromosomes 23XY. When such an egg or sperm becomes fertilised the zygote will have 3 of this chromosome</td><td>Chromosomal condition is named correctly or a correct idea is found in the explanation</td><td>Chromosomal condition correctly identified

Explanation of how condition occurred partly explained either meiotic phase omitted or fertilisation not referred to</td><td>Chromosomal condition correctly named

Explanation of how condition caused trisomy correctly explained in a logical order with mention of both meiosis and fertilisation involved</td><td></td></tr>
<tr><td>2.6a</td><td>1</td><td>Type of Gene interaction is epistasis or supplementary genes.</td><td>Correct response</td><td></td><td></td><td></td></tr>
<tr><td>2.6b</td><td>4</td><td>Genotype of parents will be
BbEe X BbEe
<table><tr><td></td><td>BE</td><td>Be</td><td>bE</td><td>be</td></tr><tr><td>BE</td><td>BBEE</td><td>BBEe</td><td>BbEE</td><td>BbEe</td></tr><tr><td>Be</td><td>BBEe</td><td>BBee</td><td>BbEe</td><td>Bbee</td></tr><tr><td>bE</td><td>BbEE</td><td>BbEe</td><td>bbEE</td><td>bbEe</td></tr><tr><td>be</td><td>BbEe</td><td>Bbee</td><td>bbEe</td><td>bbee</td></tr></table>Phenotypic ratio will be

9black:3brown:4 gold</td><td>Only one out of the three parts required correct</td><td>Incorrectly identifies parents genotypes but uses the genotype to fill punnet correctly and uses results of punnet to express phenotypic ratio correctly</td><td>Correctly identifies both parents genotype
AND
Correctly fills in punnet square withal gametes and results in the punnet correct
AND/OR
Correctly expresses the phenotypic ratio of 9:3:4</td><td>Correctly identifies both parents genotype

Correctly fills in punnet square withal gametes and results in the punnet correct

Correctly expresses the phenotypic ratio of 9:3:4</td></tr>
<tr><td colspan="7">STRAND 3</td></tr>
<tr><td>3.1a</td><td>1</td><td>Transgenesis is the process of introducing a gene(referred to as a transgene) from one organism into the genome of another organism</td><td>Transgenesis correctly defined</td><td></td><td></td><td></td></tr>
<tr><td>3.1b</td><td>2</td><td>Pronuclear microinjection technique
A transgenic DNA construct is physically microinjected into the pronuclei of fertilised eggs by using pulled glass needles. The eggs are</td><td>Description of technique only partly answered.
Ideas vague, lack clarity</td><td>Technique of pronuclear microinjection well explained
Main ideas using a microinjection thin</td><td></td><td></td></tr>
</table>

		capable of integrating foreign DNA into their genomes at random positions. Micro injected eggs are then implanted into the oviducts of pseudo pregnant foster/surrogate mothers [recipient female] where they can then develop into viable individuals		narrow needles to transfer DNA into a pronucleus. Transferred to oviduct of recipient mother Development allowed.		
3.2	2	Isolate plasmids Use enzymes to cut to produce sticky ends-endonucleases/ restriction enzymes Transfection/uptakes Replications of bacteria-reproduction by binary fission DNA extraction from plasmids Marker gene-use tetracycline	Describes basic ideas but lacks a clear understanding of the procedures involved	Correct descriptions in logic order showing clear understanding of the procedures		.
3.3a	1	PCR stands for Polymerase Chain Reaction	Long form of the PCR abbreviation correctly identified			
3.3 b	1	DNA helix is separated into single strands by heating it to about 95 degrees C	Separation method correctly identified			
3.4 a	1	DNA profiling is a forensic technique used to identify an individual by characteristics of their DNA. It is also known as DNA fingerprinting/DNA testing/DNA typing	Correctly defined			
3.4 b	2	STRs use polymorphisms called short tandem repeats [STRs] these are regions of non-coding DNA that contain repeats of the same nucleotide sequence. Examine STRs at 10 or more genetic loci which are usually on different chromosomes Get DNA sample Extract the DNA then copy the DNA using PCR to get enough DNA to make a profile	Description not very clear and lacks cohesion and understanding	STRs/VNTRs explained Techniques-PCR ENs Gel Electrophoresis + profiles Bands compared Clear and logic ascription of method used		

		Determine the size of the STRs using a genetic analyser The genetic analyser separates the copied DNA by gel electrophoresis and can detect the fluorescent dye on each STR Compare bands of repeated STRs /VNTRs explained Techniques- PCR ENs Gel Electrophoresis + profiles Bands compared				
STRAND 4						
4.1	1	Convergent evolution is where two different species that do not originate from a common ancestor become alike as a result of having to adapt to similar environments or ecological niches	Correctly defines convergent evolution			
4.1 b	2	Shark and dolphin both live in water thus they both have tail fin and streamlined bodies to reduce friction against movement in water	Basic ideas but lacks detail or clear answer	Clear explanation/ description of how dolphin and shark have evolved through a convergent pattern		
4.1c	1	Pattern of evolution is divergent evolution or adaptive radiation Structures are called homologous structures	Correctly identifies divergent evolution or homologous structure			
4.1d	3	<table><tr><td>Div Evolution *Homologous structures *Increase morphological difference between</td><td>Conv Evolution *Analogous structures *Decrease in morphological difference between</td></tr></table>	One relevant idea	Descriptions are given but no comparison	Descriptions are provided as well as appropriate comparisons i.e. Both terms clearly described Structures are liked	

		species as each species adapts to different ecological niche *Species become more dissimilar *Evolve from a common ancestor * Caused by migration or nearby extinction of a nearby environment * Live in different ways than the common ancestor species as each species adapts to different ecological niche Species become more alike *Evolve from different ancestors * Live in relatively the same way as each other * Both are important in generating variation			Development Examples Niches At least four clear and valid ideas	
4.2a	1	Gene pool -the total aggregate of all genes in a population at a particular time	Gene pool correctly defined	.		
4.2b	4	Reproductive isolating mechanism Speciation the formation of a new species over time, but two organisms are considered same species only if they are able to freely interbreed in nature to produce fertile offsprings Two types-prezygotic and post zygotic **<u>Prezygotic</u>** Difference in reproductive seasons Difference in structure of gentalia Incompatible behaviour…t able to recognise mating signals/calls…	Basic ideas presented with no examples given	Descriptions are presented with some examples given	Descriptions are related i.e. one isolating mechanism is linked to impacts and exemplified	Discusses two or three isolation mechanisms Well explained with examples illustrated Shows clear understanding

		Gametic isolation egg and sperm have chemical difference which prevent fertilisation **<u>Post zygotic</u>** Hybrid inviabilty-inability of any hybrids to survive Hybrid sterility-hybrids unable to produce viable gametes Hybrid breakdown- the offspring of hybrids are unable to reproduce Examples pine trees mature in different months/mule is sterile				
4.3a	1	Process is crossing over/synapsis	Correctly identifies process			
4.3b	3	Sexual reproduction causes genetic variation. Involves meiosis Independent assortment Segregation Crossing over/recombination Random fertilisation Random mating Gametes contain half chromosome number. Therefore half allele. Reduction division Increases chances of survival because variation allow for adaptation to changing environments	Shows basic understanding of sexual reproduction and the contribution of meiosis towards variation but lacks clear explanation of how variation arises from the factors mentioned	Provides descriptions of one or two features of sexual reproduction or genetic variation without linking these to increased survival	Explains at least two factors in sexual reproduction that contribute to variation. **Explains how, i.e. links variation benefits organisms adaptability to a changing environment**	
4.4	1	Directional selection-selection where one of the extreme is favoured so there is a shift of the average in one direction examples- the increase I in the melanic[dark] form of the peppered moth due to the darkened bark of trees during the industrial revolution	Either correctly identifies type of selection or correctly gives the example			
4.5	3	Population bottleneck A bottleneck effect is the term used to describe the loss of genetic variation that	. Two-three ideas but incomplete definitions and lacks detail in	Makes two or three descriptions of the two or three phenomena but	Population bottleneck Founder effect	

		occurs after outside forces destroy most of a population. The few individuals left to reproduce pass their traits onto all of their offspring, which then may thrive without the competition of a large population. Eventually there may be a large, very genetically similar population based on the traits of the few original survivors. The founder effect describes the low genetic variation of a population derived from a small group of individuals in a new geographic location Genetic drift is the random changes of allele frequencies in a population Both population bottlenecks and the founder effect are special cases of genetic drift because in both cases genetic variation is low. The gene pool is at risk since loss of alleles means not enough the number of reproducing members may also be declining For endangered species as the number dwindle it loses genetic variation. Even if the species rebounds, its level of variation will not. The population size may increase but the gene pool is too small to lead to an increase in variation as the population size increases. All individuals are genetically similar as they have genetically similar parents.	explaining the effects of genetic drift	fails to relate these to the ability of an endangered population to recover	Genetic drift all explained/defined clearly Explains/Links effect on populations related to low genetic variation and loss of alleles and the low numbers in the population and how they are special cases of genetic drift.	