No. 102/2

EDUCATIONAL QUALITY AND ASSESSMENT PROGRAMME

Scoring Rubric 2022

South Pacific Form Seven Certificate

BIOLOGY

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Item #	Skill score	Evidence	Skill Level			
			1	2	3	4
STRAND 1 ANIMAL BEHAVIOUR						
1.1a	1	Definition of monogamous mating: • Bond*ing* between a pair of adult animals of the same species (opposite sex) cohabiting in an area, that lasts for a time, and in some cases reproduction occurs only with each other.	One correct idea stated			
1.1b	2	List two features of ***k* strategists**: • Large body size • Long life expectancy • Production of fewer offspring • Require extensive parental care until maturity	One correct idea/feature stated	Two correct ideas/features listed		
1.2	2	Describe **adaptive value** of orthokinesis • Move out of harm's way eg reduce risk of being seen by predator, of desiccation, • relocate to a safer environment • avoid a certain environment	One correct idea stated	Two or more correct ideas stated without linkage		
1.3a	1	An **actogram** • simple graphs that show activity of organisms over time	An actogram			
1.3b	3	With reference to the actogram in Q 1.3a, explain the activity of the cockroach using the terms: free running, shift phase and zeitgeber. • The zeitgeber for the cockroach is darkness because with darkness comes activity-darkness is the cue. • In normal conditions (D1-5)-all the activities occurs during the night and no activity during the day. • But after D6, all conditions are constant (constant darkness),	One correct idea stated	Two or more correct ideas stated without linkage	Two or more correct ideas stated and linked	

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		and the free running period occurs(after D6)/activity begins later each day(slant in graph). This change or shift in the graph is the shift phase-delay in each cycle/period. • Organism is nocturnal because of night activity				
1.4	1	Out competition	Out competition			
STRAND 2 GENE EXPRESSION						
2.1a	1	Define **genome** • complete set of genetic information in an organism • provides all information the organism requires to function. • found in long molecules of DNA	One correct idea stated			
2.1b	2	Structure of DNA • two strands that wind around one another to form a shape known as a double helix. • Made up of **nucleotides** of alternating sugar (deoxyribose) and phosphate groups. • Attached to each sugar is one of four bases--adenine (A), cytosine (C), guanine (G), and thymine (T)	One correct idea stated	Two or more correct ideas on the structure are stated without linkage		
2.2a	1	Define **codon** • Triplet of bases • Set of 3 bases • a sequence of three nucleotides	One correct idea stated			
2.2b	1	Function of mRNA • carries the protein blueprint (information on what protein to be synthesised) from a cell's DNA to its ribosomes	One correct idea stated			
2.3	2	Describe use of the code to identify STOP codon. • three nucleotides in a row count as a triplet and code for a single amino acid. So, each sequence of three codes for an amino acid. • The Genetic Code is read one codon at a time.	One correct idea stated	Two or more correct ideas are stated without linkage		

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		• The STOP codons are A-G-A and A-G-G. When these are read, production of amino acids stops.				
2.4a	1	• Turners Syndrome • Monosomy of X	Either Turners Syndrome or Monosomy of X			
2.4b	2	Features of individual with Turners syndrome • a particularly short, wide neck (webbed neck) • a broad chest and widely spaced nipples. • arms that turn out slightly at the elbows. • a low hairline. • teeth problems. • a large number of moles. • small, spoon-shaped nails. • a short 4th finger or toe.	One correct idea stated	Two or more correct ideas are stated without linkage Or one physical characteristic correctly described		
2.5	1	Define Tetraploid – 4n • Having **four** whole sets of chromosomes • 4n or 4x condition	One correct idea stated			
2.6a	1	Define Epistasis • Gene interaction where the expression of one gene is affected by the expression of one or more independent genes • Expression of A,a is affected by the expression of cc	One correct idea stated			
2.6b	4	Discuss the effect of epistasis in the diagram: • Recessive epistasis: when the recessive allele (cc) of one gene masks the effects of either allele (A, a) of the second gene • Genes A, a and cc are both responsible for fur colour • When gene c is present in homozygous recessive form (cc), fur colour is masked, and mouse is albino – regardless of the form in which A, a exists • When gene c is present in Cc or CC form, then AA, Aa will code for brown and aa will code for black	One correct idea stated	Two or more correct ideas stated without linkage	Two or more correct ideas stated and linked	Two or more correct ideas stated and linked; gives examples to justify by making reference to the diagram

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		• Thus the ratio of 9 brown is A-C- genotype, the ratio of 3 black is aaC- and ratio of 4 albino is --cc				
2.7a	1	Define Semi conservative replication • double-stranded DNA separates into two single strands each of which serves as a template for the formation of a complementary strand that together with the template forms a complete molecule • the complete molecule has one old strand (from original DNA) and one newly synthesised strand	One correct idea stated			
2.7b	3	Roles of enzymes • DNA polymerase: joins individual nucleotides to produce a new strand of DNA it produces the sugar phosphate bonds that join the nucleotides together and it proof reads each new DNA strand so that each copy is a near perfect copy of the original. • DNA Ligase: play an essential role in maintaining genomic integrity by joining breaks in the phosphodiester backbone of DNA that occur during replication and recombination, and as a consequence of DNA damage and its repair. Joins the Okazaki fragments of the lagging strand. Used in both DNA repair and DNA replication. • Helicase: catalyze the disruption of the hydrogen bonds that hold the two strands of double-stranded DNA together, so the double strand is unzipped	One correct idea stated	Two or more correct ideas stated without linkage	Two or more correct ideas stated, linking and explaining the role of enzyme(s)	
STRAND 3 BIOTECHNOLOGY APPLICATIONS						
3.1	2	First **two** steps of using plasmids to clone desired genes: • Gene to be copied is identified • Plasmid is cut at point of insertion (using restriction endonucleases) Or • Plasmid is cut at point of insertion (using restriction endonucleases) • Gene is spliced into the plasmid	One correct step stated as in evidence	Two correct steps stated as in evidence		

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3.2	3	Explain one positive impact of transgenesis on gene pool • introduces advantageous genes into the gene pool, which causes • increase in the advantageous genes in gene pool • foreign genes allow the organism to better fit into the habitat, which leads to • increase in genetic diversity	One correct idea stated	Two or more correct ideas stated without linkage	Two or more correct ideas with linkage, explaining the consequence of transgenic organisms	
STRAND 4 PROCESSES AND PATTERNS OF EVOLUTION						
4.1	1	Define crossing over The exchange of genetic material during sexual reproduction between two homologous chromosomes' non-sister chromatids that results in recombinant chromosomes.	One correct idea stated			
4.2		Feature of meiosis • It results in the formation of four daughter cells in each cycle of cell division. • The daughter cells are identical to the mother cell in shape and size but different in chromosome number. • The daughter cells are haploid. • Recombination and segregation take place in meiosis.	One correct idea/feature stated			
4.3a	2	Mutation leads to formation of new alleles • New genes arise due to extra genes, repeated genes, relocated genes, deleted genes • Creating new DNA sequence for a specific gene (forms new allele)	One correct idea stated	Two or more correct ideas stated		
4.3b	4	Negative impact of mutation on a population: **Negative** • New alleles are formed in organisms that make them harmful, invasive, replaces existing organisms • May cause genetic disorders or cancer	One correct idea stated	Two or more correct ideas stated without linkage	Two or more correct ideas stated with linkage	Two or more linked ideas, the negative impact of mutation is thoroughly discussed with

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		• New functionless proteins are formed • Cystic fibrosis, cancer (Specific examples are to be used)				examples
4.4a	1	Define Natural Selection (NS) • the process through which populations of living organisms adapt and change, resulting in some individuals having traits better suited to the environment than others.	One correct idea stated, or Correct definition of NS			
4.4b	2	Main points of theory of NS: • More individuals are produced each generation that can survive. • Phenotypic variation exists among individuals and the variation is heritable. • Those individuals with heritable traits better suited to the environment will survive. • When reproductive isolation occurs new species will form	One correct idea/point stated	Two or more correct ideas/points stated		
4.5a	1	Define **fitness** • the fitness of the individual is based on its ability to pass genetic information on to the next generation, as opposed to any physical characteristic or trait. • is a measure of relative reproductive success • it refers to how many offspring organisms of a particular genotype or phenotype leave in the next generation, relative to others in the group.	One correct idea stated			
4.5b	3	**Fitness** contributes to frequency of alleles in the gene pool • fitness means better adapted and higher chance to survive • fit allele exists in greater frequency • better chances the offspring having 'fit' alleles • reduces the frequency of less adapted alleles • has better advantage over less fit alleles	One correct idea stated	Two or more correct ideas stated without linkage	Two or more correct ideas stated with linkage	
4.6	1	Define **allele frequency** • represents how often/how common an allele appears in a	One correct idea stated			

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		population • the incidence of a gene in the population • is the frequency of an allele in a population				
4.7	1	Genetic drift • random fluctuations in the frequencies of alleles from generation to generation due to chance events. (Accept any other definition reflecting the diagram in the item)	One correct idea stated, or Correct definition			
4.8a	1	Hybrid unviability	One correct idea stated			
4.8b	1	Define hybrid breakdown a type of reproductive failure that appears after the F2 generation of crosses between different species or subspecies. It is caused by incompatibility between interacting genes	One correct idea stated, or Correct definition			
4.9	1	Feature of homologous structures • share similar anatomical structure • functions of structure are different • suggest they come from a common ancestor	One correct idea/feature stated			
STRAND 5 ENVIRONMENTAL ISSUES						
5.1a	2	Features of climate change • rising sea level • rising global temperatures/global warming • increase in frequency of natural disasters • increase in strength of natural disasters • ocean acidification – bleached corals **(NB: accept any other correct feature that may not be stated above)**	One correct idea/feature stated	Two or more correct ideas/features stated		
5.1b	3	Why relocation would be the best adaptive strategy • protects lives and assets while maintaining community ties	One correct idea stated	Two or more correct ideas stated without	Two or more correct ideas stated with linkage.	

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		• generally, relocated communities are well supported (technically and financially) and have improved livelihoods • are safe from future effects of climate change as experienced in their previous locations • can explore new environments which are more fertile for farming, and new opportunities for continuing livelihoods • new beginnings allow communities to establish better practices and improve their lifestyles		linkage	Relationship between the adaptive measure and its benefit to people is clear/ Comparison between the adaptive measures is evident showing relocation as having the most benefit. Uses examples.	