Assessment Schedule – 2010

Biology: Describe genetic variation and change (90459)

Evidence Statement

Q	Achievement	Achievement with Merit	Achievement with Excellence
	Describes biological concepts and processes that relate to genetic variation and change by: recognising, naming, drawing, giving characteristics of, or an account of.	Explains biological concepts and processes that relate to genetic variation and change by: providing a reason as to how or why something occurs.	Discusses biological concepts and processes that relate to genetic variation and change by: showing understanding by linking biological ideas.
ONE	BOTH of: Description of crossing over / definition of mutation **Describes** crossing over: (Homologous) chromosomes come together in pairs (chromatids touch). The exchange of segments or parts or portions of a chromosome / DNA / genetic information occurs (not genes) Eg, during the early stages of cell division in meiosis, two chromosomes of a homologous pair may exchange segments of DNA. (A drawing is acceptable, labels not required, results of crossing over must be shown.) **Describes** a mutation as eg, a (permanent) change, a (structural) alteration in the DNA / gene.	BOTH of the following: Explanation of what crossing over is and that it only occurs during meiosis/ production of gametic cells. AND Explains the difference between gametic and somatic mutations, having stated what a mutation is. (Accept a well-labelled / annotated diagram as explanation.) Eg: The result of this crossing over is an exchange of alleles, called genetic recombination/ Without recombination, all alleles for those genes found together on the same chromosome would be inherited together/ Recombination shuffles the allele content between sister chromatids/ makes gametes unique. Somatic and gametic mutations (both needed, or somatic implied but not discussed), eg: Somatic: Alterations in DNA that occur after conception/ Somatic mutations can occur in any of the cells of the body except the germ cells (sperm and egg) and therefore are not passed on to the offspring. Gametic: (may be called germline, which is acceptable) A heritable change in the DNA that occurred in a gamete (germ cell) – a cell destined to become an egg or sperm. When transmitted to the offspring, a gametic mutation is incorporated in every cell of their body.	Requires evidence from each of the THREE areas below: Discusses how crossing over and mutation in gametic cells can lead to variation in the offspring and the effect of that variation over time. Eg: **Discusses** • Source of mutation as error in gamete producing cells leading to new allele formation and therefore variation. AND • the concept that crossing over (must mention exchange of DNA) can lead to variation in gametes AND • changes in its frequency over time will relate to ONE of - Natural selection – as environmental factors change so making the allele (NOT gene or trait)more favourable [increase in frequency] or less favourable [decrease in frequency] for survival. NOTE: For survival need to imply can reproduce and thereby increase their chance of reproducing/passing on to offspring which causes increase in frequency of this allele. - Currently neutral mutations may become positive or negative as the conditions of the environment change over time.

TWO (a)	Identifies both genotypes: B = Aaff G= AaFf **(A)**		
(b)	Describe/state that 'H' could be Ff /FF or (in words: homozygous or heterozygous for frosting) (NOTE: *aa is known but not required for question.)* **(A)**	Explains why the genotype of 'H' can't be determined directly. Must relate to **J**/one of siblings: Cannot accept an answer relating to offspring for H as answer must come from information given in question. The nature of H is such that although one of the characteristics can be identified, the frosting could be either homozygous or heterozygous. This cannot be determined from the parents as both of the parents must be heterozygous due to the non-frosting seen in animal 'J'. **(M)**	
(c)	Test cross with homozygous recessive 'aaff'. **(A)**	**'I'** could be homozygous or heterozygous for the 'f' gene ie. FF / Ff It **is** heterozygous for Aa*: AaFF / AaFf If homozygous recessive shows in offspring then 'I' is heterozygous for both alleles/ Appropriate completion of 2 Punnett squares *(4 punnett squares puts back to A)* to show outcomes or ratios given. **(M)** NOTE: *Must include Aa for Merit or must be implied	Discusses the need for the test cross appropriately and completes or explains accurate Punnett squares (as Merit) Must include the idea of uncertainty. (Many repeats are necessary) / can never be sure / MOST likely / fairly certain / can assume that. **(E)**
	Overall A for this question = 1A	***Overall M for this question = 1M***	***Overall E for this question = 1E***

THREE	Defines TWO of: • **Natural selection** Favourable alleles / phenotypes / traits / characteristics become established in the gene pool by being selected for. OR Unfavourable (harmful) alleles face elimination from the gene pool by being selected against. • **Genetic drift** chance /random changes in allele frequency • **Founder effect** a new / separate population is established by a very small number of individuals from a larger population	Explains how TWO processes contribute to the development of new species. Founder effect, Genetic drift, Natural selection AND **explains** an aspect of how these are selected for / against eg **Natural Selection** • An allele / phenotype /trait/ characteristic that is harmful is unlikely to become established as it will be selected against due to the individual's chances of survival and successful reproduction being reduced. • An allele / phenotype / trait / characteristic that is favourable will be selected for and become established in the gene pool as the individual's chance of survival and successful reproduction are increased. • An allele / phenotype / trait / characteristic that is neutral (in terms of cost / benefit) will be established in the gene pool by chance. In small populations, most likely by genetic drift. The allele itself has no effect on the individual's survival and reproductive rate. **Genetic drift** • That the frequency of the allele can change (loss or fixed) through chance especially if the population is or becomes small. **Founder effect:** • The limited / unrepresentative number of alleles from the original gene pool may mean that allele frequency in this population is different to the original population.	Discusses the development of the oystercatcher by: Linking the founder effect with natural selection and genetic drift to the formation of a new species. All THREE processes needed. Process begins with FOUNDER EFFECT when a new population is established on the Chatham Islands by a very small number of individual oystercatchers from the larger population in New Zealand, and then GENETIC DRIFT and NATURAL SELECTION, resulting in new species – environment selecting for Chatham Island oystercatcher. (The order of events starting with Founder effect should be implied.)

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
2 A	**2** M	**2** E