Assessment Schedule – 2008

Biology: Describe genetic variation and change (90459)

Evidence Statement

Q	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	Allele pairs separate independently during the formation of gametes. OR (Homologous / chromosome) pairs **separate randomly.** NOTE: distribution does not mean pair separation.		
(b)	**Describes** crossing over, eg: (During the early stages of cell division in meiosis), two chromosomes of a homologous pair may exchange segments (of DNA). OR If only a diagram, must show **homologous pair** with cross over (labels not required). OR as Merit from *.	Accept a well-labelled diagram as contributing to a poorly worded explanation. **As Achievement plus:** *The result of this process is: an exchange of alleles /genes (not information) – AND making chromatids unique OR genes swapped around AND all gametes are different. NOTE: Not just making chromosomes/gametes unique. Must include 'exchange' of alleles /genes.	
(c)	**Describes** a mutation as a (permanent) change, a structural alteration, in the DNA or RNA. OR Mutation produces NEW genetic information/alleles. OR Difference between somatic – not inherited, and gametic – inherited.	**Mutation described +** **Explains** the difference between somatic and gametic mutations. (Both needed.) **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 <u>therefore are not passed on to the offspring.</u> AND **Gametic:** (may be called germ line, 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 the offspring, a gametic mutation is incorporated in every cell of their body.	

TWO (a)	Table accurately completed to show RrYy × RrYy cross. Gametes are RY, Ry, rY, ry.		
(b)	Phenotypic ratio is: 9:3:3:1 Round Yellow: Round Green: Wrinkled Yellow: Wrinkled Green (Both ratios AND appearance are needed.) OR ALLOW Carry over error **COE**– if 2a) is incorrect but 2b) gives the correct interpretation of 2a)		
(c)	**Describes** the fact that Round Yellow seeds may be homozygous or heterozygous and the first step is to identify which are which. OR Do a test cross, which is breeding with the homozygous recessive plant (wrinkled-green). OR Test cross / back cross. OR Identify possible genotypes of all stock peas as RRYY, RRYy, RrYy and RrYY. OR Identifies required genotype of the 'outcome' to be rrYY.	**Explains** that the test cross identifies heterozygous round from homozygous round based on the phenotype of the offspring. OR Heterozygous parents will produce offspring that show recessive characteristic – wrinkled (whilst homozygous dominant parents will not). OR Test cross possibilities: RRYY x rryy = all RrYy round, yellow RRYy x rryy= 1RY:1RG RrYy x rryy= 1 RY:1RG:1WY:1WG RrYY x rryy=1RY:1WY So take offspring that produce wrinkled and yellow seeds These will be rrYy and rrYY NOTE: Results needed of first test cross. OR Possible answer may not include test/back cross if candidate thinks only round and yellow stock plants could be used to establish the pure breeding population. If so, answer should include: 1) crossing between stock plants should be done in order to select the wrinkled plants which must be rr……	Continues from explanation to **discuss** the fact that even at this stage some of the plants that are phenotypically correct will still be heterozygous for the Yellow colour and therefore capable of producing offspring that are wrinkled and green. A further test cross is necessary to screen out the heterozygotes, leaving only seeds / plants that are homozygous dominant for colour (Yellow) and homozygous recessive for texture (wrinkled). OR So take the 2 offspring seeds that are wrinkled yellow and do a test cross as below: rrYy x rryy = 1rrYy:1rryy Half offspring are green -Discard all these rrYY x rryy = rrYy All wrinkled and yellow offspring. So these rrYY (used in second cross here) are the pure breeding seeds for wrinkled and yellow you wanted to establish. OR Follow on from only using stock plants: The wrinkled yellow plants could be YY or Yy. By crossing the yellow and wrinkled plants, lines that are homozygous for yellow will produce no green offspring.

| THREE | **Describes** a possible source of alleles in a gene pool eg:
ONE of
• mutation.
OR
• immigration.

AND **Describes** a method of establishment or elimination, eg:
ONE of
• Favourable alleles become established in the gene pool by being selected for / natural selection.
OR
• Unfavourable (harmful) alleles face elimination from the gene pool by being selected against / natural selection / emigration.
OR
• Alleles may be lost from gene pool by genetic drift. | **Explains** source of mutation or immigration.
ONE of:
eg:
• Mutations (in DNA replication) create new alleles.
• Mutation must occur in gamete-producing cells to enter the gene pool of the population.
• Immigration adds new alleles when the new arrivals breed with members of the existing population they have migrated into.

AND **Explains** an aspect of how these are selected for / against, eg:
• An allele 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.
OR
• An allele 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.
OR
• An allele 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. | **Discusses**
• Source of mutation or immigration
AND
• An aspect of how these are selected for/against.
AND **changes in its frequency over time will relate to:

• Natural selection – as environmental factors change so making the allele more favourable (increase in frequency) or less favourable (decrease in frequency) for survival.
OR
• May mention that currently neutral mutations may become positive or negative as the conditions of the environment change over time.
OR
• That the frequency of the allele can change through chance especially if the population is / becomes small (genetic drift NOT bottleneck unless in small population and not founder effect) making the allele more favourable (increase in frequency) or less favourable (decrease in frequency). |

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
Total of FOUR opportunities answered at Achievement level or higher. $4 \times A$	Total of at least FIVE opportunities answered with TWO at Merit level or higher. $2 \times M + 3 \times A$	Total of at least SIX opportunities answered with ONE at Excellence level and TWO at Merit level or higher. $1 \times E + 2 \times M + 3 \times A$