Assessment Schedule – 2011

Biology: Describe processes and patterns of evolution (90717)

Assessment Criteria

Q	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)	**Describes the pattern as punctuated equilibrium or divergent evolution or adaptive radiation.** AND **Describes a process for the pattern** Eg: New / empty niches are available / mountain building / glaciations / ice ages / sea level changes.	**Punctuated equilibrium is identified as the pattern; and the processes leading to punctuated equilibrium are explained.** Eg: Short bursts of evolutionary change happened as new niches opened up / environment change / mountain building / ice ages / sea level changes followed by periods of stasis / no change in the environment.	
(b)	**An event leading to speciation is described.** Eg: Parrot populations became separated by mountains / hills / geographical barriers. AND **A process that has led to speciation is described.** Eg: Gene flow between populations stopped / do not mate / cannot mate / reproductively isolated / no interbreeding (in *Nestor*). OR Eg: The environment has little / no change (for *Strigops*). OR Eg: Gene flow continues as the population does not separate (for *Srigops*) OR Eg. Individual populations would not easily become isolated due to birds restricted movement / inability to fly. OR Eg. No competition leads to no speciation / changes (Remember competition is a selection pressure)	**Events and processes leading to speciation in *Nestor* are explained.** Eg Populations of *Nestor* spread into different areas due to competition for resources (food, nesting sites, mates). Geological isolation (mountain building / glaciation / sea levels rising) follows and opens up new niches / habitats . Due to new niches there will be different selection pressures. OR **Reasons why there has been little evidence of speciation in *Strigops* are given.** Eg: *Strigops* is in an environment with little or no changes. The selection pressures remain the same therefore no speciation occurs. Gene flow remains between groups OR Individual populations would not easily become isolated due to birds restricted movement / inability to fly. Separate species are not likely to have formed as gene flow continues.	**Discusses ecological divergence in *Nestor* AND the lack of divergence in *Strigops.*** Eg: Populations of *Nestor* spread into different areas due to competition for resources (food, nesting sites, mates) / Geological isolation (mountain building / glaciation / sea levels rising) follows and opens up new niches / habitats. Due to new niches there will be different selection pressures. New alleles / phenotypes / traits / adaptations selected for. Isolation of populations resulted in no gene flow, leading to eventual speciation. AND *Strigops* is in an environment with little or no changes. The selection pressures remain the same therefore no speciation occurs. Gene flow remains between groups OR Individual populations would not easily become isolated due to birds restricted movement / inability to fly. Separate species are not likely to have formed as gene flow continues.
	1 × a	1 × m	1 × e

TWO (a)	**Describes convergent evolution.** Eg: Species have evolved from different ancestors OR Species have evolved due to similar selection pressures.	**Explains convergent evolution.** Species arising from different evolutionary lines / without a common ancestor (must indicate no relation in the past) similar phenotypes / adaptations / traits / structures / analogous structures have evolved due to occupation of similar niches / having similar selection pressures / similar habitats / similar environmental conditions.	
(b)	Any TWO of: • Adaptive radiation is described. Eg: Many species from a common ancestor / one species evolve due to many different habitats / niches being available. • Polyploidy is described. Eg: Polyploidy results in the offspring plant having a duplicate number / extra set of chromosomes / change in the number of chromosomes sets. OR Polyploidy results when a malfunction / error occurs in meiosis OR Polyploidy gives rise to instant speciation. • Geographical isolation is described. Eg. Geographical isolation can happen when populations become separated due to environmental events such as mountain uplift / tectonic plate movement / sea level changes / ice ages.	**Polyploidy OR geographical isolation are explained as processes that result in adaptive radiation.** Eg: Polyploidy is due to non-disjunction / failure of chromosomes to separate during meiosis resulting in an extra set of chromosomes in the offspring. This leads to instant speciation / no gene flow / new species. OR Geographical isolation can happen when populations become geographically separated due to environmental events such as mountain uplift / tectonic plate movement / sea level changes / ice ages so gene flow / interbreeding cannot happen between populations.	**Discusses how both polyploidy and geographical isolation occur and have likely impacted on the evolution of *Hebe* in New Zealand.** **As for merit for BOTH processes.** AND **Discusses the impact of each process on the adaptive radiation of *Hebe*.** Eg: Polyploidy is due to non-disjunction / failure of chromosomes to separate during meiosis resulting in an extra set of chromosomes in the offspring. This leads to instant speciation / new species. The offspring cannot reproduce with is parent species / can only reproduce vegetatively / asexually and so gene flow does not occur. AND Geographical isolation can happen when populations become geographically separated due to environmental events such as mountain uplift / tectonic plate movement / sea level changes / ice ages so gene flow cannot happen between populations so becomes reproductively isolated. Physical barriers may change the environment / habitat / niche, which alters the selection pressures. New phenotypes / adaptations lead to new species.
	2 × a	2 × m	1 × e

THREE	Any TWO of: • Identifies viable selection pressures that could isolate South Island populations. Eg: Distance / competition for food / courtship behaviour / water temperature / predation etc. • Identifies the evidence that the South coast population is a founder from the West coast population. Eg: DNA of South and West coast populations are the most similar / small size of the South coast population OR South coast population contains fewer alleles that represent a small proportion of the West coast population • Identifies the significance of little or no gene flow Eg: Populations do not encounter each other and so mating does not occur so reproductively isolated / no interbreeding OR The 3 South island populations will become 3 species.	Explains how a selection pressure operates on the South Island populations. Eg: Competition for resources may have spread populations apart. Those with favourable adaptations / phenotypes to the changes survive and pass on their phenotypes / adaptations to their offspring and over time become isolated. OR Explains how the DNA evidence indicates the South coast population is a founder from the West coast population Eg: Genetic / DNA evidence / Small size if South coast population suggests populations are becoming geographically isolated. There are greater similarities between South Coast and West Coast populations, suggesting a more recent separation and that the South Coast population is a founder / break-away from the West Coast population OR Explains how reduced / no gene flow can impact on the three South Island populations. Eg: No gene flow results in the three populations becoming reproductively isolated and so low interaction which leads to further reproductive isolation.	Evolution processes occurring between the South Island populations are explained and discussed. Eg: Selection pressures such as competition for food, distance, water temperature and courtship has led to geographical isolation of the three South Island populations. Genetic / DNA / (see Guinea Pig 1 for example of small size of population) evidence suggests populations are becoming geographically isolated. There are greater similarities between South Coast and West Coast populations / differing frequency of alleles present / same mtDNA present, suggesting a more recent separation and that the South Coast population is a founder / breakaway from the West Coast population. AND The significance of the finding that there is little or no gene flow between the three South Island populations is discussed. Eg: No gene flow results in the three populations becoming reproductively isolated / having reproductive isolating mechanisms (RIM) which eventually leads to 3 species.

Judgement Statement

Achievement	Achievement with Merit	Achievement with Excellence
2 **A**	2 **M**	1 **E** + 1 **M**