Assessment Schedule – 2006

Scholarship Biology (93101)

Question	Evidence
ONE	**Examples of descriptive evidence that could be explained and included in a discussion are:** **Part 1 Biological mechanisms** • Annual rhythm. • Innate behaviour pattern stimulated by environmental cues (shortened day length is the cue for preparation – candidates should explain that this is more reliable than factors such as temperature which may fluctuate; change in wind patterns is the cue for departure). • Biological clock mechanisms – explained in terms of the responses • Navigation methods – relevant to this bird, eg sun compasses, star patterns, Earth's magnetic field, possibly landmarks for northward journey. Explanation of the need for multiple methods of navigation required. Earth's movement with respect to the sun and the ability of the bird to compensate for this is explained. **Part 2 Benefits and risks of migration** Migration would not occur unless the benefits outweighed the cost for the animals that migrate. (If it were not advantageous to make this long trip then the behaviour would not have evolved.) **Benefits:** Eg: • Need to leave Alaska due to harsh weather conditions (statement that birds are escaping NZ winter not acceptable). • Longer day length increases chance of survival of the juveniles. • Experience improves success rates / faster trips by older birds / laying down of more fat. • Usually a more successful reproductive rate among migrants is due to rapid feeding of young because of a rich and plentiful supply of food. This occurs in migrants that reproduce usually once at high latitudes where they will only have a short period of continuous light. Or they may get a chance to reproduce more than once if the migrants are at lower temperate latitudes and the favourable conditions last longer. • Lower chance of predation if the migrant is in an area for a shorter period of time. Also, the effect of predation will not affect a large group migrating at once – only young, old and weak individuals will usually be removed, increasing the fitness of the population. • Ability to use abiotic factors to assist migration such as favourable wind directions. • Ability to select the timing of departure to enable the migrant to arrive at its destination in favourable conditions or as these conditions are becoming favourable. The stopover in Korea would allow the godwit time for conditions to become favourable in Alaska as well as a chance for them to rebuild tissues for the long flight. • Reduces inter-specific competition with non-migratory animals. • Staging on the journey from NZ to Alaska enables the Godwit to have an improved body condition upon arrival at the breeding site in Alaska. This staging is not essential on the journey back to NZ as on arrival in NZ they are not breeding. **Risks:** Eg • Getting lost (blown off course or similar) and the effect of this when there is a limited fuel supply. • Insufficient food to build up tissues to complete the trip. • Increased chances of disease in weakened or exhausted birds. • Unfavourable environmental changes (fire, flood, drought) on the migratory route limit the chance of all migrants making the journey safely. • Unfavourable environments through events at destination that cannot be anticipated. • Being predated on-route. • Negative influence of human influence on the environment at staging sites.

Question	Evidence
	Part 3 Evolution of migration Eg • Benefits associated with migratory flights must be greater than those associated with staying in Alaska and having to tolerate seasonal changes. • Selective advantage linked to evolution of migration e.g. reduction in competition; improved environmental conditions; greater reproductive success must have resulted from selection for migration. • Evolution of migration is linked to the improved survival of the species, despite the energy requirements of the migratory journey. • Consideration of such factors as range expansion due to competition and / or changing environmental conditions, increased breeding success at fringes of range (but return to seasonal feeding grounds during non-breeding season), or accidental, eg blown off course. • Increasing selection for those birds that possessed physiological responses to environmental cues for migration, eg birds that depart before food availability, photoperiod or temperatures decrease. • Similar pressures at new destination forced migratory populations / birds back to origin. • May have occurred when landmasses were joined / closer together, flight distances shorter, staging sites more frequent. Continental drift then selected those best adapted for longer flights.

Question	Judgement
ONE	**Full answers required students to address all three parts of the question.** 8. **Discussion of TWO parts of the question AND explanation of the third part of the question.** 7. **Either Aspects of ONE part of the question discussed AND aspects of TWO parts of the question explained. OR** **Aspects of TWO parts of the question discussed and ONE part described.** 6. **Either Aspects of all THREE parts of the question explained. OR** **Aspects of ONE part discussed, ONE part explained and ONE part described** 5. **Either Aspects of TWO parts of the question explained AND the description of the third part of the question. OR** **Aspects of ONE part of the question discussed AND two parts described.** 4. **Either Aspects of ONE part of the question explained AND TWO parts described. OR** **Aspects of ONE part discussed, ONE part described; third part inadequate** 3. **Either Aspects of all THREE parts of the question described. OR** **Aspects of ONE part of the question explained, and ONE part described; third part inadequate OR** **Aspects of ONE part of the question discussed; remainder inadequate.** 2. **Either Aspects of TWO parts of the question described. OR** **Aspects of ONE part explained; remainder inadequate** 1. **Some correct biological ideas relevant to the question.** 0. **Answer not attempted OR** **No correct evidence supplied in the answer.**

Question	Judgement
	Note: **An explanation** requires the student to give a reason for the contribution of the factors that they have described for each part of the question. Eg the Godwit increase in feeding behaviour in order to reach 45% of body mass in fat. This is done in order to ensure that there is adequate fuel supply for the journey, during which they will not be able to feed. Eg the bird is able to use the sun as a compass during the daylight hours, navigating according to the position of the sun in the sky at different times of the day. Because the Sun remains in the same position and the earth is rotating, a biological clock is required to compensate for the movement of the earth in relation to the sun during the day. **A discussion** requires the student to link coherently at least two of the contributing factors that they have explained for each part of the question. Eg the Godwit increase in feeding behaviour in order to reach 45% of body mass in fat. This is done in order to ensure that there is adequate fuel supply for the journey, during which they will not be able to feed. In order for this to happen at the correct time, an increase in feeding needs to be stimulated at an appropriate time prior to the migration. This required the accurate recognition of the environmental cues (in this case decreasing day length) prior to the point of migration. This is achieved via the action of the pineal gland which, upon recognition of the cue, stimulates hormones to increase feeding activity.

Question	EVIDENCE
TWO	**Origin of allele** • Identifies **point mutation** at 2nd base of triplet in **DNA** with base **substitution** of G with T to produce new allele. • Identifies that the mutation occurred during production of **gametes** to enter the **gene pool.** • Not **lethal – functional protein still produced.** **Inheritance pattern** • Identifies **co-dominance** as the likely method of inheritance as **both alleles expressed in A1A2 milk**. **Explanations of frequency** • It would be expected that A1 would be **selected against** if it had an adverse effect on the calf's ability to gain nourishment from the milk / their food as the health / growth of the calf would suffer. [Or any other detrimental effect on the calf's health]. Conversely, the A1 allele would be **selected for** if it had beneficial effects for the calves / cattle. However, if this mutation does not give any effects on health / growth, then it will be **neutral** [neither selected for or against] so remain in the gene pool and neither increase / decrease except for **chance**, eg **genetic drift** in small herds / populations / breeds. • **Founder effect** – mutation brought to NZ by chance as a result of breeding programme or importation of a small number of dairy cows. • **Linkage** – A1 allele is linked to other alleles being selected for. • **Chance** – A1 allele is randomly inherited along with other alleles which are being selected for by farmers. • **Non-random mating** – dairy herd inseminated by small number of bulls, some of which are carriers of A1 allele / A1 allele may confer some type of breeding advantage that has resulted in its relatively high frequency. • **Dairy herds are managed**- the A1 allele is not subject to natural selection.

Question	JUDGEMENT
TWO	8. Comprehensive evidence for all THREE aspects. Discussion on origin of A1 allele must include the idea that the mutation occurred in the DNA, and affects the gametes. At least TWO ideas for the current frequency of A1 allele are explained in depth. 7. Comprehensive evidence for all THREE aspects. Discussion on origin of A1 allele must include the idea that the mutation occurred in DNA and/or affects the gametes. At least TWO ideas for current frequency of A1 allele, ONE of which must be explained in depth. 6. Evidence for all THREE aspects with TWO explained in depth. Current frequency of A1 allele must have at least ONE explanation in depth. 5. Evidence for all THREE aspects with no serious errors or omissions and at least ONE explained in-depth. 4. Evidence for all THREE aspects which may contain weaknesses/errors with at least ONE explained in-depth. 3. Some evidence for all THREE aspects which may contain weaknesses/errors OR Good evidence for TWO aspects. 2. Some evidence for TWO aspects which may contain serious weaknesses/ errors. OR Good evidence for ONE aspect. 1. Some correct biological ideas relevant to the question. 0. Answer not attempted OR No correct evidence supplied in the answer.

Question Three: Evidence

1. Genetic Drift

Correct description of how process (factor) occurs	Explain relevance of genetic drift to this example of named hominin	Contribution to biological evolution
Random / chance changes in allele frequencies in populations.	Eg: *H. sapiens* migrated out of Africa in small groups and alleles/individuals were lost by chance. *H. floresiensi*s had a small population that was isolated on an island.	This may account for the lack of genetic diversity seen in *H. sapiens* today. **OR** Making the loss/fixation of alleles more significant and changing course of evolution. Therefore alleles coding for the development of smaller proportions became more frequent or fixed in the population through loss of taller individuals **by chance** from the breeding population.

2. Natural Selection

Correct description of how process (factor) occurs	Explain relevance of natural selection to this example of named hominin	Discuss the contribution to biological evolution
Differential survival / reproductive success of phenotypes in a population due to an environmental condition (selection pressure).	Eg: In **H. neanderthalensis**: Cooler climate in Europe acted as a selection pressure and favoured the more squat body shape because it reduces heat. *Paranthropus*: Diet was limited to tough vegetation which acted as a selection pressure favouring a larger jaw/molars because they were more able to break down plant material. **Bipedalism: name** any species up to *A. afarensis* and describe changing environment as forest to savannah which would have acted as a selection pressure and favoured bipedal individuals because they could see further/reduced heat loss/freed up the hands etc.	Therefore allele frequencies of/number of individuals with squat body shape increased in the population over time. Therefore allele frequencies of /number of individuals with larger jaw/molars increased in the population over time. Therefore the allele frequencies/number of bipedal individuals increased in the population over time.

3. Cultural Evolution

Correct description of how process (factor) occurs	Explain relevance of cultural evolution to this example of named hominin	Discuss the contribution to biological evolution
Cultural evolution is transmission of beliefs and behaviours by learning.	Eg: Development of tools by *H. habilis* led to more meat / protein in the diet. Use of fire by *H. erectus* led to food being softer. Culture/technologies in *H. sapiens* has developed to prevent removal of less adapted phenotypes.	This more nutritious diet allowed a greater development of the brain. This led to selection in favour of smaller teeth/jaw. This means the rate of biological evolution has decreased in the recent past.

JUDGEMENT STATEMENT

The question is divided into 3 factors: Genetic drift, natural selection and cultural evolution.
Each factor has three aspects:
- A description of how the process occurs
- The use of a relevant example in a named hominin,
- A discussion of how the process occurring contributes to biological evolution.

For a **FULL** answer all **THREE** aspects must be covered completely and coherently.
For an **ADEQUATE** answer **TWO** of three aspects must be covered.
For a **LIMITED** answer correct information is presented on **ONE** of the aspects.

Question	Judgement
THREE	8. **All THREE factors covered fully OR TWO factors are covered fully and ONE covered adequately.** 7. **Either TWO factors are covered fully and ONE factor is limited OR ONE factor is covered fully and TWO factors are covered adequately.** 6. **Either ONE factor is fully covered with ONE factor adequate and ONE factor limited OR THREE factors are covered adequately OR TWO factors are covered fully.** 5. **Either ONE factor is covered fully and ONE factor is limited OR TWO factors are covered adequately and ONE factor is limited OR ONE factor is fully covered and ONE is adequate OR TWO factors are adequate.** 4. **Either ONE factor is covered adequately and TWO factors are limited OR ONE factor is fully covered and ONE factor is limited.** 3 **Either three factors have limited coverage OR ONE factor is covered adequately and ONE has limited coverage OR ONE factor is fully covered.** 2. **Either TWO factors have limited coverage OR ONE factor is adequately covered** 1. **ONE factor has limited coverage.** 0. **Answer not attempted OR No correct evidence given.**

Code:

F = Full discussion = Both process and relevant examples are explained correctly and coherently and linked to biological evolution.

A = Adequate coverage = Both process and relevant examples are explained

L = Limited = some relevant information written

N = not correct

G = genetic drift S = natural selection C = cultural evolution

n/a is irrelevant information