LIFE SCIENCES: PAPER II

MARKING GUIDELINES

Time: 2 hours   100 marks

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

QUESTION 1

1.1   1.1.1 genome   (1)
       1.1.2 adaptive radiation   (1)
       1.1.3 *ALX1*   (1)
       1.1.4 evolution   (1)

1.2   **Table of differences between seed eaters and cactus flower eaters**

	Seed eaters	**Cactus flower eaters**
Beak shape	Broader; more sturdy; curved	Longer; narrower; more pointed
Named example	*G. fortris; G. fulginosa; G. magnirostris*	*G. conirostris; G. scandens*

1 mark = beak shape comparison of same feature
2 marks = correctly named examples
1 mark = heading
1 mark = column headings   (5)

1.3   1.3.1 The average beak depth was greater after the drought increased
              from 8,8 mm to 9,3 mm.   (2)

       1.3.2 9,8 mm – 8,8 mm = 1 mm   (2)

1.4   1.4.1 In drought plants withered and died and few seeds were available/
              small soft seeds eaten quickly leaving only hard tough seeds not
              normally eaten; bigger beaks able to crack hard tough seeds smaller
              beaked birds died out/ larger beaked birds able to feed and survive.   (3)

       1.4.2 Smaller beaked and larger beaked individuals would no longer
              interbreed.   (1)

1.5   1.5.1 Darwin stated that natural selection results in one species being
              modified for different environmental conditions/purposes/ends/
              ecological niches; The ancestral finch was a ground-dwelling, seed-
              eating finch that arrived on the Galápagos Islands; different
              ecological niches were provided by the many different islands/
              islands exerted selection pressure on the ancestral finch to fill the
              many feeding niches/ on the various islands, finch species have
              become adapted for different diets e.g. seeds, insects, flowers, the
              blood of seabirds, and leaves. those most suited to feeding on the
              different foods would persist/survive and pass on their beak
              characteristics to their offspring; this resulted in a total of 14 species
              that would evolve as a result of different food types; (examples: three
              species of ground-dwelling seed-eaters; three others living on
              cactuses and eating seeds; one living in trees and eating seeds; and
              7 species of tree-dwelling insect-eaters).   (6)

       1.5.2 Allopatric speciation – different finches became geographically
              isolated on different islands physically separated so no interbreeding
              could occur.   (3)

1.5.3 Intensive use of the finches' beaks for different foods would lead to the beaks changing and these beak properties would be passed on to their offspring. (2)
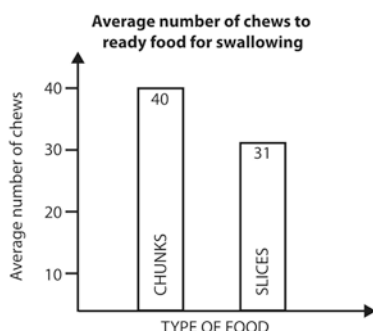
1.6 In Darwin's time there was no knowledge of genetics, now his theories have been backed up by evidence of genes responsible for beak development. (2)

[30]

QUESTION 2

2.1 2.1.1 C
    2.1.2 D
    2.1.3 A
    2.1.4 B   (4)

2.2 2.2.1 Heading
            Axes
            Bars   (5)

2.2.2 With less chewing needed, faces and jaws could get smaller; an energy-rich diet allowed hominid brains and bodies to enlarge; the shrinkage of bones and muscles involved in chewing also would have affected other parts of the body; expanded vocal tract would have boosted the ability of these early ancestors to make speech sounds; a realignment of the base of the skull would have led to a repositioning of the spinal cord; led to an increased ability to walk and run long distances (bipedalism). (5)

2.3 Smaller brow ridges/less pronounced sagittal crest = jaw muscles smaller as less effort required to chew food. (3)

2.4 2.4.1 2 to 3 mya. (1)

    2.4.2 *Australopithecus afarensis* (1)

    2.4.3 Tools enabled the hominids to slice up meat; easier to chew and digest; more protein available for brain growth for brain development. (2)

    2.4.4 Modern: sharper cutting edges/more specialised shapes.
            Older: less refined/less specialised shapes/more blunt and rounded. (1)

    2.4.5 *Homo erectus or Homo sapiens* (1)

2.5   2.5.1   Chimpanzee and early hominid had elongated/U-shaped lower jaw and highly differentiated teeth.
Modern humans had shortened/C-shaped lower jaw and teeth were very similar in size.   (2)
Description pointing out difference in ONE of the jaws.

   2.5.2   Sharp pointed canines for tearing meat evident before slicing tools developed; big molars for grinding tough plant matter and chunks of raw meat.   (2)

2.6   2.6.1   *Homo erectus*   (1)

   2.6.2   Out of Africa hypothesis – anatomically modern humans migrated out of Africa about 100 000 years ago to replace all archaic human populations in a second migration after *Homo erectus* had migrated to Europe.
Multiregional model – *Homo erectus* left Africa 2 mya to become *Homo sapiens* in different parts of the world/after *Homo erectus* left Africa and dispersed into other portions of the Old World, regional populations slowly evolved into modern humans.   (2)
[30]

60 marks

QUESTION 3

The benefits of selective breeding for producing more desirable plants and animals outweigh the disadvantages of these breeding methods.

Disadvantages of selective breeding (AGAINST ARGUMENT)	*Benefits of selective breeding* (FOR ARGUMENT)
Source A:	**Source A:** - Farmers can select animals or plants born with a desired trait, and breed more organisms with that trait e.g. many varieties of cabbage-like plants - Increases variety of food types
Source B: - Farmed in unethical ways (from Red Jungle Fowl hen laying 10 to 12 eggs during the breeding season to hens from chicken breeds developed specifically for egg production lay year-round and can produce more than 300 eggs in a year)	**Source B:** - Genetic selection has developed chicken breeds specialising in specific characteristics for human use - e.g. – efficient egg layers; - Quick growing birds for meat - Original Jungle fowl small and poor egg layer so poor food source
Source C:	**Source C:** - Selective breeding results in bigger fruit - More edible flesh, juicier, sweeter, softer skin - More nutrients
Source D: - Lenape potato = new breed of potato contained heightened levels of solanine, an alkaloid chemical that helps protect the potato against pests - Solanine is also slightly toxic and harmful to humans - Can lead to gastrointestinal and neurological disorders, and even death - Unknown genetic consequences – there is a lot more risk and uncertainty with conventional breeding as there are a lot more genes at play with conventional breeding, and a lot more ways that surprising genetic interactions could come back to haunt you	**Source D:**
Source E:	**Source E:** - Can bring back extinct species e.g. quagga which was hunted to extinction by man - Re-establish biodiversity
Source F: - Increasing homozygosity - Inbreeding can result in greater susceptibility to disease - Decreased fertility	**Source F:** - Increased homozygosity can enhance desired features
Source G: - Controlled mating to increase the frequency of desirable traits and to reduce genetic variation e.g. bulldogs and jaw, breathing problems from deformed skulls	**Source G:**

Source H:	**Source H:**
- Because of their abnormally large size, Belgian blue cattle often endure many serious health problems - Pregnancies are very difficult, and the animals almost always require C-sections to deliver their babies - Once the calves are born, they may have a number of birth defects, including enlarged tongues, which can make it difficult – or even impossible – for them to feed - They may also suffer from cardio-respiratory, bone, and joint problems, among other ailments - All this can mean a very uncomfortable existence for these animals and oftentimes leads to a premature death	- The meat industry selectively breeds animals who exhibit the double muscling mutation to produce bigger animals and, therefore, more meat
Own Knowledge: - Loss of original gene pool/wild type varieties; difficult to re-establish crops if wiped out by disease etc. (include any examples of other unethical breeding practices or failed breeding programs)	**Own Knowledge:** - Produce large quantities of food for large world population - Can provide food security - Enhanced nutrition - Modern maize (include any examples of selective breeding of crops or livestock)

Marking guidelines to be expanded at standardisation meeting.

40 marks

Total: 100 marks

Note: Essay should be 2½ to 3 pages in length.
Time allocation suggestion: Reading of sources 10 min.; Planning 10 min.; Writing essay 40 min.

	1 mark	2 marks	3 marks	4 marks	Possible mark (40)
Planning ×2	• Decision given • Key points present for and against the argument	• Decision given • Key points developed for and against the argument	• Decision given • Key points developed for and against the argument • Source references identified (e.g. Source A/own information)		6
Decision	• Vague • Changed position within essay	• Clear decision made			2
Use of knowledge from sources ×2	• Up to ¼ of potential detail in sources used to support argument	• Up to ½ of potential detail in sources used to support argument	• Up to ¾ of potential detail in sources used to support argument	• Source detail – very close to full potential used to support argument	8
Use of own knowledge	• Some facts given beyond the source to support argument	• Many facts given beyond the source to support argument	• Some facts given beyond the source to support argument • Facts integrated into the argument	• Many facts given beyond the source to support argument • Facts integrated into the argument	4
Content Relevance	• Repetition mostly avoided • Some minor digression • Supporting argument relevant	• Repetition mostly avoided • Some minor digression • Supporting argument relevant • Quality of source extracts acknowledged			2

Quality of argument supporting decision × 2	• Writing consists of facts with little linkage or reasoning • Reasoning incorrect	• **Maximum if no clear decision in support** • Reasoning correct, but hard to follow • Ordinary: some linkage evident	• Supports the position • Reasoning is clear • Minor errors in flow • Linkage sometimes missed	• Strongly supports a clear position • Reasoning is very clear and succinct • Flow is logical • Compelling with regular linkage • Well-integrated argument	8
	1 mark	**2 marks**	**3 marks**	**4 marks**	**Possible mark (40)**
Fairness – counter opinions to decision	• One to two counter opinions given from the sources	• Three to four counter opinions given from the sources	• Integration of one to two counter opinions from the sources into argument	• Integration of three to four counter opinions from the sources into argument	4
Presentation	• Writing is almost unintelligible • Tone, language, terminology unscientific and very weak • Introduction **and/or** conclusion **not** present	• Tone, language, terminology weak • Introduction **and** conclusion present	• Tone is consistent and suited to scientific language • Good and appropriate language and terminology • Mostly appropriate paragraphing • Introduction and conclusion have merit	• Tone is mature and suited to scientific language • Excellent and appropriate language and terminology • Correct paragraphing with good transitions • Interesting introduction, satisfying conclusion	4
Scientific merit	Essay shows academic rigour, accurate reasoning, insight and cohesiveness.				2