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ST ANDREW'S COLLEGE

Life Sciences Grade 12 Standardised Test

Evolution Theory 3 July 2019

50 Marks

50 minutes

Examiner: P. Gentz

Moderator:



THE DIOCESAN SCHOOL
FOR GIRLS

Name: _____

Teacher's Initials: _____

Instructions:

- Write your name and teacher's initials in the spaces above.
- This test consists of 10 pages – make sure your test is complete.
- Answer all questions on the sheet.
- Use the mark allocation to guide you.

Question 1

1.1 For each of the questions 1.1.1 to 1.1.5 choose the correct answer (A, B, C or D). Only write the letter in the box below.

Question	1.1.1 (1 mark)	1.1.2 (2 marks)	1.1.3 (1 mark)	1.1.4 (1 mark)	1.1.5 (2 marks)
Answer					

[7]

1.1.1 Which of the following age sequences (most recent to oldest) is correct?

- A. *A. sediba* → *H. habilis* → *A. afarensis* → *H. erectus*
- B. *H. sapiens* → *H. erectus* → *A. sediba* → *A. afarensis*
- C. *A. africanus* → *A. sediba* → *A. afarensis* → *H. erectus*
- D. *H. sapiens* → *H. habilis* → *A. africanus* → *H. erectus*

(1)

1.1.2 While excavating in 8-million-year-old geological beds in southern Kenya, Professor Eric Snyman unearthed a primate fossil unlike any seen before. After detailed examination, he classified it as a new species of *Australopithecus* and announced this discovery to the world. His archrival, Dr Pierre Cloete, disagreed, stating that this was an ape skull. He demanded evidence in support of Professor Snyman's claim. Which of the following pieces of evidence would be most likely to persuade Dr Cloete that Professor Snyman's claim is valid?

- A. Foramen magnum centred directly underneath the braincase.
- B. Body size larger than apes found in that era.
- C. The presence of long arms in relation to the body.
- D. The presence of opposable thumbs.

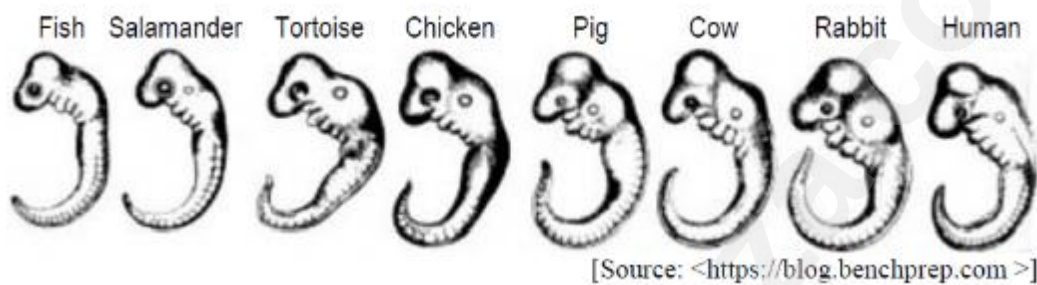
(2)

1.1.3 A poorly developed structure that has no real use but is inherited from an ancestor is ...

- A. analogous.
- B. vestigial.
- C. convergent.
- D. homologous.

(1)

1.1.4 The diagram below shows different vertebrate embryos at the same stage of development.



[Source: <<https://blog.benchprep.com>>]

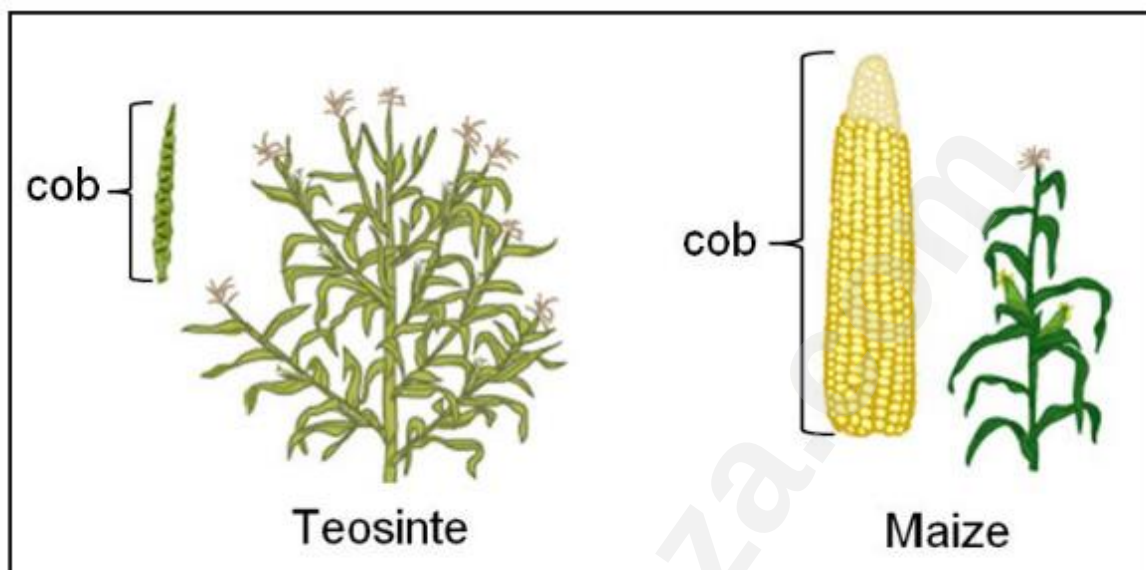
(IEB Paper 1, 2015)

How do the embryos provide evidence for evolution?

- A. The embryos have structures that look similar.
- B. The embryos have different shaped eyes.
- C. Different adults evolve from the embryos.
- D. Divergent evolution results in common characteristics in the embryos.

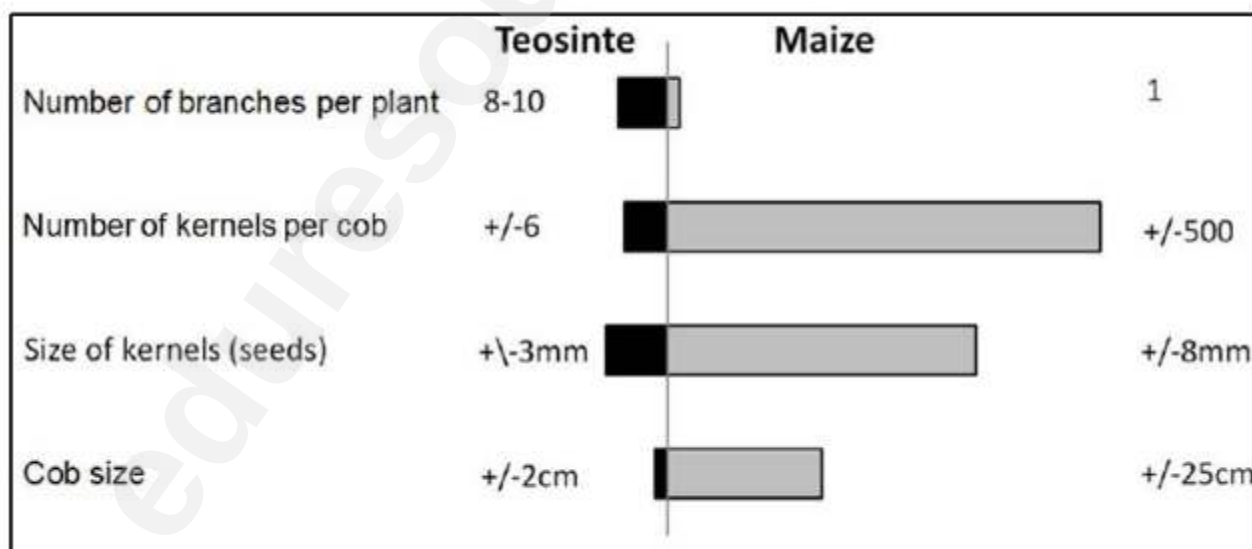
(1)

1.1.5 A wild grass, teosinte, which grew in North America about 10 000 years ago, has been changed by artificial selection to produce the maize species which is the largest grain-producing crop globally.



[Adapted from: <<http://learn.genetics.utah.edu/content/variation/corn/>>]

Over the years, selection for or against particular traits has been carried out. A comparison of some of the traits of teosinte and maize is given below. (Note: graph not drawn to scale).



[Adapted from: Peabody Museum of Archaeology]

Adapted: IEB Life Sciences Paper 1, 2015

From the information above, we can assume that humans have selected against...

- A. large cob size
- B. increased number of branches per plant
- C. large size of kernels
- D. increased number of kernels per cob

- 1.2 Select the term in Column B that best matches the description in Column A. Write the letter of the term in the corresponding space provided between the brackets. Each letter may be used only once.

Column A**Column B**

- | | | | |
|-------|--|---|-----------------------|
| [] | Type of reproductive behaviour displayed by small, isolated populations. | A | Existence |
| [] | This results from an inability to adapt to environmental change. | B | Alfred Wallace |
| [] | Term for when a population becomes very small e.g. northern elephant seal. | C | Species |
| [] | Organisms that share a gene pool. | D | Population bottleneck |
| [] | Person who theorised that acquired characteristics can be inherited. | E | Extinction |
| | | F | Outbreeding |
| | | G | Inbreeding |
| | | H | Lamarck |
| | | I | Natural selection |

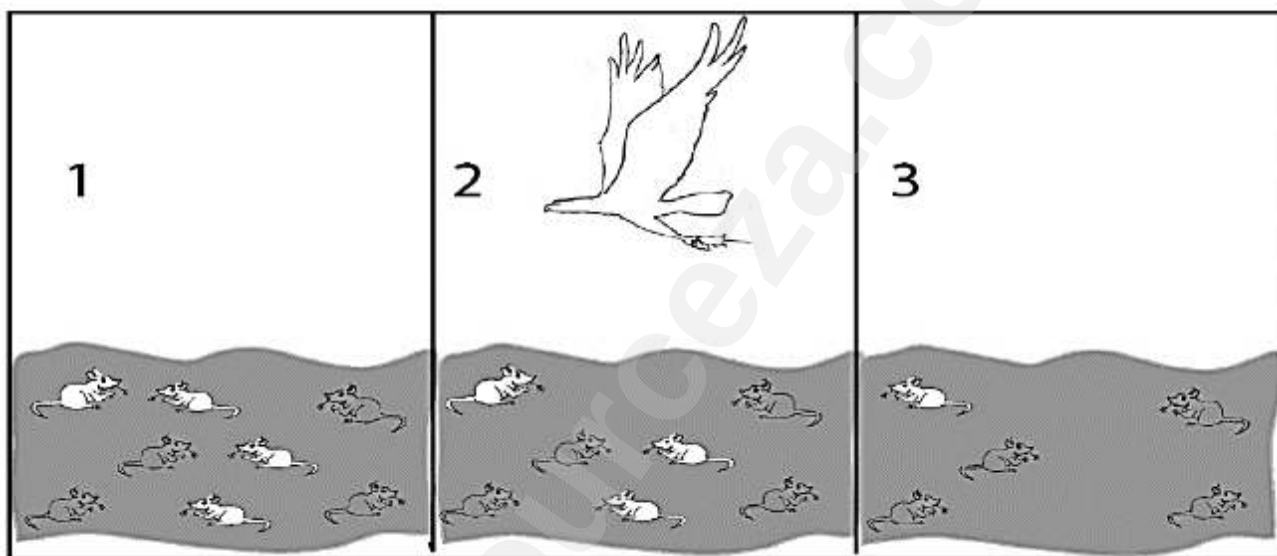
[5]

2.1.3 Why do you think the birds in this area did not undergo speciation?

(2)

[9]

2.2 Study the diagrams below (sequenced in time order) and answer the questions that follow:



Adapted: IEB Life Sciences Paper 1 Supplementary 2016

2.2.1 What was the selection pressure that directed the evolution of the mice?

(1)

2.2.2 Explain the term, 'survival of the fittest' in relation to the example given above.

(4)

[5]

- 2.3 There are many factors which contribute to the process of evolution of organisms over time.

Over the last 30 years scientists have studied many organisms on the Galapagos Islands. One of these, the Medium Ground Finch, *Geospiza fortis* (*G. fortis*), is a bird on one of the smaller islands, Daphne Major. This species of ground finch is a seedeater. During a study over an 18 month period, from June 1976 to the end of 1977, a severe drought occurred on this island. The drought resulted in a shortage of seeds, especially small seeds. To survive, the finches had to turn to large, hard seeds for food. Only birds with large beaks were able to crack and eat the large seeds. These large-beaked birds were able to survive the drought, while the small-beaked birds died. When the drought eased in 1978, the Medium Ground Finch population recovered and the average beak size was found to be greater than in 1976.

[Adapted from: *Oxford University Press*; 2006]

Adapted: IEB Life Sciences Paper 1 Supplementary 2014

- 2.3.1 State a suitable aim for the investigation which occurred from June 1976 to the end of 1977.

(2)

- 2.3.2 What is the independent variable in this investigation?

(1)

- 2.3.3 Could this Medium Ground Finch population that had a greater average beak size after the drought be termed a new species of finch? Give a scientific reason for your answer.

(2)

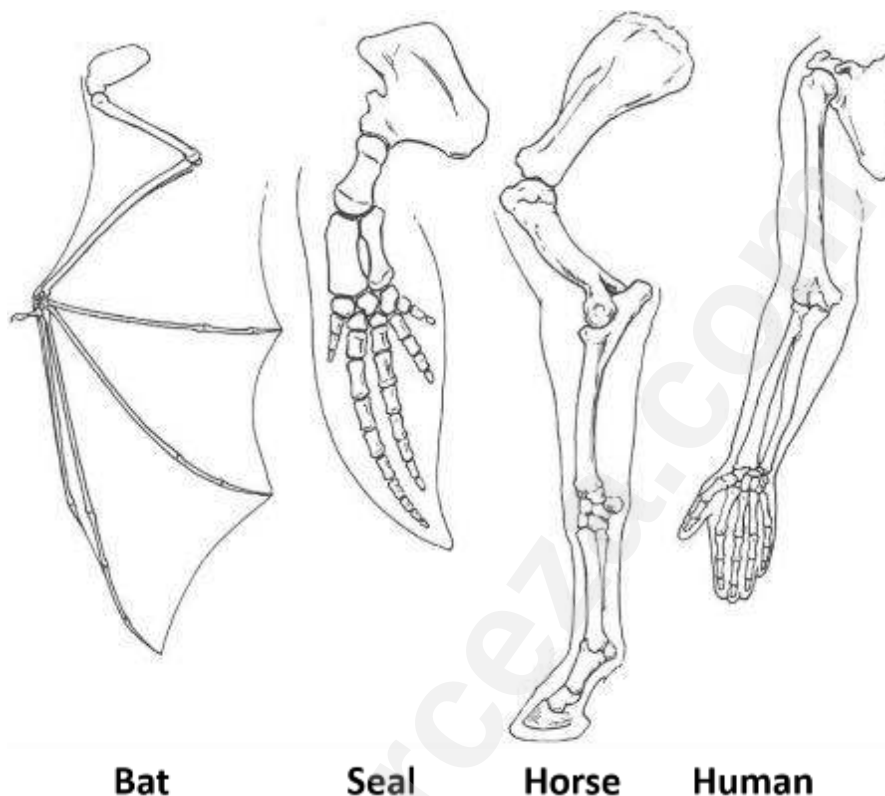
- 2.3.4 Do you think that the scientists could publish their findings on the effects of the drought on the Medium Ground Finch on Daphne Major in a scientific journal? Explain your answer.

(2)

[7]

Question 3

- 3.1 Use the diagrams of the bat, seal, horse and human forelimbs below to answer the questions that follow.



Adapted: <<https://crev.info/2019/05/stasis-is-not-evolution>>

- 3.1.1 Are the forelimbs above an example of homologous or analogous structures?

_____ (1)

- 3.1.2 Explain why these forelimbs illustrate divergent evolution.

_____ (3)

- 3.1.3 How does convergent evolution differ from divergent evolution? Give one example to illustrate your point.

_____ (3)

- 3.2 *Australopithecus sediba* was discovered in August 2008 by Professor Lee Berger and his son. The announcement of its discovery was only made public in April 2010.

***H. sapiens******A. sediba*****Chimpanzee**

Adapted: <https://www.mirror.co.uk/news/technology-science/science>

Adapted: IEB Life Sciences Paper 1 2018

- 3.2.1 Where in South Africa was the *A. sediba* fossil discovered?

(1)

- 3.2.2 Suggest any TWO possible reasons for the gap in time between the date of discovery and the date on which its discovery was made public.

(2)

3.2.3 Explain one significance of the discovery of *Australopithecus sediba* to our understanding of human evolution.

(2)

3.2.4 State one social or economic benefit to South Africa of the discovery of this fossil.

(1)

3.2.5 Using the image, describe:

a) two similarities between *A. sediba* and chimpanzees.

(2)

b) any anatomical difference between *A. sediba* and *H. sapiens*.

(2)

[10]