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ST ANDREW'S COLLEGE

St Andrew's College & Diocesan School for Girls

Life Sciences Grade 12 Standardised Test

Evolution Theory 29 July 2020

50 Marks

50 minutes

Examiner: IM Foster

Moderators: LS Department



Name: _____

Teacher's Initials: _____

Instructions:

- *Either print and answer on this question paper OR answer all the questions on lined paper.*
- *WRITE YOUR FULL NAME AND TEACHER'S INITIALS AT THE TOP OF YOUR TEST.*
- *This test consists of 7 pages – make sure your test is complete.*
- *Use the mark allocations to guide you.*
- *Read the Honour Pledge below and write your response on your test as instructed.*

HONOUR PLEDGE

I affirm that this work is entirely my own and that I have not used any dishonest means to answer this test, nor have I received or given any unauthorised help on this test. I acknowledge the fact that I am not allowed to use my booklet, a device or any other means to obtain information.

IF ANSWERING ON LINED PAPER, AT THE TOP OF YOUR TEST WRITE:

"I have read and agree with the Honour Pledge. Signed: _____" (type / sign your name and surname)

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 or if you are answering on lined paper. Write the LETTER only for each question number. e.g. 1.1.1 A

Question	1.1.1	1.1.2	1.1.3	1.1.4	1.1.5
Answer	C✓	A✓	A✓	B✓	D✓

[5]

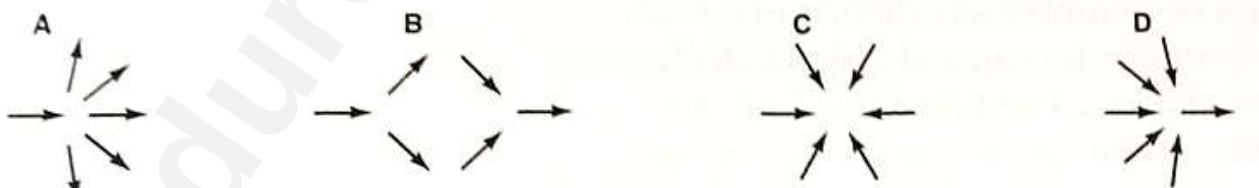
1.1.1 Darwin's primary contribution to biological theory was the idea that:

- A new alleles arise through mutation
- B evolution is the change in gene frequencies over time
- C an important mechanism of biological evolution is natural selection
- D characteristics acquired during an individual's lifetime can be passed to its offspring (1)

1.1.2 Which of the following is an example of genetic variation?

- A Two children have different eye colours
- B One person has a scar, but her friend does not
- C Todd eats meat, but his brother Rod is a vegetarian
- D None of the above (1)

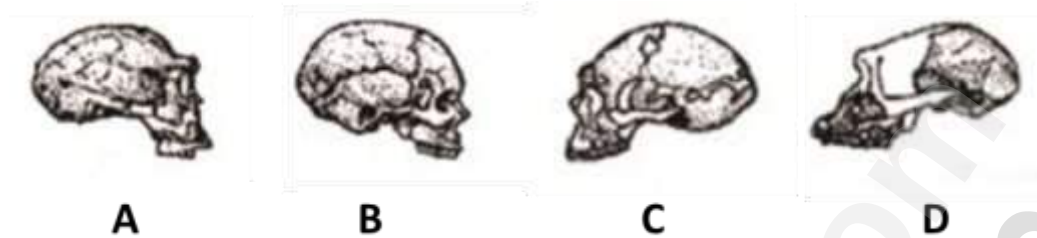
1.1.3 Which of the following diagrams (A – D) best represents the adaptive radiation of Darwin's finches? (1)



1.1.4 Which of the following statements is TRUE? Adaptive radiation enables each of the different species that evolves to:

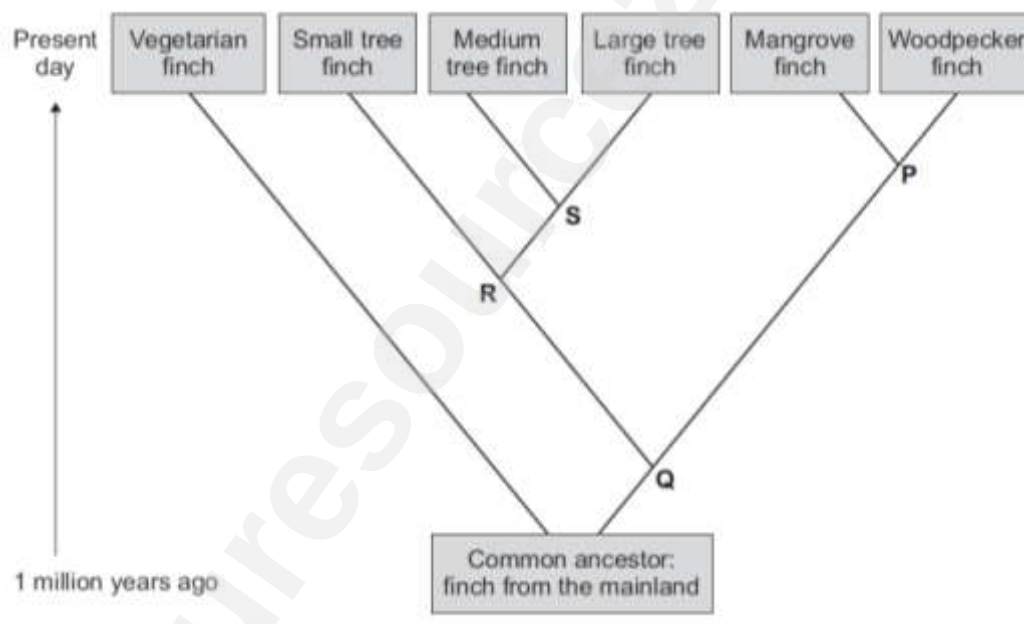
- A exploit fully a particular set of environmental resources
- B compete effectively with all the others for the same resources
- C be a versatile feeder and make use of any available resource
- D make optimum use of the same ecological niche as the others (1)

- 1.1.5 Which of the following hominid skulls is most likely to date back the furthest in the fossil record? (1)



Question 2

- 2.1 Study the cladogram below that shows the evolutionary relationships between some Galapagos finches.



- 2.1.1 Name TWO types of evidence that would be used to generate the cladogram above. (2)

Fossils, comparative anatomy, DNA evidence, biogeography any two ✓✓

- 2.1.2 Which type of present-day finch is least closely related to all the others? (1)

Vegetarian finch ✓

- 2.1.3 Which branching point P, Q, R or S shows the most recent common ancestor of all the tree finches? (1)

Point R ✓

- 2.1.4 Which two finches have the most recent common ancestor? (2)

Mangrove ✓ and woodpecker finches ✓

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Question 3

3.1 Read the following text and use it to answer the questions that follow:

Scientists have studied many organisms on the Galápagos Islands over the past 5 decades. One of these, the Medium Ground Finch, *Geospiza fortis* (*G. fortis*), is a bird on one of the smaller islands. This species of ground finch is a seed-eater. During an investigation of the Medium Ground Finches over an 18 month period by scientists from a local university, 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, these finches had to turn to large, hard seeds for food. Only the finches with larger beakers were able to crack and eat the large seeds. These larger-beaked Medium Ground Finches were able to survive the drought, while the smaller-beaked finches died. When the drought eased in 1978, the scientists measured the beak sizes of over 1000 Medium Ground Finches and found the average beak size was greater than in 1976.

[Adapted from IEB Paper 1 Supp 2014]

3.1.1 What was the aim of the investigation carried out by the scientists from June 1976 to the end of 1977? (2)

To investigate the effect of seed size ✓ on the (average) size of the beaks ✓ in the Medium Ground Finch population.

3.1.2 Give a suitable hypothesis for their investigation. (3)

The size of the seeds ✓ eaten by the finches will affect the size of their beaks ✓ over time. (Prediction ✓ stated including both variables)

3.1.3 What was the independent variable in their investigation? (1)

Size of the seeds ✓

3.1.4 Do you think that the scientists could publish their findings on the effects of the drought on *G. fortis* beak sizes in a scientific journal? Explain your answer.

Yes, they investigated over 1000 Ground Finches and worked out averages which are more accurate/good scientific practice ✓✓

Yes, they were scientists from a university and would be qualified to carry out scientific research/would use scientific methods/follow scientific practice ✓✓ (2)

[8]

Question 4

- 4.1 The extinct Woolly mammoth, *Mammuthus primigenius*, was very closely related and similar to present-day elephants. It was herbivorous and highly adapted to very cold climates, with a dense undercoat and small, fur-lined ears. It has been suggested that elephant-like ancestors of the woolly mammoth left Africa 3.5 million years ago and lived in Central Europe.

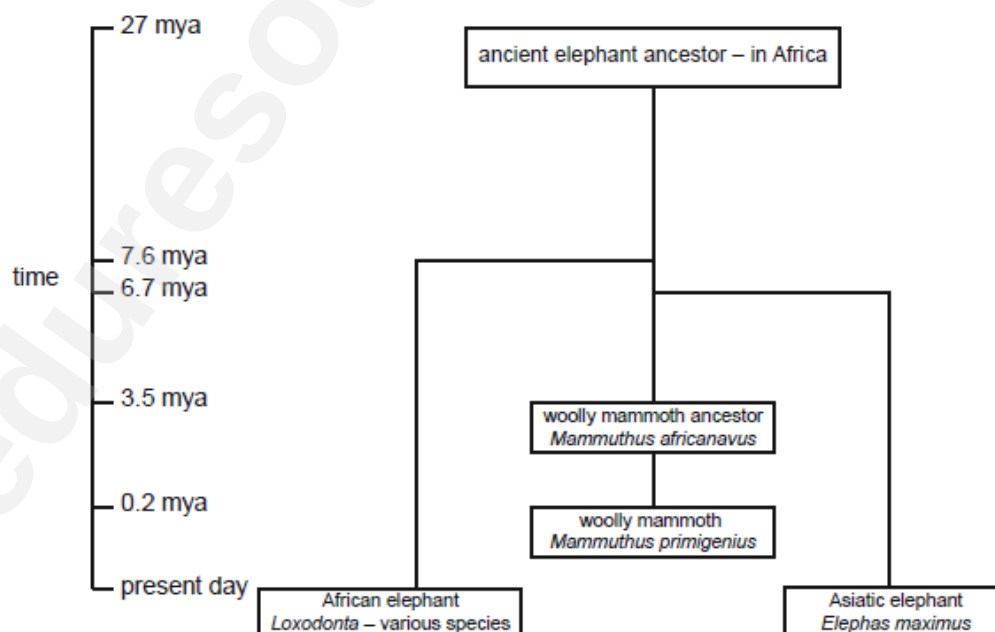


<https://metro.co.uk>

Use the information in the table and chart below to answer the questions that follow.

Number of years ago	Event	Abundance of mammoths
200 000	woolly mammoths first appeared in north-east Siberia and later spread to Europe, Asia and North America	very high
120 000–100 000	climate warmed	moderate
100 000	climate cooled again	
15 000	first evidence of human hunting: spear found in mammoth vertebrae	low
14 000–10 000	mammoths extinct in North America, Europe and most of northern Asia	very low, found only in Siberia
3900	last woolly mammoth died on an island off the coast of Siberia	non-existent

not to scale



- 4.1.1 Define the term “species”. (2)

Organisms that can interbreed ✓ and produce fertile offspring ✓

- 4.1.2 Suggest why the African elephant, Asiatic elephant and woolly mammoth are similar in general appearance despite being different species. (2)

They have evolved from a common ancestor✓ only a few features have changed in order for the different species to survive in their environments ✓

- 4.1.3 Allopatric speciation is most likely to have led to the different elephant species found in Africa and Asia. Describe how this type of speciation occurs. (4)

These elephants were geographically separated ✓(must have this point) from each other; variation through sexual reproduction ✓ and mutations ✓ resulted in genetic differences in the two groups/gene pools✓ alleles better suited to the environment in each group were retained through natural selection✓ reproductive isolation ✓(must have this point), eventually leading to two new species that could no longer interbreed ✓ (must have this point)

- 4.1.4 Is this an example of convergent or divergent evolution? Explain. (2)

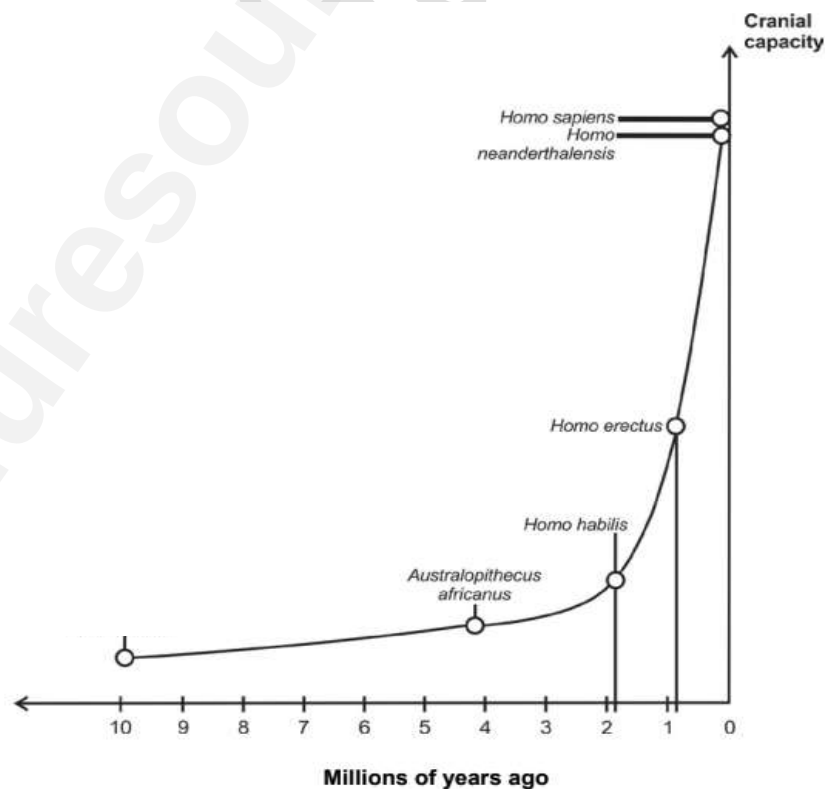
Divergent evolution✓ two new species evolve from a common ancestor to suit two new environments ✓

- 4.1.5 Selection pressures either increase or decrease an organism's chances of survival. Based on the information provided above, give TWO examples of selection pressures on woolly mammoths. (2)

Cold climate✓; warmer climate ✓; hunting✓

[12]

- 4.2 Study the graph below and answer the questions that follow:



- 4.2.1 According to the graph, how old are fossils of *Australopithecus africanus*? (2)

4.1 or 4.2 ✓ million years ✓

- 4.2.2 Describe TWO differences in behaviour between *H. habilis* and *H. erectus* that distinguish them as two different species. (4)

***H. habilis* used simple tools while *H. erectus* used more advanced tools ✓✓**
***H. habilis* did not control fire while *H. erectus* was able to control and use fire ✓✓**
***H. habilis* did not move big distances while *H. erectus* migrated over large distances ✓✓**
Any two

- 4.2.3 Between which two species is *H. naledi*, one of the most recent South African finds, proposed to fit on the graph? (2)

Between *A. africanus* ✓ and *H. habilis* ✓

- 4.2.4 Although enlarged cranial capacity was crucial in the evolution of hominids, bipedalism was also essential. Explain THREE ways in which bipedalism was advantageous to hominids. (6)

Freed up arms for carrying/ protecting young ✓✓
Freed up arms for manipulating tools, etc ✓✓
Allowed them to see greater distances so could see dangers/ opportunities better ✓✓
Cooler body because not receiving direct rays of sun on whole body ✓✓

- 4.2.5 Explain, using Darwin's theory of Natural Selection, how *H. neanderthalensis* with a larger cranial capacity evolved from *H. erectus* that had a smaller cranial capacity. (5)

Due to sexual reproduction, there was genetic variation ✓ amongst *H. erectus*, some with a slightly larger cranial capacity than others (variation) ✓. The hominids with larger cranial capacity were better able to hunt more effectively/make better tools/communicate more effectively than others ✓ and therefore had higher survival rates (natural selection) ✓. These hominids were more reproductively successful and passed their favourable genes to their offspring (inheritance) ✓. The number of hominids with a larger cranial capacity increased in the population over time and eventually became a new species (*H. neanderthalensis*). ✓

[19]