

GRADE 12 LIFE SCIENCES

K-TESTS

EVOLUTIONARY THEORY & HOMINID EVOLUTION

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DISCLAIMER

Where pertinent, questions that have been inspired by other examiners outside of St. Peter's College have been acknowledged. All other questions come from the author along with credit to Mrs A Greeff.

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To educators: When checking answers with the Memorandum document, please note that differences of opinion between schools and educators may exist, and that this is provided as a hopeful guideline to students to assist where possible.

To students: Please be critical when checking through your answers, especially for higher-order questions. Do not assume your written answers will necessarily be accepted if they deviate from the Memorandum answers provided.

Aim for students: Do not use your textbook or notes to answer the questions. These should be done from what has been memorized and understood. Time management must also be practiced. Critical reflection should focus on:

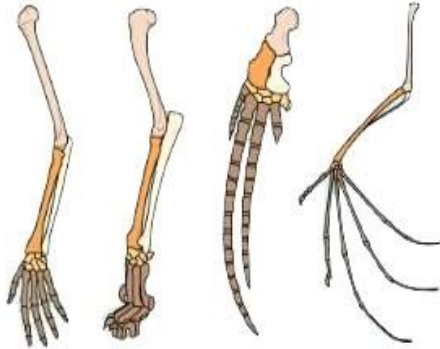
- *What terminology has not been effectively memorized*
- *Why you may not be receiving the full compliment of marks for longer questions*
- *Paying attention to instruction verbs of questions*
- *Linking concepts between different strands*

K-TEST 01 – 50 marks (45 minutes)

QUESTION 1 (Credit: H Lever)

Several Multiple Choice questions are provided below. Select the letter that represents the most correct answer:

1.1. The image shown below illustrates which evolutionary concept? (1)



- A embryological similarities
- B variation among species
- C vestigial structures
- D homologous structures

1.2. During their early stages of development, the embryos of fish, reptiles, birds and mammals look very similar. This suggests that fish, reptiles, birds and mammals: (1)

- A live in the same type of environment
- B have a common ancestor
- C are no longer undergoing evolution
- D have gotten rid of all their vestigial structures.

1.3. Which of the following provides the greatest source of variation, which is required for evolution to occur? (1)

- A Meiosis
- B Mitosis
- C Polyploidy
- D DNA replication

1.4. A new insecticide was sprayed on a large population of mosquitoes in Mpumalanga over a number of breeding cycles. At first the number of mosquitoes was reduced enormously. After a number of breeding cycles the population then began to increase in numbers and the insecticide appeared to no longer work. How would Darwin's theory of natural selection explain these observations? (1)

- A Some mosquitoes had already reproduced before the insecticide was used
- B Some mosquitoes were isolated and used as a control
- C Some of the original population were resistant to the insecticide and passed this on to their offspring
- D Some of the original population adapted to the insecticide and survived to produce offspring

1.5. The finches on the Galapagos Island were similar in form except for variations of their beaks. Darwin observed that these variations were useful for: (1)

- A attracting a mate
- B defending territory
- C building nests
- D gathering food

Select the term in Column B that matches the term provided in Column A:
(11)

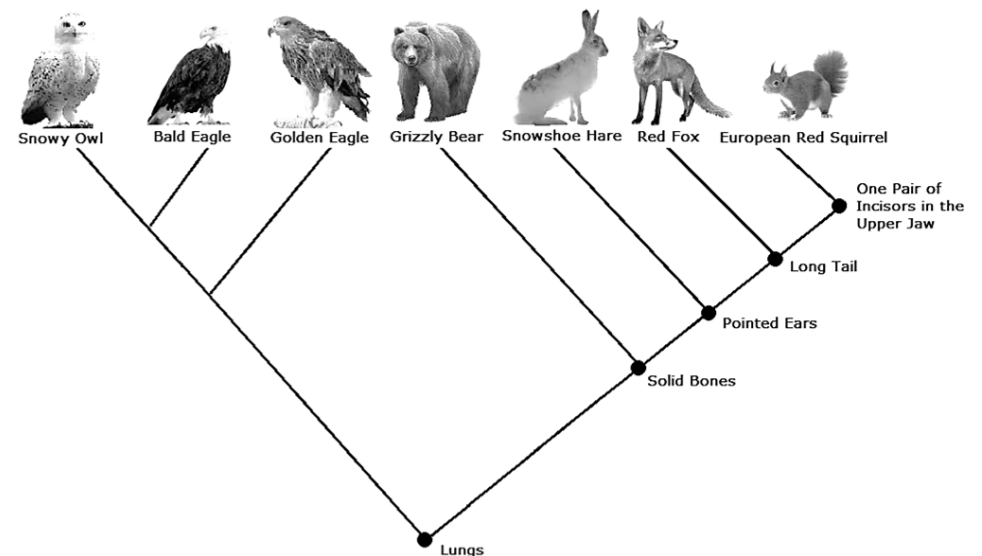
Column A - Description	Column B - Term	
1. Descent by modification	A	Artificial selection
2. Results in an increase in heterozygosity	B	Allopatric
3. Evolution on a small scale	C	Natural selection
4. When an individual competes successfully for resources and survives longer to produce offspring	D	Lamarck
5. The breeding of modern dogs to select favoured characteristics	E	Evolution
6. Most easily observable historical evidence for evolution	F	Continental drift
7. The diversification of a species into many different species adapted for new niches	G	Outbreeding
8. Theory explaining how the major land masses of earth have moved over time	H	Microevolution
9. Study of the geographical distribution of fauna and flora	I	Fossils
10. Evolution by acquired characteristics	J	Adaptive radiation
11. Type of speciation occurring when part of the population becomes geographically isolated	K	Biogeography

QUESTION 2

Define the following terms:

- 2.1. Punctuated equilibrium (2)
- 2.2. Reproductive isolation (1)
- 2.3. Species (3)
- 2.4. Bipedal (1)

Analyse the cladogram given below and answer the questions that follow:



- 2.5. Identify the trait common to all animals in this cladogram. (1)
- 2.6. Are the Eagles in the above cladogram an example of divergent or convergent evolution? Explain your answer. (2)

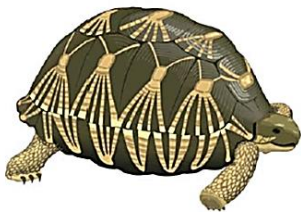
- 2.7. Explain why, despite their position on the cladogram, the Grizzly Bear and Golden Eagle are not closely related. (2)
- 2.8. Identify and explain a macroevolution from the cladogram. (2)

QUESTION 3 (Credit: C Marangoni)

"Evolution is a fact. Beyond reasonable doubt, beyond serious doubt, beyond sane, informed, intelligent doubt, beyond doubt evolution is a fact. It is not self-evidently, tautologically, obviously true, and there was a time when most people, even educated people, thought it wasn't. It didn't have to be true, but it is.... Evolution is the only game in town, the greatest show on earth."—Richard Dawkins, The Greatest Show on Earth: The Evidence for Evolution

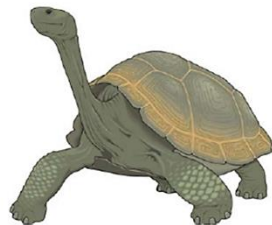
- 3.1. Explain TWO lines/types of evidence that are used by scientists in support of evolution. (4)
- 3.2. There are two main varieties of tortoise on the Galapagos Islands.

Short-necked variety



This variety of tortoise has a domed shell and short neck and lives on the moister islands where the vegetation is mainly grass.

Long-necked variety



The long-necked variety lives on the drier islands where the vegetation mainly consists of tall shrubs and bushes. This variety has a shell which allows its long neck to be raised.

Differentiate between the explanations that would have been provided by Darwin versus the explanation that would have been provided by Lamarck to account for the formation of the long-necked variety of the tortoise on the drier islands. (6)

QUESTION 4

The following three statements about evolution are INCORRECT. Explain why each of them are incorrect. (6)

- 4.1. The environment creates genetic variation between individuals
- 4.2. Natural selection is a random process
- 4.3. Natural selection breed perfection

QUESTION 5

- 5.1. Name any TWO famous hominid fossils and their hominid species. (4)

K-TEST 02 – 50 marks (45 minutes)

QUESTION 1

Several Multiple Choice questions are provided below. Select the letter which represents the most correct answer:

- 1.1. According to Charles Darwin, organisms that will be most successful biologically, are those that: (1)
- A are the largest in the population.
 - B are best adapted to the environment.
 - C reproduce the slowest.
 - D do not change.
- 1.2. The following is needed for new species to form: (1)
- A an extinction event.
 - B a homologous structure.
 - C an analogous structure.
 - D reproductive isolation.
- 1.3. The wing of a bat and the forelimb of a dog are said to be homologous structures. This indicates that: (1)
- A they have the same function.
 - B bats evolved from a lineage of dogs.
 - C they are structures which are similar due to convergent evolution.
 - D they are structures that are similar due to divergent evolution.
- 1.4. Gene flow is best defined as: (1)
- A the movement of genetic material from the nucleus to the cytoplasm.
 - B the transmission of genetic information from the cytoplasm to the nucleus.
 - C the transmission of genetic information from the parents to the offspring.
 - D the spread of alleles through a population over a period of successive generations.
- 1.5. Which of the following would be an example of convergent evolution? (1)
- A Hummingbirds changing bill size and shape to fit easily into flowers.
 - B Competition among finches of Galapagos Islands causing speciation.
 - C Anteaters in both Africa and South America developing long, narrow skulls.
 - D The distribution of *Aloe dichotoma* starting to move southward with global warming.
- 1.6.1. Gradualism is: (1)
- A the idea that evolution is a slow and steady process.
 - B the idea that evolution occurs in bursts followed by long periods of no change.
 - C the idea that changes can only be seen after a long period of time
 - D the idea that the size of individuals of a population gradually increases over a long period of time.

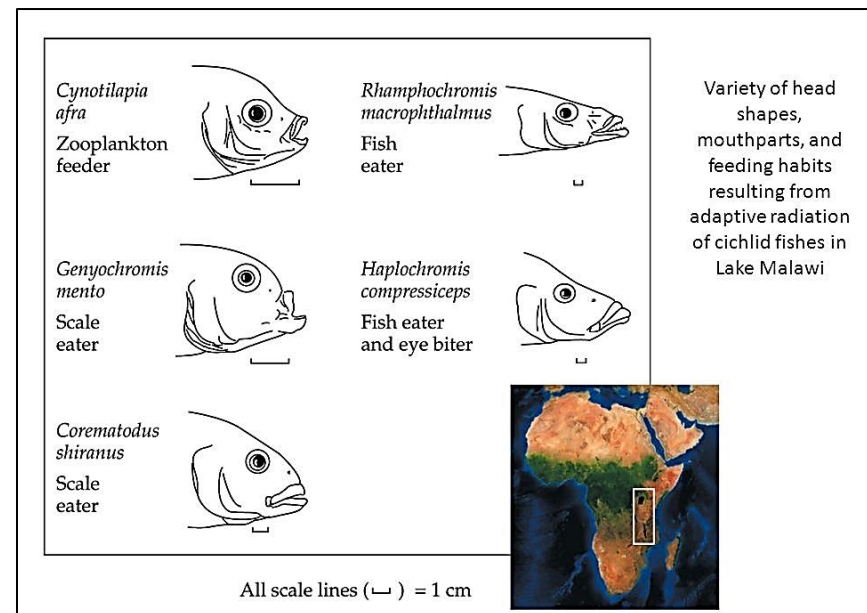
QUESTION 2 (Credit C Marangoni)

Indicate whether each of the statements below applies to Lamarck only (L), Darwin only (D) or both Lamarck and Darwin (Both). (5)

- 2.1. All the members of a species display varying characteristics and over time their appearances change
- 2.2. Species acquire better and more efficient body structures by their increased use and pass on their acquired characteristics to their offspring
- 2.3. An example of a species becoming more diverse is when bacteria become resistant to antibiotics, are able to survive and then pass on their resistance to their offspring
- 2.4. Only the fittest individuals with the most advantageous characteristics survive in a changing environment.
- 2.5. Evolution of organisms is caused by changes in the environment

QUESTION 3 (Credit C Marangoni)

There are about 1550 species of cichlids in the great lakes of East Africa. Cichlids are the only freshwater fish to have two sets of jaws; outer oral jaws to suck, scrape or bite off bits of food, and a second set in the throat to crush, slice or pierce the food before it is swallowed. The two sets of jaws are finely adapted to food habits, allowing each species to occupy its own specific ecological niche so hundreds of species can coexist without directly competing. The picture below shows a variety of mouthparts and feeding habits resulting from adaptive radiation of cichlids in Lake Malawi.



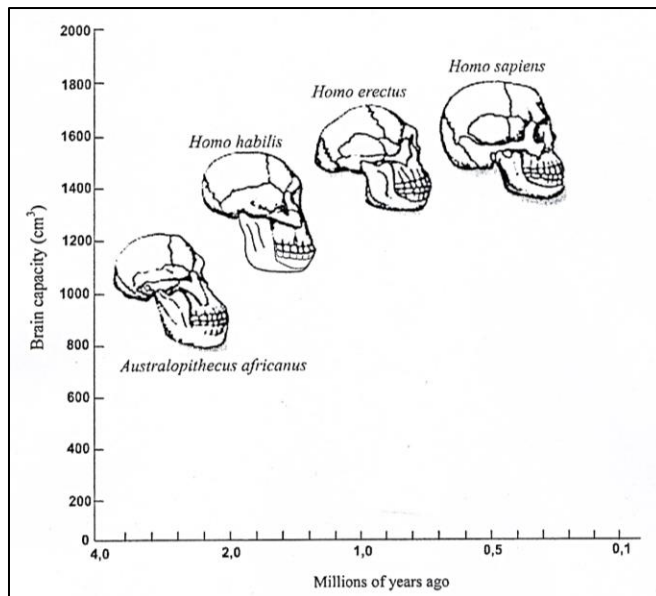
<http://slideplayer.com/6389496/22/images/35/Variety+of+head+shapes%2C+mouthparts%2C+and+feeding+habits+resulting+from+adaptive+radiation+of+cichlid+fishes+in+Lake+Malawi.jpg>

- 3.1. Define the term 'species'. (3)
- 3.2. Describe the adaptive radiation of the cichlids. (3)

- 3.3. Would cichlid evolution be described as allopatric or sympatric speciation? Justify your answer. (3)
- 3.4. How would the evolution of the cichlids have changed if all of them competed for the same ecological niche? (2)
- 3.5. Describe ONE other example you have studied that illustrates the concept of allopatric speciation. (3)
- 3.6. Name and describe the TWO sources of variation that would have assisted in the evolution of the cichlids. (4)

QUESTION 4

Analyse the graph below showing the skulls of different hominids. The skulls are not drawn to scale:

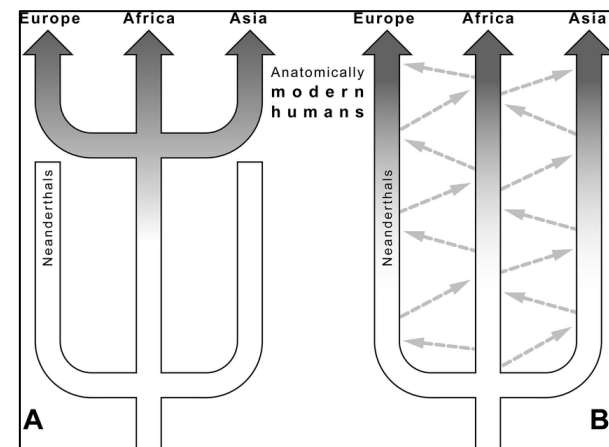


- 4.1. Describe the trend this graph is illustrating with regards to hominid evolution. (3)

- 4.2. Describe ONE other skeletal trend NOT visible in this graph that describes hominid evolution. (2)
- 4.3. Name the species of hominid that existed before *Australopithecus africanus* and state ONE famous example of this hominid. (2)
- 4.4. Besides fossils such as the skulls in the graph, describe ONE other line of evidence supporting the theory of hominid evolution. (2)
- 4.5. Suggest and describe ONE way that physical constraints affected the cultural development of hominids. (2)

QUESTION 5

Consider the following representation of two different theories related to the evolutionary pattern of modern humans:



Murray and Nasheuer, 2015. *Irish Journal of Earth Sciences*

- 5.1. State what theories relate to image A and B. Use the images provided to provide a brief description of each theory. (6)
- 5.2. The spread of hominids was only possible through bipedalism. Explain how bipedalism allowed early hominids to colonise the world. (4)

K-TEST 03 – 50 marks (45 minutes)

QUESTION 1

Study the following table which consists of two items (numbered 1 and 2) in the first column and a term in the second column. **Decide which item(s) relate to the term.**

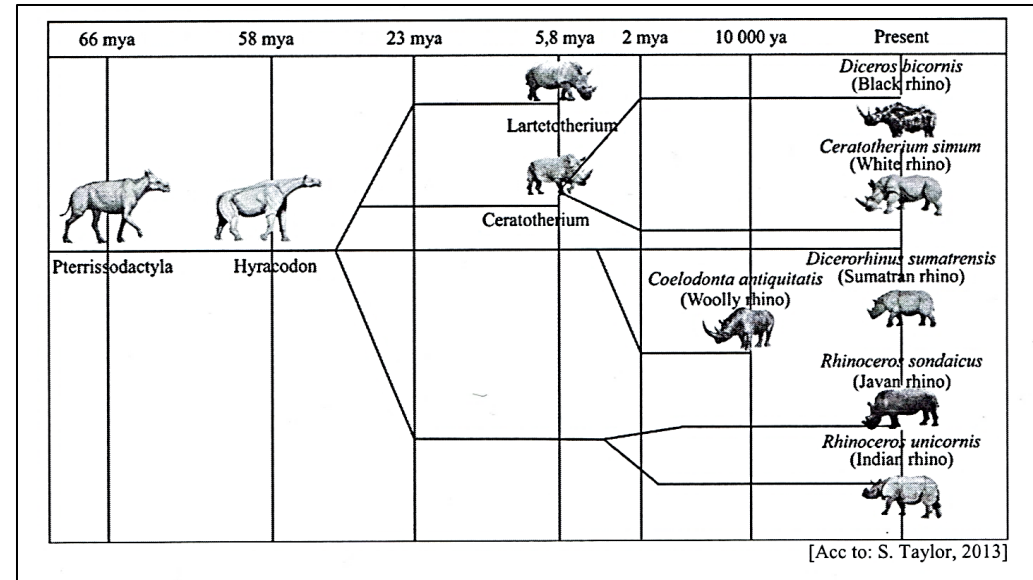
Write down your choice in the space provided in the "answer" column, making use of the following codes: (5)

- A only item 1 relates to the term
- B only item 2 relates to the term
- C both item 1 and 2 relate to the term
- D neither item 1 or 2 relates to the term

Item	Term
1. Descent with modification 2. Inheritance of acquired characteristics	Lamarckism
1. Guided by natural selection 2. Produces evolutionarily superior organisms	Artificial selection
1. Increases homozygosity 2. Increases heterozygosity	Outbreeding
1. <i>Australopithecus afarensis</i> 2. <i>Australopithecus africanus</i>	Mrs Ples
1. Breeding at different times of the year 2. Favours certain colours for choosing a mate	Reproductive isolation

QUESTION 2

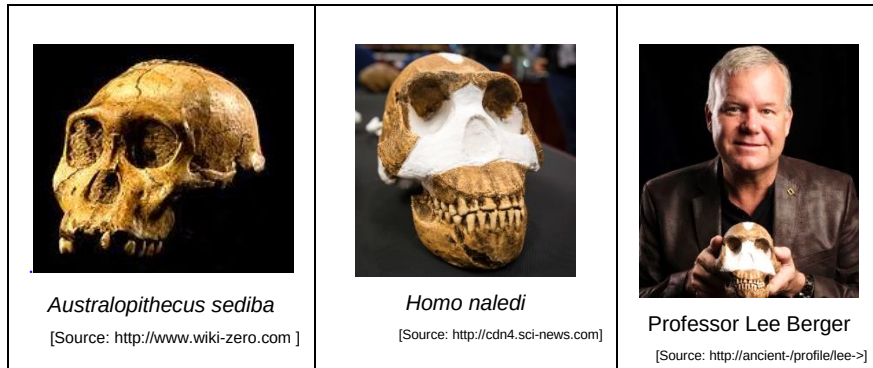
Use the diagram of the phylogenetic tree below which illustrates the evolution of the modern rhinoceros/rhino family to assist you in answering the following questions.



- 2.1. Name ONE extant rhino. (1)
- 2.2. What evidence is there from the graph that one would not find a living specimen of Woolly rhino? (1)
- 2.3. Name the most recent common ancestor of African rhinos. (1)
- 2.4. Explain how Darwin and Lamarck would have explained the evolution of the rhino horn. (6)
- 2.5. Roughly how many years ago did an adaptive radiation occur? (1)
- 2.6. Was the evolution of Hyracodon from Pterissodactyla an example of gradualism or punctuated equilibrium? Justify your answer. (3)

QUESTION 3

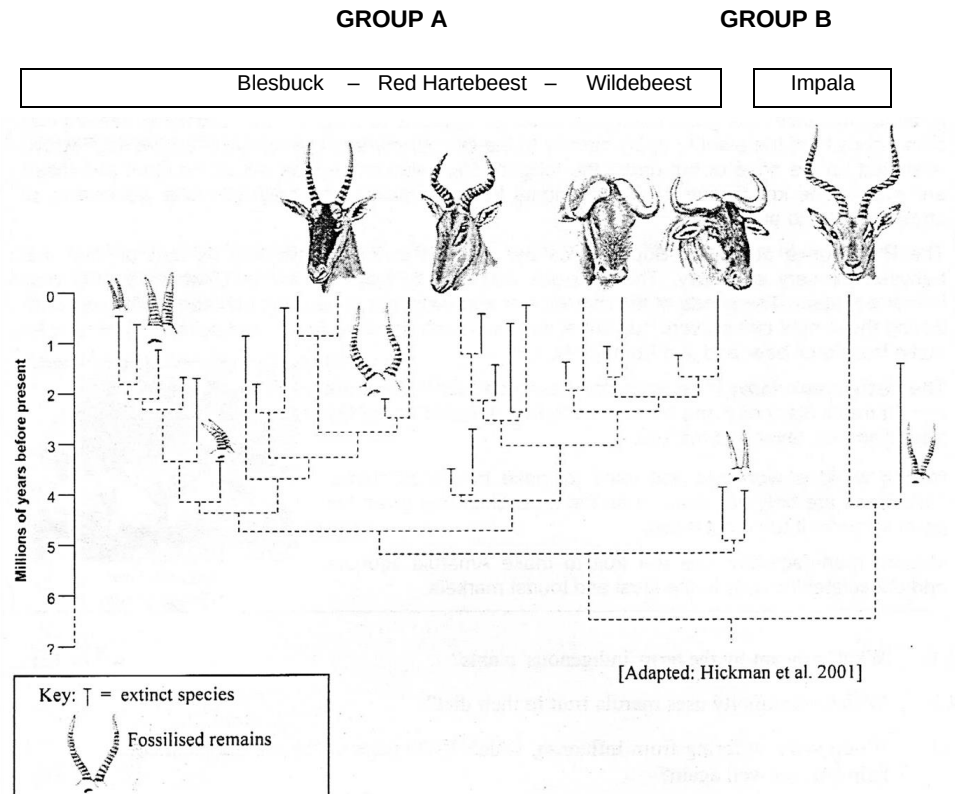
In 2012, palaeontologist Professor Lee Berger of the University of the Witwatersrand had discovered a new species of hominin, which was named *Australopithecus sediba*. Three years later, in 2015, another discovery was announced by Professor Berger, a new species named *Homo naledi*. Both of these hominin fossils were found in an area of South Africa known as the 'Cradle of Humankind'.



- 3.1. Suggest ONE function of a palaeontologist. (1)
- 3.2. Name ONE other famous fossil found in the Cradle of Humankind. (1)
- 3.3. *Homo naledi* was difficult to categorise due to its mix of ape-like and human-like characteristics. List TWO ape-like and TWO human-like characteristics that are specific to *Homo naledi*. (4)
- 3.4. Explain how mitochondrial DNA would have been important when studying the fossils of *sediba* and *naledi*. (2)
- 3.5. How have the fossils found at the Cradle of Humankind contributed to our understanding of hominid evolution? (3)

QUESTION 4

Consider the following cladogram of African antelope:



- 4.1. Explain the difference between allopatric and sympatric speciation. (4)
- 4.2. Compare the amount of speciation that has occurred between Group A and B from the above cladogram. (2)
- 4.3. Blesbok have a restricted range of food they can eat. Discuss how this would have impacted their evolution. (3)

- 4.4. Horn shape is a clear distinguisher between the different type of African antelope. Horns are important for aspects such as food foraging, defense and mating rituals. Use Darwin's theory of evolution to explain the evolution of the wildebeest. (5)
- 4.5. Would the evolution of African antelope be described as convergent or divergent evolution? Justify your answer fully. (3)
- 4.6. The cladogram above makes use of fossilized remains. Explain the important of fossils to the theory of evolution. (4)

K-TEST 04 – 50 marks (45 minutes)

QUESTION 1

Analyse the following table consisting of two biological terms in COLUMN 2, and a description in COLUMN 1.

Select how the terms from COLUMN 2 relate to the in COLUMN 1.

Write down either Option 1 or Option 2 as your answer (5)

COLUMN 1	COLUMN 2
<i>Homo sapiens</i> evolved independently across the world at the same time from <i>Homo erectus</i> that has left Africa	1. 'Out of Africa' hypothesis 2. Multiregional hypothesis
Extensively studied biogeography in the Malay Archipelago and helped to create the Theory of Natural Selection.	1. Alfred Wallace 2. Erasmus Darwin
An evolutionary event which resulted in a new Family of organisms to be created	1. Microevolution 2. Macroevolution
A large mandible, large angle of prognathism, prominent brow ridges and long arms than legs	1. <i>Australopithecus</i> 2. <i>Homo</i>
Earliest examples of <i>Homo sapien</i> artefact creation, such as fire to create ochre	1. Klasies River Mouth 2. Blombos cave

QUESTION 2 (Credit: L Dell)

The table below provides information about an investigation carried out on four types of female mice (A, B, C and D), each with a different fur colour. These mice live on a beach with a golden-yellow sand colour. The average results for 10 mice of each fur colour are presented in the table below.

Type of mouse	A	B	C	D
Fur colour	Dark brown	Yellow gold	Black	White
Average age at death (months)	4	10	2	3
Average number of offspring produced by female	4	14	0	0
Average running speed (metres per minute)	8	6	8	7

- 2.1. Which type of mouse is best suited to this environment? Justify your answer using. Include evidence from the table in your answer. (3)
- 2.2. Explain why mice C and D have 0 offspring. (2)
- 2.3. Explain TWO possible mechanisms that different fur colours were created in their offspring. (4)
- 2.4. Explain why each of the different coloured mice cannot be considered a separate species. (3)

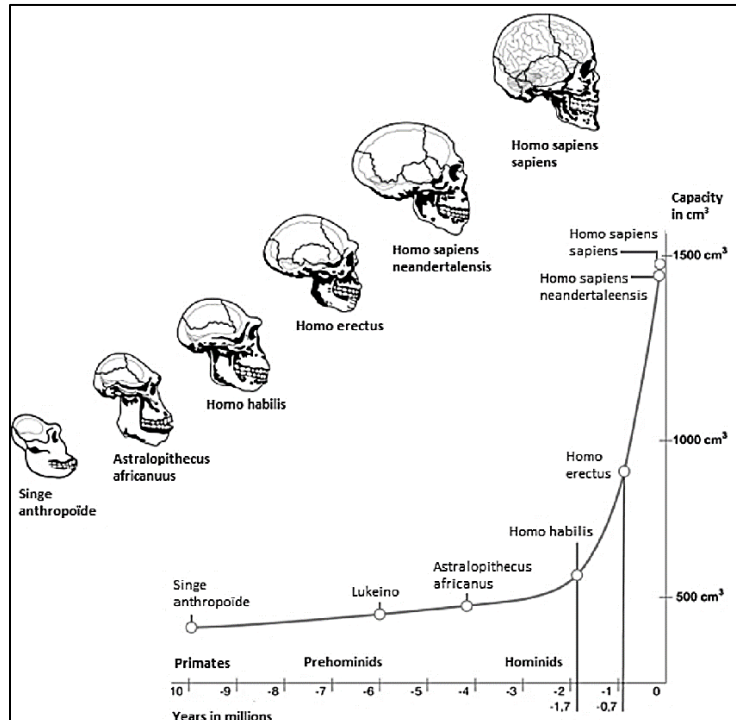
QUESTION 3

- 3.1. Match the famous example of hominids in Column B to the scientific name given in Column A. Write your answer in the space provided.

(2)

COLUMN A	COLUMN B
3.1.1. <i>Australopithecus afarensis</i>	A. 'Handy man'
3.1.2. <i>Homo erectus</i>	B. Mrs. Ples
	C. Turkana boy
	D. Lucy

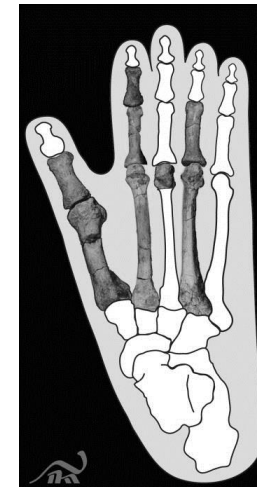
Analyse the graph below showing hominid skulls:



https://www.researchgate.net/figure/Human-evolution-based-on-skull-endocasts-of-fossil-archaic-primates-and-early-hominids_fig1_317004606

- 3.2. From the graph, identify the cranial capacity of *Homo habilis*. (1)
- 3.3. Explain why the measurement of cranial capacity is important to the study of hominid evolution. (2)
- 3.4. From the skulls in the image, explain ONE visible trend with regards to the skeletal evolution from *Australopithecus* to *Homo*. You may not discuss cranial capacity. (3)

Consider the image of a hominid foot below:

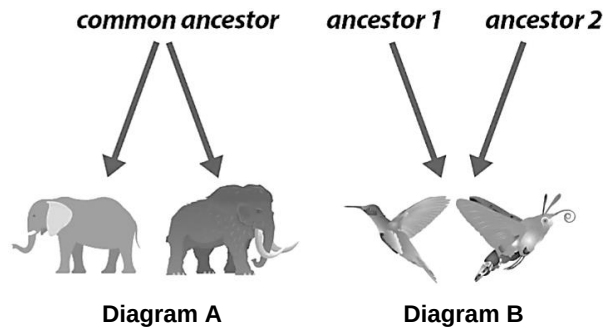


<https://www.earthmagazine.org/article/tree-climbing-hominin-opposable-toes-co-existed-lucy>

- 3.5. Explain what is meant by the term 'bipedal'. (1)
- 3.6. Is the foot in the image above more likely from the genus *Australopithecus* or *Homo*? Justify your answer with ONE visible reason. (2)
- 3.7. Explain TWO other features of the foot that could be used to determine the genus of a hominid skeleton. (4)

QUESTION 4

Study the diagrams (A and B) below illustrating the concepts of convergent and divergent evolution.



- 4.1. Match the diagrams (A and B) to each type of evolution. Explain your choice of allocations using evidence from the image. (4)

Consider the cartoon below:



- 4.2. Making reference to the cartoon, discuss which theory of evolution this cartoon relates to. (4)

QUESTION 5

Analyse the following text and answer the questions that follow:

The domestic cat (*Felis catus*) is abundant and diverse, occupying most habitable corners of the world. Archaeological evidence suggests the domestication of the cat occurred in the Near East approximately 9,000 - 10,000 years ago. Domestication began as humans and ancestral cats became more interdependent. The domestication process likely began when humans stopped following wild herds of animals and adopted more agricultural lifestyles. This change occurred 10,000-11,000 years ago and was made possible by the domestication of wild grains and grasses. The human/cat relationship was beneficial for the control of crop-destroying rodents, which had also joined human civilization. Although reasons to change the basic form and function of the cat were not as compelling as for other species, certain types of cats were artificially selected in various regions of the world. This "breed selection" was often based on aesthetics and involved simple traits of coat colour, colour patterns, etc., and less noticeably form or function.

Adapted from: US National Library of Medicine; National Institutes of Health

- 5.1. Differentiate between the 'domestication' and 'artificial selection' of cats. (2)
- 5.2. Explain the link between pedigreed cats and inbreeding. (2)
- 5.3. Comment on the ethics of the pedigree pet industry. (3)
- 5.4. Describe ONE example of plant domestication as part of your studies. (2)
- 5.5. State TWO differences between the process of artificial selection and natural selection. (2)

QUESTION 2

- 2.1. Justify the conclusion that bipedalism led to the development of complex language in hominids. (3)

Read the following extract and answer the questions that follow:

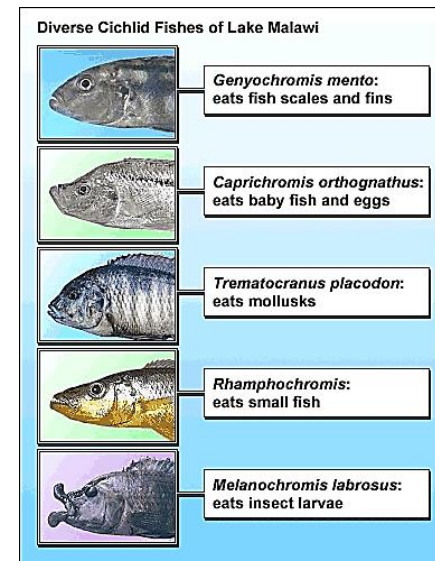
The oldest human fossils ever found outside Africa suggest that Homo sapiens might have spread to the Arabian Peninsula around 180,000 years ago — much earlier than previously thought. The upper jaw and teeth found in an Israeli cave pre-date other human fossils from the same region by at least 50,000 years. Other Homo sapien-like fossils from Morocco are older than 300,000 years. These recent discoveries have raised the possibility that humans evolved earlier than previously thought and perhaps elsewhere in Africa. Teeth from southern China hint at long-distance migrations some 120,000 years ago.

Adapted from: <https://www.nature.com/articles/d41586-018-01261-5>

- 2.2. Provide ONE similarity and ONE difference between the 'Out of Africa' and Multiregional hypotheses. (2)
- 2.3. Do you feel, based on the evidence in the above extract, that the 'Out of Africa' hypothesis can now be rejected? Justify your answer with ONE well-explained point. (3)
- 2.4. Name TWO countries, outside of South Africa, where famous examples of early hominids have been located. (2)

QUESTION 3

Roughly 40 million years ago, a handful of species of fish from the Nile River went into three lakes in Africa and experienced an unusual flurry of evolution. In one of these lakes as many as 500 new species emerged in fewer than 100,000 years. The 2,000-plus species of related fish in the African lakes alone represents morphological variations that allow them to live in niche habitats.

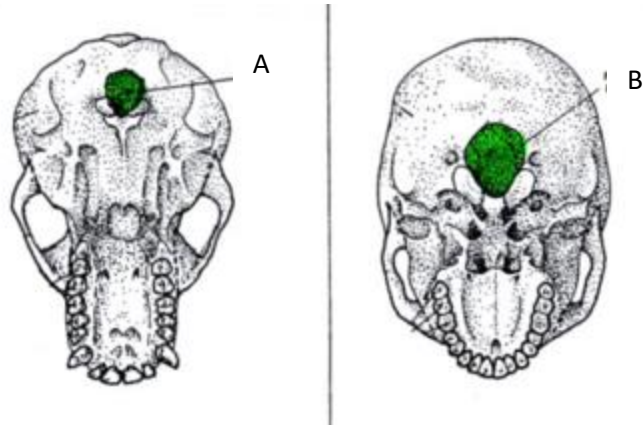


Adapted from: <https://news.stanford.edu/news> and <https://evolution.berkeley.edu>

- 3.1. Explain how the cichlid fish illustrate adaptive radiation. (2)
- 3.2. Construct a flow diagram to illustrate how Darwin would have explained the evolution of cichlid fish. (7)
- 3.3. Explain why cichlid evolution can be described as sympatric speciation. (2)
- 3.4. Describe ONE example (that is not cichlid fish) of a species illustrating allopatric speciation you have studied. (3)

QUESTION 4

Analyse the two skulls below:



- 4.1. Name the structure that A and B are pointing to. (1)
- 4.2. Which skull is from a human? Justify your answer by only discussing A and B. (3)
- 4.3. Explain why the change between A and B was an important milestone in the development in *Homo sapiens*. (4)
- 4.4. Explain why the classification of hominids remains a matter scientific debate. (3)

QUESTION 5

Analyse the following text and answer the questions that follow:

Cheetahs today are heading toward extinction, though notably cheetahs have faced and overcome the threat of extinction before. Genetic analysis of wild cheetahs shows they may have survived two historical bottlenecks, events that sharply reduce the size of a population. When this happens, the few remaining individuals end up inbreeding, or mating with relatives. Inbreeding reduces the size of the gene pool, which can lead to problems such as decreased genetic variability and the persistence of potentially harmful mutations, making it harder for the remaining population to adapt to changes in their environment. In a very small population, any mutations that occur are much more likely to be passed on to offspring and propagate through successive generations.

<https://www.nationalgeographic.org/article/cheetahs-brink-extinction-again/>

- 5.1. Define the term 'inbreeding'. (1)
- 5.2. Explain why cheetahs are an example of the Founder effect. (3)
- 5.3. Explain why even if a mutation occurs, it may not immediately be expressed to benefit (or hinder) the cheetah population. (2)
- 5.4. Do you feel the money spent on cheetah breeding programs is justified? Provide TWO reasons for your decision. (3)
- 5.5. Provide the term for the type of evolution where two new species are formed from a common ancestor. (1)

K-TEST 06 – 50 marks (45 minutes)

QUESTION 1

Several Multiple Choice Questions are provided below. Select the letter which represents the most appropriate answer:

1.1. The present day distribution of organisms is referred to as: (1)

- A) Mutations
- B) Biodiversity
- C) Biogeography
- D) Biochemistry

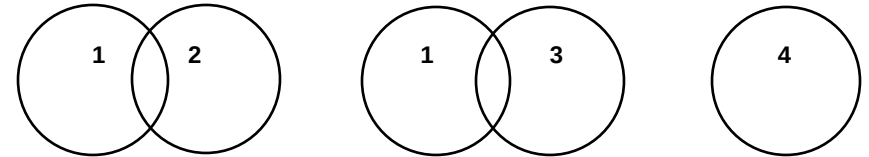
1.2. Consider the following statements:

- I) *Organisms in a population show great variation*
- II) *Characteristics are not passed on from parents to offspring*
- III) *If an organism uses an organ frequently, it will become more developed*
- IV) *A large number of offspring are produced, but only a few survive*

Which of the following combinations refer to observations upon which Darwin based his theory? (2)

- A) I, II, III and IV
- B) I and IV
- C) I, II and III
- D) II and III

1.3. Numbers 1, 2, 3 and 4 refer to four populations of frogs. These populations are represented diagrammatically by circles. Overlapping circles show populations that are capable of interbreeding to create viable offspring:



Based on the above, it would be reasonable to conclude that: (2)

- A) If populations 2 and 4 die out, two different species would remain
- B) Populations 1, 2, 3 and 4 represent four different species
- C) If population 2 were to die out, two different species would remain
- D) If population 3 were to die out, only one species would remain

1.4. The following must occur for a new species to form: (1)

- A) An extinction event
- B) A homologous structure
- C) An analogous structure
- D) Reproductive isolation

1.5. Which of the following is not a cause for speciation? (1)

- A) Founder effect
- B) Geographical barriers
- C) Sexual reproduction
- D) Random genetic mutation

1.6. Microevolution is a term that best describes: (1)

- A) The process by which a new genus of organisms is formed
- B) Small changes that occur in the genotypes of organisms within the same species
- C) Changes that can only be seen through a microscope
- D) An increase in the size of an individual's population over a long period of time

1.7. The wing of a bat and the forelimb of a dog are described as homologous structures. This indicates that: (1)

- A) The structures have the same function
- B) Bats evolved from the lineage of dogs
- C) The structures are similar due to convergent evolution
- D) The structures are similar due to divergent evolution

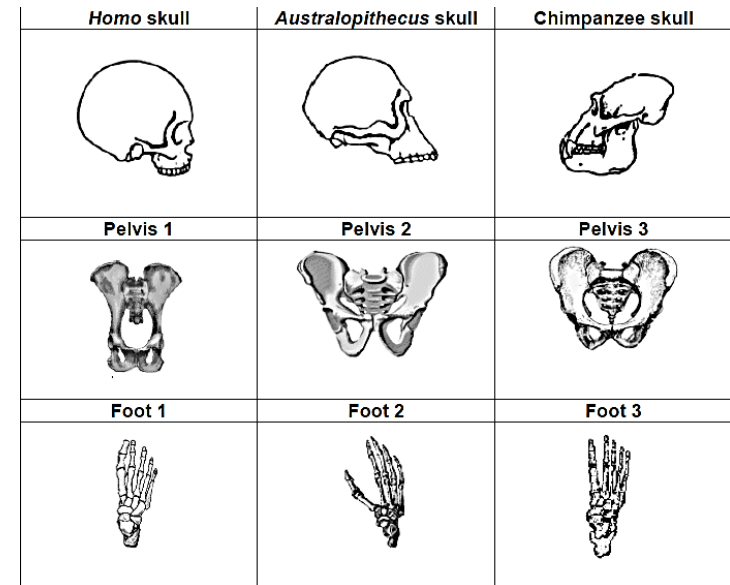
QUESTION 2

Cows have been an important commodity to humans for centuries. They provide us with many nutrients through various manners. As such, farmers have tried to optimise the off spring of cows for favourable characteristics.

- 2.1. Name the type of breeding employed by these farmers. (1)
- 2.2. Tabulate ONE advantages and ONE disadvantages related to the processes of inbreeding and outbreeding. (6)
- 2.3. Describe ONE example of plant outbreeding you have studied. (3)

QUESTION 3

Analyse the following image which shows the skeletal parts of several hominids and answer the questions that follow:



- 3.1. Which pelvis belongs to the chimpanzee? Justify your answer. (2)
- 3.2. Describe THREE visible differences between the *Homo* skull and the *Australopithecus* skull which illustrate the trend of evolution. (6)
- 3.3. Which foot is the most primitive? Provide TWO reasons for your answer. (3)

QUESTION 4

Analyse the following text and answer the questions that follow:

Lee Berger has long argued that *Homo habilis* was too primitive to deserve its privileged position at the root of our genus. Some other scientists agree that it really should be called *Australopithecus*. However, Berger has been nearly alone in arguing that South Africa was the place to look for the true earliest *Homo*.

He decided that the fossils his son found, and he described in August 2008, were a new species of *Australopithecus*, which he named *Australopithecus sediba*. Many other paleoanthropologists dismissed his interpretation of it. *A. sediba* was too young, too weird, and not in the right place to be ancestral to *Homo*.

- 4.1. What characteristic of *Homo habilis* lead anthropologists to believe it was the root of the *Homo* genus? (1)
- 4.2. Scientific revision and debate is common. Suggest TWO reasons why this should be encouraged and ONE reason why this should not be encouraged. (3)
- 4.3. The timeline of hominids has become one of the most debated topics in paleoanthropology in recent years. Construct a basic timeline with the rough dates of any FOUR hominids (except *Homo sapiens*) of your choosing. You must indicate the period of time each hominid existed, but the timeline does not have to be drawn to scale. (6)

QUESTION 5

The image below shows an iconic example of Darwinian evolution. Two varieties of the Peppered Moth are shown:



<https://www.sciencenewsforstudents.org/article/how-moth-went-dark-side>

- 5.1. In point form, use Darwin's theory of natural selection to explain the change from the white-coloured moth to the dark-coloured moth. (5)
- 5.2. Is the evolution of the peppered moth an example of gradualism or punctuated equilibrium? Justify your answer. (2)
- 5.3. How would the understanding of Peppered Moth evolution be aided by having an understanding of genetics? (3)

K-TEST 07 – 50 marks (45 minutes)

QUESTION 1

Choose a description from Column B which best suits the words in Column A.
Write the correct letter next to the appropriate number. (15)

COLUMN A	COLUMN B	
1. Lucy	A	Increases homozygosity
2. Lamarck	B	Organisms which can reproduce and produce viable offspring
3. Artificial selection	C	Fundamental aspect of natural selection
4. Macroevolution	D	Evolution that occurs at the species level
5. Inbreeding	E	Periods of rapid evolution followed by long period of stasis in evolution
6. Species	F	<i>Australopithecus africanus</i>
7. Biogeography	G	When a species accumulates small changes over time before creating a new species
8. Modification with descent	H	Evolution that creates a new genus
9. Outbreeding	I	A small sub-set of a population becomes reproductively isolated causing reduced diversity
10. Microevolution	J	Proposed the concept of use and disuse of organs
11. Punctuated equilibrium	K	<i>Australopithecus afarensis</i>
12. Mrs Ples	L	The study of the distribution of organisms; what animals exist where and why
13. Alfred Wallace	M	Humans selecting desired traits for breeding
14. Founder effect	N	Decreases homozygosity
15. Gradualism	O	Co-creator of the theory of natural selection

QUESTION 2

Analyse the following text and answer the questions that follow:

We are not the only ones who love bats – turns out the Cuban rainforest vine *Marcgravia evenia* works pretty hard to get their attention too. *M. evenia* evolved leaves that have a distinct concave shape that work like little satellite dishes. This sends back a strong signal when bombarded with echolocation from bats. That makes the plant uniquely recognizable to our flying mammal friends, who often rely on echolocation to make up for their poor eyesight. Once the plant has the attention of the bat, the bat will drink the nectar from the bracteoles (nectaries) and in so doing, will also pollinate the plant. *M. evenia* is endemic to Cuba. The bracteoles of *M. evenia* are convergent with the leaves of the pitcher plant, *Nepenthes hemsleyana* from Borneo.

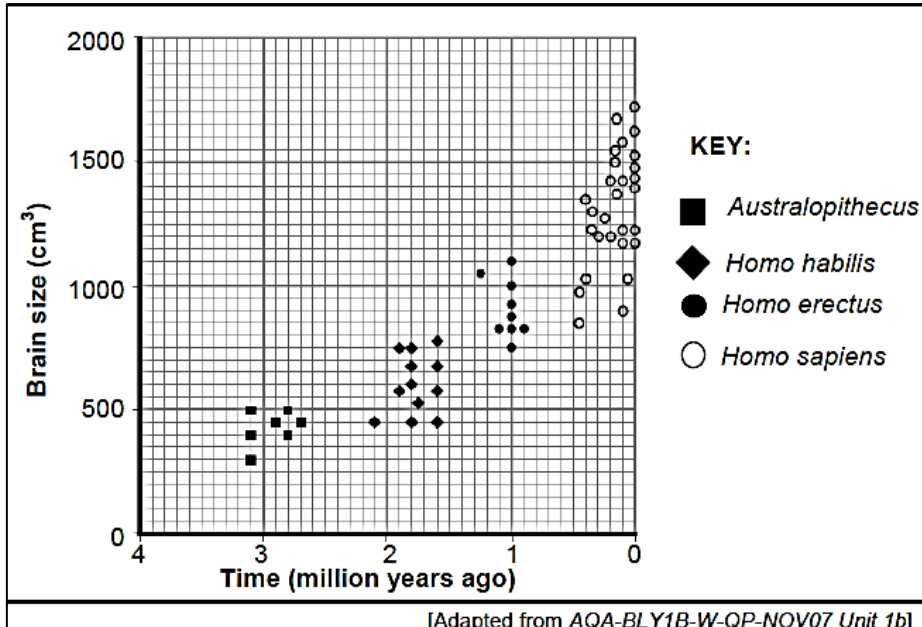
<https://www.nationalgeographic.com/science/article/vine-lures-bats-with-leaves-that-act-as-sonar-dishes>



- 2.1. Explain how *Marcgravia evenia* has become reproductively isolated from other plant species. (3)
- 2.2. Explain why this evolution would more likely be an example of sympatric speciation rather than allopatric. (2)
- 2.3. “The bracteoles of *M. evenia* are convergent with the leaves of the pitcher plant, *Nepenthes hemsleyana* from Borneo”
Explain what is meant by this statement. (3)

QUESTION 3

The following graph represents the range of brain sizes over time of several hominid species. Analyse the graph and answer the questions that follow:



3.1. According to the graph:

- When did the first *Australopithecus* appear? (1)
- Which species has the greatest variation in brain size? (1)

3.2. State the following:

- The largest *Australopithecus* brain size (1)
- The smallest *Homo sapiens* brain size (1)

3.3. Describe the importance of *Homo erectus* to understanding how hominids spread across the world. (2)

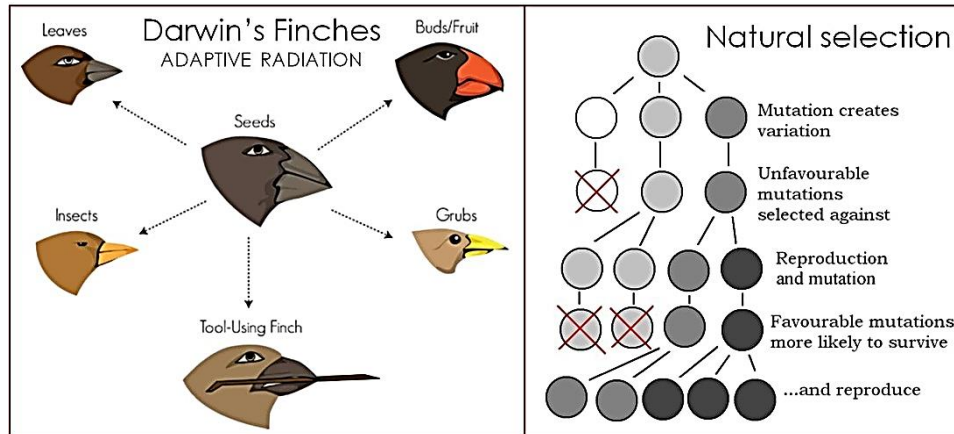
Bipedal locomotion was a key factor in the evolution of hominids

3.4. Discuss THREE aspects of life that changed for hominids after becoming bipedal. (3)

3.5. Tabulate TWO advantages and disadvantages of bipedalism. (6)

QUESTION 4

The image below shows different types of finches that exist on the Galapagos Islands, often referred to as 'Darwin's Finches'.



<http://loretocollegebiology.weebly.com/evolution--natural-selection.html>

- 4.1. Explain what is meant by the term 'adaptive radiation'. (1)
- 4.2. Discuss the significance of mutations to the success of the Galapagos finches. (3)
- 4.3. Explain why the Galapagos Finches are a perfect way to study allopatric speciation. (3)
- 4.4. Describe how studying the Galapagos finches contributes to the Theory of Evolution. (2)
- 4.5. When first presented, Darwin's research was met with much resistance. Briefly describe why his ideas were not initially accepted by society. (3)