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**TOTAL
MARKS**

INTERNATIONAL SECONDARY CERTIFICATE EXAMINATION
NOVEMBER 2022

BIOLOGY: PAPER I

EXAMINATION NUMBER

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Time: 3 hours

200 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 36 pages. Please check that your question paper is complete.
2. This question paper consists of four questions.
3. Read the questions carefully and make sure that you answer all parts of all the questions.
4. **Answer ALL the questions on the question paper and hand this in at the end of the examination. Remember to write your examination number in the space provided.**
5. Use the total marks that can be awarded for each question and the space provided as an indication of the detail required.
6. It is in your own interest to write legibly and to present your work neatly.
7. Five blank pages (pages 32–36) are included at the end of the question paper. If you run out of space for an answer, use these pages. Should you use this extra space, number the answers exactly as the questions are numbered.

FOR MARKER'S USE ONLY

Question	1	2	3	4	Total
Marks	80	40	40	40	200
Marked					
Moderated					

QUESTION 1

- 1.1 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 only be used once.

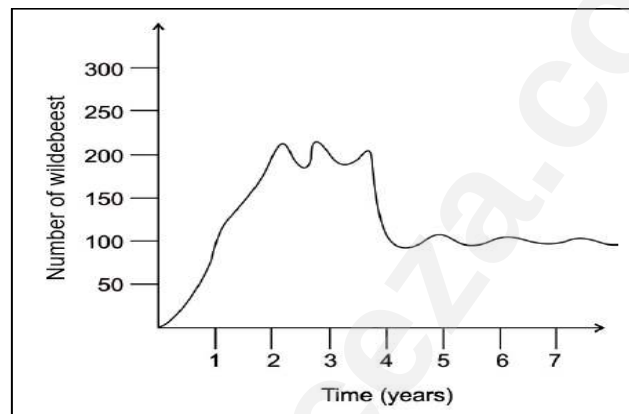
COLUMN A		COLUMN B	
[]	A hormone that stimulates the development of secondary sexual characteristics in males.	A	Fallopian tube/oviduct
[]	Part of the female reproductive system where fertilisation takes place.	B	Placenta
[]	Lining of the uterus shed during menstruation.	C	FSH
[]	An organ that provides nutrients and oxygen to the foetus.	D	Cervix
[]	A sharp increase in this hormone causes ovulation.	E	Testosterone
[]	Surrounds and protects the developing foetus.	F	Vagina
[]	A male accessory gland found at the base of the male bladder.	G	Endometrium
[]	Structure that allows the testes to be cooler than body temperature.	H	Amniotic fluid
[]	A hormone that stimulates the development of ova in the ovaries.	I	LH
[]	The structure that dilates during natural childbirth.	J	Seminal vesicle
		K	Scrotum
		L	Prostate

(10)

- 1.2 **SIX** multiple-choice questions are given below. Choose the most correct option for each question and write the letter of your choice in the space provided in the table below.

Question	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
Answer						

- 1.2.1 Parts of the Maasai Mara National Reserve in Kenya have been experiencing a drought for the last few years. The graph below shows the changes in the number of wildebeest in the reserve during the drought.



[Adapted from: <<http://www.rpd.net>>]

What is the new carrying capacity of the wildebeest as a result of the drought?

- A 100
- B 200
- C 175
- D 225

(1)

- 1.2.2 Which of the following factors will cause a decrease in population size?

- (i) emigration
- (ii) predation
- (iii) birth
- (iv) immigration
- (v) death

- A (i) and(ii)
- B (ii), (iii) and (iv)
- C (i), (ii) and (v)
- D (iii) and (iv)

(1)

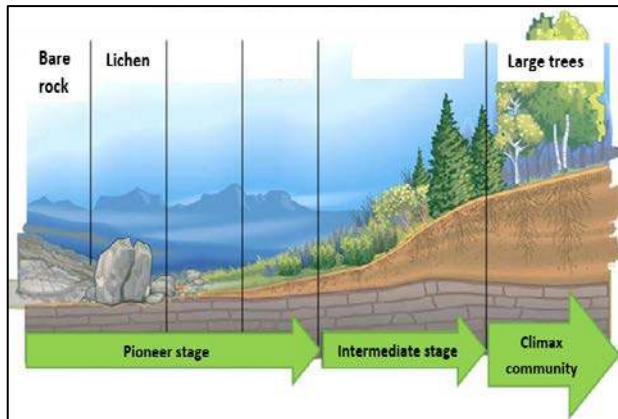
- 1.2.3 Living in a herd is of benefit to zebra as it:

- A allows individuals to source more food
- B reduces competition as some zebras eat grass whilst other zebras eat leaves
- C allows the herd to avoid predators more easily
- D reduces competition for mates

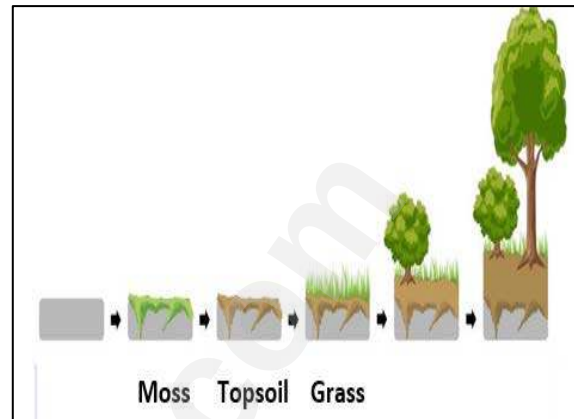
(1)

1.2.4 Which image below represents secondary succession?

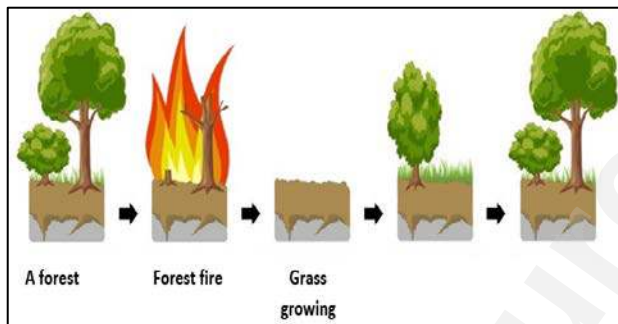
A



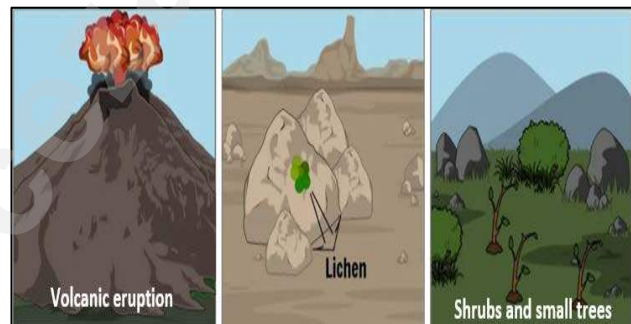
B



C



D



(1)

- 1.2.5 One thousand agama lizards were caught in a rocky area of Chobe National Park in a mark-recapture exercise. They were marked with non-toxic paint and then released back into their environment. Ten days later 300 agamas were caught again, of which 125 had paint markings. What is the estimated size of the agama population?

The agama lizard

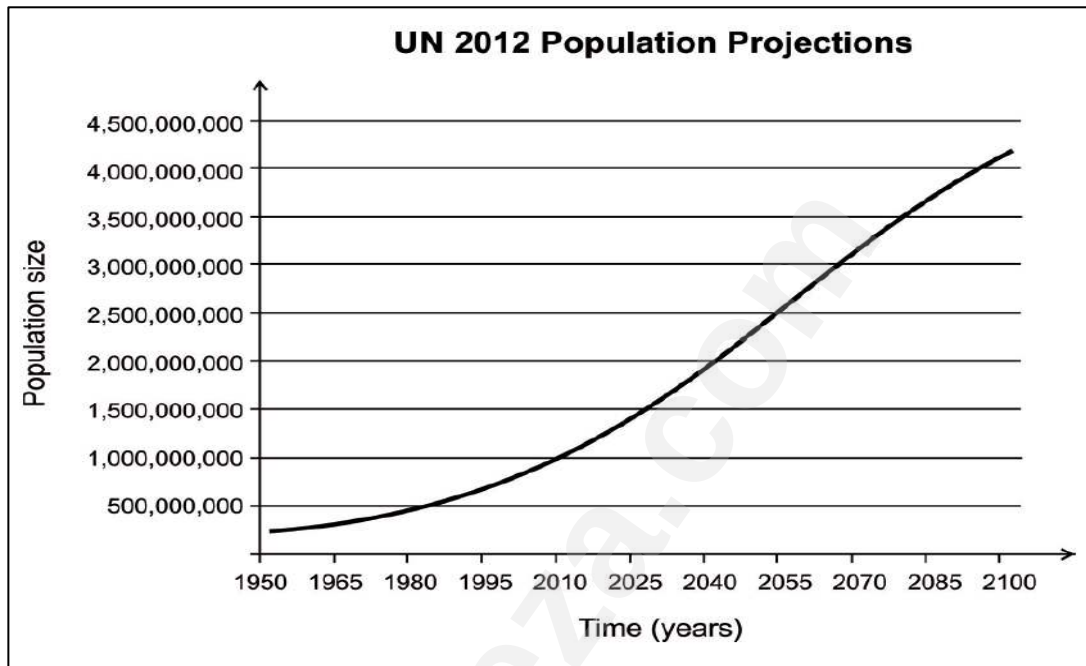


[Source: <<https://www.britannica.com/animal/agama-lizard>>]

- A 417
B 3 750
C 1 425
D 2 400

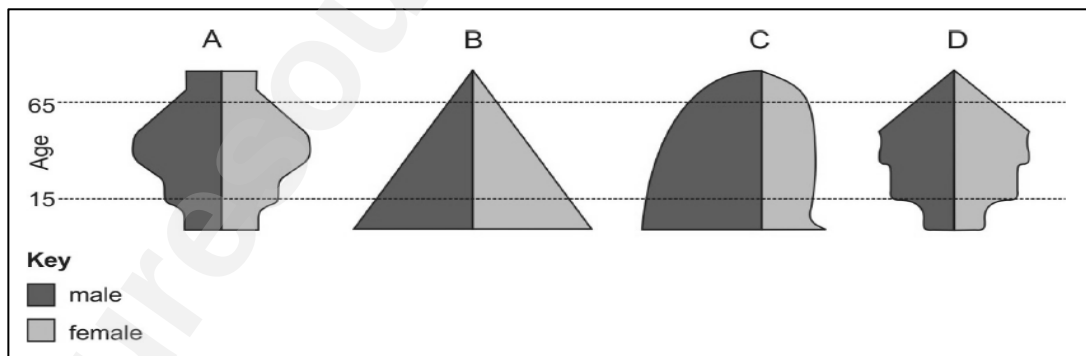
(2)

1.2.6 The graph below shows the United Nation's projections in 2012 for the population size for the whole continent of Africa.



[Adapted from: <<https://www.amren.com>>]

Based on the graph above, which of the following population pyramids (A, B, C or D) would represent the population of the whole continent of Africa in 2100?



[Adapted from: <<https://commons.wikimedia.org>>]

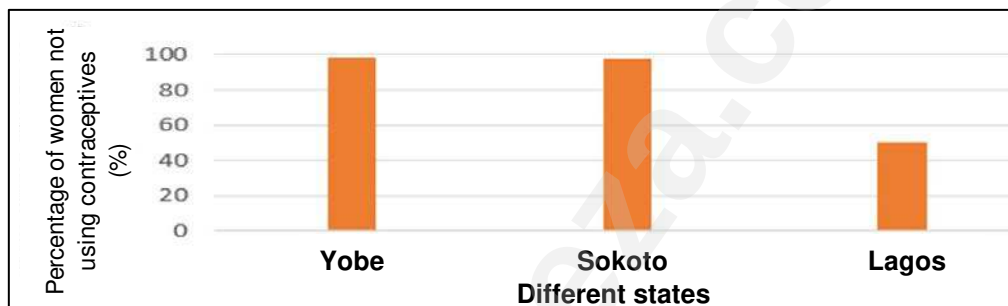
(2)

1.3 Study the information below and use the information to answer the question.

Most of the countries worldwide with the lowest rates of contraceptive use and the highest fertility rates, are in Africa. In Nigeria, only 12% of women use modern contraceptive methods and over 83% do not use any form of contraceptive to prevent pregnancy. The *Nigeria Family Planning Blueprint*, a government publication, has set out a plan to raise modern contraceptive usage to 27% among all women by 2024.

The results reflected in the graph and table below illustrate data on contraceptive usage and fertility rates from three of Nigeria's 36 states.

Figure 1: Percentage of women not using contraceptives in three different states in Nigeria



Total fertility rate (TFR) per state between 2008 and 2018

Province	TFR 2008	TFR 2011	TFR 2013	TFR 2016	TFR 2018
Yobe	7,7	7,9	6,6	6,8	5,9
Sokoto	8,7	5,2	7,0	7,3	7,0
Lagos	4,0	4,7	4,1	4,0	3,4

*TFR = the number of live births per 1 000 people in a given country each year.

Consider the **FIVE** statements in the table below and for each statement decide whether:

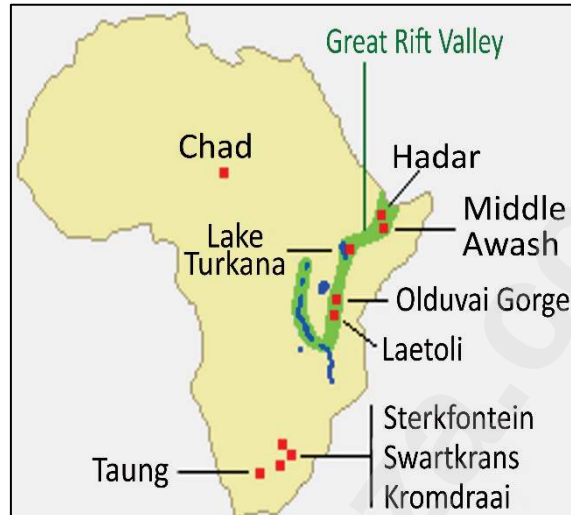
- A** the statement is supported by the information provided above
- B** the statement is contradicted by the information provided above
- C** the statement is neither supported nor contradicted by the information provided above

	STATEMENT	A, B OR C
1.3.1	Over 83% of Nigerian females do not use contraceptives.	
1.3.2	There is a correlation between low contraceptive use and a high fertility rate.	
1.3.3	The average fertility rate for Lagos over the ten-year period was six live births per female.	
1.3.4	Modern contraceptive usage in Nigeria is more common than modern contraceptive usage in the rest of Africa.	
1.3.5	Eighty percent (80%) of females in Yobe do not use contraceptives.	

(5)

- 1.4 **Figure 2** below shows the Great Rift Valley in Africa that is rich in hominid fossils. One of the most important sites within the Great Rift Valley is Olduvai Gorge, a canyon in Northern Tanzania.

Figure 2: Map of the Great Rift Valley in Africa



[Source: <https://www2.palomar.edu/anthro/hominid/australo_1.htm>]

- 1.4.1 An early hominid fossil, *Homo habilis*, was discovered at Olduvai Gorge. Why was this hominid known as 'handy man'?

(1)

- 1.4.2 Name the *Australopithecus* species to which the fossil known as the Taung child belongs.

(1)

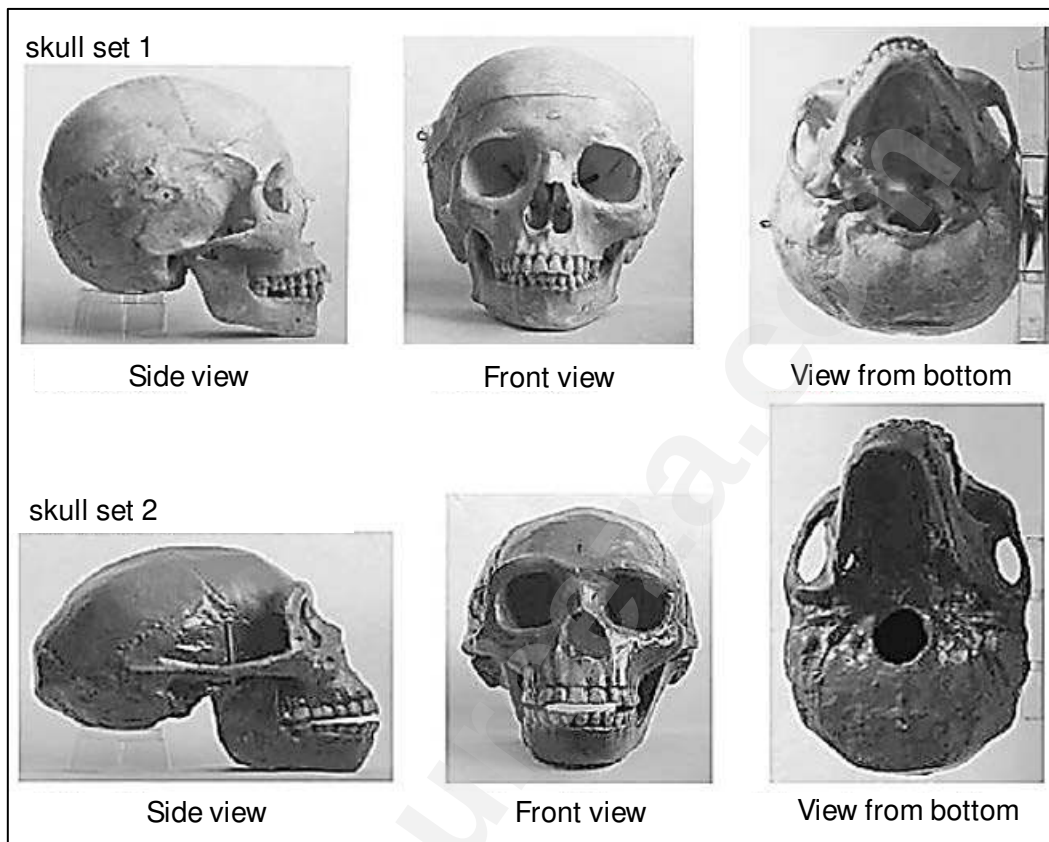
- 1.4.3 Refer to **Figure 2** and identify the three fossil sites that make up the Cradle of Humankind, an important world heritage site in South Africa. **Circle the letter of the correct answer.**

- A Laetoli, Olduvai Gorge, Taung
- B Taung, Sterkfontein, Swartkrans
- C Sterkfontein, Swartkrans, Kromdraai

(1)

1.4.4 Study the images of the two sets of skulls below and answer the questions that follow.

Figure 3: Different views of skulls from *Homo erectus* and *Homo sapiens*



(a) Which of the two skull sets represents *Homo erectus*?

(1)

(b) Describe TWO differences observed between the two sets of skulls that enabled you to identify the skull images of *Homo erectus* in your answer in (a).

(4)

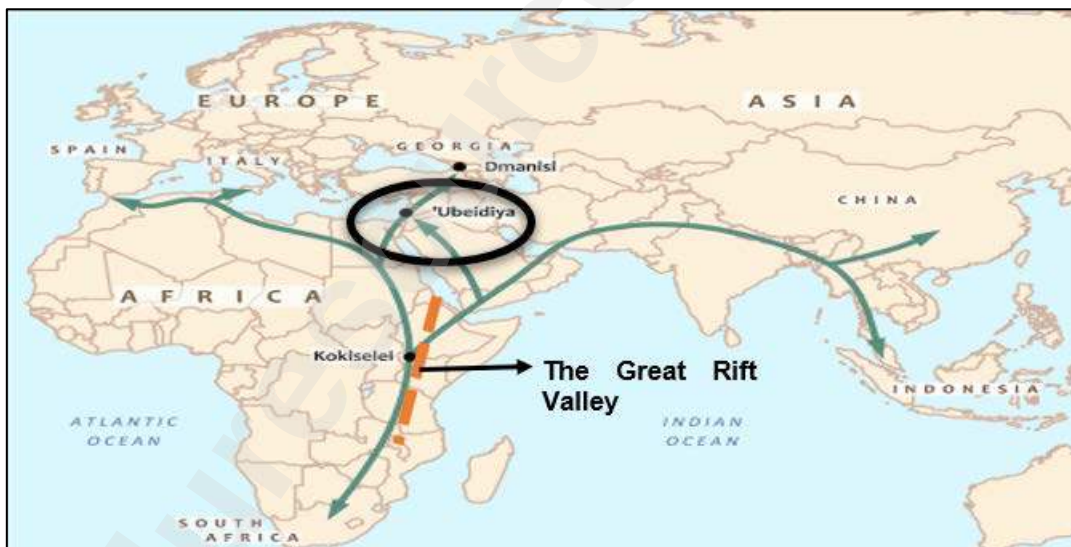
- (c) List TWO features that indicate bipedalism, in the rest of the skeleton, besides the skull.

(2)

- (d) Discuss ONE advantage of bipedalism.

(2)

1.4.5 **Figure 4: Map illustrating the 'Out of Africa' hypothesis, showing the migrations of *Homo erectus*, both within and beyond the African continent.**



[Source: <<https://www.smithsonianmag.com/science-nature/what-drove-home-erectus-out-of-africa180978881/>>]

- (a) Explain what is meant by the 'Out of Africa' hypothesis.

(4)

- (b) Suggest ONE reason for *Homo erectus* leaving the African continent.

(1)

- 1.4.6 *Ubeidiya* is a hominid fossil site in Northern Israel. It is one of the earliest known sites where *H. erectus* settled. Today, the site is covered in long grass and slabs of clay – a site that has been forgotten.

An image of what Ubeidiya looks like today



[Source: <<https://www.news.uct.ac.za/article/-2019-06-13-cultivating-the-next-great-paleoanthropologist>>]

Do you think fossil sites like *Ubeidiya* need to be protected? Give ONE well-explained reason for your opinion.

(2)

- 1.4.7 Of all the paleoanthropologists in the world, 23% are female and 77% are males. Most of the paleoanthropologists in the world are non-African. There is an extensive record of human evolution in Africa, and it is a pity that Africans are not involved in the process of unravelling the human story.

There are now programmes in Africa that are investing in changing these statistics.

- The Human Evolution Research Institute (HERI) at the University of Cape Town aims to increase the number of female paleoanthropologists in Africa.
- The Turkana Basin Institute (TBI) aims to increase the number of African paleoanthropologists with their programme – *Raising African Paleoanthropologists*.

- (a) Suggest TWO reasons why there are so few female paleoanthropologists in the world.

(2)

- (b) Discuss why it would be a victory for women in Africa if HERI is successful in achieving its goal.

(1)

- (c) Suggest what the biggest problem will be for HERI or TBI to overcome before they get more African women to enrol in their programme.

(1)

- 1.5 There is an increase in endocrine disorders in developing countries like Ghana. Unfortunately, in many of these countries, attention to endocrine disorders may not be a priority, resulting in increased mortality of those affected.

A study was conducted to determine the frequency of endocrine disorders over a five-year period in an outpatient clinic in Kumasi, in south-central Ghana. Three thousand and seventy (3 070) adults were involved in the study: 2 056 females and 1 014 males.

The two most common endocrine disorders observed were:

- diabetes
- thyroid disorders

The study concluded that there was a need for well-trained endocrinologists to improve the health of the population. However, there are still only five endocrinologists in Ghana who currently treat the population of 28 million people.

Thyroid disorders recorded in 410 patients in Kumasi, Ghana between 2011 and 2015

Thyroid gland disorders	Percentage of patients (%)
Hyperthyroidism	9,2
Hypothyroidism	1,7
Goitre	0,4

[Source: <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5343284/>>]

- 1.5.1 Provide a suitable hypothesis for this study.

(3)

- 1.5.2 Explain why there are a high number of untreated endocrine disorders in Ghana.

(2)

- 1.5.3 How many of the patients at the Kumasi clinic suffered from hyperthyroidism? Show all working.

(3)

- 1.5.4 What is the primary cause of a person developing a goitre?

(1)

- 1.5.5 Draw a flow chart, to illustrate how high levels of thyroxin are regulated by the negative feedback mechanism. Provide a heading for your flow chart.

1.6 The coffee plant, *Coffea arabica*, grows naturally in the wild on the mountains of Ethiopia. Climate change has drastically lowered the yield of coffee beans produced by *C. arabica*. Coffee farmers in Ethiopia have also started cultivating the coffee trees at sea level although the plant grows best at lower temperatures, between 15 °C and 24 °C, and at higher altitudes.

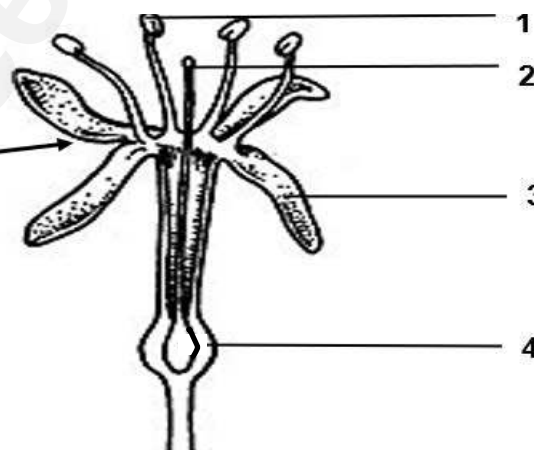
- *C. arabica* flowers have a scent of jasmine.
- *C. arabica* flowers can self-pollinate to produce the coffee fruit
- Cross pollination by honeybees enhances the quality and quantity of the yield by more than 50%.

Human impact has led to a decline in the honeybee population. To ensure the survival of the honeybees, the queen honeybee must mate with many drones. When she is ready to mate, she leaves the hive and goes on a 'mating flight' and flies down to a swarm of male honeybees called a 'drone assembly area'. The drone mounts the queen mid-air. She mates between 6 and 24 times with different males. During mating, the male inserts his male reproductive structure into the female reproductive organ to deposit the sperm. Three days later, the queen will start laying her eggs.

Coffee cherry containing two coffee bean seeds



Figure 5: Longitudinal section of *C. arabica* flower



1.6.1 Provide names for the structures labelled 1 and 2 in **Figure 5**.

1

2

(2)

1.6.2 (a) Name the reproductive organ of the flower at 4.

(1)

(b) Name the structure found in 4 which becomes the coffee bean seed after fertilisation.

(1)

1.6.3 State ONE way in which the flower attracts pollinators such as bees.

_____ (1)

1.6.4 (a) Describe the courtship behaviour displayed by honeybees.

_____ (4)

(b) Do honeybees have internal or external fertilisation?

_____ (1)

(c) Why are honeybees regarded as being oviparous?

_____ (1)

1.6.5 Explain TWO reasons for the decrease in the yield of coffee beans from *C. arabica* flowers.

_____ (4)

1.6.6 Explain why cross pollination by honeybees can enhance the quality and quantity of the coffee bean yield.

_____ (2)

1.6.7 Describe the role of the caste of worker bees in the colony.

_____ (2)

[80]

QUESTION 2

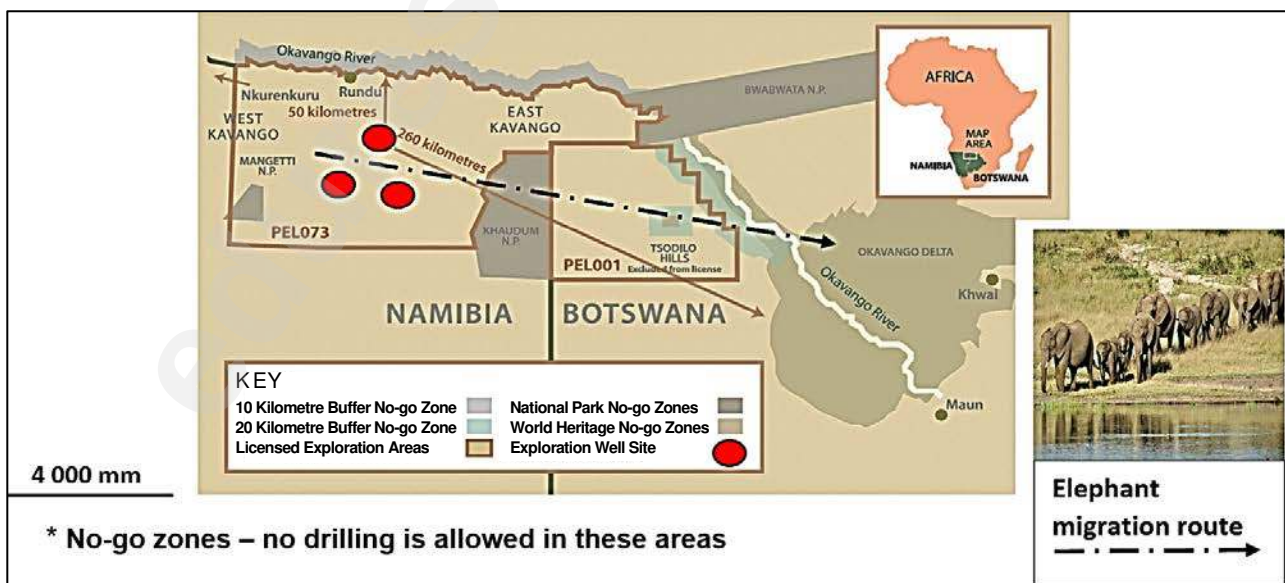
Read the source below and use the information as well as your own knowledge to answer the questions that follow.

In January 2021, a Canadian petroleum company, was given a license from the Namibian government to start test drilling for oil and gas in the Kavango Basin. This is a water basin that forms part of the Okavango River that runs into the Okavango Delta, a UNESCO World Heritage site. The area that was licensed for drilling is home to about 200 000 people and an abundance of wildlife, such as the African wild dog, the African elephant and some rare, indigenous plants.

If oil is discovered, hundreds of wells could be drilled across the area, and possible fracking will take place. Fracking refers to a process whereby underground rock is injected with high-pressure fluid to crack open the rock and release oil, CO₂ and other chemicals which may be toxic. Tons of water is required for this process to occur. This water is often contaminated and cannot be used by people or animals. Some local residents and conservationists are worried that this will use up the limited water supply and cause widespread ecological disruption of the famous Okavango Delta. The biodiversity of this ecosystem may be severely impacted.

By March 2021, three test-well sites were drilled along important migratory routes of the world's largest remaining elephant population. Elephants are very important in any ecosystem as they fertilise the soil with their dung, disperse seeds using their dung and dig up the ground which open up water supplies for other animals. The population of elephants in Namibia is about 25 000. Critics predict that the carrying capacity of the elephant population in Namibia will decrease if the drilling continues for the next twenty years.

Figure 6: The license for oil development covers over 35 223 km² in Namibia and Botswana



[Source: <<https://e360.yale.edu/features/a-big-oil-project-in-africa-threatens-the-fragile-okavango-region>>]

The San are one of five indigenous tribes that live in the Kavango region. They make a living from farming, fishing and tourism. The San use many plants for medicinal purposes, for example, they use all parts of the marula tree to treat conditions like thrush, diarrhoea and bilharzia.



Welwitschia is an endangered plant species that grows in Namibia and Angola. Antelopes and rhino feed on the soft parts of the stems to obtain water. In the coming years, this food resource will reduce even further due to the drilling.

[Source: <<https://worldofsucculents.com/welwitschia-facts/>>]

2.1 Which is the best definition of an '*ecosystem*' in context of the information provided above? **Circle the letter of the correct answer.**

- A The interactions between all the black rhino in the Kavango Basin
- B The interactions between the plants, wild dogs, giraffes, water and soil in the Kavango Basin
- C The interactions between the indigenous people and the medicinal plants in the Kavango Basin

(2)

2.2 2.2.1 Describe the impact of drilling on the water supply in the area.

(2)

2.2.2 Other than the impact on the water supply, list THREE negative effects that the drilling could have in that area.

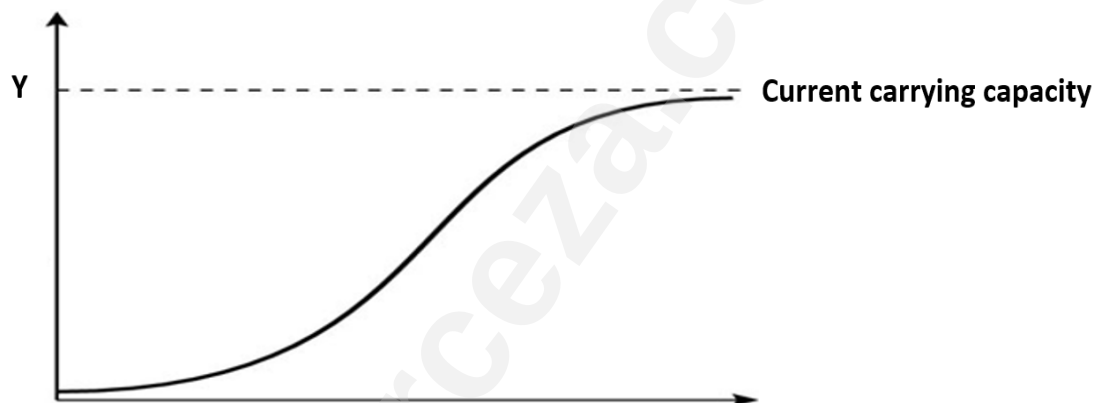
(3)

2.3 State THREE detrimental effects of blocking the migration routes of the elephants.

- 2.4 2.4.1 Provide the meaning of carrying capacity in context of the elephants in the Okavango region.

(2)

- 2.4.2 The carrying capacity of the elephants in Namibia, as it currently stands, is represented in the graph below. The carrying capacity of the elephant population will change in Namibia if drilling continues over the next twenty years.



On the graph above, add the following:

- A dotted line to represent the new carrying capacity of the elephant population. Label this line. (2)
- A graph line to represent the new population growth curve. (1)
- A heading for the graph. (1)
- Labels for the x and y axes. (2)

- 2.5 Using the scale line on **Figure 6**, calculate the diameter of one exploration well site. Show all working and write your answer in metres.

(4)

- 2.6 2.6.1 Should other stakeholders, such as the indigenous tribes living in the area, be consulted before an activity, such as drilling takes place? Provide ONE well explained reason to justify your answer.

(2)

- 2.6.2 Discuss THREE ways in which the drilling could disturb the traditional way of life for the San.

(6)

- 2.7 The African wild dog is one of seven endangered animal species that live in the Kavango region. They require large areas to hunt and are highly vulnerable to habitat loss.

A pack of wild dogs



[Source: <<https://www.thegreatprojects.com/blog/zululand-tembe-wild-dog-pack>>]

- 2.7.1 Explain TWO strategies used by wild dogs to ensure a successful hunt.

(4)

2.7.2 Suggest how drilling will further endanger the wild dog population.

(2)

2.8 2.8.1 What type of competition will exist between the antelope and the rhino for the water obtained from the *Welwitschia* stem?

(1)

2.8.2 Provide the correct biological term that refers to the different use of a resource so that competition is reduced e.g., between the antelope and the rhino.

(1)

2.8.3 Is the lack of food resources for the antelope population considered a density dependent factor or density independent factor?

(1)

2.8.4 List ONE abiotic factor that *Welwitschia* depends on for its survival.

(1)
[40]

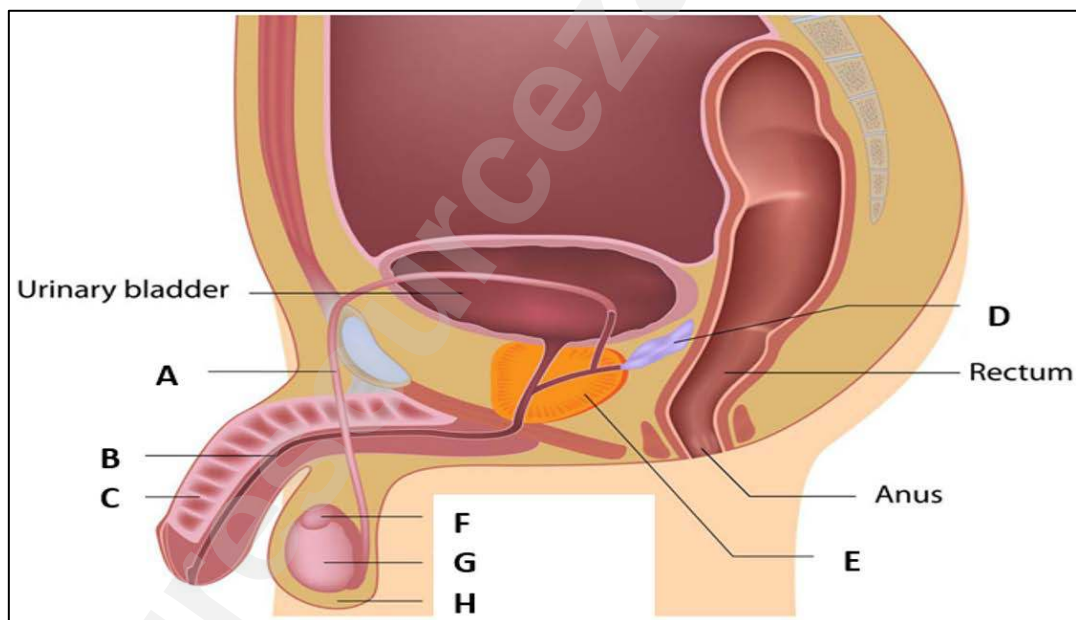
QUESTION 3

- 3.1 Read the information below and use the information and your own knowledge to answer the questions that follow.

Endocrine disrupting chemicals (EDCs) are chemicals that disrupt the functioning of many different hormones in the body. This has been linked to ill health in humans, e.g. alteration in sperm quality and fertility, abnormalities in sex organs and premature puberty. EDCs are found in various household materials for example pesticides and plastics.

There is growing concern over the use of pesticides in agriculture in Kenya, and its impact on human health, especially negative effects on the reproductive organs in males. The volume of pesticide use has increased from 2000 to 2020.

Figure 7: Structure of the male reproductive system



- 3.1.1 Provide labels for A, C and H in the diagram above.

A: _____

C: _____

H: _____

(3)

- 3.1.2 What is the function of structure D?

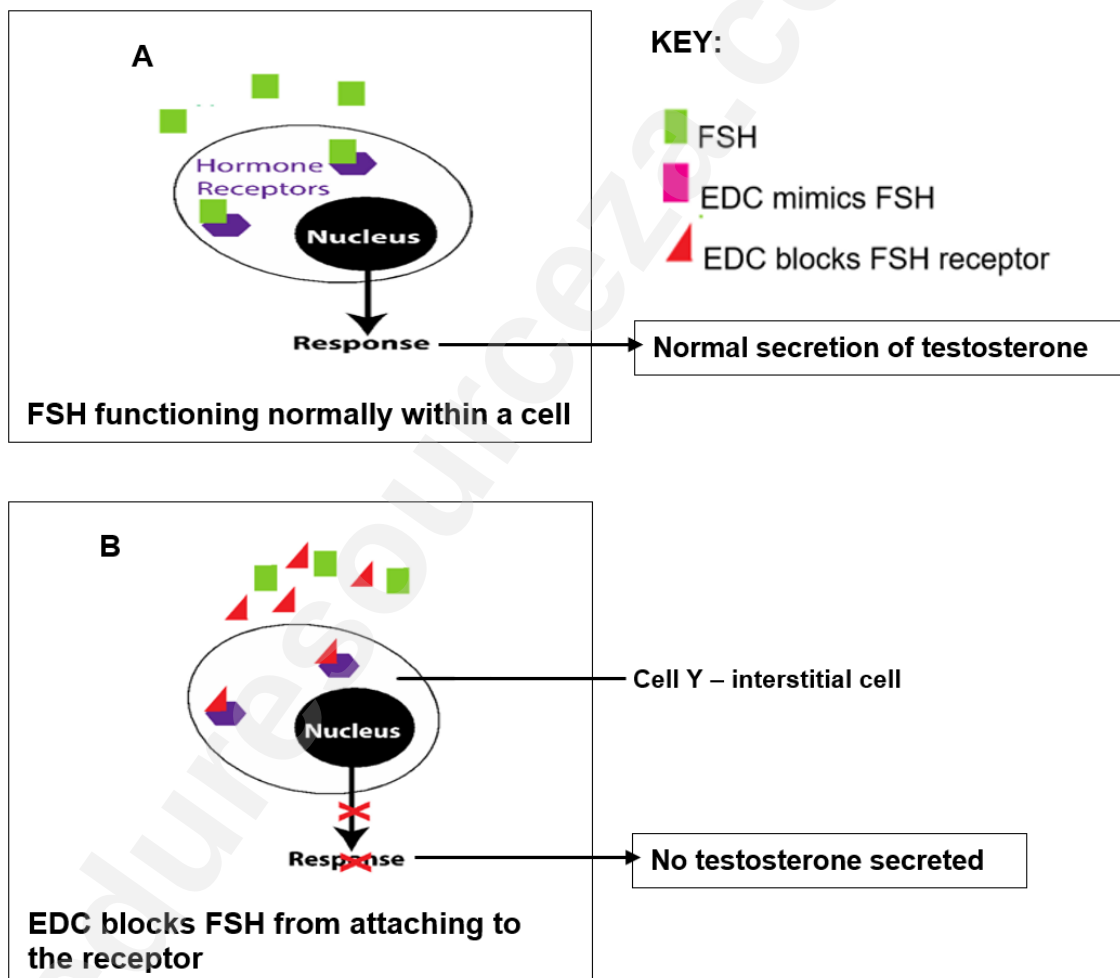
(2)

3.1.3 Name ONE fluid released through structure B.

(1)

3.1.4 Glyphosate is an endocrine disrupting chemical (EDC) that is found in *Roundup*, a pesticide commonly used in Kenya. This EDC affects young boys but can only be seen once puberty is reached. Studies have shown that high concentrations of glyphosate reduce sperm motility, mitochondrial activity and acrosome function.

Figure 8: Glyphosate blocks the FSH receptor in male reproductive cells in the testes, and this interferes with the secretion of testosterone



[Source: <<http://thatslifesci.com/pesticides>>]

(a) What is meant by puberty?

(1)

(b) Provide the letter and name of the structure from **Figure 7 on page 20** where cell Y would be found in males.

(2)

- (c) Refer to image B in **Figure 8** and explain how glyphosate can result in male infertility.

(4)

- (d) (i) In which part of a sperm cell can an acrosome be found?

(1)

- (ii) Provide the function of the acrosome.

(2)

- (e) Explain how high concentrations of glyphosate may result in reduced sperm motility.

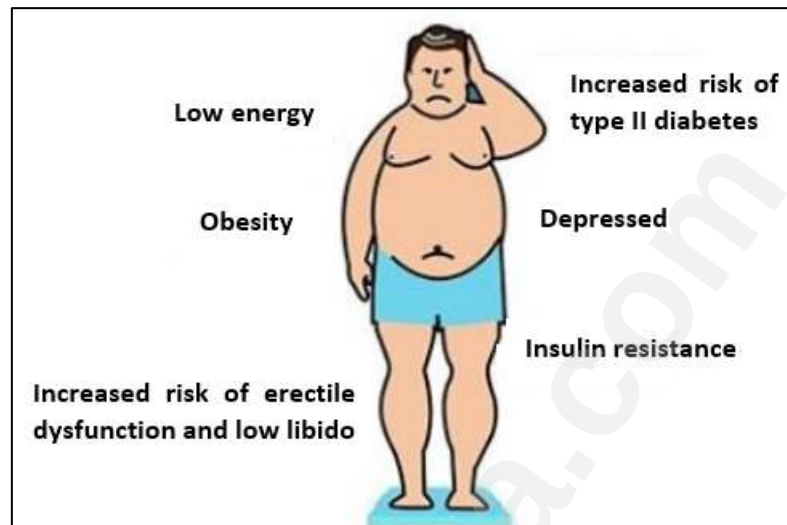
(2)

- (f) Other than the impact on sperm, list TWO male characteristics that can be disrupted at puberty due to over exposure to *Roundup*.

(2)

- 3.2 Men with low levels of testosterone are more likely to develop type II diabetes later in life.

Figure 9: Signs and symptoms of low testosterone levels in males



[Source: <<https://www.med-decisions.com/the-top-signs-of-low-testosterone/>>]

- 3.2.1 Insulin resistance refers to a decrease in insulin sensitivity. Explain how insulin resistance can lead to Type II diabetes.

(4)

- 3.2.2 What is the most natural solution for overweight males to increase their testosterone levels?

(1)

- 3.3 Study the figures below, showing a normal menstrual cycle and a menstrual cycle of a female taking the Oral Contraceptive Pill (OCP), and answer the questions that follow.

Figure 10 (a): Normal menstrual cycle

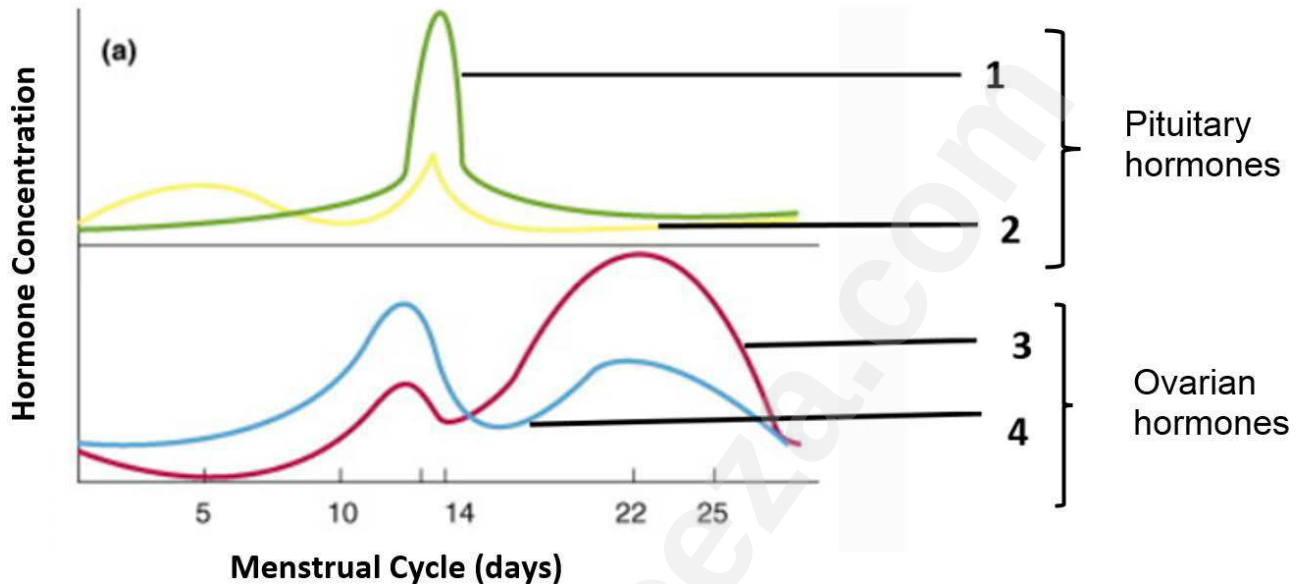
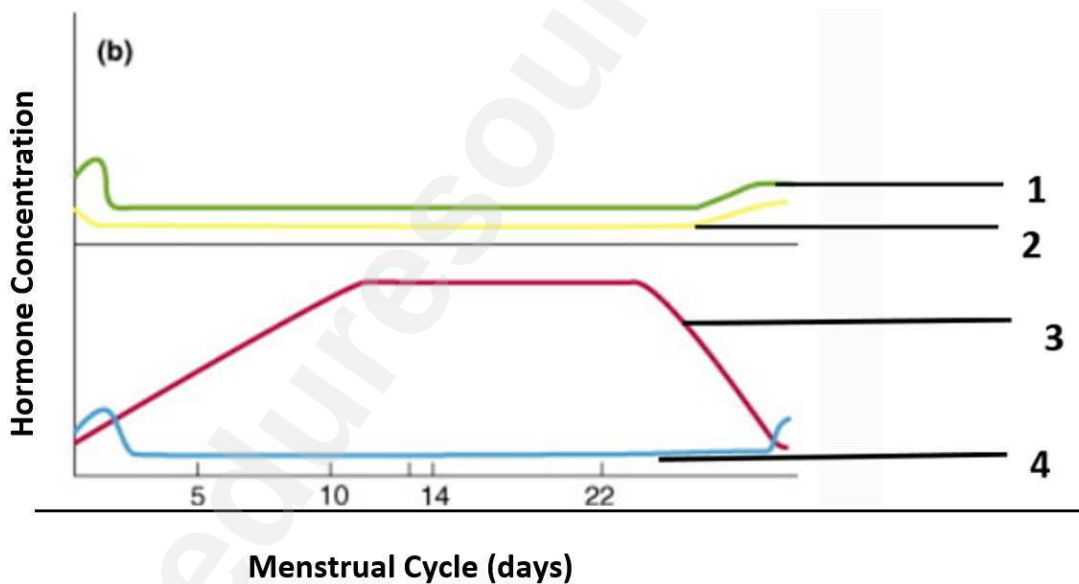


Figure 10 (b): Menstrual cycle of a female on the pill OCP (oral contraceptive pill)



[Source: <[https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347\(09\)00263-8](https://www.cell.com/trends/ecology-evolution/fulltext/S0169-5347(09)00263-8)>]

- 3.3.1 Draw a table of the female reproductive hormones numbered 3 and 4, secreted by the ovaries, shown in **Figure 10a**. Provide the name and ONE function of each hormone in the table.

(6)

- 3.3.2 Refer to **Figure 10** and use your knowledge of the negative feedback of female reproductive hormones, to complete the paragraph that outlines how the Oral Contraceptive Pill prevents pregnancy. Select the words from the list in the text box. Each word may only be used once.

Constant	Ovum	Hypothalamus	Progesterone
Pituitary gland	LH	Fluctuated	Ovary
Oestrogen	Menstruation	Ovulation	FSH
		Graafian follicle	

The contraceptive pill contains two hormones, namely, _____ and _____. When taking the OCP, the levels of these hormones do not fluctuate as in a normal cycle, and the hormones remain _____. Oestrogen inhibits the secretion of _____, by the _____, and this results in no maturation of an _____ in a follicle. High levels of progesterone inhibit the secretion of _____ so _____ does not occur on day fourteen (14). Oestrogen is secreted by the _____ within the ovary.

(9)

[40]

QUESTION 4

- 4.1 **Read the source below and use the information as well as your own knowledge to answer the questions that follow.**

Recent studies show that some African savannah elephants have evolved to be tuskless. It is believed that this is in response to increased ivory poaching. When the civil war took place in Mozambique between 1977 and 1992, fighters slaughtered elephants for ivory to finance the war. Ninety percent of the elephants were poached.

Before the war, a small percentage of the females were tuskless due to a random mutation. However, after the war more than 50% of the females were born tuskless and in each new generation, more tuskless females are being born. It was also observed that males are not born tuskless. If a mother is pregnant with a tuskless male; the foetus is aborted before birth. Tuskless females can still mate with tusked males and produce offspring. After studying DNA from blood samples of seven tusked elephants and eleven tuskless elephants, scientists concluded that the mutation resulting in tuskless elephants is a lethal mutation.

The photo below, taken by ElephantVoices in October 2021, shows some of the tuskless elephants in Gorongosa National Park in Mozambique. A good set of tusks is usually an advantage for elephants since it allows them to dig for water, strip bark for food and defend themselves. However, the tusks became a liability in times of intense poaching.



[Source: <<https://www.npr.org/2021/10/22/1048336907/elephants-tuskless-ivory-poaching-africa>>]

- 4.1.1 Provide evidence from the text to support the following statement:

'The mutation leading to tusklessness is a lethal mutation.'

(2)

- 4.1.2 Identify the selection pressure that drove the evolution of tuskless elephants.

(1)

4.1.3 Evolution usually proceeds very slowly, but human actions can accelerate the process. Tusklessness appeared as a feature over a period of 15 years.

- (a) Is this an example of gradualism or punctuated equilibrium? Explain your answer.

(2)

- (b) Can the tuskless elephant be regarded as a new species of elephant? Provide a well explained reason for your answer.

(3)

4.1.4 Is artificial selection or natural selection responsible for tuskless female elephants? Provide a reason for your answer.

(3)

4.1.5 Explain how Darwin would have described the evolution of tuskless elephants.

(6)

4.1.6 List THREE disadvantages to the elephants of being born tuskless.

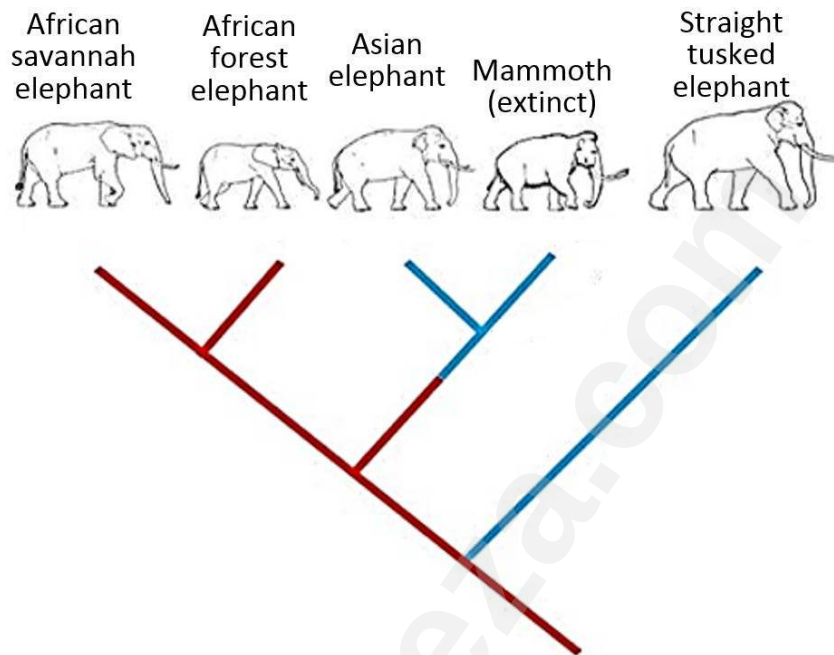
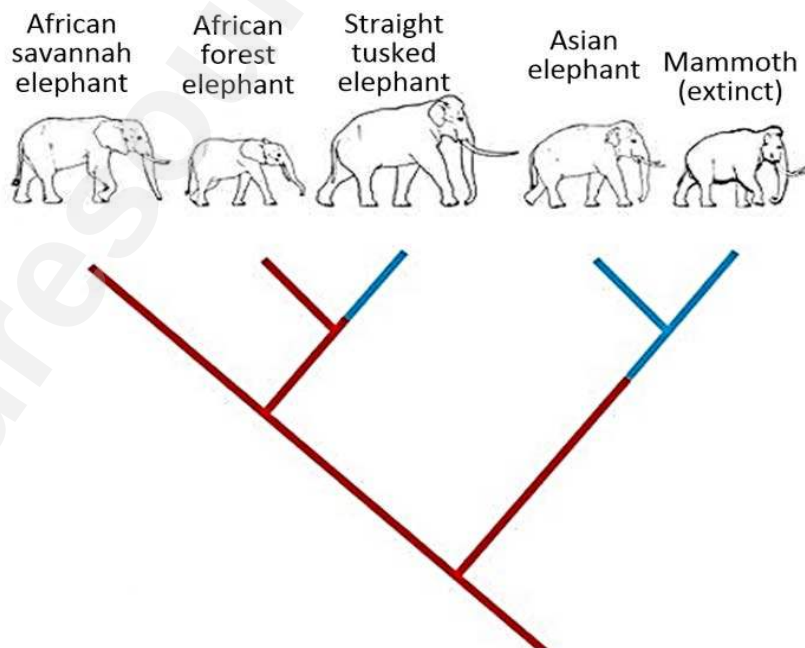
(3)

4.2 Read the source below and use the information as well as your own knowledge to answer the questions that follow.

For a long time, it was assumed only two species of elephants existed: the African elephant and the Asian elephant. Genetic analysis of the African elephant's DNA showed that it can be divided into two distinct subgroups: The African savannah elephant and the African forest elephant. The two groups of elephants diverged due to climate change. When Africa became drier, the forests became smaller. Both African elephant species are still capable of mating with each other and producing hybrids.

Forest elephants inhabit the dense rainforest of central and west Africa. The savannah elephant prefers open country and is found in a range of habitats in southern and eastern Africa.

This discovery is vital for conservation purposes, as new evidence suggests that both species may be facing very different selection pressures and will therefore require different conservation strategies. The African elephant is an endangered species, and the forest elephant is facing an even bigger threat. Their numbers are dwindling quickly due to habitat destruction and poaching.

Figure 11: Two evolutionary trees showing speciation of elephants**A: Evolutionary tree based on fossil evidence****B: Evolutionary tree based on DNA evidence**

— African Lineage

— Asian Lineage

[Source: <<https://theconversation.com/ancient-dna-changes-everything-we-know-about-the-evolution-of-elephants-94426>>]

4.2.1 Provide another name for the evolutionary trees shown in **Figure 11**.

(1)

4.2.2 Identify the TWO pieces of evolutionary evidence that were used to construct the evolutionary trees.

(2)

4.2.3 Using information from **Figure 11 A and B**, explain how each tree is different in its classification of the two species of African elephants.

(4)

4.2.4 Explain why the speciation of the African forest elephant and the African savannah elephant is considered to be allopatric.

(6)

4.2.5 What important information about the future conservation of the African elephant is provided in the source?

(2)

- 4.2.6 Identify ONE conservation strategy that can be put in place to save the African forest elephant.

(2)

- 4.2.7 The statements in the table below indicate some of Darwin's and/or Lamarck's ideas related to the evolution of the elephant.

If the statement applies to Darwin only, write A as your answer.

If the statement applies to Lamarck only, write B as your answer.

If the statement refers to Darwin and Lamarck, write C as your answer.

	Darwin's and/or Lamarck's ideas on the evolution of the elephant.	Answer A, B OR C
(a)	The original African elephant population had varying characteristics and over time their appearance changed as they adapted to changes in the environment, resulting in two new species.	
(b)	All species of elephants had to adapt to a changing environment.	
(c)	The elephants acquired better and more efficient structures by increased use and passed on the acquired trait to their offspring.	

(3)

[40]**Total: 200 marks**

