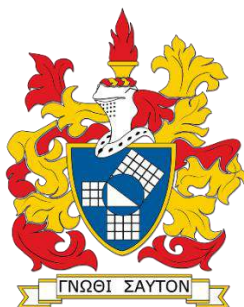




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SAHETI SCHOOL

LIFE SCIENCE

GRADE 12

PAPER 1

EXAMINER : B SOOBRAMONEY

DATE : 12 JULY 2023

MODERATOR : EXTERNAL

HOURS : 3 hrs

MARKS : 200

STUDENT NAME:

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of **40** pages. Please check that your question paper is complete.
2. This question paper consists of four questions.
3. **Answer ALL the questions on the question paper and hand it in at the end of the examination. Remember to write your name in the space provided.**
4. Read the questions carefully.
5. Use the total marks that can be awarded for each of the questions as an indication of the detail required.
6. It is in your own interest to write legibly and to present your work neatly.
7. TWO additional pages (pages 39-40) are included at the end of the paper. If you run out of space for an answer, use these pages. Clearly indicate the number of your answer should you use this extra space.

Marks	Q1	Q2	Q3	Q4	TOTAL	
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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 be used only once.

COLUMN A

- [] Site of fertilization.
- [] Carries deoxygenated blood.
- [] Target organ of prolactin.
- [] Inner membrane that surrounds the embryo.
- [] Hormone that initiates labour.
- [] Maintains a regular temperature around the foetus.
- [] Dilates during labour.
- [] Muscular canal through which the foetus passes during birth.
- [] Surgical delivery of the baby through the abdomen.
- [] Site of implantation of the blastocyst.

COLUMN B

- A Amnion
- B Cervix
- C Endometrium
- D Umbilical artery
- E Caesarean section
- F Vagina
- G Oxytocin
- H Umbilical vein
- I Mammary gland
- J Amniotic fluid
- K Fallopian tube

(10)

- 1.2 Five multiple-choice questions are given on pages 3 and 4. 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
Answer					

Refer to the information below to answer the multiple-choice questions that follow.

Achondroplasia is a rare genetic disorder caused by a mutated FGFR3 gene on chromosome 4. Achondroplasia begins during foetal development when the mutation prevents the body from turning cartilage into bone correctly. The result is abnormal bone growth, short stature, short arms and legs and a large head.

The chromosomes below show the location of the normal (A) and abnormal (a) FGFR3 genes.



Figure 1.1 – Homologous chromosomes showing the location of the normal and abnormal FGFR3 genes.

1.2.1 Which of the following is the best description of the FGFR3 gene?

- A A section of one chromatid.
- B An organised structure containing protein and DNA.
- C A piece of DNA made up of a single codon.
- D A length of DNA that codes for a polypeptide. (1)

1.2.2 The term 'alleles' can best be described as:

- A alternate forms of the FGFR3 gene.
- B the locus of the FGFR3 genes on the chromosomes.
- C the presence of the same form of the FGFR3 gene on the homologous chromosomes.
- D the FGFR3 genes occurring in pairs on the homologous chromosomes. (1)

One of the amino acids that makes up the protein coded for by the FGFR3 gene is leucine.

Codon sequence	Amino acid
CUU	Leucine
CUC	
CUA	
CUG	

1.2.3 Use the section of the amino acid – codon table above to determine what the base sequence on the DNA template for leucine is.

- A CTT
- B GTT
- C GAA
- D CAG

(2)

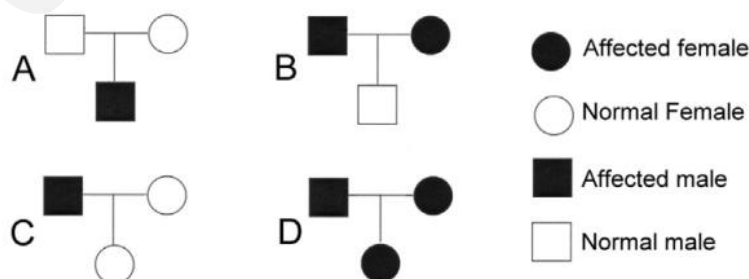
1.2.4 The gene pair on the chromosomes consists of the dominant allele (A) and the recessive allele (a).

If, in 1000 offspring, 500 are aa and 500 are of some other genotype, which of the following are most probably the genotypes of the parents?

- A Aa and aa
- B Aa and Aa
- C AA and aa
- D AA and Aa

(2)

1.2.5 A genetic counsellor wants to draw a family pedigree to represent the inheritance of achondroplasia. Which of the following four pedigrees is NOT possible?



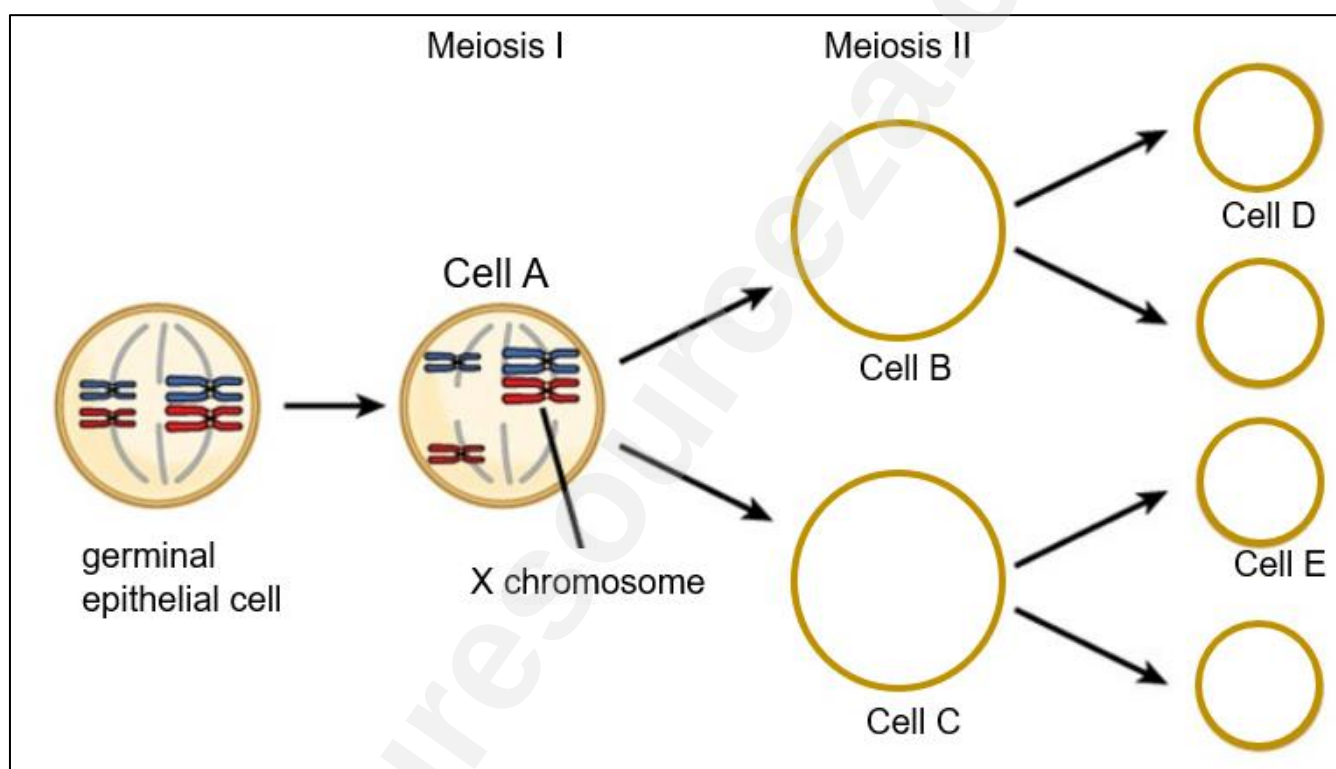
(2)

1.3 Read the information below and use it and your own knowledge to answer the questions that follow.

Triple X syndrome (Trisomy X) is caused because of a pair of sex chromosomes which fail to separate during the formation of a gamete. The condition affects only females. Females who have triple X syndrome have an extra X chromosome.

The simplified diagram below illustrates part of the process of abnormal gamete formation during meiosis in a female. Only two pairs of chromosomes are shown.

Figure 1.2 – Diagram showing abnormal gamete formation during meiosis.



[Image adapted from: <https://www.opentextbooks.org.hk/ditatopic/34793>]

1.3.1 Refer to the germinal epithelial cell.

- (a) The chromosome number of the germinal epithelial cell in the diagram above can be described as diploid. Explain what this means.

(1)

- (b) In what organ is this germinal epithelial cell found?

_____ (1)

1.3.2 Study the cell labelled **A**.

- (a) What is the phase of meiosis taking place at cell A?

_____ (1)

- (b) What should normally occur during this phase?

_____ (2)

- (c) Explain how the chromosome abnormality in cell **A** has occurred.

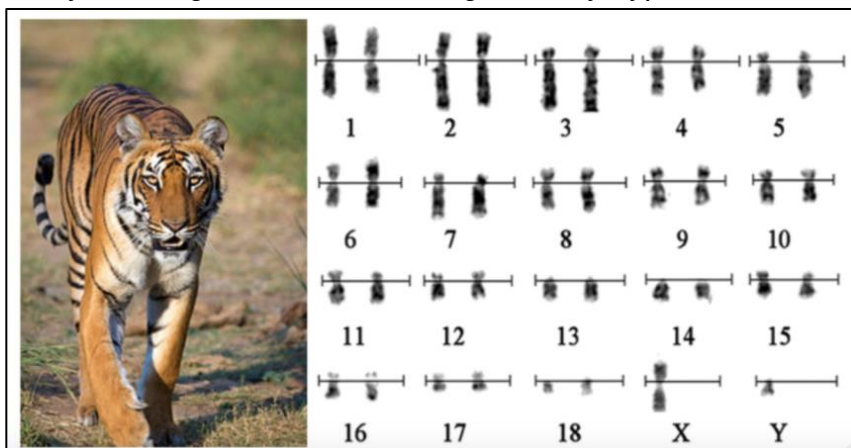
_____ (2)

1.3.3 Complete **Figure 1.2** by drawing the resultant number and shape of the chromosomes in cells B, C, D, and E. (5)

1.3.4 Explain how fertilisation of two gametes produced could result in a person with Triple X syndrome.

_____ (2)

1.4 Study the diagram below showing the karyotype for a cell from a tiger.



[Source: <https://www.chegg.com/homework-help/questions-and-answers/karyotype-panthera-tigris-altaica-shown--ploidy-coefficient-mathrm-c-animal-shown-figure---q102384763>]

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

Select the correct option from the key provided below. Write only the correct letter (A, B or C) in the answer column.

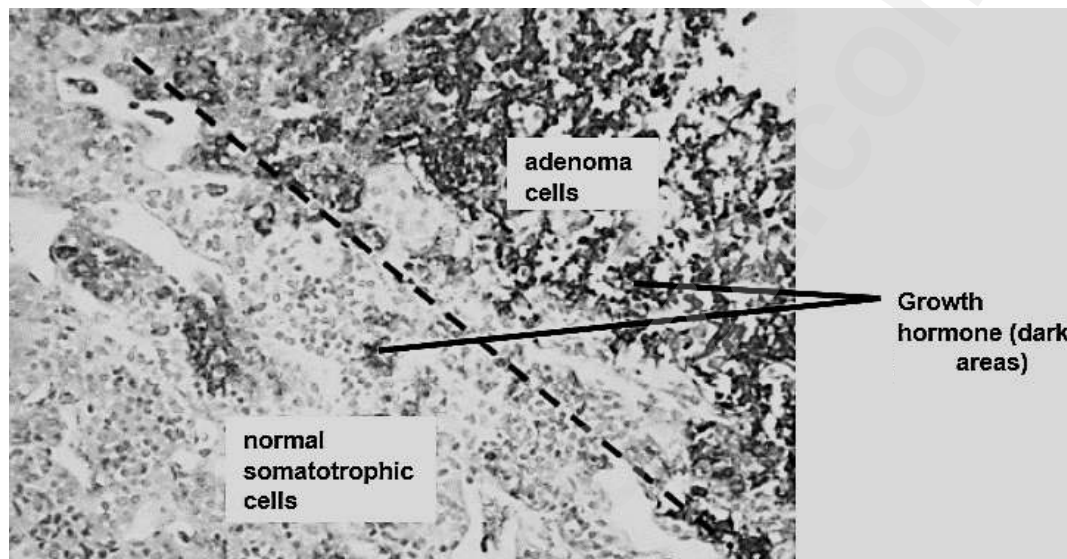
- A Only item 1 is correct.
 B Only item 2 is correct.
 C Neither item 1 nor item 2 is correct.

	Statement	Item		Answer
1.4.1	The gender of the tiger.	1	Female	
		2	Male	
1.4.2	The diploid number from the somatic cell of the tiger.	1	20	
		2	38	
1.4.3	The number of chromosomes in one gamete from the tiger.	1	19	
		2	38	
1.4.4	The DNA of a diploid tiger cell weighs 14 pg (picograms). The mass of the DNA of the tiger cell during Anaphase I is:	1	14 pg	
		2	28 pg	
1.4.5	The number of chromatids per cell in Prophase II.	1	20	
		2	40	
1.4.6	The number of replicated chromosomes that would move away from each other during Anaphase II.	1	19	
		2	38	

1.5 Human Growth Hormone (hGH) is a single-chain polypeptide consisting of 191 amino acids. This hormone is synthesised, stored, and secreted by somatotrophic cells. Human Growth hormone disorders are characterised by either an over-secretion of hGH or a hGH deficiency.

Adenomas are non-cancerous tumours that cause an over-secretion of hGH.

Figure 1.3 – Micrographs of normal somatotrophic cells (bottom left) and cells from an adenoma (top right).



[Image adapted: <https://www.ncbi.nlm.nih.gov/books/NBK425704/>]

1.5.1 Refer to the micrograph above.

(a) In which gland are the somatotrophic cells found?

(1)

(b) What is the difference between the normal somatotrophic cells and the adenoma cells?

(2)

- (c) Why is it important for doctors to know what normal somatotrophic cells look like?

(2)

- (d) If a person develops an adenoma as an adult, describe TWO symptoms this person could have as a result of the over-secretion of growth hormone.

(2)

- 1.5.2 Name and describe the condition caused by an under secretion of growth hormone in children.

(2)

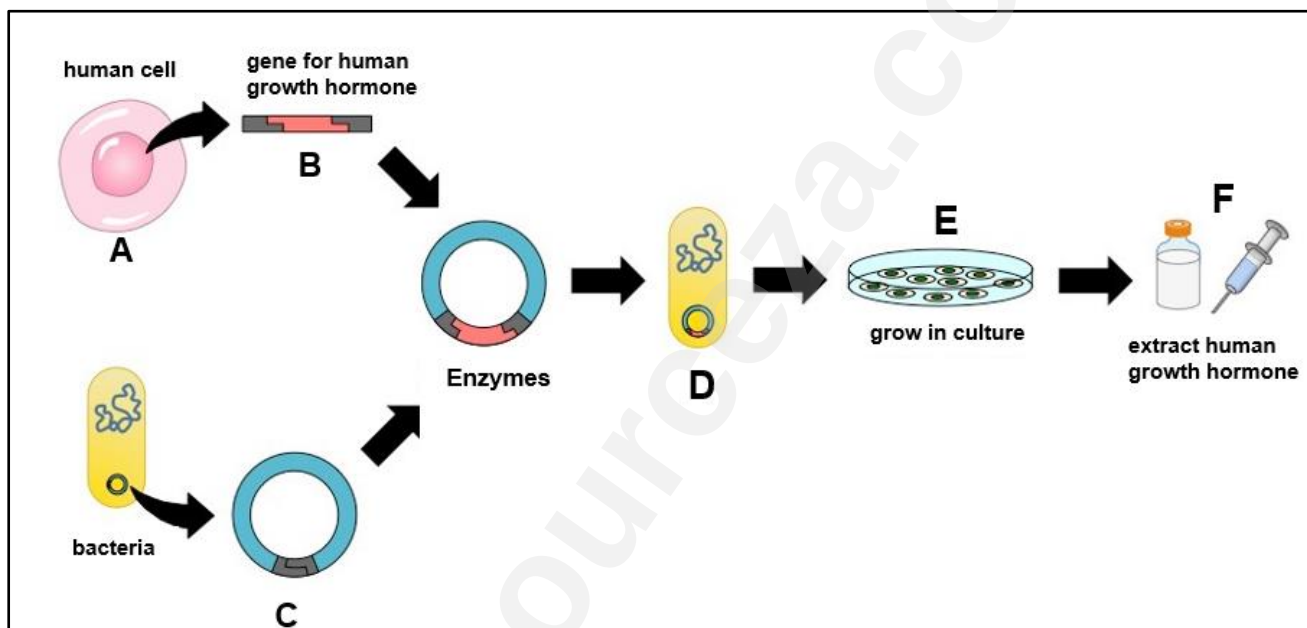
- 1.5.3 Growth hormone is a polypeptide made up of 191 amino acids.
How many nucleotides are needed to produce these amino acids?
Show your working out in the space below.

(2)

1.6 Read the following information and answer the questions that follow.

A recombinant form of human growth hormone called **somatropin INN** is used as a prescription drug to treat children's growth disorders and adult growth hormone deficiency. Somatropin INN is only available legally from pharmacies by prescription from a doctor. Some health care providers are prescribing growth hormone in the elderly to improve their health and energy.

Figure 1.4 – Diagram showing process by which artificial hormones are produced.



[Adapted: <https://ib.bioninja.com.au/standard-level/topic-3-genetics/>]

1.6.1 Name the circular structure at **C**.

_____ (1)

1.6.2 Which letter/s represent transgenic organisms?

_____ (1)

1.6.3 Name the enzyme used to cut the DNA in the human cell to remove the gene for human growth hormone.

_____ (1)

- 1.6.4 Identify FOUR important steps in this process of producing artificial hormones.

(4)

- 1.6.5 Briefly describe how the information gained from the human genome project made the process shown in Figure 1.4 possible.

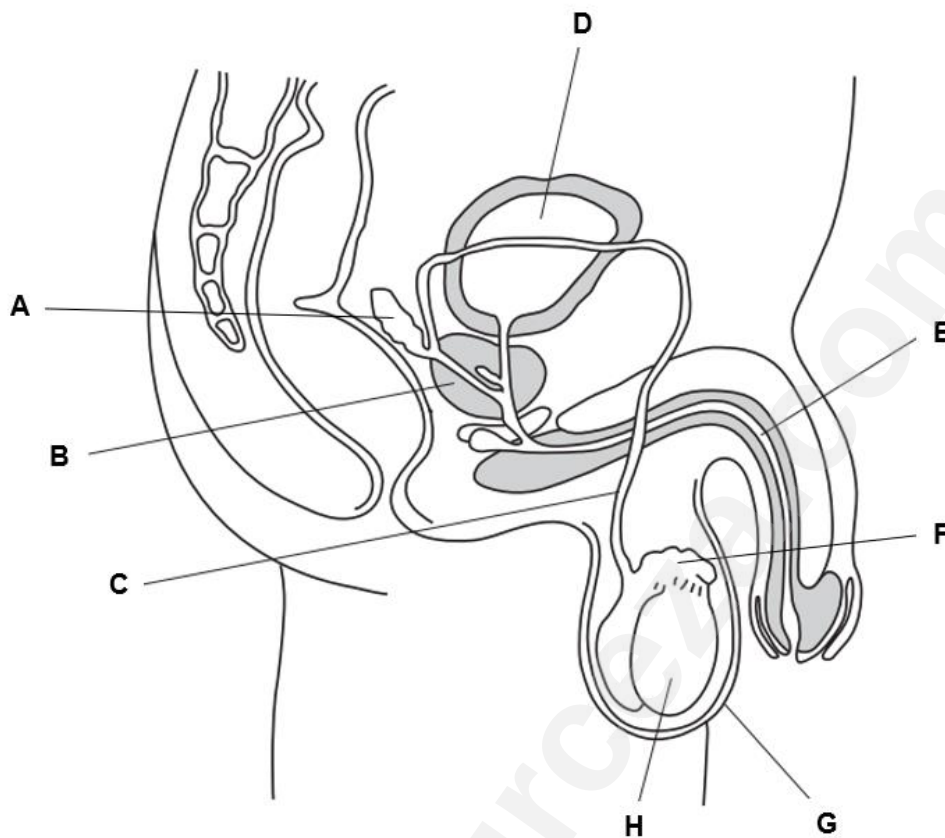
(2)

- 1.6.6 Suggest a reason why somatotropin INN is only available legally if prescribed by a doctor.

(2)

1.7 Refer to the diagram of the male reproductive system and complete the table below.

Match the name of the structure to its function and the label letter of the structure.



Name of structure	Function of the structure	Letter
Testis		
	Transports sperm but not urine.	
		B
	Sperm mature and are stored.	

(8)

- 1.8 Read the information in the text box below and use it and your own knowledge to answer the questions that follow.

The praying mantis mates in a strange way. The female uses pheromones to attract the male. When the male approaches the female, he engages in a courtship dance. If she approves of his dance, he will be able to climb on her back and deposit his sperm into her abdomen, which fertilise her eggs.

Occasionally, she may bite his head off, which only makes him mate more vigorously, increasing the success and duration of copulation. If she eats him, his DNA is more likely to be incorporated into her reproductive tissues (ovaries and eggs), increasing genetic variation of the offspring. In addition, she is provided with more nutrients and energy. The female will then lay up to 300 eggs in a foamy substance which hardens quickly to protect the eggs from predators. The eggs are laid on twigs and are well camouflaged. About one fifth of the offspring will survive to adulthood. The average lifespan of a praying mantis is 10-12 months.

[Adapted: <https://www.australiangeographic.com.au/news/2016/07>]

Figure 1.5 – Praying mantises mating.
The male has no head.



Figure 1.6 - Praying mantis egg case
(foam has hardened around the eggs)



[Images: <https://www.reddit.com/r/oddlyterrifying/comments/xahty8/this_is_what_happens_to_male_praying_mantis_after/> <<https://growingsmallfarms.ces.ncsu.edu/2023/03/challenging-the-conventional-wisdom-about-praying-mantids/>>]

- 1.8.1 In the box below are reproductive strategies used by various organisms. Some are used by the praying mantis.

<i>Internal fertilisation</i>	<i>External fertilisation</i>
<i>Asexual reproduction</i>	<i>Courtship</i>
<i>Vivipary</i>	<i>Ovipary</i>
	<i>Parental care</i>
	<i>Ovovivipary</i>

Choose TWO reproductive strategies (from the box) used by the praying mantis and explain how each ensures successful breeding.

(4)

- 1.8.2 Explain TWO reasons why it is beneficial for the survival of the praying mantis species if the female bites off the male's head during mating.

(4)

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- 1.8.3 Using the information given, sketch the survivorship curve for the praying mantis on the axes below. Provide a heading for the graph and labels for the axes.



(4)

[80]

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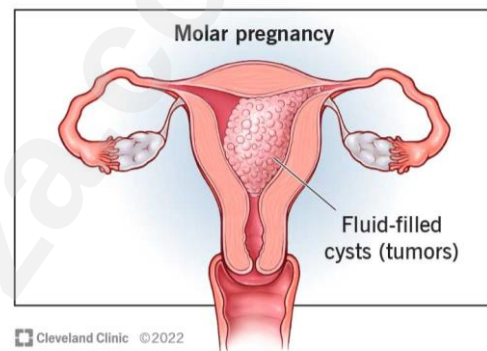
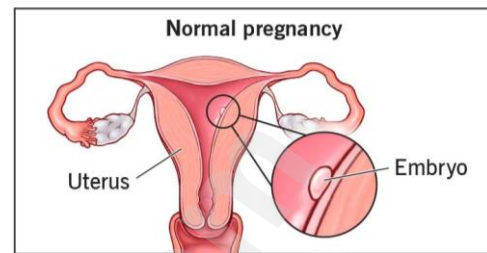
QUESTION 2

2.1 Read the information in the text box below and use it and your own knowledge to answer the questions that follow.

Gestational trophoblastic disease (GTD) occurs when tumours, that look like tiny water-filled sacs, start in the **womb**, after fertilization has occurred. The tumours start off as cells called trophoblasts, which typically develop into the placenta. With gestational trophoblastic disease, the trophoblasts (placenta-like cells) grow abnormally, instead of into a healthy placenta.

Most cases of GTD occur early in pregnancy and form what is called a molar pregnancy. Despite being called pregnancies, these cells don't develop into a foetus. In complete molar pregnancies, no embryo forms. It happens when a sperm fertilizes an empty egg. Since the egg is empty, the embryo can't grow. This tissue still produces the pregnancy hormone, human chorionic gonadotropin (HCG), which is made by a healthy placenta during pregnancy.

These tumours are typically non-cancerous, although some can be cancerous and spread to nearby tissues or organs. Some people may have a miscarriage but if this doesn't happen, surgery is needed to remove the pregnancy. If left untreated, molar pregnancies can cause serious complications.



[Adapted from: <https://my.clevelandclinic.org/health/diseases/17889-molar-pregnancy>;
<https://my.clevelandclinic.org/health/diseases/17889-molar-pregnancy>]

2.1.1 Provide the biological term for the word “womb” which is bolded in the first paragraph of the extract.

(1)

2.1.2 State TWO functions of a fully functioning placenta.

(2)

2.1.3 When fertilisation occurs a zygote is formed, which develops into other structures named in the table below. Put the structures in the correct order by writing the LETTERS of the structures, in the space provided.

A	foetus
B	embryo
C	zygote
D	baby

Answer				
--------	--	--	--	--

(2)

2.1.4 (a) How many chromosomes are found in the resultant cell after fertilization in a molar pregnancy?

(1)

(b) Explain why some people may have a miscarriage when they have a complete molar pregnancy.

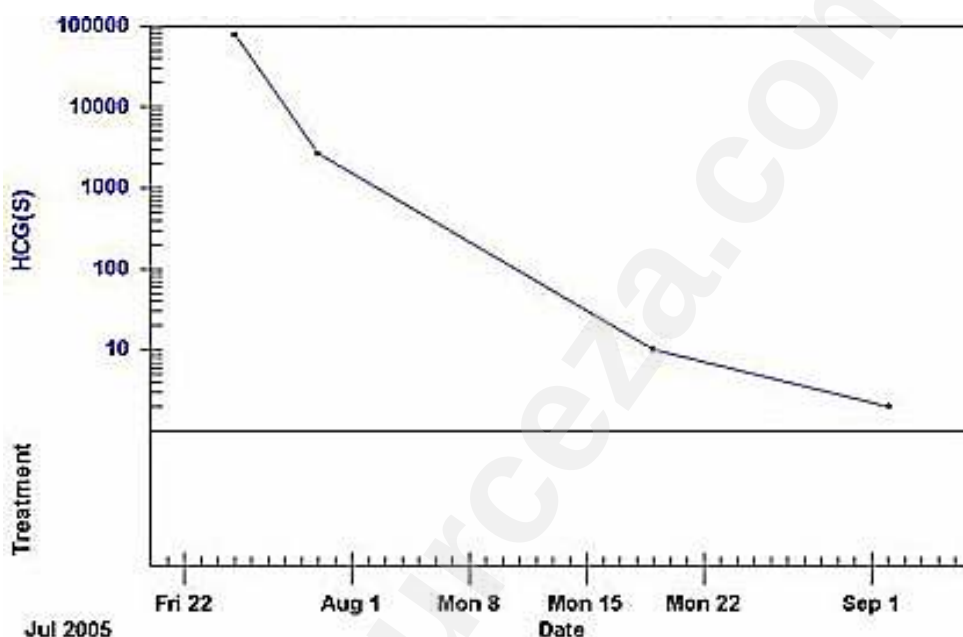
(2)

2.1.5 Explain ONE serious complication that could occur from having a molar pregnancy.

(2)

- 2.1.6 After a miscarriage or when the pregnancy is removed surgically (called an evacuation), the patient's HCG levels may be monitored at two-week intervals for 8 weeks. This is done to make sure no tumour cells remain, which may cause the cancer to spread to other organs. If the HCG levels fall rapidly within 8 weeks, then no chemotherapy treatment is needed.

The graph below shows the HCG levels for a patient after a complete molar pregnancy was removed.



[Adapted from: https://www.hmole-chorio.org.uk/patients_info/patients_info_followup/]

- (a) What month and year was the complete molar pregnancy removed?

_____ (2)

- (b) What were the HCG results of the patient on 1 September?

_____ (1)

- (c) Does this patient require chemotherapy? Give a reason for your answer.

 _____ (2)

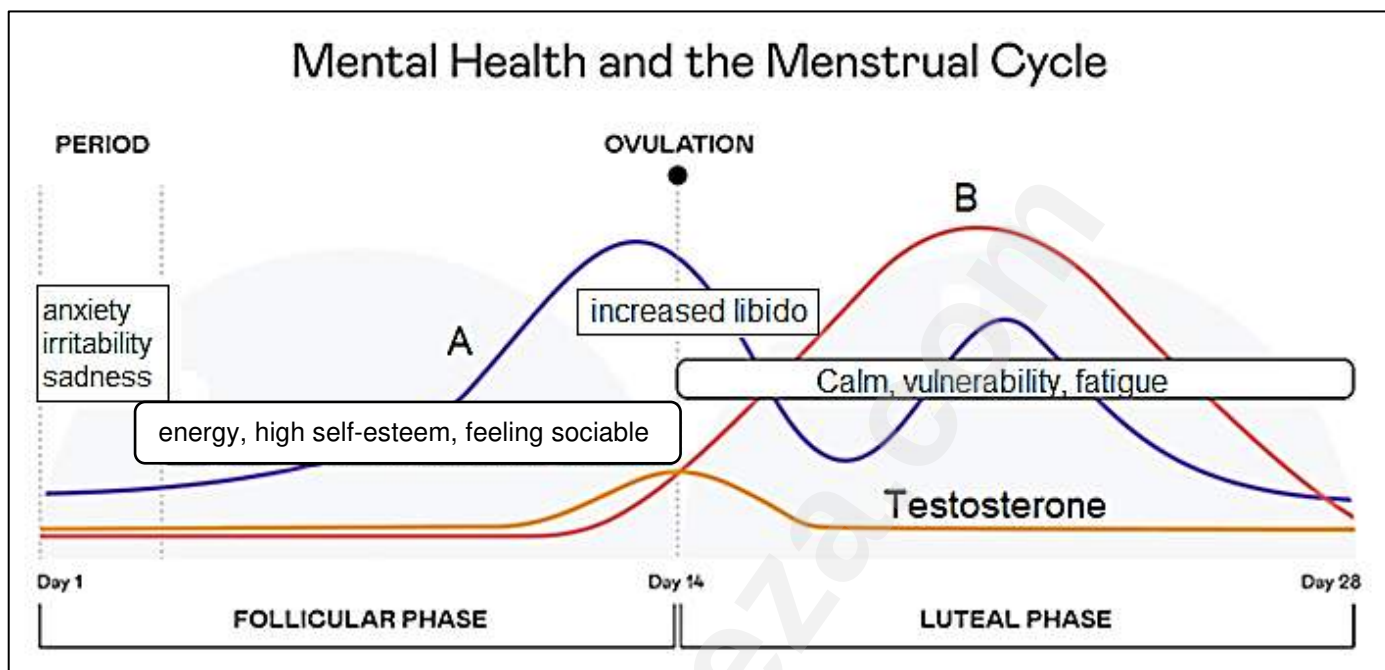
- 2.1.7 There are times when gynaecologists send patients for HCG testing after a miscarriage or evacuation, without explaining to the patient the actual reasoning for the blood tests (could have been a molar pregnancy). Give a reason why you think gynaecologists may do this.

(2)

- 2.1.8 Do you think that not telling the patient the actual reason for the follow-up HCG tests is ethical? Explain your answer.

(3)

2.2 The graph below shows the mental health effects caused by three hormones: testosterone, progesterone and oestrogen at different times during the menstrual cycle.



[Adapted from: <https://blog.tuune.com/hormones/mental-health-and-the-menstrual-cycle>]

2.2.1 Which hormone from the graph above is **mainly** responsible for:

- (a) low energy levels _____ (1)
- (b) high energy levels _____ (1)
- (c) an increase in libido (sex drive) _____ (1)

2.2.2 Explain why there is an increase in a females' libido (sex drive) close to day 14.

(2)

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2.2.3 During days 7-14 an increase in hormone A causes an increase in another hormone. Explain this feedback loop, mentioning the structures which are involved.

source2a.com

2.3 The table below shows some of the benefits and risks associated with the contraceptive pill.

Benefits	Risks
99 % effective when taken correctly	Depression
Decreases risk of certain cancers	Blood clots in legs and lungs
Decreases severity of cramps	Headaches, nausea, breast tenderness
Aids with acne	Changes in libido
Potential protection against osteoporosis	Bleeding between periods

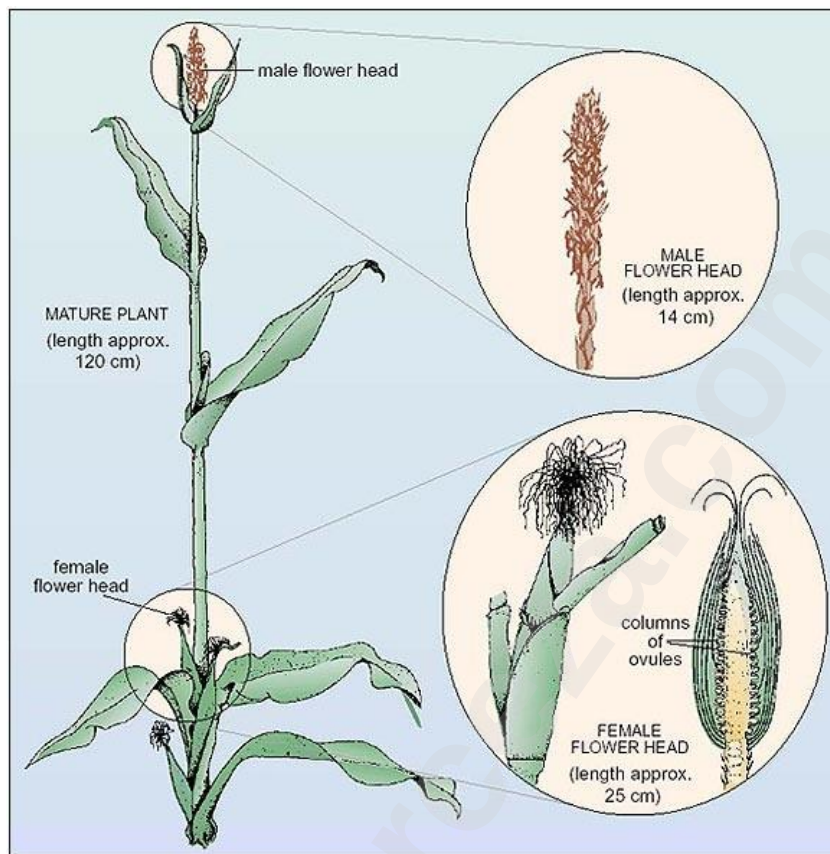
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2.3.1 A young adult is struggling with severe cramps and heavy periods. Her doctor has suggested that she take the contraceptive pill. Using the table on page 21, decide whether you agree with the doctor. Give well explained reasons for your answer.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. A faint, diagonal watermark reading "ceza.com" is visible across the center of the page.

2.3.2 The same young adult is no longer experiencing severe cramps and heavy periods and has decided to stop using the contraceptive pill, but is looking at using another method of contraception. Which other method would you suggest she use and why?

2.4 Study the diagram of self-pollination of corn below and answer the questions that follow.



[Source: <https://steemit.com/promo-steem/@alaoabdulhaleem/structure-and-pollination-of-maize-zea-mays>]

2.4.1 Explain the difference between self-pollination and cross pollination.

(2)

2.4.2 Is self-pollination of corn considered to be sexual or asexual reproduction? Give a reason for your answer.

(2)

- 2.4.3 Corn is a vital staple crop that feeds a significant proportion of the world's population. Explain the importance of having the seeds of different corn species in a seed bank.

(2)

[40]

QUESTION 3

- 3.1 Read the following information on Mitochondrial DNA Depletion Syndrome (MDDS) and answer the questions that follow.

MDDS is characterised by severe reduction in the quantity of mitochondria in various muscle tissues, resulting in mitochondrial myopathy (muscle weakness). Mitochondria are important as they provide cells with almost 90% of energy for them to function efficiently.

MDDS is caused by genetic errors in genes found within nuclear DNA (nDNA). These genetic errors affect a single gene found on chromosome 16 – the *TK2* gene. The *TK2* gene provides instructions for making an enzyme called thymidine kinase 2 which is made up of 264 amino acids. Thymidine kinase 2 plays a role, within the mitochondria, in the synthesis of mitochondrial DNA (mtDNA) building blocks so that mtDNA can be maintained and replicated. For a person to develop MDDS, two copies of the faulty gene must be inherited. It is also possible for the gene to randomly mutate in early stages of the embryo.

Early-onset of MDDS, which affects 1 in 5 000 infants and children, is most severe and often fatal in the first two years of life. Muscle weakness can result in breathing difficulty which can lead to respiratory failure. There is no cure for MDDS, but genetic testing can be used to identify the syndrome. Some of the symptoms can be treated by mitochondrial supplement medications consisting of amino acids, antioxidants, and vitamins. Scientists have commenced with clinical trials looking into CRISPR and gene therapy, as a means of treating the syndrome.

[Source:<<https://www.chop.edu/conditions-diseases/mitochondrial-depletion-syndrome>>]

[Source:<<https://medlineplus.gov/genetics/condition/tk2-related-mitochondrial-dna-depletion-syndrome-myopathic-form/>>]

3.1.1 From your **own knowledge**, provide the correct biological term for the following phrases found within the text:

(a) "genetic errors" _____ (1)

(b) "mtDNA building blocks" _____ (1)

3.1.2 Provide evidence from the text that proves the pattern of inheritance for MDDS is:

(a) autosomal: _____ (1)

(b) recessive _____ (1)

3.1.3 Discuss, with reference to the function of the mitochondria, why MDDS results in muscle weakness.

_____ (3)

- 3.1.4 State whether the following statements in the table below are True or False. If false correct the underlined word, by rewriting the correct word in the last column on the table.

	Statement	True or False	Correct word if False
a)	MDDS is caused by a mutation within the <u>mtDNA</u> .		
b)	The TK2 gene contains <u>88</u> nitrogenous bases.		
c)	MDDS is caused by a <u>point mutation</u> .		
d)	Thymidine kinase 2 enzyme is produced by <u>protein synthesis</u> .		

(6)

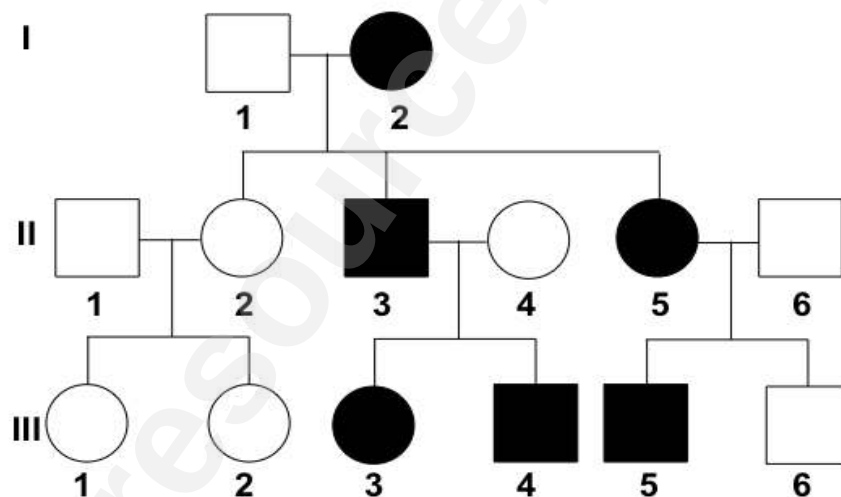
- 3.1.5 Explain the process of translation that occurs at the ribosome to produce thymidine kinase 2 enzyme.

(4)

- 3.1.6 Discuss how a genetic error within the TK2 gene results in the occurrence of MDDS.

(4)

- 3.1.7 The following pedigree chart shows the pattern of inheritance for MDDS in a family. Study the pedigree chart to answer the questions that follow.



Using the letters D and d, answer the following questions:

- (a) Provide the genotype for individuals:

I – 1 : _____ (1)

III – 3: _____ (1)

- (b) Individual III – 6 marries a female that is affected with MDSS. Using a Punnett square and a genetic diagram, show the probability of this couple having another child with MDSS. Show all phenotypic and genotypic ratios. (5)

- (c) The parents were advised to speak to a genetic counsellor before they planned their next pregnancy; they chose to ignore this advice. Was this a wise choice?

Support your answer by using evidence from:

- **your Punnett square**
- **the text**
- **your own knowledge**

(3)

(d) What is a genetic test?

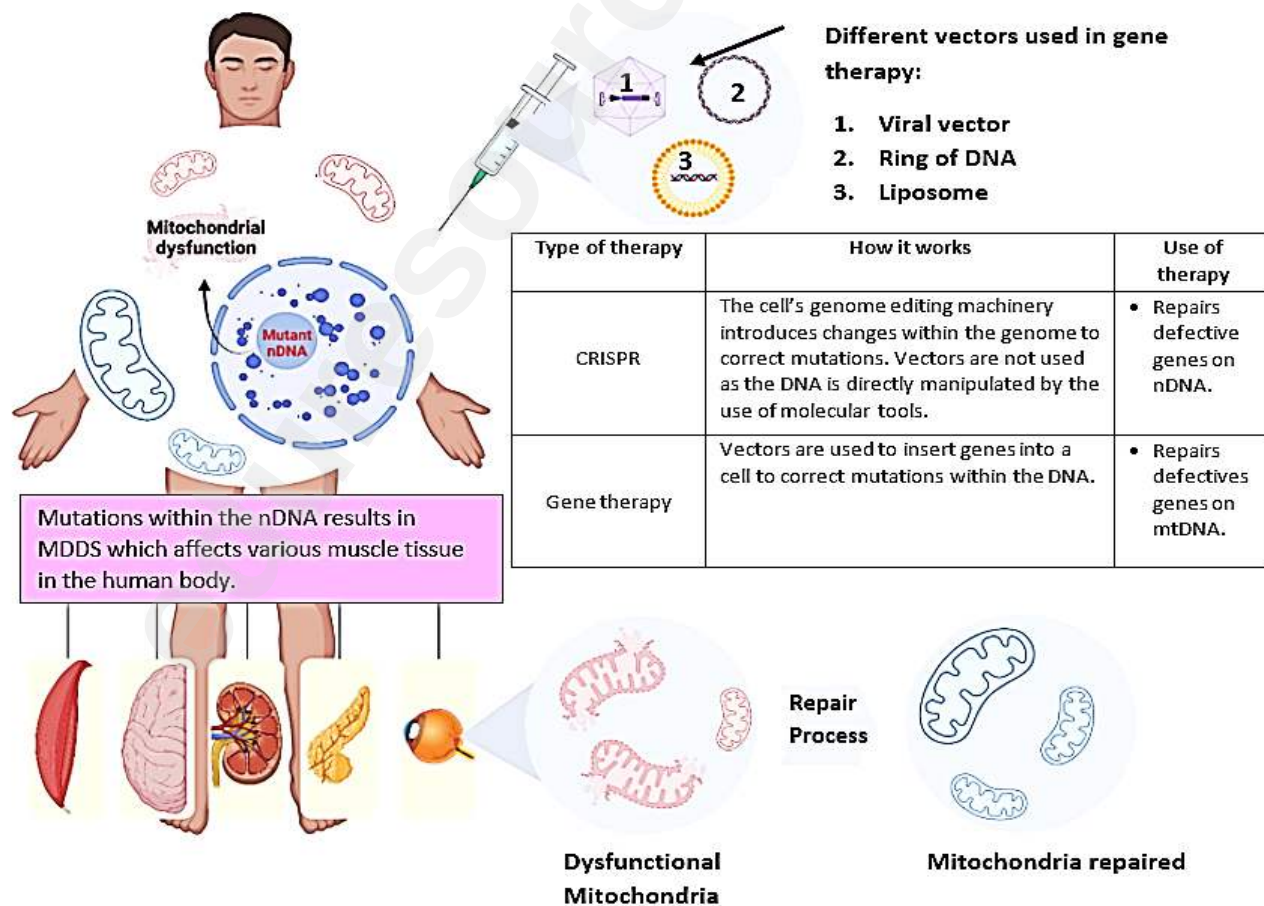
(2)

(e) Can MDDS be picked up on a karyotype? Explain your answer.

(2)

3.1.8 Refer to **Figure 4** to answer the questions that follow.

Figure 4: Different Interventions for Gene Repair



[Source: <<https://translational-medicine.biomedcentral.com/articles/10.1186/s12967-022-03685-0#Sec4>>]

- (a) Which therapy can be used to treat MDDS?
- _____ (1)
- (b) Name the enzyme used in the therapy mentioned in (a) above.
- _____ (1)
- (c) Provide ONE difference between the two types of therapies shown in **Figure 4** on page 29.
- _____
- _____ (2)
- (d) Why is it important for clinical trials to be carried out on treatments like CRISPR?
- _____
- _____ (1)

[40]

QUESTION 4

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



One of the world's worst invasive species, the troublesome Indian myna, has rapidly infiltrated the Kruger National Park over the past 20 years, worrying conservationists.

The aerial invaders have a strong preference for urban areas and usually do not expand into natural areas. The number of mynas has grown dramatically over the last few years. They are known to be a fairly aggressive species and seem to be in an initial phase of setting up.

In the Kruger, some of the concerns include the aggressive competition with other birds for nesting sites and potentially feeding on eggs and the young of other birds. They have also been observed taking nesting material from other birds' nests or taking over native birds' nests, for example, the red-billed buffalo weaver. While it appears some mynas have established themselves in the Kruger, it is quite difficult to state exact numbers. Some birds seem to move into the park in summer and out in winter, so it is not certain if they are permanent residents or spend part of the year in the park, but this has not been tested scientifically.

[Adapted: [https://mg.co.za/environment/2022-10-31-indian-mynas-are-taking-wing-in-the-kruger-national-park-and-scientists-are-concerned/#:~:text=via%20Getty%20Images\),One%20of%20the%20world's%20worst%20invasive%20species%2C%20the%20pesky%20Indian,past%2020%20years%2C%20worrying%20conservationists](https://mg.co.za/environment/2022-10-31-indian-mynas-are-taking-wing-in-the-kruger-national-park-and-scientists-are-concerned/#:~:text=via%20Getty%20Images),One%20of%20the%20world's%20worst%20invasive%20species%2C%20the%20pesky%20Indian,past%2020%20years%2C%20worrying%20conservationists)]

- 4.1.1 Why would the myna prefer to nest in urban areas as opposed to natural areas?

(1)

- 4.1.2 Provide TWO reasons why conservationists are concerned about the myna's presence in the Kruger National Park.

(2)

- 4.1.3 State ONE measure conservationists could take to decrease the numbers of the myna in the Kruger National Park.

(2)

- 4.1.4 (a) The exact numbers of myna in the Kruger National Park have not been estimated. What would be a suitable method to estimate the population numbers?

(1)

- (b) An ecologist wanted to estimate the number of mynas found in the Kruger National Park. Approximately 300 mynas were sighted, captured and tagged in March 2023 and then released. A month later 230 were caught, of which only 50 were tagged. Work out the estimated population size of the myna. Show all your working out.

(4)

- 4.1.5 (a) Name the type of competition that exists between the myna and the red-billed buffalo weaver.

_____ (1)

- (b) The red-billed buffalo weaver would have had to use certain strategies to avoid competition with other birds living in the Kruger National Park. Explain the strategies it could use in order to survive.

_____ (4)

- (c) Draw a simple graph to show how the red-billed buffalo weaver and any other bird species (species X), would find ways to co-exist in the Kruger National Park. (4)



4.1.6 Ecologists want to carry out an investigation to see if the myna moves into the park in summer and out in winter, as the source states that it has not been scientifically proven whether the myna is a permanent resident of the Kruger National Park or not.

- (a) State the hypothesis that could be used to test this.

(2)

- (b) State the independent variable that the scientists would be testing for.

(2)

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



A red-billed buffalo weaver nest

[Source: https://live.staticflickr.com/6198/6041784294_2e3dd02cca.jpg]

The red-billed buffalo weaver has been observed in small family groups or in large flocks. Males tend to be polygamous (having more than one mate) and control anywhere from one to eight nest chambers with three females. Typically, there is one dominant male who controls the most chambers and the most females. The males in lower social positions control fewer chambers and fewer females. These males will defend their chambers and females by showing aggressive displays and giving loud calls. However, two males sometimes cooperate with each other to build the nest, defend their territory, and help feed the chicks.

[Adapted: https://en.wikipedia.org/wiki/Red-billed_buffalo_weaver]

4.2.1 The red-billed buffalo weaver's nests are under threat from the myna. Although the myna is not a predator of the weaver, how could the weaver avoid this threat as well as threats from other predators by living in a flock?

This image shows a blank sheet of white paper with horizontal ruling lines. A diagonal watermark with the text "urceza.com" is visible across the page. The watermark is light gray and slanted from the bottom left towards the top right. There are ten horizontal lines spaced evenly down the page.

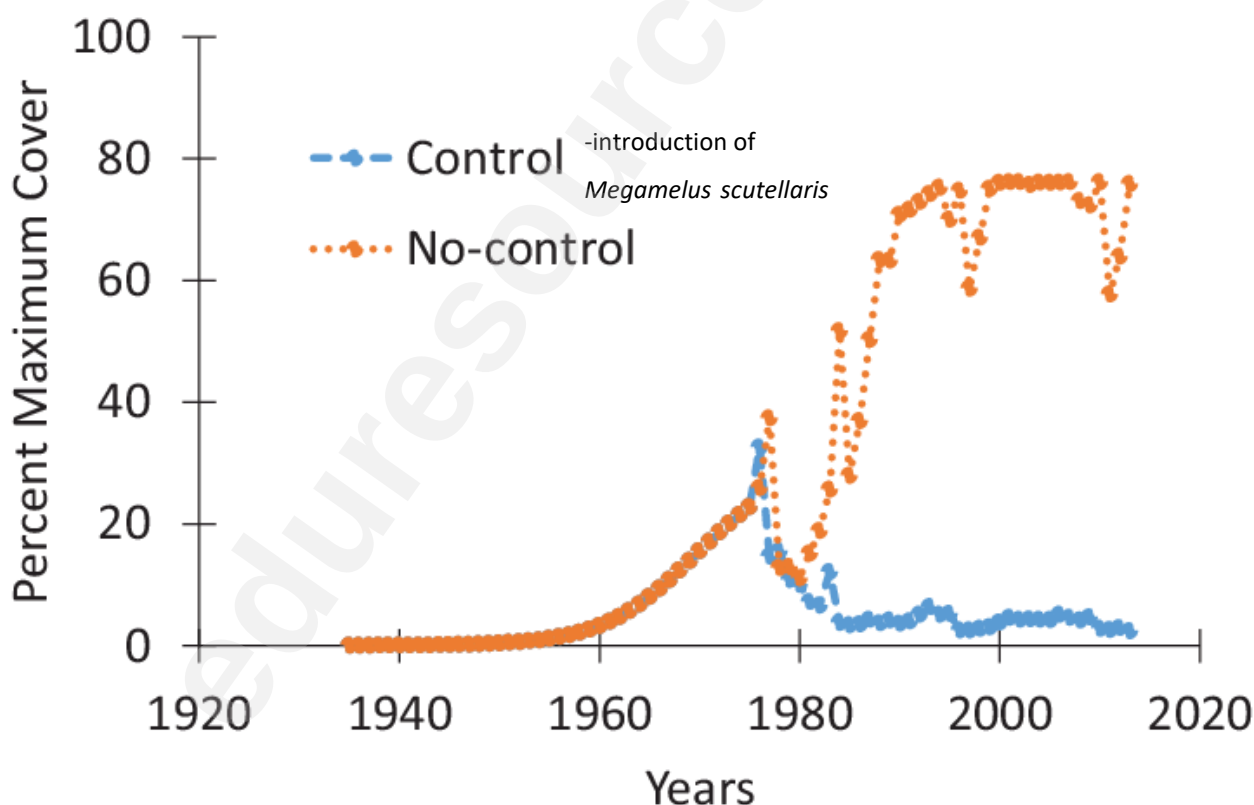
4.2.2 Why is it beneficial to the red-billed buffalo weaver to have one dominant male?

4.2.3 There is a co-operative relationship that exists between the dominant male and the males in lower social positions. State TWO reasons why this is beneficial to the survival of the red-billed buffalo weaver?

- 4.2.4 State THREE density dependent factors that would limit the size of the red-billed buffalo weaver population.

(3)

- 4.3 The graph below shows a simulation of the effect of a method used to control the number of invasive water hyacinth in the Hartbeespoort dam. Water hyacinth is commonly considered the most harmful aquatic weed in the world. Scientists and community members have, however, found a unique way to deal with the invasion by introducing a water hyacinth eating bug called *Megamelus scutellaris*. The tiny insects are the natural enemy of the plants. Both are originally from the Amazon basin in South America and the insects are released by the thousands at a time.



[Adapted: <https://www.timeslive.co.za/news/south-africa/2023-03-01-scientists-deploy-insect-army-in-war-against-water-hyacinth-weed-at-harties/>]

https://www.researchgate.net/figure/Simulation-of-fall-water-hyacinth-density-through-time-with-and-without-control_fig1_325322841

4.3.1 Describe the trend in the graph.

(2)

4.3.2 Why would the water hyacinth flourish in the absence of the *Megamelus scutellaris*?

(2)

4.3.3 Invasive species are replacing the once dominant species in climax communities. Discuss TWO measures that the government or conservationists could take to prevent this from happening.

(2)

[40]

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ADDITIONAL SPACE (ALL QUESTIONS)

REMEMBER TO CLEARLY INDICATE AT THE QUESTION NUMBER THAT YOU USED THE ADDITIONAL SPACE TO ENSURE THAT ALL ANSWERS ARE MARKED.

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