LIFE SCIENCES: PAPER II

Time: 2½ hours   150 marks

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PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 9 pages and a yellow Answer Booklet of 5 pages (i – v). Please check that your question paper is complete. Detach the yellow Answer Booklet from the middle of your question paper.

2. This question paper consists of five questions.

3. Question 1 must be answered in the yellow Answer Booklet. Questions 2, 3, 4 and 5 must be answered in your Answer Book.

4. Read the questions carefully.

5. Number the answers exactly as the questions are numbered.

6. Use the total marks that can be awarded for Questions 1, 2, 3 and 4, as an indicator of the amount of detail required.

7. It is in your own interest to write legibly and to present your work neatly.

8. Please hand in this question paper.

QUESTION 2

2.1   Use this diagram below to answer Questions 2.1.1 and 2.1.2.
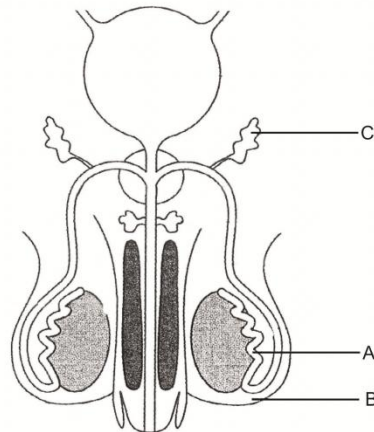
        2.1.1   Supply a suitable heading for the diagram above.   (3)

        2.1.2   Identify and state ONE function of each of the structures A, B and C shown
                on the diagram above.   (6)

        2.1.3   Distinguish between the terms 'erection' and 'ejaculation'.   (2)

        2.1.4   Draw a diagram of a sperm clearly showing the three regions.
                Add labels X, Y and Z to the structures that carry out each of the following
                functions in your drawing. No other labels are necessary.
                X – ensures the sperm can 'swim' to the egg.
                Y – encloses the haploid genetic material.
                Z – provides large amounts of energy.   (6)

2.2   Read the article below and then answer the questions that follow.

Anti-HIV gel welcomed – Breakthrough for women and HIV

Durban husband and wife team, Professors Salim and Quarrisha Karim, have headed
the University of KwaZulu-Natal research that tested a vaginal gel containing an anti-
HIV drug. The gel proved to protect 39% of the 900 women in South Africa who were
part of the clinical trial. This breakthrough was announced at the 18th International AIDS
Conference in Vienna.

"This new technology has the potential to alter the course of the HIV epidemic,
especially in southern Africa where young women bear the brunt of this disease," said
Karim.

A senior World Health Organisation official said, "It's the first time we have something
that gives women the possibility to take control. But no HIV prevention medicine would
ever be 100% effective."

One challenge of the high rate of HIV infection in the patriarchal (male dominated)
societies in South Africa is that many women are unable to reduce their risk of infection
because many men refuse to use condoms.

        [Adapted from two articles in *The Citizen* 21 July 2010 pp 9, 12]

2.2.1   Where in the female body is the new anti-HIV gel applied? (1)

2.2.2   Why is the HIV gel 'proudly South African'? (2)

2.2.3   Why would the author of the article say that the gel is a 'breakthrough for women'? (3)

2.2.4   Do you think that a '39% success rate' is sufficient in the fight against HIV? Explain your answer. (3)

2.2.5   Describe TWO other actions (not in the article) a person should take to prevent HIV infection during sexual activity. (4)

[30]

QUESTION 3

3.1   The graph below shows the concentration of glucose in a person's blood one hour before and four hours after eating 50 g of glucose.

Note: The line A to B represents the normal blood-glucose concentration in the one hour before eating.
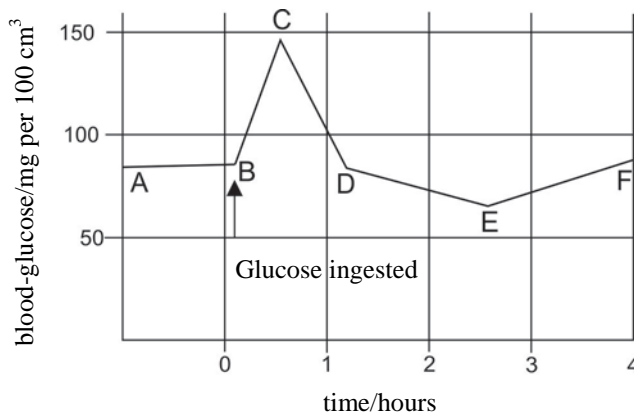
3.1.1   How long did it take the blood-glucose level to return to normal, after the glucose was ingested? (2)

3.1.2   Why did the blood-glucose level rise after point B? (3)

3.1.3   Estimate the blood-glucose concentration at point C. (2)

3.1.4   Explain what has happened in the person's body between points C and D to bring the blood-glucose level down. (4)

3.1.5   What caused the blood-glucose concentration to increase between E and F? (3)

3.2   The flow chart below illustrates a process of feedback control involving the endocrine system.
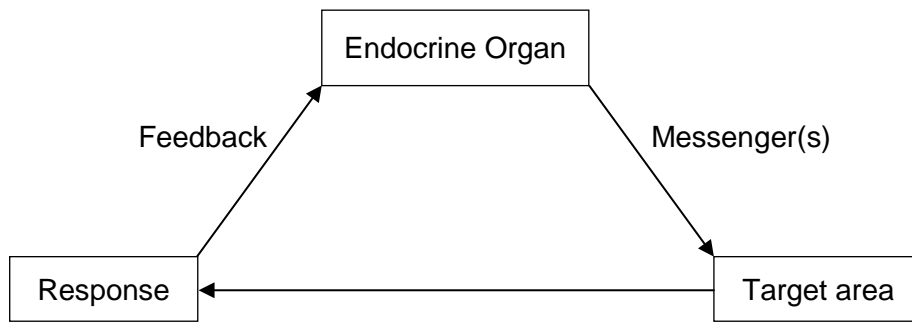
An example of this feedback system occurs in the female human body in connection with the levels of **progesterone** which circulates in the blood.

    3.2.1   For this example, name the 'endocrine organ', the 'messenger(s)' and then the 'target area' within the ovary before ovulation. (4)

    3.2.2   Describe in detail the target area's response to the messenger(s). (4)

    3.2.3   How does the feedback ensure there is not a second fertilisation whilst the individual is pregnant? (4)

3.3   Over the past few years our knowledge about hormones has increased greatly. We know more about how they control growth, development and maintain various processes in the body. A number of moral and ethical questions have now arisen in terms of the extent to which this knowledge should be used to improve human lives.

Should HRT (Hormone Replacement Therapy) be used to increase fertility in women who cannot have children?

Should HRT be used in women at menopause to improve their quality of life?

State your opinion and justify your answer with regard to each of the two questions above. (4)

[30]

QUESTION 4

Kudu   Springbuck

A game farmer in the Northern Cape had kudu and springbuck on his fenced farm. There were mice and mongoose colonies living on the farm which formed part of the territory of a pair of black eagles. A borehole supplied the animals with water all year round. Herding dogs ensured that there were no large predators on the farm. The mongooses' diet consists of insects, frogs, bird eggs and rodents.

The following data was collected over twenty years. Use the information to answer the questions below.

Size of Animal Populations on a Northern Cape Farm

Year	Kudu	Springbuck	Mongoose
1991	0	0	102
1992	4	20	97
1996	10	36	95
1999	12	52	101
2001	15	70	100
2003	19	100	96
2005	21	96	98
2007	24	105	107
2009	21	100	102
2011	20	96	98

4.1   In which year did the farmer introduce kudu and springbuck?   (1)

4.2   Why are the kudu referred to as a 'population'?   (2)

4.3   A population size is affected by a number of factors.

    4.3.1   State TWO factors that will **not** influence the size of the kudu and springbuck populations.   (2)

    4.3.2   State TWO factors that will influence the size of the mongoose population.   (2)

4.3.3   Suggest a population control factor the farmer might use with the springbuck population. Explain the benefits of the suggested control factor to the springbuck and to the farmer.   (5)

4.4   4.4.1   Sketch a graph to show the growth of the kudu population.   (4)

      4.4.2   What would you consider to be the kudu carrying capacity of the farm?   (1)

      4.4.3   Suggest a possible reason for the large numbers of buck in both populations in 2007.   (2)

4.5   4.5.1   Using the information above, draw a diagram to show a possible food web on the farm showing feeding relationships.   (6)

      4.5.2   Is there competition between the mongooses and springbuck? Explain your answer.   (3)

      4.5.3   In your opinion is this farm conserving or destroying the indigenous ecosystem? Justify your answer.   (2)

[30]

QUESTION 5

'A census is a waste of time and money.'
Do you agree with this statement?

Read the source material carefully and present a debated argument to illustrate your point of view.

To answer this question you are expected to:

- Select relevant information from sources A to G below. Do not attempt to use all the detail provided.
- Integrate your own relevant biological knowledge. However, do not write an essay based solely on your own knowledge.
- Take a definite stand on the question and arrange the information to best develop your argument.
- Write in a way that is scientifically appropriate and communicates your point of view clearly.

[20]

Write an essay of not more than 1½ to 2 pages to answer the question.

SOURCE A

Press release 10 October 2010

Statistics South Africa is ready for Census 2011 Big Count

In 365 days' time all people within the borders of South Africa will be counted on the night of the 9th to 10th October 2011 in the biggest census ever conducted in this country.

This census is set to provide the most comprehensive picture of South African society and economy. For years Africa has lagged behind in matters of statistics but now South Africa, through Statistics South Africa, has played an important role in getting Africa to conduct population counts.

The total cost of conducting Census 2011 is more than a billion rand. Statistics South Africa has received R1.2 billion to run the census, but the organisation still needs a further R700 million.

More than 120 000 field workers will be employed to conduct the big count, which will cover more than 14 million households in the country.

[Adapted: Statistics South Africa 10 October 2010]

SOURCE B

Frequently asked questions

Why do we need to have a census?
The information collected will give planners in South Africa an accurate picture of how many people are living in the country, their living conditions and access to basic services. It will tell them what resources such as education, health care, housing and transport are needed.

Do I have to participate?
A census attempts to collect data from everyone, unlike a survey which only collects data from a sample. A census is the only source of human community data which is critical in planning. Legally, section 16 of the Statistics Act (Act 6 of 1999) obliges respondents to answer all questions put to them by an officer of Statistics South Africa.

How long does it take to fill in the questionnaire?
About 35 minutes for a small household.

When will the results of Census 2011 be available to the public?
The final results will be available in March 2013.

[Taken from: <http://www.statssa.gov.za/census2011/faq.asp>]

SOURCE C

AfriForum makes an appeal to the public to support Census 2011 – it will encourage the promotion of Afrikaans

With reference to Census 2011, which starts today, civil rights group AfriForum made an appeal to the public to support the census. It is important that the data collected is complete and accurate. AfriForum is grateful to Statistics South Africa for ensuring that all South African languages including Afrikaans have been accommodated.

AfriForum also appealed to all Afrikaans speaking people to ask for Afrikaans census forms. "The more Afrikaans forms people use, the more it will be evident that there is a need in this country for service delivery in Afrikaans," said Alana Bailey. She reminded people who feel strongly about the future of their mother tongue to clearly indicate their language preference on the census form.

[Adapted from: AfriForum press release 10 October 2011]

SOURCE D

Ethics, Confidentiality and Data dissemination

In an article Hermann Habermann questioned the US Census Bureau's commitment to the confidentiality protections of the Census Law, and the extent to which statistics are used to the detriment of certain populations. It is important to recognise that such issues undermine public trust in census processes.

[Adapted from: Hermann Habermann Deputy Director, US Census Bureau]

How do I know that my information will not be sold or made available to other organisations such as SARS? Whilst there may be a fine of R10 000 for fieldworkers found guilty of making personal information public, how often are people actually caught and convicted for doing such things? This census is an invasion of my privacy. They are even asking questions about what appliances I have in my house – next minute thieves will arrive to help themselves!

[Anonymous respondent]

SOURCE E

Elephant census

Thousands of rangers and volunteers have climbed into treetop huts near watering holes in Sri Lanka to carry out the island nation's first full count of its wild elephant population. The government says the three-day census is aimed at devising a plan to protect the elephants.

In the 1900s the wild elephant population was thought to be between 10 000 and 15 000 animals. But poaching and deforestation for farming has resulted in more wild elephants entering villages in search of food and the wild elephant numbers are now estimated to be about 5 000.

Officials say the census will give an estimate of the wild elephant population as well as information about the structure of the population, that is the proportion of calves, juveniles, adults, males and females.

But several conservation groups have boycotted the count, accusing the government of using it as a 'smoke screen' for capturing and domesticating the best young animals for use in temples, tourism and labour.

[Adapted from: < http://www.timeslive.co.za/world/2011/08/12>]

Census data reveals the plight of lions in Africa
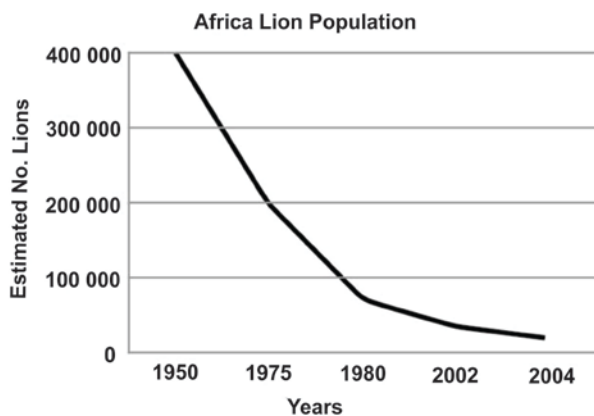
[Graph 1: Africa Lion Population. Source: Myers (1975), Ferreras and Cousins (1996), Chardonnet (2002), Bauer and Van Der Merve (2004)]
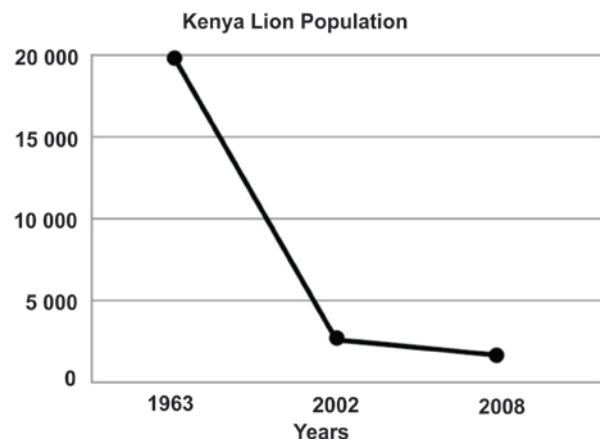
[Graph 2: Kenya Lion Population. Source: Omondi (2009)]

About 20 – 30 years ago there were up to 75 000 lions in all of Africa, but today only a maximum of 25 000 individuals remain. In Kenya only about 1 800 lions survive with an estimated loss of 100 lions each year.

[Adapted from: <http://www.mnlp.org/the-mara-naboisho-lion-project>]

Total: 150 marks