



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2013

**LIFE SCIENCES: PAPER II**

Time: 2½ hours

150 marks

---

**PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY**

1. This question paper consists of 11 pages and a yellow Answer Booklet of 6 pages (i – vi). Please check that your question paper is complete. Detach the 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 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, which 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 interests to write legibly and to present your work neatly.
-

**QUESTION 2**

2.1 The thyroid gland is an endocrine gland in the human body.

2.1.1 Where in the body is the thyroid gland found? (2)

2.1.2 Name the hormone the thyroid gland produces. (1)

2.1.3 Why are hormones released directly into the blood? (1)

2.1.4 State the functions of the hormone produced by the thyroid gland in the human body. (2)

2.1.5 The production of the thyroid hormone is stimulated by another hormone.

(a) Name the stimulating hormone. (1)

(b) From where in the body is the hormone in Question 2.1.5 (a) released? (1)

2.1.6 Describe the cause and TWO symptoms of ONE of the following conditions:

Cretinism OR  
Myxoedema OR  
Grave's Disease

(4)

2.2 A literary review revealed that laughing is related to adrenalin production.

An investigation was carried out during which six stressed people were questioned and their blood pressure was measured.

The results of the investigation are tabulated below.

**Results of investigation into the effects of laughing**

Person	Before laughing		After laughing	
	General feeling	Blood pressure mmHg	General feeling	Blood pressure mmHg
1	Anxious	130/90	Good	120/82
2	Irritated	135/91	Relaxed	122/80
3	Angry	145/100	Peaceful	135/90
4	Tired	132/98	Good	125/85
5	Up-tight	138/94	Chilled	130/86
6	Worried	128/85	Great	118/78

[Examiner's observations]

Study the information provided in the table.

Draw THREE generalised conclusions you can deduce from this investigation. (6)

- 2.3 Read the information below and then answer the questions that follow, referring to the article and your own knowledge.

**Blazing or Grazing – the great fire debate**

Fire is a natural ecological process that has occurred for millennia on the grasslands of Africa. Prof. Winston Trollope explains, "The African continent is prone to lightning fires and has an ideal fire climate with dry and wet periods. African ecosystems evolved in the presence of early man who has been burning for more than a million years." His research in the Kruger National Park showed that lightning accounted for 10% of grassland fires, while 90% were caused by humans. Whilst fire, humans and herbivores may have evolved together, there are differing schools of thought as to whether the use of fire as a management tool, in the form of prescribed burning, promotes or undermines grassland conditions. Prof. Trollope believes that managed burning is critical to the wellbeing of grasslands.

Holistic grazing pioneer Allan Savory counters this approach saying that burning is a key contributor to the decline and desertification of grasslands. He thinks fire is used excessively by some farmers and this contributes to soil erosion.

[Adapted from: *Farmer's Weekly*, 7 December 2012]

- 2.3.1 According to the article why does the African continent have an ideal fire climate? (2)
- 2.3.2 What percentage of fires in the Kruger National Park is caused by lightning? (1)
- 2.3.3 Describe ONE example of humans causing fire in the Kruger National Park. (2)
- 2.3.4 Briefly describe the process of succession after a fire in grassland. (3)
- 2.3.5 Suggest why:
- (a) Prof. Trollope believes that managed burning is critical to the well-being of grasslands. (2)
  - (b) Allan Savory says burning contributes to soil erosion. (2)

**[30]**

**QUESTION 3**

3.1 Read the information below and then answer the questions that follow.



[<www.westerncapebirding.co.za>]



[<birdguide.com>]

### **The Denham's bustard**

Denham's bustard is a large bird and males can weigh up to 8 kg, making this bustard one of the heaviest flying birds in the world.

Denham's bustards are found in the moist eastern and southern parts of South Africa where they are seen in farmlands not far from natural veld (grasslands).

To attract a female, males gather together in a 'lek', a regularly used display area in natural grassland. They fluff out the white feathers of the neck and breast creating a bright white 'balloon' visible for more than 2 km.

One or two eggs are laid in a small hollow on the ground within a kilometre of the 'lek' in tall vegetation so as to hide the female who incubates the eggs. The female rears the chicks. Bustards are likely to abandon a nest and chicks if they feel it's been discovered by humans or other animals.

[Adapted from: *Farmer's Weekly*, 7 December 2012]

- 3.1.1 What is a 'lek'? (2)
- 3.1.2 Does the male use 'display' in courtship? Explain your answer. (3)
- 3.1.3 Does the male courtship place the male in danger? Explain your answer. (2)
- 3.1.4 Describe ONE threat that you would consider to be a problem to the Denham's bustard's reproductive strategy. (3)
- 3.1.5 Write down the correct option which applies to the Denham's bustard.
- (a) external fertilisation OR internal fertilisation
  - (b) foetus in the uterus OR amniotic egg
  - (c) no parental care OR some parental care OR excellent parental care (3)

- 3.2 The hunting successes of a pack of wild dogs were studied. The table below shows the number of hunts carried out and the percentage of hunts that resulted in a kill.

**Wild dog hunts and kills**

Prey species	Number of hunts	% of hunts resulting in one kill
Zebra	50	10
Impala	70	30
Wildebeest calves	70	25

- 3.2.1 Which of the following conclusions could be supported by the data in the table and your own knowledge? Write down the letters of all the correct statements.

- A Wild dogs killed more impala than any other prey species shown in the table.
- B Cooperative hunting allowed the wild dogs to hunt successfully.
- C Zebra successfully used social organisation as a defence mechanism.
- D More wildebeest calves escaped than any other prey species shown in the table.

(3)

- 3.2.2 Explain briefly the cooperative hunting methods of the wild dog for a successful kill.

(4)

- 3.3 As a biologist you have been asked to give a talk on the importance of seeds as food. Various seeds were analysed to determine their value as a food source. The results are presented in the table below.

**Food values of 250 ml of several seeds**

250 ml seeds	Food energy (kJ)	Protein %	Oils (unsaturated fats) %
Almonds	3254	13	91
Coconut	2216	7	9
Peanuts	4230	17	80
Sunflower seeds	3750	15	87

- 3.3.1 Briefly describe how a seed is formed in a flowering plant.
- 3.3.2 Draw the basic outline of a pie chart to show the % protein in the different seeds as a proportion of the varieties researched. Label each segment.
- 3.3.3 Using the information in the table, compile THREE factual statements you would tell an audience about seeds as a food source.

(3)

(4)

(3)

**[30]**

**QUESTION 4**

4.1 4.1.1 Define intraspecific competition in a human population. (2)

4.1.2 Give ONE example of interspecific competition, involving a human population, and explain the consequences of the competition. (4)

4.2 Marion Island and Prince Edward Island lie in the Southern Indian Ocean between Cape Town and Antarctica. These young volcanic islands form part of South Africa's Western Cape Province. The only vegetation on the islands is lichen, moss and ferns. There are no trees. The islands are populated with elephant seals, fur seals, penguins and other bird species. The main diet of all the animals is fish.

[Source: <www.sanap.org.za>]

4.2.1 All the animals on the islands live in colonies (which are similar to herds). In which way could this type of social organisation help the individuals to survive? (3)

4.2.2 Why are there no trees on the islands? (1)

**Killer whale predation on fur seals at Prince Edward Island**

The authors of an article in *Polar Biology* report on killer whale observations at Prince Edward Island during March 2012. During 3 days of observation at a fur seal colony on the island, killer whales were sighted on six occasions. During all sightings, individuals were seen hunting fur seal pups. Four successful predatory events were observed.

[Adapted from: *Polar Biology* Vol. 35, Issue 11, pages 1 767 – 1 772]

4.2.3 What type of sampling method was used to obtain the data? (1)

4.2.4 Define predation. (3)

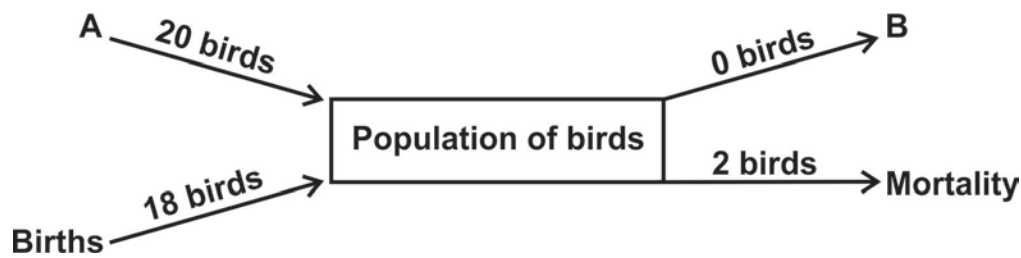
4.2.5 In the article above identify the:

(a) predator

(b) prey (2)

4.2.6 Explain how the relationship between the killer whale and fur seal regulates the populations. (4)

4.3



**Diagram representing population parameters during summer time at a nesting area of migratory birds**

- 4.3.1 Provide labels for the population parameters A and B. (2)
- 4.3.2 Define mortality. (1)
- 4.3.3 Redraw the diagram above for winter time in the nesting area with appropriate estimate bird numbers on each arrow. (4)
- 4.3.4 Describe the interaction between the parameters if the population of birds is showing positive growth over three years in the example above. (3)

**[30]**

## QUESTION 5

**'For those couples who are not capable of having children, surrogate motherhood is the best option.'**

- 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 E 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.

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

**[20]**

**SOURCE A****Treatment for infertility**

Treatment for infertility can be the use of hormone therapy, change in lifestyle, the option of adoption, in-vitro fertilisation (IVF) and other treatments.

In-vitro fertilisation is used for women who have no viable eggs, in which case donor eggs are used, or for couples who cannot conceive naturally. Eggs are removed from an ovary and they are then fertilised outside the body with the partner's sperm. The fertilised eggs are placed in the woman's uterus and left to implant in the endometrium. This may not be successful or some couples may end up with twins or triplets. This is a very expensive treatment, takes up a lot of the couple's time and is emotionally exhausting.

Sometimes fertilised eggs are implanted in women who are not the biological mothers. They have volunteered to go through a pregnancy for another person and are known as surrogate mothers.



[Source: Google Images]

**SOURCE B****Stories of various people****A gay couple**

The couple have found a surrogate mother to carry their child. The donor egg will be fertilised by sperm from one of the partners by in vitro fertilisation and then implanted in the surrogate mother who will give birth to their baby. The couple is very excited.

**Helping a sister**

Jackie's sister has had her uterus removed due to cancer. After in vitro fertilisation several embryos were produced from her sister's eggs and husband's sperm. Jackie has offered to carry the baby (babies) for her. Jackie's husband is concerned about her decision, but has agreed to support her.

**Confused couple**

Eli says that she and her husband cannot have children since both her oviducts are blocked. They cannot decide what to do next. Eli would like to adopt a baby whereas her husband wants to try in vitro fertilisation. Eli knows that it is very expensive and that there is only a 30% chance of success.



**Source B continued**

[<www.fitpregnancy.com>]

**Suzie claims the baby she has carried for 9 months!**

She says she has fallen in love with the baby whom she felt kicking and moving inside and she will NEVER give him up.

But Kathy and Tshepo provided eggs and sperm and are claiming to be the biological parents.

Court date pending.

**SOURCE C****The ethical and religious concerns around surrogacy****Interview with a theology scholar**

The scholar was asked to explain the view of some faiths in terms of their religious standpoint towards surrogacy. His explanations are summarised below.

Within the Jewish faith there are different Halachic opinions concerning in vitro fertilisation (IVF) and surrogacy. One general ruling does not permit IVF particularly as it involves 'wasting' of the male sperm. Another ruling permits only IVF from a married couple and the whole procedure must be overseen by a trained Jewish supervisor who receives no pay for his services.

The Catholic Church prohibits IVF, and therefore surrogacy, since the procedure involves the destruction of innocent unborn human life when the unused embryos are destroyed.

[Theology scholar interview]

Scholars agree that there is nothing in Islamic law which forbids many types of fertility treatment, as long as the treatments do not go outside of the bounds of the marriage relationship. If chosen, *in vitro* fertilisation must be done with sperm and egg from a husband and wife and the embryos transplanted in the wife's uterus. Therefore, use of donor eggs or sperm from outsiders and surrogate motherhood are forbidden.

[Adapted: <<http://islam.about.com/od/health>>]

**SOURCE D****Legal aspects of surrogacy**

The Children's Act, outlining Surrogacy in South Africa, was promulgated on the 1 April 2010. This legislation protects the rights of the unborn child and the responsibilities of the intended parents and surrogate mother.

The legislation summarised:

**The Intended Parents**

- Intended parents must live in South Africa.
- Intended parents must have medical proof of the need for a surrogate mother.
- Intended parents must have been psychologically assessed as regards their emotional disposition towards a surrogacy program.
- The eggs and sperm of either one or both of the intended parents must be used for conception.
- Should both intended parents be male, the intended parents are required to show a female influence in the life of the child.
- Intended parents are not discriminated against based on race, relationship status or sexual preference.
- Intended parents may not advertise for the services of a surrogate mother.

**The Surrogate Mother**

- The surrogate mother must live in South Africa.
- She must undergo a medical and psychological assessment of her suitability to surrogate.
- Must have had at least one successful pregnancy.
- She must have at least one living child of her own.
- She must be prepared to surrogate for no financial rewards.

**The Surrogacy Agreement**

- A surrogacy agreement must be drawn up.
- Both intended parents, the surrogate mother and her partner/husband must sign the agreement.
- The surrogacy agreement with supporting documentation, must be presented to the High Court by appropriately commissioned surrogacy attorneys, for the granting of a High Court order stating that the surrogacy may proceed.
- The granting of a court order results in no adoption of the child, by the intended parents, being necessary.
- An agency may not accept payment for the match and management of surrogates and intended parents.

[Adapted from: <www.giftovlife.com>]

**Statistics**

Maximum age for IVF treatment: 41 years

Approximate cost of one IVF treatment: R60 000 to R120 000

Initial consultation: R1 200 upwards

Initial blood tests: R1 200 upwards

Success rates .... 25% – 30%

[Source: Surrogacy the truth: <health24.com>]

**SOURCE E****ADOPTION**

'Every child has a right to grow up in a loving family unit. No institution, no matter how well managed, can match the feeling of belonging that a family can provide.'

Sheri Shenker: Adoption Accredited Social Worker

[<[www.giftovlife.com](http://www.giftovlife.com)>]

**Total: 150 marks**