NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2018

LIFE SCIENCES: PAPER II

Time: 2 hours 100 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 5 pages and a Source Material Booklet of 13 pages (i–xiii). Please check that your question paper is complete. Remove the Source Material Booklet from the middle of the question paper.

2. The question paper consists of three questions. Question 1 and Question 2 are case studies and Question 3 is an essay. Read the sources provided in the Source Material Booklet and use the information and your own knowledge to answer Questions 1 and 2.

3. Source material is also provided in the Source Material Booklet for the essay. Use this information and your own knowledge to first plan and then write your response.

4. All questions must be answered in the Answer Book provided.

5. Read the questions carefully.

6. Please start **each question** on a **new** page and leave lines open between each sub question (e.g. 1.1 and 1.2).

7. Number the answers exactly as the questions are numbered in the question paper.

8. Use the total number of marks that can be awarded for each part of the questions in Question 1 and 2 as an indication of the detail required.

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

SECTION A

QUESTION 1

These questions refer to the sources in Question 1 (on pages ii–iv) in the Source Material Booklet.

1.1 The article states that the expression of this gene follows "simple Mendelian rules".

1.1.1 What is a "gene"? (2)

1.1.2 Discuss Gregor Mendel's role in the discovery of the patterns of inheritance. (3)

1.2 State the locus of the gene for the enzyme described in the article. (1)

1.3 Explain in your own words how the non-functional enzyme causes "blue people". (3)

1.4 Answer True or False to the following statements:

1.4.1 The condition MHG can be detected in a person by doing a karyotype analysis. (1)

1.4.2 The condition is a skin disorder. (1)

1.4.3 John Stacy in the pedigree chart is phenotypically normal. (1)

1.5 Provide any TWO pieces of information for *each* of the following (Questions 1.5.1 and 1.5.2) that indicate that MHG is:

1.5.1 recessive. (2)

1.5.2 autosomally inherited. (2)

1.6 Mabala and Maurice are both heterozygous (Bb) for MHG in the pedigree chart. Draw a genetic cross/Punnett square to determine the probability of Mabala and Maurice having a child with MHG. Include the probability of each phenotype arising from the cross. (6)

1.7 What type of point mutation caused the abnormal allele? Give ONE reason for your choice. (2)

1.8 The gene contains 30 000 base pairs that code for the enzyme. Calculate the number of amino acids required to make the enzyme. Show all working. (2)

1.9 MHG incidence increased around Troublesome Creek due to inbreeding.

1.9.1 Provide a phrase from the text to support this statement. (1)

1.9.2 Do you think that it is ethical to use real families and people's actual names to illustrate genetic disorders and examples of inbreeding? Justify your answer. (3)

[30]

QUESTION 2

These questions refer to the sources in Question 2 (on pages iv–vii) in the Source Material Booklet.

2.1 Provide a definition for the following terms in the article:

2.1.1 Cloning (2)

2.1.2 Recombinant DNA (2)

2.2 Only a small amount of DNA could be extracted from the mosquitoes. What process would the scientists have used to make many copies of this DNA? (1)

2.3 Study the following table which consists of a phrase *taken from the text* in **COLUMN 1** and two biological descriptions/terms in **COLUMN 2**.

Decide which description/term from COLUMN 2 relates to the phrase in COLUMN 1.

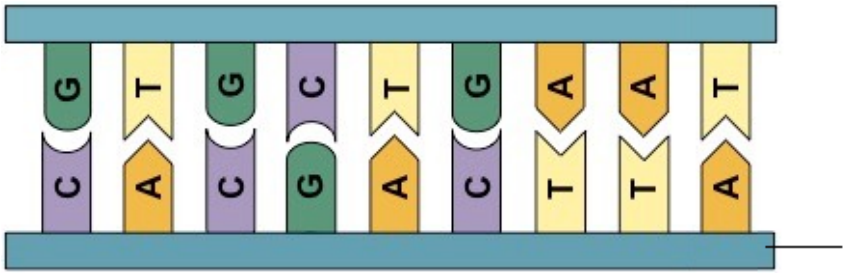
Write down the LETTER of the correct description/term (option A or B) in your Answer Book next to the appropriate question number (2.3.1–2.3.3)

	COLUMN 1	**COLUMN 2**
2.3.1	"strand of DNA"	A. Many amino acids joined together B. Sequence of nucleotides
2.3.2	"the building blocks of life"	A. DNA B. Blood cells
2.3.3	"bunch of DNA letters"	A. A C G T B. A C G U

(3)

2.4 Suggest why using frog genes to replace the missing dinosaur genes will not result in a viable dinosaur. (2)

2.5 Study the following section of dinosaur DNA.



[Adapted: <ib.bioninja.com.au>]

2.5.1 Use the template strand to write the corresponding mRNA nucleotide sequence. (3)

2.5.2 Use the mRNA codon table shown below to write down the amino acids coded for by the mRNA in the correct order.

mRNA codon table

mRNA codon	Amino acid abbreviation
CAC	His
GUG	Val
AAU	Asn
GAC	Asp
UUA	Leu
CUG	Leu
AUU	Ile
GUC	Val
CAC	His

(3)

2.6 Calculate the percentage of implanted embryos that resulted in a bucardo birth. Show all working. (2)

2.7 SKETCH the outline of a graph to show the change in numbers of bucardo from 1899 to 2000. Provide a heading and labels for the axes. No actual plotting of values is required. (4)

2.8 Refer to the SCNT diagram on page (vii) in the Source Material Booklet to answer the following:

2.8.1 Is cell C haploid or diploid? (1)

2.8.2 Is ovum D haploid or diploid? (1)

2.8.3 Name the type of cell division that produces cell D. (1)

2.8.4 Identify structure B. (1)

2.9 Using information from the source, list any TWO ethical arguments that support de-extinction, and TWO ethical arguments against de-extinction. Clearly indicate which arguments support and which are against de-extinction. (4)

[30]

60 marks

SECTION B

The sources for the essay are on pages viii–xiii of the Source Material Booklet.

QUESTION 3

Consider the following statement:

Scientific research supports a genetic cause for transgenderism.

Using the source material provided as well as your own knowledge, discuss your opinion on the above statement in the form of a 2½–3 page essay.

To answer this question you are expected to:

- Read the source material carefully and present a debated argument to illustrate your point of view.
- Select relevant information from sources A to H.
- It is important to integrate your own relevant biological 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.
- **Provide** a clear **plan** of your essay before you start writing. Note that the plan will be marked as part of the assessment of this question.

40 marks

Total: 100 marks