KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA



NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES

COMMON TEST

JUNE 2021

MARKS: 60

TIME: 1 hour

N.B. This question paper consists of 9 pages including this page.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Make ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass, where necessary.
11. Write neatly and legibly.

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SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.5) in your ANSWER BOOK, for example 1.1.6 D.

1.1.1 If a recessive allele on the X-chromosome is passed on to the offspring it is an example of…

A sex-linked inheritance.
B incomplete dominance.
C multiple alleles.
D co-dominance.

1.1.2 In pea plants, the allele for flower colour (**B**) is dominant to the allele for lack of colour (**b**). The allele for tall (**T**) is dominant to allele for short (**t**).

The genotype for a colourless flower pea plant that is heterozygous for height is:

A Bbtt
B BBTT
C bbTt
D BbTT



1.1.3 Study the following steps.

(i) Extraction of the desired gene from the champion organism
(ii) Host organism displays the effect of the desired gene
(iii) Desired gene is identified
(iv) DNA of a host organism is cut open
(v) Desired gene is incorporated into the DNA of a host organism

Which ONE of the following is the correct sequence of steps during genetic engineering?

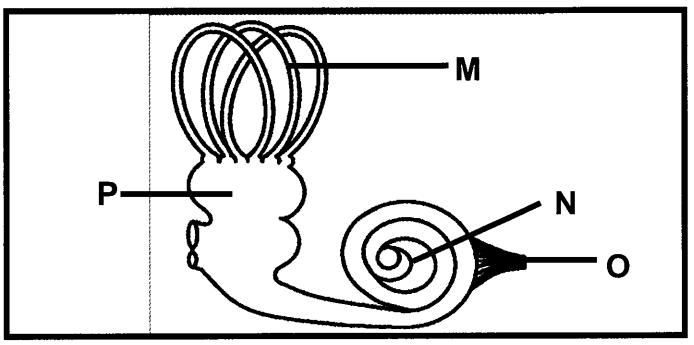
A (i), (ii), (iii), (iv) and (v)
B (i), (iii), (ii), (iv) and (v)
C (iii), (i), (iv), (ii) and (v)
D (iii), (i), (iv), (v) and (ii)

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1.1.4 Which ONE of the following will be regarded as not useful mutation?

A Mutations occuring in somatic cells
B Mutations that increase the survival chances of the species
C Mutations that limits the survival chances of the species
D Mutations that increase the survival chances of an individual

1.1.5 Study the following diagram of a part of a human ear.





Which ONE of the following is damaged if a person cannot convert pressure waves into a sound impulse?

A M
B N
C O
D P

(5 x 2) **(10)**

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.4) in the ANSWER BOOK.

1.2.1 Physical expression of a gene

1.2.2 The process that produces a genetically identical copy of an organism

1.2.3 A genetic disorder characterised by the inability to distinguish certain colours

1.2.4 A hormone that regulates the water balance in the body **(4)**

1.3 Indicate whether each of the descriptions in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	Position of a gene on a chromosome	A: Allele B: Locus
1.3.2	An organism have two "factors" that separate during gamete formation.	A: Principle of segregation B: Law of inheritance
1.3.3	Chromosomes involved in sex determination	A: Autosomes B: Gonosomes

(3 x 2) **(6)**

TOTAL SECTION A: [20]

SECTION B

QUESTION 2

2.1 A group of grade 12 learners investigated the effect of eating chocolate on the blood glucose level. A group of 300 learners participated in the investigation.

The procedure was as follows:

- At the start of the investigation glucose level was measured in each learner, and the average of all the participants was calculated.
- Participants were divided into 2 groups (**A** and **B**) of 150 each and the groups were treated as follows:
- **Group A**: learners did not eat anything.
- **Group B**: Each learner ate a 50g chocolate at the start of the investigation after their first glucose measurements.
- The glucose level was measured every 30 minutes for a period of 2 hours, and the average was calculated.
- All the participants were seated during the period of the investigation.

The table below shows the results of the investigation.

TIME (Minutes)	Glucose concentration (mg/dL)	
	GROUP A	GROUP B
0	70	70
30	70	85
60	71	95
90	69,9	110
120	69,8	135

2.1.1 State the hypothesis for this investigation. (2)

2.1.2 Why was group **A** included in this investigation? (1)

2.1.3 Name the gland responsible for secretions that control blood glucose level. (1)

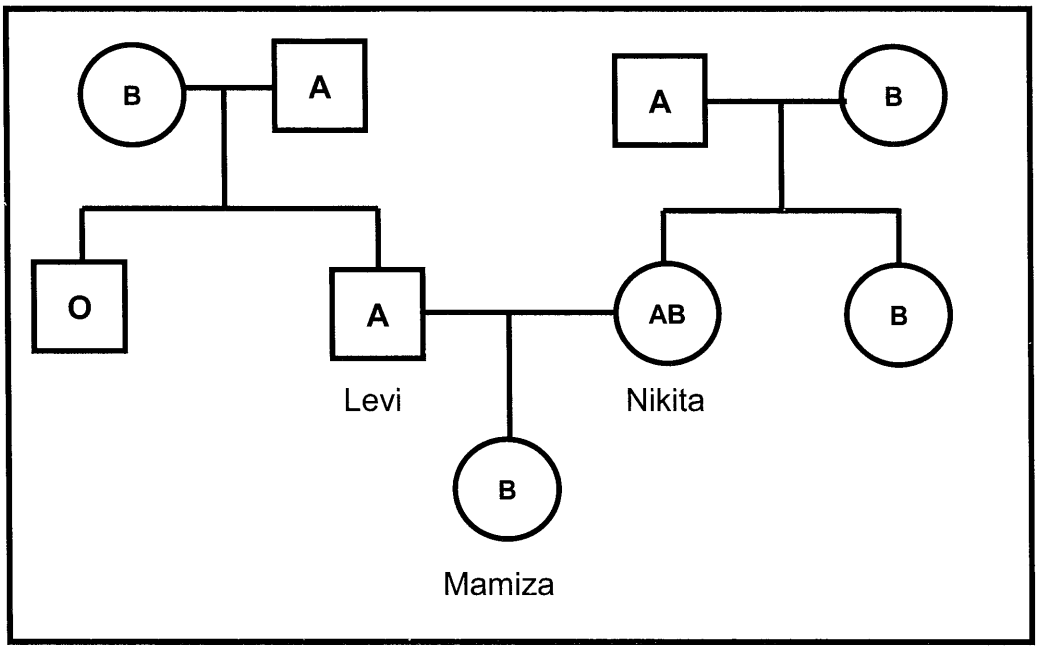
2.1.4 Which hormone will be secreted due to the change in blood glucose level shown by group **B** participants? (1)

2.1.5 State TWO ways in which the investigator could have ensured validity of this investigation. (2)

2.1.6 Explain how the results shown by group **B** will affect energy levels in the participants. (3)
(10)

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2.2 Study the following pedigree showing the inheritance of blood type in a family.





2.2.1 Write down the genotype for Mamiza. (1)

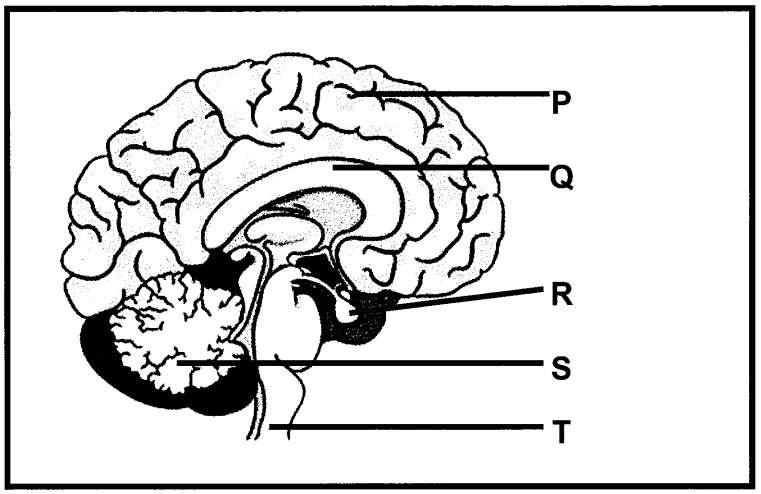
2.2.2 Explain why blood group **AB** is an example of co-dominance. (3)

2.2.3 What are the chances of Levi and Nikita having a baby with blood group **O?** Use a genetic cross to show your answer. (6)
(10)
[20]

QUESTION 3

3.1 Study the diagram below.





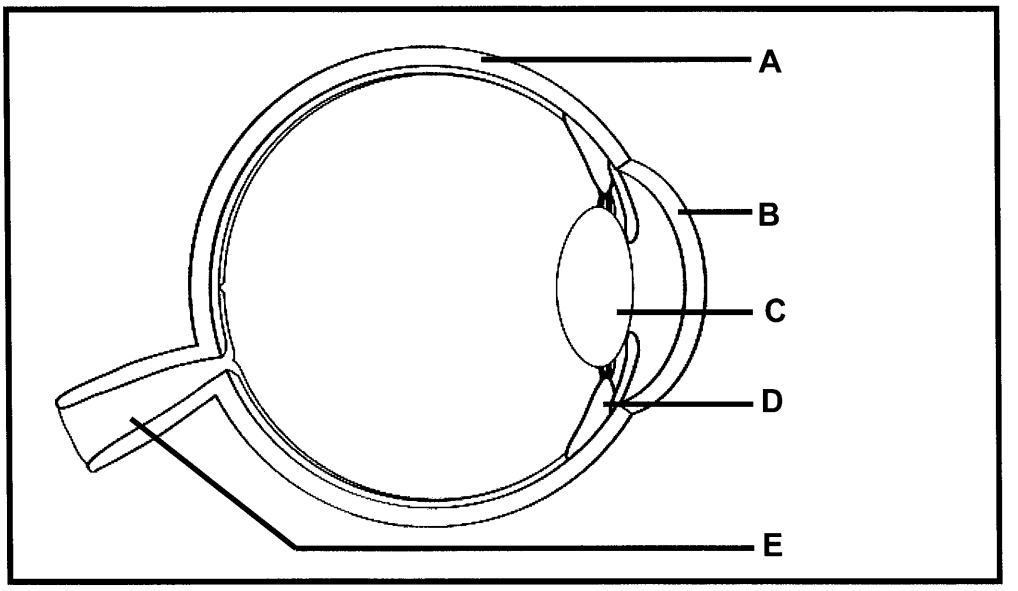
3.1.1 Identify part **R**. (1)

3.1.2 Write down the LETTER and the NAME of a part that could have been damaged when a person cannot interpret senses. (2)

3.1.3 Explain the consequence with regards to voluntary movements if part **S** is damaged. (3)

3.1.4 Describe the role of cristae in maintaining balance. (4)
(10)

3.2 Study the diagram of a human eye.



Stanmorephysics.com

3.2.1 Identify part:

(a) **A** (1)

(b) **E** (1)

3.2.2 State TWO similarities between parts **B** and **C**. (2)

3.2.3 Explain the consequence with regards to vision if muscle in part **D** could not relax. (3)

3.2.4 Describe the changes that occur in the eye under bright light. (3)
(10)
[20]

TOTAL SECTION B: [40]

GRAND TOTAL: [60]

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Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES

COMMON TEST

MEMORANDUM - JUNE 2021

NATIONAL
SENIOR CERTIFICATE

GRADE 12

MARKS: 60

This memorandum consists of 5 pages.

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PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is reached and put a wavy line and 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three irrespective of whether all or some are correct/incorrect.

3. **If whole process is given when only a part of it is required**
   Read all and credit the relevant part.

4. **If comparisons are asked for, but descriptions are given**
   Accept if the differences/similarities are clear.

5. **If tabulation is required, but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links become correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation, but credit the rest of the answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions, but the wrong number is given, it is acceptable.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognisable, accept the answer, provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
    Accept, provided it was accepted at the national memo discussion meeting.

14. **If only the letter is asked for, but only the name is given (and vice versa)**
    Do not credit.

15. **If units are not given in measurements**
    Candidates will lose marks. Memorandum will allocate marks for units separately.

16. **Be sensitive to the sense of an answer, which may be stated in a different way.**

17. **Caption**
    All illustrations (diagrams, graphs, tables, etc.) must have a caption.

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SECTION A

QUESTION 1



1.1	1.1.1	A✓✓	
	1.1.2	C✓✓	
	1.1.3	D✓✓	
	1.1.4	C✓✓	
	1.1.5	B✓✓	
			(5 x 2) **(10)**
1.2	1.2.1	Phenotype✓	
	1.2.2	Cloning✓	
	1.2.3	Colour blindness✓	
	1.2.4	ADH✓/Anti-diuretic hormone	**(4)**
1.3	1.3.1	B only✓✓	(2)
	1.3.2	A only✓✓	(2)
	1.3.3	B only✓✓	(2)
			(6)

TOTAL SECTION A: 20

SECTION B

QUESTION 2

2.1	2.1.1	Eating chocolate will have no effect on the blood glucose level✓✓ OR Eating chocolate will increase/decrease the blood glucose level✓✓	(2)
	2.1.2	It serves as a control✓	(1)
	2.1.3	Pancreas✓/ (Liver)	(1)
	2.1.4	Insulin✓	(1)
	2.1.5	- Learners must be of the same age✓ - Same health status✓ - Same person taking measurements✓ - Same type of chocolate✓ - Same amount of chocolate✓ - Same gender of learners✓ - Same fitness level✓ - Two groups were used,one was given chocolate the other was not given chocolate✓ - All participants were seated✓ - The glucose levels of all participants was measured at the beginning of the investigation ✓ - Same thyroxin levels in the blood✓	

- The glucose levels of all participants was measured at regular intevals✓ Any 2 (2)

(Mark the FIRST TWO only)

2.1.6
- Increase in glucose levels✓
- will stimulate the pancreas✓
- to secrete more insulin✓
- which will increase glucose absorption into the muscles/cells✓
- The rate of cellular respiration will increase✓
- resulting in more energy being produced/released✓ (Any 3) (3)

(10)

2.2 2.2.1 I^Bi✓ (1)



2.2.2
- It's controlled by alleles I^A and I^B ✓
- which are equally dominant to each other✓
- and are both expressed in the phenotype✓ (3)

2.2.3

P_1 Phenotype Blood group A × Blood group AB✓
Genotype I^Ai × I^AI^B ✓
Meiosis
G/Gametes I^A, i × I^A, I^B ✓
Fertilisation
F_1
Genotype I^AI^A I^AI^B I^Ai I^Bi ✓
Phenotype A AB A B✓

P_1 and F_1 ✓
Meiosis and fertilisation✓
Blood group O = 0%✓* (no chance) Any 6

OR

P_1
Phenotype Blood group A × Blood group AB✓
Genotype I^Ai × I^AI^B ✓
Meiosis
Fertilisation
F_1

Blood group AB	Blood group A	
Gametes	I^A	i
I^A	I^AI^A	I^Ai
I^B	I^AI^B	I^Bi

Phenotype: Blood group A; Blood group AB;Blood group A;Blood group B

P_1 and F_1 ✓
✓(correct gametes)
Meiosis and fertilisation✓
✓ (correct genotype)
Blood group O = 0%✓* (no chance) Any 6 (6)

(10)
[20]

QUESTION 3

3.1 3.1.1 Pituitary gland✓/Hypophysis (1)

3.1.2 P✓ - Cerebrum✓ (2)

3.1.3
- Motor impulses may not be generated✓
- To be sent to the effector muscles✓
- And walking/running/voluntary movements may not be coordinated✓
- Resulting in paralysis✓ (3)

3.1.4
- Cristae detects the change in direction and speed✓
- Stimulus is converted into an impulse✓
- which are sent to the cerebellum✓
- which sends impulses to the skeletal muscles✓
- to restore balance✓ Any 4 (4)

(10)

3.2 3.2.1 (a) Sclera✓ 

(1)

(b) Optic nerve✓ (1)

3.2.2
- Both are transparent✓
- Both are curved to refract light✓
- Both are flexible✓

(Mark the FIRST TWO only) (2)

3.2.3
- Distant objects remain unclear✓/blurred
- Suspensory ligaments will not become taut✓
- tension on the lens will remain low✓
- causing a high refractive power✓
- causing only near objects being clear✓ (3)

3.2.4
- Circular muscles contract✓
- radial muscles relax✓
- pupil constrict✓
- less light enters the eye✓ (Any 3) (3)

(10)
[20]

TOTAL SECTION B: 40

GRAND TOTAL: 60