Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES

COMMON TEST

MARCH 2018

NATIONAL SENIOR CERTIFICATE

GRADE 12

MARKS: 60

TIME: 1 hour

N.B. This question paper consists of 7 pages including this page.

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.

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 1.1.2) in your ANSWER BOOK, for example 1.1.3 D.

1.1.1 Which ONE of the following receives and stores waste products in an amniotic egg?

A Amnion
B Yolk sac
C Chorion
D Allantois

1.1.2 At the end of meiosis I, a cell with 20 chromosomes originally will produce two cells each with ...

A 5 chromosomes.
B 20 pairs of chromosomes.
C 10 chromosomes.
D 10 pairs of chromosomes. (2 x 2) **(4)**

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 1.2.2) in the ANSWER BOOK.

1.2.1 A type of development where the young is incapable of movement and is weak and helpless at birth

1.2.2 A type of reproduction where the young is nourished through the placenta of the mother

(2 x 1) **(2)**

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 1.3.2) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	Forms spindle threads in animal cells	A: Centriole B: Centromere
1.3.2	Peptide bonds form between amino acids	A: Translation B: Transcription

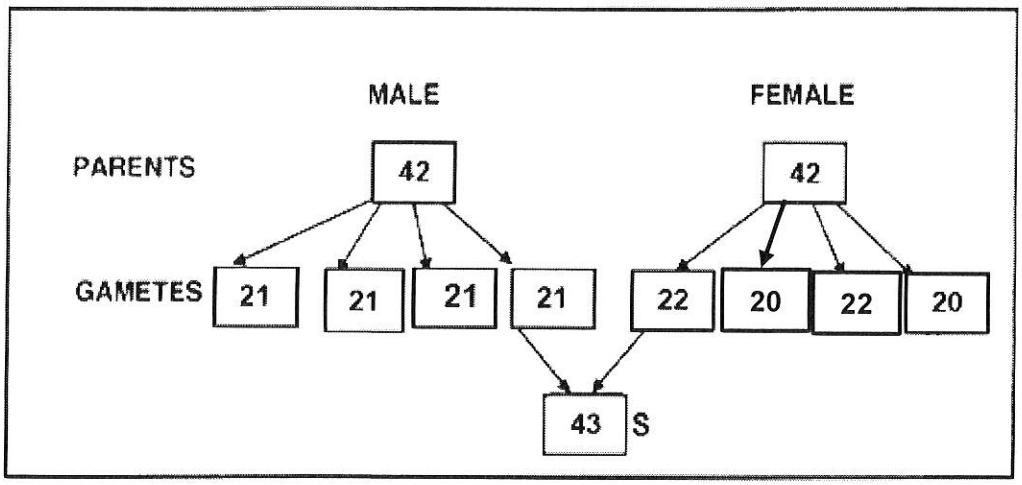
(2 x 2) **(4)**

TOTAL SECTION A: 10

SECTION B

QUESTION 2

2.1 The diagram below represents the life cycle of an organism. The number of chromosomes in the cells at different stages is shown.



Explain what led to a difference in the chromosome number between offspring **S** and the parents. **(5)**

2.2 Describe how the events and the result of protein synthesis will be influenced if one of the nitrogenous bases on DNA is changed. **(6)**

2.3 Read the following extract relating to a criminal investigation.

> Inspector Memela was investigating the scene of a violent crime. The victim was a 25 year old woman. She had been raped, stabbed and left to die. They found a view pieces of hair in one of her hands. There was also skin tissue under her nails.
>
> They arrested three possible suspects. DNA profiles of the 3 suspects and the victim were compared with the profile developed using DNA from the crime scene.

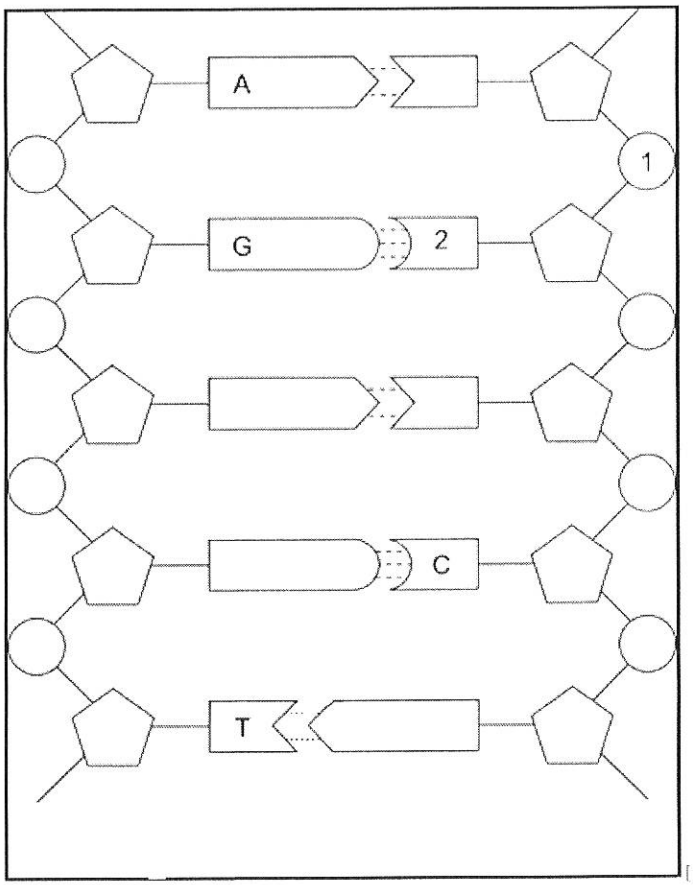
2.3.1 Mention TWO sources of DNA that were collected from the crime scene. (2)

2.3.2 State TWO possible objections to the use of DNA profiles as evidence in a criminal investigation. (2)

(4)
[15]

QUESTION 3

3.1 The diagram below shows a portion of a DNA molecule.



3.1.1 Identify:

(a) Part **1** (1)

(b) Part **2** (1)

3.1.2 Give THREE visible reasons for identifying this molecule as DNA. (3)

3.1.3 State TWO places in a cell where DNA is found. (2)
(7)

3.2 The concentration of hormones of 30 women aged between 20 and 30 was monitored over 28 days during an investigation. The procedure was as follows:

- All women were put on the same type of diet.
- The instrument used to measure the concentration of hormones was the same in all women.
- The measurements were taken by the same person.
- Measurements were taken at the same time of the day.

The table below shows the results of the investigation.

Days	Average Hormone Concentration (arbitrary units)	
	Progesterone	Oestrogen
0	0	5
5	0	5
10	0	5
15	3	15
20	6	10
25	12	11
28	9	7

3.2.1 What evidence from the table indicates that ovulation occurred around day 15? (2)

3.2.2 Account for the decrease in progesterone concentration between day 25 and 28. (2)

3.2.3 Why did the investigator use 30 women in this investigation rather than 5? (1)

3.2.4 State THREE factors that were kept constant during this investigation. (3)
(8)
[15]

TOTAL SECTION B: 30

SECTION C

QUESTION 4

Describe the mechanisms during meiosis that result in genetic variation. Also describe the process of fertilisation and how the resulting foetus is protected during gestation.

Content: (17)
Synthesis: (3)

(20)

NOTE: NO marks will be awarded for answers in the form of flow charts, tables or diagrams.

TOTAL SECTION C: 20
GRAND TOTAL: 60

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LIFE SCIENCES

COMMON TEST

MEMORANDUM - MARCH 2018

NATIONAL
SENIOR CERTIFICATE

GRADE 12

MARKS: 60

This memorandum consists of 6 pages.

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.

SECTION A

QUESTION 1

1.1	1.1.1	D ✓✓		
	1.1.2	C ✓✓	(2 x 2)	**(4)**
1.2	1.2.1	Altricial ✓		(1)
	1.2.2	Viviparous ✓/ Vivipary		(1)
				(2)
1.3	1.3.1	A only ✓✓		(2)
	1.3.2	A only ✓✓		(2)
				(4)

TOTAL SECTION A: 10

SECTION B

QUESTION 2

2.1
- During anaphase✓I/II of meiosis
- One pair of chromosomes/the chromatids of one chromosome failed to separate✓/ there was non-disjunction
- leading to some gametes with an extra chromosome✓/22 chromosomes instead of 21
- When this gamete fused with a normal gamete✓/gamete with 21 chromosomes
- The result will be an offspring having 43 chromosomes✓ **(5)**

2.2
- The mRNA formed✓
- will have 1 different codon✓
- This will now be complementary to a tRNA molecule✓
- with one different anticodon✓
- If the new anticodon codes for a different amino acid✓
- then a new protein will form✓
- If the new anticodon codes for the same amino acid✓ as before
- then the protein formed will not change✓

Any 6 **(6)**

2.3 2.3.1
- Hair✓
- Skin tissue✓
- Semen✓
- Blood✓

Any 2 (2)
(Mark first TWO only)

2.3.2
- Planting of evidence✓/Person can be framed
- Human error in DNA analysis✓
- The person could have been at the scene previously but was not involved in the crime✓

Any 2 (2)
(Mark first TWO only)

(4)
[15]

QUESTION 3

3.1 3.1.1 (a) Phosphate✓ (1)

(b) Cytosine✓/C (1)

3.1.2
- It contains thymine✓
- It is double stranded✓
- It has hydrogen bonds✓

(3)
(Mark first THREE only)

3.1.3
- Nucleus✓
- Mitochondrion✓

(2)
(Mark first TWO only)

(7)

3.2 3.2.1
- The progesterone level✓
- starts to increase✓

OR
- The oestrogen level✓
- is at its highest✓ (2)

3.2.2
- Pregnancy✓
- did not result✓

OR
- The corpus luteum✓
- degenerated✓ (2)

3.2.3 - To increase the reliability✓ of the results. (1)

3.2.4
- Women were in the same age category✓/20-30 age category
- Women were given the same diet✓
- Same instrument was used✓
- Same person took the measurements✓
- Measurements were taken at the same time of the day✓

Any 3 (3)
(Mark first THREE only)

(8)
[15]

TOTAL SECTION B: 30

SECTION C

QUESTION 4

Meiosis and variation (V)

- During crossing over✓/prophase I
- non-sister chromatids of a homologous chromosome pair overlap✓
- at the chiasmata✓
- so that genetic material is exchanged✓
- leading to a mix of paternal and maternal genetic material in each chromosome✓

- During metaphase✓I/II
- chromosomes arrange randomly at the equator✓
- such that they move in different combinations into the gametes✓ Any 6 (6)

Fertilisation (F)

- In the Fallopian tubes✓
- one sperm cell makes contact with the ovum's membrane✓
- The acrosome produces an enzyme✓
- which dissolves the membrane of the ovum✓
- Only the nucleus of the sperm enters the ovum✓
- and fuses with the nucleus of the ovum✓
- to form a diploid✓ zygote Any 5 (5)

Protection (P)

- The foetus is protected by the chorion✓
- and by the amniotic fluid✓
- which keeps the foetus hydrated✓
- protects the foetus from temperature changes✓
- and from mechanical injury✓
- The placenta forms a micro-filter✓
- protecting the foetus against pathogens✓
- Placenta allows the maternal antibodies to pass into the foetus✓
- allowing for immunity✓
- At the placenta, waste from the foetus is passed into the blood of the mother✓

Any 6 (6)

Content: **(17)**
Synthesis **(3)**
[20]

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the topic	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
Only information relevant to: - The role of meiosis in variation - The process of fertilisation - Protection of the foetus is given There is no irrelevant information	Information regarding - The role of meiosis in variation - The process of fertilisation - Protection of the foetus is arranged in a logical way within each aspect	Answer contains at least the following: - The role of meiosis in variation (4/6) - The process of fertilisation (3/5) - Protection of the foetus (4/6)
1 mark	1 mark	1 mark

TOTAL SECTION C: 20

GRAND TOTAL: 60