Education

KwaZulu-Natal Department of Education

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES

PROVINCIAL COMMON TEST

MARCH 2020

MARKS: 60

TIME: 1 hour

This question paper consists of 9 pages.

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. Do 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 may use a non-programmable calculator, protractor and a compass.
11. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.3) in the ANSWER BOOK, for example 1.1.4 D.

1.1.1 The process where one DNA molecule produces two identical DNA molecules is called …

A reproduction.
B translation.
C replication.
D protein synthesis.

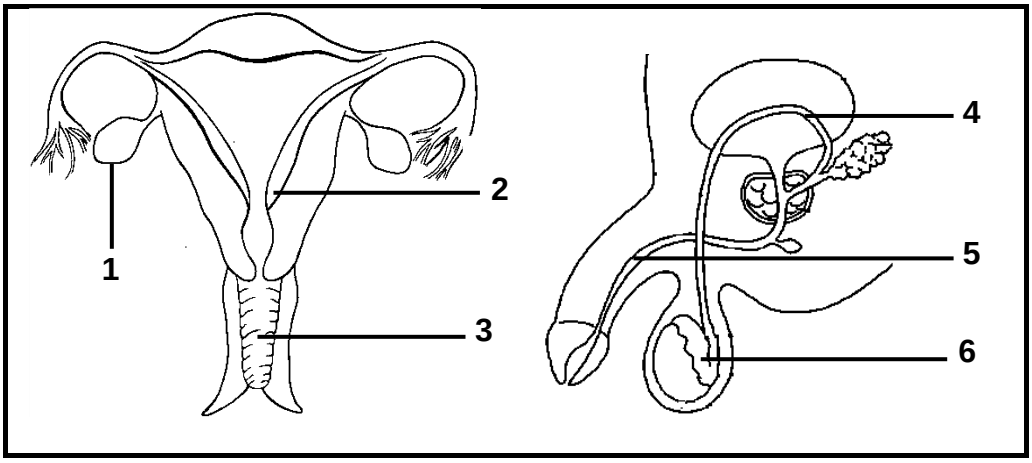
1.1.2 Study the table below that shows the success rate in solving criminal cases.

SUSPECTS	SUCCESS RATE IN SOLVING CRIMINALCASES (%)	
	TRADITIONAL METHOD	DNA PROFILING
Identified	14	44
Prosecuted	8	24
Arrested	14	30

A possible conclusion from this table is that …

A more suspects have been prosecuted by using traditional method.
B more suspects have been identified by using traditional method.
C more suspects have been prosecuted than arrested by using traditional method.
D more suspects have been identified and arrested by using DNA profiling.

1.1.3 Study the diagrams below.



Which ONE of the following combinations matches the labels with their correct function?

A 5 - transports sperm cells from the epididymis, 2 – attachment of embryo
B 3 - sperm cells are deposited, 6 - sperm cells are stored
C 4 - provides nutrients for sperm cells, 1 – produce ova
D 2 - fertilisation occurs, 6 – sperm cells mature

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

1.2 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
1.2.1	Involved in the prevention of mechanical injuries in an amniotic egg	A: Chorion B: Amnion
1.2.2	Foetus is attached to the mother's uterus	A: Vivipary B: Ovovivipary

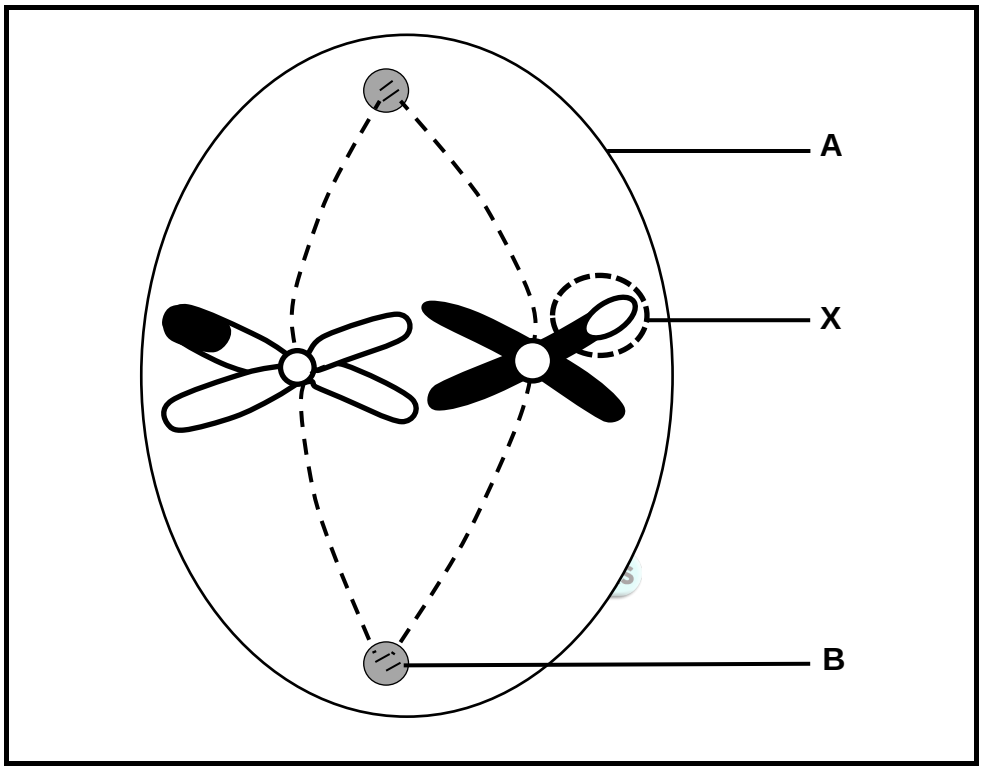
(2 x 2) **(4)**

TOTAL SECTION A: 10

SECTION B

QUESTION 2

2.1 The diagram below represents a phase of meiosis.



2.1.1 Identify:

(a) **A** (1)

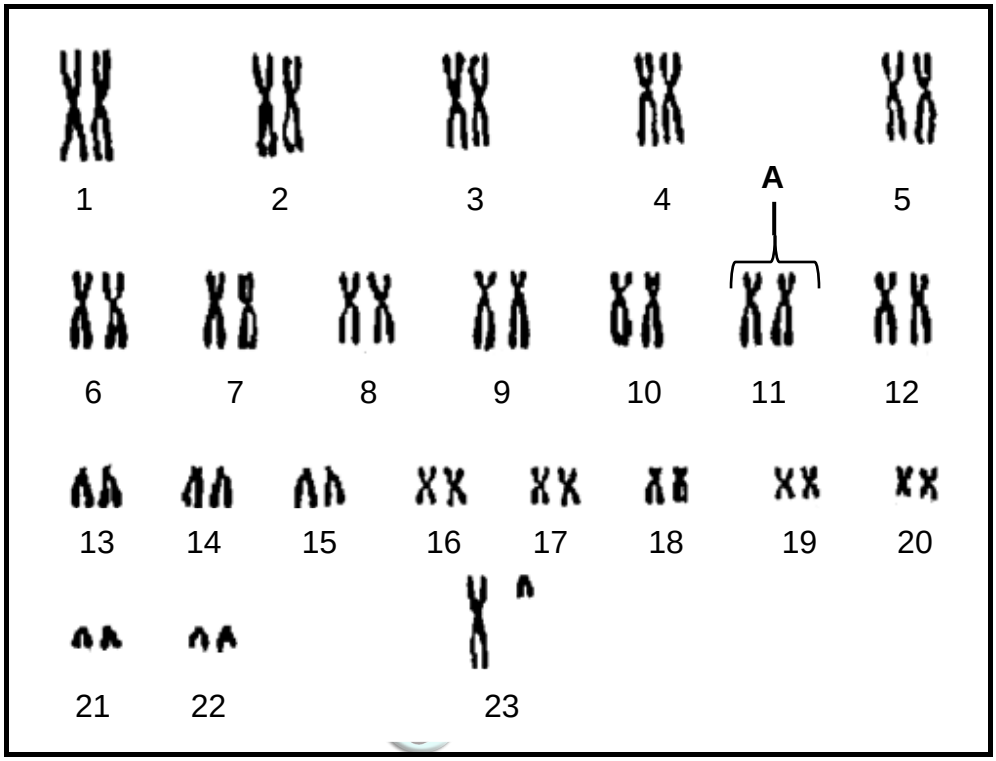
(b) **B** (1)

2.1.2 Identify the phase of meiosis represented in the diagram above. (1)

2.1.3 Describe the process responsible for the appearance of the chromosomes as shown in region **X**. (4)

2.1.4 State TWO significance of meiosis. (2)
(9)

2.2 The diagram below shows the human karyotype.



2.2.1 State the correct **biological term** for the chromosome pair number 23. (1)

2.2.2 Identify **A** in the diagram. (1)

2.2.3 Explain the consequence if chromosome pair number 21 in a human cell fails to separate during meiosis. (4)
(6)

[15]

TOTAL SECTION B: 30

QUESTION 3

3.1 The diagram below shows some codons of mRNA together with their corresponding amino acids.

AAA	UCA	CUG	CAA	UGG	CUA	UGU	UAC
Phe	Ser	Asp	Val	Thr	Asp	Ser	Met

The base sequence of a section of tRNA used during translation is shown below.

GUU	AGU	ACC	ACA	AUG	UUU
1	2	3	4	5	6

3.1.1 How many different types of amino acids are required for the above tRNA strand during translation? (1)

3.1.2 Write down the complementary base sequence of the DNA strand that formed anticodon **5** of the tRNA. (1)

3.1.3 Explain the effect on the composition of the protein molecule if the base sequence at **4** was AGU instead of ACA. (2)

3.1.4 Describe the process of *translation*. (5)
(9)

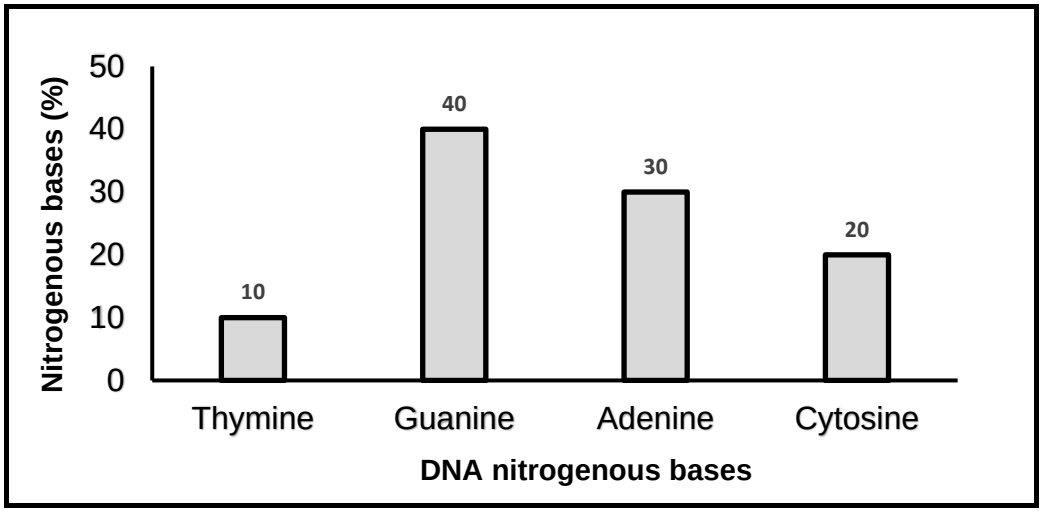
3.2 A DNA molecule is double stranded and helical in shape.

Scientists carried out a DNA analysis to determine the percentage of nitrogenous bases on **one strand** of a DNA molecule consisting of 450 nitrogenous bases.

The scientists:

- Took a sample of human blood
- Extracted a DNA molecule
- X-rayed the DNA molecule to get a profile
- Counted the number of each nitrogenous base in a DNA molecule
- Repeated the process 3 times
- Calculated the average percentage of nitrogenous bases on each strand

The graph below shows the percentage of bases on STRAND **1** of a DNA molecule.



3.2.1 Identify the dependent variable in this investigation. (1)

3.2.2 State TWO ways in which the scientists ensured the reliability of the investigation. (2)

3.2.3 Calculate the number of guanine on STRAND **2** of a DNA molecule that is the complimentary strand to the one shown on the graph above. Show all working. (3)
(6)

(15)

SECTION C

QUESTION 4

Describe the role of ovarian hormones in menstrual cycle and the process of fertilisation. Also describe the role of umbilical cord in a developing foetus.

Content:	(17)
Synthesis:	(3)
	(20)

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

TOTAL SECTION C:	**20**
GRAND TOTAL:	**60**

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES

MARCH 2020 COMMON TEST

MARKING GUIDELINE

MARKS: 60

This marking guideline consists of 5 pages

FM. MEMELA

12/03/2020

A. Singh

12/03/2020

SECTION A

QUESTION 1

1.1 1.1.1 C✓✓
1.1.2 D✓✓
1.1.3 B✓✓

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

1.2 1.2.1 B✓✓
1.2.2 A✓✓

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

TOTAL SECTION A: 10

SECTION B

QUESTION 2

2.1 2.1.1 (a) Cell membrane✓/plasma membrane (1)
(b) Centrosome✓/centriole (1)

2.1.2 Metaphase II✓ (1)

2.1.3
- Crossing over✓
- in prophase I✓
- Chromatids of homologous chromosomes cross✓
- at a point called chiasma✓
- to exchange genetic material✓

Any (4)

2.1.4
- Production of gametes✓
- Prevents the doubling effect during fertilisation✓
- Introduces genetic variation✓

(2)
(Mark the first TWO only) **(9)**

2.2 2.2.1 Gonosome✓ (1)

2.2.2 Homologous chromosomes✓ (1)

2.2.3
- Non-disjunction during Anaphase I✓/II in humans
- results in an abnormal gamete with an extra chromosome✓being formed
- The fusion between an abnormal gamete (24 chromosomes) and a normal gamete✓ (23 chromosomes)
- results in an individual with 47 chromosomes✓ instead of 46
- leading to Down syndrome✓

OR

- Non-disjunction during Anaphase I✓/II in humans
- results in an abnormal gamete with one chromosome less✓being formed
- The fusion between an abnormal gamete (22 chromosomes) and a normal gamete✓ (23 chromosomes)
- results in an individual with 45 chromosomes✓ instead of 46
- leading to a genetic disorder✓ Any (4)

(6)

[15]

QUESTION 3

3.1 3.1.1 5✓ (1)

3.1.2 ATG✓ (1)

3.1.3
- Both AGU and ACA carries ser✓/serine
- Ser/serine will be replaced by another serine✓/ser
- Same protein formed✓/no change in the protein Any (2)

3.1.4
- Each tRNA carries a specific amino acid✓
- When the anticodon on the tRNA✓
- matches the codon on the mRNA✓
- then tRNA brings the required amino acid to the ribosome✓
- Amino acids become attached by peptide bonds✓
- to form the required protein✓ Any (5)

(9)

3.2 3.2.1 Percentage of nitrogenous bases✓ (1)

3.2.2
- Repeated the process 3 times✓
- Calculated the average % of nitrogenous bases✓ (2)

(Mark first TWO only)

3.2.3 $\frac{20}{100}$ ✓ x 450✓

= 90✓ (3)

(6)

[15]

TOTAL SECTION B: 30

SECTION C

QUESTION 4

Role of oestrogen and progesterone

- Oestrogen✓
- produced by follicle✓ in the ovary
- causing the thickening of endometrium✓
- In preparation for the implantation✓

- Progesterone✓
- produced by corpus luteum✓
- Further thickens endometrium✓
- to maintain pregnancy ✓
- High levels of progesterone inhibit the secretion of FSH✓
- in the pituitary gland✓
- to prevent further development of new follicles✓ in the ovary

Any (8)

Fertilisation

- In the Fallopian tube✓/Oviduct
- Haploid sperm cell makes a contact with a haploid ovum✓
- Enzymes of acrosome penetrate the egg cell membrane✓
- Only the nucleus of a sperm cell enters the ovum✓
- to fuse with the nucleus of the egg cell✓
- to form a diploid zygote✓

Any (4)

Role of umbilical cord

- Attaches foetus to the placenta✓
- Umbilical cord has umbilical artery✓
- and umbilical vein✓
- Umbilical artery carries deoxygenated blood✓/nitrogenous waste
- from foetus to placenta✓
- Umbilical vein carries oxygenated blood✓/nutrients
- from placenta to foetus✓

Any (5)

Content: (17)
Synthesis: (3)
(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logic sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information provided is relevant to the: - Role of oestrogen and progesterone - Fertilisation - Role of umbilical cord No irrelevant information given	All the information regarding the: - Role of oestrogen and progesterone - Fertilisation - Role of umbilical cord Is arranged in a logical manner	At least the following points should be included: - Role of oestrogen and progesterone 6/8 - Fertilisation 2/4 - Role of umbilical cord3/5
1 mark	**1 mark**	**1 mark**

TOTAL SECTION C: **20**

GRAND TOTAL: **60**