Education

KwaZulu-Natal Department of Education
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES

COMMON TEST

MARCH 2017

NATIONAL SENIOR CERTIFICATE

GRADE 12

MARKS: 60

TIME: 1 HOUR

This question paper consists of 10 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. Make ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, flow charts or tables 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

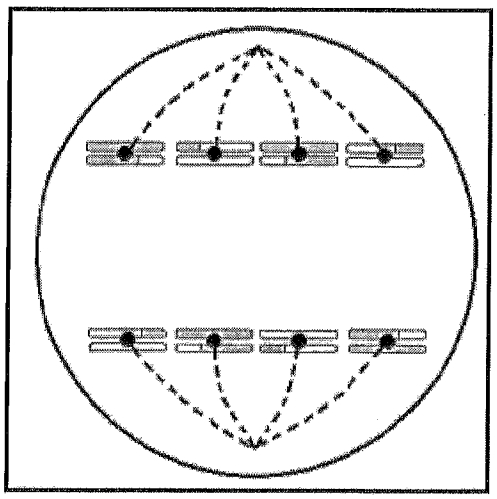
1.1 Various possible options are provided as answers to the following questions. Choose the correct answer and write only the letter (A - D) next to the question number (1.1.1 – 1.1.5) in the answer book, for e.g. 1.1.6 D.

1.1.1 A portion of DNA was found to have 120 guanine bases and 60 thymine bases.

What is the total number of deoxyribose molecules in this portion of DNA?

A 360
B 180
C 120
D 60

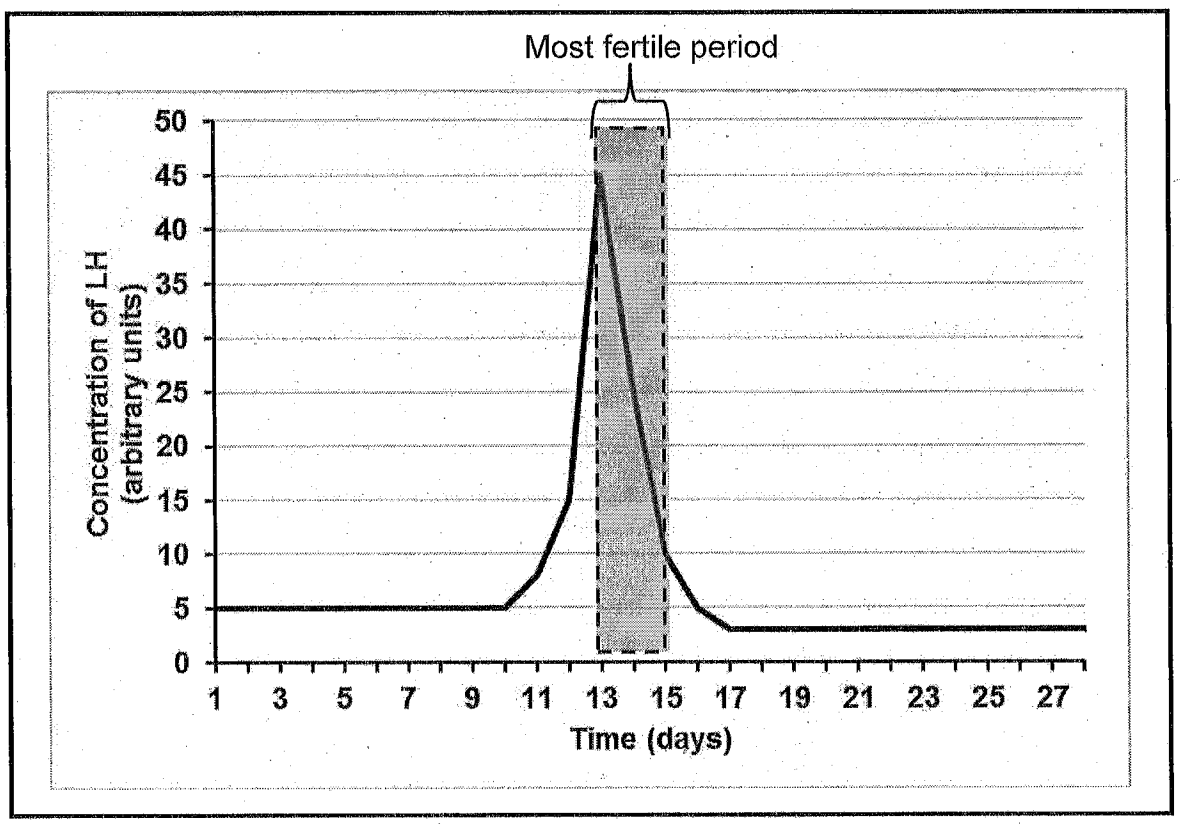
1.1.2 The diagram below represents a phase of meiosis.



The next phase of meiosis will be ...

A metaphase I.
B metaphase II.
C telophase I.
D telophase II.

Questions 1.1.3 and 1.1.4 refer to the graph below which shows the concentration of LH in the blood of a woman over a period of 28 days.



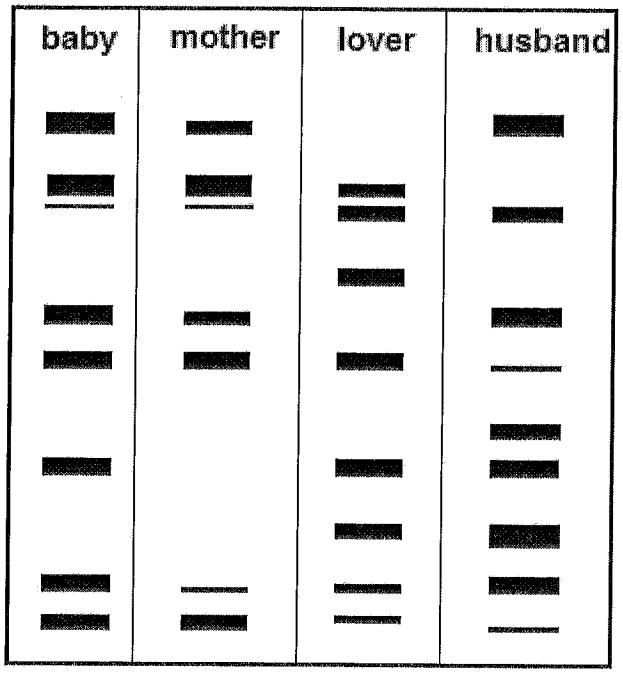
1.1.3 The process that occurs during the 'most fertile period' is ...

A ovulation.
B menstruation.
C oogenesis.
D implantation.

1.1.4 If the LH concentration reached its highest level on day 10 instead of day 13 then her most fertile period would be days ...

A 12 to 14.
B 11 to 13.
C 10 to 12.
D 9 to 11.

1.1.5 The DNA profiles below show the DNA bands of a baby, the baby's mother, the mother's lover and her husband.



Which ONE of the following statements is correct about who the father of the child is, with a corresponding correct reason?

	THE FATHER	REASON
A	Husband	All of baby's bands match his DNA profile
B	Husband	Approximately 50% of the baby's bands match his DNA profile
C	Lover	Approximately 50% of the baby's bands match his DNA profile
D	Lover	All of the baby's bands match his DNA profile

(5 x 2)(10)

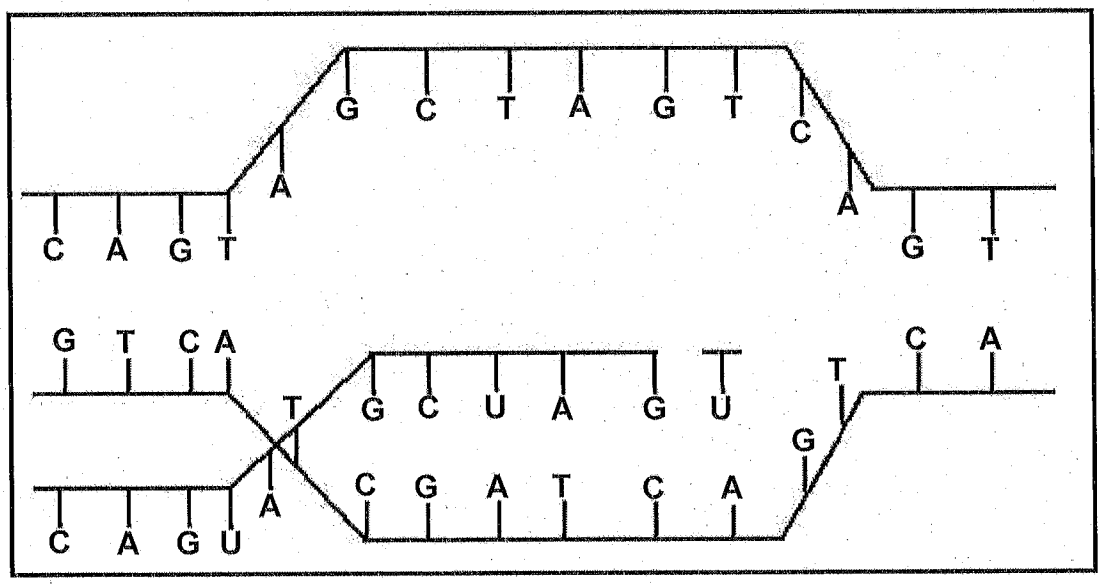
TOTAL QUESTION 1: 10

TOTAL SECTION A: 10

SECTION B

QUESTION 2

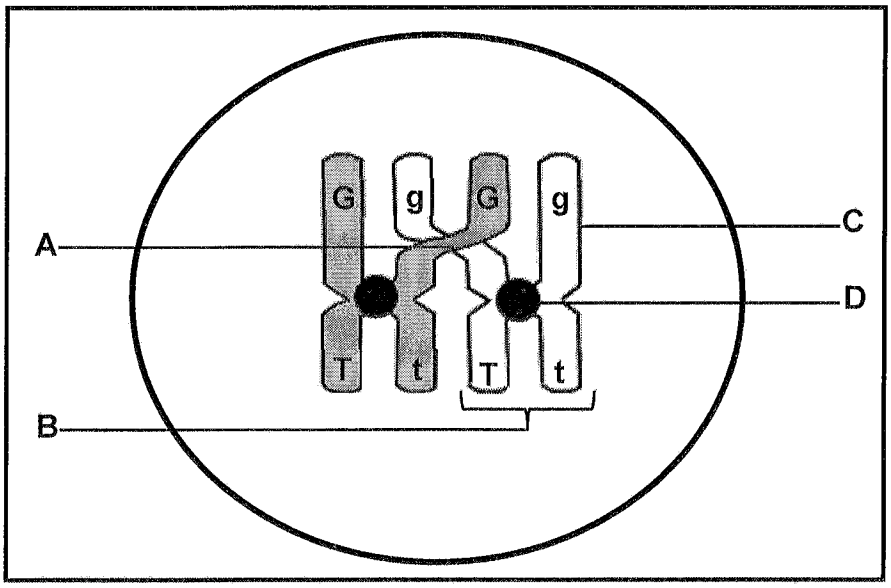
2.1 The diagram below represents a part of the process of protein synthesis.



2.1.1 Name the part of protein synthesis that is represented in the diagram. (1)

2.1.2 Tabulate TWO ways in which the process represented above differs from the process of DNA replication. (5)
(6)

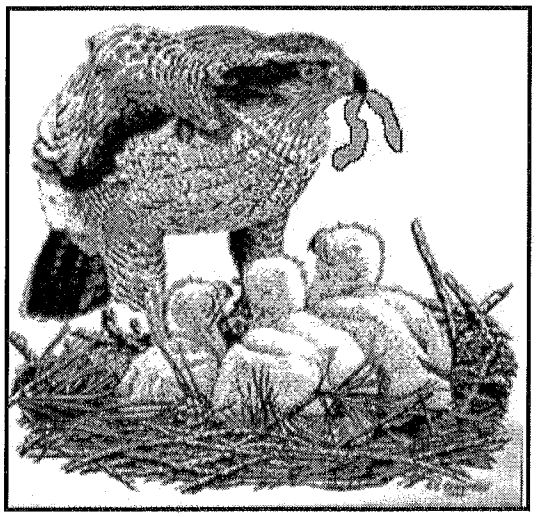
2.2 The diagram below represents a process that occurs during meiosis.



2.2.1 Name the process represented in the diagram. (1)

2.2.2 Draw a diagram to show what the chromosome labelled **B** will look like at the end of this process. (3)
(4)

2.3 The diagram below represents a bird with its chicks.



2.3.1 List TWO reproductive strategies visible in the diagram that are used by this species of bird. (2)

2.3.2 (a) Name the type of fertilization that occurs in this bird. (1)

(b) Explain why this type of fertilization allows for greater success in reproduction. (2)
(5)

TOTAL QUESTION 2: (15)

QUESTION 3

3.1 The table below shows four amino acids and their corresponding anticodons.

AMINO ACID	ANTICODON
Leucine	GAA
Glycine	CCU
Glutamic acid	GUU
Proline	GGA

3.1.1 Name the:

(a) Molecule on which the anticodon is found (1)

(b) Process used to identify the amino acids required according to the sequence of codons on m-RNA (1)

3.1.2 Give the codon for glutamic acid. (1)

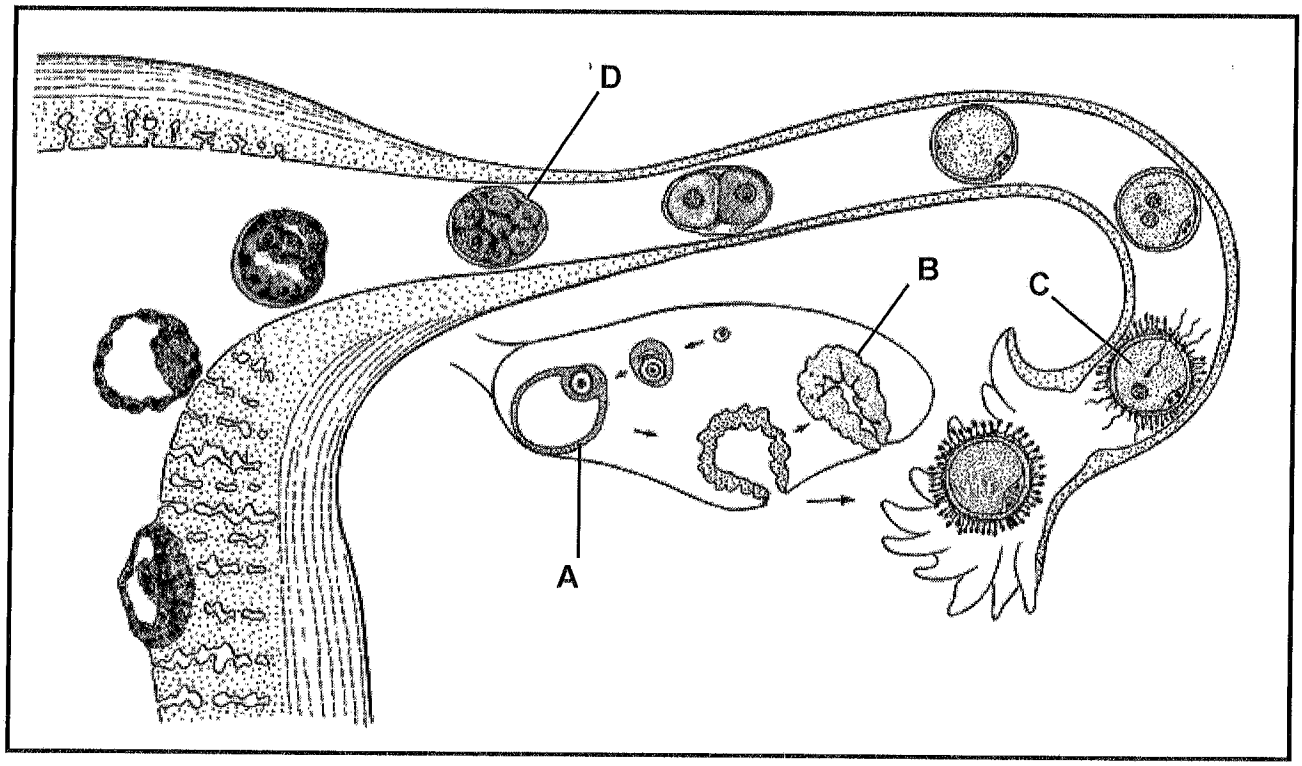
3.1.3 Use the DNA code provided below to determine the correct amino acid sequence from left to right.

CCT-GGA-GAA (2)

3.1.4 Describe the effect on protein synthesis if the DNA code changed to the following:

CCT-GGA-GGA (2)
(7)

3.2 The diagram below shows several events that occur in the human female during reproduction.



3.2.1 Identify:

(a) Structure **A** (1)

(b) The stage of embryo development represented by **D** (1)

(c) The process occurring at **C** (1)

3.2.2 (a) Name the hormone produced by the structure labelled **B**. (1)

(b) Describe the negative feedback mechanism between FSH and the hormone named in Question 3.2.2 (a). (2)

3.2.3 Explain ONE consequence if the level of the hormone named in Question 3.2.2 (a) decreases in a woman who is 7 weeks pregnant. (2)
(8)

TOTAL SECTION 3: (15)

SECTION C

QUESTION 4

Describe gametogenesis in human males, explain how the resulting cells are adapted to ensure successful fertilization and describe how abnormal meiosis can result in Down Syndrome.

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

Content (17)
Synthesis: (3)

TOTAL QUESTION 4: 20

TOTAL SECTION C: 20

GRAND TOTAL: 60

SECTION A

QUESTION 1

1.1

1.1.1 A ✓✓

1.1.2 C ✓✓

1.1.3 A ✓✓

1.1.4 C ✓✓

1.1.5 B ✓✓ **(5 x 2) (10)**

TOTAL SECTION 1: 10

TOTAL SECTION A: 10

SECTION B

2.1

2.1.1 Transcription✓ (1)

2.1.2

	Transcription (Process in the diagram) ✓		DNA Replication
1.	One DNA strand acts as a template✓	1.	Both DNA strands act as a template✓
2.	mRNA is formed✓	2.	Two DNA molecules are formed✓
3.	Uracil pairs with adenine✓	3.	Thymine pairs with adenine✓
4.	Portion of DNA molecule used✓	4.	Entire DNA molecule used✓

MARK FIRST TWO ONLY (1 + Any 2 x 2) (5)
(6)

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LIFE SCIENCES P1

MEMORANDUM

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N.B. This memorandum consists of 6 pages including this page.

2.2

2.2.1 Crossing over ✓ (1)

2.2.2

Chromosome B

Caption ✓
The chromatid is correctly shaded ✓
Correct letters on each chromatid ✓ (3)
(4)

2.3

2.3.1 Parental care ✓ and altricial development ✓

MARK FIRST TWO ONLY (2)

2.3.2 (a) Internal ✓ (1)

(b) - Since sperm are transferred directly into the body of the female ✓
- the chances of fertilization increases ✓/ chances of the sperm being destroyed is reduced (2)
(5)

TOTAL QUESTION 2: (15)

QUESTION 3

3.1

3.1.1 (a) tRNA ✓ (1)

(b) Translation ✓ (1)

3.1.2 CAA ✓ (1)

3.1.3 Glycine - Proline - Leucine ✓✓ (amino acids in correct order) (2)

3.1.4 - The order of the amino acids in the protein would change ✓ / Leucine would be replaced by proline
- A different protein would be formed ✓ (2)
(7)

3.2

3.2.1 (a) Graafian follicle ✓ (1)

(b) Morula ✓ (1)

(c) Fertilization ✓ (1)

3.2.2 (a) Progesterone ✓ (1)

(b) - High level✓ of progesterone/hormone A
- inhibits the production of FSH✓
- therefore a new follicle will not be produced ✓ Any 2 (2)

3.2.3 - The endometrium/D will be shed✓
- and the woman could have a miscarriage✓/foetus dislodged (2)
(8)

TOTAL QUESTION 3: (15)

TOTAL SECTION B: (30)

SECTION C

QUESTION 4

How male gametes are produced

- During spermatogenesis ✓
- under the influence of testosterone ✓
- diploid cells ✓
- in the seminiferous tubules ✓
- of the testes ✓
- undergo meiosis ✓
- to form haploid ✓
- sperm cells ✓

(Max 5)

Structural adaptations of the mature sperm

- The front of the head of the sperm cell contains an acrosome ✓ / vesicle which carries enzymes to dissolve a path into the ovum ✓
- The nucleus of the sperm ✓ carries genetic material of the male ✓
- The middle piece contains mitochondria ✓ which release energy ✓ so that the sperms can swim
- The presence of a long tail ✓ enables the sperm cells to swim ✓ towards the ovum
- The contents of the sperm cell, such as the cytoplasm, is reduced ✓ making the sperm light ✓ for efficient movement (Any 3 x 2) (6)

How Down Syndrome occurs

- In meiosis I✓
- the chromosome pair 21 does not separate✓
- In meiosis II✓
- the chromatids of chromosome 21 do not separate✓/ centromere does not divide
- This is referred to as non-disjunction ✓
- One gamete will have an extra copy of chromosome number 21✓ / two copies of chromosome number 21
- If this gamete fuses with a normal gamete✓/ gamete with 23 chromosomes
- the resulting zygote will have 3 copies✓ of chromosome 21 instead of 2/ the zygote has 47 chromosomes leading to Down syndrome

(Max 6)

Content (17)
Synthesis (3)
(20)

Marks for Synthesis			
Criterion	**Relevance (R)**	**Logical Sequence (L)**	**Comprehensive (C)**
Generally	All information provided is relevant to the topic	Ideas are arranged in a logical/cause-effect sequence	All aspects required by the essay have been sufficiently addressed
In this essay	All information relevant to spermatogenesis, abnormal meiosis and adaptations of sperm are mentioned	All events of spermatogenesis and abnormal meiosis are in sequence and structures are linked to functions.	Sperm formation: 3/5 Abnormal meiosis: 4/6 Structural adaptations of sperm: 4/6
Mark	1	1	1

TOTAL QUESTION 4: 20

TOTAL SECTION C: 20

GRAND TOTAL: 60