

# Basic Education

KwaZulu-Natal Department of Basic Education  
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES

COMMON TEST

MARCH 2016

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

MARKS: 60

TIME : 1 hour

This question paper consists of 8 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 The following statements may / may not occur when an mRNA strand is formed.

- (i) DNA replicates
- (ii) DNA unwinds
- (iii) DNA acts as a template
- (iv) mRNA is formed on the complementary strand of DNA
- (v) RNA nucleotides pair off with the DNA molecule

Which of the following is correct when an mRNA strand is formed?

- A. (ii); (iii); (v)
  - B. (i); (ii); (iii); (iv); (v)
  - C. (ii); (iii); (iv)
  - D. (i); (iii); (v)
- 1.1.2 Which ONE of the following is CORRECT with regard to the structure of DNA and RNA?
- A. RNA is double-stranded and DNA is single-stranded.
  - B. DNA forms a double helix while RNA does not.
  - C. RNA contains deoxyribose sugar while DNA contains ribose sugar.
  - D. RNA is a very long molecule while DNA is a short molecule.
- 1.1.3 How many amino acids make up a portion of a protein if the number of nitrogenous bases on the DNA molecule that codes for that portion of the protein is 120?

- A. 3
- B. 20
- C. 60
- D. 120

1.1.4 The DNA profiles shown below are from a family with four children.

PARENT 1	PARENT 2	CHILD 1	CHILD 2	CHILD 3	CHILD 4
████████		████████			████████
			████████		
████████	████████	████████	████████	████████	
████████			████████	████████	
	████████				████████
	████████		████████	████████	
████████		████████		████████	████████
	████████				
████████		████████	████████	████████	
	████████	████████			████████
████████	████████	████████			
		████████			████████

Which ONE of the children in the family is adopted?

- A. 4
- B. 3
- C. 1
- D. 2

1.1.5 The difference between spermatogenesis and oogenesis is that ...

- A. all 4 cells formed in both become haploid sperm and ova.
- B. only 1 haploid sperm and 4 haploid ova is / are formed.
- C. 4 cells become haploid sperm cells and only 1 cell forms a haploid ovum.
- D. 4 diploid sperm cells and 1 diploid ovum is / are formed

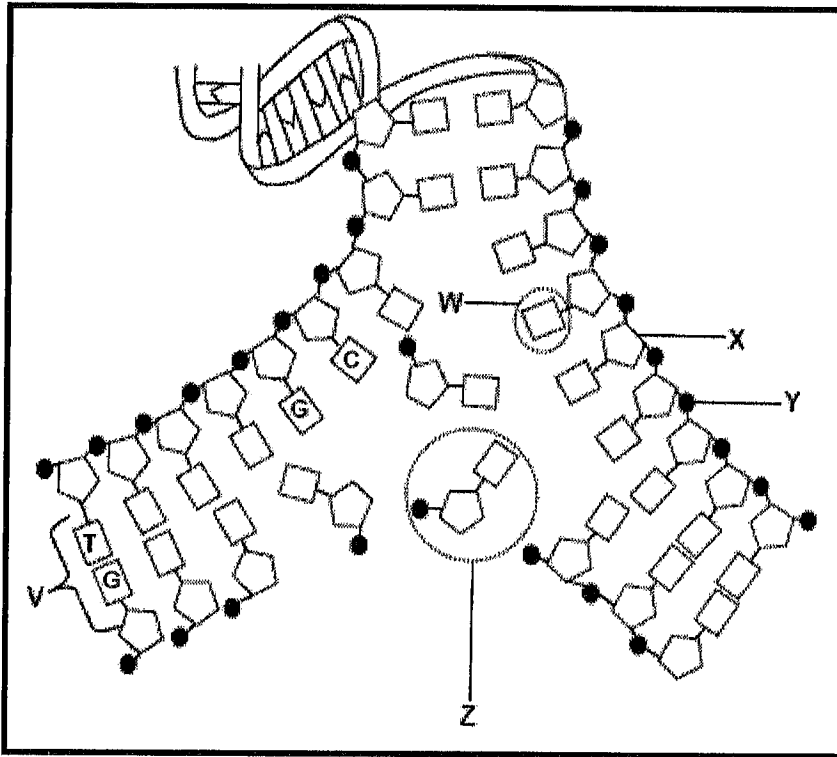
(5 x 2) (10)

TOTAL QUESTION 1: [10]

TOTAL SECTION A: [10]

**SECTION B****QUESTION 2**

2.1 The diagram below represents a nucleic acid.



2.1.1 Identify:

- (a) X (1)  
 (b) Z (1)

2.1.2 Give TWO reasons why DNA replication is important in cells. (2)

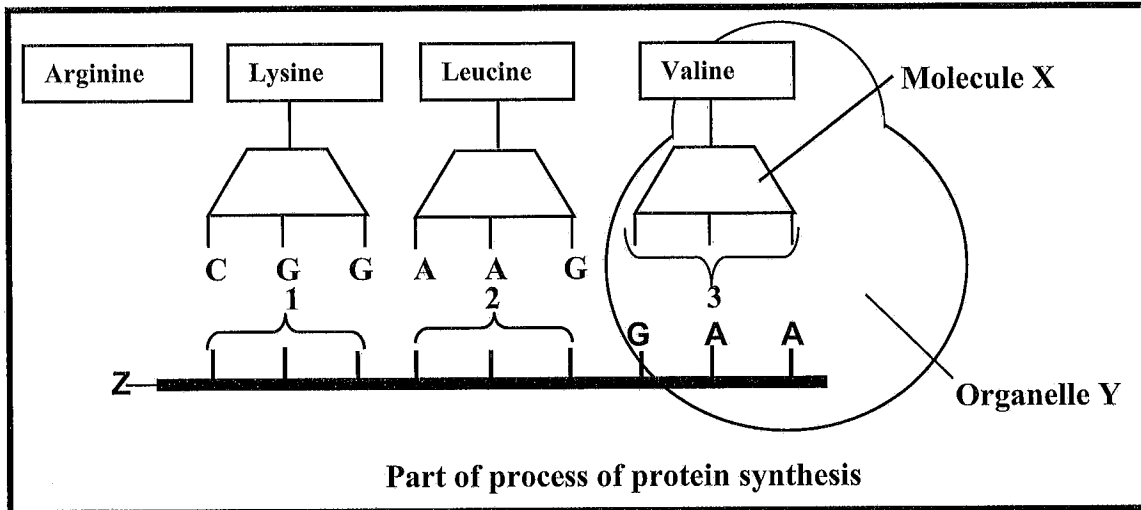
2.1.3 During what phase of the cell cycle does DNA replication take place? (1)

2.1.4 Identify the nitrogenous base, labelled W, in the diagram. (1)

2.1.5 Describe the type of error at V on the diagram. (2)

**(8)**

2.2 The diagrams below represent part of the process of protein synthesis.



2.2.1 Name the process that is represented in the diagram (1)

2.2.2 Identify each of the following molecules:

- (a) X (1)
- (b) Z (1)

2.2.3 Give each of the following:

- (a) The codon for lysine. (1)
- (b) The anticodon for valine. (1)
- (c) DNA base triplet for arginine if the anticodon for it is UCA. (1)

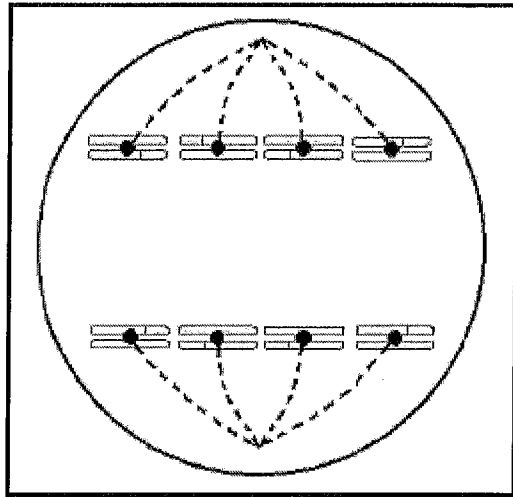
2.2.4 If the next three bases (to the right) on molecule Z is UUC then what will the next amino acid in the chain be? (1)

(7)

**TOTAL QUESTION 2: (15)**

**QUESTION 3**

3.1 The diagram below represent a phase of the process of meiosis.



- 3.1.1 How many chromosomes will be present in this cell at the end of the cell division? (1)
- 3.1.2 (a) Name the phase of meiosis that occurs immediately before the phase shown in the diagram. (1)
- (b) Describe events that take place in the phase of meiosis identified in QUESTION 3.1.2(a). (2)
- 3.1.3 State TWO ways in which genetic variation is introduced during meiosis. (2)
- 3.1.4 The process shown in the diagram produces male and female gametes in a human being. Describe the process involved when these gametes fuse during sexual reproduction. (4)
- (10)**

3.2 The information provided below explains how seahorses reproduce.

The reproductive process begins when a male and a female seahorse do daily pre-dawn dances, intertwining their tails and swimming together. Eventually they engage in a true courtship dance, which can last as long as eight hours. It ends with the female depositing her eggs in the male's pouch which is on his stomach.

The eggs are then fertilized in the dad's pouch.

The eggs hatch in the pouch. The father cares for the young in his pouch as they grow, regulating the water salinity in the pouch to prepare them for life in the sea.

When the tiny seahorses are ready to be born, the male undergoes muscular contractions to expel the young, known as "fry," from the pouch. The fry then swim away to live on their own.

Adapted from :news.nationalgeographic.com

3.2.1 List THREE reproductive strategies used by seahorses. (3)

3.2.2 Explain ONE way how the seahorses improve the chances that the eggs will be successfully fertilized. (2)

(5)

**TOTAL QUESTION 3: (15)**

## SECTION C

### QUESTION 4

Describe the role of hormones in the ovarian and uterine cycles when a woman falls pregnant.

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

Content: 17  
Syntesis: 3

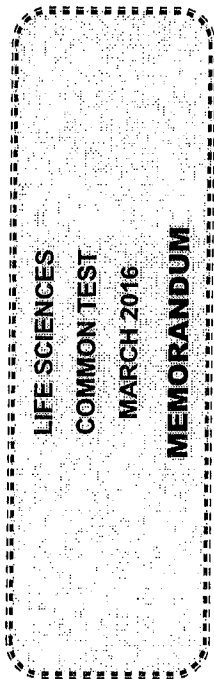
**TOTAL QUESTION 4: (20)**  
**TOTAL SECTION C: (20)**  
**GRAND TOTAL: [60]**





## Basic Education

KwaZulu-Natal Department of Basic Education  
REPUBLIC OF SOUTH AFRICA



**NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

MARKS : 60

TIME : 1 hr

This memorandum consists of 5 pages.

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LIFE SCIENCES

2  
NSC-MEMORANDUM

March 2016 Common Test

### QUESTION 1 SECTION A

1. 1.1  
1.1.1 A✓✓  
1.1.2 B✓✓  
1.1.3 B✓✓  
1.1.4 D  
1.1.5 C✓✓

(10)

TOTAL QUESTION 1: [10]

TOTAL SECTION A: [10]

### SECTION: B

- 2.1 2.1.1 (a) Deoxyribose sugar✓  
(b) Nucleotide✓ (1)  
2.1.2 - To ensure that each daughter cell has the correct amount of DNA✓ (1)  
- The daughter cells chromosomes/genetic material is identical to the parent cell✓ (2)  
2.1.3 Interphase✓ (1)  
2.1.4 G✓/Guanine (1)  
2.1.5 - Incorrect base-pairing✓  
- T with G instead of T with A✓ / G with T instead of G with C (any 2) (2)  
- which represents a mutation✓ (8)

2.2

- 2.2.1 Translation✓ (1)  
2.2.2 (a) tRNA✓ (1)  
(b) mRNA✓ (1)  
2.2.3 (a) GCC✓ (1)  
(b) CUU✓ (1)  
(c) TCA✓ (1)  
2.2.4 Leucine✓ (1)

(15)

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- 3.
- 3.1
- 3.1.1 Four ✓/4 (1)
- 3.1.2 (a) Metaphase ✓ (1)
- (b) Homologous chromosomes ✓ line up at the equator ✓ of the cell (2)
- 3.1.3 - Crossing over ✓ (2)
- Random arrangement of chromosomes at the equator ✓
- 3.1.4 - In the Fallopian tubes ✓
- one sperm cell makes contact with the ovum's membrane ✓
- The acrosome on the sperm contains enzymes ✓
- which digests the membrane of the ovum ✓
- The nucleus of the sperm enters the ovum ✓
- The membrane of the ovum becomes impenetrable ✓ to other sperm
- The nucleus of the sperm fuses ✓
- with the nucleus of the ovum ✓
- to form a diploid zygote ✓
- This is called fertilization ✓ (Any 4) (4) (10)
- 3.2
- 3.2.1 - External fertilization ✓
- Artificial ✓ offspring
- Parental care ✓
- Ovipary ✓
- Courtship behaviour ✓ (Any 3) (3)
- (Mark first THREE only)
- 3.2.2 - The eggs are deposited into the males pouch ✓ / Fertilisation occurs in the pouch
- this ensures that the sperm remain close to/hear the eggs ✓ (Any 1 X 2) (2) (5) (15)
- (Mark first ONE only)

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4. Ovarian Cycle
- FSH ✓/follicle stimulating hormone
- is secreted by the pituitary gland ✓
- FSH stimulates the development of a primary follicle ✓ into a Graafian follicle ✓ containing the ovum ✓
- Around day 14 the pituitary gland secretes LH ✓
- which causes the Graafian follicle to rupture and release the ovum ✓
- This process is called ovulation ✓
- The empty follicle changes and becomes the corpus luteum ✓
- under the influence of LH ✓
- which begins to secrete progesterone ✓

- Uterine cycle
- As the Graafian follicle develops it secretes oestrogen ✓
- which causes the lining of the uterus ✓/endometrium
- to become thicker ✓/more vascular
- in preparation for a possible implantation of the embryo ✓/development of the foetus
- The progesterone that is produced by the corpus luteum after ovulation causes the further thickening ✓ of the endometrium
- High levels of progesterone ✓
- inhibits the secretion of FSH ✓
- which prevents the development of a new follicle in the ovary ✓ (Any 11)

- When pregnancy occurs
- The corpus luteum remains intact ✓
- which leads to the levels of progesterone remaining high ✓
- to maintain the endometrium ✓
- so that the pregnancy is maintained ✓
- Around the 12<sup>th</sup> week of pregnancy ✓
- the corpus luteum degenerates ✓
- and the placenta takes over the production of progesterone ✓

(Any 6)  
Content  
Synthesis  
17  
3  
(20)

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2016/03/16

<b>Marks for synthesis</b>			
<b>Criterion</b>	<b>Relevance (R)</b>	<b>Logical sequence (L)</b>	<b>Comprehensive (C)</b>
<b>Generally</b>	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
<b>In this essay</b>	Only information relevant to the hormones involved in the ovarian and uterine cycles of the menstrual cycle and pregnancy are discussed. There is NO irrelevant information provided.	The role of hormones in the events of the ovarian and uterine cycles and pregnancy are described in a logical sequence.	Information provided should include correct content from each of the following sections:  Ovarian cycle and Uterine cycle 7/11 Pregnancy 3/6
<b>Mark</b>	1	1	1

**TOTAL QUESTION 4: [20]**  
**TOTAL SECTION C: [20]**  
**GRAND TOTAL: [60]**

