

Basic Education

KwaZulu-Natal Department of Basic Education
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES

COMMON TEST

MARCH 2015

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

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. 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**

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 The process of gametogenesis in human males and females is different in that ...

- A meiosis does not take place in males.
- B sperm cells are formed by mitosis while ova are formed by meiosis.
- C all the cells formed in males become sperm cells but only one cell becomes the ovum in females.
- D sperm cells are haploid whereas the ovum is diploid.

1.2 Study the steps below representing a process in males.

- i. Immature sperm are stored in the epididymis
- ii. Spermatogenesis occurs
- iii. As sperm move along the sperm duct, fluids are added from glands
- iv. Semen passes along the urethra out of the body

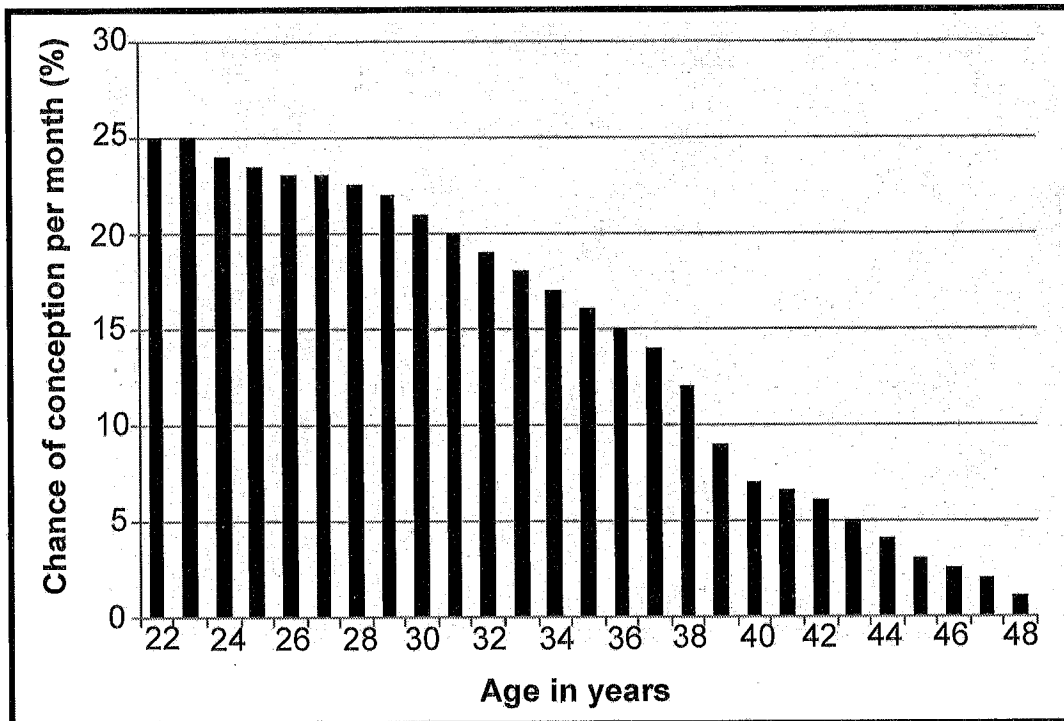
Which **ONE** of the following combinations represents the correct steps in the production of semen in males?

- A i, ii, iii, iv
- B ii, iii, i, iv
- C ii, i, iii, iv
- D iii, ii, iv, i

1.3 Which **ONE** of the following statements about the hormones FSH and LH is correct?

- A As the level of FSH increases, the level of LH decreases
- B FSH inhibits LH
- C FSH is produced by the pituitary gland and LH is produced by the corpus luteum
- D Both hormones reach a maximum level around the time of ovulation

- 1.4 The graph below shows the differences in the chances of conception per month in women between the ages of 22 years and 48 years.



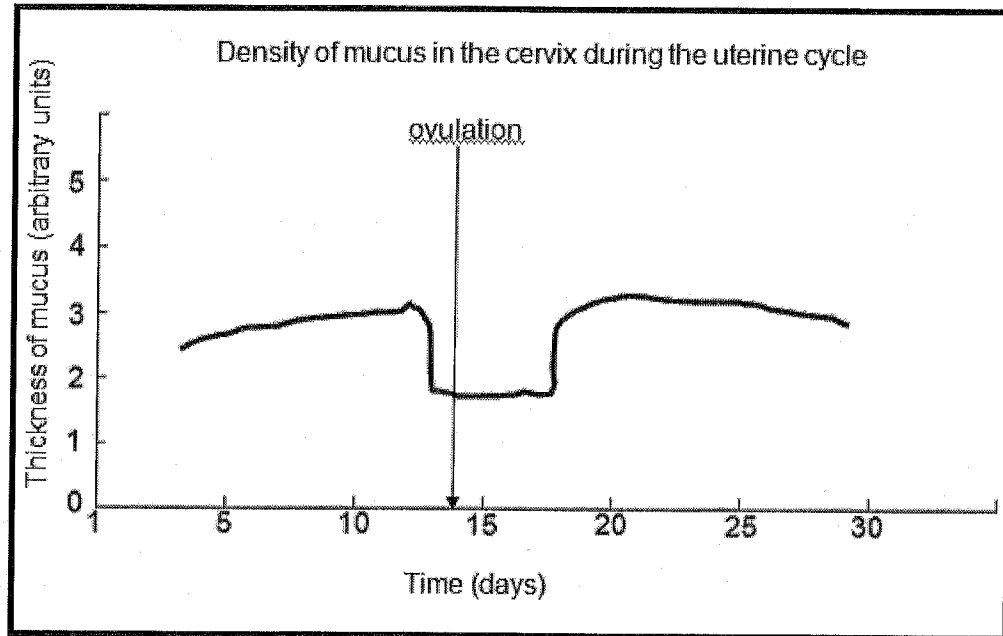
<http://rba-online.com/ivf/index.php?Female-Infertility-31>

What is the difference in the chance of conception per month between a woman that is 43 years old and one that is 36 years old?

- A 20 %
- B 10 %
- C 5 %
- D 15 %

1.5

Study the graph below that shows the density of mucus in the cervix during the uterine cycle.



A reasonable conclusion that can be made from the information in the graph above is that ...

- A the mucus in the cervix is thinnest around the time of ovulation.
- B the thickness of the mucus does not change during the uterine cycle.
- C the thickness of the mucus is controlled by hormones.
- D mucus in the cervix promotes implantation.

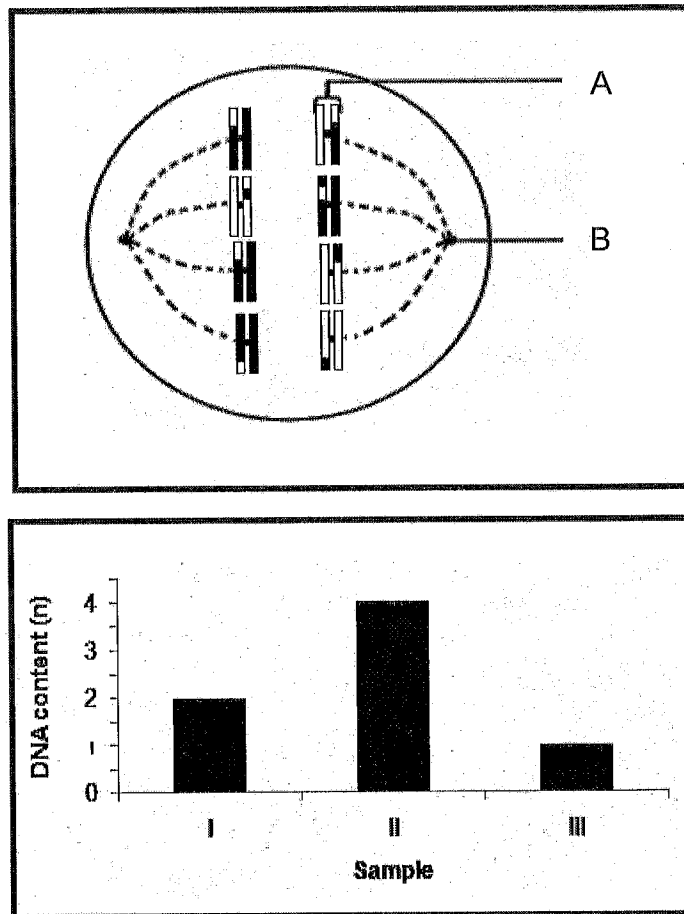
TOTAL QUESTION 1: 10

TOTAL SECTION A: 10

SECTION B

QUESTION 2

2.1 The diagram below represents a cell undergoing meiosis. The graph shows the DNA content of three samples of cells.



http://www.easynotecards.com/notecard_set/7760

- 2.1.1 Identify the structures labelled **A** and **B**. (2)
- 2.1.2 Name the phase of meiosis shown in the diagram. (1)
- 2.1.3 Give **ONE** observable reason for your answer to QUESTION 2.1.2. (1)
- 2.1.4 How many chromosomes will be present in the cell at the:
- Beginning of prophase I (1)
 - End of meiosis II (1)
- 2.1.5 State whether the cell undergoing meiosis was taken from sample I, II or III on the graph. (1)
- 2.1.6 Give an explanation for your answer to QUESTION 2.1.5. (2)
- (9)**

2.2 The diagrams below represent chicks that are three hours old.



- 2.2.1 Both sets of parents of the chicks in the above diagram lay eggs. Give the correct term for this type of reproductive strategy. (1)
- 2.2.2 Which chick (**A** or **B**) represents precocial development? (1)
- 2.2.3 State **TWO** ways in which the chick identified in QUESTION 2.2.2 will be different from the chick that has altricial development. (2)
- 2.2.4 "Precocial development requires fertilization to be internal."

List **TWO** advantages of internal fertilization for organisms living on land.

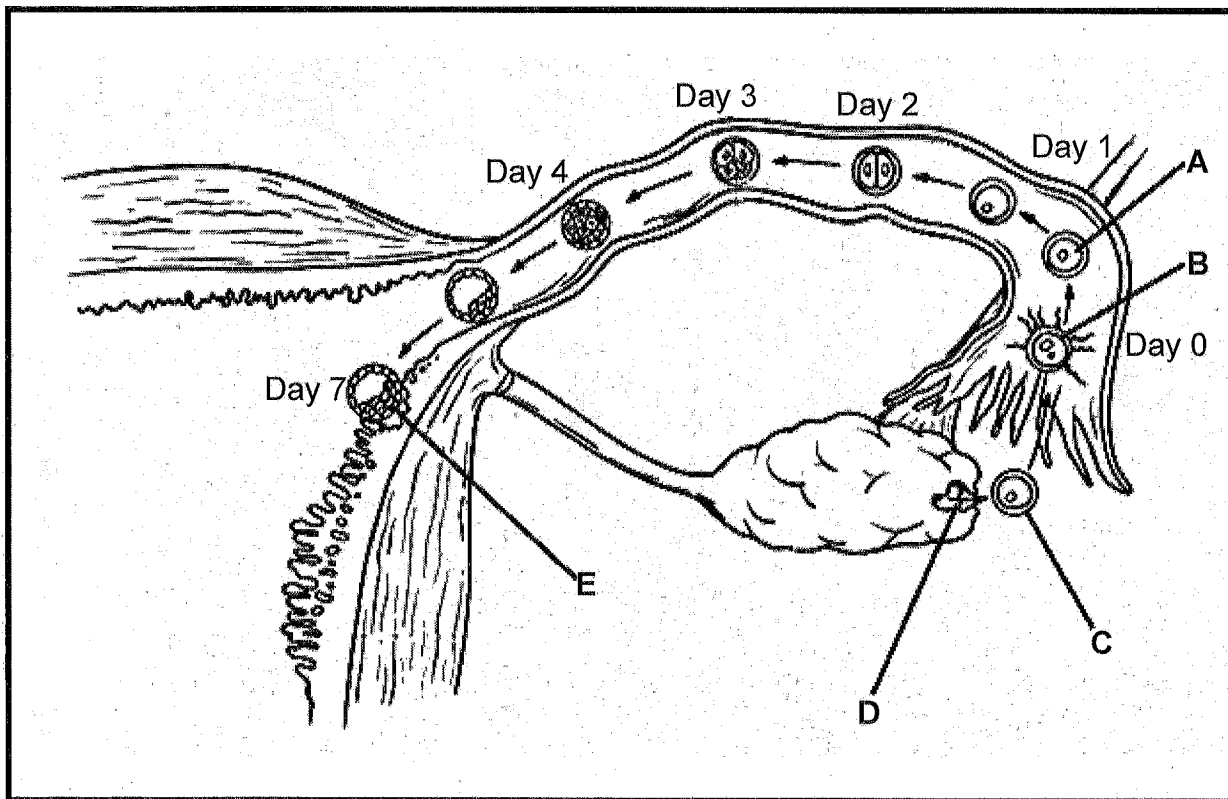
(2)

(6)

TOTAL QUESTION 2 (15)

QUESTION 3

3.1 The diagram below represents a part of the reproductive process in humans.



3.1.1 Which LETTER on the above diagram represents the process of:

- (a) Fertilization (1)
 (b) Implantation (1)

3.1.2 Give the correct term for the cell labelled A. (1)

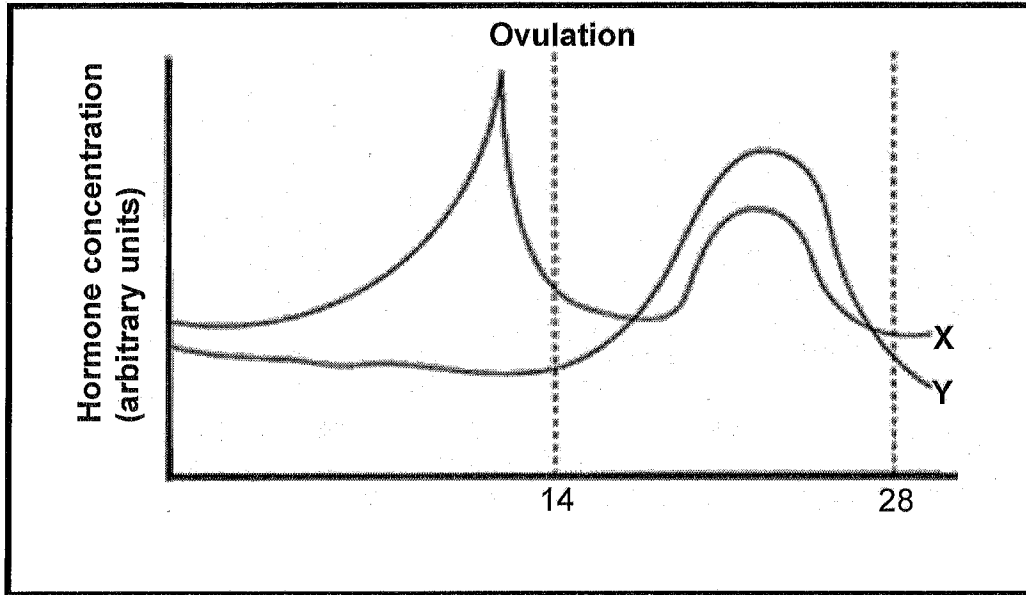
3.1.3 Describe the changes that occur in cell A until it forms a blastula / blastocyst. (4)

3.1.4 Name the structure that will form at D after the release of structure labelled C. (1)

3.1.5 Give **ONE** function of the structure named in QUESTION 3.1.4. (1)

(9)

3.2 Study the graph below.



3.2.1 Identify hormones X and Y. (2)

3.2.2 Explain the changes in level of hormone Y between day 14 and day 28. (4)

TOTAL QUESTION 2: (6)
(15)

SECTION C

QUESTION 4

A gene consists of DNA which codes for a particular protein. When a gene mutation occurs, it changes the base sequence on the DNA molecule, affecting protein synthesis.

Describe the process of protein synthesis and explain how this process may be affected by a gene mutation.

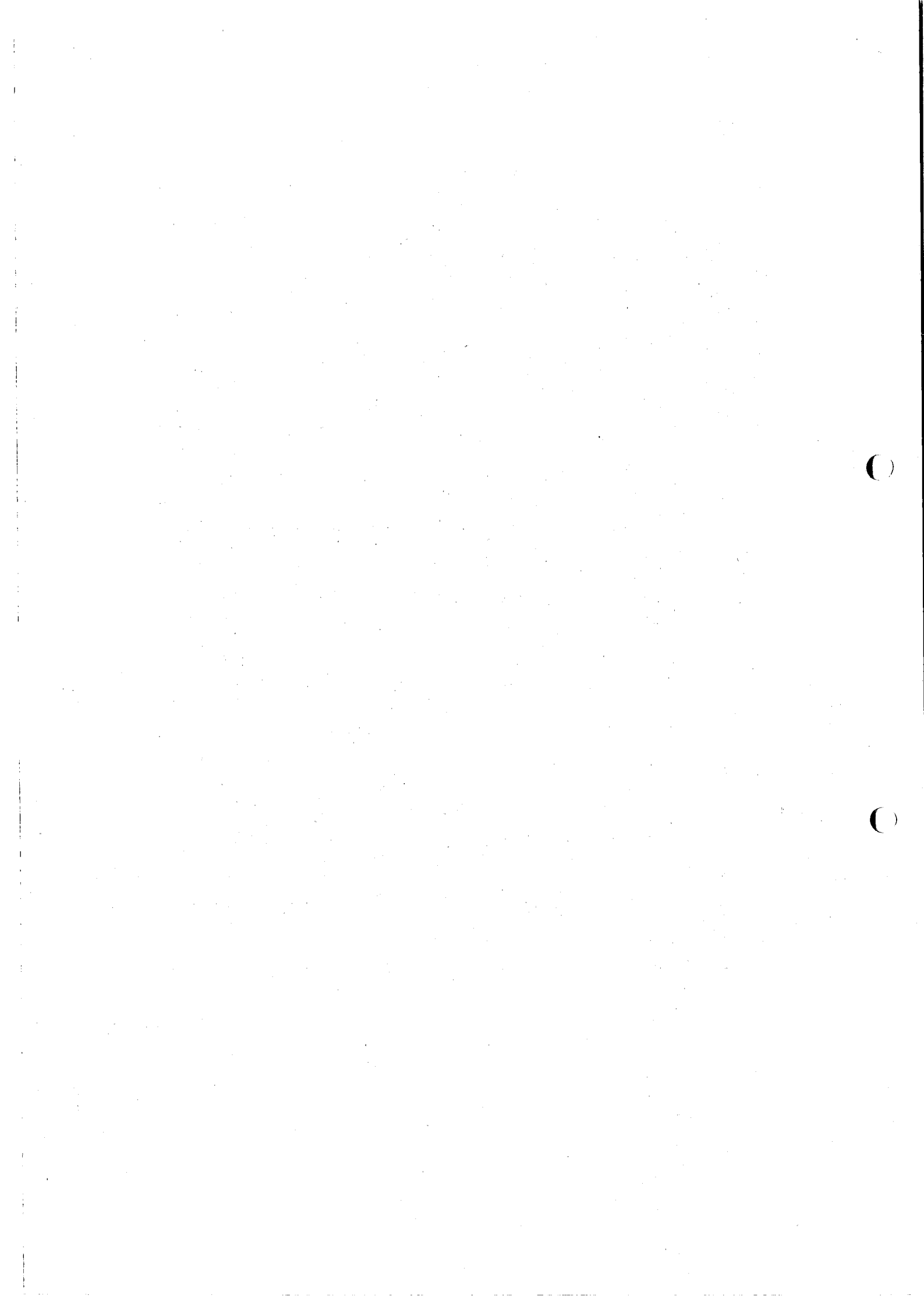
NOTE: NO marks will be awarded for answers in the form of flow charts or diagrams.

Content: (17)
Synthesis: (3)

TOTAL QUESTION 4: (20)

TOTAL SECTION C: (20)

GRAND TOTAL: 60





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This memorandum consists of 4 pages.

Life Sciences

QUESTION 1

- 1.1 C✓✓
- 1.2 C✓✓
- 1.3 D✓✓
- 1.4 B✓✓
- 1.5 A✓✓

SECTION: B QUESTION 2

- 2.1 2.1.1 A - chromosome✓
B - centriole✓ / centrosome
- 2.1.2 Anaphase I✓
- 2.1.3 - Homologous chromosomes are being separated ✓ / chromosomes are being pulled to opposite poles of the cell
- Spindle fibres are being shortened ✓

Mark first ONE only

- 2.1.4 (a) 8 ✓
(b) 4 ✓

2.1.5 Sample II✓

- 2.1.6 - DNA replication took place in a diploid cell ✓
- doubling the amount of DNA✓ in the cell

2.2 2.2.1 Ovipary✓

2.2.2 B✓

2.2.3 The young bird will be able to:-

- Move on its own✓
- Feed itself ✓
- Escape from danger ✓
- Open its eyes ✓

Mark first TWO only

2.2.4

- Sperm don't need water to swim to the egg✓
- Sperm/ovum do not dry out✓
- Sperm cannot get "lost" in a large body of water✓/sperm only have one path to follow
- Ovum /sperm are protected from predation ✓
- Increases chance of fertilization ✓
- Fewer offspring produced ✓
- Allows for some degree of parental care ✓

Mark first TWO only

Any 2

TOTAL QUESTION 1 (10)
TOTAL SECTION A (10)

TOTAL QUESTION 2 (15)

QUESTION 3

- 3.1 3.1.1 (a) B ✓ (1)
(b) E ✓ (1)
- 3.1.2 Zygote ✓ (1)
- 3.1.3 - The zygote undergoes mitosis ✓
- until a ball of cells is formed ✓
- called a morula ✓
- The morula continues to divide and forms a mass of cells with a hollow cavity ✓ called a blastula / blastocyst
Any 4 (4)
- 3.1.4 Corpus luteum ✓ (1)
- 3.1.5 Secretes progesterone ✓ (1)
(9)
- 3.2 3.2.1 X - oestrogen ✓ (2)
Y - progesterone ✓
- 3.2.2 Day 14 - 21
- Progesterone level rises ✓ to prepare for a pregnancy
- since the released ovum may be fertilized ✓
- Day 21 - 28
- Progesterone level drops ✓
- probably due to fertilization not taking place ✓ / allowing for menstruation (6)

SECTION C**QUESTION 4**

This process occurs in two steps
Transcription ✓

- The double-stranded DNA unzips ✓
 - When the hydrogen bonds between the two strands break ✓ / the two strands separate
 - One strand is used as a template ✓
 - To form mRNA ✓
 - Using free RNA nucleotides ✓ from the nucleoplasm
 - The mRNA is complementary to the DNA ✓ / A-U and G-C
 - mRNA now has the coded message for protein synthesis ✓
 - The mRNA moves from the nucleus to the cytoplasm ✓ / attaches to the ribosome
- Any 7 (7)

Translation ✓

- Each tRNA carries a specific amino acid ✓
 - When the anticodon on the tRNA ✓
 - matches/is complementary to 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 ✓
 - The process is controlled by specific enzymes ✓
- Any 6 (6)

Gene Mutation

- mRNA codons will change ✓
 - tRNA with a different amino acid ✓ will be brought to the mRNA strand
 - Changing the sequence of amino acids ✓
 - Hence changing the type of protein made ✓
- (4)

Marks for synthesis

Criterion Generally	Relevance (R) All information provided is relevant to the topic	Logical sequence (L) Ideas are arranged in a logical/cause-effect sequence	Comprehensive (C) All aspects required by the essay have been sufficiently addressed
In this essay	Only information relevant to protein synthesis and the effects of a gene mutation are included. (There is no irrelevant information)	The events of protein synthesis and the effects of a gene mutation are included in a logical sequence within each aspect.	At least THREE points are included on each of the following aspects:- - transcription, - translation and - gene mutations
Mark	1	1	1

TOTAL QUESTION 3: (15)

Content (17)
Synthesis (3)

TOTAL QUESTION 4: (20)
TOTAL SECTION C: (20)
GRAND TOTAL: [50]