education

Department:
Education
PROVINCE OF KWAZULU-NATAL

GRADE 12

NATIONAL SENIOR CERTIFICATE

LIFE SCIENCES

COMMON TEST

JUNE 2019

MARKS: 150

TIME: 2½ hours

N.B. This question paper consists of 15 pages including this page.

Copyright reserved

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 1.1.10) in your ANSWER BOOK, for example 1.1.11 D.

1.1.1 Each somatic cell in a human has ...

A 23 different chromosomes.
B 46 similar chromosomes.
C 23 pairs of chromosomes.
D 46 pairs of different chromosomes.

1.1.2 A stimulus is usually received by a ...

A receptor.
B effector.
C sensory neuron.
D motor neuron.

1.1.3 In most stable freshwater environments populations of a type of water fleas are almost entirely females and reproduce asexually. However, males are observed in low-oxygen environments.

Based on these observations, a researcher suggests at the start of an experiment that:

Male water fleas only develop in response to low-oxygen environments.

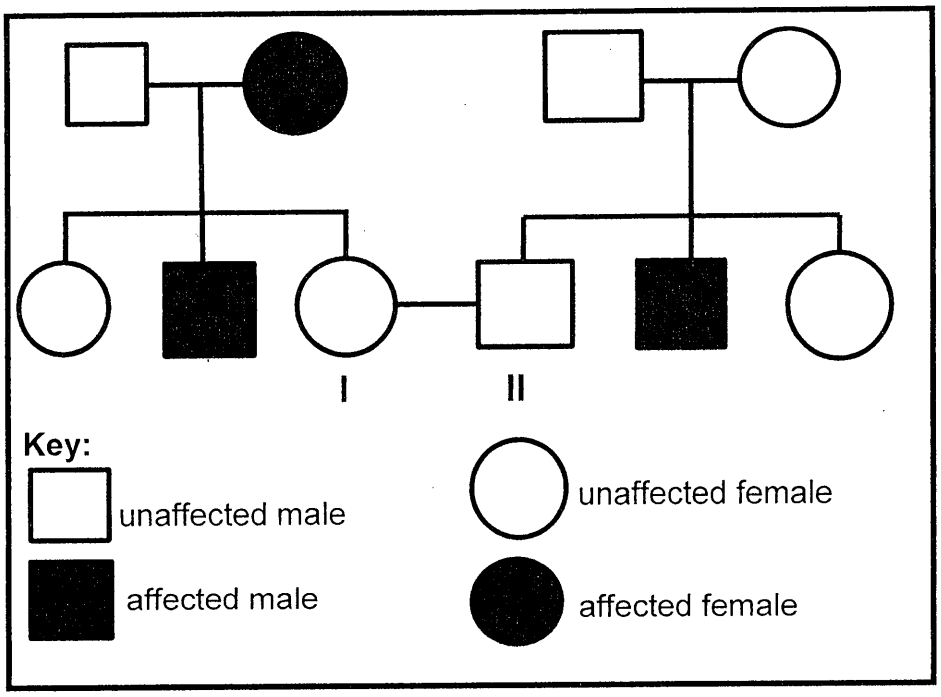
This is an example of a/an ...

A conclusion.
B hypothesis.
C theory.
D aim.

1.1.4 The nucleotides making up a nucleic acid are held together by...

A strong phosphate bonds.
B sugar phosphate bonds.
C weak hydrogen bonds.
D weak nitrogen bonds.

1.1.5 The pedigree diagram shows the inheritance of a sex-linked genetic disorder in a family. The allele for this disorder is recessive to the normal allele.



It is true that the allele for this disorder is carried on the **X** chromosome because...

A there are fewer affected males than unaffected males.
B Only one of the five females is affected.
C unaffected males have affected sons.
D an affected female gave birth to unaffected daughters.

1.1.6 Which one of the following is the CORRECT statement and significance for DNA replication?

A Two non-identical DNA molecules are formed so that daughter cells will be identical.
B Two identical DNA molecules are formed so that it is shared equally amongst daughter cells.
C Three identical DNA molecules are formed so that three identical gametes are formed.
D Two identical DNA molecules are formed so that the gametes will be identical.

1.1.7 In a breeding experiment between two organisms showing the same phenotype, the offspring showed a different phenotype.

Which ONE of the following statements is TRUE regarding the above?

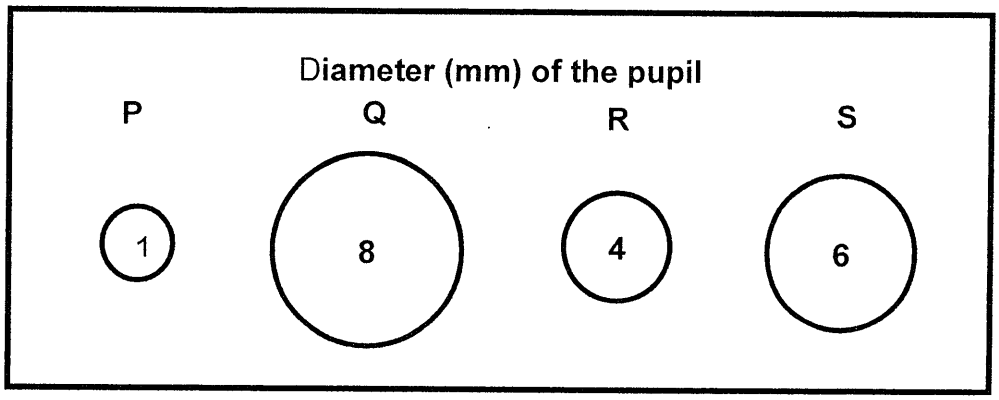
A A mutation occurred.
B Both parents were homozygous.
C Both parents carry at least one recessive gene.
D Only one parent carried at least one recessive gene.

QUESTIONS 1.1.8 AND QUESTION 1.1.9 REFER TO THE INVESTIGATION AND A GRAPH BELOW.

An investigation was done to determine the effect of light intensity on the diameter of a pupil when looking at the same object.

The procedure was as follows:

- Same type and size of rooms were used
- Rooms were painted the same colour
- All rooms had no windows
- One room had no light bulb, another room had 2 light bulbs switched on, another one had 4 light bulbs switched on and the other one had 8 light bulbs switched on
- The same person was given equal time to look at the same object within the different rooms and the diameter of a pupil was measured and is represented in the circles below. The circles are not drawn to scale.



1.1.8 Which of the following is the correct number and a reason for a room that had **8** light bulbs switched on?

A P, because too much light had no effect on the pupil size
B Q, because too much light increases the diameter of the pupil
C P, because too much light caused a pupil to constrict
D R, because too much light stops the flexibility of the pupil.

1.1.9 When looking at an object in room **2** the...

A cilliary muscles contract and the radial muscles relax
B radial muscles relax and circular muscles contract
C radial muscles contract and the pupil constrict
D circular muscles relax and radial muscles contract

1.1.10 Study the list below relating to reflex arc:

(i) damaged motor neuron
(ii) extremely shortened dendrites of the interneuron
(iii) damaged effector muscles
(iv) damaged dendrites of a sensory neuron

Which ONE of the following will definitely lead to the inability to respond to the stimulus?

A (i) and (iii) only
B (i), (ii) and (iii) only
C (i), (ii), (iii) and (iv)
D (ii) and (iv) only

(10 x 2) **(20)**

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 1.2.10) in the ANSWER BOOK.

1.2.1 Monomer of nucleic acids

1.2.2 The production of genetically identical organisms using biotechnology

1.2.3 The reproductive strategy in some reptiles where the fertilised egg is retained inside the mother and the embryo is nourished by the egg yolk until it hatches

1.2.4 The position of a gene on a chromosome

1.2.5 A genetic disorder characterised by the inability to distinguish certain colours

1.2.6 Undifferentiated animal cells that can form any type of tissue

1.2.7 Receptors sensitive to the change in the position of the head

1.2.8 The type of dominance where none of the alleles is dominant over the other

1.2.9 Having similar alleles for a particular gene

1.2.10 The division of the cytoplasm during telophase I

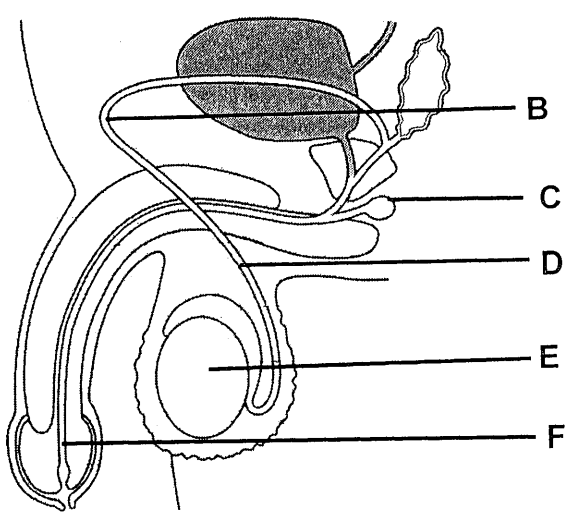
(10 x 1) **(10)**

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 1.3.4) in the ANSWER BOOK.

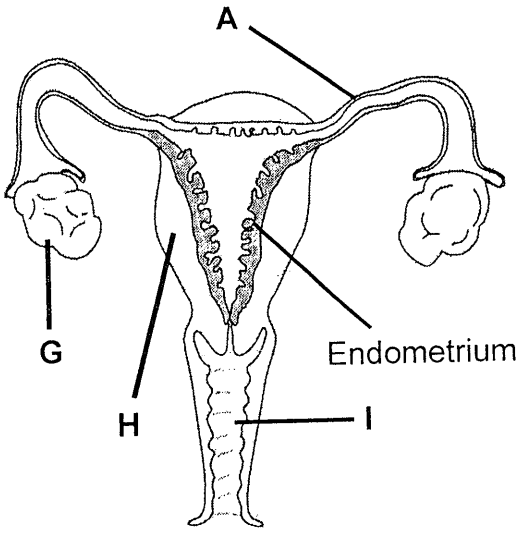
	COLUMN I	COLUMN II
1.3.1	Microscopic gap between the axon terminals of one neuron and dendrites of the next neuron	A: Synapse B: Neurotransmitter
1.3.2	Sex chromosomes	A: Gonosomes B: Chromatids
1.3.3	Development in which a hatchling is capable of moving on its own and feed itself	A: Altricial B: Precocial
1.3.4	Increases the chances of survival	A: Parental Care B: Internal fertilisation

(4 x 2) **(8)**

1.4 Study the diagram of a human male reproductive system.



Male reproductive system



Female reproductive system

1.4.1 Name the hormone produced by **E**. (1)

1.4.2 State TWO functions of the hormone mentioned in QUESTION 1.4.1 above. (2)

1.4.3 Identify part **G** and gland **C**. (2)

1.4.4 State the function of the endometrium during pregnancy. (1)

1.4.5 Write down the LETTER and NAME of the part that:

(a) Contracts and relaxes during birth (2)

(b) Passes semen during ejaculation (2)

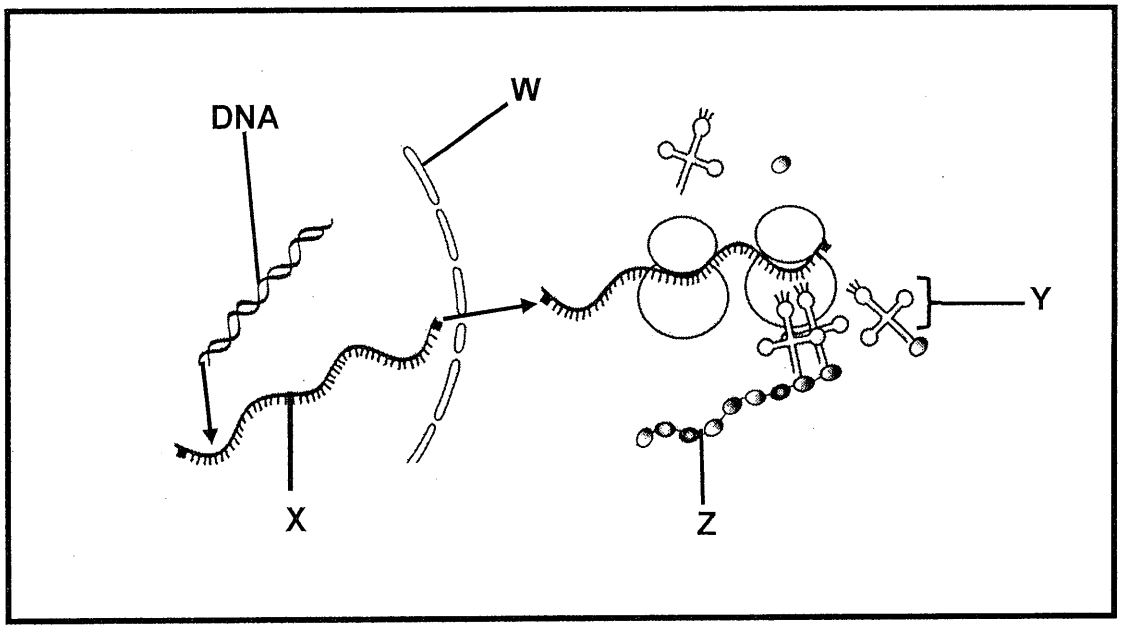
(c) Is the site for fertilization (2)
(12)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Study the diagram showing the process of protein synthesis and the table that shows anticodons that code for different amino acids.



Anti-codons on tRNA coding for the amino acid	Amino acid coded for
AAC	Valine
AUA	Histidine
GGA	Tyrosine
UAC	Valine
GAC	Leucine
UGA	Asparganine

2.1.1 Identify structure **W** and bond **Z**. (2)

2.1.2 Name and describe the process that produced molecule **X**. (6)

2.1.3 Tabulate ONE difference between DNA and molecule **Y**. (3)

2.1.4 The DNA code for a particular protein is GGA TGA AAC.

Use the table to write down the sequence of amino acids that will make up this protein. (3)

2.1.5 If nitrogen base number seven in the sequence mentioned in QUESTION 2.1.4 was changed from **A** to **T**. What effect will this have in the composition of the protein coded for? (2)
(16)

2.2 In a certain type of pigeons it was found that grey eye colour (**G**) is dominant over red eye colour (**g**), while black tail feathers (**B**) were dominant over white tail feathers (**b**). Gg Bb G Bb

A pigeon breeder crosses a heterozygous female with grey eyes and black tail feathers with a male heterozygous for eye colour and homozygous for white tail feathers.

2.2.1 Write down the eye colour of the male pigeon. (1)

2.2.2 State the phenotype of an offspring having the genotype:

(a) GGBb (1)

(b) ggBB (1)

2.2.3 Write down the genotypes of:

(a) Male pigeon (1)

(b) Female pigeon (1)

2.2.4 State ONE difference between a monohybrid cross and a dihybrid cross. (2)
(7)

2.3 A farmer has an orchard of nectarine trees. He observed that some trees produced yellow (**Y**) nectarines, some produced red (**R**) nectarines while some produced nectarines with yellow and red colour equally (yellow-red nectarines).

2.3.1 Identify the type of dominance displayed by nectarine plants. (1)

2.3.2 The farmer cross pollinated a yellow nectarine producing plant with a yellow-red nectarine producing plant.

Use a genetic cross to show the possible genotype and phenotype of the offsprings. (6)
(7)

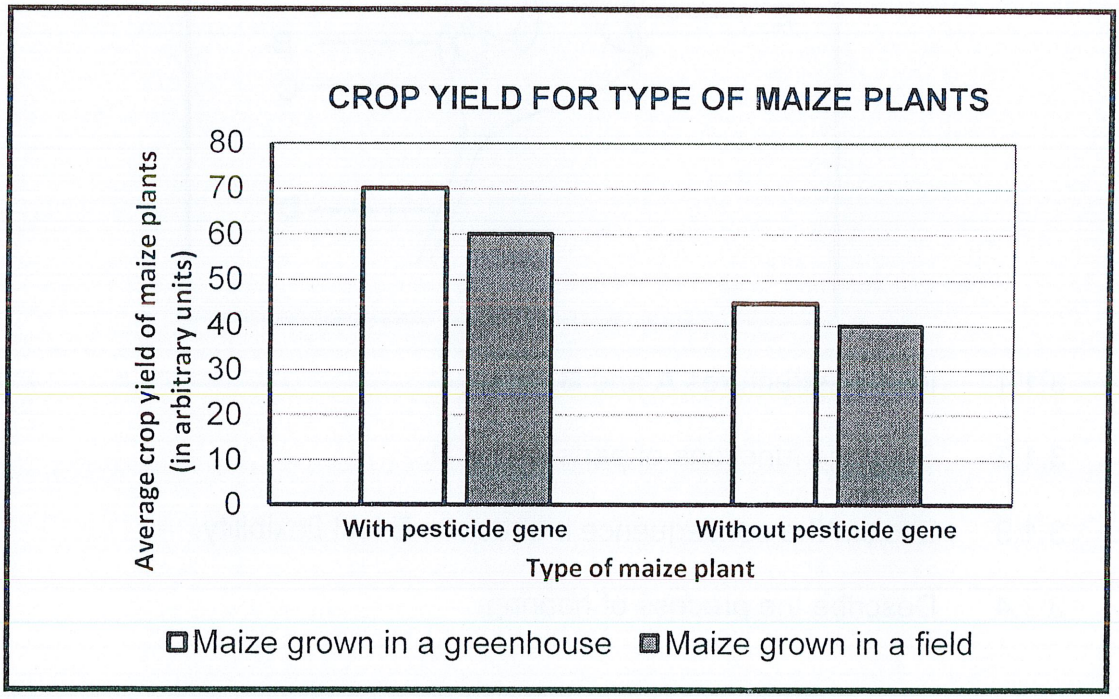
2.4 In order to increase crop yield, farmers use pesticides to kill pests that destroy their crops.

They found a bacterium which contains a gene that produces pesticides. Scientists transferred the pesticide gene to maize plants and wanted to investigate the effect of the pesticide gene in maize plants on crop yield.

Below are some of the steps they followed.

- Large samples of maize plants with the pesticide gene were grown in a field and in a greenhouse.
- Large samples of maize plants without the pesticide gene were grown in a field and in a greenhouse.
- This was repeated for five years in a row.
- The crop yield of the maize plants was measured over the years.

The results are shown in the graph below.



2.4.1 What is the process called where maize plants are altered by the insertion of genes? (1)

2.4.2 Identify the:

(a) Dependent variable (1)

(b) Independent variable (1)

2.4.3 Which maize sample had the least average crop yield over the years? (1)

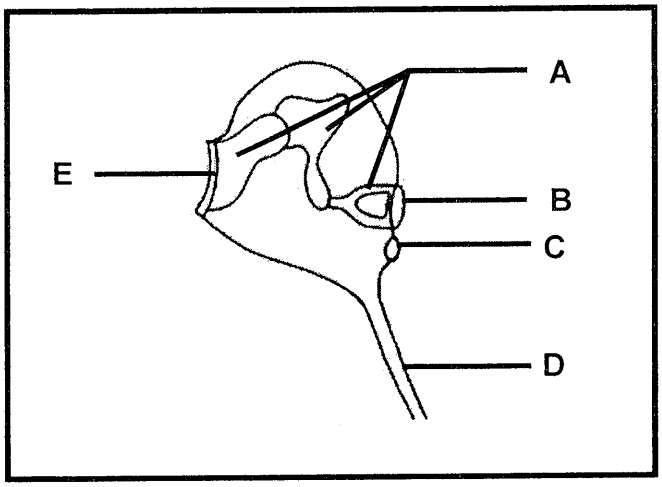
2.4.4 Describe the difference in results for the maize with the pesticide gene grown in a greenhouse and the maize grown in a field. (2)

2.4.5 State the conclusion for this investigation. (2)

2.4.6 State TWO ways in which scientists improved the reliability of this investigation. (2)
(10)
[40]

QUESTION 3

3.1 Study the diagram below of a human ear.



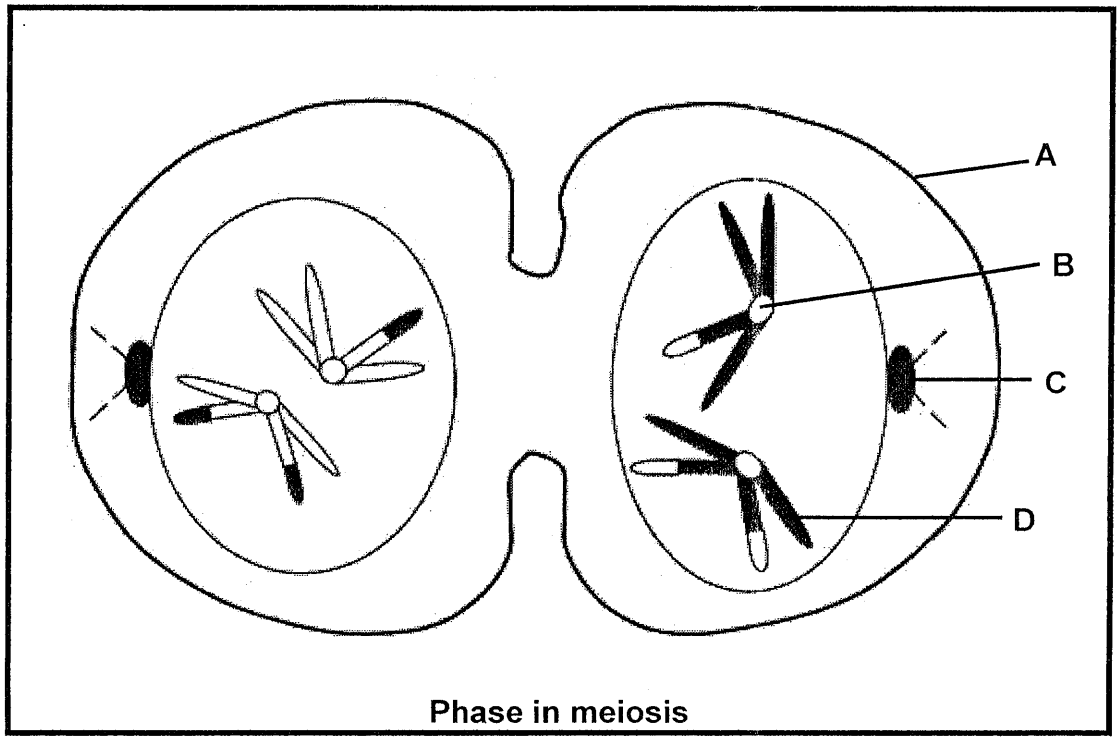
3.1.1 Identify structures **A** and **B**. (2)

3.1.2 State the functions of parts **C** and **D**. (2)

3.1.3 Explain the consequence if structure **E** lost flexibility. (2)

3.1.4 Describe the process of hearing. (7)
(13)

3.2 Study the diagram below showing a phase in meiosis



Phase in meiosis

3.2.1 Provide labels for parts **A** and **D**. (2)

3.2.2 Is the phase shown in the diagram in meiosis **I** or **II**? (1)

3.2.3 Explain your answer to QUESTION 3.2.2 above. (1)

3.2.4 Name the phase before the one shown in the diagram. (1)

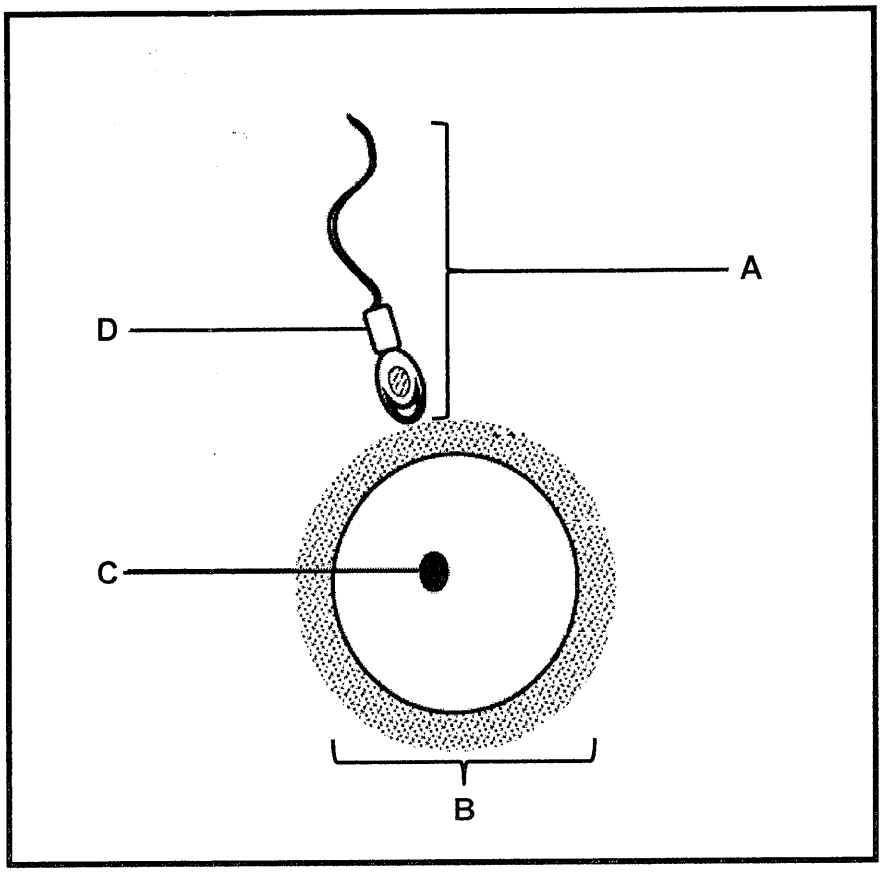
3.2.5 State the function of structure **B**. (1)

3.2.6 Identify structure **C** and give ONE function for it. (2)

3.2.7 How many chromosomes did this cell have before it started meiosis? (1)

3.2.8 Name and describe the process that led to the variation shown in the chromosomes above. (4)
(13)

3.3 Study the diagram below of a stage during human reproduction.



3.3.1 Identify structure **C**. (1)

3.3.2 Name the hormone responsible for the release of gamete **B**. (1)

3.3.3 Gametes **A** and **B** are formed by meiosis. State ONE difference with regards to the number of daughter cells maturing to form gamete **A** and those maturing to form gamete **B**. (2)

3.3.4 Explain the significance of part **D**. (2)
(6)

3.4 Double ovulation is the release of two egg cells during the same month of a single menstrual cycle. In double ovulators, two growth waves of maturing follicles occur in the ovaries during the same month.

An investigation was done to determine the relationship between a woman's age and the chances of double ovulation.

The table below shows the results obtained.

AGES OF WOMEN	CHANCES OF DOUBLE OVULATION (%)
22	10
28	11
34	15
40	24
46	50

3.4.1 Describe the relationship that exist between the age of a woman and the chances of double ovulating. (2)

3.4.2 Draw a line graph to represent the trend shown in the table. (6)
(8)
[40]

TOTAL SECTION B: 80

SECTION C

QUESTION 4

Name and describe the functions of the four parts of the brain and the changes in the eye when reading a question paper. Also describe the structure and functioning of the autonomic nervous system.

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: 150


EA019LF1E0000001