basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

FEBRUARY/MARCH 2011

MARKS: 150

TIME: 2½ hours

This question paper consists of 14 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your 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 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 correct answer and write only the letter (A – D) next to the question number (1.1.1 – 1.1.6) in the ANSWER BOOK, for example 1.1.7 D.

1.1.1 The process in which male gametes are formed in humans is called …

A vasectomy.
B spermatogenesis.
C oogenesis.
D mitosis.

1.1.2 When the first child of two parents, without any visible genetic disorder, was born, the child was found to have a serious genetic disorder. The parents were told that a recessive gene had caused the disorder, and that only one pair of genes was involved. If they had a second child this child …

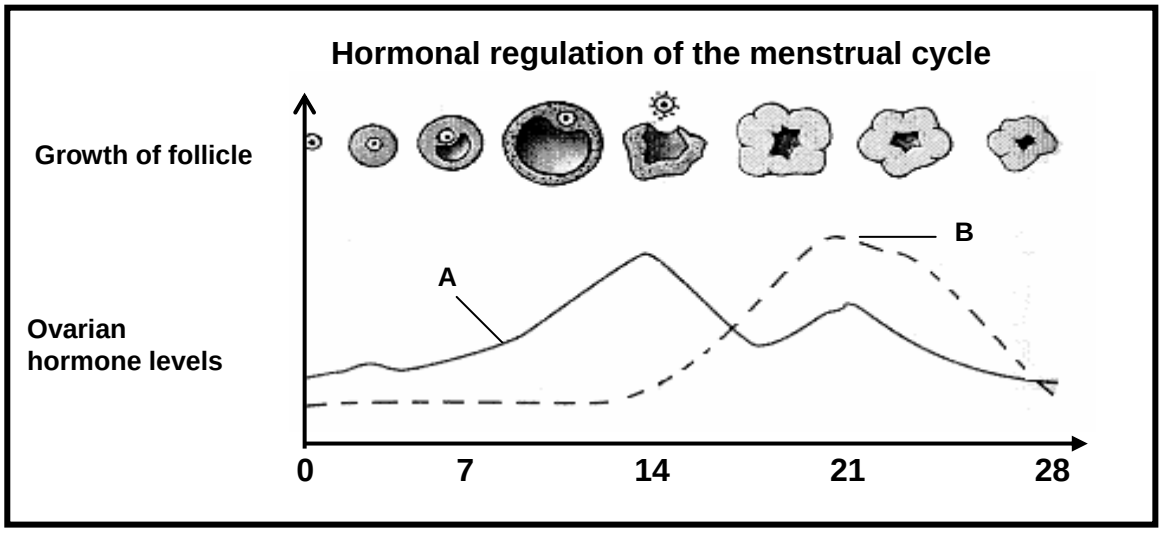
A was certain to have the disorder.
B had a 1 in 2 chance of having the disorder.
C had a 1 in 4 chance of having the disorder.
D no chance of having the disorder.

1.1.3 Below is a set of steps following fertilisation in humans. Which is the CORRECT order of events?

1. The embryo is embedded in the uterine wall in humans.
2. A zygote is formed in the Fallopian tube.
3. Cell division occurs to form a ball of several hundred cells.
4. The blastocyst remains free for several days in the uterus.

A 2, 3, 4, 1
B 2, 1, 3, 4
C 3, 2, 4, 1
D 1, 3, 2, 4

QUESTIONS 1.1.4 and 1.1.5 refer to the graph below which shows the growth of the follicle and the ovarian hormone levels.



1.1.4 Which hormones are represented by **A** and **B**?

A Progesterone and LH
B FSH and LH
C Oestrogen and progesterone
D Oestrogen and FSH

1.1.5 What is the follicle called after day 14?

A Primary follicle
B Graafian follicle
C Secondary follicle
D Corpus luteum

1.1.6 A ring of DNA (plasmid) is taken from a bacterial cell to produce insulin. The steps which follow are NOT in the correct order below.

1. The gene for insulin is removed from a cell of a human pancreas.
2. The bacteria make clones of themselves and produce insulin.
3. The insulin gene is put into the plasmid and into a new bacterial cell.
4. The bacterial plasmid is cut using enzymes.

The CORRECT order of the steps is …

A 3, 2, 4, 3.
B 3, 2, 4, 3.
C 4, 1, 3, 2.
D 4, 2, 1, 3. (6 x 2) **(12)**

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 – 1.2.7) in the ANSWER BOOK.

1.2.1 All the genes in all the chromosomes of a particular species

1.2.2 An arrangement of black bars representing DNA fragments that can be used to determine whether people are related

1.2.3 Structure in the sperm cell containing enzymes that break down the membrane of the ovum

1.2.4 The release of an ovum from a follicle

1.2.5 The period from fertilisation to birth

1.2.6 The tube that transports the sperm from the testis to the urethra

1.2.7 A hormone produced in females to stimulate milk production **(7)**

1.3 Indicate whether each of the statements 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 – 1.3.5) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Possible ways of improving of fertility	A: Artificial insemination B: In vitro fertilisation
1.3.2 Forms the placenta	A: Amnion B: Chorion
1.3.3 Having a single set of chromosomes	A: Diploid B: Haploid
1.3.4 Sexually-transmitted disease(s) caused by bacteria	A: Syphilis B: HIV
1.3.5 Technique used to determine abnormalities of the foetus	A: Ultrasound B: Amniocentesis

(5 x 2) **(10)**

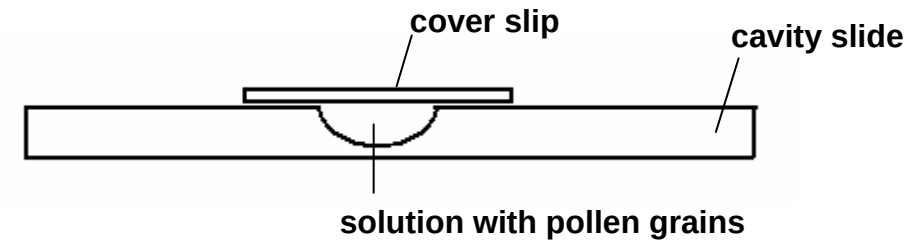
1.4 When a stigma is ripe, it secretes a fluid which stimulates pollen grains to grow tubes. The fluid contains sugar.

Zama wanted to investigate the following question:

How does the concentration of sugar affect the number of pollen grains that germinate/form pollen tubes in flowers?

She designed the following investigation.

- She took 5 cavity slides.



  - The first slide she filled with distilled water.
  - The second slide she filled with a 5% sugar solution.
  - The third slide she filled with a 10% sugar solution.
  - The fourth slide she filled with a 15% sugar solution.
  - The fifth slide she filled with a 20% sugar solution.

- She transferred the same number of pollen grains from the anthers of a flower into each cavity of the five slides.
- A cover slip was gently lowered onto the slide.
- All five slides were placed in a warm incubator and left for one hour.
- Each slide was then examined under a microscope and the number of pollen tubes in each slide was counted and recorded in the table below.

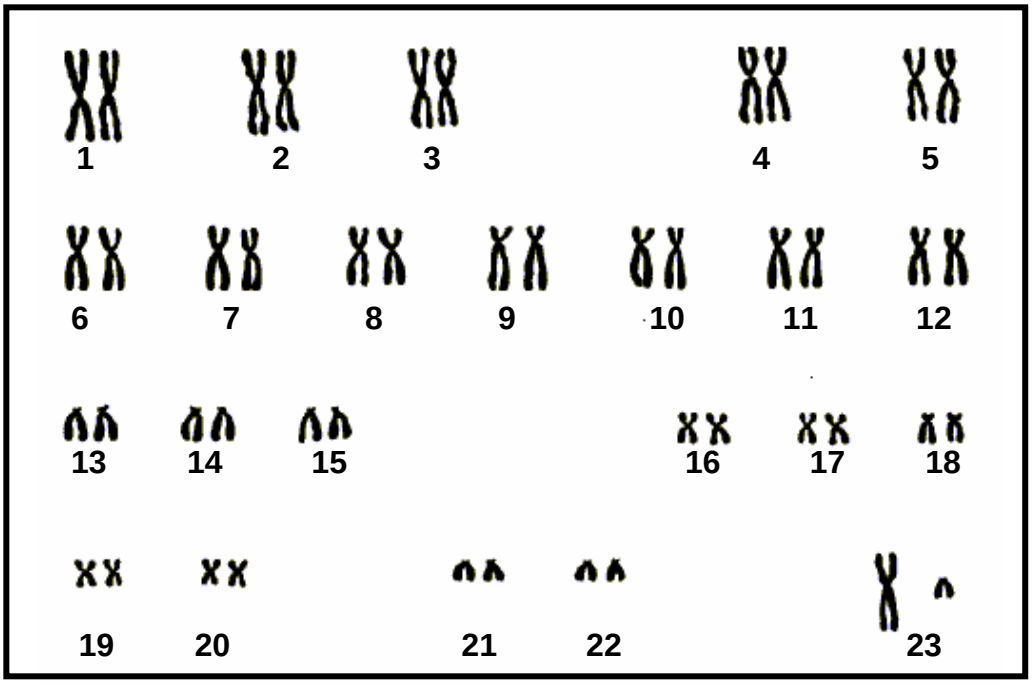
Concentration of sugar solution (%)	Number of pollen tubes
0	0
5	7
10	11
15	15
20	21

1.4.1 Explain why Zama used distilled water in the first cavity slide. (2)

1.4.2 State THREE ways in which this investigation would be improved to get more reliable results. (3)

1.4.3 Describe a conclusion for the above investigation. (2)
(7)

1.5 The diagram below represents a karyotype of a human cell.



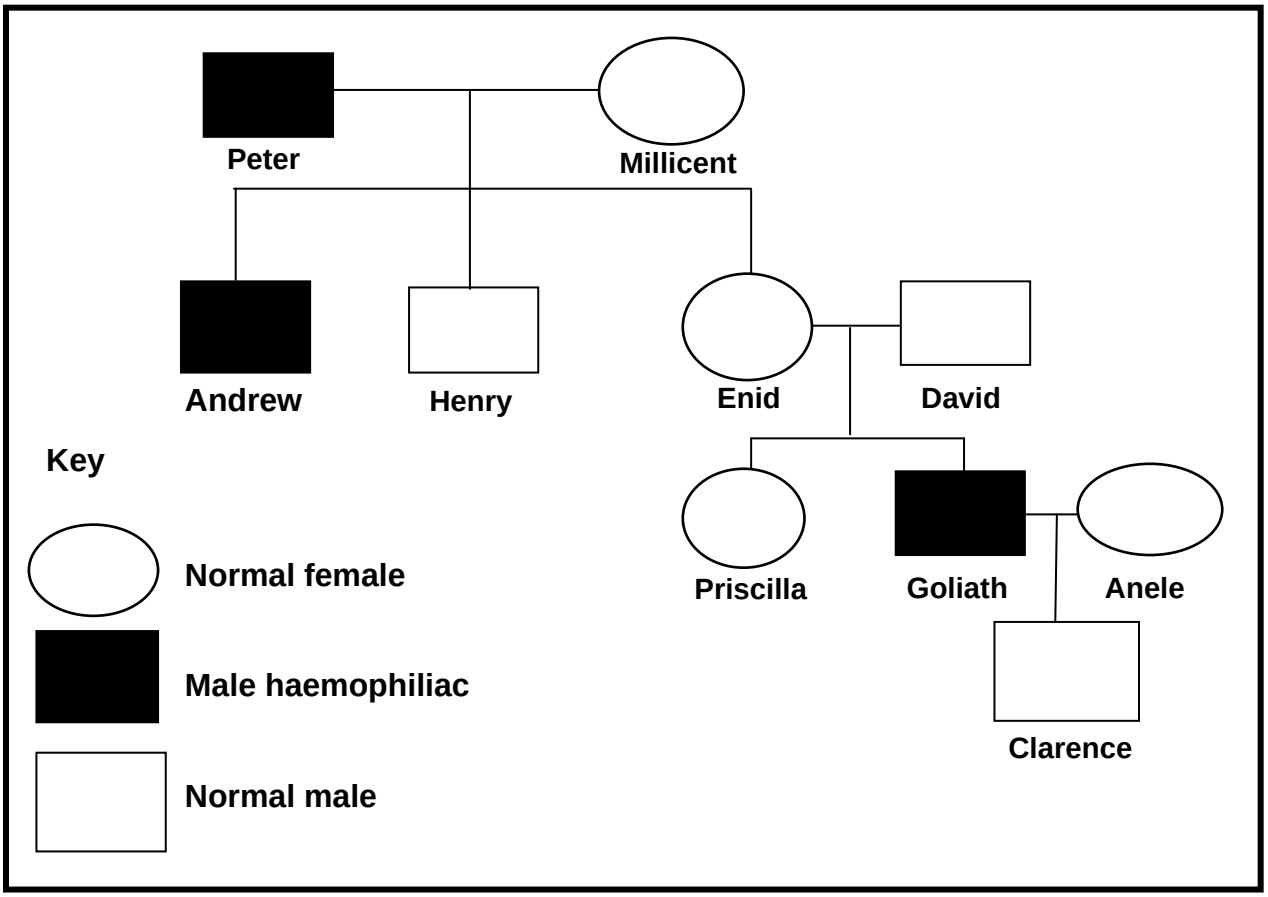
1.5.1 How many chromosomes are present in this karyotype? (1)

1.5.2 Is this karyotype that of a man or a woman? (1)

1.5.3 Give a reason for your answer to QUESTION 1.5.2. (2)

1.5.4 Describe how the karyotype of a person with Down's syndrome will be different from the karyotype shown in the diagram above. (2)
(6)

1.6 Study the pedigree diagram of a family where some individuals have haemophilia. Haemophilia is a **sex-linked** disorder. Use **H** for normal blood clotting and **h** for the haemophiliac trait.



1.6.1 From the pedigree diagram above, state the relationship between gender and haemophilia. (2)

1.6.2 Write down all the possible genotypes of individuals:

(a) Peter

(b) Enid

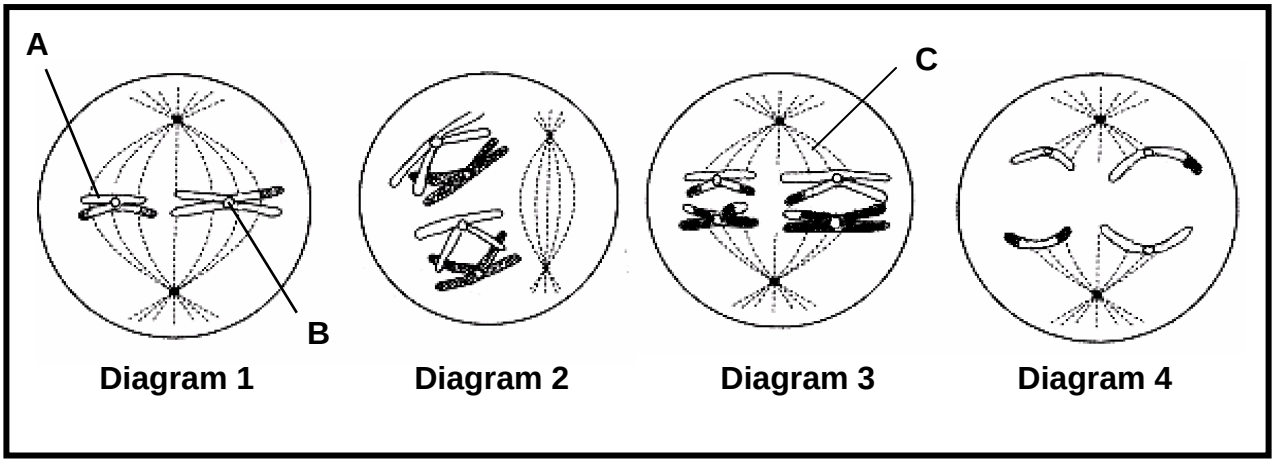
(c) Clarence (6)
(8)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Study the following diagrams representing different phases of meiosis.



2.1.1 Label structures **A**, **B** and **C**. (3)

2.1.2 Which phase is represented by:

(a) Diagram 1 (1)

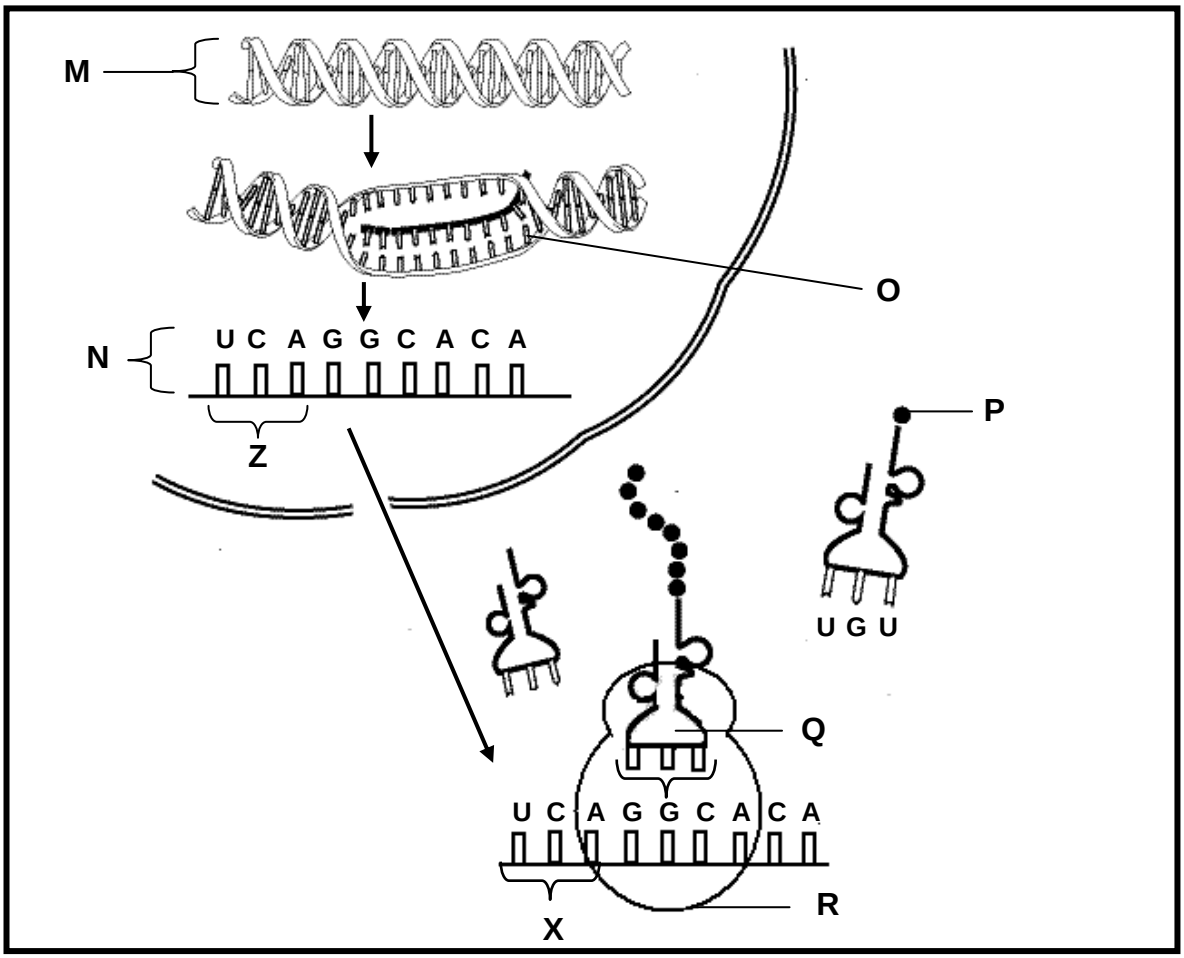
(b) Diagram 2 (1)

2.1.3 Write down the numbers of the diagrams to show the correct sequence in which the phases occur. (2)

2.1.4 Tabulate THREE differences between the first and second stages of meiosis. (7)

2.1.5 Name and explain TWO processes/mechanisms that ensure that the gametes produced at the end of meiosis are genetically different from each other. (4)
(18)

2.2 The diagrams below represent the process of protein synthesis.



2.2.1 Identify compound **M** and organelle **R**. (2)

2.2.2 Write down the sequence of the FIRST THREE nitrogenous bases on the DNA strand that led to the formation of **Z**. (2)

2.2.3 Name the part/stage of protein synthesis that is illustrated in **O.** (1)

2.2.4 The table below shows the base triplets of DNA and the amino acid each codes for.

Base triplet of DNA	Amino acid coded for
AGT	Serine
CCG	Glycine
TGT	Threonine
GTA	Histidine
CAA	Valine
TCC	Arginine
ACA	Cysteine

With reference to the diagram in QUESTION 2.2 and the table above:

(a) Name the amino acid labelled **P**. (2)

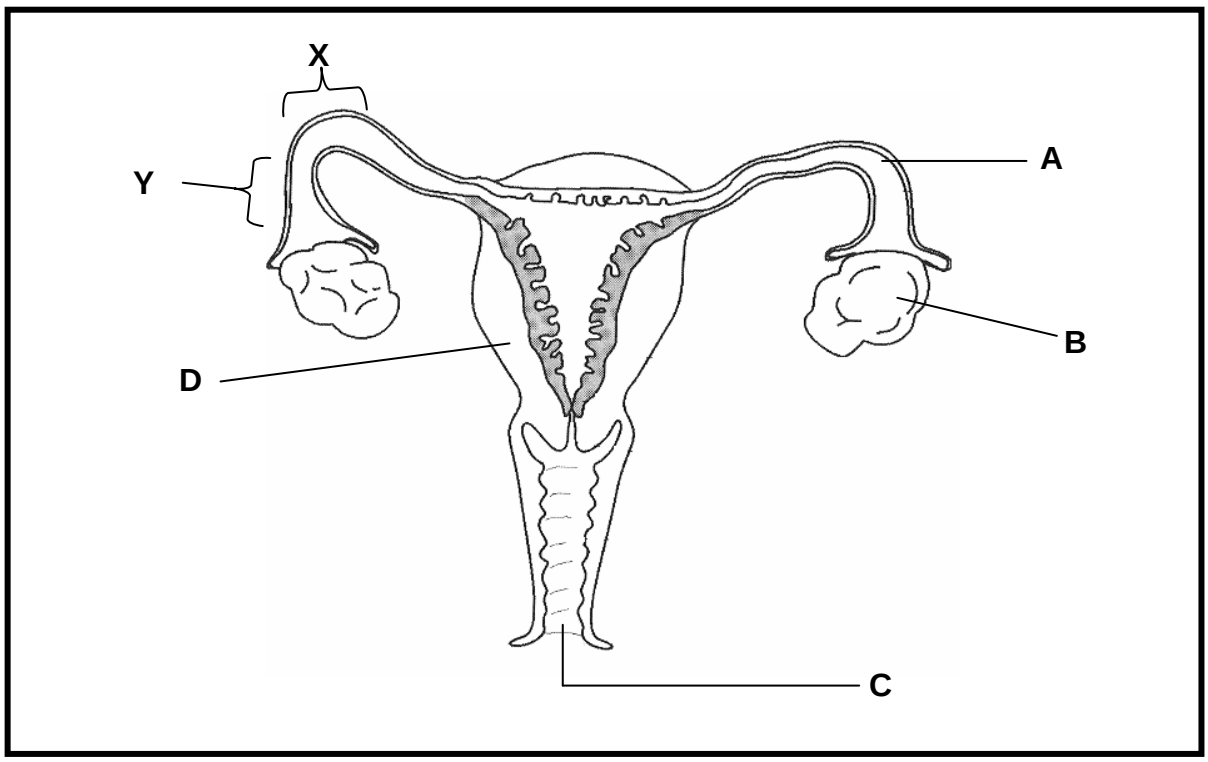
(b) State the base sequence of the molecule labelled **Q**. (2)

(c) What name is given to the triplet of tRNA bases that codes for each amino acid? (1)

(d) Describe how the composition of the protein molecule changes if the base sequence at **X** is UGU instead of UCA. (2)
(12)
[30]

QUESTION 3

3.1 The diagram below represents the female reproductive system.



3.1.1 Label structures **A**, **B** and **C**. (3)

3.1.2 State THREE functions of **D**. (3)

3.1.3 Fertilisation usually takes place at **Y**. Why will a blockage at **X**:

(a) Prevent fertilisation at **Y** (1)

(b) Not necessarily lead to infertility (2)
(9)

3.2 Read the paragraph below and answer the questions that follow.

MALE CONTRACEPTIVE CHEMICAL

Gossypol is a chemical which is extracted from the seeds of cotton plants. When gossypol was given to rats, mice, dogs and monkeys, it caused a reduction in the fertility of the male animals by reducing their sperm count.

Scientists wanted to investigate the idea that gossypol could be used as a human male contraceptive.

[Adapted from: *Liffen and Liffen*, 1987]

3.2.1 State a hypothesis for the investigation that scientists wanted to do. (3)

3.2.2 State FOUR planning steps that must be followed by researchers before the investigation above is undertaken on humans. (4)

3.2.3 In the investigation above, name the following:

(a) Dependent variable (1)

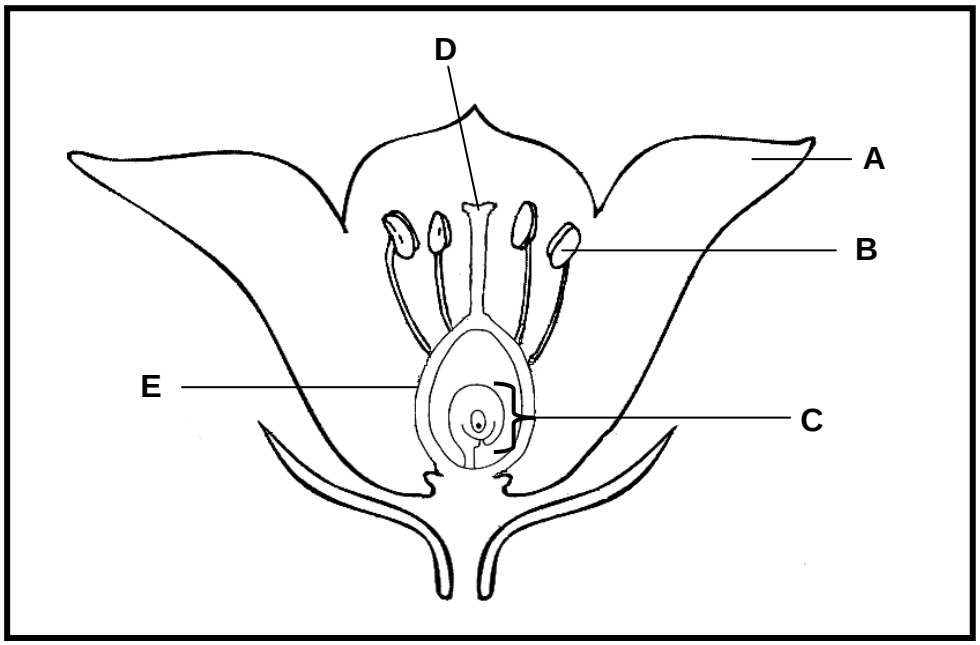
(b) Independent variable (1)

3.2.4 Explain ONE reason why some people might:

(a) Support research on male contraception (2)

(b) Object to research on male contraception (2)
(13)

3.3 Study the diagram of a flower below and answer the questions that follow.



3.3.1 Label parts **A**, **B** and **D**. (3)

3.3.2 Describe how the male gamete reaches the ovum after pollination. (3)

3.3.3 What do the following structures develop into after fertilisation:

(a) Structure **C** (1)

(b) Structure **E** (1)

(8)
[30]

TOTAL SECTION B: 60

SECTION C

QUESTION 4

4.1 Explain THREE advantages of using genetically modified organisms as food. **(6)**

4.2 The table below shows the percentage frequency of human blood groups in the populations of two different cities in South Africa.

Human blood groups	% frequency in population	
	City 1	City 2
A	25	45
B	20	10
AB	10	5
O	45	40

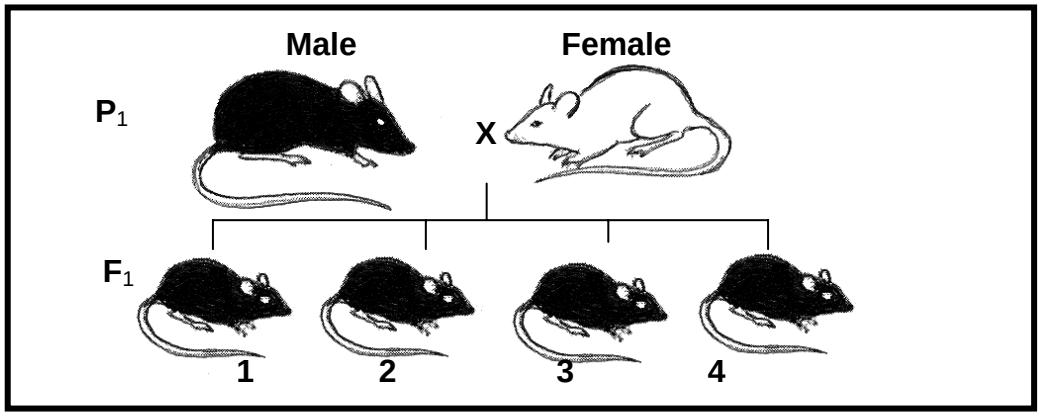
4.2.1 Which blood group has:

(a) The highest frequency in City **1** (1)

(b) The lowest frequency in City **2** (1)

4.2.2 Plot the data in the table as bar graphs on the same system of axes. (10)
(12)

4.3 The diagram below shows a crossing between a homozygous black mouse and a homozygous white mouse. The F_1-generation was all black.



Use the symbols **B** and **b** for the alleles of fur colour and show diagrammatically a genetic cross between mouse **1** and mouse **3** to show the possible genotypes and phenotypes of the next generation (F_2). **(7)**

4.4 Clones are a group of genetically identical organisms. Explain THREE advantages and THREE disadvantages with reasons of cloning. (12)
Synthesis: (3)
(15)

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

TOTAL SECTION C: 40
GRAND TOTAL: 150