education

Department:
Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P1

EXEMPLAR 2008

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 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 EACH question on a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. If answers are NOT presented according to the instructions of each question, candidates will lose marks.
6. ALL drawings should be done in pencil and labelled in blue or black ink.
7. Draw diagrams and flow charts ONLY when requested to do so.
8. The diagrams in this question paper may NOT necessarily be drawn to scale.
9. The use of graph paper is NOT permitted.
10. Non-programmable calculators, protractors and compasses may be used.
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 example 1.1.6 D.

1.1.1 The human testes are protected by the …

A scrotum.
B prostate gland.
C bladder.
D seminal vesicles.

1.1.2 The function of the amnion is to …

A serve as a reserve food supply.
B give rise to the placenta.
C prevent the developing foetus from moving about.
D enclose the fluid that protects the embryo against injury.

1.1.3 In pea plants the allele for flower colour (C) is dominant to the allele for lack of flower colour (c). A plant homozygous for flower colour was crossed with a plant bearing colourless flowers. The F_1 plants were then self-pollinated. Which of the following correctly represents the ratio of genotypes expected in the F_2 generation?

A All Cc
B 1CC:1Cc
C 3CC:1cc
D 1CC:2Cc :1cc

1.1.4 When a diploid cell divides during meiosis the result will be … cells.

A two diploid
B four haploid
C two haploid and two diploid
D four diploid

1.1.5 In humans, the sex of a child is determined by the …

A mother's gametes.
B autosomes.
C father's gametes.
D XX chromosomes of the mother. (5 x 2) (10)

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 – 1.2.6) in the ANSWER BOOK.

1.2.1 The offspring produced from a fertilised egg cell or zygote which subsequently divides into two separate balls of cells

1.2.2 The process whereby a small amount of amniotic fluid containing foetal cells is withdrawn and analysed for genetic defects

1.2.3 A full set of chromosomes with all the genes of an organism

1.2.4 A blood-clotting disorder, occurring mainly in males, that is linked to a recessive gene on the X chromosome

1.2.5 A point at which chromatids of homologous chromosomes cross over during meiosis

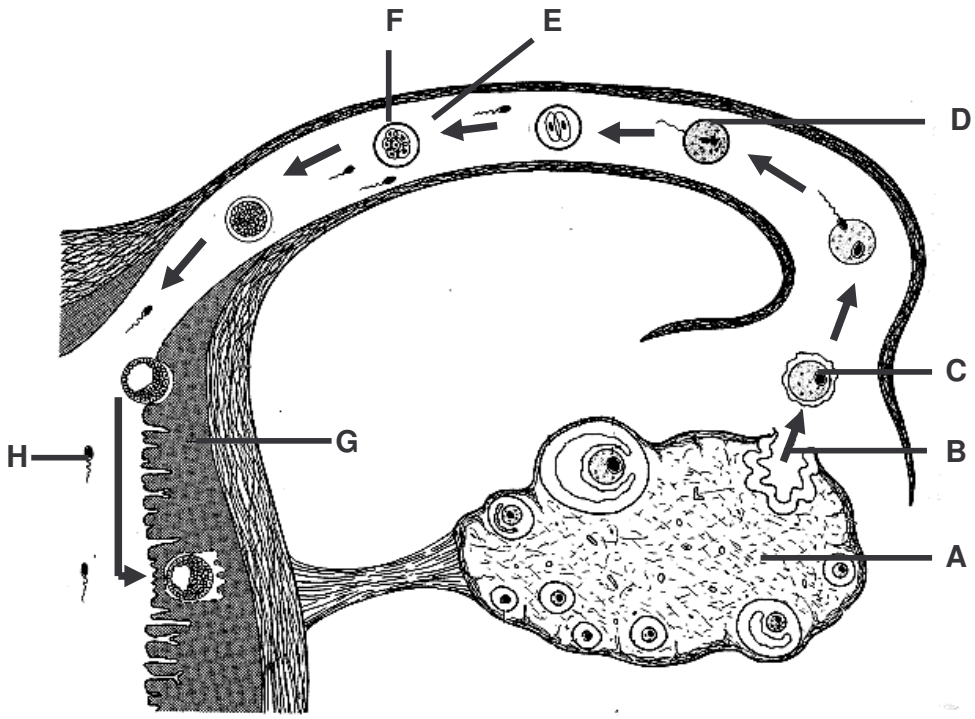
1.2.6 The process during which strong contractions of the uterus result in the birth of a baby (6)

1.3 Choose an item from COLUMN B that matches a description in COLUMN A. Write only the letter (A – H) next to the question number (1.3.1 – 1.3.5) in the ANSWER BOOK, for example 1.3.6 J.

	COLUMN A	COLUMN B
1.3.1	The appearance of an organism as a result of its genetic makeup	A genotype
1.3.2	An individual that has unlike alleles for a particular characteristic	B phenotype
1.3.3	Prevention of the fusion of an egg cell by a sperm cell	C homozygous
1.3.4	The duct/tube carrying sperm to the urethra in males	D heterozygous
1.3.5	A change in the structure of a gene	E contraception
		F mutation
		G epididymis
		H vas deferens

(5 x 1) (5)

1.4 The diagram below represents a part of the human female reproductive system after copulation. Study the diagram and answer the questions that follow.



Structure of part of the human female reproductive system to show certain processes taking place

1.4.1 Give labels for parts A, E and G respectively. (3)

1.4.2 Name the process that takes place at B. (1)

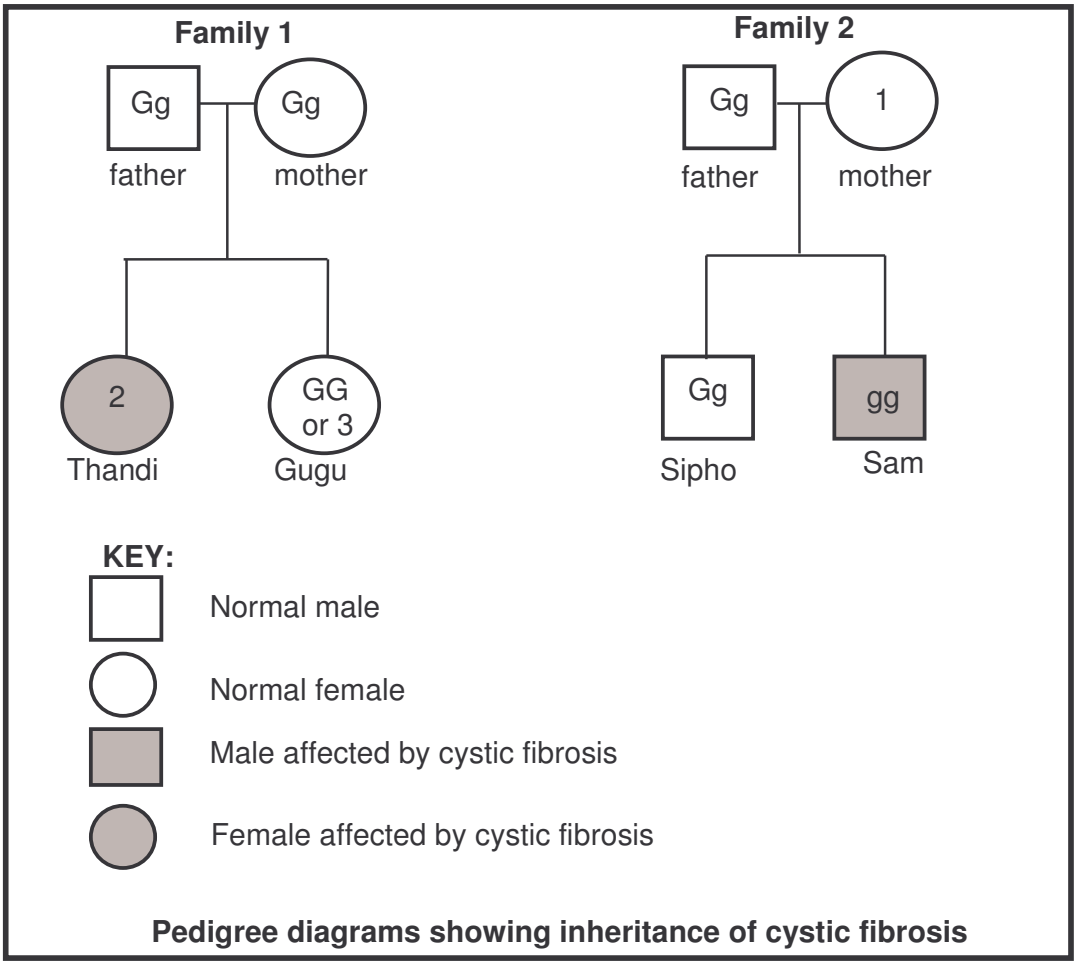
1.4.3 When, during the menstrual cycle, does the process mentioned in QUESTION 1.4.2 take place? (1)

1.4.4 Describe the process represented by D. (3)

1.4.5 Write down the number of chromosomes that would be present in the nucleus of the following:

(a) Cell C (1)
(b) One cell of F (1)
(c) Cell H (1)

1.5 Cystic fibrosis is an inherited disorder of the human body caused by a recessive gene. This disorder affects mucus production causing blockage of tiny air passages in the lungs. Study the pedigree diagrams below and answer the questions that follow.



Pedigree diagrams showing inheritance of cystic fibrosis

1.5.1 Name the genotypes represented by 1 and 3 in the diagrams respectively. (2)

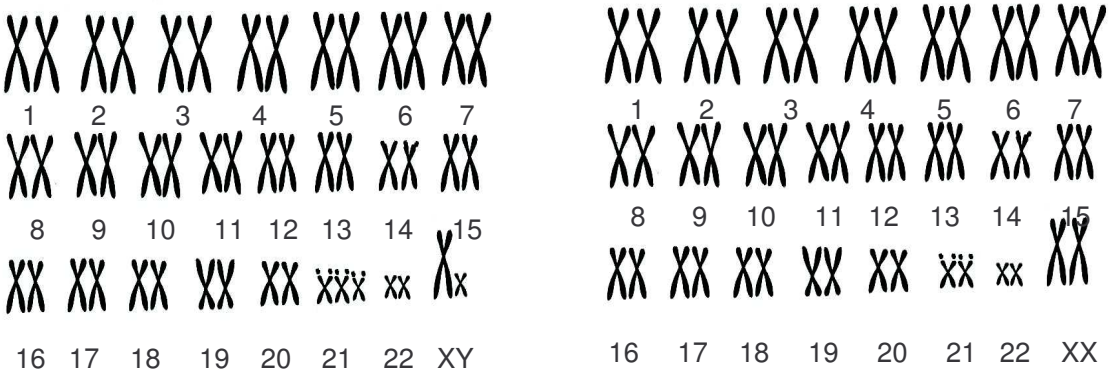
1.5.2 What is Thandi's genotype? (1)

1.5.3 Does Thandi suffer from cystic fibrosis? (1)

1.5.4 Thandi and Sipho intend getting married. Show, using a pedigree diagram and the key above, ALL the possible genotypes of any sons they might have. (4)

1.5.5 Explain what Thandi and Sipho should consider before deciding whether to have children or not. (3)

1.6 The diagrams below show the sets of chromosomes (karyotypes) in two human individuals, A and B. Study the diagrams and answer the questions that follow.



Individual A **Individual B**

Karyotypes of two individuals

1.6.1 Which individual (A or B) is female? (1)

1.6.2 Give a reason for your answer to QUESTION 1.6.1. (2)

1.6.3 Identify which individual (A or B) has an abnormal number of chromosomes. (1)

1.6.4 Name the genetic disorder that the individual in QUESTION 1.6.3 has. (1)

1.6.5 Explain the abnormal chromosome number of the disorder named in QUESTION 1.6.4. (2)

[50]

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a phase of meiosis. Study the diagram and answer the questions that follow.

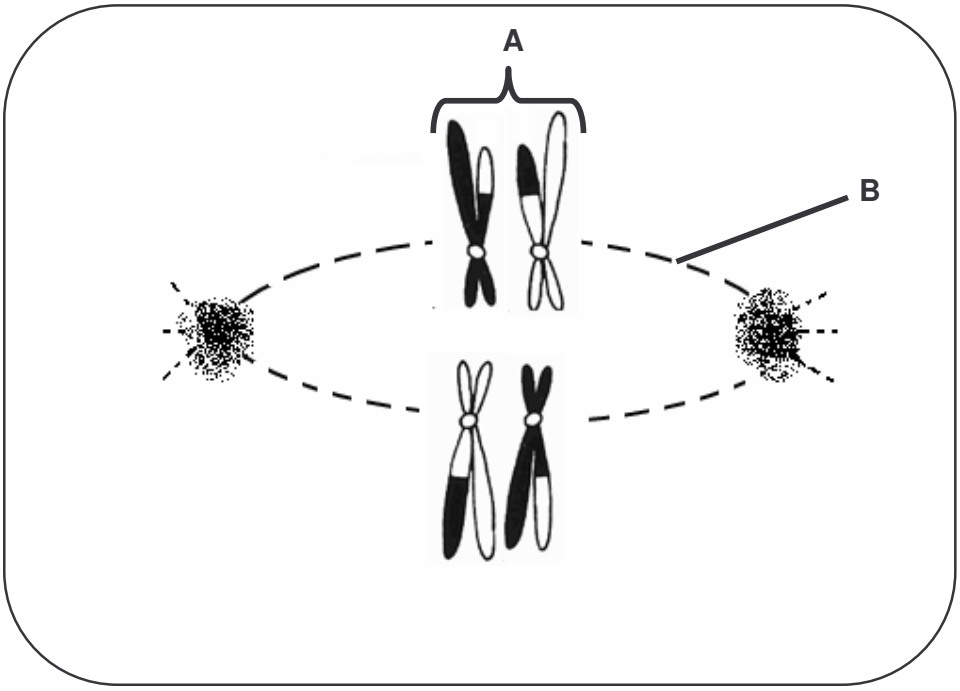


Diagram representing a phase of meiosis

2.1.1 Write down the term that best describes the paired chromosomes labelled A. (1)

2.1.2 Identify structure B. (1)

2.1.3 What phase of meiosis is represented in the diagram above? (2)

2.1.4 How many chromosomes are shown in the diagram above? (1)

2.1.5 How many chromosomes would there be in each cell at the end of meiosis? (1)

2.2 Read the passage below and answer the questions that follow.

Preformation and epigenesis theories

In the seventeenth century scientists believed in the preformation theory. One group of scientists believed that the egg cell contained a miniature human being that was completely formed. This group was called the ovists.

Another group of scientists were called spermists because they believed that a miniature human being was found in a sperm cell.

Many of the ovists and spermists reported seeing the completely formed miniature human being inside the sexual cells. The preformation theory was believed for almost 200 years.

As equipment for microscopy improved the theory of epigenesis became widely accepted. In epigenesis it is believed that an embryo develops from a zygote. The theory of epigenesis is still accepted today.

2.2.1 What can we learn from this passage about the way in which scientific knowledge develops? (2)

2.2.2 Why do you think scientists believed in the preformation theory in the seventeenth century? (2)

2.2.3 What evidence from the passage rejects the preformation theory? (2)

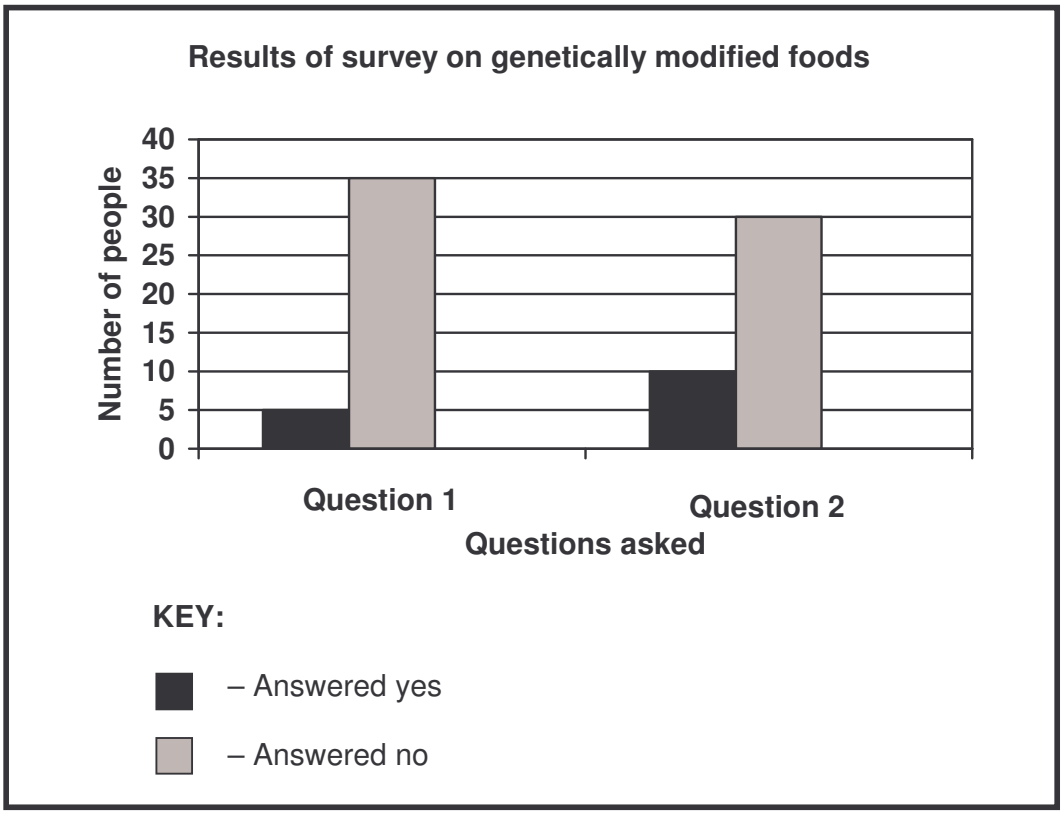
2.2.4 Keeping your current knowledge in mind, why would you reject the preformation theory? (2)

2.3 A group of Grade 12 learners carried out a survey about genetically modified (GM) foods.

They used the following two questions in their survey:

1. Are GM foods better than normal foods?
2. Are you aware of any dangers in using GM foods?

The results of the survey are shown in the bar graph below. Study the graph and answer the questions that follow.



2.3.1 Explain what GM foods are. (2)

2.3.2 State TWO advantages of genetic modification for food production. (2)

2.3.3 How many people participated in the survey? (1)

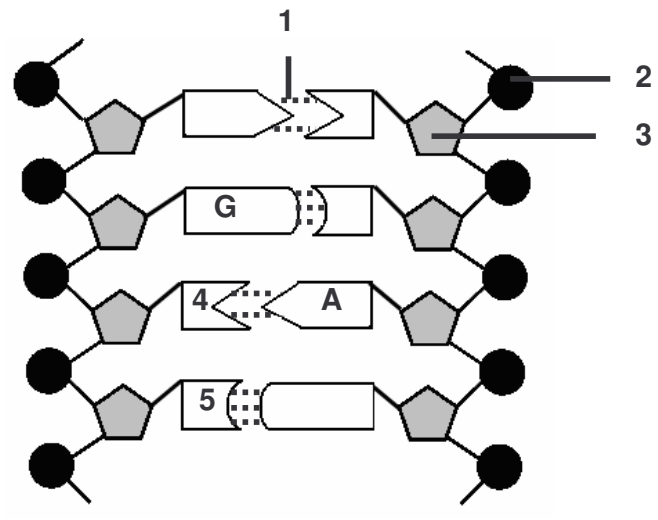
2.3.4 Draw a table to show the results of the survey. (6)

2.3.5 Suggest TWO ways in which the learners can make sure that the results of the survey are reliable. (4)

2.3.6 State ONE conclusion that can be made from this survey. (1)
[30]

QUESTION 3

3.1 The diagram below represents a part of a molecule. Study the diagram and answer the questions that follow.



Part of a molecule

3.1.1 Identify the molecule in the above diagram. (1)

3.1.2 Label the parts numbered 1 and 5 respectively. (2)

3.1.3 What is the collective name for the parts numbered 2, 3 and 4? (1)

3.1.4 What is the significance of this molecule being able to replicate itself? (2)

3.2 The following questions are based on protein synthesis.

3.2.1 Describe each of the following:

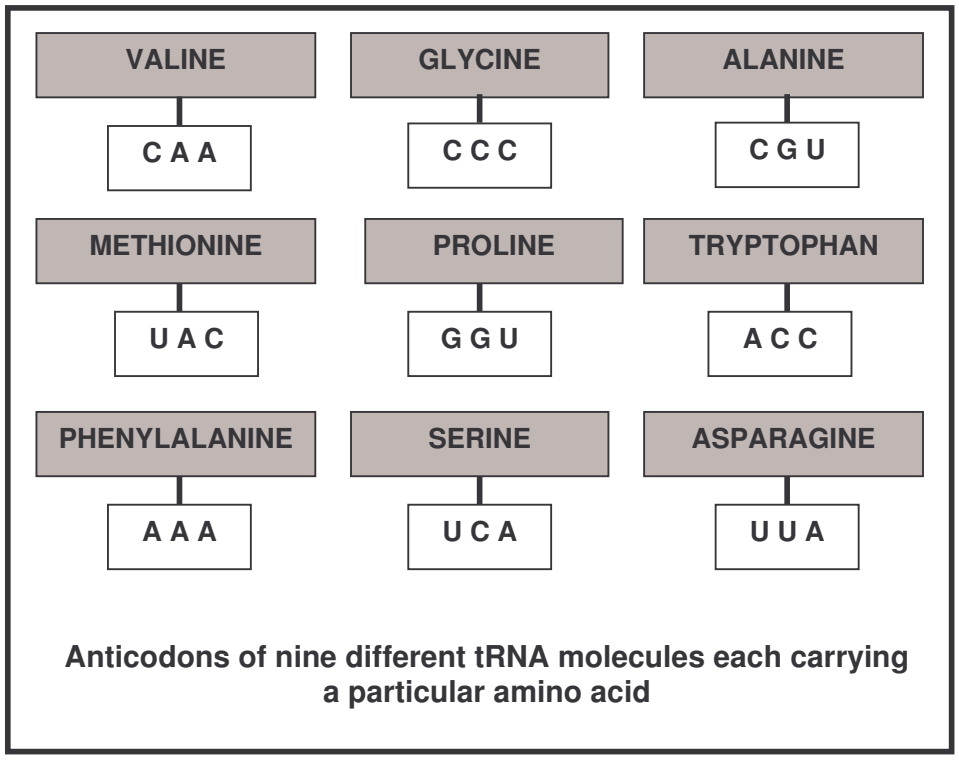
(a) Transcription (2)
(b) Translation (2)

3.2.2 The diagram below shows the sequence of nitrogenous bases of a strand of DNA which codes for part of a protein molecule.

GTT — ATG — TGG

Write down the mRNA codon sequence that reads from left to right from the DNA sequence above. (3)

3.2.3 The following diagram shows the anticodons of nine different tRNA (transfer RNA) molecules each carrying a particular amino acid.



Anticodons of nine different tRNA molecules each carrying a particular amino acid

Select and write down from the above diagram the amino acids (in the correct sequence) that would be required for the base sequence of mRNA shown below.

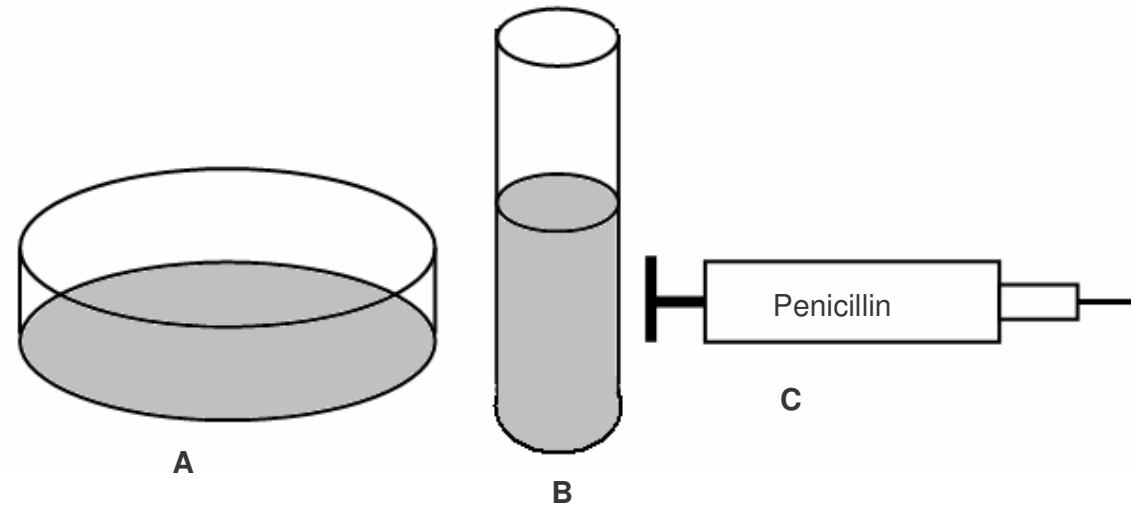
UUU — GUU — AUG

(3)

3.3 Antibiotics work by interfering with various stages of protein synthesis in a bacterial cell. A group of Grade 12 learners wanted to test the effect of the antibiotic penicillin on the bacterium *Staphylococcus aureus.*

They were provided with the following apparatus:

1. Petri dishes containing agar (agar supports bacterial growth) (A)
2. Culture of *Staphylococcus aureus* (B)
3. The antibiotic penicillin (C)



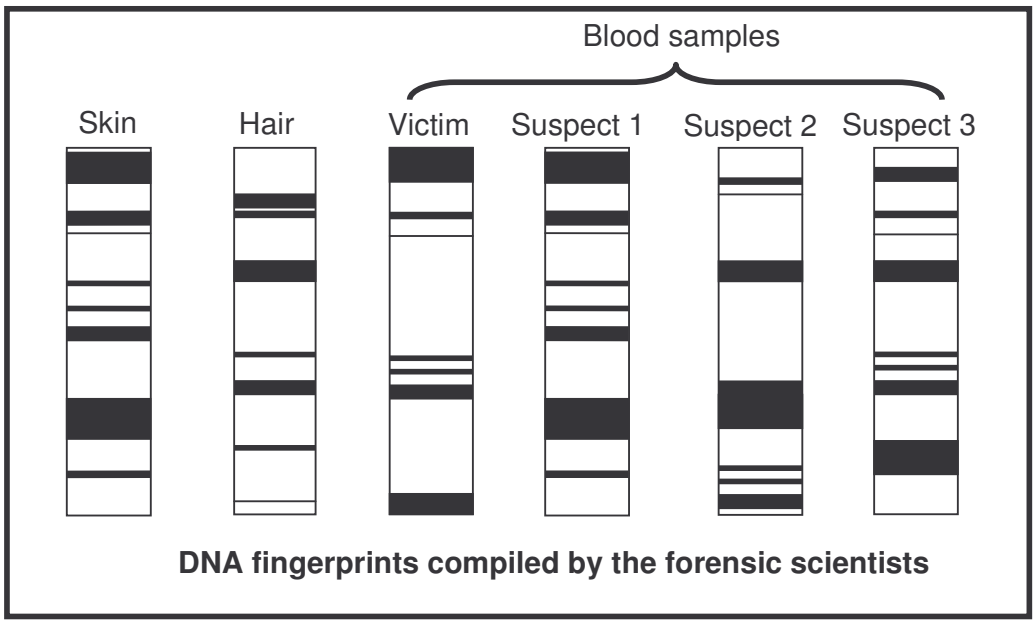
Apparatus used in the investigation

List the steps that you would follow to determine the effect of the antibiotic penicillin on the bacterium *Staphylococcus aureus.* (4)

3.4 A woman was found stabbed to death in a hotel. The police found a few strands of hair in one of her hands. There was also skin tissue under her long nails.

Forensic scientists took blood samples from three suspects to compile DNA fingerprints. DNA fingerprints were also compiled from the victim's blood and the hair and skin tissue found in the victim's hands.

The following diagram shows the DNA fingerprints of the hair sample, the skin tissue sample and blood from the victim and the three suspects.



DNA fingerprints compiled by the forensic scientists

3.4.1 Did the DNA from the hair and skin tissue come from the same person? (1)

3.4.2 What conclusion can you make from QUESTION 3.4.1 about the possible number of people involved in the murder? (2)

3.4.3 Which of the three suspects might have been involved in the murder? (1)

3.4.4 Give a reason for your answer to QUESTION 3.4.3. (1)

3.4.5 Do you think that the DNA evidence on its own is enough to convict a suspect? (1)

3.4.6 Give a reason for your answer to QUESTION 3.4.5. (2)

3.4.7 Explain whether the collection of DNA from every citizen in South Africa to create a DNA fingerprint database is a good idea or not. (2)

[30]

TOTAL SECTION B: 60

SECTION C

QUESTION 4

4.1 Read the passage below and then answer the questions based on it.

Sixty-five million affected by HIV

A new United Nations report revealed that since the first cases of HIV and Aids were detected 25 years ago, sixty-five million people around the world have become infected with HIV and around 25 million have died.

The distribution of the number of people living with HIV in various parts of the world at the end of 2005 is indicated in the table below.

Region	Number living with HIV (million)
Sub-Saharan Africa	25,00
Asia	8,30
Eastern Europe and Central Asia	1,50
Latin America	1,60
Middle East	0,44
Other countries	1,76
Total	**38,60**

[Adapted from: Evelyn Leopold for Reuters in the *Daily News*, 31 May 2006]

4.1.1 State TWO reasons why the figures reported in this passage may not be accurate. (2)

4.1.2 Using the information in the passage above calculate the percentage of HIV infected people in each region. (3)

4.1.3 Use the percentages calculated in QUESTION 4.1.2 to draw a pie chart of HIV infected people in each region. (11)

4.1.4 Although the population of Africa is much lower than that of Asia, the 25 million people living with HIV in Africa is about three times the number of people living with HIV in Asia. Give TWO possible reasons for this. (4)

4.1.5 The following proposal was made to control the spread of HIV:
'An HIV test should be compulsory before people get married.'

Explain your view on this. (2)

4.2 Sportswomen use the contraceptive pill not only for birth control but also to alter their menstrual cycle to suit their sporting lifestyle. Explain your view on this. (3)

4.3 Study the following letter to an editor of a newspaper concerning abortion.

A FOETUS IS A BABY

The biggest lie of the abortion industry is that the unborn child is a worthless, disposable blob of tissue. The second lie is that it is acceptable to ruthlessly terminate this life simply because it will be an inconvenience.

More than 85 000 babies were aborted in South Africa last year bringing the total number of abortions since legalisation of abortion on demand, to more than half a million since 1997. These statistics indicate that abortion on demand is being used as a heartless form of birth control.

No wonder that baby/child abuse and murders have increased. The only difference between abortion and murder victims is that one has been born while the other is supposedly in the safety of the mother's womb.

Abortion, which places little value on human life, breeds a society that is heartless, especially towards its most vulnerable citizens.

[Source: *Daily News,* 7 June 2006]

You are required to respond to this letter by addressing the following points:

4.3.1 Choose an opinion that is either for or against abortion and discuss at least FOUR reasons to support your viewpoint. (8)

4.3.2 Some people use abortion to get rid of unwanted offspring. Describe TWO methods that they could have used to prevent pregnancy in the first place. (4)

Synthesis (3)

NOTE: NO marks will be awarded for answers in the form of flow charts or diagrams. **[40]**

TOTAL SECTION C: 40

GRAND TOTAL: 150