



# education

---

Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P1**

**NOVEMBER 2009**

**MARKS: 150**

**TIME: 2½ hours**

**This question paper consists of 15 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. ALL drawings should be done in pencil and labelled in blue or black ink.
7. Only draw diagrams or flow charts when asked to do so.
8. The diagrams in this question paper are NOT all drawn to scale.
9. Do NOT use graph paper.
10. Non-programmable calculators, protractors and compasses may be used.
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 1.1.5) in the ANSWER BOOK, for example 1.1.6 D.

1.1.1 The amniotic fluid ...

- A attaches the embryo to the mother.
- B allows for the diffusion of nutrients and oxygen from the mother to the foetus.
- C secretes a hormone to maintain pregnancy.
- D acts as a shock absorber to protect the foetus against mechanical injury.

1.1.2 A couple has four daughters. The chances of their fifth child being a son is ...

- A 20%
- B 50%
- C 100%
- D 80%

1.1.3 In which ONE of the following parts of a flowering plant does meiosis occur?

- A Cotyledons
- B Pollen grain
- C Anther
- D Pollen tube

1.1.4 If an analysis of DNA from cells in a human body showed that thymine made up 15% of the nucleotide bases, then the percentage composition of guanine making up the DNA would be ...

- A 15%
- B 70%
- C 35%
- D 85%

1.1.5 The events of childbirth listed below are not in the correct sequence:

1. Placenta expelled from uterus
2. The baby's head emerges from the vagina
3. Contractions of the uterus begin

The correct sequence is ...

- A 3 → 2 → 1  
B 3 → 1 → 2  
C 2 → 1 → 3  
D 1 → 2 → 3

(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 to 1.2.6) in the ANSWER BOOK.

1.2.1 The narrow tube through which ova travel from the ovary to the uterus

1.2.2 The mature structure in the ovary of humans in which an ovum develops before ovulation

1.2.3 The blood vessel in the umbilical cord which is rich in oxygen and nutrients

1.2.4 The hormone in humans responsible for the contraction of the uterus during childbirth

1.2.5 The structure into which the ovule develops after fertilisation

1.2.6 The lower neck of the uterus that opens into the vagina (6)

- 1.3 Choose an item from COLUMN II that matches a description in COLUMN I. Write only the letter (A to I) next to the question number (1.3.1 to 1.3.6) in the ANSWER BOOK, for example 1.3.7 J.

COLUMN I		COLUMN II	
1.3.1	The type of reproduction involving a male gamete that fuses with a female gamete	A	gestation
		B	identical
1.3.2	The type of fertilisation that occurs outside the body in a glass petri dish in a laboratory	C	placenta
		D	cancer
1.3.3	The type of twins formed as a result of the fertilisation of two ova	E	sexual
		F	fraternal/dizygotic/non-identical
1.3.4	The muscular, hollow organ in mammals in which the embryo develops	G	in-vitro
		H	asexual
1.3.5	The period of development of an embryo between fertilisation and birth	I	uterus
1.3.6	Forms as a result of uncontrolled division of cells		

(6 x 1) (6)

- 1.4 The table below shows the DNA base triplets that code for different amino acids.

Amino acid	Base triplet in DNA template
Leu (leucine)	GAA
His (histidine)	GTA
Lys (lysine)	TTT
Pro (proline)	GGG
Ala (alanine)	CGA
Trp (tryptophan)	ACC
Phe (phenylalanine)	AAA
Gly (glycine)	CCT

The following is a part of a sequence of amino acids that form a particular protein molecule:

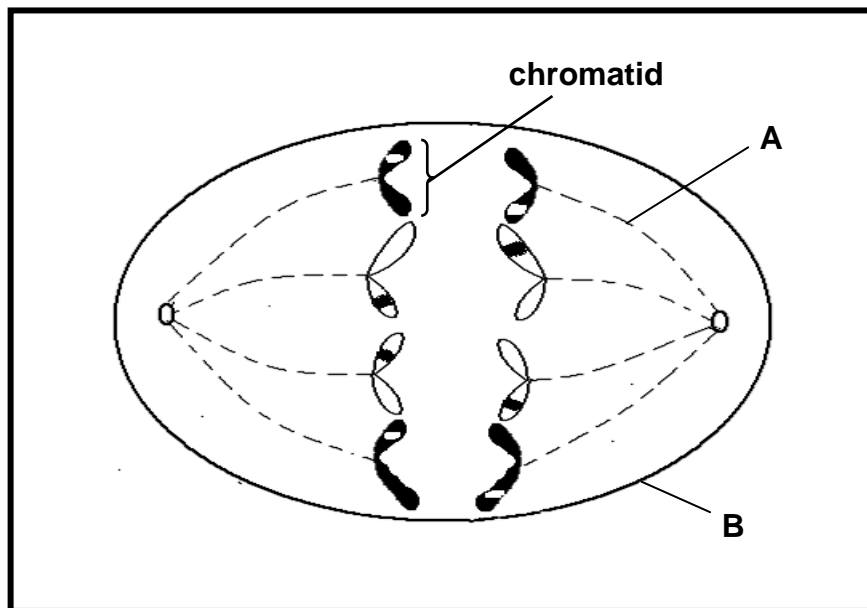
<b>Ala</b>	<b>His</b>	<b>Trp</b>	<b>Leu</b>	<b>Lys</b>
------------	------------	------------	------------	------------

- 1.4.1 Name the process by which mRNA is formed from a DNA template. (1)
- 1.4.2 How many mRNA codons would be involved in forming the portion of protein shown above? (1)
- 1.4.3 Write down the sequence of the first THREE mRNA codons (from left to right) for this portion of the protein. (3)
- 1.4.4 The following is a sequence of base triplets in DNA:

**GAA - GTA - TTT - AAA**

- (a) If guanine, found in the first base triplet, is removed, explain how this would affect the structure of the protein. (2)
- (b) Name the process that occurs when the sequence of bases in DNA changes. (1)
- (8)**

1.5 The diagram below represents an animal cell in a phase of meiosis.

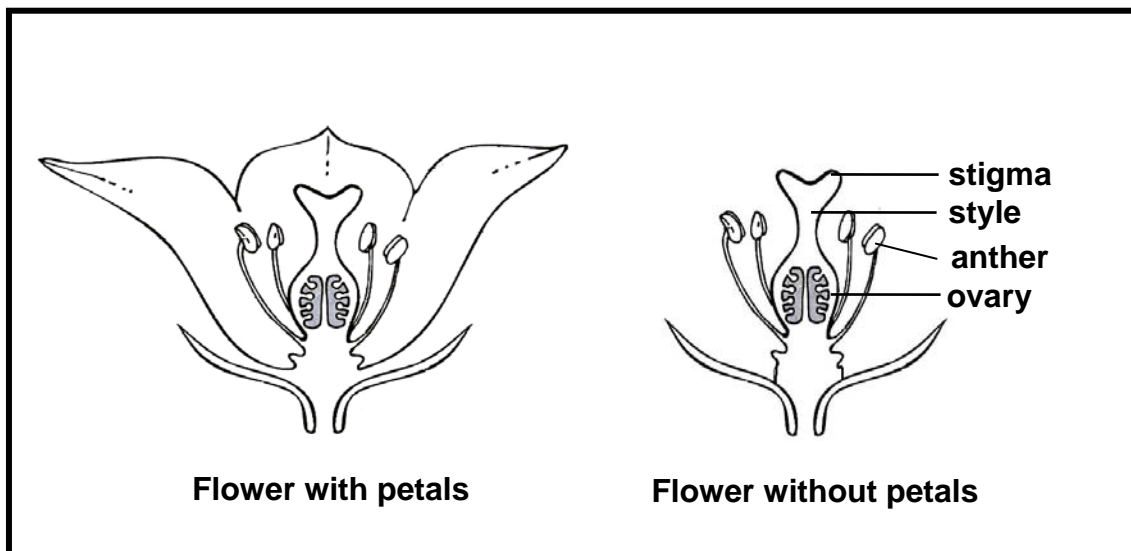


- 1.5.1 State which phase of meiosis is represented in the diagram above. (1)
- 1.5.2 Give a reason for your answer to QUESTION 1.5.1. (2)
- 1.5.3 Identify parts A and B. (2)
- 1.5.4 How many chromosomes ...
- (a) were present in the parent cell before it underwent meiosis? (1)
- (b) will be present in each cell at the end of the meiotic division? (1)
- 1.5.5 State ONE place in the body of a human female where meiosis would take place. (1)
- 1.5.6 Could the cell represented in the diagram be that of a human? (1)
- 1.5.7 Explain your answer to QUESTION 1.5.6. (2)
- 1.5.8 Give TWO reasons why meiosis is biologically important. (2)
- (13)**

1.6 An investigation was done to determine the role of petals in insect pollination in apple flowers. When flowers are self-pollinated, the pollen tubes grow a little into the stigma and style and fertilisation does not take place.

- 10 flowers with petals and 10 flowers without petals were used.
- After two days the flowers were prevented from further pollination.
- After seven days the extent of pollination and fertilisation was recorded.

The diagrams below show the appearance of the flowers with and without petals.



The results are shown in the table below.

	NUMBER	
	Flower with petals	Flower without petals
Pollen on stigma	158	25
Pollen tubes in the style	86	8
Ovules fertilised	38	4

- 1.6.1 Give an explanation for the presence of more pollen on the stigmas of the flowers with petals than on the flowers without petals. (2)
- 1.6.2 Explain why there are more pollen tubes present in the styles of both types of flowers than the number of ovules fertilised. (2)
- 1.6.3 State THREE ways in which this investigation could be improved. (3)
- [50]**

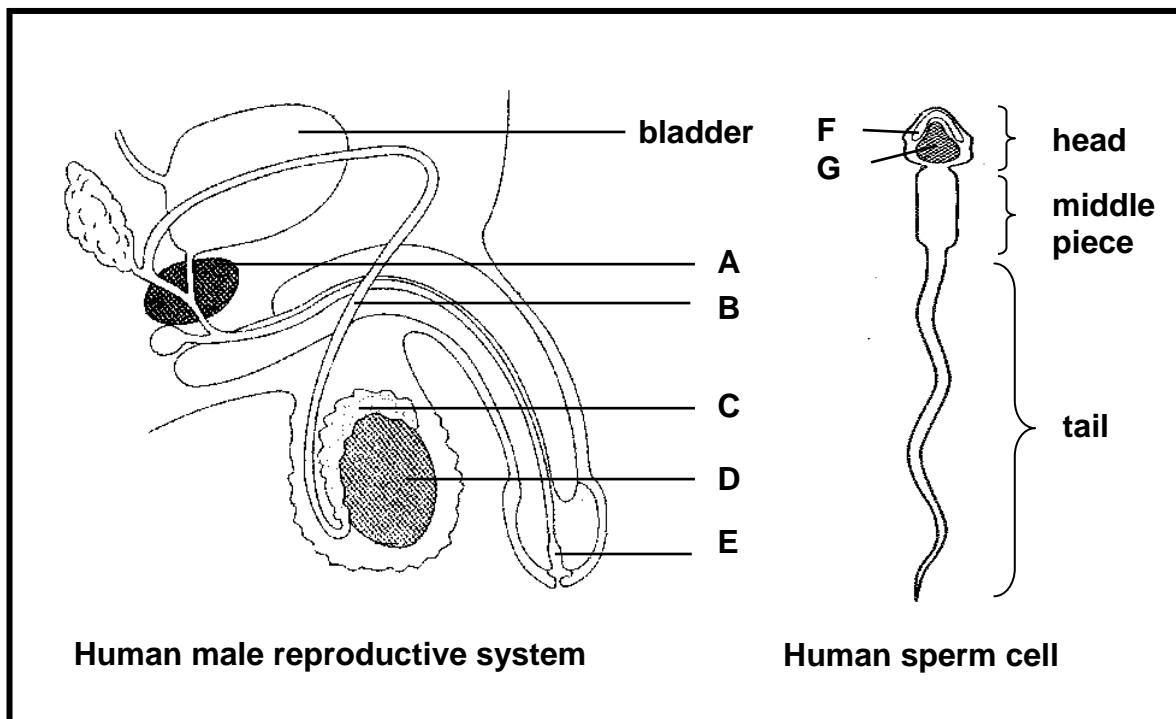
**TOTAL SECTION A: 50**



**SECTION B**

**QUESTION 2**

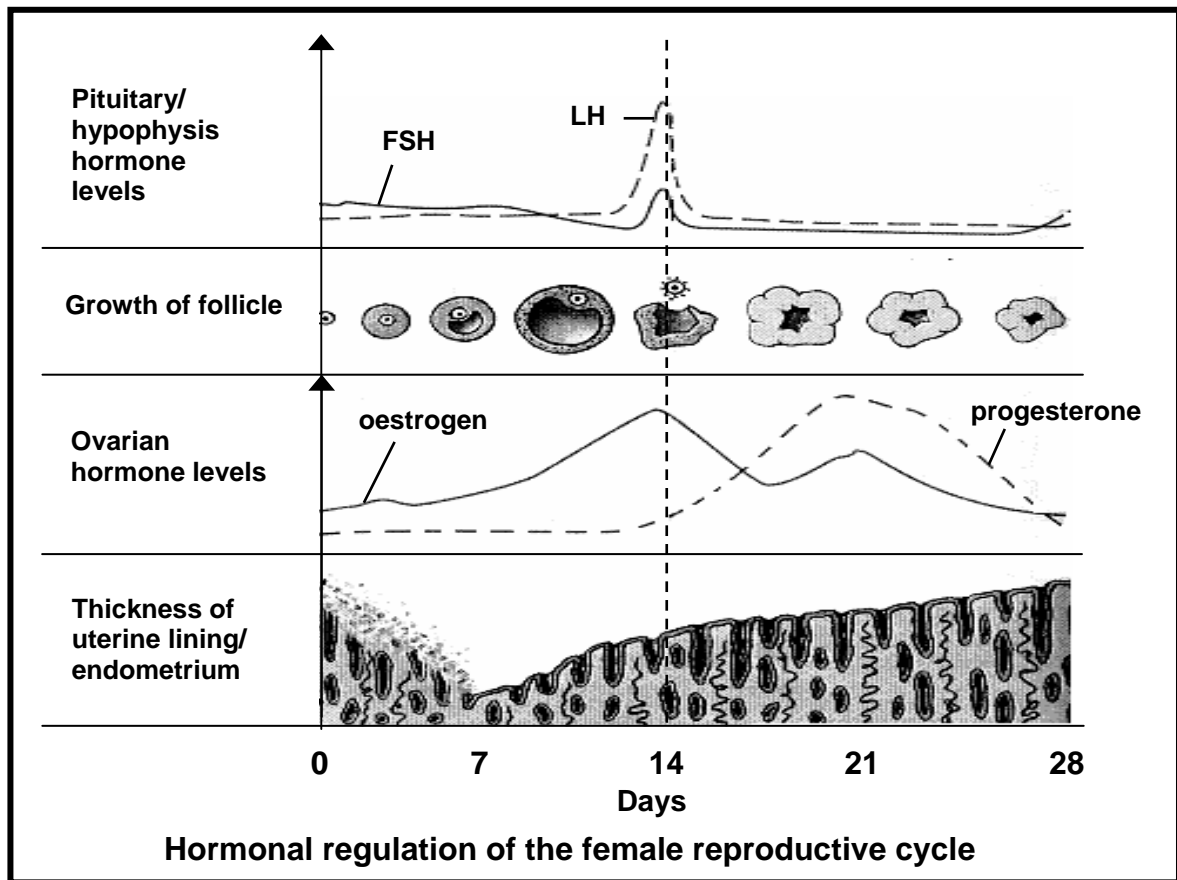
2.1 Study the diagrams below and answer the questions that follow.



- 2.1.1 Provide labels for A, B, E and G. (4)
- 2.1.2 State ONE function each of C and F, respectively. (2)
- 2.1.3 State the LETTER and NAME of the part where sperm are produced. (2)
- 2.1.4 Explain why it is necessary for part D to 'hang outside' the body of the male. (2)
- 2.1.5 Name the following: (1)
- (a) The cells that secrete a male sex hormone (1)
  - (b) The hormone that stimulates the development of secondary sexual characteristics in males (1)
- 2.1.6 During a vasectomy, part B is surgically cut. (2)
- (a) Explain how this procedure will act as a method of contraception. (2)
  - (b) Will it be possible for a man who is HIV positive to pass the HI virus to another person after he undergoes a vasectomy? (1)
  - (c) Explain your answer to QUESTION 2.1.6 (b). (2)

**(17)**

2.2 Study the graph below which shows the menstrual cycle and the influence of the different hormones on it.



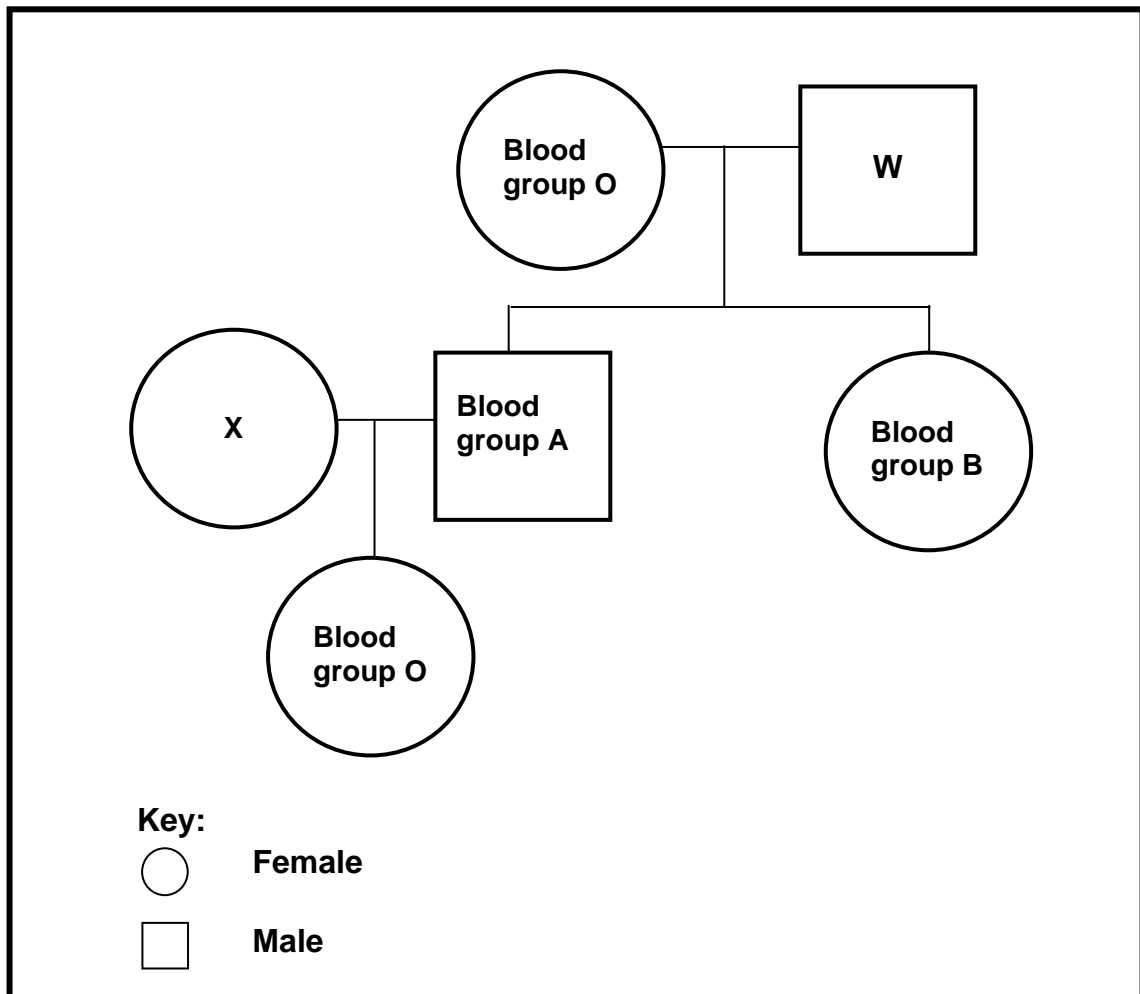
- 2.2.1 On which day does ovulation take place? (1)
- 2.2.2 Between which days does menstruation take place? (1)
- 2.2.3 State any ONE function of luteinising hormone (LH). (1)
- 2.2.4 Describe the changes in the level of LH shown in the graph. (3)
- 2.2.5 Describe the relationship between the level of oestrogen and the endometrium from day 7 to day 14. (2)
- 2.2.6 Explain why it is necessary for the level of progesterone in the blood to increase after ovulation. (2)
- 2.2.7 Did fertilisation take place in the 28-day cycle illustrated in the graph? (1)
- 2.2.8 Explain your answer to QUESTION 2.2.7. (2)

**(13)**  
**[30]**

**QUESTION 3**

3.1 It is possible to trace the inheritance of characteristics such as blood groups and genetic disorders over a number of generations.

3.1.1 The pedigree diagram below shows the blood groups of individuals of a family. The blood groups are indicated inside the circle or square. The blood groups of individuals W and X are not indicated.



Write down all the possible genotypes of individuals:

(a) W

(b) X

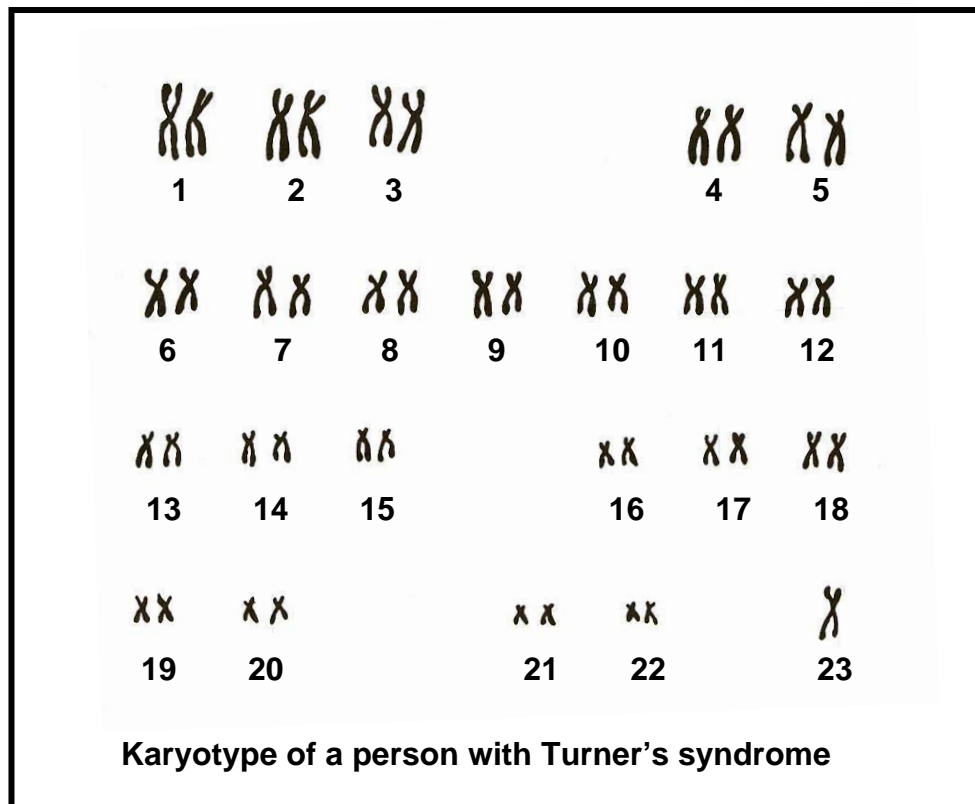
(8)

3.1.2 Haemophilia is a blood clotting disorder. Explain why mainly males suffer from this disorder.

(4)

**(12)**

- 3.2 Study the karyotype below of a person suffering from Turner's syndrome. Females with Turner's syndrome do not develop mature sex organs.



- 3.2.1 State the differences between the karyotype for a normal female and a female with Turner's syndrome. (2)
- 3.2.2 Explain ONE effect of the disorder on a female. (2)  
(4)
- 3.3 Tommy carried out a survey to find out if there was a difference between the numbers of boys and girls who have unattached ear lobes. In his investigation Tommy observed 120 boys and 100 girls. Of the boys, 102 had unattached earlobes and of the girls, 80 had unattached earlobes.
- 3.3.1 What percentage of the boys had unattached earlobes? Show ALL working. (2)
- 3.3.2 From his results, Tommy calculated that a greater percentage of boys than girls in the sample had unattached earlobes. Tommy concluded that in the human population, more boys than girls have unattached earlobes.
- Suggest TWO ways to improve the investigation. (2)  
(4)

- 3.4 Fur colour in mice is controlled by a gene with two alleles. A homozygous mouse with black fur was crossed with a homozygous mouse with brown fur. All the offspring had black fur.

Using the symbols B and b to represent the two alleles for fur colour, show diagrammatically a genetic cross between a mouse that is heterozygous for fur colour with a mouse with brown fur. Show the possible genotypes and phenotypes of the offspring.

(6)

- 3.5 Suggest FOUR reasons why more teenagers nowadays have unplanned pregnancies.

(4)

**[30]****TOTAL SECTION B: 60****SECTION C****QUESTION 4**

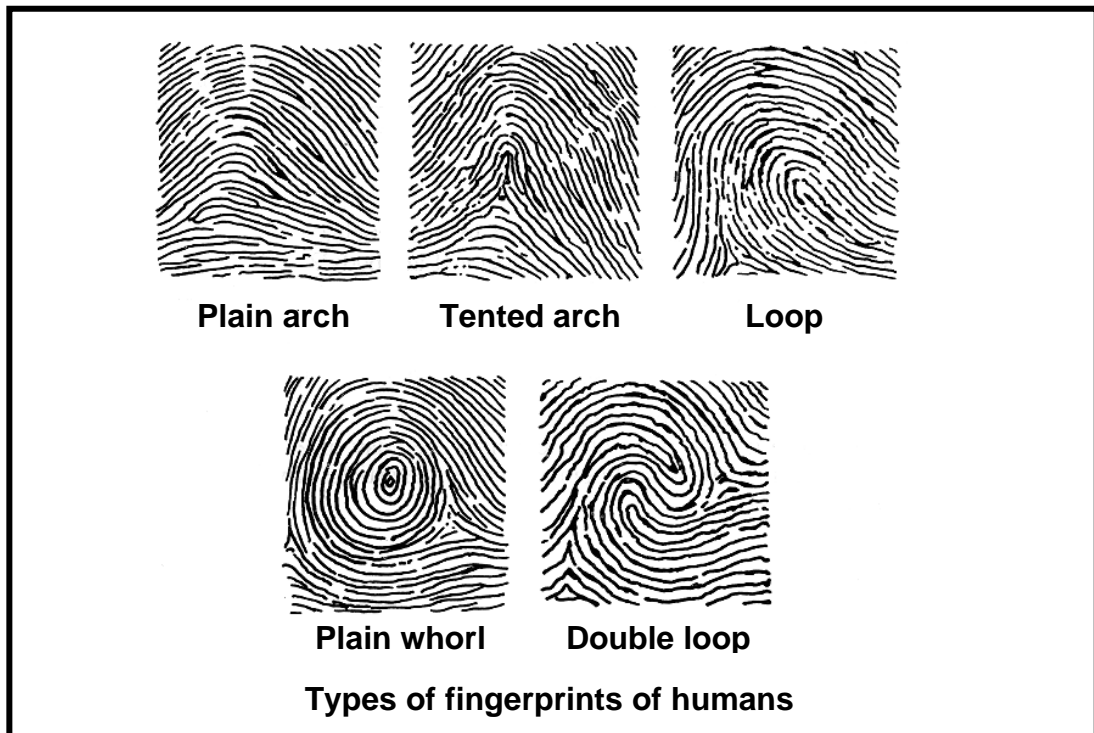
- 4.1 In an experiment to show co-dominance, cows with white fur (W) were crossed with bulls with red fur (R). All the offspring of the F<sub>1</sub>-generation have roan fur (RW). A roan fur consists of patches of white and patches of red fur. Roan cows and roan bulls were crossed and the results are given below.

Genotype	RR	RW	WW
Number of offspring	120	240	120

- 4.1.1 Give the ratio of the different phenotypes shown in the above table. (2)
- 4.1.2 Use the information in the table above to draw a pie-chart showing the proportions of the different genotypes. (7)
- 4.1.3 Explain why the cows and bulls with genotype RW have roan fur and not only red or only white fur. (3)

**(12)**

- 4.2 Humans show differences in characteristics such as fingerprints. Humans have five main types of fingerprints as shown in the diagram below.



A fingerprint is a useful way of identifying people and classifying them into groups. A fingerprint is taken by rolling the right index finger onto an inkpad and then on a piece of paper.

During a discussion of this topic, a group of learners asked the following question:

"Which one of the five main types of fingerprints is most common amongst the learners of this school?"

- 4.2.1 State any **FOUR** steps in the planning process that must be considered when planning an investigation to answer the question above.

(4)

- 4.2.2 The learners carried out an investigation and the results are shown in the table below.

Main types of fingerprints	Number of learners
Plain arch	123
Tented arch	112
Loop	124
Plain whorl	150
Double loop	50

- (a) Give a caption for the table. (2)
- (b) Learners came to the following conclusion:  
*Most learners have the plain arch-type fingerprint.*  
Is this a valid conclusion? (1)
- (c) Give a reason for your answer to QUESTION 4.2.2 (b). (2)

- 4.2.3 State the following:

- (a) TWO advantages of having a fingerprint database of every citizen and visitor in South Africa (2)
- (b) TWO disadvantages of having a fingerprint database of every citizen and visitor in South Africa (2)
- (13)**

- 4.3 *Using genetically modified organisms as a source of food is supported by some people and rejected by others.*

Explain SIX advantages of using genetically modified organisms as a source of food. (12)

Synthesis: (3)  
**(15)**  
**[40]**

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

**TOTAL SECTION C: 40**  
**GRAND TOTAL: 150**