



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P1**

**NOVEMBER 2008**

**MARKS: 150**

**TIME: 2½ hours**

**This question paper consists of 18 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 answer to EACH question at the top of a NEW page.
4. Number the answers 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. Draw diagrams or flow charts only 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 – D) next to the question number (1.1.1 – 1.1.6), for example 1.1.7 D.

1.1.1 The part of a plant that receives the pollen during pollination is the ...

- A stigma.
- B anther.
- C ovule.
- D petal.

1.1.2 Which of the following terms matches its related description?

- A Implantation – embedding of a fertilised egg
- B Fertilisation – release of semen from the penis
- C Ovulation – fluid containing spermatozoa
- D Semen – joining of an egg and a spermatozoon

1.1.3 Which of the following represents the correct order of the parts through which spermatozoa pass?

- A Testis → vas deferens → epididymis → ureter
- B Vas deferens → seminal vesicles → ureter
- C Testis → epididymis → vas deferens → urethra
- D Vas deferens → prostate gland → urethra

1.1.4 The following events occur during sexual reproduction of angiosperms:

- (i) Diploid zygote develops by mitosis into an embryo
- (ii) Anthers split open
- (iii) Pollen tube enters the micropyle
- (iv) Nucleus of the male gamete fuses with the nucleus of the egg cell

The correct sequence in which the events above occur is ...

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

1.1.5 Which of the following is NOT part of a DNA molecule?

- A Adenine
- B Uracil
- C Guanine
- D Cytosine

1.1.6 Two complementary bases in a DNA strand are held together ...

- A by strong nitrogen bonds.
- B by weak nitrogen bonds.
- C because they are coiled around each other.
- D by weak hydrogen bonds.

(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 – 1.2.8).

1.2.1 The structure that develops from the remains of the Graafian follicle after ovulation

1.2.2 The part of the head of a spermatozoon containing enzymes

1.2.3 The type of reproduction in plants which does not involve the fusion of gametes

1.2.4 The appearance of an organism as a result of its genetic make-up

1.2.5 The region of a chromosome where sister chromatids are attached to each other

1.2.6 The division of cytoplasm that occurs after a cell nucleus has divided

1.2.7 Changes in the structure of DNA that might be harmful or beneficial

1.2.8 Specific lengths of DNA which carry the codes for characteristics of organisms

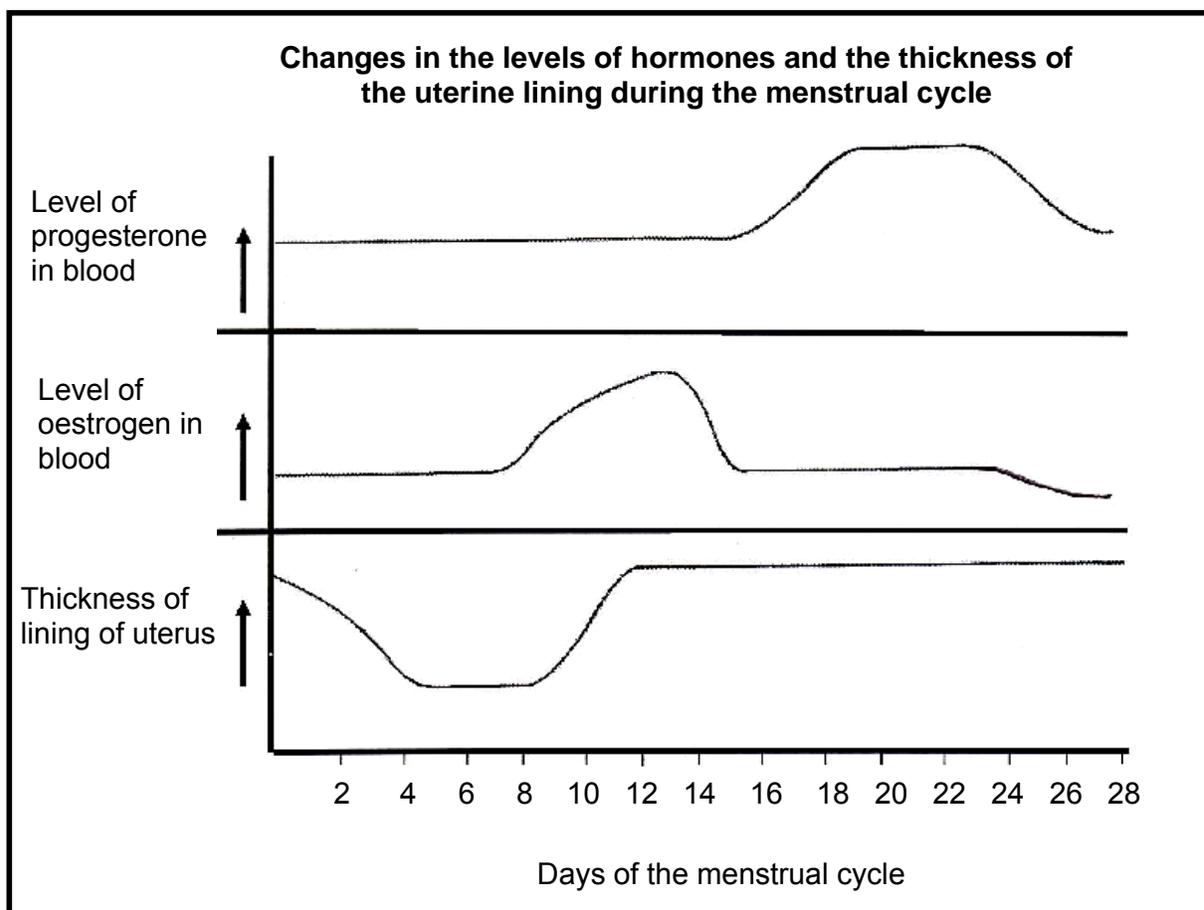
(8)

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

COLUMN I		COLUMN II	
1.3.1	The structure into which the ovary of an angiosperm develops after fertilisation	A	dihybrid
		B	recessive
1.3.2	A full set of chromosomes with all the genes of an organism	C	homologous
		D	dominant
1.3.3	Red flowering plants crossed with white flowering plants produce pink flowering plants	E	fruit
		F	incomplete dominance
1.3.4	An allele that expresses itself when in a heterozygous state	G	genome
1.3.5	Two chromosomes in the same cell which have genes for the same characteristic in corresponding positions	H	seed

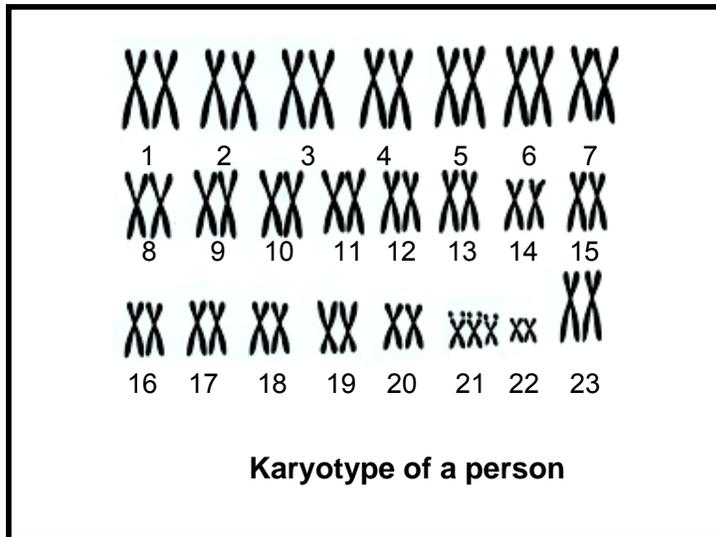
(5 x 1) (5)

1.4 Study the graph below and answer the questions that follow.



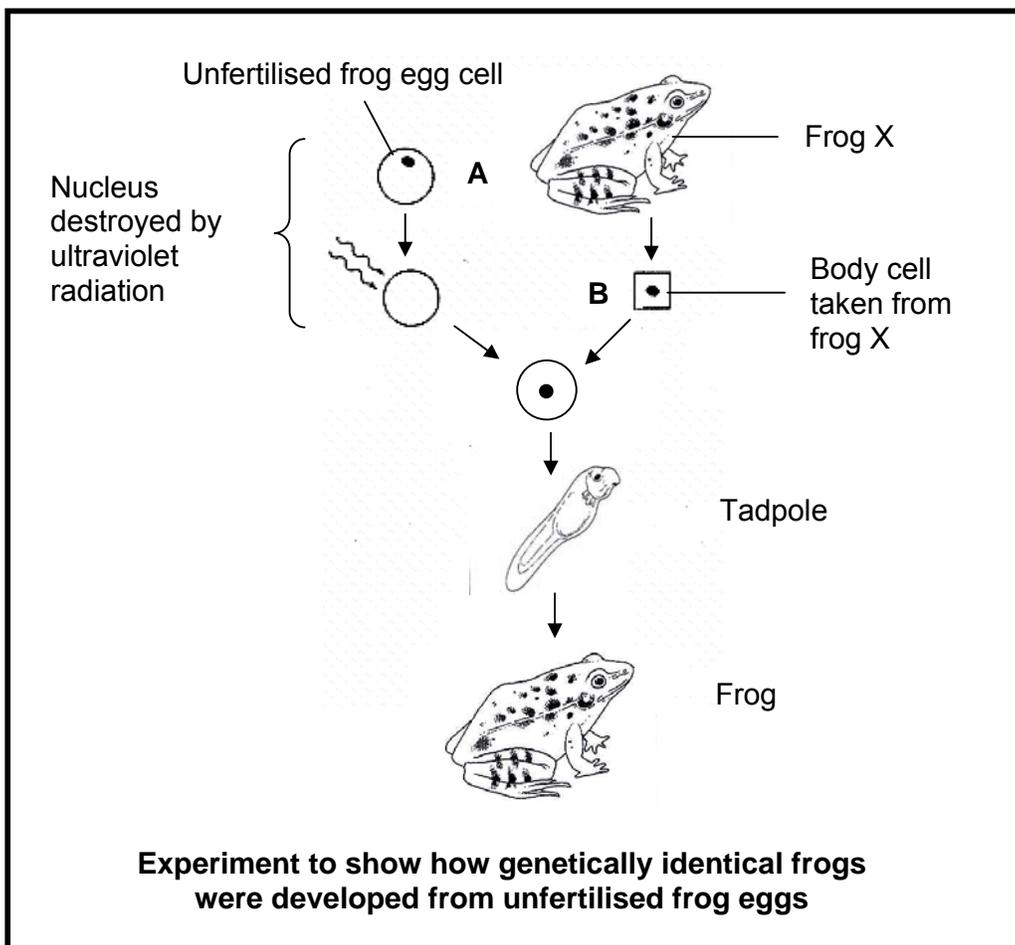
- 1.4.1 What is *menstruation*? (2)
- 1.4.2 Select the days on which menstruation occurs from those given below:  
 Days 0 – 5  
 Days 5 – 12  
 Days 9 – 16  
 Days 24 – 28 (1)
- 1.4.3 Using the graph above, describe the changes in the hormone levels that took place before the breakdown of the uterine lining. (2)
- 1.4.4 What is the effect on the uterine lining when the level of oestrogen increases? (2)
- 1.4.5 Why is it important that a high level of progesterone is maintained during pregnancy? (2)

1.5 Study the diagram below and answer the questions that follow.



- 1.5.1 Is this the karyotype of a male or a female? (1)
- 1.5.2 Give a reason for your answer to QUESTION 1.5.1. (2)
- 1.5.3 How many chromosomes does this person have? (1)
- 1.5.4 Name the genetic disorder that this person has. (1)

1.6 The diagram below shows the steps of an experiment in which a large number of genetically identical frogs were developed from unfertilised frog eggs. The nucleus of each unfertilised egg was destroyed and replaced by a nucleus obtained from a body cell from frog X.



1.6.1 The diploid number of chromosomes in the above frogs is 26. How many chromosomes are present in the nucleus of the following cells?

- (a) Cell A (1)
- (b) Cell B (1)

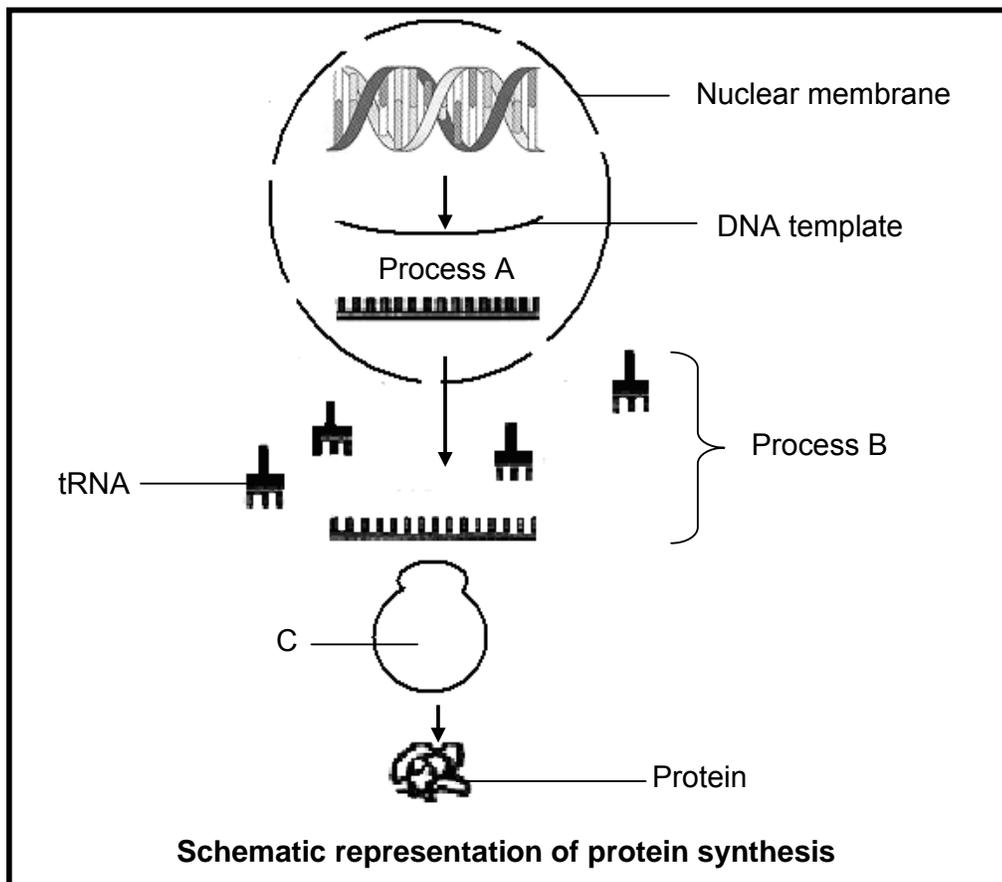
- 1.6.2 Why can an egg containing a nucleus from the body cell of a frog develop into a tadpole? (2)
- 1.6.3 Explain why all the frogs produced from the treated eggs are genetically identical. (2)
- 1.6.4 Name the method of producing genetically identical offspring as shown in the diagram. (1)
- 1.6.5 State ONE reason why some people might:
- (a) Favour the process shown in the diagram (2)
- (b) Be against the process shown in the diagram (2)

**TOTAL SECTION A: 50**

**SECTION B**

**QUESTION 2**

2.1 The following diagram represents protein synthesis.



- 2.1.1 Name the following processes:
- (a) A (1)
  - (b) B (1)
- 2.1.2 Name the organelle labelled C. (1)
- 2.1.3 Explain how the mRNA is made from the DNA template during process A. (5)

- 2.1.4 Processes A and B above can be summarised by the table below. Write the numbers 1 – 3 and next to each number the nitrogenous bases that will complete the table.

<b>Base sequence on DNA</b>	<b>Codon on mRNA</b>	<b>Anticodon on tRNA</b>	<b>Amino acid</b>
CAA	1	2	Valine
3	GCA	CGU	Alanine

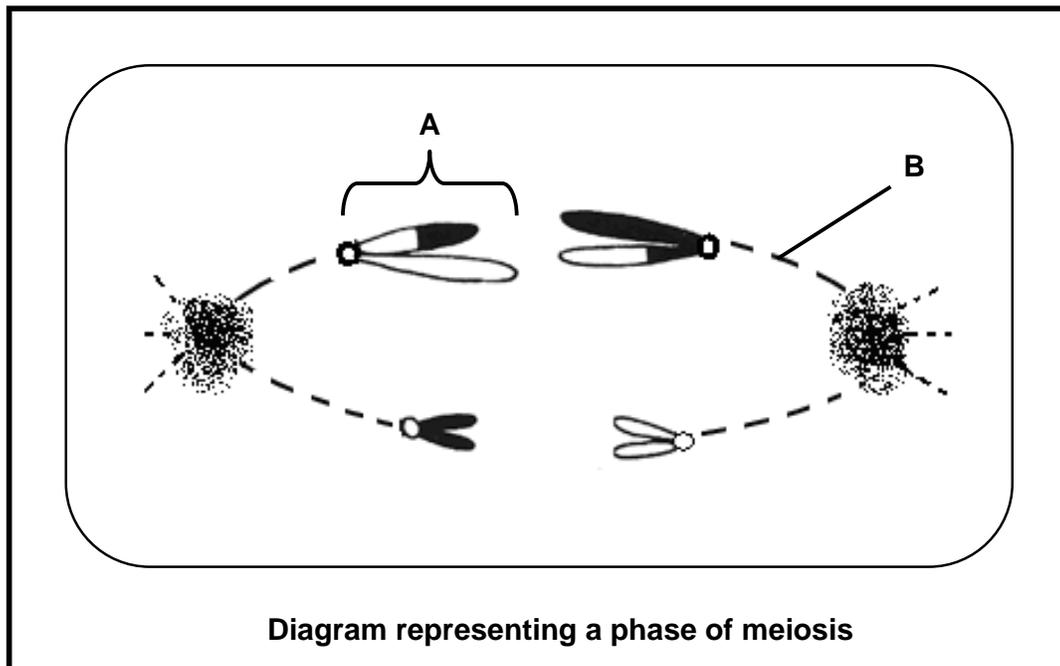
(6)

- 2.2 Genetic counselling might include prenatal (before birth) diagnostic tests, advice and support.

2.2.1 State TWO benefits of prenatal diagnostic tests for parents. (2)

2.2.2 State TWO reasons why supportive and accurate counselling for parents is important. (2)

2.3 The following diagram represents a phase of meiosis.



- 2.3.1 Provide labels for parts A and B. (2)
- 2.3.2 What phase of meiosis is represented in the diagram above? (2)
- 2.3.3 How many chromosomes will there be in each cell formed from this cell at the end of meiosis? (1)
- 2.3.4 How many chromosomes were present in the phase before the one represented in the diagram? (1)

2.4 Learners want to investigate eye colour in fruit flies (*Drosophila melanogaster*). Fruit flies can have red (R) eyes or white (r) eyes. Red eye colour is dominant and white eye colour is recessive.

Male fruit flies, homozygous for red eye colour, were bred with female fruit flies, homozygous for white eye colour.

Show how the possible phenotypes and the genotypes of the F<sub>1</sub> generation for eye colour may be obtained.

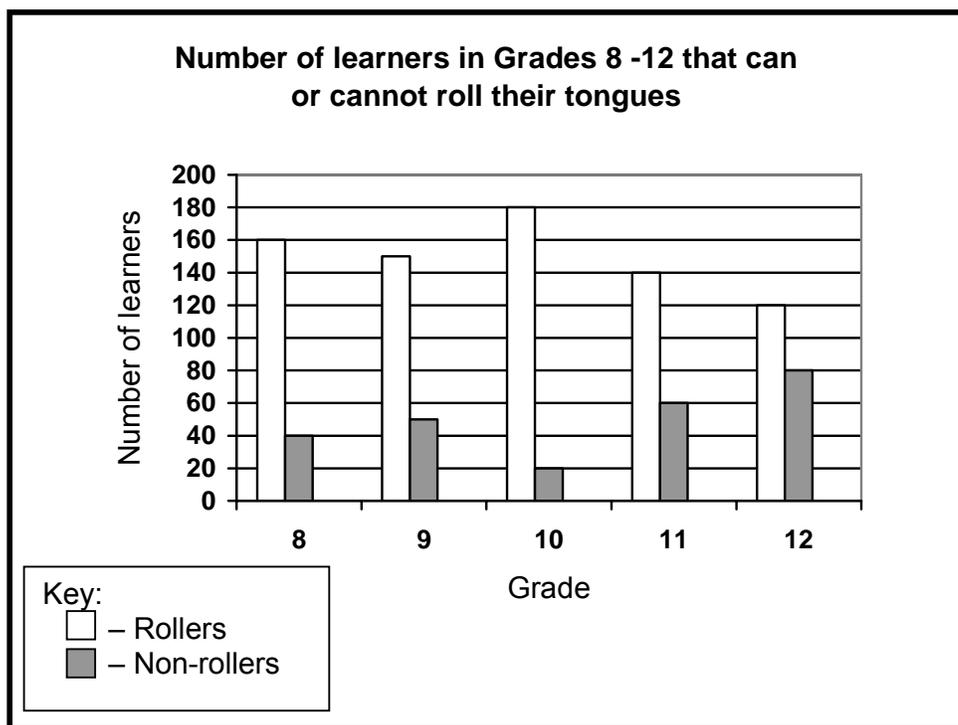
(6)  
**[30]**

**QUESTION 3**

- 3.1 Some people have the ability to roll their tongue (rollers) while other people cannot roll their tongues (non-rollers).

A Grade 12 learner wanted to determine the frequency of learners in the school that could roll their tongues.

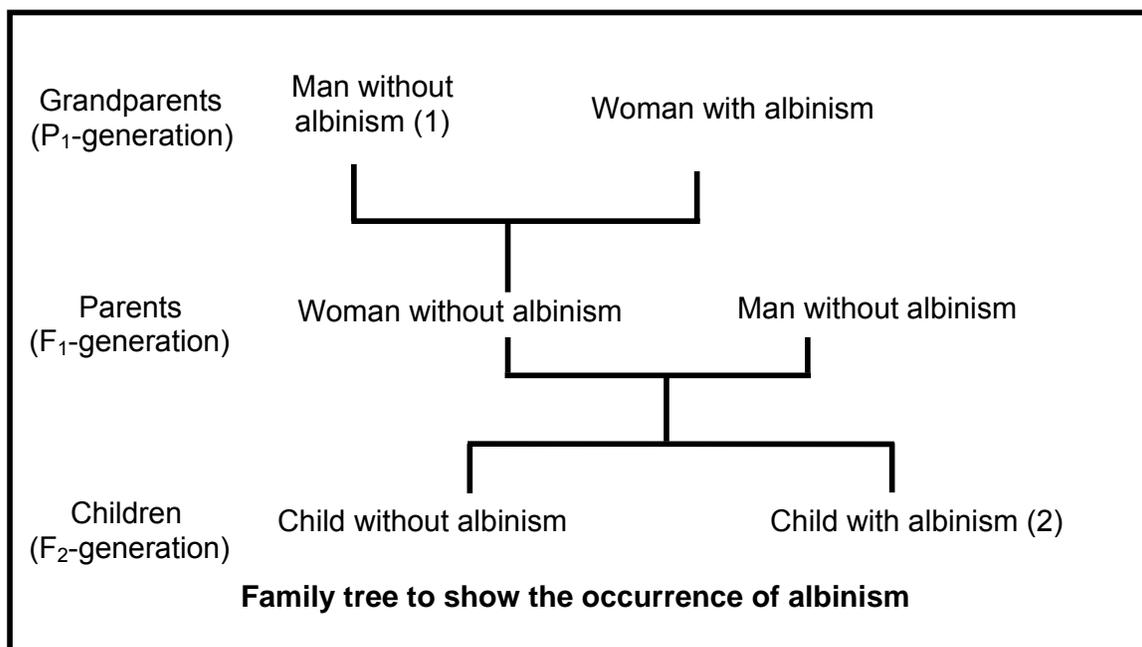
She went to each grade in the school and counted the number of rollers and non-rollers. She presented her results in the graph below.



- 3.1.1 State a hypothesis for this investigation. (2)
- 3.1.2 Which grade had the most learners that could roll their tongues? (1)
- 3.1.3 Use the data in the graph to draw a table that shows the results she obtained. (7)
- 3.1.4 Calculate the ratio of rollers to non-rollers. Show ALL working. (4)

3.2 People with albinism are unable to produce the dark pigment, melanin, in their skin. This condition is caused when an individual is homozygous recessive for this characteristic.

The family tree below shows the occurrence of albinism over three generations.



3.2.1 Indicate whether each of the individuals below could be homozygous dominant, homozygous recessive or heterozygous:

- (a) 1
- (b) 2 (3)

3.2.2 Explain your answer to QUESTION 3.2.1(a). (2)

3.3 Since the 1980s, human insulin has been produced using genetically modified bacteria and yeast.

3.3.1 State THREE advantages of producing human insulin by genetic modification. (3)

3.3.2 Give TWO reasons why some people might be against genetic modification. (2)

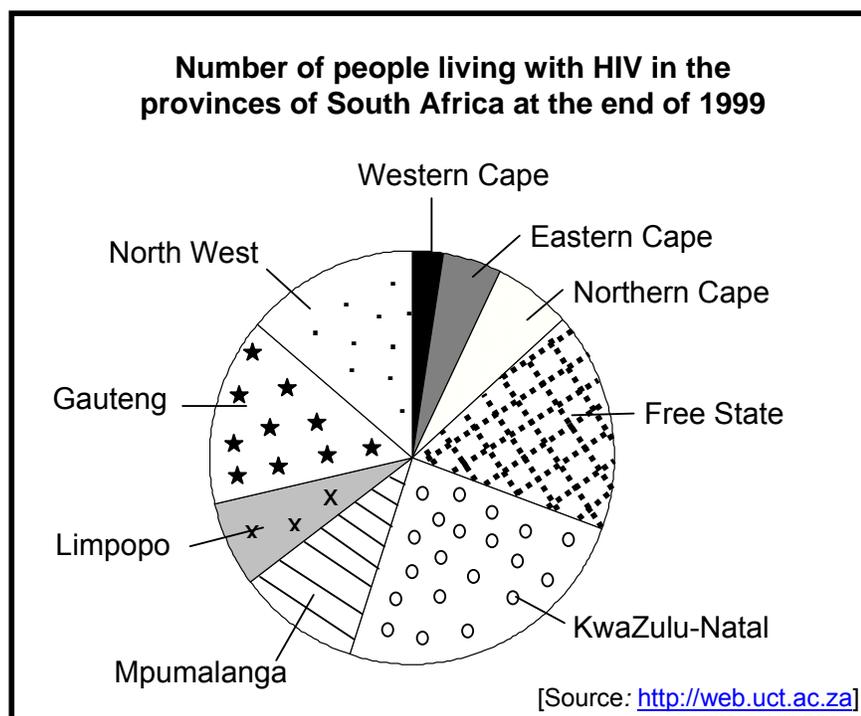
3.4 Explain:

- 3.4.1 The principle of dominance (3)
  - 3.4.2 Mendel's law of segregation (3)
- [30]**

**TOTAL SECTION B: 60**

**SECTION C****QUESTION 4**

- 4.1 A Department of Health (South Africa) report indicates the distribution of the number of people living with HIV in the various provinces of South Africa. The results are shown below.



- 4.1.1 Give TWO reasons why the figures reported above may not be accurate. (2)
- 4.1.2 Name the province of South Africa that had the:
- Highest number of people infected with HIV (1)
  - Lowest number of people infected with HIV (1)
- 4.1.3 Some sources indicate that there is now a slight decline in the number of people infected with HIV in South Africa. Give ONE possible reason for this decline. (1)
- 4.1.4 The following proposal was made to control the spread of HIV:
- All sexually active people should be compelled by law to get an HIV test and to make the results available to anybody who needs this information.
- State TWO advantages of this proposal. (2)
  - State TWO disadvantages of this proposal. (2)

4.2 Some sexually transmitted diseases (STDs) are increasing world-wide.

The table below indicates the number of people infected with two common bacterial STDs.

<b>Year</b>	<b>Number (per 100 000 people) infected with syphilis</b>	<b>Number (per 100 000 people) infected with gonorrhoea</b>
1986	50	150
1990	150	280
1994	200	150
1998	220	100

4.2.1 On the same system of axes, draw TWO line graphs to compare the number of people infected with syphilis and gonorrhoea from 1986 to 1998. (13)

4.2.2 Describe the trends shown in both graphs for EACH of the two diseases. (3)

- 4.3 The passage below is based on a number of issues concerning human reproduction.

During the process of *in vitro* fertilisation many spermatozoa and ova of the couple are used and therefore many embryos are formed. Not all the embryos are implanted into the female. The embryos that are not used are called 'spare' embryos. The 'spare' embryos could be used in ethical or unethical ways.

It is possible to determine the sex of the various embryos formed. If this is possible, couples may have the option of selecting the sex of their child and hence have the appropriate embryo implanted. There could be advantages and disadvantages resulting from offering such a choice.

While some people are trying hard to have children, others are trying various methods to prevent falling pregnant. The use of contraceptives is promoted by some cultures, but not supported by others.

Write a mini-essay that explains TWO opposing viewpoints, each with a reason, which people might have on each of the THREE issues that have been outlined in the passage. (12)

Synthesis: (3)

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

**TOTAL SECTION C: 40**

**GRAND TOTAL: 150**