



education

Department of
Education
FREE STATE PROVINCE

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES P1

JUNE 2011

MARKS: 150

TIME: 2½ hours

This question paper consists out of 12 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 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 and 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 given 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 1.1.9) in your ANSWER BOOK, for example 1.1.10 D.

1.1.1 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.

Answer questions 1.1.2 and 1.1.3 with reference to the statement below:

A pure-breeding red rose was crossed with a pure-breeding yellow rose.
The offspring were then crossed with each other. Red (R) is dominant over yellow (r).

1.1.2 The expected phenotype (s) of the 1st offspring will be:

- A all red
- B all yellow
- C 75% red and 25% yellow
- D 50% red, 25% orange and 25% yellow

1.1.3 The expected genotype (s) of the 2nd offspring will be:

- A RR and rr
- B RR, Rr and rr
- C RR only
- D rr only

1.1.4 In a breeding experiment between a parent showing the dominant phenotype and a parent showing the recessive phenotype, the offspring showed equal proportions of the dominant and recessive phenotypes. Which ONE of the following statements is TRUE?

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

1.1.5 If all 24 nucleotides of a DNA strand code for amino acids, how many amino acids will be present in the polypeptide

- A 12
- B 24
- C 6
- D 8

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

- A by strong nitrogen bonds.
- B by weak nitrogen bonds.
- C by strong hydrogen bonds.
- D by weak hydrogen bonds.

1.1.7 Which amino acid coding sequence is correct for the DNA bases in table?

	DNA	mRNA	tRNA	amino acid
A	CAT	GUU	CAU	leucine
B	CAU	GUA	CAU	histidine
C	GTA	CAU	GUA	valine
D	AUG	TAC	AUG	methionine

1.1.8 The doctor analyse DNA obtained from patient cells. He determined that 15% of the nucleotide bases contain thymine. What percentage of bases was guanine?

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

1.1.9 Which of the following statements are characteristic of DNA?

- (i) Double stranded helix
 - (ii) Sugar is deoxyribose
 - (iii) Found in the nucleus
 - (iv) Constant amount normally found in all the somatic cells a particular species
- A (i), (ii) and (iii)
 - B (i), (ii) and (iv)
 - C (ii), (iii) and (iv)
 - D (i), (ii), (iii) and (iv)

2 X 9 **(18)**

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 your ANSWER BOOK.

- 1.2.1 Different forms of same gene.
- 1.2.2 The position of a gene on a chromosome
- 1.2.3 The phenomenon of the phenotypic intermediate pink flower when a white flower and a red flower are crossed
- 1.2.4 An individual that has dominant gene and one recessive gene for a Particular characteristic
- 1.2.5 A ring of DNA found in bacteria that is used in the production of insulin
- 1.2.6 A plant or animal has more than a diploid set of chromosomes

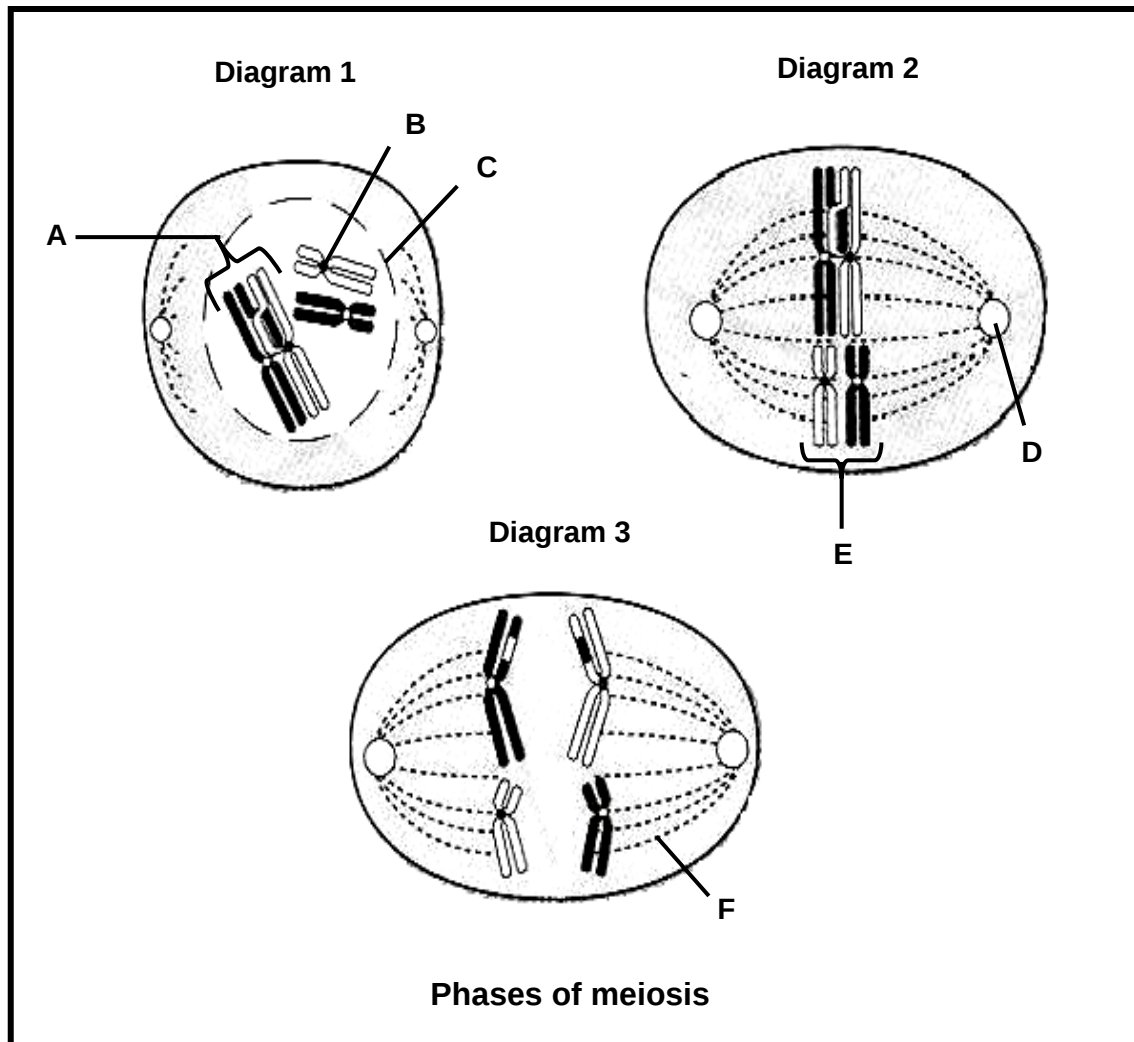
6 X 1 (6)

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 to 1.3.8) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Genetic disorder/s which leads to absence of blood clotting factors	A: sickle-cell anaemia B: haemophilia
1.3.2 Results in variation in the offspring	A: crossing over B: independent assortment
1.3.3 RNA nucleotide	A: ribose sugar B: thymine
1.3.4 pyrimidine bases	A: adenine B: guanine
1.3.5 Upright posture	A: <i>Homo habilis</i> B: <i>Australopithecus</i>
1.3.6 Life forms have descended with modification	A: Biological evolution B: Evolution
1.3.7 Law of use and disuse	A: Lamarck B: Darwin
1.3.8 Has no effect on structure and functioning of the organism	A: Lethal mutation B: Neutral mutation

8X 2 (16)

1.4 The diagrams below represent phases of meiosis.



1.4.1 Identify structures C,D and E. (3)

1.4.2 State ONE function of structure F. (2)

1.4.3 (a) Identify the phase represented by diagram 3. (2)

(b) Describe the events that take place in diagram 3 (2)

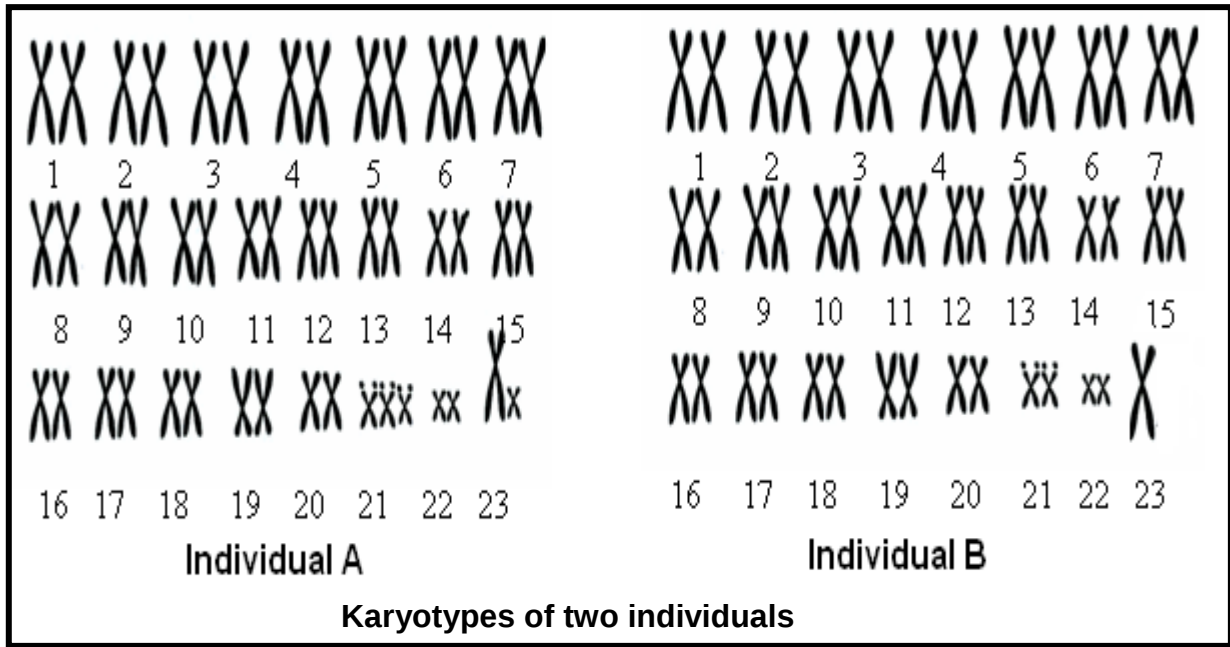
1.4.4 How many chromosomes are shown in Diagram 3? (1)

(10)

TOTAL QUESTION 1: 50
TOTAL SECTION A: 50

SECTION B**QUESTION 2**

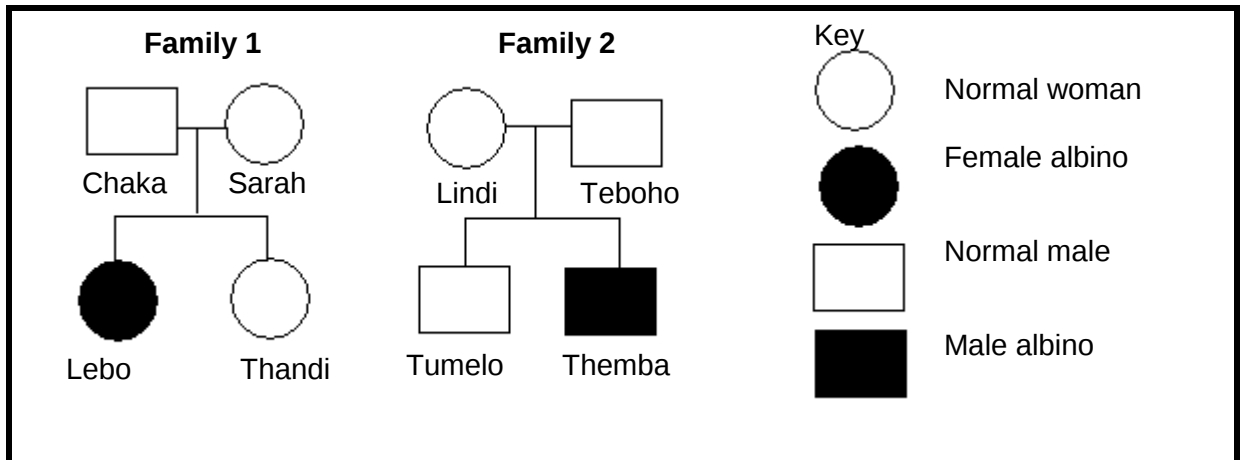
2.1 Study the representation of the karyotypes of an individual A and B below.



- 2.1.1 Which individual A or B is female? (1)
- 2.1.2 Give a reason for your answer in 2.1.1. (2)
- 2.1.3 Name the genetic disorder that Individual A suffers from. (1)
- 2.1.4 List THREE characteristics of this genetic disorder. (2)
- 2.1.5 State the difference between the karyotype for a normal individual and an individual B with Turner's syndrome which do not develop mature sex organs. (2)
- 2.1.6 Explain ONE effect of the disorder on chromosome number 23 of individual B. (2)
- (10)**

- 2.2 The ability of a person to form pigment in the skin hair and eyes depends on the presence of a particular gene (**A**), whereas the lack of this ability, known as albinism, is caused by another gene (**a**) of the same allele. The effects of **A** are dominant, and those of **a** are recessive. So heterozygous for individual (**Aa**) as well as those homozygous for the pigment-producing allele (**AA**), have normal pigmentation.

Use the family tree below to answer the following questions



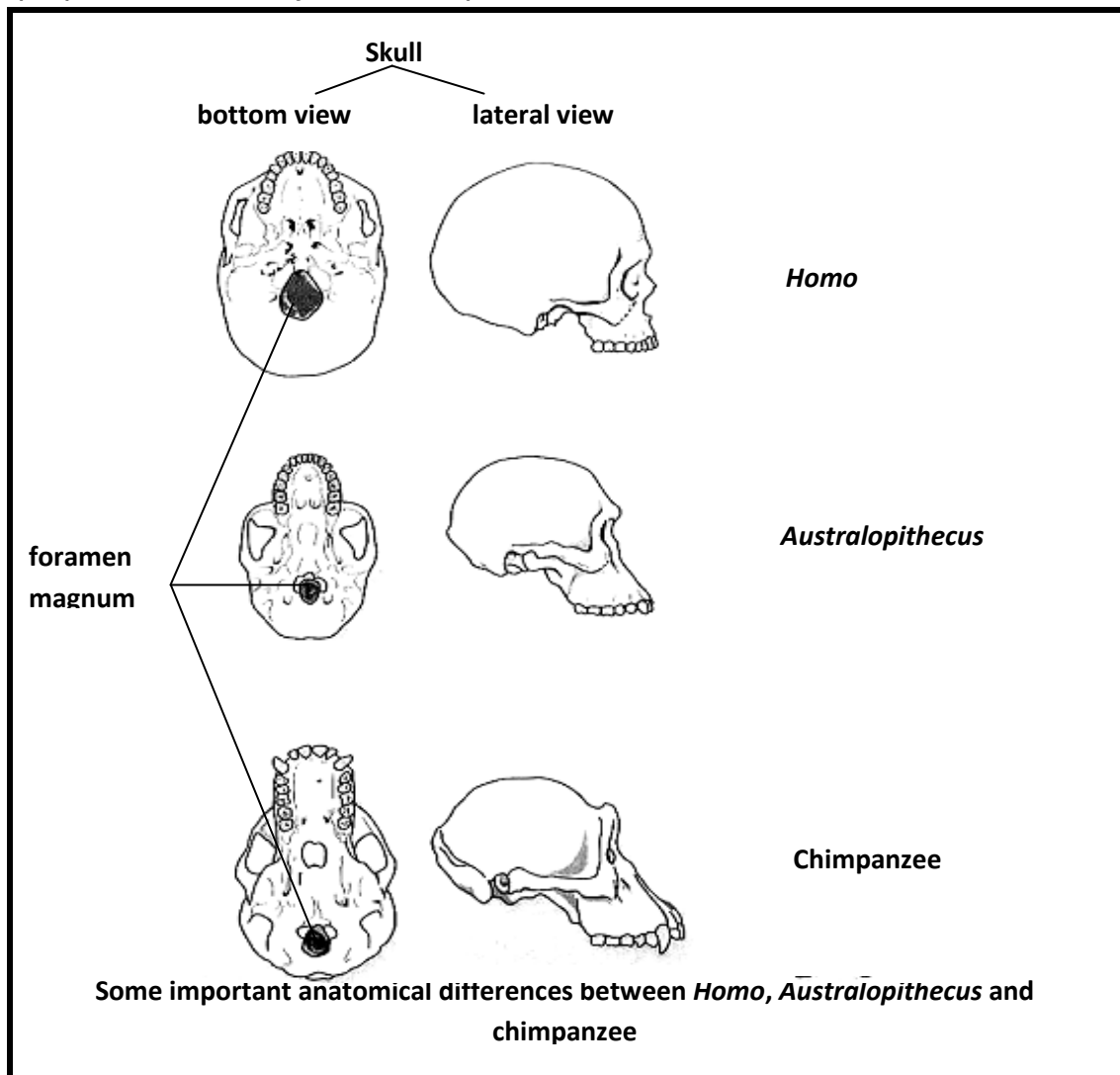
- 2.2.1 State the genotype of:
- (a) Lebo (1)
 - (b) Themba (1)
- 2.2.2 Use the diagram to work out the possible genotype/s of Chaka. (2)
- (i) work out Lebo's genotype. (1)
 - (ii) indicate whether Lebo suffers from albinism. (1)
- 2.2.3 Lebo and Tumelo intend to get married. Show, in family tree form using the key, all the possible genotypes of children born from such a marriage. (4)
- 2.2.4 Explain in your opinion, should Lebo and Tumelo reconsider having children. (2)
- (10)**
- 2.3 In humans, the ability to curve the thumb backwards 'hitch-hikers' thumb is due to a dominant gene.
- 2.3.1 Using **H** to represent the gene for 'hitch-hikers' thumb and **h** for normal thumb, explain the possible offspring that can be produced when the parents have 'hitch-hikers' thumb and a normal thumb. (6)
- 2.3.2 Define the law of dominance. (4)

(10)

TOTAL QUESTION 2: 30

QUESTION 3

- 3.1 A comparison of the anatomical features of organisms has helped scientists to propose evolutionary relationships.



- 3.1.1 Tabulate TWO observable differences between the side view of the skulls of *Homo* and the chimpanzee. (5)
- 3.1.2 Name TWO fossils of *Australopithecus* found in South Africa. (2)
- 3.1.3 List FOUR characteristics we share with other primates. (4)
- (11)**
- 3.2 Explain how Darwin used the tortoises of Galapagos to explain speciation. (5)

- 3.3 Study the data provided from DNA comparison between different organisms. The bigger the percentage the more relate is the organisms.

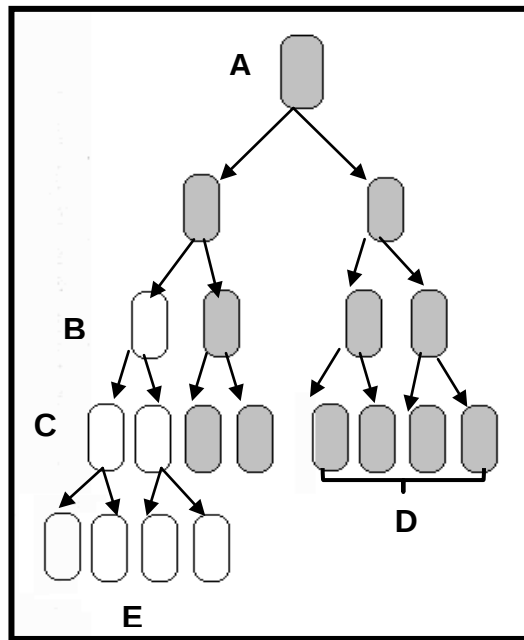
Organism	DNA similarities (%)
Human	100,0
Gibbon	94,5
Rhesus monkey	92,0
Capuchin monkey	82,1
Galago monkey	59,0

- 3.2.1 Formulate a hypothesis for this investigation. (3)
- 3.2.3 Use the data provided and plot a bar graph. (9)
- 3.2.4 Provide a conclusion for this investigation. (2)
- (14)**

TOTAL QUESTION 3: 30
TOTAL SECTION B: 60

SECTION C
QUESTION 4

- 4.1 The following diagram illustrates how bacteria evolved to become resistant to penicillin. Use the letter A to E to discuss the process.



(5)

- 4.2 In the 1950s, Kettlewell did mark-recapture experiments with the peppered moth, *Biston betularia*. During an experiment both light and dark coloured moths were marked and simultaneously released in two different forests – one a polluted industrial forest and the other an unpolluted rural forest. By observing bird predation, he confirmed that conspicuousness greatly influenced the chances of moths being eaten. His results are shown in the table below

Area	Polluted forest		Unpolluted forest	
Type of moth	Light	Dark	Light	Dark
Number of marked moths released	140	480	507	470
Number of marked moths recaptured	19	140	70	35

- 4.2.1 Which moths will survive the best in:

(a) polluted forest?

(b) unpolluted forest?

(2)

- 4.2.2 Explain natural selection using this example.

(6)

- 4.2.3 Why was the experiment extended to an unpolluted area?

(2)

(10)

- 4.3 Tabulate TWO differences between artificial and selective breeding.

(5)

(5)

- 4.3 **Name** and **describe** TWO processes involved in converting the DNA into a protein
- | | |
|-----------|-------------|
| Content | (17) |
| Synthesis | (3) |
| | (20) |

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

TOTAL SECTION C:	40
GRAND TOTAL:	150