



Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

SEPTEMBER 2011

LIFE SCIENCES P1

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 on your ANSWER BOOK.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Present your answers according to the instructions of each question.
5. Do ALL drawings in pencil and label them in blue or black ink.
6. Draw diagrams or flow charts only when asked to do so.
7. The diagrams in this question paper are NOT necessarily drawn to scale.
8. Do NOT use graph paper.
9. You may use a non-programmable calculator, protractor and compass.
10. 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 – 1.1.5) in the ANSWER BOOK, for example 1.1.6 D.

- 1.1.1 Use the following table showing the DNA base analysis to answer the question below:

DNA base analysis				
Base	Guanine	X	Y	Z
% of base in sample	23%	27%	23%	27%

Which ONE of the following identifies the DNA bases X, Y and Z correct?

	X	Y	Z	
A	Adenine	Cytosine	Uracil	
B	Adenine	Cytosine	Thymine	
C	Cytosine	Uracil	Adenine	
D	Thymine	Adenine	Cytosine	(2)

- 1.1.2 Which of the following occurs during complementary base pairing?

- A Bonds break between phosphates and sugars.
 B Bonds break between amino acids and phosphates.
 C Bonds form between cytosine and guanine.
 D Bonds form between uracil and thymine. (2)

- 1.1.3 Which of the following is produced as a result of replication?

- A DNA
 B mRNA
 C protein
 D ribosome (2)

- 1.1.4 How many heterozygous offspring would you expect if two parents, who were heterozygous for a trait, produced an F₁ generation of 40 individuals?

- A 5
 B 10
 C 15
 D 20 (2)

- 1.1.5 The creationists argue that ...
- A all present-day life forms have descended from, and are related to, those that lived in the past.
 - B all present-day life forms may look different from those that they descended from because they became modified from one generation to another.
 - C all living forms have been designed and produced by some Supreme Being.
 - D earth began as a huge ball of fire with rocks and burning gas about 4 – 6 billion years ago. (2)

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 – 1.2.5) in the ANSWER BOOK.

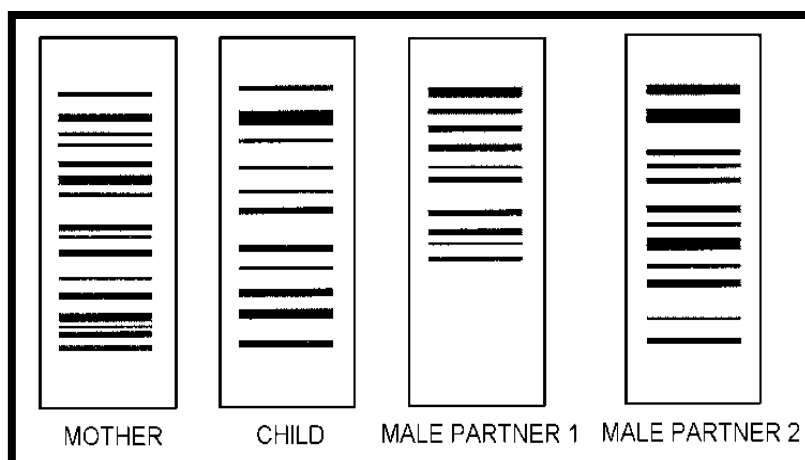
- 1.2.1 The indicator used to trace human female lineage. (1)
- 1.2.2 The term used to describe alleles of which the characteristics only show up in a homozygous combination. (1)
- 1.2.3 A condition whereby each cell in a plant or animal has more than a diploid set of chromosomes. (1)
- 1.2.4 A geneticist who provides information and advice to couples planning families based on the results of tests carried out during genetic screening as well as analysis of family trees and pedigrees. (1)
- 1.2.5 A 2,6 million year-old fossil discovered by Robert Broom in the Sterkfontein caves in 1947. (1)

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) on the ANSWER BOOK.

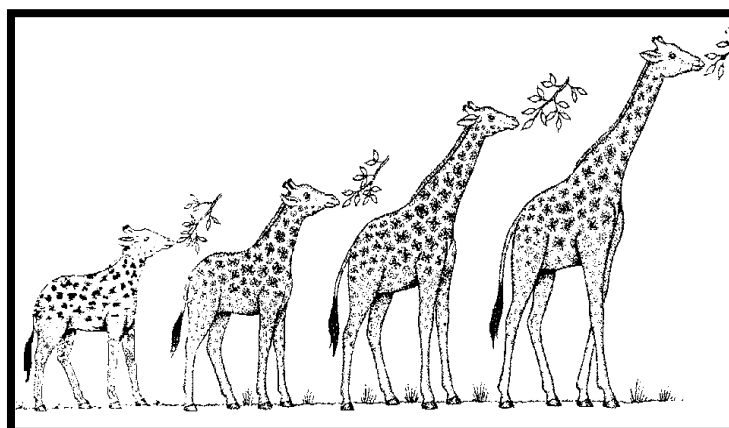
	COLUMN I		COLUMN II
1.3.1	Both alleles contribute equally to the phenotype	A B	Incomplete dominance Co-dominance
1.3.2	Monomer of a protein molecule	A B	Monosaccharide Nucleotide
1.3.3	A process that creates replicas or identical copies of molecules, cells or organisms	A B	Cloning Meiosis
1.3.4	The enzyme involved in the formation of mRNA from DNA during protein synthesis	A B	Transcriptase Ligase
1.3.5	The number, shape and arrangement of all the chromosomes in the nucleus of a somatic cell	A B	Pedigree Karyotype

(5x2) (10)

- 1.4 A court has ordered DNA profiling as means to settle a paternity dispute. The result of DNA profiling is given below. Study the result carefully and answer the questions given below:



- 1.4.1 Identify the possible biological father of the child by using the DNA evidence presented. (1)
- 1.4.2 Explain your answer in QUESTION 1.4.1. (2)
- 1.4.3 Mention any TWO significances of DNA profiling. (2)
- 1.4.4 Some people question the validity of DNA profiling as conclusive evidence in a court of law. Give any TWO reasons for their concern. (2)
- 1.5 Giraffes eat leaves from high tree tops and are adapted to survive in their environment. The following diagram shows the evolution of modern giraffe. Study the diagram and answer the following questions.



- 1.5.1 Name the scientist who studied the giraffe to formulate his theory of evolution. (1)
- 1.5.2 Explain why the scientists' finding was called a "theory" and not a "hypothesis". (2)
- 1.5.3 Tabulate TWO differences between the theories of the scientist mentioned in QUESTION 1.5.1 and that of Charles Darwin. (5)

- 1.6 Read the Newspaper article below and answer the questions that follow.

New 'human ancestor'

Professor and son find 1,95 million-year-old skeletons

The nine-year-old son of a Wits University scientist, with a bit of help from Internet mapper Google Earth, helped find the fossil of a new hominid species that lived 1,95 million years ago, the scientists revealed yesterday.

Professor Lee Berger, a paleo-anthropologist at the University of Witwatersrand, undertook a project with Professor Paul Dirks, then head of university's school of geosciences, to map known fossil sites in the cradle of Humankind, a heritage site, to permanently record their location. The two fossils, which Berger called a new species of human ancestors, were named *Australopithecus sediba*.

Scientists believe that a group of ape-like hominids known as *Australopithecus*, which first emerged in Africa around 3,9 million years ago, gradually evolved into the first *Homo sapien* species. Over time the species lost its more ape-like features as it started to stand upright and its brain capacity increased.

Around 2,5 million years ago *Homo habilis*, the first species to be described distinctly human, began to appear, although only a handful of specimens have been found.

It is thought the new fossil will be identified as a species that fits somewhere between *Australopithecus africanus* and either *Homo habilis* or even a direct ancestor of *Homo erectus*.

The discovery is being rated as the most important from Sterkfontein since an almost complete fossil of a 3,3 million year old *Australopithecus* was found in 1994.

[Adapted from an article published in Daily Dispatch, on 9 April 2010]

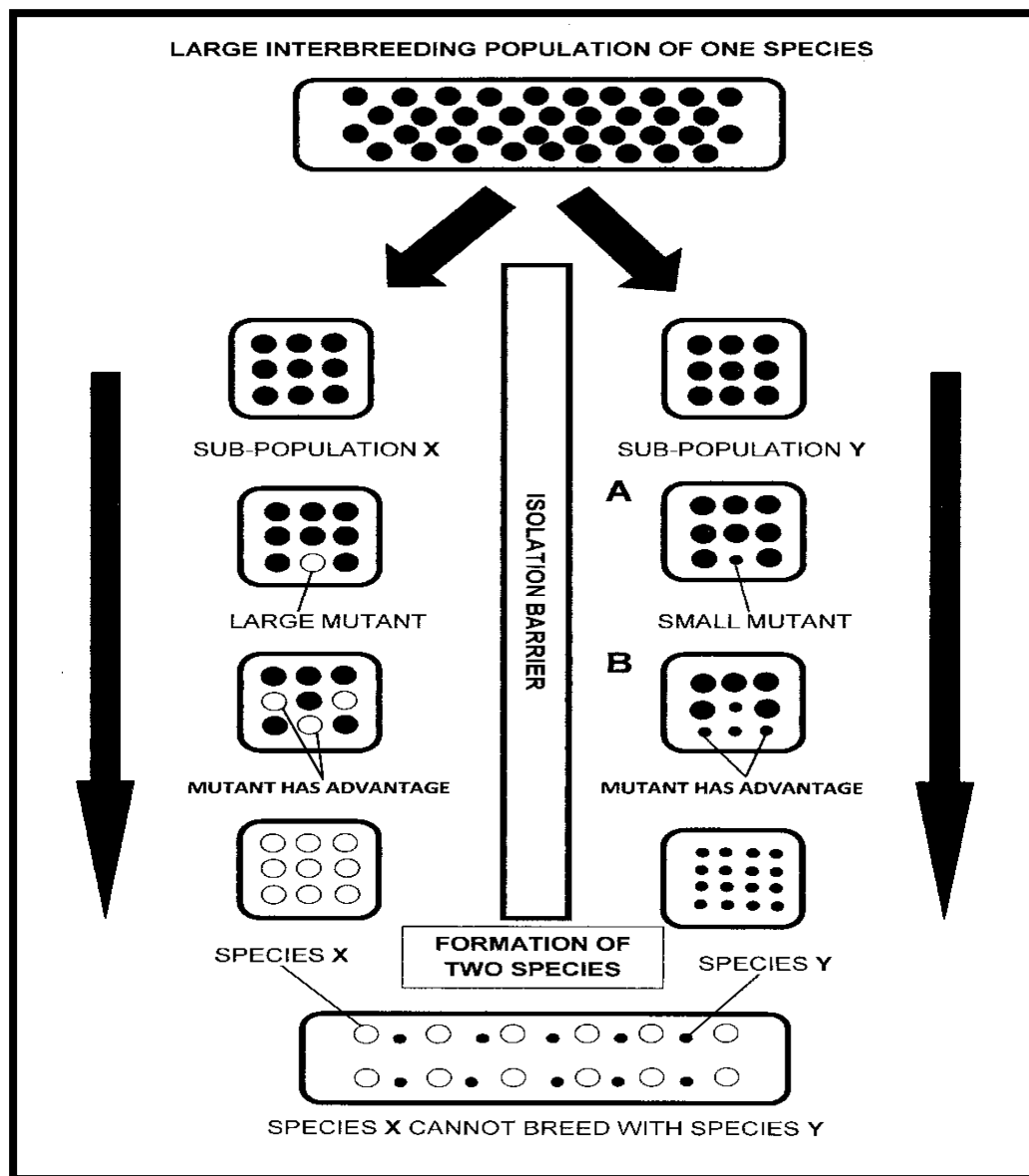
- 1.6.1 What is a hominid? (2)
- 1.6.2 What technique did the scientist use to determine the age of a fossil? (1)
- 1.6.3 Name the Scientist who discovered the 1, 95 million year old fossil? (1)
- 1.6.4 What is the 1,95 million year old *hominid* fossil mentioned in the article called? (1)
- 1.6.5 Name any TWO characteristics of *Homo habilis* that distinguish them from *Homo sapiens*. (4)
- 1.6.6 Where was the 1,95 million year old fossil found? (1)

TOTAL SECTION A: 50

SECTION B:

QUESTION 2

- 2.1 The diagram below represents the occurrence of speciation. Study the diagram carefully and answer questions that follow.



- 2.1.1 Name the type of speciation represented in the above diagram. (1)
- 2.1.2 Name TWO examples of barriers which will have the same effect as shown in the diagram. (2)
- 2.1.3 Name the phenomenon that led to variation at **A**. (1)
- 2.1.4 Give THREE other causes of variation other than the one mentioned in QUESTION 2.1.3. (3)
- 2.1.5 What has happened at **B**? (1)
- 2.1.6 Define the term *species*. (3)

- 2.2 The table below shows what proportion of mosquitoes in a region of South Africa became resistant to the insecticide that was used. Study the table and answer the following questions.

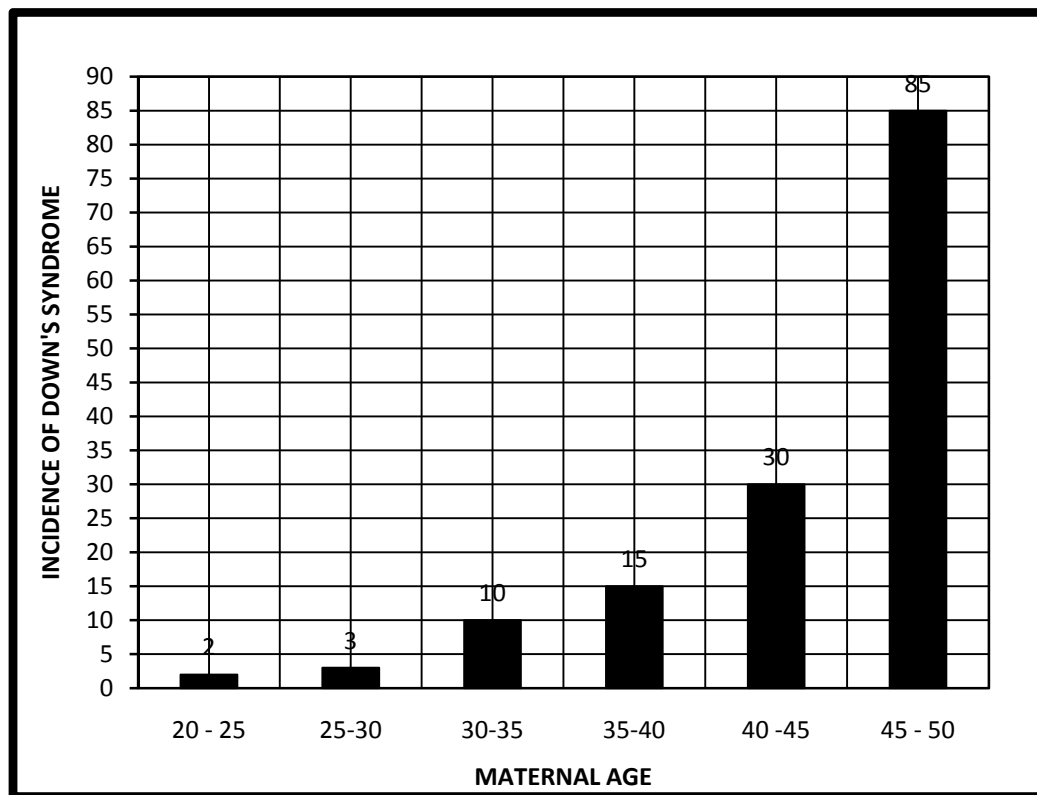
Year	1995	1996	1997	1998	1999
Resistant mosquitoes	10%	25%	50%	90%	Total resistance
Deaths from malaria	A	B	C	D	400

- 2.2.1 Calculate the number of probable deaths in each year. Write your answer next to the relevant letter, in your answer book. Show all workings. (8)
- 2.2.2 Plot a bar graph showing the percentage of mosquitoes that developed a resistance against the insecticide that was used from 1995 to 1999. (7)
- 2.2.3 Explain how the mosquitoes developed resistance to insecticides. (4)

[30]

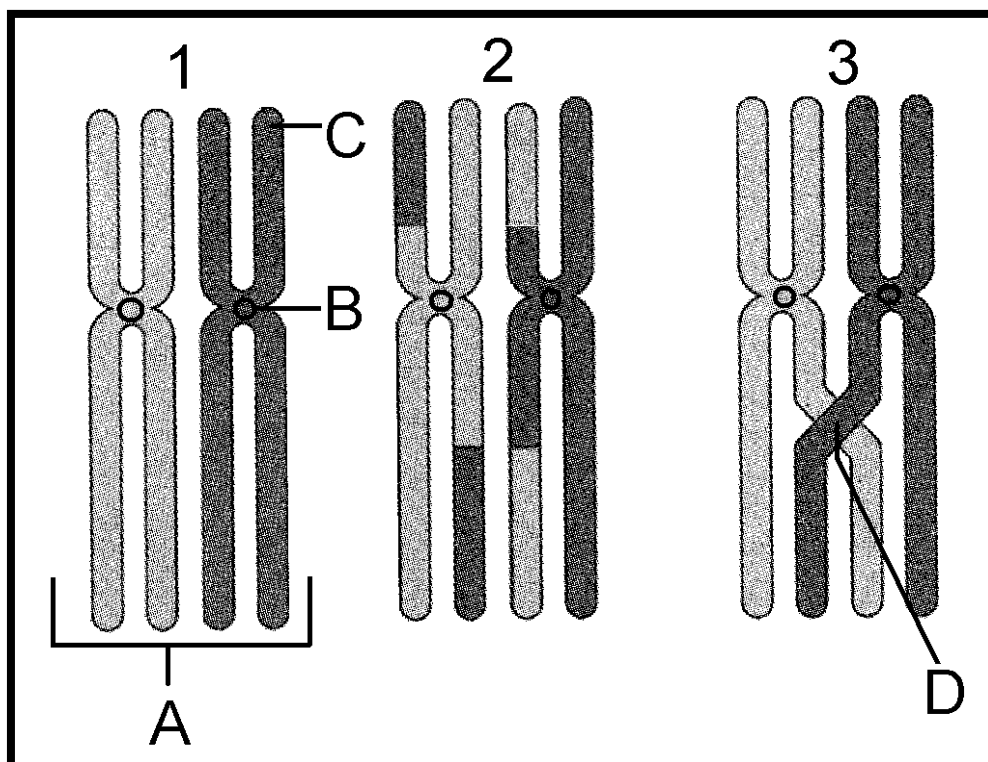
QUESTION 3

- 3.1 The graph below represents the result of a practical survey conducted by a pupil. Study the graph and answer the questions that follow.



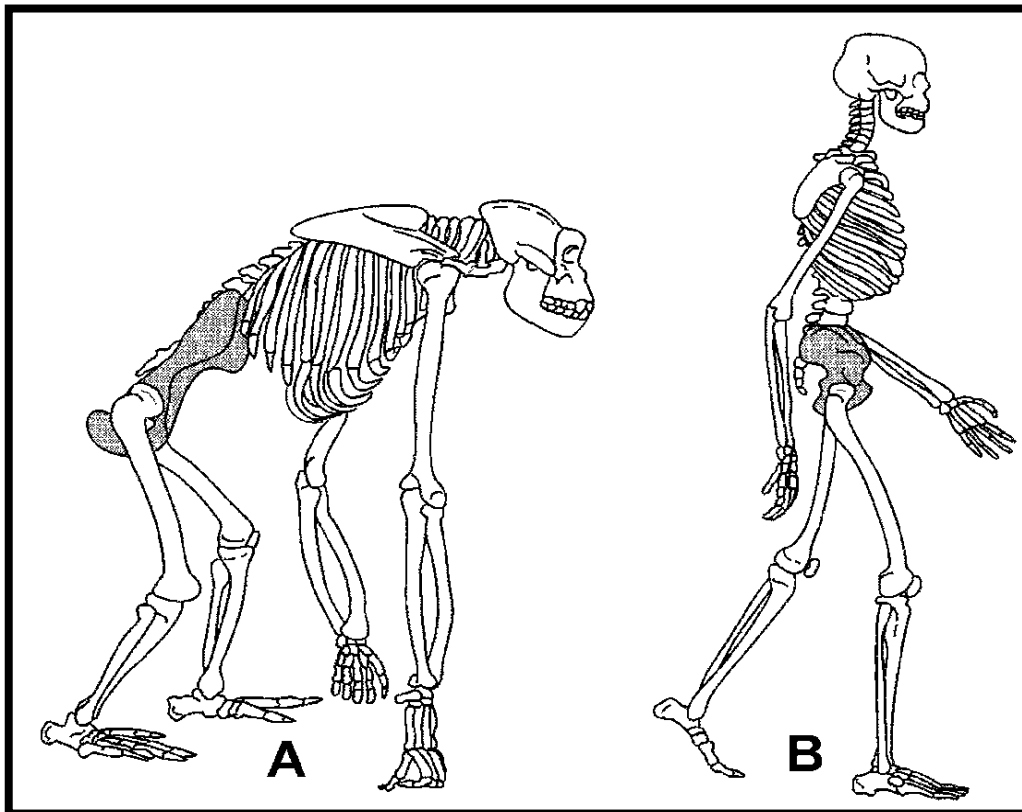
- 3.1.1 Formulate a hypothesis for this investigation. (2)
- 3.1.2 Mention ONE aspect that should be considered during the planning of this investigation. (1)
- 3.1.3 What percentage of children born to women aged between 45 and 50 years is suffering from Down's syndrome? Show all your working. (3)
- 3.1.4 Calculate the percentage increase in incidence of Down's syndrome between the age groups 30 – 35 and 35 – 40. Show all your working. (3)
- 3.1.5 What conclusion can be drawn from this investigation? (2)

- 3.2 The diagram below shows a process that takes place during a cell division. Study the diagram and answer the questions that follow.



- 3.2.1 Name the type of cell division in which the process above would occur. (1)
- 3.2.2 Label the parts that are labelled A, B, C and D. (4)
- 3.2.3 What process occurs at the part labelled D? (1)
- 3.2.4 Write the sequence of events in the diagram in the correct order using the numbers given in the diagram. (3)
- 3.2.5 The product of the process mentioned in QUESTION 3.2.3 is incorrectly represented in the diagram. Rectify the mistake in the diagram and draw it in the answer sheet, using the correct shading. (2)

- 3.3 The diagram below shows the skeletons of two hominids. Study the diagram and answer the following questions.



- 3.3.1 Which one of the above organisms (**A** or **B**) is a bipedal organism? (1)
- 3.3.2 Give an observable reason to support your answer in QUESTION 3.3.1. (1)
- 3.3.3 Mention any TWO advantages of bipedalism. (2)
- 3.3.4 Describe TWO ways in which the toes of organism **A** are adapted for arboreal life. (2)
- 3.3.5 Mention any TWO characteristics that organism **A** and **B** share with each other. (2)
- [30]

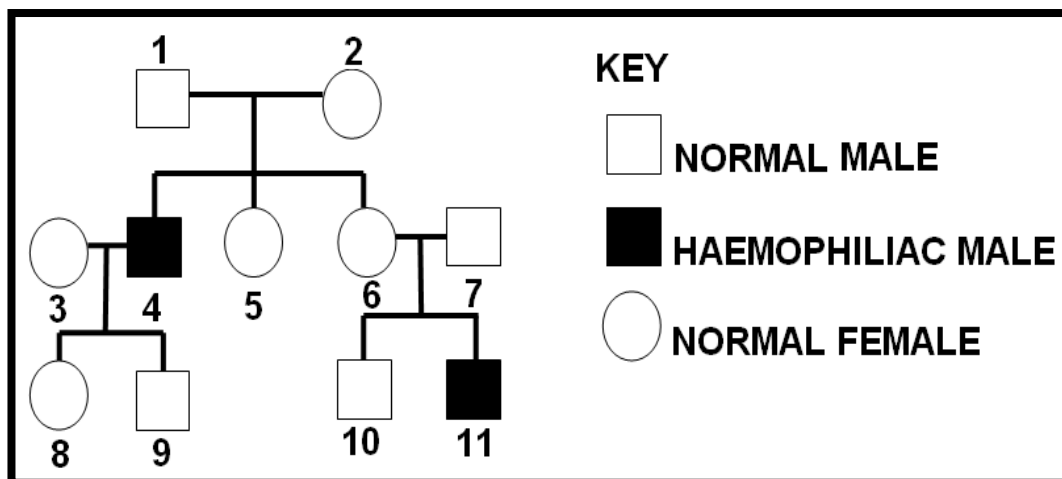
TOTAL SECTION B: 60

SECTION C

QUESTION 4

- 4.1 The pedigree diagram below shows how haemophilia is inherited in a family. Study the diagram and answer the questions that follow.

[Use the symbols H for normal and h for the recessive alleles. e.g. $X^H X^h$]



- 4.1.1 What is a pedigree diagram? (1)
- 4.1.2 Haemophilia is a sex-linked disorder. What evidence can be drawn from the above pedigree diagram to support this statement? (1)
- 4.1.3 What is the genotype and phenotype of individuals 2 and 4? (4)
- 4.1.4 If individual 11 marries a carrier female, what percentage of their sons is likely to be haemophiliacs? (1)

- 4.2 Part of a protein molecule consists of four amino acids. The cordons for these amino acids are illustrated in the diagram below. Study the diagram and answer the questions that follow.



- 4.2.1 What are the anticodons for these amino acids? Write them in the correct order, from left to the right. (4)
- 4.2.2 Name the structure illustrated above. (1)
- 4.2.3 Which process is responsible for the synthesis of the structure mentioned in QUESTION 4.2.2? (1)
- 4.2.4 In Fukushima, Japan, thousands of inhabitants were evacuated to safer areas, soon after the explosion at the nuclear plant during recent earthquake and tsunami. Name the single factor that has the potential of altering the sequence of nitrogen bases on the DNA molecules of the people in that area. (1)
- 4.2.5 Use the information in the following table and arrange the amino acids in the correct order for the part of the protein showed above.

GENETIC CODE IN THE DNA	AMINO ACID
TTG	Leucine
TAC	Tyrosine
TAT	Tyrosine
AAC	Asparagine
GCA	Alanine
GCT	Alanine
GGT	Glycine

(4)

- 4.3 Human blood type is determined by co-dominant alleles. There are three different alleles known as I^A , I^B and i . The I^A and I^B alleles are co-dominant and the allele i is recessive.

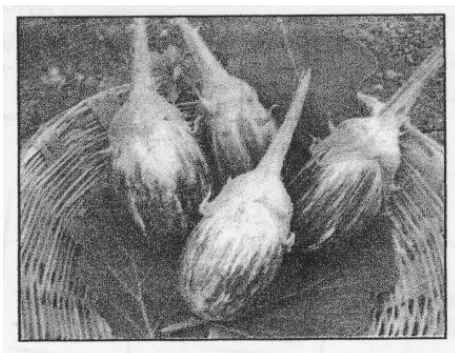
A man with type A blood marries a woman with type B blood. Predict possible blood types of their children using a genetic diagram.

(7)

4.4

India refuses to take GM bait

Tougher approval, health studies, labelling required



“In February, India halted the commercial release of the world’s first genetically engineered egg plant, called Bt brinjal. The environment minister, Jairam Ramesh, said given the lack of consensus within the scientific community and public opposition, further study was needed to guarantee consumer safety”.

[Adapted from *Daily Dispatch* News paper article, 2011]

Genetically engineered or genetically modified food sources are gaining unprecedented acceptance in most part of the world while in countries such as India there is a growing scepticism and opposition regarding the production, sale and consumption of genetically modified foods. Write a mini essay on genetic modification of crops, explaining what genetic modification is. Discuss FOUR advantages, FOUR disadvantages/ opposition to genetic modification of food and give your opinion on the labelling of genetically modified foods as these foods are currently not labelled.

(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**