basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P2

MAY/JUNE 2025

MARKS: 150

TIME: 2½ hours

This question paper consists of 14 pages.

Please turn over

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. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass, where necessary.
11. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.9) in the ANSWER BOOK, e.g. 1.1.10 D.

1.1.1 Which ONE of the following characteristics do African apes and humans have in common?

A Opposable thumbs
B C-shaped spines
C S-shaped spines
D Short upper arms

1.1.2 Meiosis is a biologically important process because it …

A produces diploid gametes.
B doubles the chromosome number from generation to generation.
C produces genetically identical gametes.
D produces haploid gametes.

1.1.3 The reproductive isolation mechanism characterised by an animal displaying a specific action to attract a mating partner is known as …

A breeding at different times of the year.
B prevention of fertilisation.
C infertile offspring.
D species-specific courtship behaviour.

1.1.4 Which ONE of the following genotypes is homozygous dominant?

A RW
B Rr
C I^BI^B
D ii

1.1.5 How many alleles control blood groups in humans?

A 1
B 2
C 3
D 4

1.1.6 Which ONE of the following is an example of discontinuous variation in humans?

A Blood groups
B Height
C Skin colour
D Hair colour

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1.1.7 Which ONE of the following is a CORRECT description of stem cells?

A Specialised cells that divide by mitosis to produce cells that may become further specialised for specific functions
B Unspecialised cells that divide by mitosis to produce cells that may become specialised for specific functions
C Unspecialised cells that divide by meiosis to produce cells that may become specialised for specific functions
D Specialised cells that divide by meiosis to produce cells that may become specialised for specific functions

1.1.8 A list of different lines of evidence to support evolution is given below.

(i) Evidence from biogeography
(ii) Fossil evidence
(iii) Genetic evidence
(iv) Cultural evidence

Which ONE of the following options are used as evidence to support human evolution?

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

1.1.9 The police arrested two suspects accused of housebreaking. Their DNA profiles were analysed and compared to the profile of DNA evidence collected from the crime scene.



What conclusion can be drawn from the DNA analysis conducted by the police?

A Suspect **1** is positively linked to the crime.
B Suspect **2** is positively linked to the crime.
C Both suspects are positively linked the crime.
D Neither of the suspects are positively linked to the crime. (9 x 2) **(18)**

1.2 Give the correct **biological term** for EACH of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.10) in the ANSWER BOOK.

1.2.1 Alternative forms of a gene at the same locus

1.2.2 The DNA-containing cell organelle found only in plants

1.2.3 A diagrammatic representation showing the possible evolutionary relationships among different species

1.2.4 An allele that is masked in the phenotype when found in the heterozygous condition

1.2.5 The permanent disappearance of a species from Earth

1.2.6 The deliberate breeding of organisms for desirable characteristics selected by humans

1.2.7 A genetic disorder characterised by the absence of a blood-clotting factor

1.2.8 A group of organisms of the same species in a specific habitat at a particular time

1.2.9 The chromosome pairs 1 to 22 in a human somatic cell

1.2.10 A representation of the number, shape and arrangement of all the chromosomes in the nucleus of a somatic cell (10 x 1) **(10)**

1.3 Indicate whether each of the descriptions in COLUMN I apply 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 numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

	COLUMN I	COLUMN II
1.3.1	The DNA-containing material in the nucleus of a non-dividing cell	A: Chromatid B: Chromatin
1.3.2	Location of DNA	A: Nucleus B: Mitochondria
1.3.3	The phase between two consecutive cell divisions	A: Prophase B: Telophase

(3 x 2) **(6)**

1.4 The diagrams below represent two biological processes occurring in the nucleus.

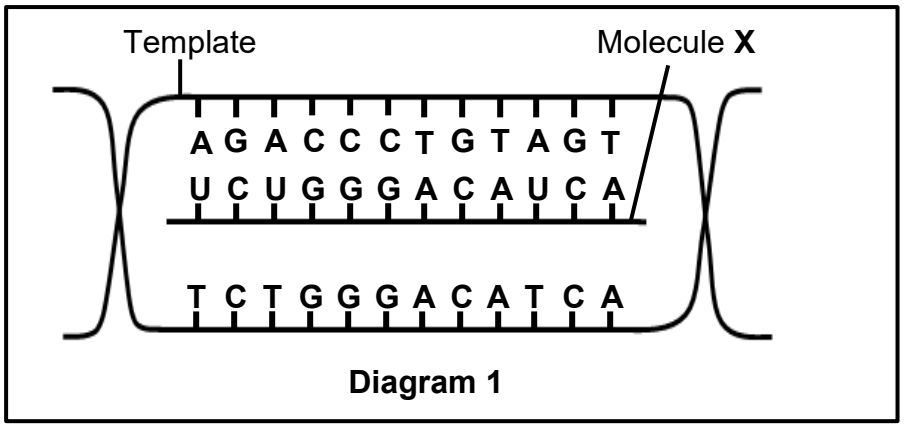


Diagram 1

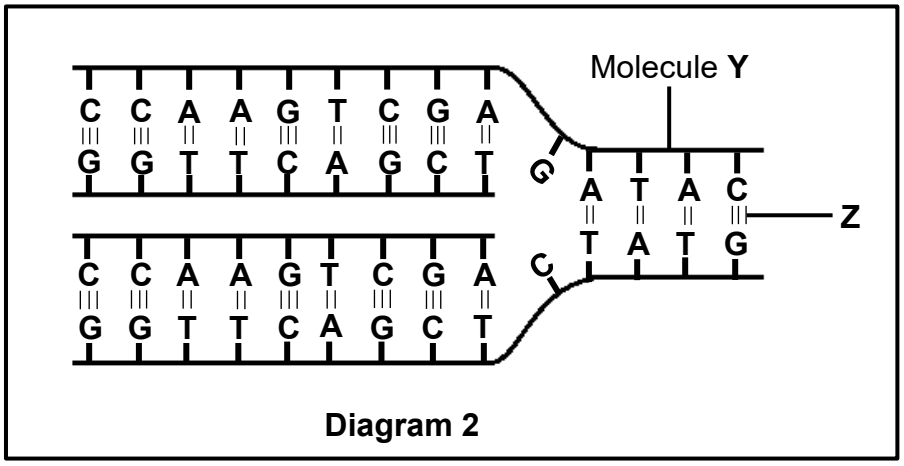


Diagram 2

1.4.1 Name the process represented by:

(a) Diagram **1** (1)

(b) Diagram **2** (1)

1.4.2 Identify molecule **X**. (1)

1.4.3 Give the:

(a) Natural shape of molecule **Y** (1)

(b) Phase of the cell cycle during which the process in Diagram **2** occurs (1)

(c) Full name of the nitrogenous base that is found in molecule **X**, but not in molecule **Y** (1)

1.4.4 Name the:

(a) Sugar found in molecule **X** (1)

(b) Bond **Z** (1)

1.4.5 State the number of codons on molecule **X**. (1)
(9)

1.5 In a plant species, the gene coding for plant height has two alleles. The allele for tall plants (**T**) is dominant over the allele for dwarf plants (**t**). The gene for flower colour has two alleles where the allele for red flower colour (**R**) is dominant over the allele for white flower colour (**r**).

A dwarf, white-flowered plant is crossed with a plant that is homozygous tall and heterozygous for red flower colour.

1.5.1 State the characteristics that are being investigated in this cross. (2)

1.5.2 Give the genotype of the plant that is homozygous tall and heterozygous for red flower colour. (2)

1.5.3 Below is an incomplete Punnett square representing the cross referred to above.

	TR	Tr
tr	**X**	**Y**

Identify the:

(a) Genotype of offspring **X** (1)

(b) Phenotype of offspring **Y** (2)
(7)

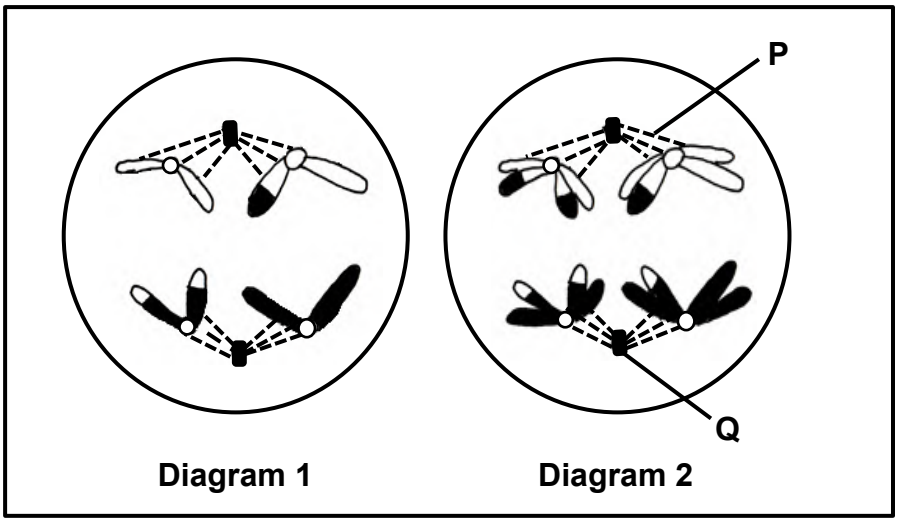
TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 Diagrams **1** and **2** below show two cells of the same organism in different phases of meiosis.

The phases are NOT necessarily shown in the correct order.



2.1.1 State ONE place in the human body where meiosis occurs. (1)

2.1.2 Identify:

(a) Structure **P** (1)

(b) Organelle **Q** (1)

2.1.3 Identify the phase of cell division represented in Diagram **2**. (1)

2.1.4 How many chromosomes will be found in a somatic cell of this organism? (1)

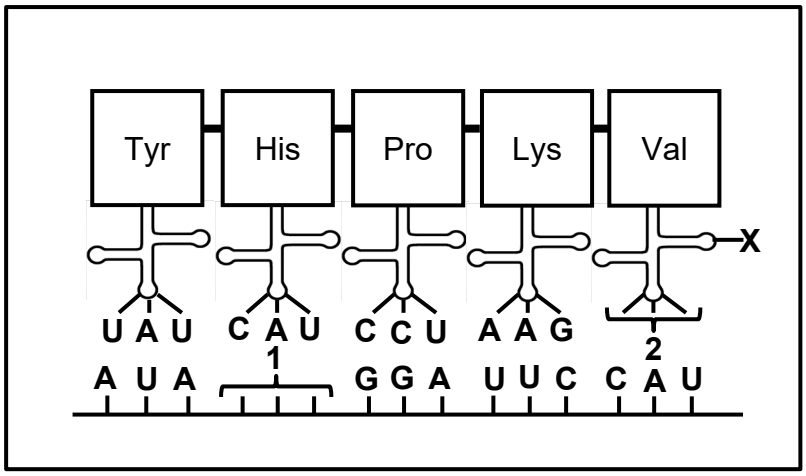
2.1.5 State ONE difference between the processes occurring in Diagram **1** and Diagram **2**. (2)

2.1.6 The chromosomes in the diagram are genetically different due to crossing over.

Describe the process of crossing over. (3)
(10)

2.2 Describe how non-disjunction leads to Down syndrome. **(5)**

2.3 The diagram below represents a stage of protein synthesis.



2.3.1 Name the:

(a) Stage of protein synthesis represented in the diagram (1)

(b) Site where the process named in QUESTION 2.3.1(a) occurs (1)

2.3.2 Describe the role of molecule **X** in protein synthesis. (2)

2.3.3 Identify the complementary bases (from left to right) representing the following:

(a) Anticodon **2** (1)

(b) The DNA triplet for codon **1** (1)

2.3.4 The table below represents the anticodons coding for different amino acids.

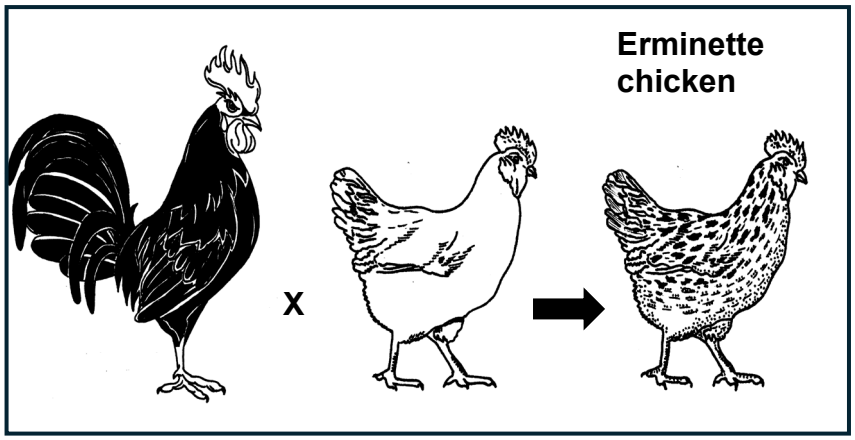
ANTICODON	AMINO ACID
UAU	Tyrosine (Tyr)
CCU	Proline (Pro)
AAG	Lysine (Lys)
GUA	Valine (Val)
CGU	Arginine (Arg)

A mutation occurs during replication. The mutation results in the amino acid proline (Pro) being replaced by arginine (Arg).

Use the table and explain how this mutation will affect the protein that is synthesised. (7)
(13)

2.4 In some chickens, feather colour is controlled by two alleles, white feathers (**W**) and black feathers (**B**).

If a homozygous white chicken is crossed with a homozygous black chicken, the offspring have feathers that are both black and white, a phenotype that is known as erminette, as shown in the diagram below.



2.4.1 Explain why this inheritance is an example of co-dominance. (2)

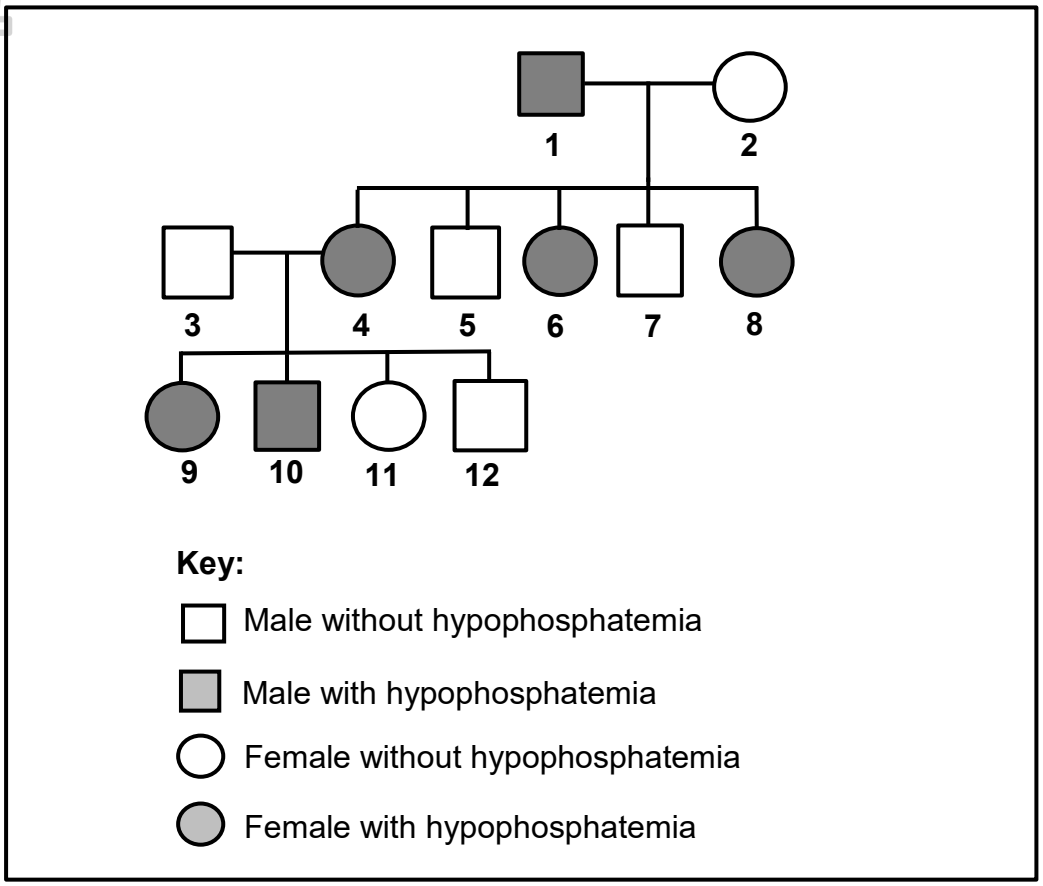
2.4.2 The inheritance of which blood group in humans shows the same type of dominance as explained in QUESTION 2.4.1? (1)

2.4.3 A white chicken is crossed with an erminette chicken.

Use a genetic cross to show ALL the possible phenotypes of the offspring. (6)
(9)

2.5 Hypophosphatemia is a sex-linked inherited condition that is caused by a dominant allele (X^H) on the X chromosome. It results in abnormally low levels of phosphate in the blood which can cause rickets. The recessive allele (X^h) codes for normal phosphate levels.

The pedigree diagram below shows the inheritance of hypophosphatemia in one family.



2.5.1 Name the type of:

(a) Diagram shown (1)

(b) Gonosome found only in males (1)

2.5.2 State TWO effects of hypophosphatemia in humans. (2)

2.5.3 How many individuals in the F_1-generation have hypophosphatemia? (1)

2.5.4 Give ALL the possible genotypes of individual:

(a) **3** (1)

(b) **4** (1)

2.5.5 Explain why ALL the daughters of individuals **1** and **2** will have hypophosphatemia. (6)

(13)
[50]

QUESTION 3

3.1 Cloning is a process during which an identical copy of an organism is produced using biotechnology.

3.1.1 Describe the process of cloning. (5)

3.1.2 List THREE benefits of cloning animals. (3)
(8)

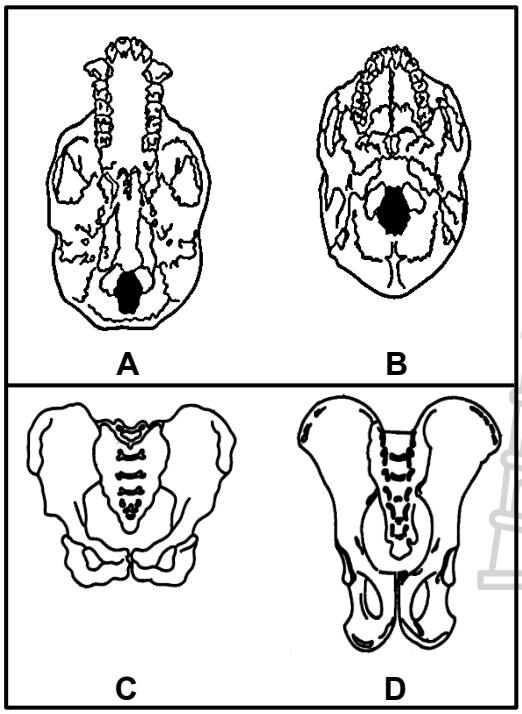
3.2 Read the extract below.

STICKLEBACK FISH

Stickleback fish are small fish found in the ocean and freshwater lakes. The ones in the ocean have spikey fins for protection against predators. Until about 10 000 years ago, most stickleback fish lived in the ocean. But, when the last ice age ended, the melting ice created new lakes and some populations swam into the lakes. The connections between the ocean and the lakes eventually dried up, trapping the stickleback populations in some lakes for thousands of years. Over time, the stickleback fish populations in the lakes lost the spikey fins.

How would Lamarck have explained the absence of spikey fins on stickleback fish in lakes? **(5)**

3.3 The diagrams below represent the skulls and pelvises of a human and a chimpanzee in NO particular order. (The diagrams are drawn to scale.)



3.3.1 Tabulate THREE observable differences between skull **A** and skull **B**. (7)

3.3.2 State why pelvis **C** belongs to a human. (2)
(9)

3.4 The malaria parasite is transmitted to human blood by mosquitoes. People living in malaria-affected areas take antimalarial drugs to prevent infection. If the antimalarial drugs are effective, there should be no parasites in their blood. The presence of parasites, even after treatment, indicates that they have evolved to be drug-resistant.

Researchers wanted to determine if the use of antimalarial drugs caused drug resistance in the malaria parasite.

The procedure was as follows:

- Blood samples were collected from people in affected areas who were taking the drugs.
- The collection of blood samples was done in seven villages in the affected areas.
- The blood samples were kept in the same laboratory and tested for the malaria parasite.
- The number of blood samples having the malaria parasite was counted.
- The investigation was repeated three times in the same seven villages during a year.

In total, 1 485 samples were collected and 551 had the malaria parasite.

3.4.1 How is the malaria parasite transmitted to humans? (1)

3.4.2 State the:

(a) Independent variable (1)

(b) Dependent variable (1)

3.4.3 Calculate the percentage drug resistance in the blood samples taken. Show ALL working and round off your answer to ONE decimal place. (3)

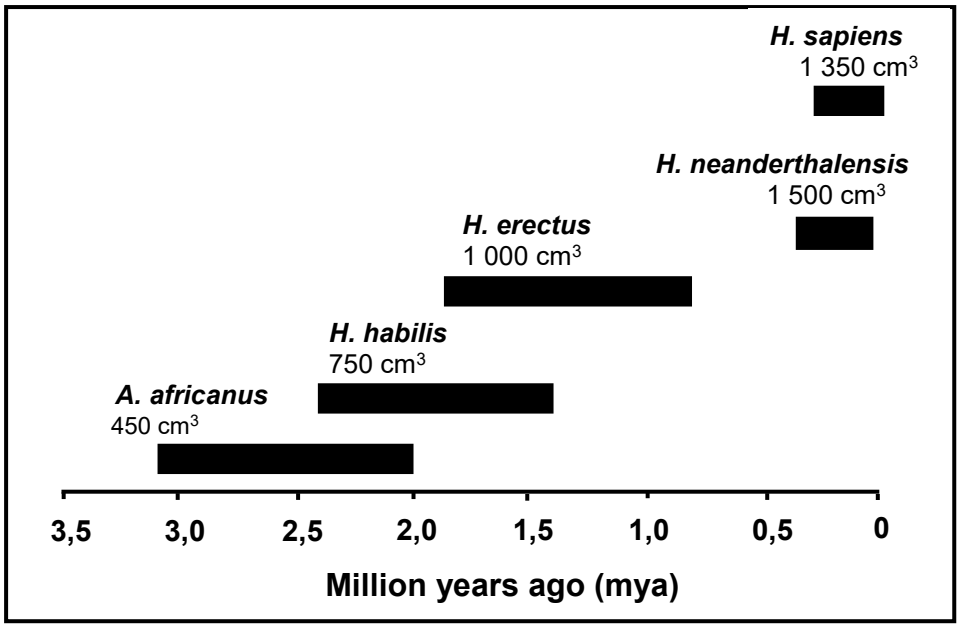
3.4.4 State TWO ways in which the researchers ensured the following:

(a) Validity of the investigation (2)

(b) Reliability of the results (2)

3.4.5 Describe how the malaria parasite developed drug resistance through natural selection. (7)
(17)

3.5 The diagram below shows the evolutionary relationships between different hominids. Their average brain volume is also indicated.



3.5.1 How many genera are shown in the diagram? (1)

3.5.2 When did *A. africanus* become extinct? (1)

3.5.3 Name TWO *A. africanus* fossils found in South Africa. (2)

3.5.4 Using only the species in the diagram, describe the fossil evidence that supports the 'Out-of-Africa' hypothesis. (4)

3.5.5 Explain the influence of brain volume on the complexity of tools made by *H. habilis* and *H. sapiens*. (3)

(11)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150