education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

SEPTEMBER 2025

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 pages.

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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 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 all drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and compass, where necessary.
11. Write neatly and legibly.

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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 A possible explanation for an observation that can be tested is known as a …

A fact.
B law.
C theory.
D hypothesis.

1.1.2 The lines of evidence that supports the idea of common ancestor for living hominids …

A biogeography, fossil evidence and genetic evidence.
B modification by descent fossil evidence and genetic evidence.
C fossil evidence, genetic evidence and cultural evidence.
D fossil evidence and genetic evidence only.

1.1.3 A small section of DNA has the following sequence of bases that codes for different amino acids:

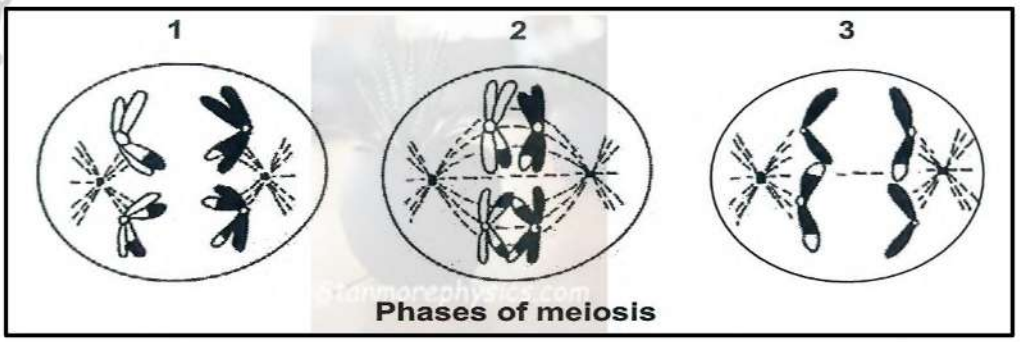
GCT CGT TAA

Which ONE of the following is the CORRECT representation of the anticodons and number of amino acids coded for this section?

	ANTICODONS	NUMBER OF AMINO ACIDS
A	GCU CGU UAA	9
B	GCU CGU UAA	3
C	CGA GCA AUU	9
D	CGA GCA AUU	3

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1.1.4 The diagram below represents different phases of meiosis.



Phases of meiosis

The CORRECT order of the phases is …

A 1, 2 and 3.
B 2, 3 and 1.
C 3, 1 and 2.
D 2, 1 and 3.

1.1.5 The scientist who discovered the fossil *Karabo* is …

A Ronald Clarke.
B Lee Berger.
C Mary Leakey.
D Robert Broom.

1.1.6 Each gamete in the human female has …

A 22 autosomes and an X gonosome.
B 22 autosomes and a Y gonosome.
C 21 autosomes and XX gonosomes.
D 21 autosomes and XY gonosomes.

1.1.7 Two parents without colour blindness have a son with colour blindness.

Which ONE of the following are the correct genotypes of the parents?

A $X^DY \times X^DX^D$
B $X^dY \times X^DX^D$
C $X^DY \times X^DX^d$
D $X^DY \times X^dX^d$

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1.1.8 The following refers to reproduction in different organisms:

(i) Breeding at different times of the year
(ii) Fertile offspring
(iii) Prevention of fertilisation
(iv) Species specific courtship behaviour

Which ONE of the following is a combination of the reproductive isolating mechanisms?

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

1.1.9 A, B and O blood groups are inherited characteristics.

What would be the possible blood group of the offspring, when the parents have the genotype $\mathbf{I^AI^A}$ and $\mathbf{I^Ai}$?

A Blood group **O** only
B Blood groups **A** and **O**
C Blood group **AB**
D Blood group **A** only (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 The RNA containing body, usually spherical, within the nucleus of cells

1.2.2 A complete set of chromosomes found in each nucleus of any individual of a particular species

1.2.3 A cleavage of cells cytoplasm that follows karyokinesis

1.2.4 An organelle that gives rise to the spindle in a dividing animal cell

1.2.5 The genus to which Little foot and Mrs Ples belongs

1.2.6 An undifferentiated cell that can form any other cell type in an organism

1.2.7 The type of variation where there is a range of different phenotypes for a particular characteristic

1.2.8 The organisms with similar characteristics and that are capable of random interbreeding to produce fertile offspring

1.2.9 The similar structures that are inherited from a common ancestor and are modified for different functions

1.2.10 The bond formed between two amino acids (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	Proposed the 'Law of Use and Disuse'	A: Eldredge B: Watson
1.3.2	An allele that is not shown in the phenotype when found in the heterozygous condition	A: Dominant B: Recessive
1.3.3	Breeding of organisms for human desire	A: Natural selection B: Artificial selection

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

1.4 Mendel observed some characteristics of the pea plant (*Pisum sativum*) which he suggested were controlled by inherited factors. He conducted a series of experiments in which he crossed pea plants with contrasting phenotypes to obtain the offspring of the **F_1** generation. At first his crosses were simple and involved only one pair of characteristics.

Mendel counted the number of offspring showing each of the variations.

His results are shown in the table below.

Plant part	Characteristics	P_1 generation	F_1 generation
Seed	Seed shape	Round x Oval	All round
	Seed colour	Yellow x Green	All yellow
Pod	Pod texture	Smooth x Wrinkled	All smooth
	Pod Colour	Green x yellow	All green
Flowers	Flower colour	Violet x yellow	All violet

1.4.1 Give the term for:

(a) The inherited the factors that Mendel referred to (1)

(b) A cross involving only ONE characteristic (1)

1.4.2 Name the female structure of the flower where meiosis occurs. (1)

1.4.3 Give the characteristics that is:

(a) Dominant for flower colour (1)

(b) Recessive for pod texture (1)

1.4.4 Which ONE of Mendel's Laws of inheritance is demonstrated by the **F_1** generation in the table above? (2)

1.4.5 The **F_1** generation with round seeds **(R)** and violet flowers **(P)** are crossed.

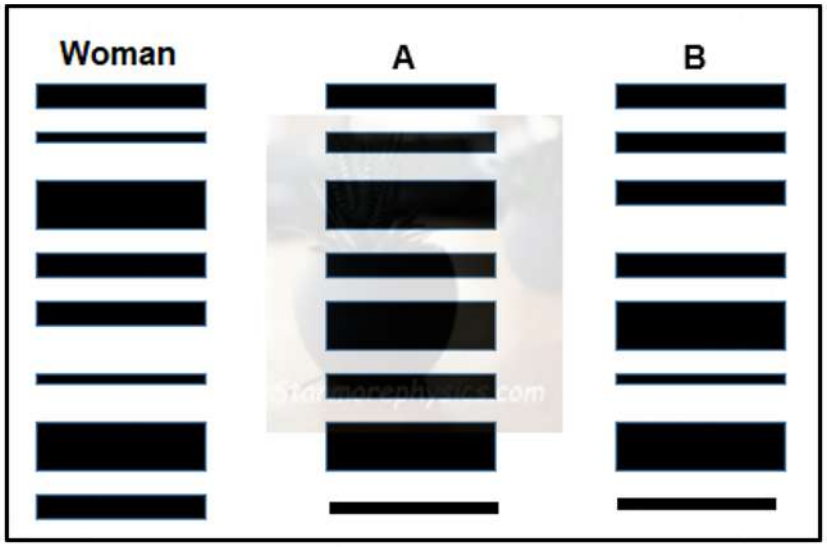
(a) What will be the phenotypic ratio of their offspring? (2)

(b) State the genotype of the offspring that is heterozygous for the two characteristics. (1)
(10)

1.5 A woman looking for her missing son went to the authorities.

A DNA profiling of the woman, her other son (**A**) and the bone fragment (**B**) obtained from the recently discovered decomposed remains of an unknown person was done.

The diagram below represents their DNA profiles.



1.5.1 What was used as source of DNA profile of decomposed remains? (1)

1.5.2 Do the remains belong to the woman's missing son? (1)

1.5.3 Explain your answer to QUESTION 1.5.2. (2)

1.5.4 State TWO other uses of DNA profiling in humans. (2)
(6)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The sequence of amino acid in a protein molecule is coded for by DNA and RNA. The table below shows some mRNA codons and the corresponding amino acids.

AMINO ACID	mRNA CODONS
Serine	AGC, AGU
Aspartate	GAU, GAC
Leucine	CUA, CUC
Tyrosine	UAU, UAC
Phenylalanine	UUC, UUU
Glutamic acid	GAG

2.1.1 Name the site for protein synthesis in cells. (1)

2.1.2 A section of mRNA has the following base sequence and is read from left to right:

GAU CUC GAC AGC AUG ACC

Write down the names of the amino acids coded for by base triplets 3 and 4. (2)

2.1.3 Describe the effect of the mutation on protein formation if **GAC** changes to **GAU**. (2)

2.1.4 Describe the process of translation. (5)

2.1.5 Tabulate TWO differences between DNA replication and transcription. (5)
(15)

2.2 Read the extract below.

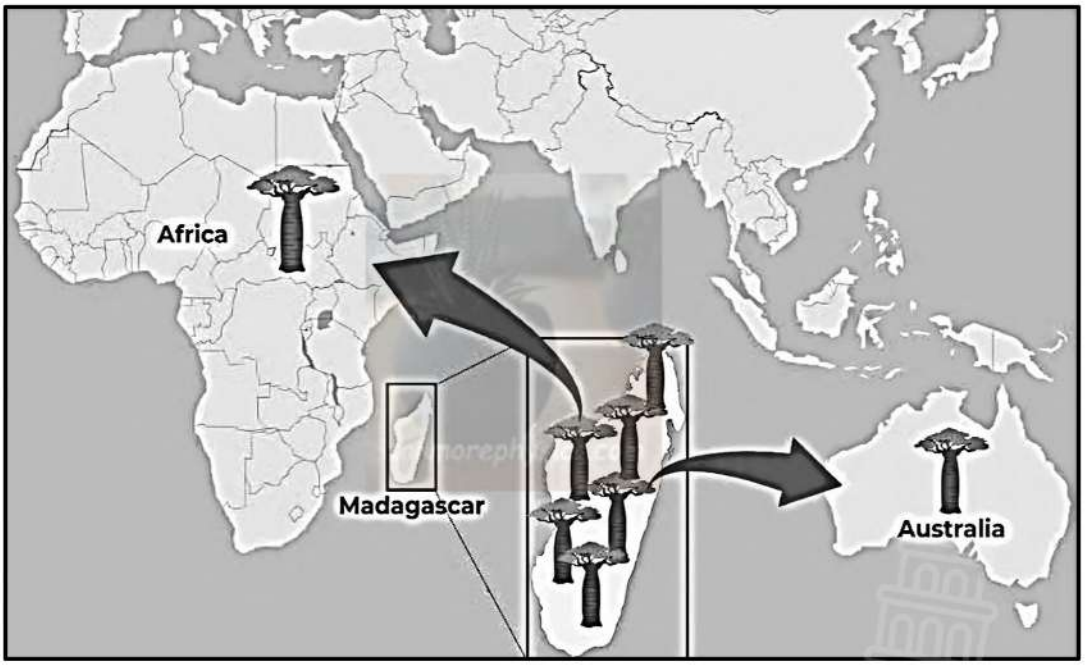
BAOBAB TREES ALL CAME FROM MADAGASCAR

The origin of this group of plants has fascinated people for a long time.

Baobabs are a remarkable keystone species capable of supporting a wide variety of animals for food and shelter.

Researchers found that baobabs we see today all originated in Madagascar. They started evolving to form distinct species around 21 million years ago (mya). Later, two species evolved in Africa and Australia before the lineages went extinct in Madagascar.

The diagram below shows the distribution of baobab trees in Madagascar, Africa and Australia.



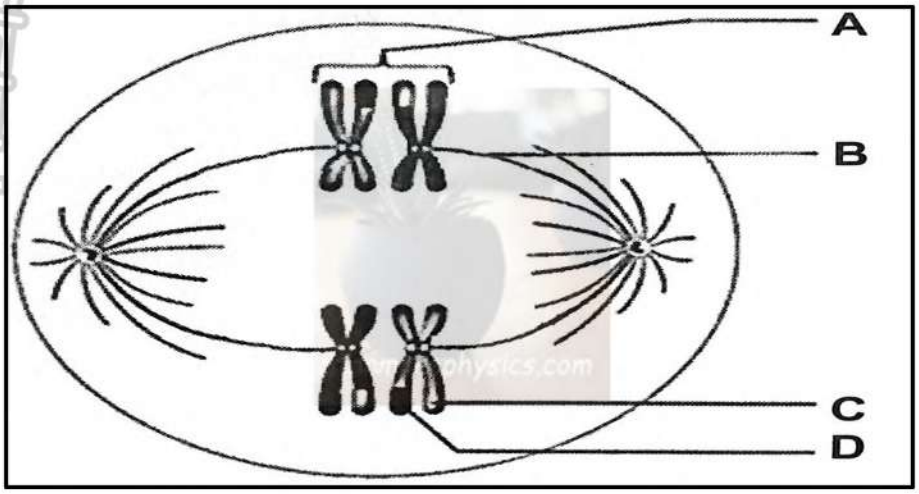
2.2.1 Identify the type of evidence for evolution shown in the diagram above. (1)

2.2.2 Give THREE other types of evidence for evolution. (3)

2.2.3 Distinguish between *speciation* and *extinction*. (2)

2.2.4. Describe how baobab trees in Africa and in Australia became different species. (6)
(12)

2.3 The diagram below represents some chromosomes in a human cell during a phase of meiosis.



2.3.1 Identify structure:

(a) **A** (1)

(b) **B** (1)

2.3.2 Identify the phase shown in the diagram above. (1)

2.3.3 Describe the events of the phase prior to the one shown in the diagram. (4)

2.3.4 Explain the role of crossing over in natural selection. (5)

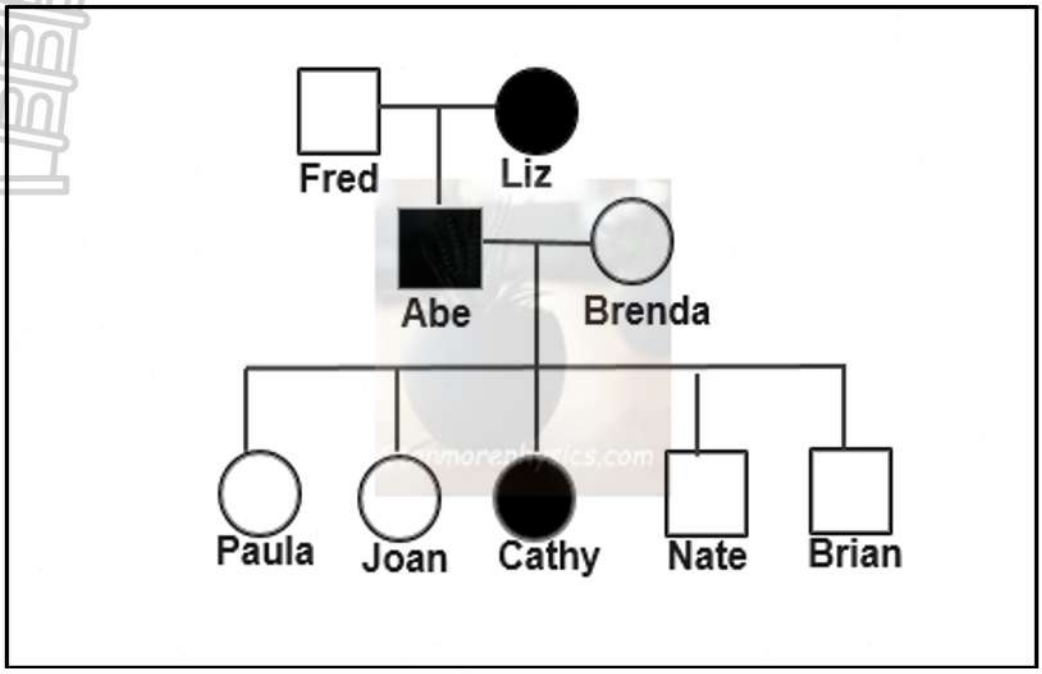
2.3.5 How many chromosomes would be present in each gamete at the end of meiosis? (1)

2.3.6 At the end of meiosis, one of the gametes had an extra chromosome 21.

Describe how this may have occurred. (2)

(15)

2.4 X-linked Alport syndrome is caused by a recessive allele (**X^a**). The pedigree diagram below shows the inheritance of this syndrome in a certain family.



2.4.1 Give the:

(a) Phenotype of Liz (2)

(b) Genotype of Nate (2)

2.4.2 How many males are definitely without X-linked Alport syndrome? (1)

2.4.3 Is Brenda homozygous or heterozygous? (1)

2.4.4 Explain your answer in QUESTION 2.4.3. (2)
(8)
[50]

QUESTION 3

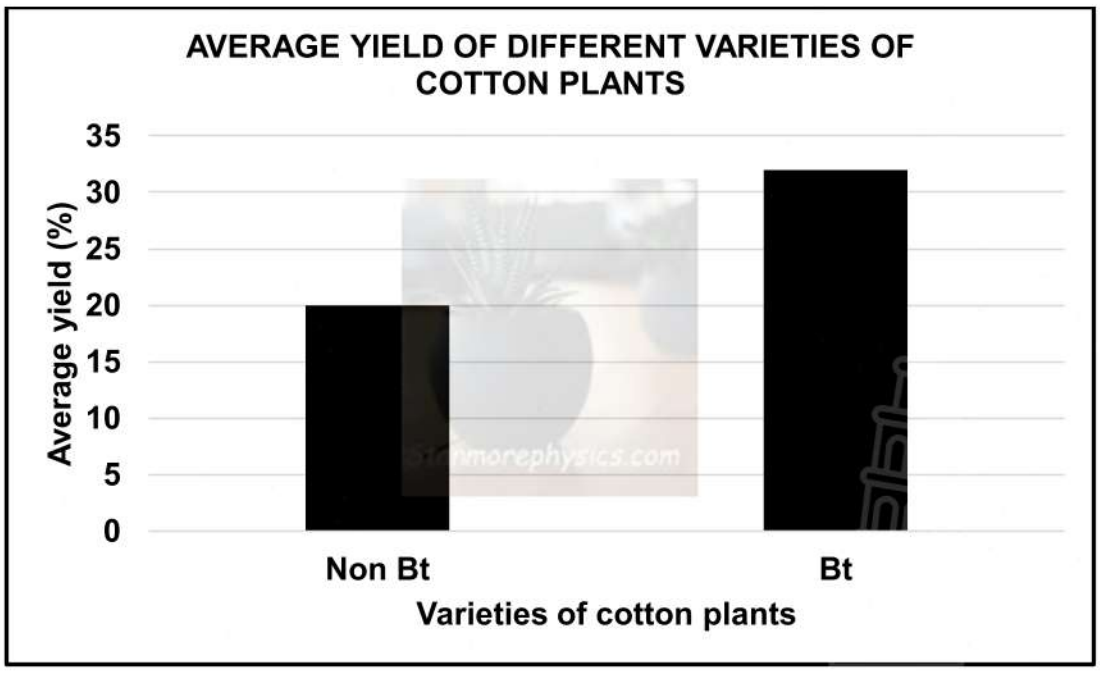
3.1 Bt cotton is genetically modified by inserting genes from the soil bacterium *Bacillus thurigeinsis* (Bt) into cotton plants. When insects eat the cotton plant, the activated Cry-proteins attach to the insect's cells, forming ion channels that cause the cells to die.

An investigation was conducted to determine the effect of Bt-gene on the yield of cotton plants.

The procedure was as follows:

- A field was divided in two equal planting fields (**P** and **Q**)
- 500 Bt cotton plants were planted in one planting field (**P**) and 500 non Bt cotton plants in another planting field (**Q**)
- The environmental conditions for the two planting fields were exactly the same
- 500 insects of the same species were introduced into both planting fields
- All the cotton plants started flowering after 5 weeks and were counted in both planting fields **P** and **Q**
- The average yield in each planting field was calculated and used as an indication of insect resistance

The graph below shows the results at the end of the investigation.



3.1.1 State the aim of this investigation. (2)

3.1.2 Identify the:

(a) Independent variable (1)

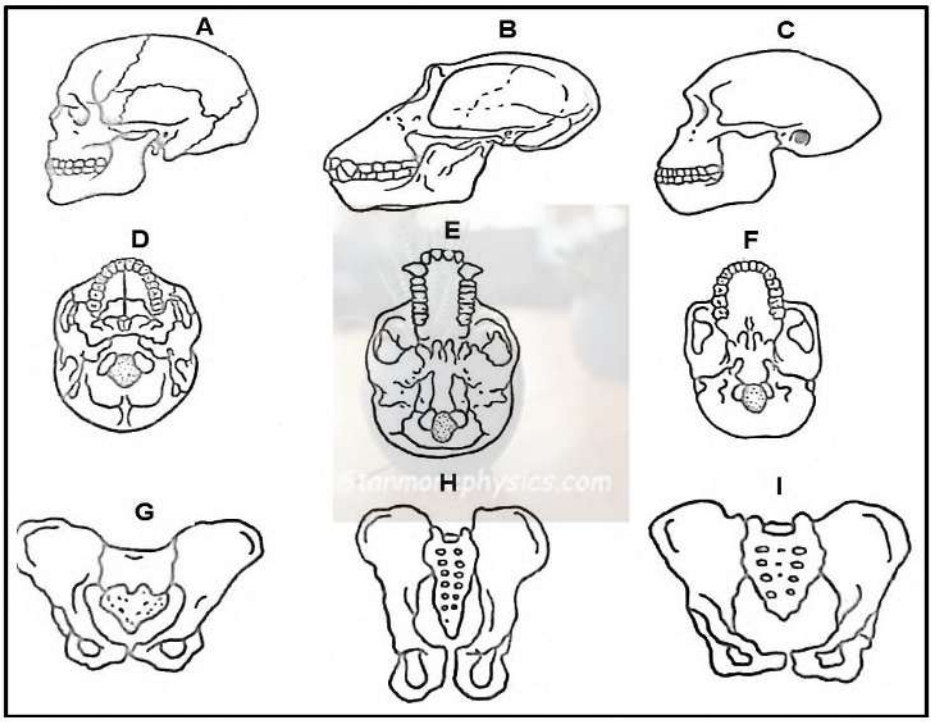
(b) Dependent variable (1)

3.1.3 State ONE way in which the validity of this investigation was ensured. (1)

3.1.4 Why was the average yield per plot calculated? (1)

3.1.5 State the conclusion for this investigation. (2)
(8)

3.2 The diagrams below represents the anatomical structures of three different primates.



3.2.1 Which ONE of the following structures (**A**–**I**) represent that of a human …

(a) skull? (1)

(b) pelvis? (1)

3.2.2 Give a reason for your answer in QUESTION 3.2.1 (b). (2)

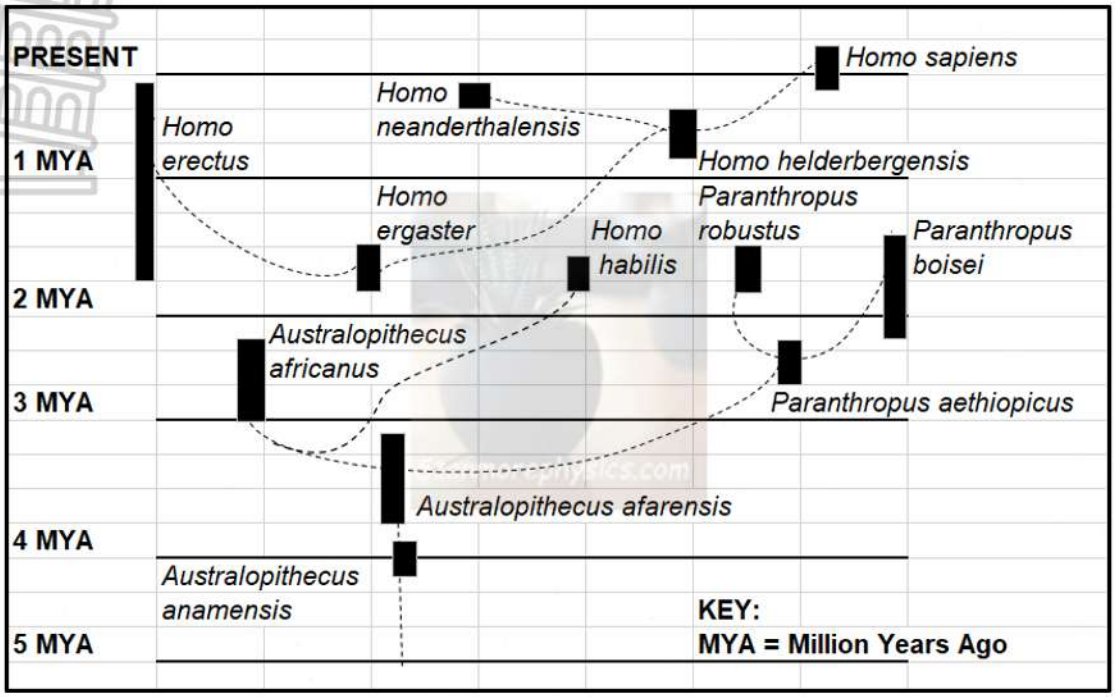
3.2.3 Explain the significance of the cranial size of skull **A**. (2)

3.2.4 Describe the changes in the position of the foramen magnum from quadrapedalism to bipedalism. (2)

3.2.5 Explain the relationship between the dentition and diet in hominin species **D** and **E**. (4)

3.2.6 Describe the shape of the spine of quadrapedal organisms. (1)
(13)

3.3 The diagram below shows possible evolutionary relationships among some hominids.



3.3.1 What is the above diagram called? (1)

3.3.2 What is the common ancestor to all species in the diagram? (1)

3.3.3 How many of EACH of the following are represented in the diagram above?

(a) Genera (1)

(b) *Homo* species (1)

3.3.4 When did *Australopethicus africanus* first appear? (2)

3.3.5 Explain why *P. robustus* and *P. boisei* are more closely related. (2)

3.3.6 Name:

(a) The species that is a direct ancestor of *Homo habilis* (1)

(b) The first hominid species to have moved out of Africa (1)

3.3.7 Describe how the fossils of the Homo species provide evidence for the 'Out of Africa' hypothesis. (3)
(13)

3.4 The table below shows the results obtained in an investigation where purebred black lizards were crossed with brown lizards. The gene for black skin is dominant over the gene for brown skin.

The F_1 generation was used as parents (consisting of 4 breeding pairs) to produce the F_2 generation

GENERATIONS	NUMBER OF BLACK LIZARDS	NUMBER OF BROWN LIZARDS
P_1 generation	1	1
F_1 generation	12	0
F_2 generation		
Offspring of 1st breeding pair	12	0
Offspring of 2nd breeding pair	9	3
Offspring of 3rd breeding pair	6	6
Offspring of 4th breeding pair	12	4

3.4.1 Calculate the simplified phenotypic ratio of black lizards to brown lizards in the F_2 generation. Show ALL calculations. (2)

3.4.2 Provide evidence from the data to support the following statement:

The gene for black skin is dominant over the gene for brown skin. (2)

3.4.3 Draw a bar graph to show the phenotypic results of F_2 generation for the 3rd and 4th breeding pairs. (6)
(10)

3.5 A man with blood group A marries a woman with blood group B.

Use a genetic cross to show the possibility of them having ALL the blood groups in the F_1 generation. **(6)**
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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