basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

LIFE SCIENCES P2

MAY/JUNE 2026

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 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 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

1.1.1 The individual who is known as the 'father of genetics' is …

A Charles Darwin.
B James Watson.
C Gregor Mendel.
D Francis Crick.

1.1.2 During which phase of the cell cycle does DNA replication take place?

A Prophase II
B Interphase
C Telophase I
D Anaphase I

1.1.3 A cell has 24 chromosomes at the start of meiosis. How many chromatids would there be in one daughter cell at the end of telophase I?

A 24
B 48
C 12
D 6

1.1.4 Which ONE of the following refers to the end product of mitosis of a human somatic cell?

A Four haploid daughter cells
B Four diploid daughter cells
C Two haploid daughter cells
D Two diploid daughter cells

1.1.5 Which ONE of the following is a characteristic of a bipedal organism?

A A C-shaped spine
B A short, wide pelvis
C A long, narrow pelvis
D A more backward foramen magnum

1.1.6 Below is a list of reproductive isolating mechanisms.

(i) Species-specific courtship behaviour
(ii) Prevention of fertilisation
(iii) Adaptation to different pollinators

Which ONE of the following combinations refers to reproductive isolation mechanisms in plants?

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

1.1.7 An investigation was done to determine the change in antibiotic resistance in bacteria over a number of generations.

The results are shown in the table below.

NUMBER OF GENERATIONS OF BACTERIA	ANTIBIOTIC-RESISTANT BACTERIA IN A POPULATION (%)
5	1
50	5
500	20
5 000	40
50 000	70

How many times did the percentage of antibiotic-resistant bacteria in a population increase between the 50^{th} and 5 000^{th} generation?

A 8
B 35
C 45
D 700

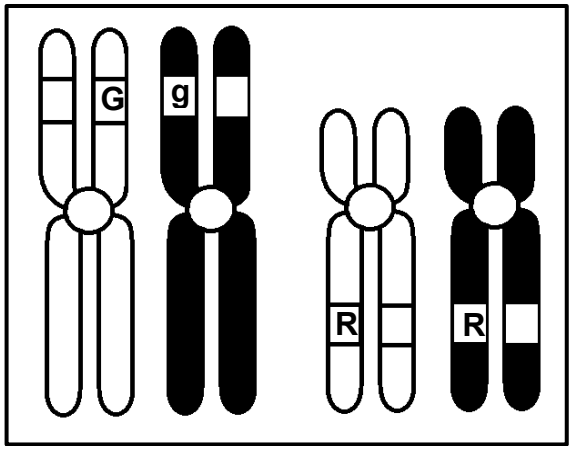
1.1.8 Stem cells are …

A specialised cells that are found in bone marrow.
B undifferentiated cells that are found in the umbilical cord.
C cells that are formed by meiosis.
D cells that are always haploid.

QUESTIONS 1.1.9 AND 1.1.10 REFER TO THE INFORMATION AND THE TWO SETS OF HOMOLOGOUS CHROMOSOMES BELOW.

In tomato plants, the genes for fruit size and fruit colour are located on different chromosomes. The gene for fruit size has two alleles, large (**G**) and small (**g**). The gene for fruit colour also has two alleles, red (**R**) and yellow (**r**).

The diagram below shows the alleles from one tomato plant.



1.1.9 What is the CORRECT genotype and phenotype of this tomato plant?

	GENOTYPE	PHENOTYPE
A	GGRR	Large and red
B	GgRR	Large and red
C	GgRR	Small and yellow
D	GGRr	Small and yellow

1.1.10 This tomato plant is crossed with a tomato plant that has small, yellow fruit.

What is the expected phenotypic ratio in the offspring?

A 1 : 1
B 9 : 3 : 3 : 1
C 1 : 1 : 1 : 1
D 3 : 1 (10 x 2) **(20)**

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 1.2.9) in the ANSWER BOOK.

1.2.1 The division of the nucleus during meiosis

1.2.2 The structure that connects the two chromatids of a chromosome

1.2.3 The type of variation where characteristics fall into distinct categories

1.2.4 The present-day distribution of species on different continents that serves as evidence for evolution

1.2.5 The bond that connects the two strands of DNA

1.2.6 The area where the chromatids overlap during crossing over

1.2.7 The type of inheritance where neither of the alleles is dominant and the heterozygous offspring have an intermediate phenotype

1.2.8 The natural shape of a DNA molecule

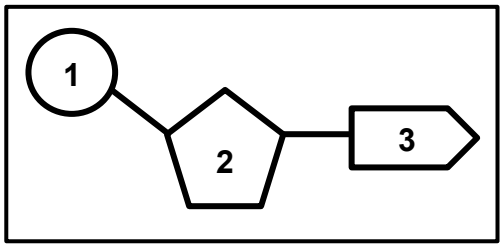
1.2.9 The position of a gene on a chromosome (9 x 1) **(9)**

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	A feature that causes African apes to be prognathous	A: Larger jaw B: Bigger teeth
1.3.2	A characteristic that humans share with African apes	A: Eyes in front B: Longer upper arms
1.3.3	A source of genetic variation in a population	A: Random fertilisation B: Random mating

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

1.4 The diagram below represents a monomer of nucleic acids.



1.4.1 Name the monomer represented in the diagram. (1)

1.4.2 Identify molecule:

(a) **1** (1)

(b) **3** (1)

1.4.3 Give the name of molecule **2** that will be found in the following:

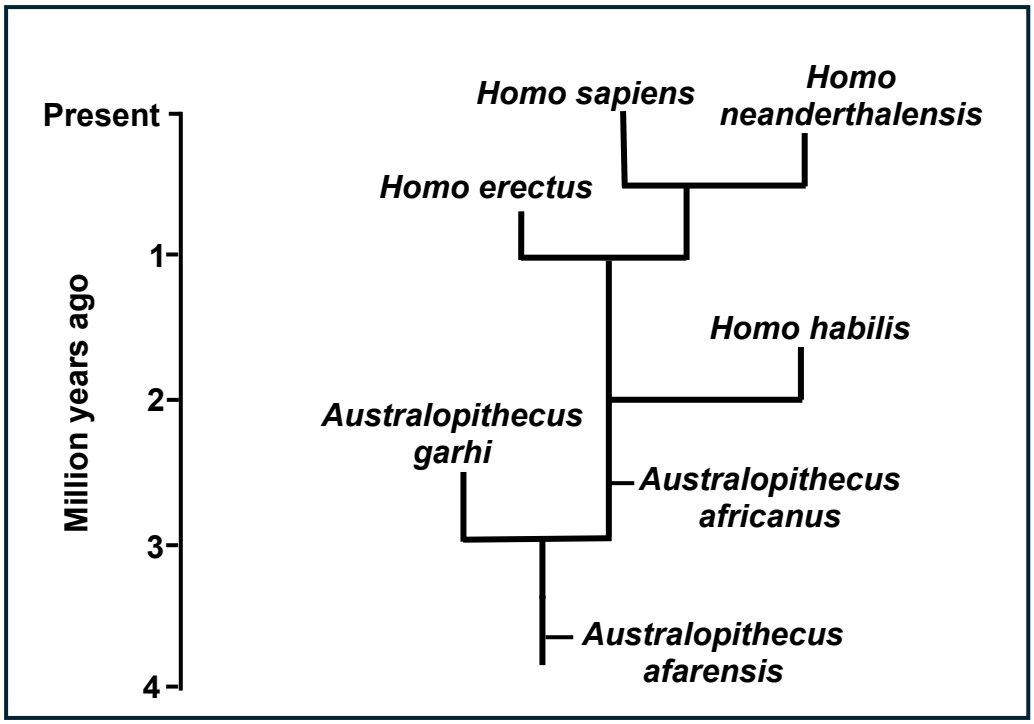
(a) DNA (1)

(b) RNA (1)

1.4.4 Name molecule **3** that will be found only in DNA. (1)

1.4.5 Name TWO organelles in a human cell where DNA is located. (2)
(8)

1.5 The diagram below shows the evolutionary relationships between some hominid species.



1.5.1 Identify the type of diagram shown above. (1)

1.5.2 Name the hominid genus that is thought to be the common ancestor of the *Australopithecines*. (1)

1.5.3 When (in mya) did the species, which was thought to be the first to make tools, appear on Earth? (1)

1.5.4 Which species is the most recent common ancestor of *Australopithecus garhi* and *Homo habilis*? (1)

1.5.5 Name ONE species that would have competed for the same resources with *Homo sapiens* if they had been living in the same area. (1)

1.5.6 *Homo naledi* is thought to be a transitional species between the *Australopithecines* and the *Homo* species.

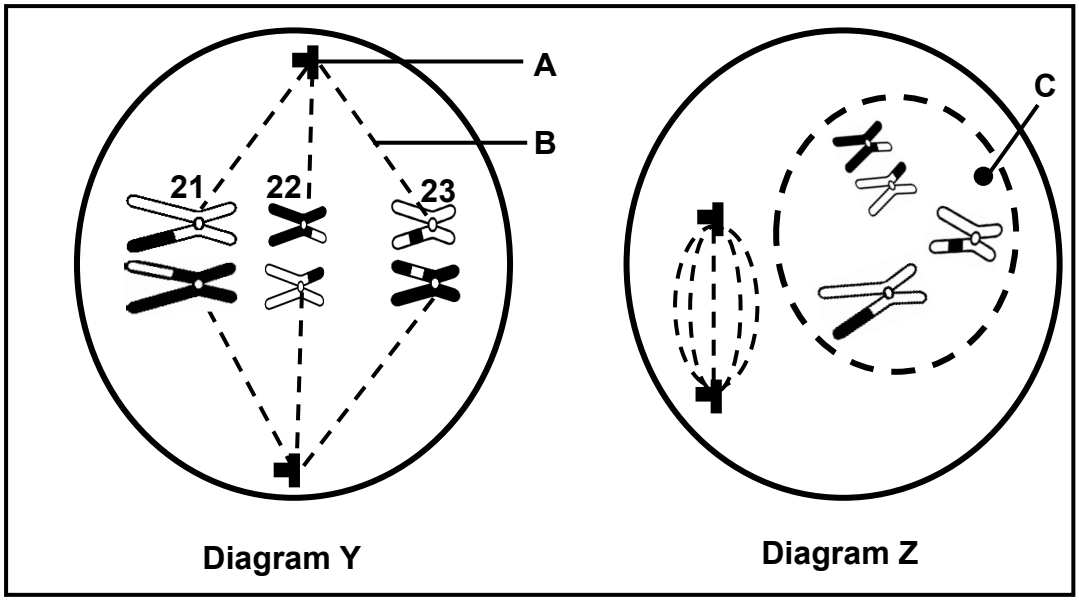
Between which TWO species would *Homo naledi* be placed in the diagram above? (2)
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagrams below show chromosomes **21**, **22** and **23** in a human cell in different phases of cell division.



2.1.1 Identify:

(a) Structure **B** (1)

(b) Structure **C** (1)

(c) The type of gamete that will be formed at the end of this cell division (1)

2.1.2 State ONE function of part **A** during cell division. (1)

2.1.3 Identify the phase in diagram **Y**. (1)

2.1.4 Describe TWO observable differences between the phase identified in QUESTION 2.1.3 and the same phase in mitosis. (4)

2.1.5 Explain the chromosome number in the phase represented in diagram **Z**. (3)
(12)

2.2 Describe the process of *transcription*. **(7)**

2.3 The table below shows amino acids and their codons.

AMINO ACID	CODON
Methionine	AUG
Glycine	GGU; GGA
Serine	AGU; AGC
Threonine	ACA; ACU
Isoleucine	AUC; AUA
Aspartate	GAU

2.3.1 What is a *codon*? (1)

2.3.2 Name the:

(a) DNA base triplet for methionine (1)

(b) Anticodon for aspartate (1)

(c) Amino acid carried by the tRNA with anticodon UGA (1)

2.3.3 A mutation occurred on a DNA molecule where one nitrogenous base was affected. This caused the amino acid serine to be replaced by glycine during protein synthesis.

(a) Name the type of mutation that occurred. (1)

(b) During which process could a DNA mutation occur? (1)

(c) Name the DNA base triplet for this glycine. (2)

(d) Explain how this mutation will affect the protein formed. (2)
(10)

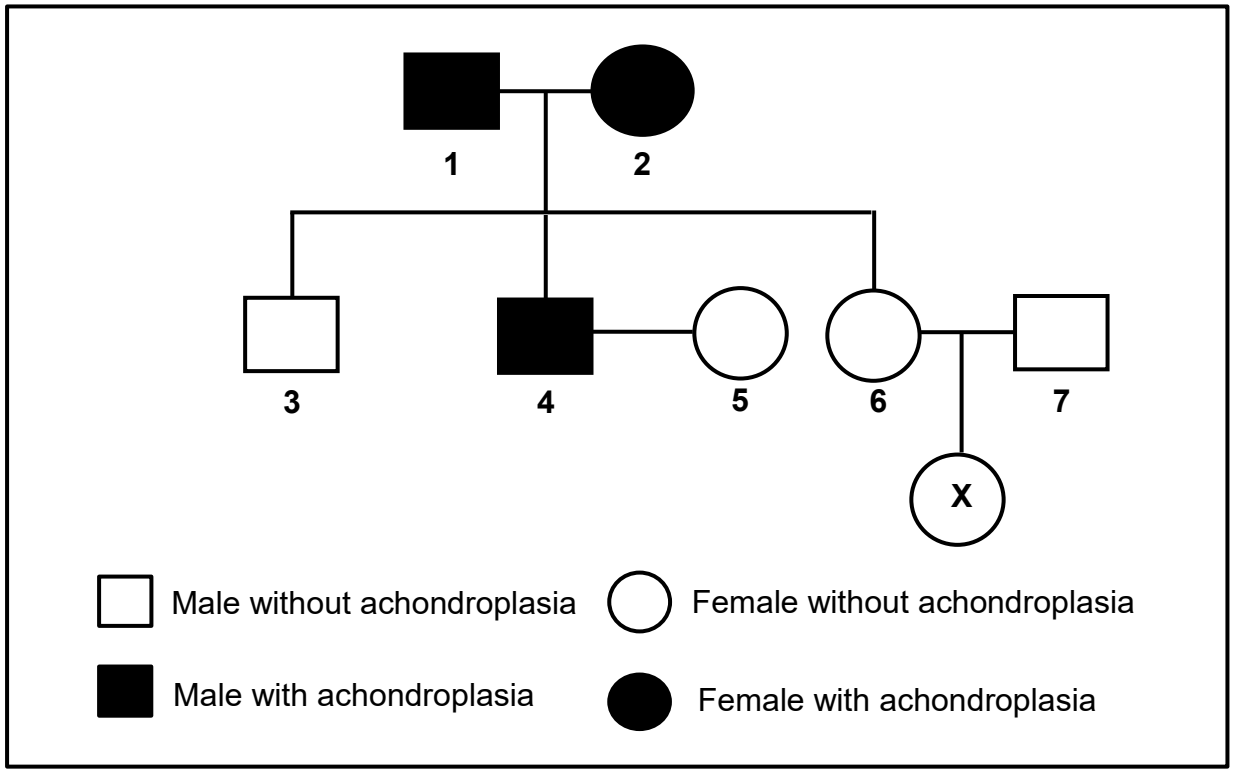
2.4 In birds, sex determination is controlled by sex chromosomes **Z** and **W**. Chromosome **W** is shorter than **Z**. Female birds have **ZW** chromosomes and male birds have **ZZ** chromosomes.

2.4.1 Use a genetic cross to show the percentage chance of having female offspring in birds. (6)

2.4.2 Describe TWO structural differences between the sex chromosomes of birds and humans. (4)
(10)

2.5 Achondroplasia is an autosomal genetic disorder caused by the dominant allele (**A**). This genetic disorder leads to a form of dwarfism. Offspring who inherit both dominant alleles, die during the baby/infant stage.

The pedigree diagram below shows the inheritance of achondroplasia.



2.5.1 State what is meant by a *dominant allele*. (2)

2.5.2 How many generations are represented in this diagram? (1)

2.5.3 State the:

(a) Phenotype of individual **2** (1)

(b) Genotype of individual **1** (1)

(c) Number of individuals that are heterozygous (1)

2.5.4 Individuals **6** and **7** had one daughter **X**.

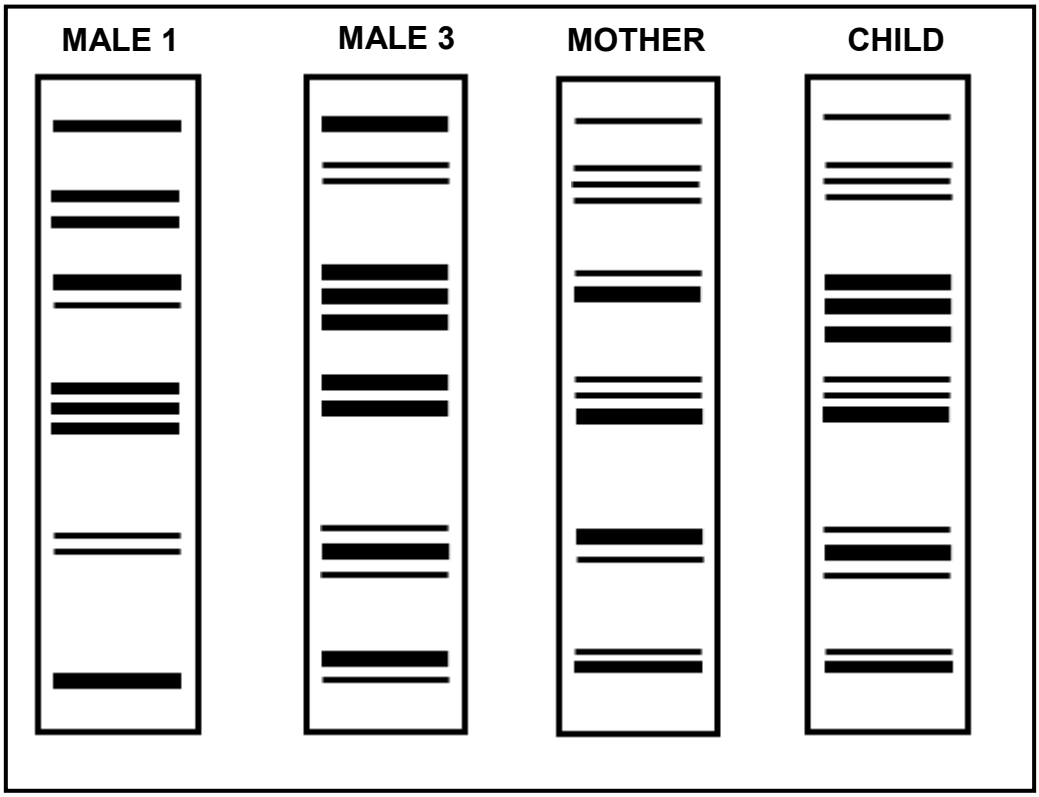
Explain her phenotype. (5)
(11)
[50]

QUESTION 3

3.1 In a paternity test, investigators first analysed the blood groups before they conducted DNA profiling. A paternity test was done for THREE males.

The results from the blood group analysis and DNA profiling are shown below.

	MALE 1	MALE 2	MALE 3	MOTHER	CHILD
BLOOD GROUP	B	O	A	AB	AB



3.1.1 Name ALL the possible genotypes for male **3**. (2)

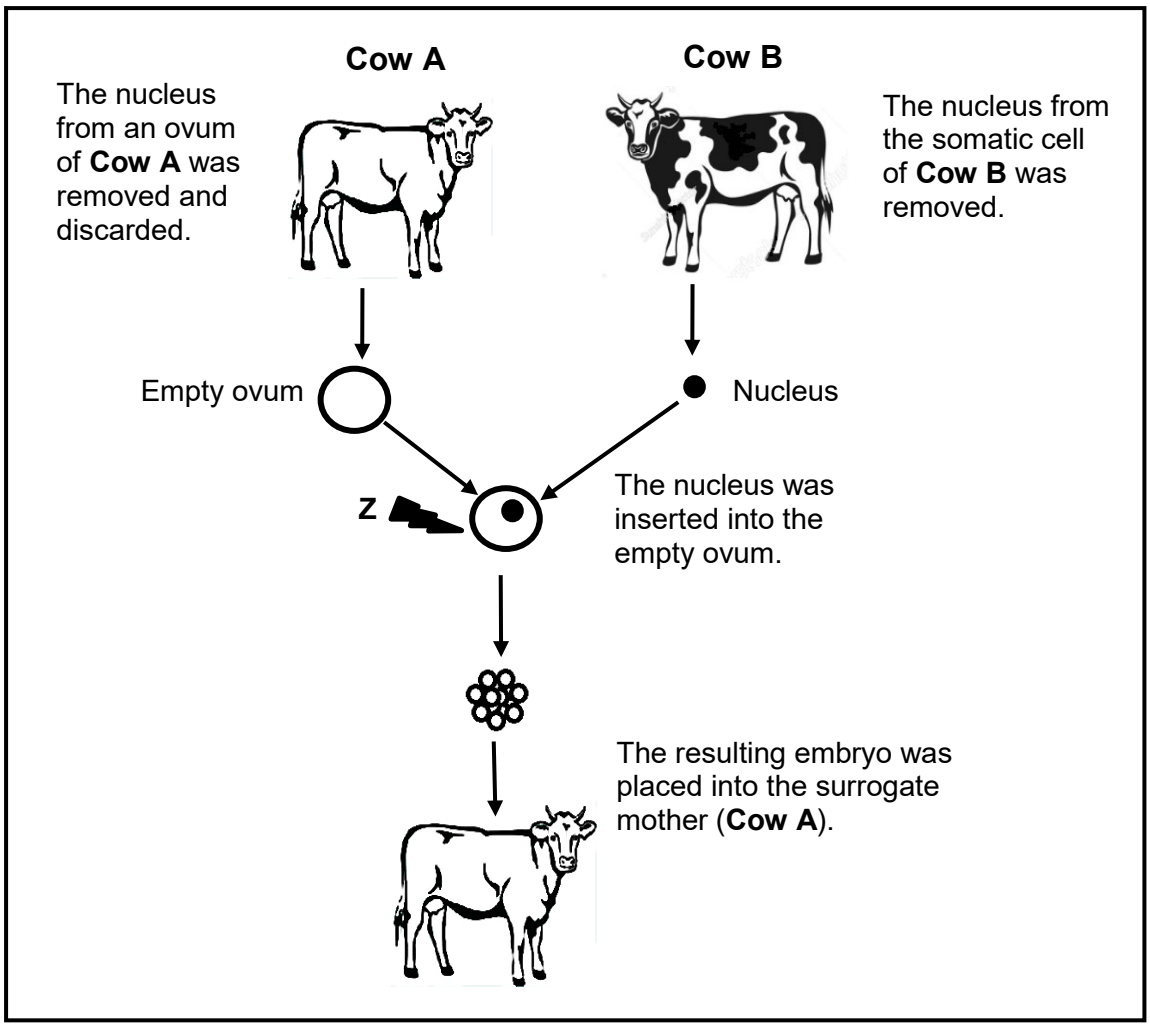
3.1.2 Explain why the investigators excluded male **2** in the DNA profiling. (5)

3.1.3 Explain why the mother was included in the DNA profiling. (2)

3.1.4 According to the DNA profiles, which male (**1** or **3**) is the father? (1)

3.1.5 State ONE other use of DNA profiling. (1)
(11)

3.2 The diagram below shows how biotechnology can be used to produce a cow with a desired characteristic.



3.2.1 What is meant by *biotechnology*? (1)

3.2.2 Name the biotechnological process represented in the diagram above. (1)

3.2.3 Give ONE reason why an ovum is used during this process. (1)

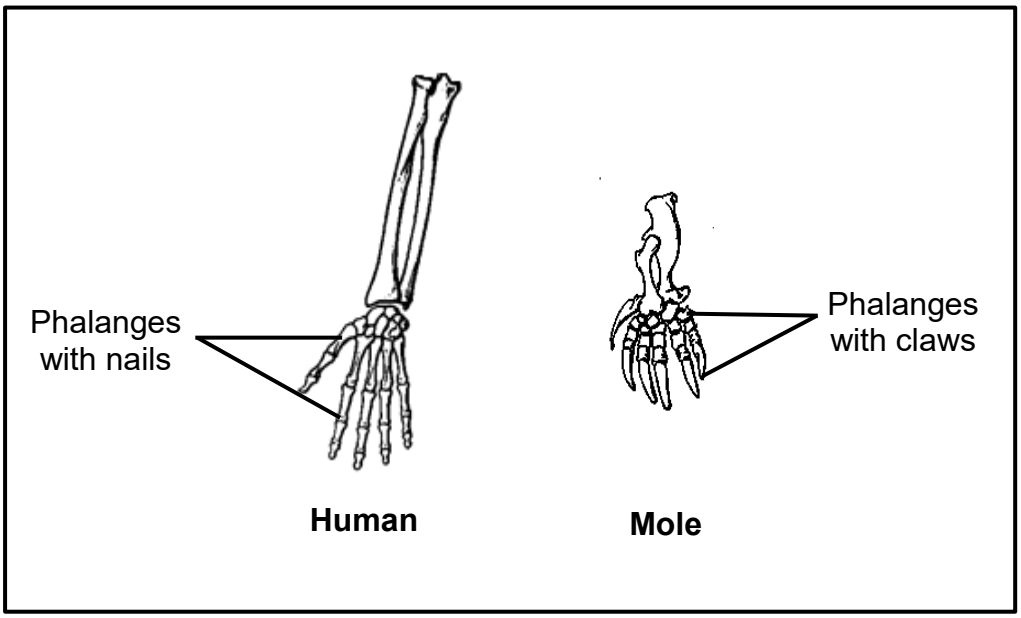
3.2.4 Why is an electric shock applied to the 'ovum' at **Z**? (1)

3.2.5 State why the offspring produced is phenotypically different to the surrogate mother. (1)

3.2.6 Give ONE possible disadvantage of having all the cows on a particular farm produced through this process. (1)
(6)

3.3 Describe *speciation* through geographic isolation. **(8)**

3.4 The diagram below shows the forelimbs of a human and a mole.



3.4.1 Name the type of evidence for evolution represented in the diagram above. (1)

3.4.2 Explain how these structures are used as evidence for evolution. (3)

3.4.3 State ONE way in which the forelimb of a mole is:

(a) Modified for digging through soil (1)

(b) Different from the forelimb of an African ape (1)
(6)

3.5 Read the extract below.

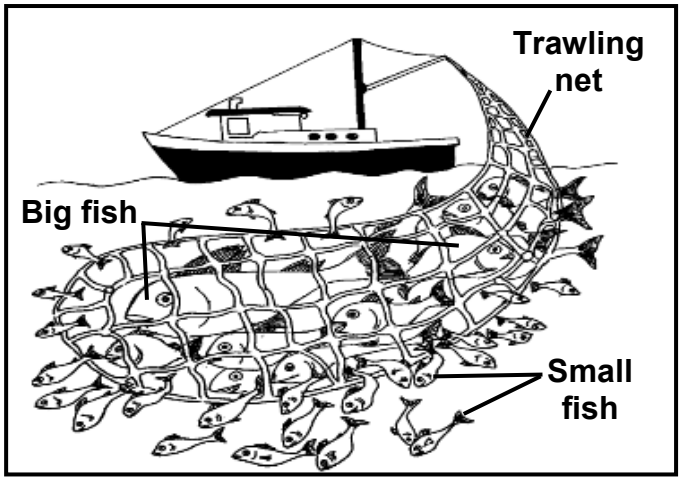
EFFECT OF OCEAN TEMPERATURES ON THE BODY SIZE OF A FISH SPECIES

Ocean temperatures have been increasing due to climate change. When the water temperatures increase, oxygen concentration decreases. Fish with bigger bodies need more oxygen for their metabolic activities. A decrease in oxygen, therefore, leads to a decline in individual performance (such as avoiding predators, searching for food, etc.), which can decrease the chances of survival.

From 1970 to 2014, marine biologists conducted an investigation to determine the effect that ocean temperatures had on the average adult body size of a commercial fish species.

This fish species is sold for food by seafood companies. Big trawling nets are used to catch the fish and mainly the bigger fish are trapped and the smaller fish escape, as shown in the diagram below.

The results have shown a decrease in the average body size of this fish species over the years.



3.5.1 Identify the independent variable in the investigation. (1)

3.5.2 State ONE way in which the marine biologists ensured the reliability of their results. (1)

3.5.3 Explain why:

(a) The higher ocean temperatures resulted in a greater proportion of fish with a smaller average body size (5)

(b) The use of trawling nets by fisherman could have affected the validity of this investigation (3)
(10)

3.6 The table below shows some of the hominid fossils found in different parts of the world that are used as evidence for the 'Out of Africa' hypothesis.

SPECIES	FOSSIL	AGE OF THE FOSSIL (million years)	SITE OF DISCOVERY
Australopithecus africanus	Mrs Ples	2,5	Sterkfontein (South Africa)
Homo erectus	Turkana boy	1,9	Kenya (Africa)
	Java man	0,035	Java (Asia)
Homo sapiens	Florisbad man	0,26	Florisbad (South Africa)
	Liujiang	0,015	Guanxi (Asia)

3.6.1 State the 'Out of Africa' hypothesis. (2)

3.6.2 Use the information in the table to describe how the fossils of *Homo erectus* and *Homo sapiens* support the 'Out of Africa' hypothesis. (4)

3.6.3 Name the scientist who discovered Mrs Ples. (1)

3.6.4 Name TWO other *Australopithecus africanus* fossils discovered in South Africa. (2)
(9)
[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150

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