

GRADE 12

LIFE SCIENCES P2

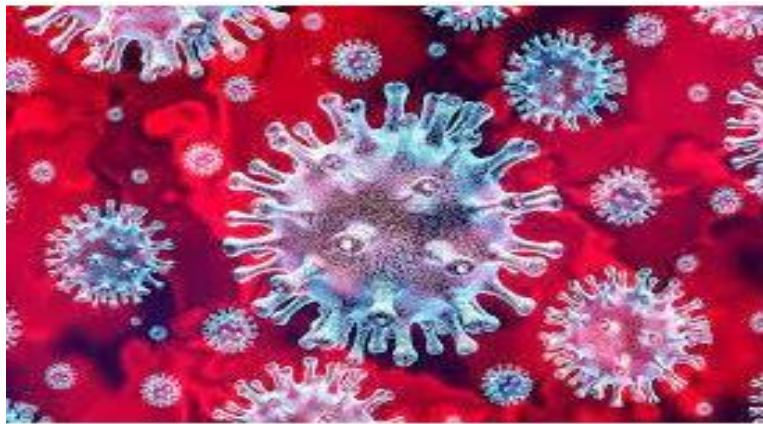
FINAL EXAM



LAST PUSH

Mopani West District

Rakwadu 2 Circuit



TOPICS

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DNA – THE CODE OF LIFE	27
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BIOLOGICAL TERM & MATCH COLUMN

MAY/JUNE 22

- 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 Division of the cytoplasm of a cell during meiosis
- 1.2.2 The sugar molecule present in a nucleotide of RNA
- 1.2.3 The position of a gene on a chromosome
- 1.2.4 The process during which a DNA molecule makes an exact copy of itself
- 1.2.5 Undifferentiated cells that may be stimulated to develop into any type of body cell
- 1.2.6 Mendel's principle which states that an organism possesses two factors which separate so that each gamete contains only one of these factors
- 1.2.7 The evolutionary theory that proposes long periods where species do not change, alternating with short periods where rapid changes occur
- 1.2.8 A tangled network of DNA and protein located within the nucleus
- 1.2.9 The natural shape of the DNA molecule
- 1.2.10 The phase in the cell cycle during which cell growth occurs
- (10 x 1) **(10)**

- 1.3 Indicate whether each of the statements 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 group of similar organisms that occurs in a particular place at a particular time with the ability to interbreed	A: Population B: Species
1.3.2 The manipulation of biological processes to satisfy human needs	A: Biogeography B: Biotechnology
1.3.3 Discovered the structure of the DNA molecule	A: Francis Crick B: James Watson

(3 x 2) (6)

NW SEPT 24

- 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 type of vision present in both apes and humans that allows for depth perception
- 1.2.2 The monomers of nucleic acids
- 1.2.3 An explanation describing evolution as consisting of long phases of little change alternating with short phases of rapid change
- 1.2.4 The phase in the cell cycle during which DNA replication occurs
- 1.2.5 The type of variation in a population in which there is no range of intermediate phenotype
- 1.2.6 A sub-group of the hominids that includes only modern humans and early human ancestors
- 1.2.7 Undifferentiated cells that can develop into any type of cell, tissue or organ
- 1.2.8 The characteristics that are influenced by alleles carried on the gonosomes
- 1.2.9 The biotechnological production of genetically identical offspring

(9 x 1) (9)

- 1.3 Indicate whether each of the statements 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 genotype of a male with colour blindness	A: X^{dY} B: X^{dX^d}
1.3.2 Evidence of evolution	A: Modification by descent B: Fossil record
1.3.3 Discovered the structure of the DNA molecule	A: Raymond Dart B: Watson and Crick

(3 x 2) (6)

MP SEPT 24

- 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 1.2.9) in the ANSWER BOOK.

- 1.2.1 A monomer consisting of phosphate group, sugar and a nitrogenous base
- 1.2.2 A part of a DNA molecule that acts as a pattern for the building of mRNA
- 1.2.3 A cell that contains only one chromosome of each homologous pair
- 1.2.4 One of the two identical strands of a replicated chromosome
- 1.2.5 A type of dominance that creates an intermediate phenotype
- 1.2.6 The use of biological process to make products that humans desire
- 1.2.7 A genetic cross involving two different characteristics
- 1.2.8 The change in inherited traits over successive generations in populations of organisms
- 1.2.9 The outward projection of the face in hominids

(9 x 1) (9)

- 1.3 Indicate whether each of the statements 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 number (1.3.1 to 1.3.4) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 The cell organelle that contains chromatin	A: Mitochondrion B: Ribosomes
1.3.2 Sequencing of amino acids according to mRNA	A: Translation B: Transcription
1.3.3 All the alleles of all the individuals in a population	A: Genome B: Gene pool
1.3.4 Characteristics that may be used to build a phylogenetic tree	A: Similarity of DNA sequence B: Fossil evidence

(4 x 2)

(8)

NOV 23

- 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 position of a gene on a chromosome
- 1.2.2 The type of evolution characterised by long periods of little or no change followed by short periods of rapid change
- 1.2.3 The natural shape of a DNA molecule
- 1.2.4 The type of bond found between two amino acids
- 1.2.5 The type of vision shared in primates that allows for depth perception
- 1.2.6 The type of dominance which results in an intermediate phenotype in the heterozygous condition
- 1.2.7 The fluid of the nucleus where free nucleotides are found
- 1.2.8 A tangled mass of chromosomes located within the nucleus
- 1.2.9 The division of the cytoplasm after a nuclear division
- 1.2.10 The name for the X and Y sex chromosomes in humans

(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	A genetic disorder caused by a chromosomal mutation	A: Haemophilia B: Colour-blindness
1.3.2	The importance of meiosis	A: Formation of gametes B: Halving of the chromosome number
1.3.3	The organelle where DNA is found in plants	A: Mitochondria B: Chloroplast

(3 x 2)

(6)

NOV 23

- 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 process of change in the characteristics of biological species over time
- 1.2.2 The type of bonds between nitrogenous bases in a DNA molecule
- 1.2.3 The structure that joins two chromatids of a chromosome
- 1.2.4 The division of the cytoplasm of a cell during cell division
- 1.2.5 The process during meiosis where there is an exchange of genetic material between chromatids
- 1.2.6 The structures in animal cells that give rise to spindle fibres during cell division
- 1.2.7 Similar structures that are inherited from a common ancestor and are modified for different functions
- 1.2.8 The phase in the cell cycle during which DNA replication takes place
- 1.2.9 The organelle where translation occurs during protein synthesis

(9 x 1)

(9)

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

COLUMN I		COLUMN II	
1.3.1	Type of evolution characterised by long periods of little or no change alternating with short periods of rapid change	A:	Artificial selection
		B:	Punctuated equilibrium
1.3.2	A plant with white flowers that is crossed with a plant with red flowers and produces offspring with pink flowers	A:	Incomplete dominance
		B:	Complete dominance
1.3.3	The separation of alleles during gamete formation	A:	Law of Dominance
		B:	Principle of Segregation

(3 x 2)

(6)

MAY/JUNE 23

- 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 1.2.7) in the ANSWER BOOK.

- 1.2.1 The type of inheritance which produces an intermediate phenotype
- 1.2.2 The point where adjacent chromatids overlap during crossing over
- 1.2.3 The process whereby information is copied from DNA to RNA in the nucleus of a cell
- 1.2.4 The sugar found in a DNA molecule
- 1.2.5 The bond that occurs between nitrogenous bases in a DNA molecule
- 1.2.6 The manipulation of an organism's genes to obtain a desired characteristic
- 1.2.7 The representation showing the arrangement of a diploid set of chromosomes

(7 x 1)

(7)

- 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	Source of variation in a species	A: random mating B: random fertilisation
1.3.2	An organism possesses two factors which separate so that each gamete contains only one of these factors	A: law of dominance B: principle of independent assortment
1.3.3	Reproductive isolating mechanism in species	A: breeding in the same season of the year B: infertile offspring

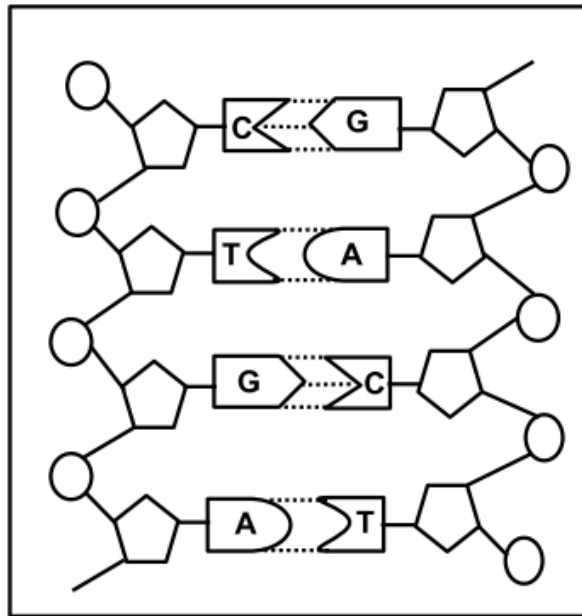
(3 x 2)

(6)

DNA

EC JUNE 23

2.1 The diagram below represents part of a DNA molecule.



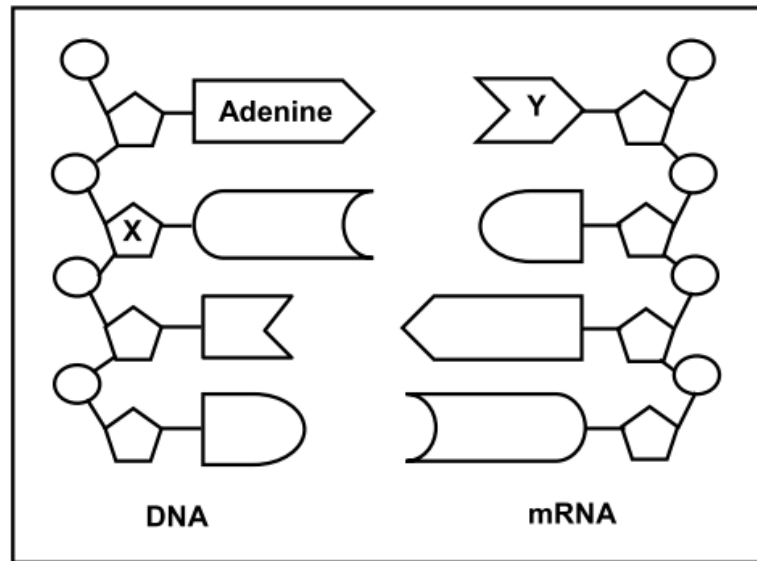
- 2.1.1 Name the structures inside the nucleus that contain DNA. (1)
- 2.1.2 Besides the nucleus, name ONE other place in a cell where DNA is found. (1)
- 2.1.3 What type of substances are labelled **A**, **G**, **C** and **T** in the DNA molecule shown above? (1)
- 2.1.4 The coded message in DNA is used in the process of protein synthesis.

Name and describe the stage during protein synthesis responsible for the copying of the coded message from DNA.

(*1 compulsory mark + Any 5) (6)

NOV 22

2.1 The diagram below represents transcription during protein synthesis.



2.1.1 Name the part of the cell where this process occurs. (1)

2.1.2 Identify:

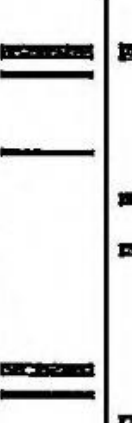
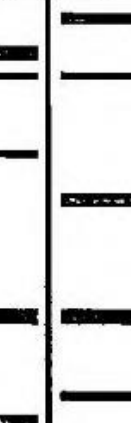
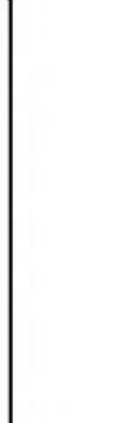
(a) Sugar **X** (1)

(b) Nitrogenous base **Y** (1)

2.1.3 Tabulate TWO differences between *transcription* and *DNA replication*. (5)
(8)

NW SEPT 24

1.4 The diagram below shows the DNA profiles of a girl, her mother and four males.

Girl	Mother	Males			
		1	2	3	4
					

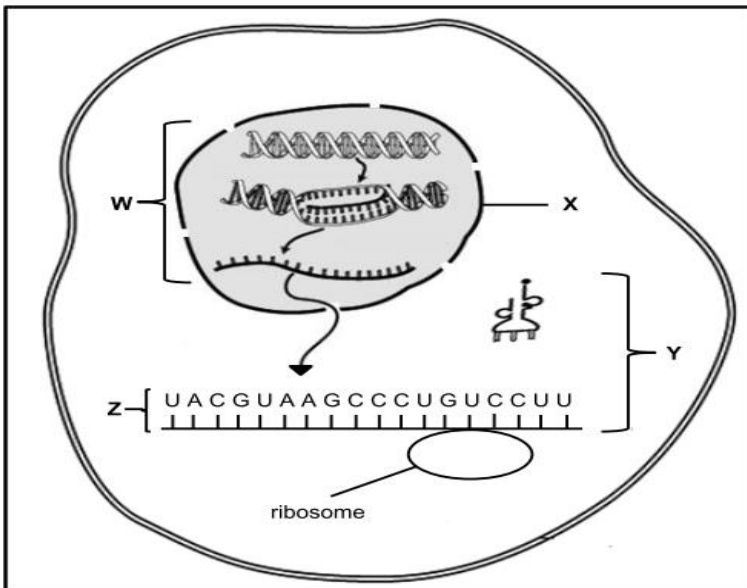
1.4.1 Which male is the girl's biological father? (1)

1.4.2 Explain your answer in QUESTION 1.4.1. (2)

1.4.3 State TWO other functions of DNA profiling. (2)
(5)

MAY/JUNE 22

2.2 The diagram below represents the process of protein synthesis in a cell.



- 2.2.1 Name the process which occurs at:
- (a) **W** (1)
 - (b) **Y** (1)
- 2.2.2 Identify:
- (a) Organelle **X** (1)
 - (b) Molecule **Z** (1)
- 2.2.3 State TWO locations of DNA in a cell, other than in the nucleus. (2)
- 2.2.4 Describe the process at **W**. (7)

The table below shows some tRNA anticodons with their corresponding amino acids.

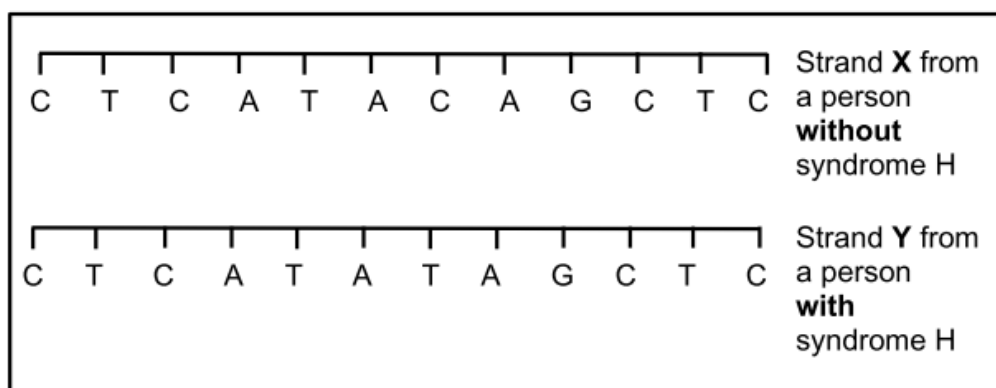
tRNA ANTICODON	AMINO ACID
CAG	Valine
GAA	Leucine
AUG	Tyrosine
GGA	Proline
UCG	Serine
CAU	Valine

- 2.2.5 Name the:
- (a) DNA base triplet that codes for serine (1)
 - (b) First TWO amino acids coded for by molecule **Z** in the diagram (the molecule is read from left to right) (2)
- 2.2.6 What is the change in the sequence of nitrogenous bases in a DNA molecule called? (1)
- 2.2.7 The codon CUU (last codon) on molecule **Z** changed to CCU.
Explain the effect it would have on this particular protein molecule. (3)
- (20)**

EC JUNE 23

- 2.2 **Syndrome H** is an inherited condition. People with **syndrome H** do not produce the enzyme IDUA. All enzymes are proteins.

The diagram below shows part of a gene coding for the enzyme IDUA.



The table below shows mRNA anticodons and the amino acids they code for.

mRNA codons	Amino acid
AUA	Methionine
AUC	Isoleucine
CAG	Glutamine
CUC	Leucine
GAG	Glutamic acid
GUC	Valine
UAU	Tyrosine

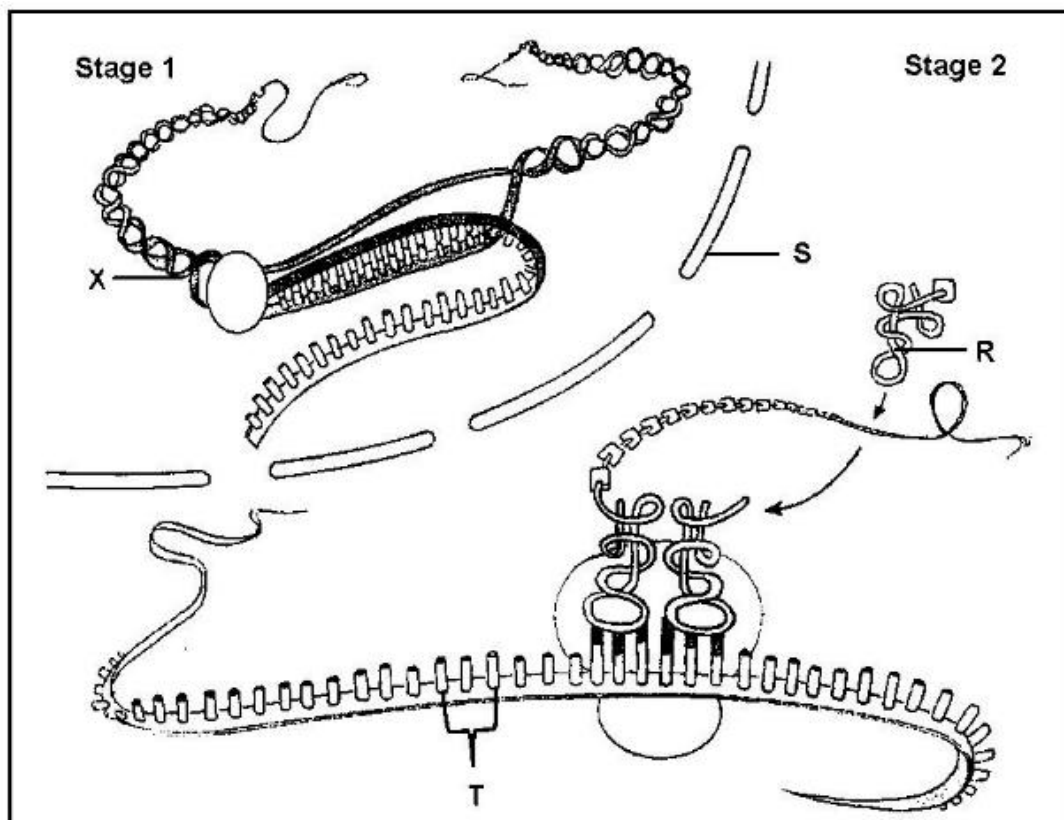
- 2.2.1 For strand **X**, state the number of:
- (a) Codons for the corresponding mRNA molecule (1)
 - (b) Different amino acids coded for (1)
- 2.2.2 Give the DNA triplet on strand **Y** that codes for the amino acid glutamic acid. (1)
- 2.2.3 Strand **Y** shows a mutation in the DNA which has caused syndrome H.

The enzyme IDUA helps to break down a carbohydrate in the human body. The enzyme IDUA produced from Strand **Y** will not work.

Explain how the mutation could cause the enzyme not to work. (5)

MP SEPT 24

- 2.2 The diagram below is a schematic representation of a process that takes place in all living cells.



2.2.1 Name:

- (a) The process taking place in the diagram (1)
- (b) Structure **S** (1)
- (c) The type of sugar that forms part of the structure **X** (1)

2.2.2 Give the collective name of nitrogenous bases **R**. (1)

2.2.3 Explain the role of molecule **R** during the process in QUESTION 2.2.1 (a). (4)
(8)

NOV 23

2.2 Describe the process of DNA replication. (6)

2.3 A mutation has occurred on a section of mRNA.

Amino acid	Serine	Proline	Glycine	Threonine	Alanine
Codons	UCU	CCU	GGA	ACU	GCA
	UCC	CCA	GGG	ACC	GCG

Figure 1:	AGG	CGT	CCT	GGA
Figure 2:	Serine	Glycine	Glycine	Proline

2.3.1 Use information from the table and in figure 1 to give the last three amino acid sequence (Read from the left) (2)

2.3.2 How many DNA nitrogenous bases code for the amino acids from the table? (1)

2.3.3 Name and describe the type of mutation that has occurred between figure 1 and 2. (2)

2.3.4 Use the information in the table, figure 1 and 2 to describe the effect of this mutation on the protein formed. (4)
(9)

NOV 22

2.2 A mutation has occurred on a section of an mRNA molecule as shown below.

Original sequence	AUG GAA AUA CCG CCA GGA
Mutated sequence	AUG GAA AUA CUG CCA GGA

2.2.1 Name the type of mutation that has occurred. (1)

2.2.2 Give a reason for your answer to QUESTION 2.2.1. (1)

2.2.3 The table below shows some mRNA codons and the amino acids that they code for.

2.2.3 The table below shows some mRNA codons and the amino acids that they code for.

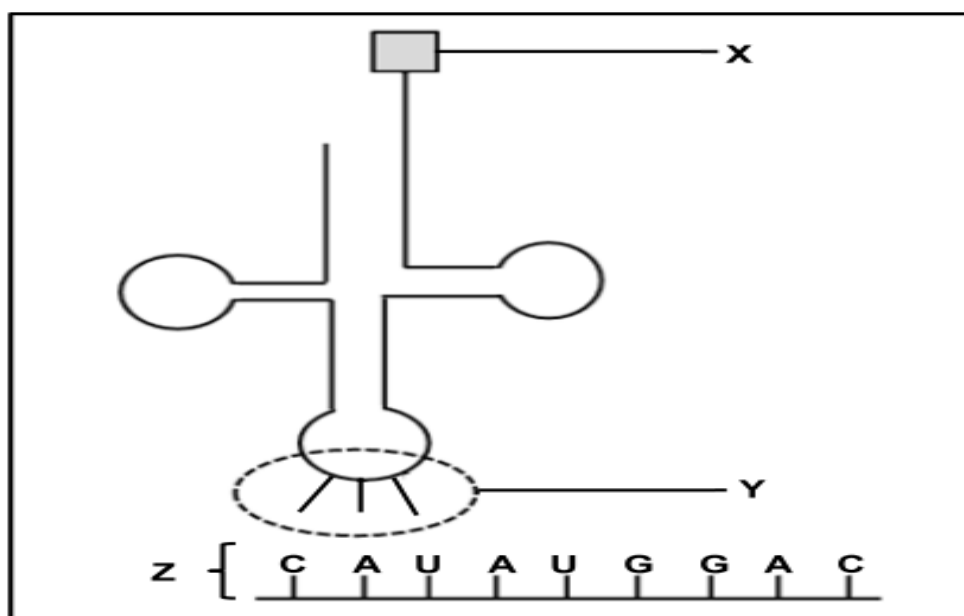
mRNA codon	Amino acid
AUA	Isoleucine
AUG	Methionine
CCA	Proline
CCG	Proline
CUG	Leucine
GAA	Glutamic acid
GGA	Glycine

- State the number of different amino acids coded for by the original sequence of the mRNA molecule given above. (1)
 - Give the anticodon on the tRNA molecule that carries the amino acid isoleucine. (1)
 - Use information in the table to describe the effect of the mutation on the protein formed. (4)
- (8)**

MAY/JUNE 23

QUESTION 2

2.1 The diagram below represents a process that occurs during protein synthesis.



- 2.1.1 Identify molecule: (1)
- (a) **X** (1)
- (b) **Z** (1)
- 2.1.2 Give the nitrogenous base sequence of:
- (a) The DNA base triplet complementary to the middle codon on molecule **Z** (2)
- (b) **Y** (1)
- 2.1.3 Name and describe the process shown in the diagram during the formation of a protein. (7)
- (12)

- 2.2 The table below shows the codons that code for some amino acids.

mRNA codon	Amino acid
AUG	methionine
CAU	histidine
CUA	leucine
GUA	valine
GAC	aspartic acid
GAG	glutamic acid
GAU	aspartic acid

A mutation caused a DNA base triplet to change from CTG to CTA.

Describe the effect of this mutation on the protein formed. (4)

- 2.3 Tabulate TWO differences between *DNA* and *RNA nucleotides*. (5)

NOV 23

- 2.3 A family wanted to identify the biological father of a boy. The mother of the boy is known. Blood groups and DNA profiles of the mother, the boy and two males were used to determine paternity.

The data below shows the results of the two procedures.

BLOOD GROUPS			
Mother	Boy	Male 1	Male 2
O	B	AB	B
DNA PROFILES			
Mother	Boy	Male 1	Male 2
			
 	 	 	
 	 	 	 
			 
			
 	 	 	 

- 2.3.1 Explain why paternity of the boy could not be established using blood groups only. (5)
- 2.3.2 Who is the biological father of the boy according to the DNA profiles? (1)
- 2.3.3 Explain your answer to QUESTION 2.3.2. (3)
- 2.3.4 State ONE other use of DNA profiling. (1)
- (10)**

NOV 22

- 2.4 The table below shows information about blood groups in a certain population.

BLOOD GROUP	NUMBER OF PEOPLE	PERCENTAGE OF THE POPULATION
O	954 000	53
A	X	34
B	180 000	10
AB	54 000	3

- 2.4.1 How many people have the genotype ii? (1)
- 2.4.2 The population size is 1 800 000.
Calculate the value of X. Show ALL working. (3)
- 2.4.3 Describe how a child inherits the blood group represented by 3 per cent of this population. (3)
- (7)**

NOV 22

- 3.1 Read the extract below.

When a child is born, the umbilical cord is cut and stem cells can be obtained from it. Many people think that the stem cells for treating human conditions should be obtained from umbilical cords, rather than from human embryos.

Recently, stem cells have also been obtained from bone marrow. These stem cells are used to treat conditions such as heart disease and spinal injuries.

- 3.1.1 Name THREE sources of stem cells mentioned in the extract. (3)
- 3.1.2 Explain why the characteristics of stem cells make them useful for treating some disorders. (2)
- 3.1.3 Name ONE condition in the extract that can be treated with stem cells. (1)
- (6)**

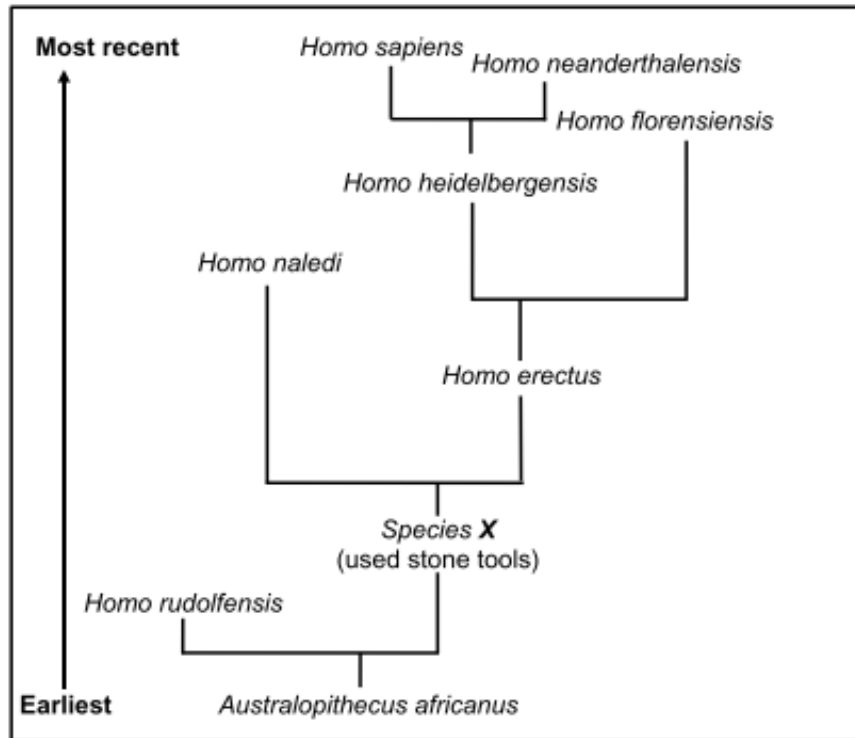
NOV 23

3.2 Read the extract below.

Samango and vervet are two species of monkeys that occupy the same habitat. Researchers have recently discovered that a population of samango monkeys were able to interbreed with vervet monkeys to produce offspring. These offspring were infertile.

- | | | |
|-------|--|-------------------|
| 3.2.1 | Define the term <i>population</i> . | (3) |
| 3.2.2 | Give ONE reason why samango and vervet monkeys are considered to be two different species. | (1) |
| 3.2.3 | List THREE mechanisms of reproductive isolation that are NOT mentioned above. | (3)
(7) |
-
- | | | |
|-------|--|-------------------|
| 3.3 | Scientists find evidence for human evolution by comparing humans to other hominids. The upper limbs of humans and African apes show similar characteristics, whereas there are differences between the dentition (teeth) of the two. | |
| 3.3.1 | Why do scientists look for similarities between humans and African apes? | (1) |
| 3.3.2 | Explain the importance of the positioning of the thumbs for humans and African apes. | (2) |
| 3.3.3 | State ONE difference between the teeth of humans and African apes. | (2)
(5) |

3.4 The diagram below represents one model of the evolution of some hominids.



- 3.4.1 Identify the type of diagram shown. (1)
- 3.4.2 How many genera are represented by the diagram? (1)
- 3.4.3 Name the species:
- (a) Represented by **X** on the diagram (1)
- (b) That shares a common ancestor with *Homo erectus* (1)
- 3.4.4 Which species of the genus *Homo* is the only one in existence today? (1)
- 3.4.5 Name TWO forms of evidence that would have been used to support the information in the diagram. (2)
- 3.4.6 The average cranial capacity of *Homo sapiens* is 1 500 cm³ compared to 520 cm³ in *Australopithecus africanus*. Explain the significance of the difference in cranial capacity. (3)
- 3.4.7 Explain how the fossils of *Australopithecus africanus*, *Species X* and *Homo erectus* are used to support the 'Out of Africa' hypothesis. (4)
- (14)**

- | | | |
|-------|---|-----|
| 3.5.4 | Explain, according to Lamarck, why modern-day whales do not have legs. | (3) |
| 3.6.4 | Describe the evolution of resistance to antiretroviral medication in the HIV virus. | (5) |

MP SEPT 24

- 2.5 Three ladies each gave birth to a baby boy in a hospital. The babies were accidentally swopped.

The diagram below shows a technique used in paternity testing and the results of each parent and their baby boys.

[illegible]

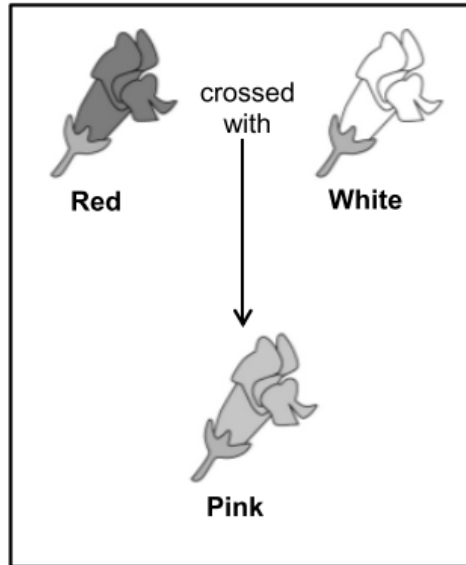
- | | | |
|-------|---|-------------|
| 2.5.1 | Identify the technique used. | (1) |
| 2.5.2 | Give ONE source that can be used as DNA sample for paternity testing. | (1) |
| 2.5.3 | Identify the biological parents of baby 1. | (2) |
| 2.5.4 | Which baby belongs to Mr and Mrs Gumede? | (2) |
| 2.5.5 | Explain your answer to QUESTION 2.4.4 | (2) |
| 2.5.6 | Give TWO other uses for this technique. | (2) |
| | | (10) |

GENETICS

MAY/JUNE 22

- 2.4 The diagram below shows the inheritance of flower colour in snapdragon plants.

The two alleles controlling flower colour are red (**R**) and white (**W**).



- 2.4.1 State the type of dominance shown by the snapdragon plants. (1)
- 2.4.2 Give a reason for your answer to QUESTION 2.4.1. (2)
- 2.4.3 A gardener crossed two pink-flowered snapdragon plants.
- Use a genetic cross to show the ratio of the expected phenotypes in the offspring. (6)
- (9)

NOV 23

- 2.4 Polydactyly is a condition that leads to extra fingers or toes. It is caused by a dominant allele.

A man who is heterozygous for polydactyly has a wife who is not polydactyl.

Using the letters **R** and **r**, do a genetic cross to show the percentage chance that their children will have polydactyly.

(6)

- 1.4 In tomato plants, tall stems (**T**) are dominant over short stems (**t**) and red fruit (**R**) is dominant over yellow fruit (**r**).

A farmer crosses a homozygous tall, yellow tomato plant with a plant that is heterozygous for both characteristics.

- 1.4.1 Name this type of genetic cross. (1)
- 1.4.2 Give the genotype of a homozygous tall, yellow tomato plant. (2)
- 1.4.3 List the genotypes of ALL the possible gametes for a plant that is heterozygous for both characteristics. (4)
(7)

EC JUNE 23

- 1.4 In watermelons, there are two alleles for taste, bitter fruit and sweet fruit. The allele for bitter fruit (**B**) is dominant over the allele for sweet fruit (**b**). There are two alleles for skin appearance, yellow spots and no spots. The allele for yellow spots (**N**) is dominant over the allele for no spots (**n**).

Plant **A**, which is heterozygous for bitter fruit and yellow spots, was crossed with plant **B**, which has sweet fruit and no spots.

- 1.4.1 Give the term that describes a genetic cross involving two characteristics. (1)
- 1.4.2 Give:
- (a) The genotype of plant **B** (2)
- (b) The dominant phenotype for taste in watermelons (1)
- (c) All possible genotypes of the gametes of plant **A** (2)
- 1.4.3 List TWO ways in which the phenotype of a watermelon with genotype **bbNn** differs from the phenotype of a watermelon with genotype **Bbnn**. (2)
- 1.4.4 State Mendel's principle of independent assortment. (2)

NOV 23

- 2.5 In summer squash plants, white fruit colour (**B**) is dominant over yellow fruit colour (**b**), and round fruit (**D**) is dominant over oval fruit (**d**).

A summer squash plant that is homozygous for white and round fruit is crossed with a plant that is homozygous for yellow and oval fruit.

2.5.1 State the:

(a) Genotypes of the P_1 -parents (2)

(b) Phenotypes of the F_1 -generation (2)

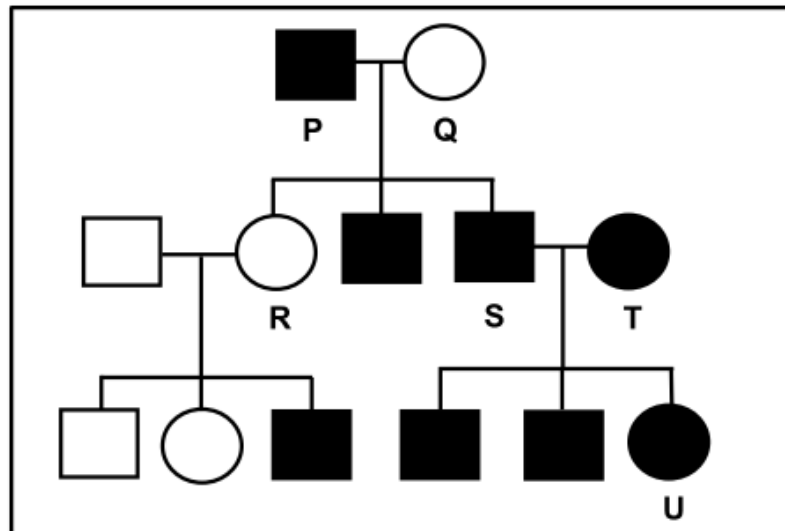
2.5.2 Two plants that are heterozygous for both characteristics were crossed.

(a) Give ALL the possible genotypes in the **gametes** that will be formed. (2)

(b) How many plants in the next generation are likely to have yellow and oval fruit? (1)

2.5.3 Give the possible genotypes of both parents that must be crossed if a farmer wants summer squash that are white with oval fruit only. (2)
(9)

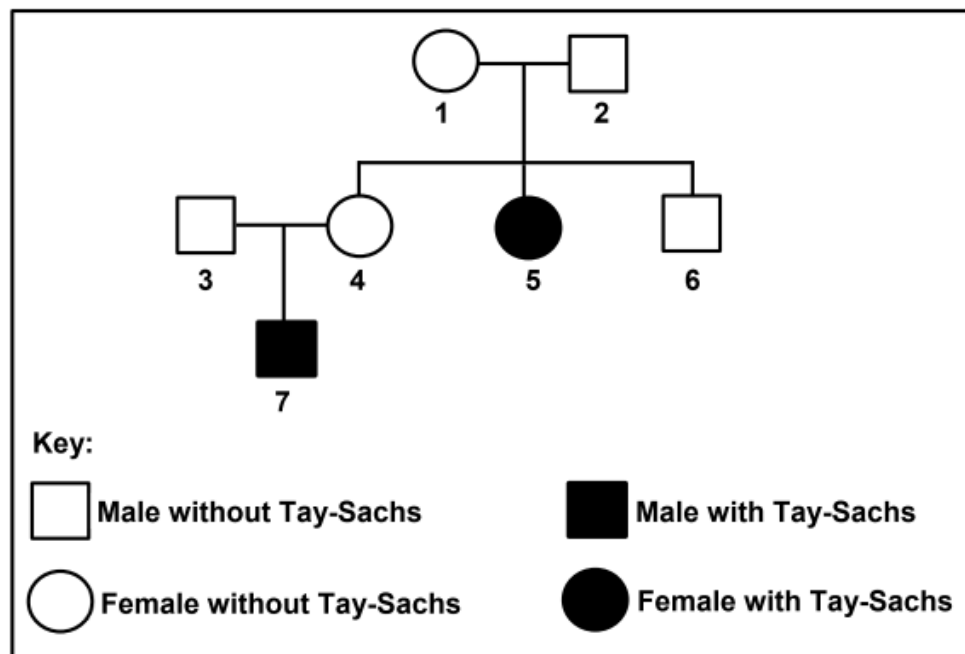
- 1.5 Haemophilia is a sex-linked recessive trait (X^h). The pedigree diagram below shows the inheritance of haemophilia in a family.



- 1.5.1 State what is represented by the squares on a pedigree diagram. (1)
- 1.5.2 State the number of:
- (a) Generations represented in this pedigree diagram (1)
 - (b) Offspring of individuals **P** and **Q** (1)
- 1.5.3 Give the:
- (a) LETTERS only, of females who have haemophilia (2)
 - (b) Genotype of individual **R** (2)
- (7)**

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- 2.5 The diagram below shows the inheritance of Tay-Sachs, a rare disease which leads to the destruction of neurons. It is inherited as an autosomal disorder, controlled by two alleles, **(T)** and **(t)**.



- 2.5.1 Describe what is meant by an *autosomal disorder*. (2)
- 2.5.2 How many sons do individuals **1** and **2** have? (1)
- 2.5.3 Using individuals **3**, **4** and **7**, explain why it can be concluded that Tay-Sachs disease is controlled by a recessive allele. (5)
- 2.5.4 Individuals **1** and **2** can produce children with three possible genotypes.
List ALL the genotypes that have a 25% chance of being produced. (2)
(10)

2.6 In humans, haemophilia is caused by a recessive allele on the X-chromosome (X^h).

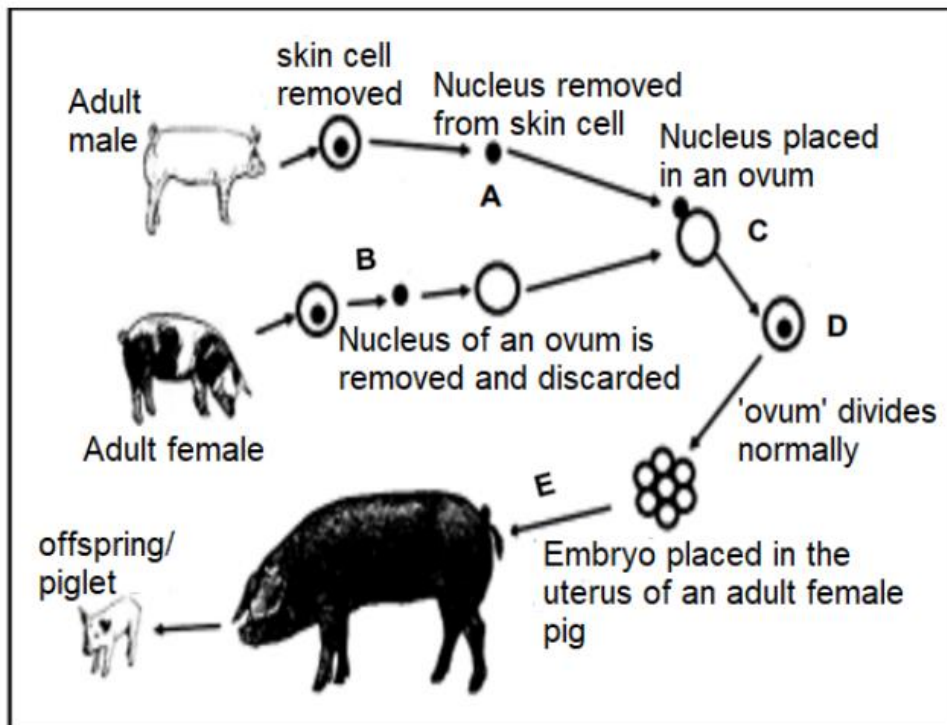
A woman, who is heterozygous for haemophilia, marries a man with haemophilia.

Use a genetic cross to show the percentage chance of the couple having a *daughter* who is homozygous for normal blood clotting.

(7)

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- 1.5 The diagram below shows a genetic engineering process. A donor cell was taken from the skin cell of a male pig to create a new offspring.

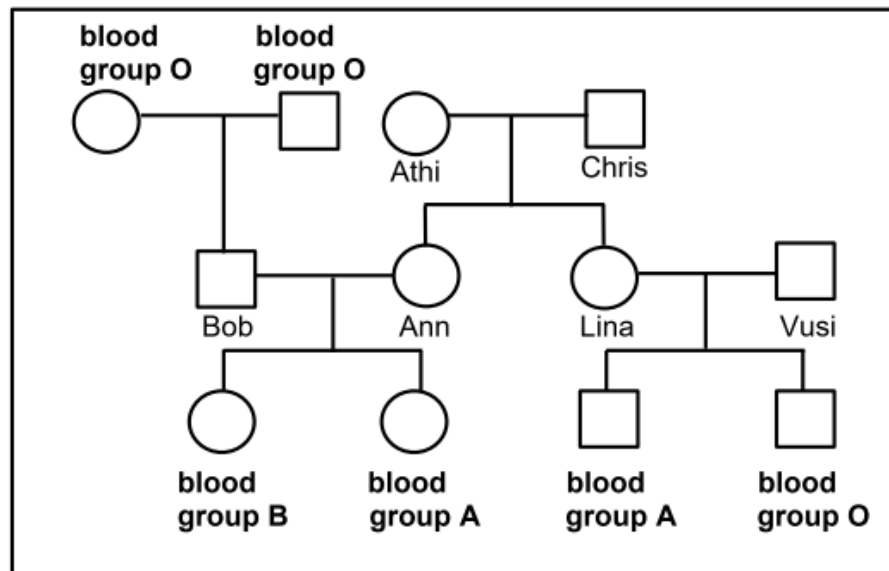


- 1.5.1 Name the genetic engineering process shown in the diagram above. (1)
- 1.5.2 State TWO advantages of the process mentioned in QUESTION 1.5.1 in agriculture. (2)
- 1.5.3 Name the type of cell division through which:
- (a) Cell **D** divides (1)
 - (b) Ovum **B** is produced (1)
- 1.5.4 A somatic cell in a pig contains **38** chromosomes.
- How many chromosomes would there be in:
- (a) Structure **A** (1)
 - (b) A skin cell in organism **E** (1)

NOV 23

NOV 23

- 1.4 The diagram below shows the inheritance of blood groups in a family.

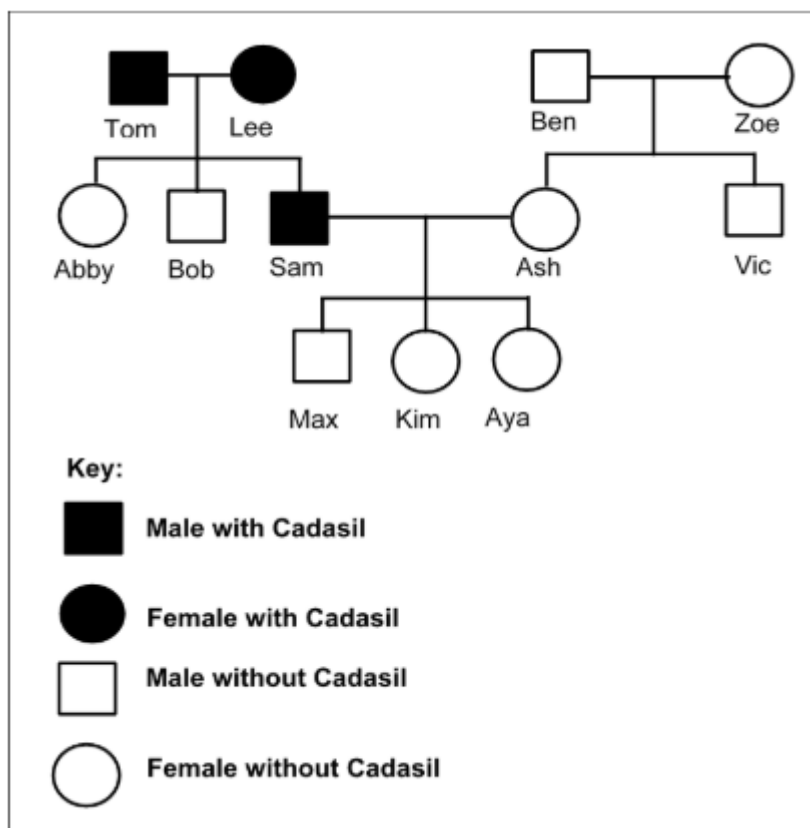


- 1.4.1 Name the type of diagram shown. (1)
- 1.4.2 Give the number of alleles that control blood groups. (1)
- 1.4.3 How many generations are represented in the diagram? (1)
- 1.4.4 Lina's genotype is $I^A i$.
State ALL the possible genotypes of Vusi. (2)
- 1.4.5 Give the genotype of Bob. (1)
- 1.4.6 Give the name of the individual which displays co-dominance. (2)
- (8)**

EC JUNE 23

- 2.5 Cadasil is an inherited disorder which leads to the weakening of blood vessels in the brain. It is caused by a dominant allele (**D**).

The pedigree diagram shows the inheritance of Cadasil in a family.



- 2.5.1 (a) State what a dominant allele is. (1)
- (b) Give evidence from the pedigree diagram that Cadasil is caused by a dominant allele. (1)
- 2.5.2 (a) Is Sam homozygous or heterozygous for the Cadasil allele? (1)
- (b) Give evidence from the diagram for your answer to QUESTION 2.5.2 (a). (1)
- 2.5.3 Sam and Ash are planning to have another baby.
- Use a genetic cross to find the percentage chance that the new baby will develop into a person with Cadasil. (6)

2.6 Read the passage below and answer the questions that follow.

Scientists are trying to develop treatment for Cadasil by using stem cells.

Specially treated stem cells would be injected into the damaged part of the brain. Embryonic stem cells can be obtained by removing a few cells from a human embryo. Scientists have discovered how to change adult skin cells into stem cells.

- 2.6.1 Why would scientists use stem cells in the treatment of Cadasil? (3)
- 2.6.2 Suggest ONE advantage of using stem cells from adult skin cells than from embryos. (1)

NW SEPT 24

2.3 There are four blood groups in humans.

Blood group A, B, AB and O are regarded as phenotypes.

- 2.3.1 Explain why blood groups are controlled by multiple alleles. (2)
- 2.3.2 How many of these alleles can an individual inherit in the genotype? (1)
- 2.3.3 Explain the role of blood grouping in paternity testing. (2)
- (5)

MP SEPT 24

2.4 Blood groups are controlled by multiple alleles.

2.4.1 How many alleles for blood groups does an individual have? (1)

2.4.2 Write down all the possible alleles. (2)

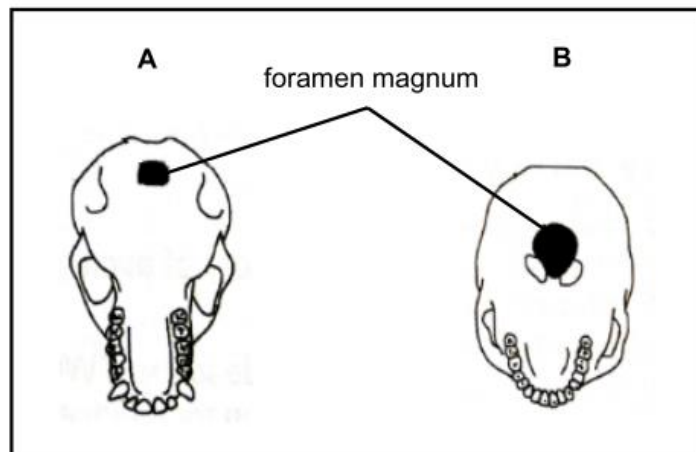
2.4.3 Explain how these alleles through different genetic dominances form four different blood groups. (5)
(8)

EVOLUTION

MAY/JUNE 22

QUESTION 3

3.1 Diagrams **A** and **B** show the ventral (bottom) view of the skulls of two organisms. The diagrams are NOT drawn to scale.



3.1.1 Which diagram represents the skull of a bipedal organism? (1)

3.1.2 Give ONE visible reason for your answer to QUESTION 3.1.1. (2)

3.1.3 Tabulate TWO visible differences between the upper jaws in diagrams **A** and **B** that represent trends in human evolution. (5)

3.1.4 Explain the significance of the shape of the spine that is associated with the skull in diagram **B**. (2)
(10)

- 3.3 A population of lizards on an island, Island **A**, were well suited to feed mainly on insects. Scientists moved five adult pairs of this lizard species to a neighbouring island, Island **B**. Here they reproduced and a new population formed. Island **B** has a large supply of plants with tough fibrous leaves and fewer insects. Exposure to this new environment may have caused the lizards to undergo evolution.

Thirty-six years later, scientists returned to Island **B** to conduct further investigations on the lizard population there. They observed that the jaw size of the lizards had increased. Scientists also analysed the stomach content of the lizards and found that it was mainly plant-based. They also confirmed that the two populations still belong to the same species.

- 3.3.1 Describe how the scientists could confirm that there was a change in jaw size between the lizards of Island **A** and the lizards of Island **B**. (3)
- 3.3.2 Explain how the larger jaws of the lizards on Island **B** would be structurally suited to eat tough fibrous leaves. (3)
- 3.3.3 How did the scientists determine that the two populations of lizards on both islands still belong to the same species? (2)
- 3.3.4 Explain the possible effect that the evolution of the lizards has on biodiversity. (2)
- 3.3.5 Use Darwin's theory of natural selection to explain the evolution of lizards with larger jaws. (7)
- (17)
- 3.4 The 'Out of Africa' hypothesis is one explanation of the evolution of modern humans.
- 3.4.1 State the 'Out of Africa' hypothesis. (2)
- 3.4.2 Name the family to which modern humans belong. (1)
- 3.4.3 What genetic evidence is used to support the 'Out of Africa' hypothesis? (1)
- 3.4.4 Describe how fossil evidence is used to support the 'Out of Africa' hypothesis. (4)
- (8)

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- 3.5 Fossil evidence is used to support the 'Out-of-Africa' hypothesis.
- 3.5.1 State the 'Out-of-Africa' hypothesis. (2)
- 3.5.2 Describe how fossil evidence is used to support the 'Out-of-Africa' hypothesis. (6)
- (8)

NW SEPT 24

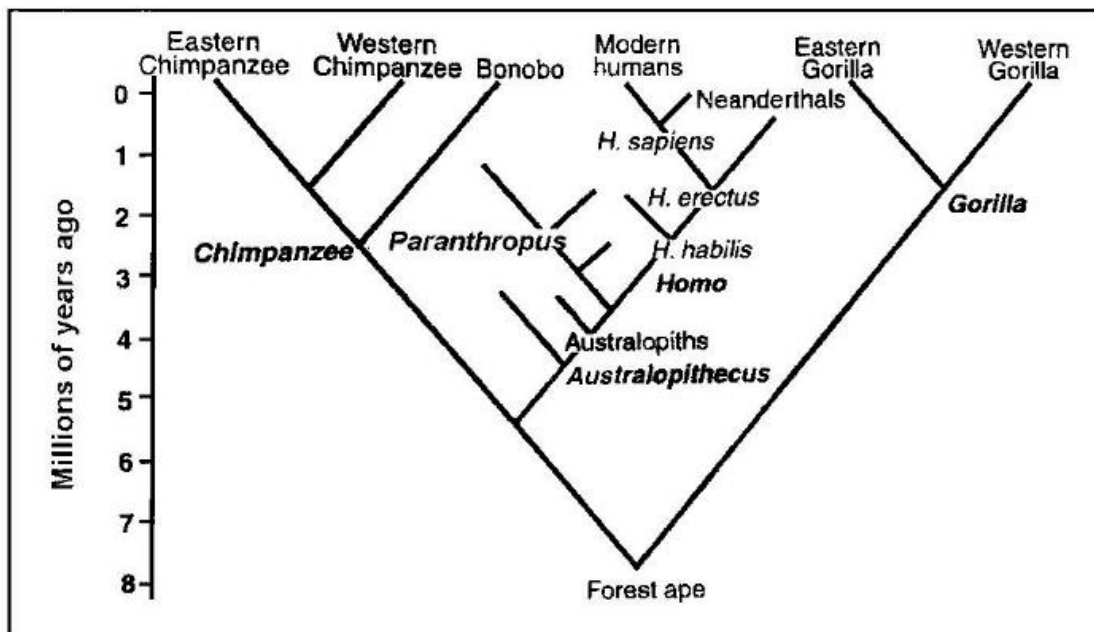
- 2.2 Lamarck's theory of evolution is based on TWO Laws or Principles.

The **Law of use and disuse** and the **Law of inheritance of acquired characteristics**

- 2.2.1 Explain the Law of inheritance of acquired characteristics according to Lamarckism. (2)
- 2.2.2 Explain why Lamarck's ideas are NOT accepted in the science community today. (2)
- ...

MP SEPT 24

- 1.4 The diagram below shows the suggested phylogenetic tree of human evolution.



- 1.4.1 Identify the family represented in the phylogenetic tree. (1)
- 1.4.2 Give the name of the most recent relative of modern humans. (1)
- 1.4.3 Approximately how long ago did the hominin line branch off from that of the chimpanzee. (1)
- 1.4.4 Give the common name of the species *H. habilis*. (1)
- 1.4.5 Name THREE genera represented in the diagram. (3)
(7)

MP SEPT 24

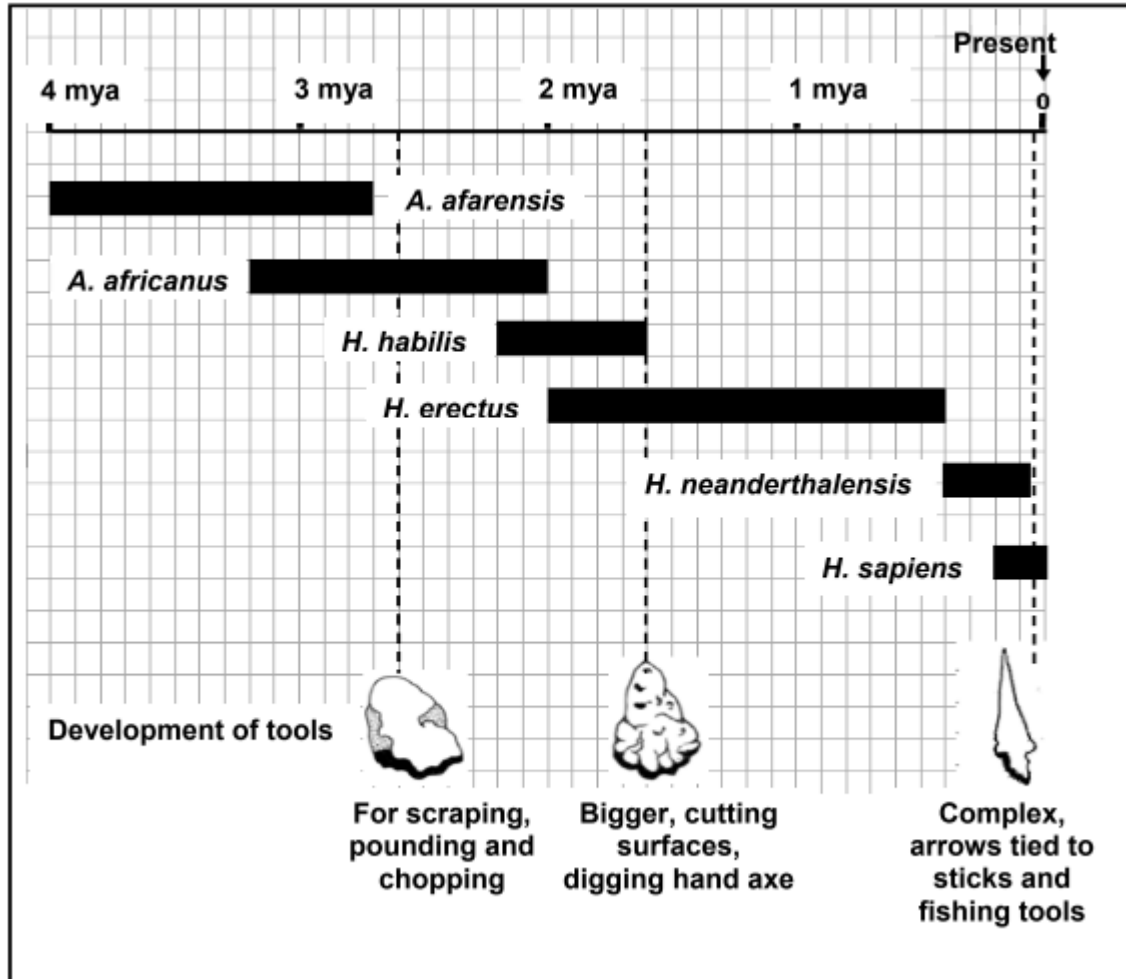
- 3.2 The development of new species is referred to as speciation.
Describe the process of speciation through geographic isolation. (7)

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- 3.2 Describe Darwin's theory of evolution by natural selection. (7)
- 3.4 Human ancestry can be traced back to Africa, with various fossils found in South Africa.
 - 3.4.1 Name the theory mentioned above. (1)
 - 3.4.2 Which lines of evidence can be used to support this theory mentioned in QUESTION 3.4.1? (2)
 - 3.4.3 What is the series of fossil sites collectively called where Mrs Ples was found? (1)
 - 3.4.4 To which genus does Mrs Ples belong? (1).
 - 3.4.5 Give the names of TWO other fossils found in South Africa that belongs to the same genus as Mrs Ples. (2)
(7)

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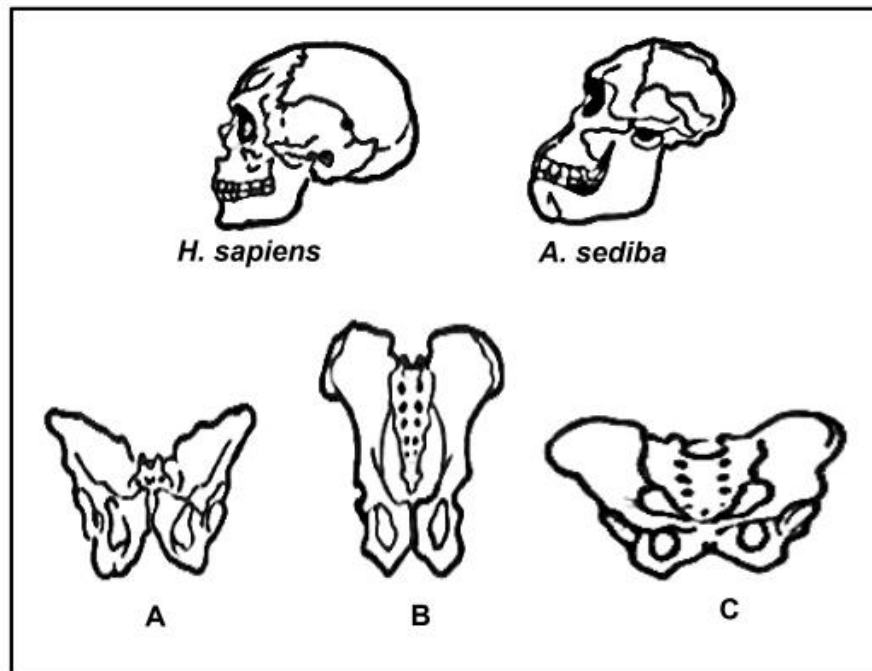
- 3.4 The diagram below shows a timeline of different hominid species and the development of tools.



- 3.4.1 Which species in the diagram above existed/survived for the longest period of time? (1)
- 3.4.2 Calculate the period (million years) in which the *A. afarensis* and *A. africanus* coexisted. Show ALL working. (2)
- 3.4.3 Name the species that was also known as the handyman. (1)
- 3.4.4 State TWO uses of the tool that was developed 2,6 mya. (2)
- 3.4.5 Identify TWO species that used the most complex tools. (2)
- 3.4.6 Explain how the changes in brain size over time relates to the development of tools. (3)

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3.5 The diagrams below show the skulls and pelvises of different hominids.

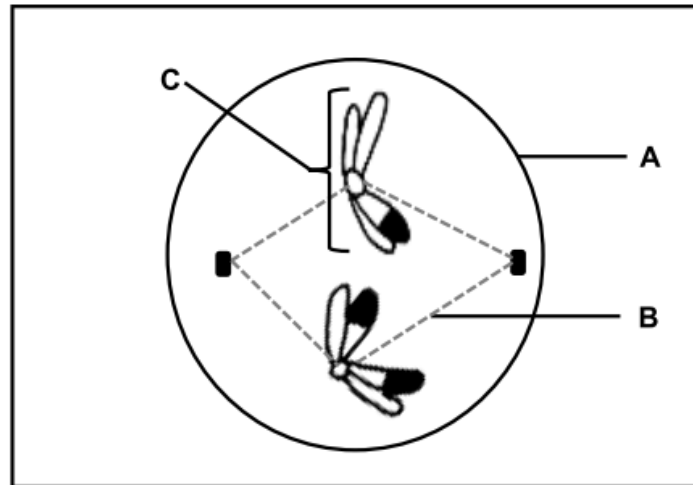


- 3.5.1 State the genus name of *A. sediba*. (1)
- 3.5.2 Describe the shape of the spine of *H. sapiens*. (1)
- 3.5.3 *A. sediba* is thought to be a transitional species.
State what is meant by a *transitional species*. (2)
- 3.5.4 Give the LETTER of the pelvis that would be representative of *A. sediba*. (1)
- 3.5.5 Explain your answer to QUESTION 3.5.4. (2)
- 3.5.6 Explain the significance of the change in prognathism from *A. sediba* to *H. sapiens*. (5)
- (12)

MEIOSIS

MAY/JUNE 22

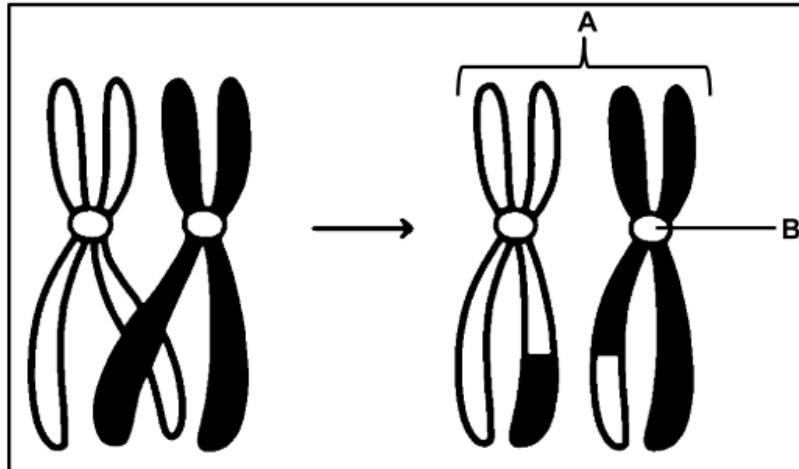
2.1 The diagram below represents one cell in a phase of meiosis.



- 2.1.1 Identify the phase of meiosis shown. (1)
- 2.1.2 Give ONE observable reason for your answer to QUESTION 2.1.1. (2)
- 2.1.3 Identify structure:
- (a) **A** (1)
- (b) **B** (1)
- 2.1.4 Describe the role of part **B** in the movement of chromosomes during meiosis. (2)
- 2.1.5 Draw a labelled diagram of structure **C** as it would appear in the final phase of this meiotic division. Show the correct shading. (4)
- (11)**

EC JUNE 23

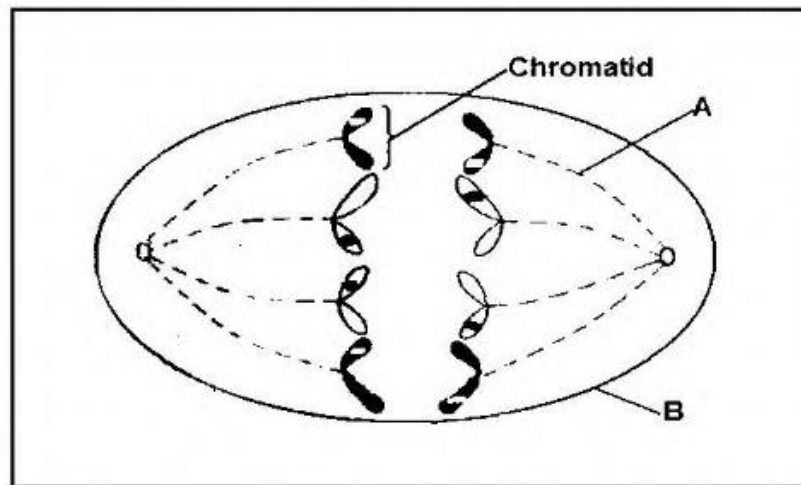
- 2.3 The diagram below is a representation of chromosomes during and after a certain process during meiosis.



- 2.3.1 Name the process represented above. (1)
- 2.3.2 Identify part **A**. (1)
- 2.3.3 Give ONE function of part **B**. (1)
- 2.3.4 Describe the behaviour of chromosomes during the process mentioned in QUESTION 2.3.1. (3)
- 2.3.5 Explain ONE significance of the process shown. (2)

NW SEPT 24

2.1 The diagram below represents an animal cell in a phase of meiosis.



2.1.1 Name structure:

(a) **A** (1)

(b) **B** (1)

2.1.2 Identify the phase represented in the diagram above. (1)

2.1.3 Give a reason for your answer to QUESTION 2.1.2. (2)

2.1.4 Which phase occurred before to the one represented in diagram? (1)

2.1.5 Explain the consequences if the process, causing variation, did not occur between chromatids from the cell above. (3)

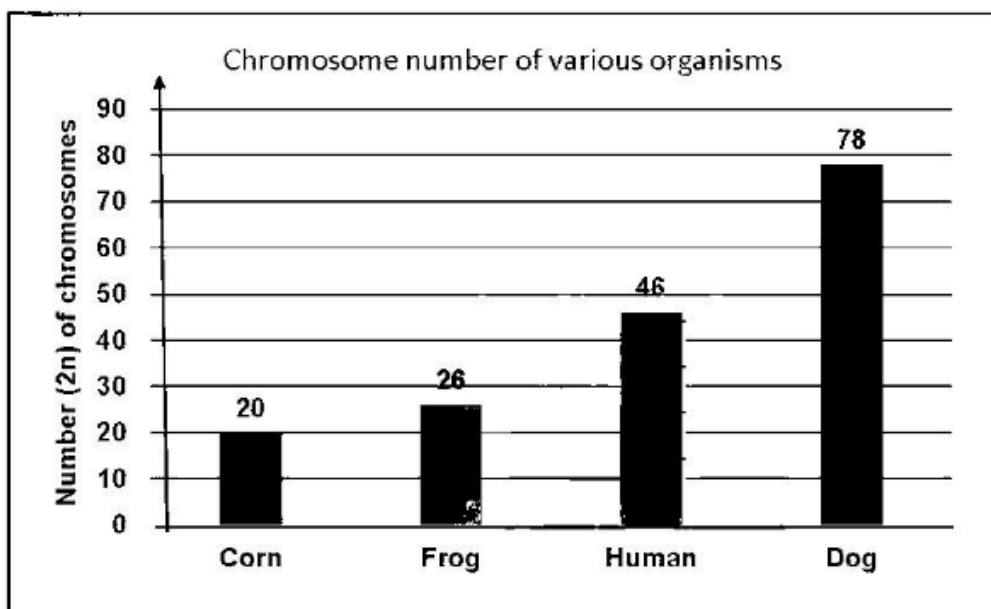
2.1.6 How many cells will be formed at the end of this cell division? (1)

2.1.7 Tabulate TWO differences between Meiosis I and Meiosis II (5)
(15)

MP SEPT 24

QUESTION 2

- 2.1 The graph below shows the chromosome number in each somatic cell of four different organisms.

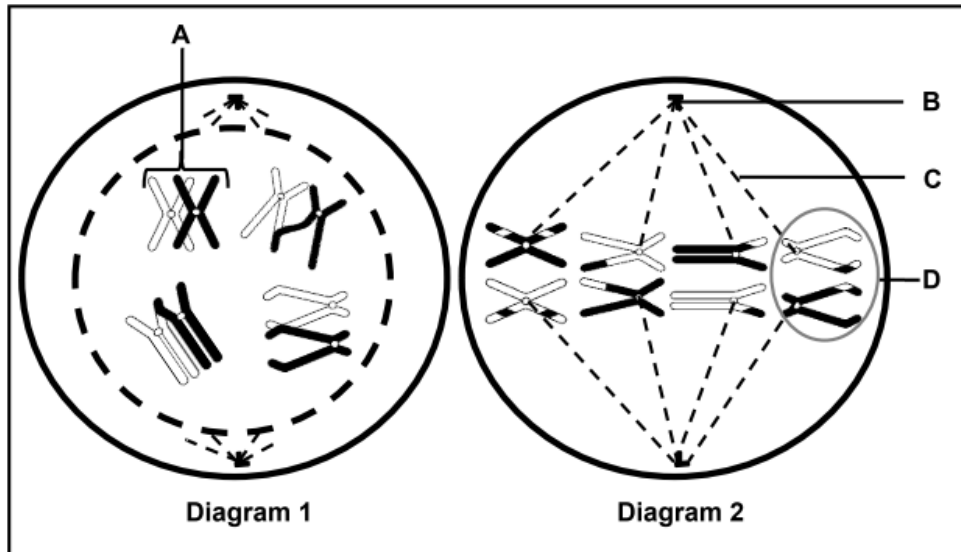


- 2.1.1 Describe what is meant by somatic cells. (1)
- 2.1.2 How many chromosomes will be present in:
- (a) Frog cells during telophase I in meiosis (1)
 - (b) Stem cells of human (1)
- 2.1.3 Which organism has **10** chromosomes in one of its gametes? (1)
- 2.1.4 Name the male organ where the gametes are produced in QUESTION 2.1.3. (1)
- 2.1.5 Name and describe the phase of meiosis where the halving of chromosomes number begins. (4)
- 2.1.6 Explain why an ovum of a dog has **39** chromosomes. (4)
- 2.1.7 Explain ONE way in which this process is biologically important. (2)
- (15)**

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QUESTION 2

2.1 The diagrams below represent two stages of meiotic cell division.



2.1.1 Name structure:

(a) **B** (1)

(b) **C** (1)

2.1.2 Identify the phase represented in Diagram 1. (1)

2.1.3 Give THREE reasons for your answer to QUESTION 2.1.2. (3)

2.1.4 Describe the process taking place at **A**. (3)

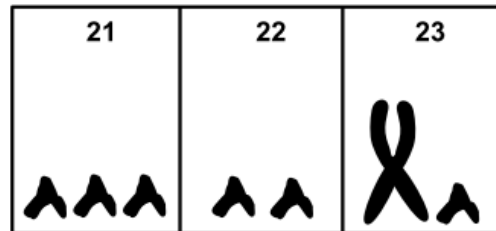
2.1.5 (a) Identify the phase represented in Diagram 2. (1)

(b) Describe the difference in the events that take place in the phase mentioned in (a) and the same phase during mitosis. (2)

2.1.6 Describe the results at the end of meiosis if the chromosomes at **D** failed to separate. (3)
(15)

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- 1.5 The diagram below represents part of an abnormal human karyotype.



- 1.5.1 How many autosomes are shown in the diagram? (1)
- 1.5.2 Name the type of chromosomes represented by pair **23**. (1)
- 1.5.3 Name the:
- (a) Disorder represented in the diagram (1)
 - (b) Process during anaphase of meiosis that resulted in the abnormal number of chromosomes in this karyotype (1)
- 1.5.4 State the gender of the person represented in this karyotype. (1)
- (5)**