



education

MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

GRADE 12

LIFE SCIENCES

PAPER 2

EASY TO SCORE MARKS

CONTENT MANUAL



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STRUCTURE OF EXAM QUESTION PAPERS: GRADE 12		
PAPER	TOPIC	DURATION
PAPER 1	<ul style="list-style-type: none"> • Reproduction in vertebrates • Human reproduction • Responding to the environment (Humans) • Responding to the environment (Plants) • Endocrine system and Homeostasis (Humans) 	2,5 HRS
PAPER 2	<ul style="list-style-type: none"> • DNA: Code of Life • Meiosis • Genetics and Inheritance • Evolution 	2,5HRS

Weighting of topics per paper: Grade 12

PAPER 1	MARK ALLOCATION	WEIGHTING (%)
Reproduction in vertebrates	8	5%
Human Reproduction	41	27%
Responding to the environment (Humans)	54	36%
Responding to the environment (Plants)	13	9%
Endocrine System and Homeostasis	34	23%
TOTAL	150	100%
PAPER 2		
DNA: Code of Life	27	18%
Meiosis	21	14%
Genetics and Inheritance	48	32%
Evolution	54	36%
TOTAL	150	100%

COGNITIVE LEVELS

COGNITIVE LEVELS	WEIGHTING	APPROXIMATE NUMBER OF MARKS IN A 150-MARK PAPER
A (KNOWLEDGE)	40%	60
B (COMPREHENSION)	25%	37,5
C (APPLICATION)	20%	30
D (ANALYSIS, SYNTHESIS AND EVALUATION)	15%	22,5
TOTAL	100%	150 MARKS

FORMAT OF THE QUESTION PAPER

SECTION	TYPES OF QUESTIONS	MARKS
A	Short answer questions such as multiple-choice questions, terminology, matching items, diagrams (identifying/labelling parts and the functions of the parts thereof)	50 marks
B	A variety of question types: Two questions of 50 marks each, divided into a number of subquestions. Each may be further divided	2x50= 100 marks

EASY TO SCORE QUESTIONS (P1 & P2)

45 MARKS PER PAPER (NOMA KANJANI/ GUARANTEED/GEWAARBORG)

SECTION A

QUESTION 1

SUB-QUESTION	TYPE OF QUESTION	Max marks
1.1	Multiple choice questions	20 marks (2 x 10)
1.2	Biological terms (terminology)	10 marks (1 x 10)
1.3	Match items	06 marks (2 x 3)
1.4	Diagram (labels and functions)	07 marks
1.5	Diagram (labels and functions)	07 marks
	TOTAL	50 marks

Skills to master Section A

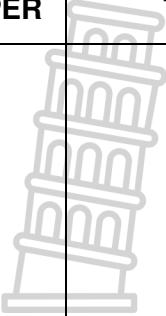
Sub question	KEY POINTS TO FOCUS ON DURING REVISION	
1.1	Multiple choice question (MCQ):	<ul style="list-style-type: none"> • Assesses questions mostly in cognitive levels A & B • Through scaffolding, 2 or 3 questions will be on levels C or D • No unanswered question • Thorough content knowledge required • Read the stem/ question with understanding • Identify the 2 distractors and eliminate them • Go back to the stem or question and identify the key word • Choose the most correct answer
1.2	BIOLOGICAL TERMS	<ul style="list-style-type: none"> • Can only be mastered through practice • Know every term relating to a particular topic • Practice as often as possible in order to perfect their spelling skills • Know the simple English meanings of biological terms that comprises of more than one syllable, and relate the meaning to the description given
1.3	MATCHING ITEMS	<ul style="list-style-type: none"> • Same as strategies for mastering terminology • No unanswered question • Adherence to the instruction when choosing options (e.g., A only, B only, Both A and B or None) also learners must stick to the uppercases of the letters as per the instruction.
1.4 & 1.5	DIAGRAMS	<ul style="list-style-type: none"> • Know the name of the diagram, parts associated with the diagram and the functions of the parts.

SECTION B

QUESTION 2 AND 3 (GENERIC QUESTIONS TO OBTAIN MARKS)

<p>P1 & P2 SKILLS</p>	<p>Drawing a: Line graph Bar graph Histogram Pie chart</p>	<ul style="list-style-type: none"> • The caption must have two variables • Labels of X and Y-axes and units where necessary • Scale: Equal spaces between units on axes which are in chronological order • Plotting (points of intersections clearly indicated) • Equal width of the bars and between bars • Pie chart must show calculations and a compass & protractor must be used
	<p>Drawing a: Table Diagram with labels</p>	<ul style="list-style-type: none"> • Table must be drawn with clear columns and related items must be compared • Caption of the table • Headings of rows and columns • Drawing must be in pencil with a definite heading/caption and label lines must point to the exact part and the labels written in pen



PAPER	TOPIC	CONTENT	KEY POINTS TO FOCUS ON DURING REVISION
		<p>Answering: Scientific investigative questions</p>	<ul style="list-style-type: none"> • Use the aim of the investigation to determine the dependent and independent variables which is not always the same as the labels on a graph or table • Formulate an aim with both dependent and independent variables bearing in mind the opening statement of the investigation • Planning steps and precautions to be taken before/ during the investigation • Reliability – repeat the investigation and increase the sample size (learners need to be specific if in this question, the sample size and how many times was the investigation done) • Validity – keep the variables constant e.g., same age, gender, environmental conditions etc. • Take into consideration the tense when answering question based on reliability and validity • Control – to compare results and ensure that the results are due to the factor that is tested
		<p>Paragraph questions (Processes)</p>	<ul style="list-style-type: none"> • Read each question with understanding and take note of the total value of the sub-questions
		<p>Interpreting: Extracts</p>	<ul style="list-style-type: none"> • Read the questions with understanding and link it with known content topics
		<p>Do calculations</p>	<ul style="list-style-type: none"> • Be able to do simple calculations • Pay attention on how to calculate the percentage, percentage increase/decrease, sums, differences and averages

PAPER 2 CONTENT

DNA: CODE OF LIFE (27 MARKS)

KEY TERMINOLOGY

	DESCRIPTION	TERMINOLOGY
1.1.1	The organelle in the cytoplasm which is the site of protein synthesis	
1.1.2	The name of the bond that forms between amino acids in a protein	
1.1.3	The process by which a DNA molecule makes identical copies of itself	
1.1.4	The type of nucleic acid that carries a specific amino acid	
1.1.5	Nitrogenous base found only in RNA molecules	
1.1.6	A sugar molecule found in a nucleotide of DNA	
1.1.7	The bond that forms between two amino acids	
1.1.8	The bonds between nitrogenous bases in a DNA molecule	
1.1.9	The cell organelle to which mRNA attaches during protein synthesis	
1.1.10	the monomer which forms DNA and RNA	
1.1.11	Building block of polymers	
1.1.12	DNA found in the nucleus	
1.1.13	DNA found outside of the nucleus: mitochondrial and chloroplastic DNA.	
1.1.14	the shape of DNA consists of two strands joined together and twisted spirally	
1.1.15	carries the code for protein synthesis from DNA to the ribosome	
1.1.16	brings amino acids to the ribosome to form the protein	
1.1.17	monomers of proteins	
1.1.18	three nitrogenous bases one after the other on DNA	
1.1.19	1 st stage of protein synthesis – mRNA formed from DNA carrying code for the protein to be made	
1.1.20	2 nd stage of protein synthesis – amino acids combine to form a protein	
1.1.21	three nitrogenous bases one after the other on mRNA – these are complementary to the triplet on DNA	
1.1.22	three nitrogenous bases one after the other on tRNA – these are complementary to the codon on mRNA	
1.1.23	Proteins that form part of the chromosomes.	

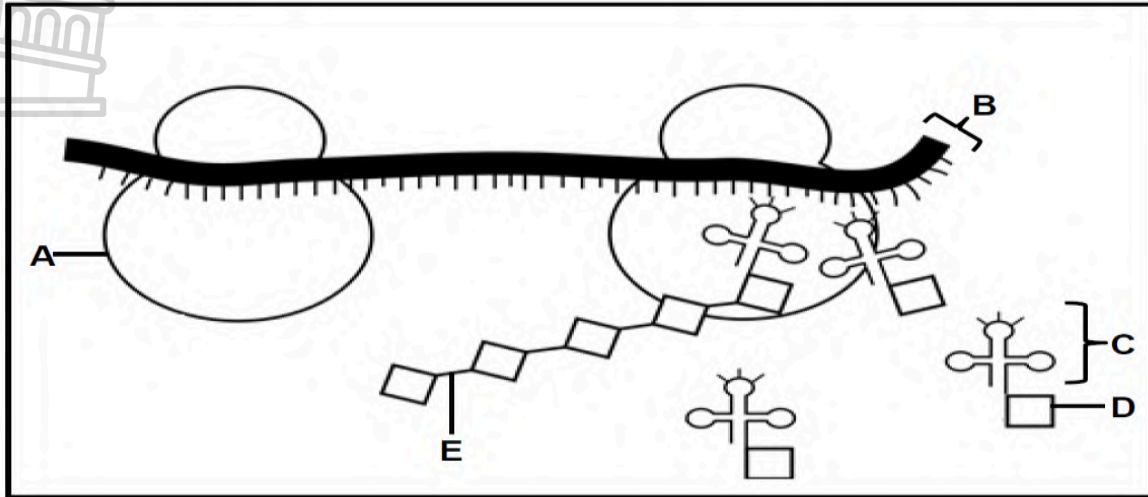
1.1.24	Which type of RNA travels from the nucleoplasm to the cytoplasm.	
1.1.25	A sugar that is a component of DNA.	
1.1.26	A sudden change in the sequence / order of the nitrogenous bases of a nucleic acid.	
1.1.27	The name of the bond that forms between amino acids in a protein molecule.	
1.1.28	The type of nucleic acid that carries a specific amino acid.	
1.1.29	A segment of DNA coding for a particular characteristic.	
1.1.30	The bonds that form between nitrogenous bases in a DNA,	
1.1.31	The organelle in the cytoplasm on which protein synthesis occurs.	
1.1.32	The process where the DNA molecule makes an exact copy of itself.	

KEY POINTS TO FOCUS ON:

- Use diagrams to identify the natural shape of each nucleic acid and arrangement of nucleotides
- DNA replication and importance: DESCRIBE THE CORRECT SEQUENCE
- Structure of a nucleotide: Identify parts/draw
- Tabulate differences between DNA and RNA (Target 3): Draw table with columns and rows and include correct headings at the correct places: NB: distinguished when asked only nucleotides or the complete structure
- Transcription and Translation: MEMORIZE WITH SEQUENCE
- Attempt the one-word answers on transcription and translation diagrams
- The role of DNA and RNA in protein synthesis
- Interpretation of diagrams of DNA profiling
- Refer to DNA profile bars or DNA bars and NOT just black bars or just DNA, e.g., **DNA profile bars of SUSPECT A compare with the DNA profile bars of the blood on the glass**
- Uses of DNA profiling
- Uses for or against DNA profiling

ACTIVITY 1

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



1.1.1 Identify the process above. (1)

1.1.2 Identify:

(a) Organelle **A** (1)

(b) Molecule **B** (1)

(c) The bond at **E** (1)

1.1.3 Give only the LETTER of the molecule that:

(a) Carries the amino acid (1)

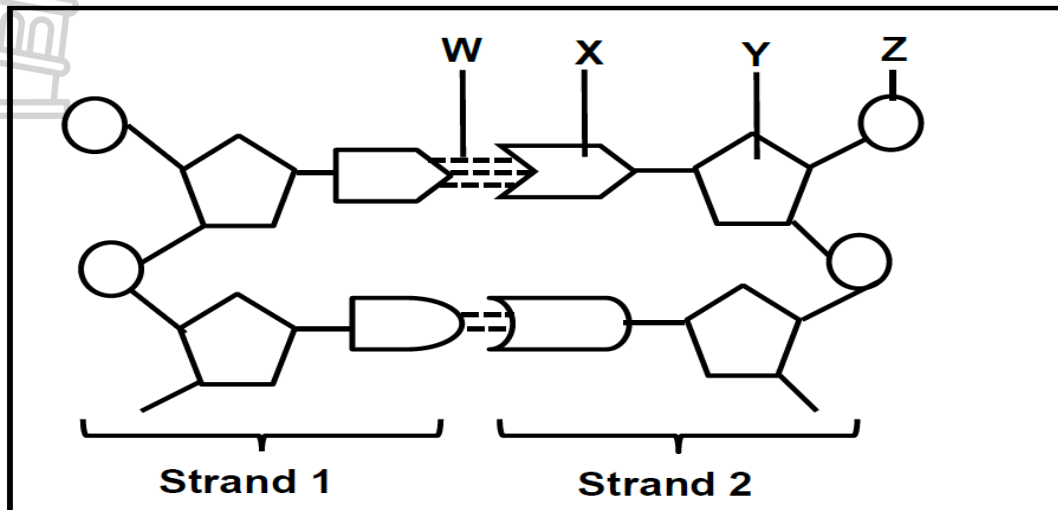
(b) Is copied from DNA (1)

(c) Is the monomer/building block of proteins (1)

(7)

ACTIVITY 2

1.2 The diagram below represents part of a DNA molecule.



- 1.2.1 (a) Molecule **X** (1)
(b) Sugar at **Y** (1)
(c) Bond **W** (1)
- 1.2.2 Give the collective name of parts **X**, **Y** and **Z**. (1)
- 1.2.3 State the natural shape of the DNA molecule. (1)
- 1.2.4 Name the process whereby DNA makes a copy of itself. (1)
- 1.2.5 Name TWO places in an animal cell where DNA is located. (2)
- (8)**

MEIOSIS (21 MARKS)

	DESCRIPTION	TERMINOLOGY
1.1.1	A threadlike structure made up of DNA and protein found in the nucleus of most living cells, carrying genetic information in the form of genes	
1.1.2	One of the two identical strands of a replicated chromosome	
1.1.3	Region where the two chromatids of a chromosome are held together	
1.1.4	A pair of chromosomes of the same shape, size and having similar genes for each characteristic occupying the same position	
1.1.5	A pair of homologous chromosomes which lie next to each other and are physically in contact with each other at a point where crossing over will occur	
1.1.6	An unreplicated "chromosome" has a single double-stranded DNA molecule	
1.1.7	A replicated "chromosome" has two identical double-stranded DNA molecules	
1.1.8	The phase in the cell cycle when DNA replication occurs	
1.1.9	Two complete set of chromosomes in a cell	
1.1.10	One complete sets of chromosomes in a cell	
1.1.11	A segment of DNA in a chromosome that contains the code for a particular characteristic	
1.1.12	Organelle (containing two centrioles) found only in animal cells	
1.1.13	Structures formed when the centrosome divides into two; they move to opposite ends of the cell during cell division	
1.1.14	Overlapping of homologous chromosomes resulting in the exchange of genetic material during Prophase I	
1.1.15	point where two chromatids overlap during crossing over	
1.1.16	A representation of the number, shape and arrangement of a full set of chromosomes in the nucleus of a somatic cell	
1.1.17	The first 22 pairs of chromosomes which control the appearance, structure and functioning of the body	
1.1.18	The pair of chromosomes (XX or XY) responsible for sex determination	
1.1.19	Any cells in an organism excluding male and female gametes – they are diploid (have 2 sets of chromosomes) and are produced through mitosis	
1.1.20	Specialized cells called gametes (sperm cell and egg cell). They have a haploid number of chromosomes and are produced through meiosis	
1.1.21	The process of division of the nucleus of a cell	
1.1.22	Is the process of division during which the cytoplasm of a single cell divides into two daughter cells.	

KEY POINTS TO FOCUS ON

Identify the **MAIN** characteristics of each phase

- Explain crossing over - homologous chromosomes form bivalent and NOT chromosomes only
- The process using diagrams with labels

Significance of meiosis:

- Production of haploid gametes
- The halving effect of meiosis overcomes the doubling effect of fertilisation, thus maintaining a constant chromosome number from one generation to the next
- Mechanism to introduce genetic variation through crossing-over and random arrangement of chromosomes on the equator
- Identify the main characteristics of each phase
- Explain crossing over where homologous chromosomes forms bivalent chromosomes NOT just chromosomes
- The process of crossing over using diagrams with labels

Differences between meiosis I and meiosis II and similarities between mitosis and meiosis

- Especially in the different phases.
- e.g., In metaphase I chromosome pairs align and in metaphase II single chromosomes align

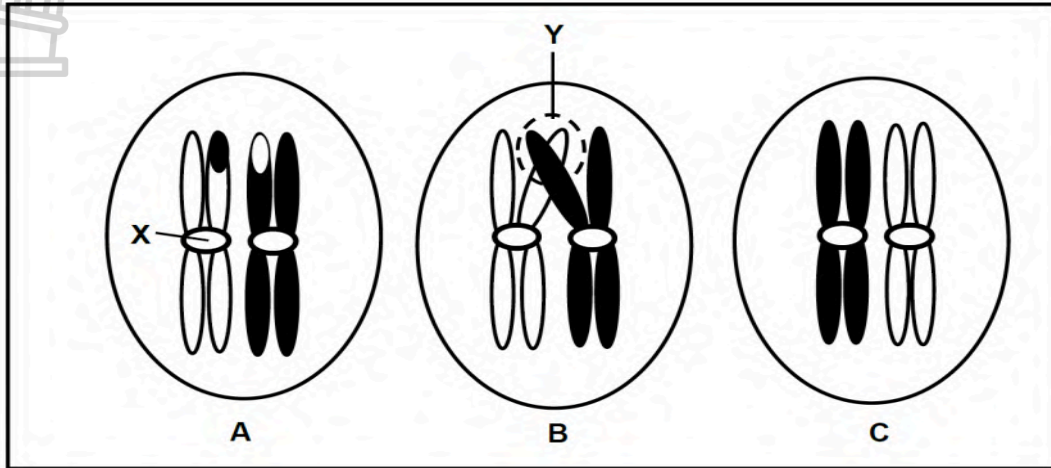
Abnormal meiosis: Non-disjunction & Down syndrome

- Non-disjunction of chromosomes at position 21 during Anaphase in humans to form abnormal gametes with an extra copy of chromosome 21



ACTIVITY 1

2.1 The diagrams below represent a chromosome pair in a female human cell. The cells (**A**, **B** and **C**) show different events in a phase of meiosis, which are not necessarily in the correct sequence.

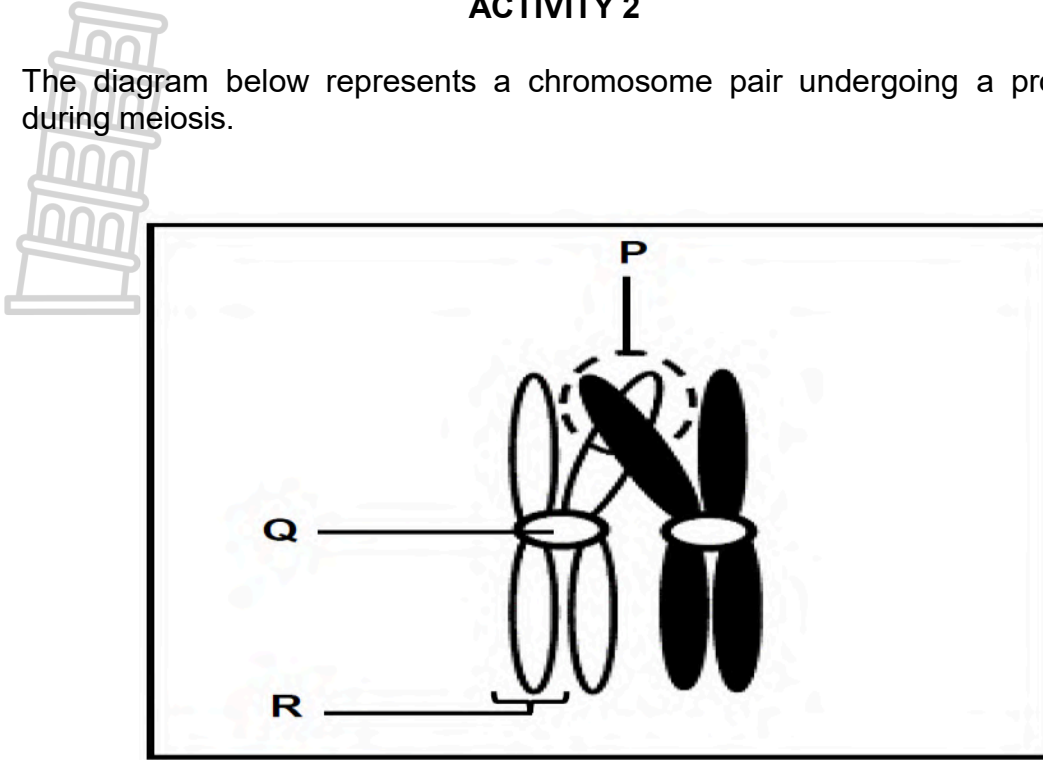


- 2.1.1 How many pairs of chromosomes occur in a normal human cell? (1)
- 2.1.2 Give labels for:
 - (a) Structure **X** (1)
 - (b) Area **Y** (1)
- 2.1.3 Name the organ in the human female where meiosis occurs. (1)
- 2.1.4 Name the:
 - (a) Process occurring in diagram **B** (1)
 - (b) Phase represented by the diagrams above (1)
 - (c) Type of cells that would result from meiosis of this cell (1)
- 2.1.5 Arrange the letters **A**, **B** and **C** to show the correct sequence of the events. (1)

(8)

ACTIVITY 2

2.2 The diagram below represents a chromosome pair undergoing a process during meiosis.



2.2.1 Name the:

- (a) Organ in the human male where meiosis occurs (1)
- (b) Process represented in the diagram (1)

2.2.2 Label:

- (a) Area **P** (1)
 - (b) Structure **Q** (1)
 - (c) Structure **R** (1)
- (5)**

GENETICS AND INHERITANCE (48 MARKS)

KEY TERMINOLOGY

	DESCRIPTION	TERMINOLOGY
1.1.1	Passing of hereditary characteristics from parent to offspring	
1.1.2	Offspring of parent organisms	
1.1.3	The exact position (location) of a gene on a chromosome	
1.1.4	Techniques used to change the genetic material of a cell or living organism – a form of biotechnology	
1.1.5	A segment of DNA in a chromosome that contains the code for a particular characteristic	
1.1.6	Different forms of a gene which occur at the same locus on homologous chromosomes	
1.1.7	Genetic composition of an organism	
1.1.8	The physical appearance of an organism based on the genotype, e.g. tall, short	
1.1.9	An allele that is expressed (shown) in the phenotype when found in the heterozygous (Tt) and homozygous (TT) condition	
1.1.10	An allele that is masked (not shown) in the phenotype when found in the heterozygous (Tt) condition; only expressed in the homozygous (tt) condition	
1.1.11	Two different alleles for a particular characteristic, e.g., Tt	
1.1.12	Two identical alleles for a particular characteristic, e.g., TT or tt	
1.1.13	Only one characteristic or trait is shown in the genetic cross	
1.1.14	Two different characteristics shown in genetic cross	
1.1.15	A genetic cross where the dominant allele masks the expression of a recessive allele in the heterozygous condition	
1.1.16	Cross between two phenotypically different parents produces offspring different from both parents but with an intermediate phenotype	
1.1.17	Cross in which both alleles are expressed equally in the phenotype.	
1.1.18	more than two alternative forms of a gene at the same locus	
1.1.19	Traits that are carried in the sex chromosomes	
1.1.20	The number, shape and arrangement of the chromosomes in the nucleus of a somatic cell	
1.1.21	A set of one maternal and one paternal chromosome that pair up with each other inside a cell during meiosis	
1.1.22	Process by which genetically identical organisms are formed using biotechnology	
1.1.23	Manipulation of the genetic material of an organism to get desired changes	
1.1.24	Mapping of the exact position of all the genes in all the chromosomes of a human	

KEY POINTS TO FOCUS ON

Complete dominance, Incomplete dominance and Co-dominance

- As stated in Exam Guidelines
- State the Law of Dominance (see Examination Guidelines)

Monohybrid crossing

- Understand and use the template
- Position of meiosis and fertilization as well as P₁ and F₁ on the template
- Answer the question at the end (usually for a compulsory mark)
- Proportion and ratio of genotypes and phenotypes
- State the Principle of Segregation (see Examination Guidelines)

Inheritance of sex

- Differentiate between sex chromosomes (gonosomes) and autosomes (body cells) in the karyotypes of human males and females

Sex-linked characteristics & disorders

- The correct way of writing it
- Also, in pedigree diagrams

Blood groups

- Difference between genotype and phenotype of each blood group
- Correct way of writing genotypes:
e.g., I^Ai, I^Bi or ii or I^AI^B

Dihybrid crossing

- Correct way of writing:
- Genotype: e.g., GGRR or GgRr Gametes: e.g., GR, Gr, gR, gr
- Distinguish between dominant phenotype and dominant allele
- Mendel's Principle of Independent Assortment (See Examination Guidelines)

Pedigree diagrams

- Interpretation of pedigree diagrams
- Give the phenotype, genotype
- State which allele is inherited from each parent
- The examiner DOES NOT have to provide a key

Mutations

- Different types of mutations:
- Gene and Chromosome mutations
- Different effects of mutations: harmful, useful and harmless
- Refer to Examination Guidelines

Genetic engineering: Stem cells, genetic modification and cloning

- Sources and uses
- Benefits (Advantages and disadvantages)
- Brief outline of processes

Paternity testing and DNA profiling

- Describe how paternity testing is done not only identifying the father in a diagram but describe how the mother, father and child’s DNA bars play a role

3. ACTIVITY 1

3.1 Coat colour in mice is controlled by two alleles, black (**B**) and grey (**b**). Tail length is controlled by two alleles, long (**T**) and short (**t**).

The Punnett square below shows a part of the cross between two mice. Genotype (**i**) has been left out.

		Parent 1			
		Gametes	BT	Bt	bT
Parent 2	Bt	BBTt	BBtt	BbTt	Bbtt
	Bt	BBTt	BBtt	BbTt	Bbtt
	Bt	BBTt	BBtt	(i)	Bbtt
	Bt	BBTt	BBtt	BbTt	Bbtt

3.1.1 Give the:

- (a) Genotype of parent 1 (2)
- (b) Phenotype of parent 2 (2)
- (c) Genotype of offspring (**i**) (1)

3.1.2 What percentage of the offspring above is grey with short tails? (1)

3.1.3 State the genotypes of TWO gametes from the table above that will result in offspring that are heterozygous for both traits, if fertilisation occurs. (2)

(8)

ACTIVITY 2

3.2 In rabbits, brown fur (**B**) is dominant to white fur (**b**) and long ears (**E**) is dominant to short ears (**e**).

A rabbit, that is heterozygous for both characteristics, is crossed with a white rabbit with short ears.

3.2.1 Name the type of cross represented. (1)

3.2.2 Give the:

(a) Phenotype of a rabbit that is dominant for both characteristics (2)

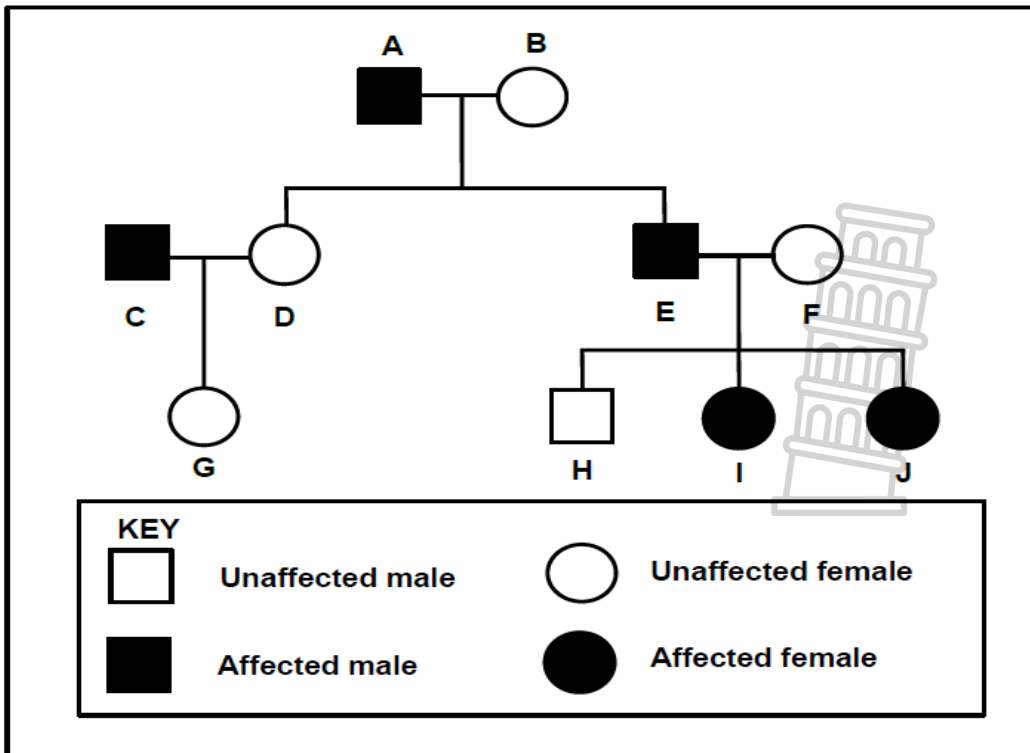
(b) Genotype of the white rabbit with short ears (2)

(c) Genotype of the gametes of a heterozygous brown rabbit with short ears (2)
(7)

ACTIVITY 3

3.3 Moyamoya is a disorder caused by a dominant allele (**R**). This disorder damages the arteries supplying blood to the brain.

The pedigree diagram below shows the inheritance of Moyamoya in a family.



- 3.3.1 How many generations are represented in the diagram? (1)
- 3.3.2 Give the:
- (a) LETTER(S) of unaffected males (1)
 - (b) Genotype of individual **A** (1)
 - (c) LETTER(S) of individuals not biologically related to **A** and **B** (2)
- (5)**

EVOLUTION (54 MARKS)

KEY TERMINOLOGY (EVOLUTION BY NATURAL SELECTION)

	DESCRIPTION	TERMINOLOGY
1.1.1	any genetic change in a population that is inherited over several generations	
1.1.2	a group of organisms with similar characteristics that interbreed with one another to produce fertile offspring	
1.1.3	a group of individuals of the same species occupying a particular habitat	
1.1.4	evolution characterised by long periods of little or no change followed by short periods of rapid change	
1.1.5	mechanism of evolution - organisms survive if they have characteristics that make them suited to the environment	
1.1.6	human-driven selective force, e.g., breeding of plants and animals to produce desirable traits	
1.1.7	mating of individuals that are closely related	
1.1.8	mating of individuals that are not closely related	
1.1.9	the formation of a new species	
1.1.10	formation of a new species when the parent population separated by a geographical barrier	
1.1.11	a mechanism that prevents two species from mating with one another and making fertile hybrids	
KEY TERMINOLOGY (HUMAN EVOLUTION)		
1.1.12	Hominids are a biological group that includes modern humans, our early human ancestors, chimpanzees and bonobos, gorillas and orangutans, sometimes collectively referred to as apes.	
1.1.13	Hominins are a sub-group of the hominids, and includes only modern humans and early human ancestors.	
1.1.14	This is a Latin term meaning 'human'.	
1.1.15	Homo sapiens means 'wise human'. All humans living today belong to the same species of Homo sapiens.	

1.1.16	A biological grouping that includes lemurs, baboons, chimpanzees, apes, and humans. Primates share a number of characteristics as will be detailed shortly.	
1.1.17	A branching diagram or "tree" showing the evolutionary relationships among various biological species	
1.1.18	living primarily in trees	
1.1.19	a thumb that can be placed opposite the fingers of the same hand	
1.1.20	distinct differences in size or appearance between the sexes of an animal in addition to the sexual organs themselves	
1.1.21	ability to walk on two legs	
1.1.22	use of four limbs for locomotion (quadrupeds)	
1.1.23	active during the day rather than at night.	
1.1.24	hole in the base of skull through which the spinal cord passes	
1.1.25	ridge running across the top of the skull that served to attach large jaw muscles to the head	
1.1.26	protruding (projecting forward) upper / lower jaw	
1.1.27	living primarily in trees	
1.1.28	a thumb that can be placed opposite the fingers of the same hand	
1.1.29	The group consisting of modern and early humans Greek word of 'ape'	
1.1.30	A group of organisms that are genetically similar, can interbreed and produce fertile offspring	

KEY POINTS TO FOCUS ON

Evidence for evolution

Role of Fossil record, Biogeography, Modification by descent and Genetics as evidence for evolution

Sources of variation

- Meiosis:
 - ✓ Crossing over
 - ✓ Random arrangement of chromosomes
- Mutations
- Random fertilisation
- Random mating



Lamarck and Darwin's theories

- State the general theories according to the
- Exam Guidelines but apply it to a given example

Natural and artificial selection

- Describe the processes
- Tabulate the differences

Punctuated

- Define, describe & be able to identify examples

Speciation

- Apply the example given in a paper according to the format in the Examination Guidelines
- Be able to identify the geographic barrier and speciation of one species becoming different species

Mechanisms for reproductive isolation

- Refer to Examination Guidelines for different mechanisms

Evolution in present times

- Any ONE example according to Examination Guidelines

Human evolution: similarities of humans and African apes

- With the aid of diagrams, as it applies to the characteristics in the Examination Guidelines

Human evolution: anatomical differences between humans and African apes

See Examination Guidelines:

e.g.

- Long and narrow vs. short and wide
- Large canines vs. small canines
- The significance of the evolutionary changes
e.g., Foramen magnum more in front and under the skull

Trends in human evolution

- Interpretation of phylogenetic trees proposed by different scientists showing possible evolutionary relationships as it applies to hominid evolution

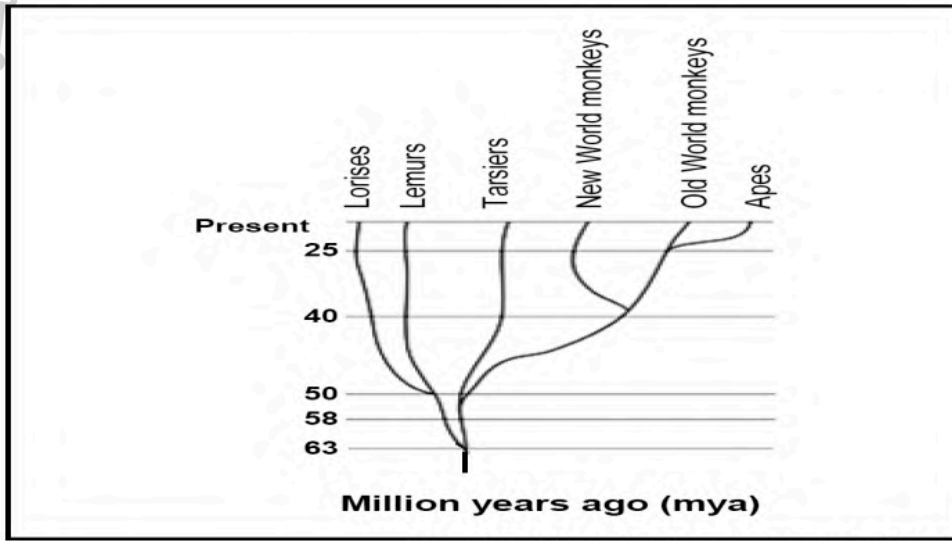
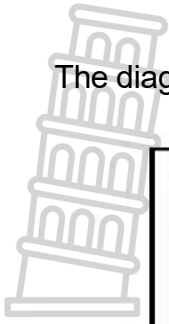
Out of Africa hypothesis

- According to the examination guidelines
- Focus on species found in Africa or found ONLY in Africa



ACTIVITY 1

4.1 The diagram below shows possible evolutionary relationships among primates.



- 4.1.1 How many million years ago did the:
- (a) Apes appear on Earth (1)
 - (b) Common ancestor evolves to form the Tarsiers and Lemurs (1)
- 4.1.2 Which TWO species share the most recent common ancestor? (2)
- 4.1.3 Which species is most closely related to the Lemur? (1)
- (5)



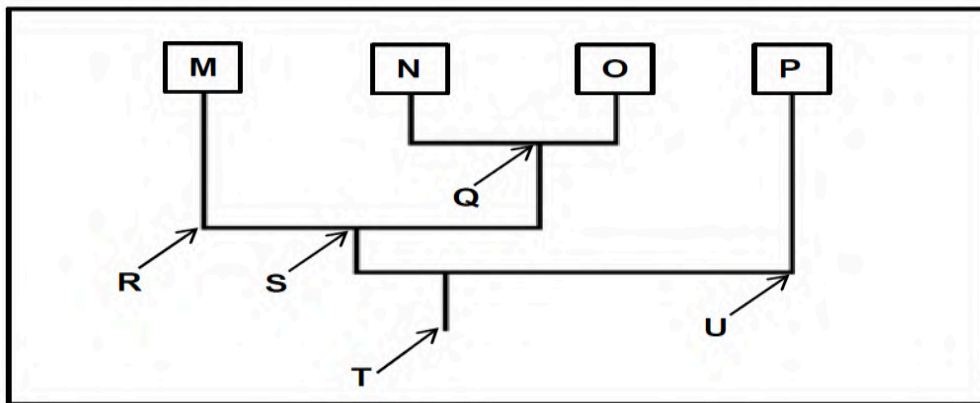
ACTIVITY 2

4.2

Trilobites are an extinct group of marine arthropods. Many of their fossils have been discovered. They had a tough exoskeleton and they are thought to be closely related to three other phyla of extinct arthropods, namely helmetids, tegopeltids and naraoids.

The tegopeltids and helmetids are the two most closely related phyla and are more closely related to trilobites than to naraoids.

The diagram below illustrates the possible evolutionary relationships among the four phyla, represented by the letters **M**, **N**, **O** and **P**.



4.2.1 Name the type of diagram illustrated. (1)

4.2.2 What structural feature of trilobites, described in the extract, improved the chances of fossilisation? (1)

4.2.3 Give only the LETTER of the most recent common ancestor for phyla:

(a) **M** and **O** (1)

(b) **M**, **N**, **O** and **P** (1)

4.2.4 Which of the extinct arthropods (trilobites, helmetids, tegopeltids or naraoids) are represented by phylum:

(a) **M** (1)

(b) **N** (1)

(c) **O** (1)

(d) **P** (1)

(8)

ADDITIONAL INFORMATION

1. Learners will not be expected to draw:

- DNA strand and replication
- Pedigree

2. Drawing diagrams and graphs

- Drawing should be in pencil
- Labels should be in ink

3. Learners are expected to:

- bring protractor to draw a pie chart if given in question paper

PARAGRAPH TYPE QUESTIONS

1. Describe the location, structure and functions of the DNA molecule. (10)
2. Describe the process of replication. (6)
3. Describe the process of transcription.
4. Describe the structure and arrangement of chromosomes making up the normal human karyotype. (10)
5. Describe the behaviour of the chromosomes during the different phases of meiosis I. (10)
6. Describe sex determination in humans (6)
7. Describe how DNA profiling are used in paternity testing. (5)
8. Describe natural selection. (7)
9. Describe the process of speciation through geographical isolation. (6)
10. Differentiate between a *population* and a *species*. (6)