



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2013

MARKS: 150

TIME: 2½ hours

This question paper consists of 15 pages.

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 answer 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 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 correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 The distribution of organisms is known as ...

- A biochemistry.
- B biogeography.
- C archaeology.
- D palaeontology.

1.1.2 Which ONE of the following CORRECTLY describes the cells produced by meiosis?

CELLS PRODUCED BY MEIOSIS		
	Chromosome complement	Genetic composition
A	Haploid	Different
B	Diploid	Identical
C	Diploid	Different
D	Haploid	Identical

1.1.3 Study the following statements:

- (i) Organisms in a population show a great deal of variation.
- (ii) Characteristics are passed on from parents to offspring.
- (iii) If an organism uses an organ frequently it becomes more developed.
- (iv) A large number of offspring are produced, but only few survive.

Which ONE of the following combinations refers to observations upon which Darwin based his theory?

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

1.1.4 Study the following list of molecules:

- (i) Sugar
- (ii) Phosphate
- (iii) Nitrogenous base
- (iv) Amino acid

Which ONE of the following combinations represents components of a nucleotide?

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

1.1.5 Four different phenotypes are possible in the F_1 -generation if the parents' blood types are ...

- A B and B.
- B A and B.
- C O and AB.
- D AB and AB.

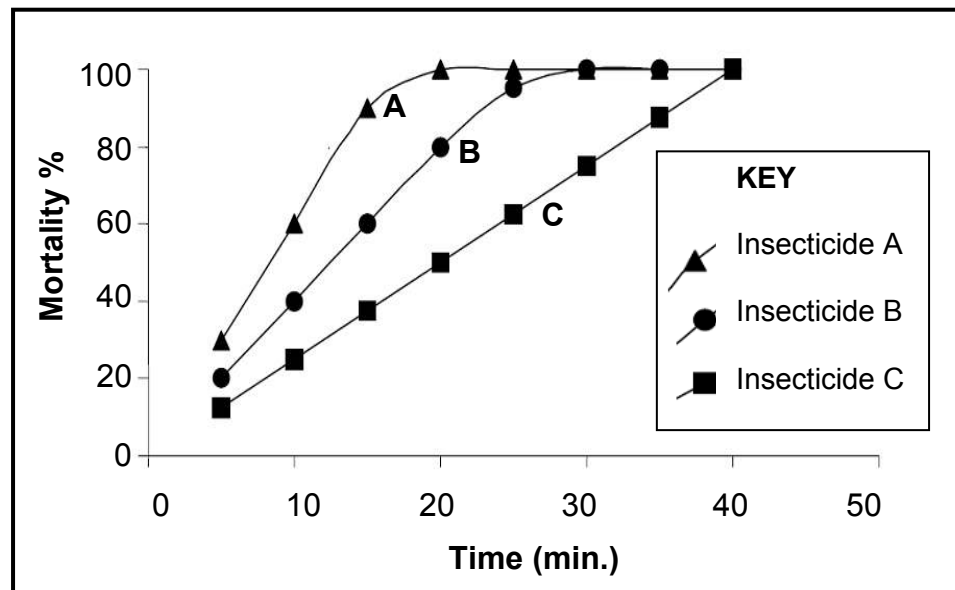
1.1.6 In humans, brown eye colour is dominant over blue eye colour. A mother with blue eyes had two children, a boy with brown eyes and a girl with blue eyes. The eye colour of the father is ...

- A brown, because the allele for brown eye colour is sex-linked.
- B brown, because at least one of the parents must have brown eyes.
- C blue, because at least two other members of the family have blue eyes.
- D blue, because at least one of the parents must be heterozygous for eye colour.

QUESTIONS 1.1.7 TO 1.1.9 ARE BASED ON THE INFORMATION AND GRAPH BELOW.

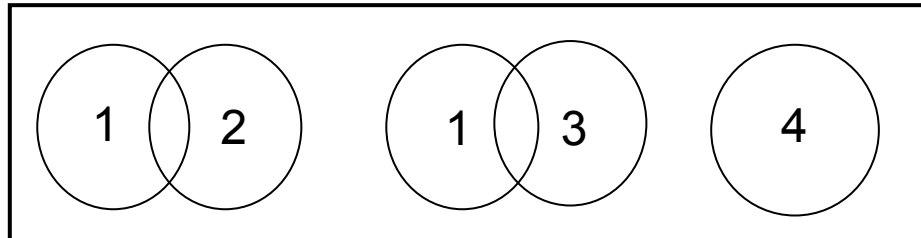
One way to measure the resistance of an insect population to an insecticide is to determine the time taken for the insecticide to kill 90% of the population. This is called the resistance factor (RF).

The graph below shows the results from a resistance investigation in a single population. The same amount of each of three insecticides was used.



- 1.1.7 What is the approximate RF value for insecticide B?
- A 0,5
B 1
C 2
D 24
- 1.1.8 Which ONE of the insecticides has the fastest killing action given that the same quantity of each insecticide was used?
- A Insecticide A
B Insecticide B
C Insecticide C
D All the insecticides were equally fast
- 1.1.9 A general conclusion from the data shown in the graph above, at 30 minutes, is that ...
- A both insecticide B and insecticide C have been 100% effective.
B both insecticide A and insecticide B have been 100% effective.
C both insecticide A and insecticide C have been 100% effective.
D all the insecticides have been 100% effective.

- 1.1.10 Numbers **1**, **2**, **3** and **4** below refer to four populations of frogs. These populations are represented diagrammatically by circles. Overlapping circles show populations that are capable of interbreeding to produce fertile offspring.



It would be reasonable to conclude that ...

- A if populations **2** and **4** were to die out, two different species would remain.
- B populations **1**, **2**, **3** and **4** represent four different species.
- C if population **2** were to die out, two different species would remain.
- D if population **3** were to die out, only one species would remain.

(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 number (1.2.1 to 1.2.8) in the ANSWER BOOK.

- 1.2.1 The triplet of bases found in a tRNA molecule
- 1.2.2 The condition where an organism has more than two complete sets of chromosomes in a cell
- 1.2.3 A genetic disorder characterised by the absence of a blood clotting factor
- 1.2.4 Organisms that have different alleles at a given locus
- 1.2.5 The physical and/or functional expression of a gene
- 1.2.6 An arrangement of black bars representing DNA fragments that can be used to determine whether people are related
- 1.2.7 All the chromosomes found in a cell except the sex chromosomes
- 1.2.8 The biotechnological production of genetically identical offspring

(8)

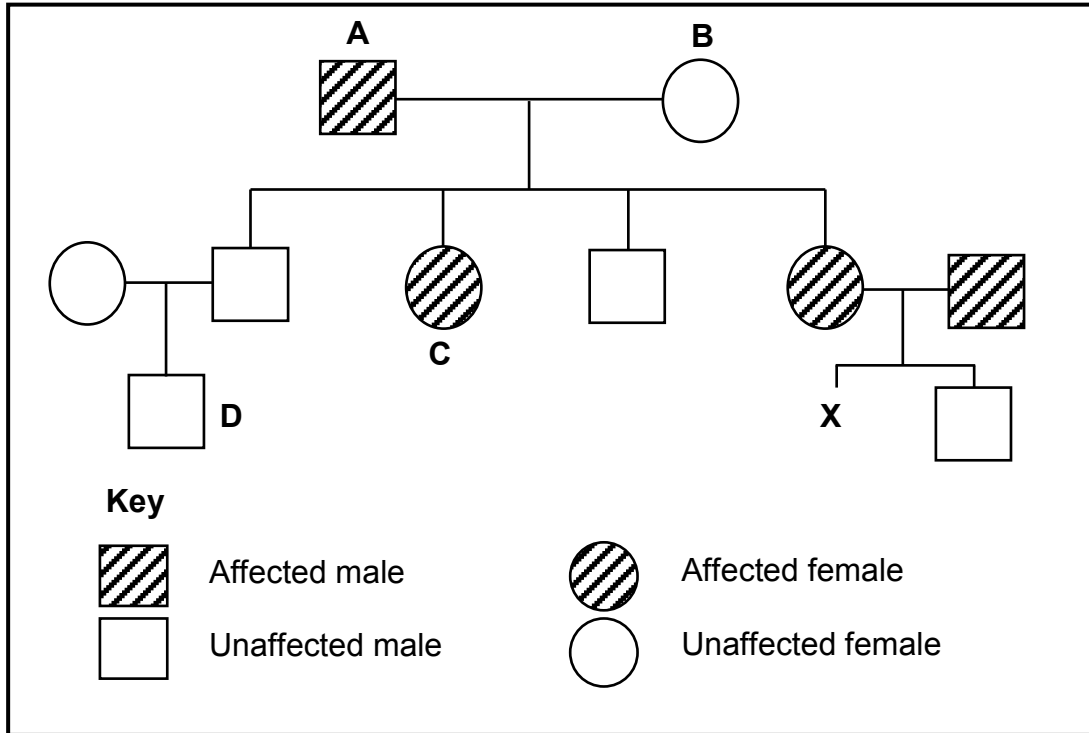
- 1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.8) in the ANSWER BOOK.

COLUMN I		COLUMN II	
1.3.1	A trait such as height in humans that has a range of intermediate phenotypes	A:	Polygenic inheritance
		B:	Codominance
1.3.2	Alternative forms of the same gene in a population	A:	Alleles
		B:	Chromosomes
1.3.3	A type of gene mutation in which adenine is lost/deleted from a DNA base triplet	A:	Frame-shift mutation
		B:	Point mutation
1.3.4	The structure that moves chromosomes/chromatids to the poles during cell division	A:	Centromere
		B:	Spindle
1.3.5	Inheritance of acquired characteristics	A:	Lamarck
		B:	Darwin
1.3.6	Influence(s) the inheritance of blood groups	A:	Multiple alleles
		B:	Codominance
1.3.7	A characteristic that humans share with other primates	A:	Opposable thumb
		B:	Binocular vision
1.3.8	A characteristic that is only expressed when in the homozygous state	A:	Recessive
		B:	Dominant

(8 x 2)

(16)

1.4 A scientist gathered information about the affected and unaffected individuals for a certain genetic disorder. The genetic disorder is caused by a dominant allele. The findings of the scientist are represented in the pedigree diagram below.



1.4.1 Using the letters **R** and **r** to represent the dominant and recessive alleles respectively, state the genotype of individual:

- (a) **A** (1)
- (b) **D** (1)

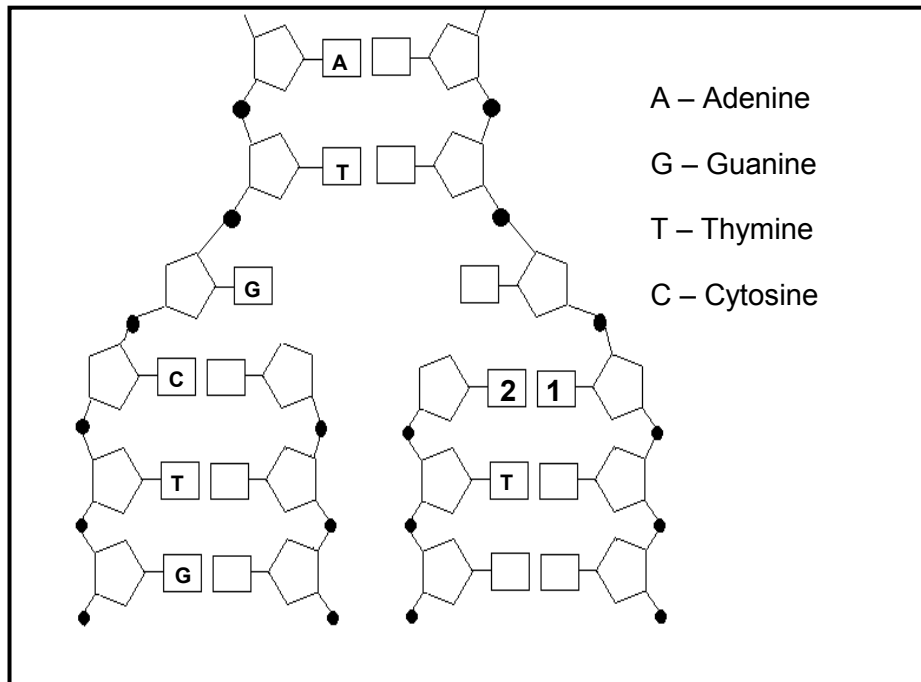
1.4.2 What is the percentage chance of individual **X** having a genetic disorder? (2)

1.4.3 If individual **C** marries an unaffected male, state the possible genotype(s) of their offspring. (2)
(6)

TOTAL SECTION A: 50

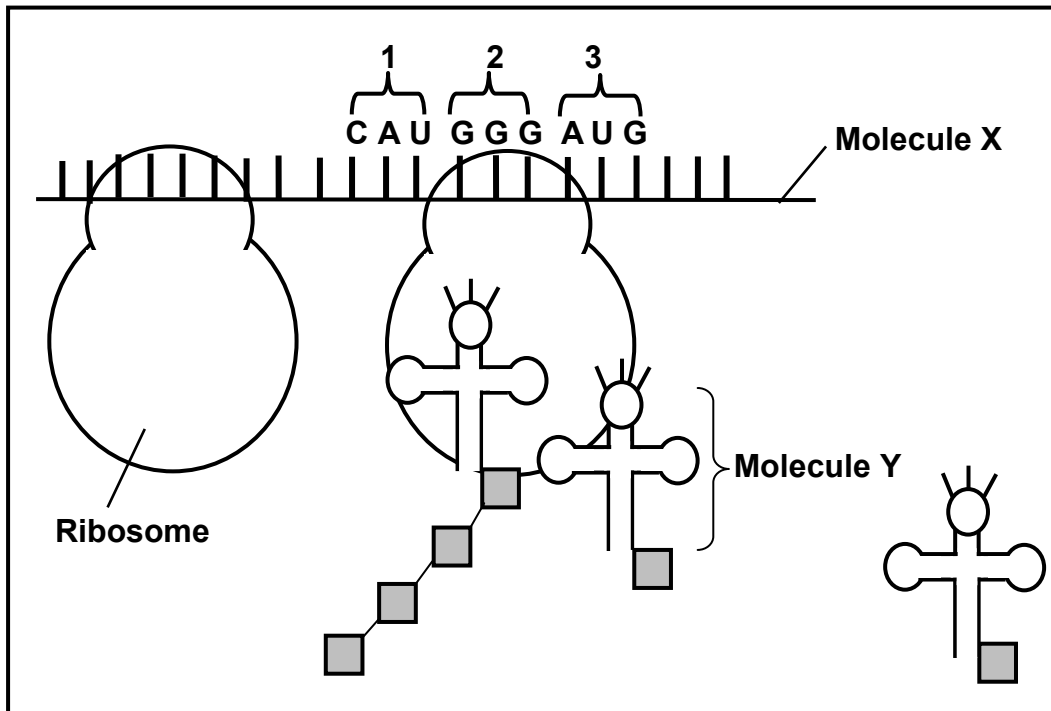
SECTION B**QUESTION 2**

- 2.1 Study the diagram below, which shows a section of a DNA molecule during a process taking place in a cell.



- 2.1.1 Name the process represented in the diagram. (1)
- 2.1.2 When exactly will this process take place in a cell? (1)
- 2.1.3 Give labels for **1** and **2**. (2)
- 2.1.4 State TWO ways in which the structure of RNA differs from the DNA structure shown in the diagram. (2)
- (6)**

2.2 The diagram below shows a part of the process of protein synthesis.



2.2.1 Name the stage of protein synthesis represented in the diagram above. (1)

2.2.2 Identify:

(a) Molecule X (1)

(b) Molecule Y (1)

(c) Structure 1 (1)

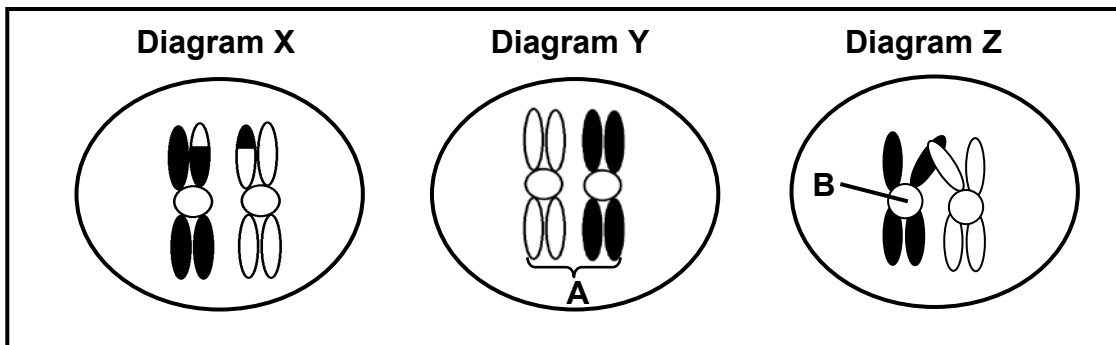
2.2.3 The table below shows the DNA base triplets that code for different amino acids found in human proteins.

AMINO ACID	BASE TRIPLET IN DNA
Leucine	GAA
Proline	GGG
Lycine	TTT
Histidine	GTA
Serine	TCA
Methionine	TAC
Glycine	CCC
Glutamine	GTC

Using the information in the table and the diagram above, write down the sequence of the amino acids that correspond with structures 1, 2 and 3.

(3)
(7)

2.3 The diagrams below show chromosome pair 21 in the nucleus of a cell of the ovary of a woman. The chromosomes are involved in a process that takes place in a phase of meiosis.

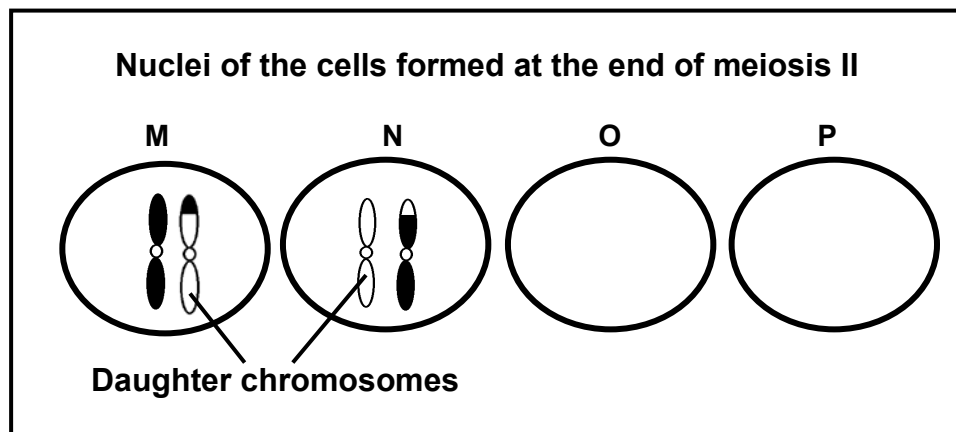


2.3.1 Give labels for **A** and **B**. (2)

2.3.2 Rearrange the letters **X**, **Y** and **Z** to show the correct sequence in which the events take place in this phase. (1)

2.3.3 Explain why the chromosomes in Diagram **X** and Diagram **Y** are different in appearance. (3)

2.3.4 The diagram below shows the nuclei of the four cells that resulted from meiosis involving the chromosomes in Diagram **X** above.



(a) Explain why nuclei **O** and **P** do NOT have chromosomes. (2)

(b) Name and explain the disorder that will result if diagram **M** represents an egg cell that fuses with a normal sperm cell. (3)
(11)

2.4 When flies with grey bodies were crossed with flies with black bodies, all the offspring in the F_1 had grey bodies.

Use the letters **G** and **g** to represent a genetic cross to show the F_2 genotypes and phenotypes if the F_1 were interbred.

(6)
[30]

QUESTION 3

3.1 Read the extract below.

Genetic engineering involves a process whereby a gene is isolated from one organism and transferred into another organism. This gene can become part of the new host's genome. Usually the gene transfer takes place between organisms from different kingdoms.

For example, a gene from a certain bacterium codes for an enzyme that deactivates a herbicide (a weedkiller). This gene is isolated from the bacterium and inserted into the chromosome of a crop plant. The resulting plant will now be herbicide-resistant.

Before the products of genetic engineering can be sold, many tests must be done.

Some seed companies have exclusive rights to sell the seeds that they have genetically engineered. Farmers cannot use seeds harvested from the crops that they have grown. Farmers must buy the seeds from the seed companies every time they want to plant the crop.

[Adapted from *Microbiology and Biotechnology*, 1994]

- 3.1.1 What is meant by the term *genome* referred to in the extract? (1)
- 3.1.2 State ONE way in which the genetic engineering described in the extract differs from selective breeding. (2)
- 3.1.3 Give ONE reason why the products of genetic engineering must undergo many tests before they can be sold. (1)
- 3.1.4 Explain the value of growing herbicide-resistant crops. (3)
- 3.1.5 State THREE advantages of genetic engineering in crop production other than those mentioned in the extract above. (3)
- 3.1.6 Give a reason why seed companies insist that they must have the exclusive rights to the selling of seeds. (2)
- (12)**

- 3.2 Gregor Mendel conducted breeding experiments with pea plants to study the inheritance patterns of four different traits (plant height, seed shape, seed colour and seed coat colour).

For each trait, for example plant height, he crossed homozygous tall plants with homozygous dwarf plants. The offspring obtained in the F₁-generation were then interbred to form the F₂-generation. He did the same for each of the other traits.

The results obtained for the F₂-generation are shown in the table below.

TRAIT	RESULTS OF F ₂ -CROSSING	RATIO
Plant height (Tall or dwarf)	Tall: 787	2,84 : 1
	Dwarf: 277	
Seed shape (Round or wrinkled)	Round: 5 474	X
	Wrinkled: 1 850	
Seed colour (Yellow or green)	Yellow: 6 022	Y
	Green: 2 001	
Seed coat colour (Grey or white)	Grey: 705	3,15 : 1
	White: 224	

[Adapted from *Basic Concepts in Biology*, 3rd edition., C Starr, 1997]

- 3.2.1 What is the expected phenotypic ratio for a trait involving two heterozygous parents? (1)
- 3.2.2 From the results, calculate **X** and **Y**. Also state which trait provided a ratio closest to the expected phenotypic ratio mentioned in QUESTION 3.2.1. Show ALL working. (3)
- 3.2.3 Give a possible reason why the ratio selected in QUESTION 3.2.2 was closest to the theoretical ratio. (2)
- 3.2.4 Using the results, state whether the allele for round seeds or for wrinkled seeds is dominant. (1)
- 3.2.5 State TWO factors that Mendel controlled during these breeding experiments. (2)
- 3.2.6 Write down Mendel's law of segregation. (2)
- 3.3 Describe how allopatric speciation occurs. (7)
- [30]**

TOTAL SECTION B: 60

SECTION C**QUESTION 4**

- 4.1 Although copper is an essential nutrient for the growth of plants, it is toxic and may kill the plants if present in very high amounts.

High amounts of copper in the soil may be a result of ore deposits from old copper mines. Some grass species are tolerant to high levels of copper.

An investigation was carried out to determine the effect of copper on the growth of a species of grass, *Eragrostis sp.*, found near an old copper mine.

- Seeds were collected from plants growing in five sample areas that were 10 metres apart, starting from an old copper mine.
- Forty seeds from each sample area were planted under laboratory conditions in soil containing nutrients for normal growth.
- The seeds were allowed to germinate into seedlings.
- The 40 seedlings from each sample area were divided into two groups (Group 1 and Group 2).
- A dilute copper solution was added to the soil of the Group 1 seedlings.
- Distilled water was added to the soil of the Group 2 seedlings.

After two weeks, the number of seedlings surviving was counted and the average height of the surviving seedlings was measured.

The results are shown in the table below.

Sample area	Distance from the old copper mine where the seeds were collected (m)	Number of seedlings surviving		Average height of surviving seedlings (cm)	
		Group 1	Group 2	Group 1	Group 2
1	10	20	20	3,9	4,0
2	20	20	20	3,8	4,1
3	30	12	20	4,0	4,9
4	40	4	20	3,7	4,8
5	50	2	20	3,8	4,9

[Adapted from *Tropical Grasslands*, Journal Volume 24, 1990]

- 4.1.1 Draw a line graph to represent the results obtained for the number of seedlings surviving in **Group 1**. (7)
- 4.1.2 Identify the dependent variable(s) in the investigation. (2)
- 4.1.3 Identify TWO independent variables in this investigation. (2)

- 4.1.4 In terms of natural selection, explain why seedlings from seeds collected closer to the mine for Group 1 had a high survival rate. (6)
(17)
- 4.2 Describe how a study of the Y-chromosome provides evidence for the 'Out of Africa' hypothesis. (3)
- 4.3 Describe the structural changes to the skull that characterise the evolution of modern humans from their ape-like ancestors, and explain the significance of these changes.
- Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts or diagrams.

TOTAL SECTION C: 40
GRAND TOTAL: 150



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**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES P1

NOVEMBER 2013

MEMORANDUM

MARKS: 150

This memorandum consists of 12 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2013

1. **If more information than marks allocated is given**
Stop marking when maximum marks is reached and put a wavy line and 'max' in the right-hand margin.
2. **If, for example, three reasons are required and five are given**
Mark the first three irrespective of whether all or some are correct/incorrect.
3. **If whole process is given when only part of it is required**
Read all and credit relevant part.
4. **If comparisons are asked for and descriptions are given**
Accept if differences/similarities are clear.
5. **If tabulation is required but paragraphs are given**
Candidates will lose marks for not tabulating.
6. **If diagrams are given with annotations when descriptions are required**
Candidates will lose marks.
7. **If flow charts are given instead of descriptions**
Candidates will lose marks.
8. **If sequence is muddled and links do not make sense**
Where sequence and links are correct, credit. Where sequence and links is incorrect, do not credit. If sequence and links becomes correct again, resume credit.
9. **Non-recognised abbreviations**
Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of answer if correct.
10. **Wrong numbering**
If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.
11. **If language used changes the intended meaning**
Do not accept.
12. **Spelling errors**
If recognisable accept provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names given in terminology**
Accept provided it was accepted at the national memo discussion meeting.
14. **If only letter is asked for and only name is given (and vice versa)**
No credit.
15. **If units are not given in measurements**
Candidates will lose marks. Memorandum will allocate marks for units separately.
16. Be sensitive to the **sense of an answer, which may be stated in a different way.**
17. **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.
18. **Code-switching of official languages (terms and concepts)**
A single word or two that appears in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited, if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.
19. No changes must be made to the marking memoranda without consulting the provincial internal moderator who in turn will consult with the national internal moderator (and the external moderators where necessary)
20. Only memoranda bearing the signatures of the national internal moderator and the UMALUSI moderators and distributed by the National Department of Education via the provinces must be used.

SECTION A**QUESTION 1**

1.1	1.1.1	B ✓✓		
	1.1.2	A ✓✓		
	1.1.3	C ✓✓		
	1.1.4	B ✓✓		
	1.1.5	B ✓✓		
	1.1.6	B ✓✓		
	1.1.7	D ✓✓		
	1.1.8	A ✓✓		
	1.1.9	B ✓✓		
	1.1.10	C ✓✓	(10 x 2)	(20)
1.2	1.2.1	Anticodon ✓		
	1.2.2	Polyploid ✓/polyploidy		
	1.2.3	Haemophilia ✓		
	1.2.4	Heterozygotes ✓/heterozygous/hybrid		
	1.2.5	Phenotype ✓		
	1.2.6	DNA profiling ✓/DNA fingerprinting		
	1.2.7	Autosomes ✓		
	1.2.8	Cloning ✓		(8)
1.3	1.3.1	A only ✓✓		
	1.3.2	A only ✓✓		
	1.3.3	A only ✓✓		
	1.3.4	B only ✓✓		
	1.3.5	A only ✓✓		
	1.3.6	Both A and B ✓✓		
	1.3.7	Both A and B ✓✓		
	1.3.8	A only ✓✓	(8 x 2)	(16)
1.4	1.4.1	(a) Rr ✓		(1)
		(b) rr ✓		(1)
	1.4.2	75 ✓✓%		(2)
	1.4.3	Rr ✓		(2)
		rr ✓ (any order)		(6)
TOTAL SECTION A:				50

SECTION B**QUESTION 2**

- 2.1 2.1.1 (DNA) replication✓ (1)
- 2.1.2 During interphase✓/ between cell divisions /before cell division/before mitosis/ before meiosis (1)
- 2.1.3 1 - G✓/Guanine
2 - C✓/Cytosine (2)
- 2.1.4 RNA is a single strand✓/while DNA is double stranded
RNA has uracil✓/and DNA has thymine
RNA has single bases✓/and DNA has paired bases
RNA has ribose✓/while DNA has deoxyribose
RNA is much shorter✓/whereas DNA is longer
RNA maybe linear✓/straight/ looped /and DNA is helix
(Mark first TWO only) Any (2)
(6)
- 2.2 2.2.1 Translation✓ (1)
- 2.2.2 (a) mRNA✓ (1)
(b) tRNA✓ (1)
(c) Codon✓ (1)
- 2.2.3 Histidine✓ glycine✓ methionine✓ (correct sequence) (3)
(7)
- 2.3 2.3.1 A - Homologous ✓ chromosomes/bivalent/(tetrad) (1)
B - Centromere✓ (1)
- 2.3.2 Y – Z – X ✓ **(Must be in the correct sequence)** (1)
- 2.3.3 Genetic material was exchanged✓ between the chromosomes in diagram X
due to crossing over ✓
whereas the chromosomes in diagram Y did not undergo crossing over✓ (3)
- 2.3.4 (a) During meiosis the chromosome pair 21 does not separate✓/
there is non-disjunction
Two gametes (M and N) will have an extra copy of chromosome✓ number 21 and therefore the other gametes (O and P) do not have a copy of chromosome 21 (2)
- (b) Down syndrome✓/ Trisomy 21
If this gamete fuses with a normal sperm having 1 copy of chromosome 21✓
the resulting zygote will have 3 copies ✓of chromosome number 21 /47 chromosomes (3)
(11)

2.4

P_2 /(parent) phenotype genotype Grey bodied x Grey bodied✓
 Gg x Gg ✓

Meiosis
 G /gametes G, g x G, g ✓

Fertilisation
 F_2 /(offspring/ F_1) genotype $\{GG, Gg, Gg\}$ & $\{gg\}$ ✓
 phenotype grey bodied black bodied✓

Any (6)

OR

P_2 /(parent) phenotype genotype Grey bodied x Grey bodied✓
 Gg x Gg ✓

Meiosis
Fertilisation

gametes	G	g
G	GG	Gg
g	Gg	gg

1 mark for correct gametes✓
 1 mark for correct genotypes✓

F_2 /(offspring) genotype $\{GG, Gg, Gg\}$ & $\{gg\}$
 phenotype grey bodied black bodied✓

Any (6)
[30]

QUESTION 3

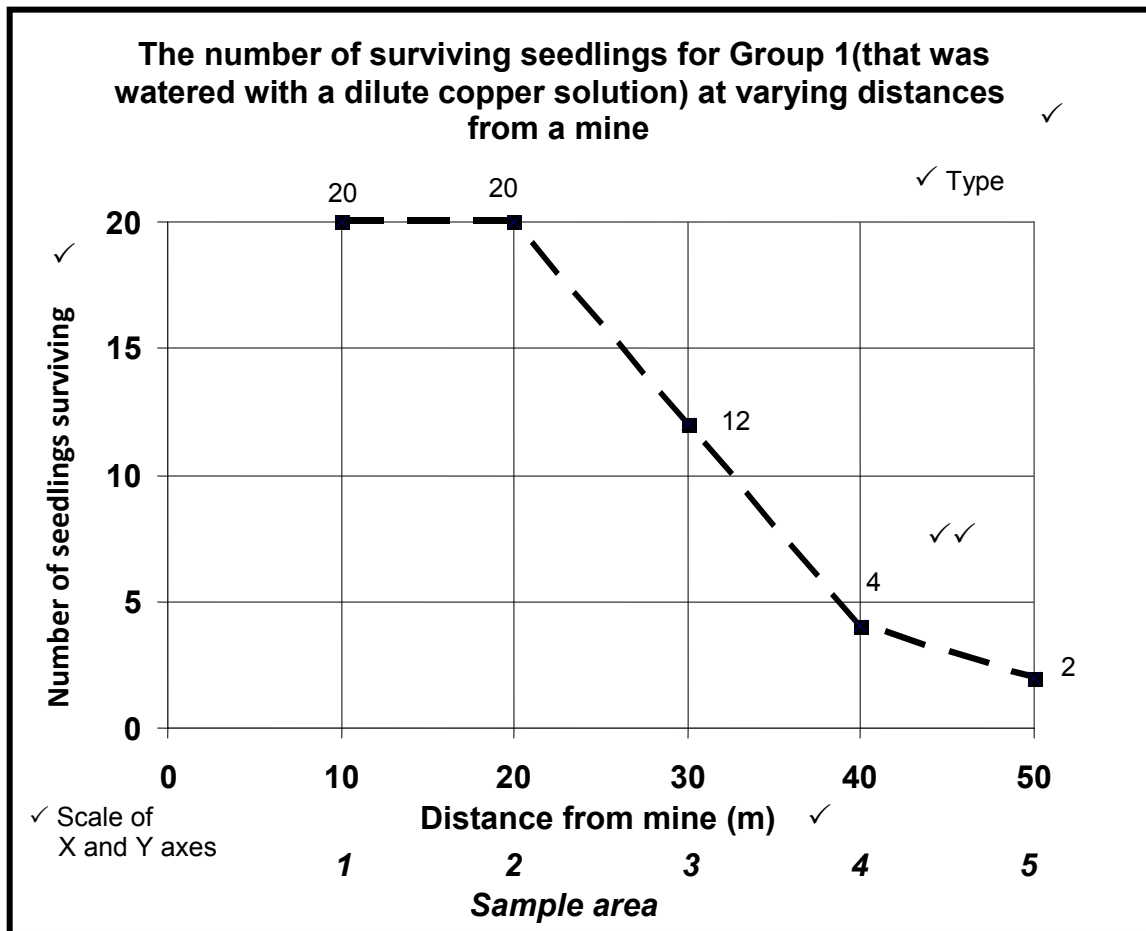
- 3.1 3.1.1 An organism's complete set of genes✓ (1)
- 3.1.2 Genetic engineering: involves the transfer of genes✓ from one organism to another/(manipulation of DNA)
- Selective breeding: Parents with desirable phenotypes are selected to produce offspring with desirable phenotypes✓
- OR**
- Genetic engineering can involve gene transfer between organisms from different kingdoms✓
- Selective breeding can occur using organisms from the same or different species within a kingdom✓ (2)
- 3.1.3 - To assess the risks to human health ✓/the environment
- To determine if the presence of the transferred gene will affect the expression of other genes✓
- To test the effectiveness✓of the product
(Mark first ONE only) Any (1)
- 3.1.4 - The spraying of herbicide will kill the weeds✓
- without killing the crops✓,
- thus reducing the competition✓ and increasing the yield✓ Any (3)
- 3.1.5 - Produce crops that are resistant to adverse conditions✓/drought/disease/pests
- Increase crop yield✓
- Change the time for the ripening of fruits✓
- Increase shelf life of plant products✓
- Improve nutritional value of food✓
- Improve the taste✓ of food
- Developing fruit/plants with desirable characteristics✓
(Mark first THREE only) Any (3)
- 3.1.6 The companies have invested✓ a lot of time✓/money to make the GM seeds
The companies want to control the seed market✓ thus increasing their profit✓ Any 1 x 2 (2)
(12)

- 3.2 3.2.1 3:1✓ (1)
- 3.2.2 X: Seed shape = $\frac{5474}{1850} = 2,96 : 1✓/2.95:1$
- Y: Seed colour = $\frac{6022}{2001} = 3,01 : 1✓$
- Closest: Seed colour✓/(Y) (3)
- 3.2.3 Y has the larger✓ sample✓ size (2)
- 3.2.4 Round✓ seeds (1)
- 3.2.5 All the plants must be homozygous in P₁✓
All the plants must be heterozygous in P₂✓
Same type of plant✓/species
Same environmental conditions✓
Same method of pollination✓
(Mark first TWO only) Any (2)
- 3.2.6 During gamete formation, members of each allele pair separate✓
such that each gamete only contains one allele✓ for a particular trait (2)
(11)
- 3.3
- There is variation in the original population of organisms✓
 - The population has been separated into two groups✓
 - due to a **geographical barrier***✓/any example
 - No gene flow✓ occurs between the two groups
 - The environmental conditions on either side of the geographical barrier may be different✓
 - Each population undergoes natural selection independently✓ and develops differently✓
 - Genotypically✓ and phenotypically✓
 - The differences that develop between the two populations prevent them from inter-breeding✓ even if they were to mix
 - One or both groups may become new species✓
- Max 6 + 1*(compulsory mark) (7)
[30]
- TOTAL SECTION B: 60**

SECTION C

QUESTION 4

4.1 4.1.1



Checklist for the mark allocation of the graph

Correct type of graph with points joined	1
Title of graph	1
Correct label for X-axis	1
Correct label for Y-axis	1
Appropriate scale for X-axis and Y-axis	1
Plotting of points	1–1 to 4 points plotted correctly 2–all 5 points plotted correctly

NOTE:

If the wrong type of graph is drawn:

- Marks will be lost for 'correct type of graph'

If axes are transposed:

- Marks will be lost for labelling of X-axis and Y-axis

(7)

- 4.1.2 Number of surviving seedlings✓
Average height of surviving seedlings✓ (2)
- 4.1.3 Distance✓ from mine/sample area
Solution added ✓/(dilute copper solution and distilled water)
(Mark first TWO only) (2)
- 4.1.4 - In the beginning, there was variation✓in the grass species population
- there were copper tolerant and copper intolerant forms✓
- Due to the high copper concentration near the mine✓
- the copper intolerant plants died ✓
- whereas the copper tolerant plants survived✓
- and were able to reproduce✓
- thus passing copper tolerance to the offspring✓
- Over many generations, the proportion of copper tolerant plants increased✓and hence most seedlings from seeds collected near the mine survived Any (6)
(17)
- 4.2 Analysis of mutations✓ on the Y-chromosome shows that the oldest male ancestors ✓of humans were from Africa✓ (3)

4.3 Foramen magnum

- The foramen magnum was in a backward position in the ape-like beings^{✓^F}
- but in a forward/ central/ ventral position in modern humans^{✓^F}

Significance

- This represents a change from quadrupedalism in ape-like beings^{✓^S}
- To bipedalism/(walking upright) in modern humans^{✓^S}, leading to the following in modern humans:
 - o Increased awareness of the environment^{✓^S} in sensing danger/food
 - o Freeing of the hands to use implements^{✓^S}/ carry objects/ weapons/ offspring
 - o Exposure of a large surface area for thermoregulation^{✓^S}/losing body heat to surroundings in hot conditions/reducing overheating
 - o Display of sex organs /breasts as part of courtship behaviour^{✓^S}

Cranium

- Modern humans have a larger cranium^{✓^F} *than the ape-like beings*^{✓^F}
- Modern humans have a less sloping forehead^{✓^F} *than the ape-like beings*^{✓^F}
- Modern humans have a cranium that is more rounded^{✓^F} *than the ape-like beings*^{✓^F}

Significance

- This allowed space for a larger brain^{✓^S} in humans *than in ape-like beings*^{✓^S}, making the following possible:
 - o Better co-ordination of movement^{✓^S}
 - o Processing of a large amount of information^{✓^S}
 - o Processing information faster^{✓^S}
 - o Development of spoken and written languages to communicate^{✓^S}

Jaws

- Humans have smaller jaws^{✓^F} *than the ape-like beings*^{✓^F}
- Humans have jaws that are non-prognathous^{✓^F}/ flat face compared to the jaws of ape-like beings which are prognathous^{✓^F}/sloping face
- Humans have C-shaped jaws^{✓^F} /jaws that are gently curved compared to the U shaped jaws^{✓^F} in the ape-like beings

Significance

- This corresponds with a change in diet from hard, raw food^{✓^S} in the ape-like beings
- To softer, cooked food^{✓^S} in humans

Dentition/Teeth

- In ape-like beings there are gaps^{✓^F}/diastema between incisors and canines
- but no gaps^{✓^F} between the teeth in humans
- Humans have smaller teeth^{✓^F}/incisors and canines *than the ape-like beings*^{✓^F}
- Humans have flatter molars and pre-molars^{✓^F} *than the ape-like beings*^{✓^F}

Significance

- This corresponds with the decreased need to bite and tear^{✓^S}
- and an increased need to grind and chew^{✓^S} in humans in view of the change in diet to soft, cooked food^{✓^S}

Eyebrow ridges

- Humans have eyebrow ridges that are smaller^{✓F} than those of the ape-like beings^{✓F}

Significance

- There is a decreased need to strengthen the skull^{✓S} of humans
- due to the smaller size of the jaws^{✓S}

Chin

- In humans the chin is more developed^{✓F} compared to the ape-like beings^{✓F}

Significance

- Developed chin assists with speech^{✓S} in humans

Zygomatic arch

- In humans the zygomatic arch/cheek bone is less developed^{✓F} than in the ape-like beings^{✓F}

Significance

- This corresponds with the decreased need for attachment of strong muscles^{✓S}
- due to the decreased jaw size^{✓S} in humans

	Description of features that changed	any	(10)
	Significance of the changes (must be linked to the features described)	any	(7)
		Content:	(17)
		Synthesis:	(3)
			(20)

Assessing the presentation of the essay

Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)
Generally	All information provided is relevant to the topic	Ideas are arranged in a logical/cause-effect sequence	All aspects required by the essay have been sufficiently addressed
In this essay	Only information relevant to the <i>structural changes</i> or <i>significance</i> is given (there is no irrelevant information)	Generally each significance is appropriately linked to the relevant structural change to the skull	At least 3 structural changes described together with the significance of each
Mark	1	1	1

R[✓]

L[✓]

C[✓]

TOTAL SECTION C: 40
GRAND TOTAL: 150



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

NOVEMBER 2013

MARKS: 150

TIME: 2½ hours

This question paper consists of 17 pages.

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 answer 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 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 correct answer and write only the letter (A to D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11 D.

1.1.1 A relationship in which organisms of two species interact and both benefit is known as ...

- A commensalism.
- B parasitism.
- C predation.
- D mutualism.

1.1.2 The social organisation that enhances the survival of a species is ...

- A external fertilisation.
- B division of labour among members of a colony.
- C symbiosis between members of a species.
- D living together in different habitats.

1.1.3 Which of the following will lead to the greatest increase in the amount of CO₂ in an area after cutting down forest trees?

- A Planting crops in the same area
- B Using the cut trees as building material
- C Introducing animals into the area
- D Leaving the soil bare

1.1.4 Populations grow exponentially (at a high rate) when ...

- A immigration and emigration rates are equal.
- B the death rate remains above the birth rate.
- C the birth rate remains far above the death rate.
- D the emigration rate exceeds the immigration rate.

1.1.5 A researcher was testing the hypothesis that 'the range of sound frequencies that a person can hear decreases with age'.

Males and females of differing ages were selected and a sound generator that produces sounds of varying frequencies was used.

What was the dependent variable in the investigation?

- A Age
- B Gender (male or female)
- C The sound generator
- D The range of frequencies that a person can hear

- 1.1.6 The table below shows the average height of human males and females, from birth to 24 years.

Age (years)	Average height of human males (cm)	Average height of human females (cm)
0	50	50
4	100	90
8	120	120
12	130	135
16	150	150
20	170	160
24	175	160

From this data, one could reasonably conclude that ...

- A males and females reach their maximum height at the same age.
- B females reach their maximum height later compared to males.
- C males are taller than females at all ages.
- D male adults are on average taller than female adults.

QUESTIONS 1.1.7 AND 1.1.8 ARE BASED ON THE INFORMATION BELOW.

Population size can be estimated using the formula below:

P = population estimate

M = number of organisms captured and marked

C = number of organisms recaptured (second capture)

R = number of marked organisms in second capture

$$P = \frac{M \times C}{R}$$

In an investigation to estimate the fish population in a certain dam, the following data was obtained:

Fish captured, marked and released = 40

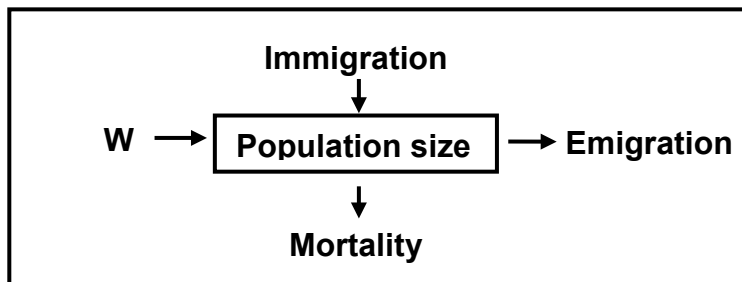
Marked fish in the second capture = 12

Unmarked fish in the second capture = 48

- 1.1.7 The estimated size of the fish population is ...

- A 1 920.
- B 160.
- C 200.
- D 100.

- 1.1.8 The validity of the investigation could be decreased if the ...
- A investigation was repeated and the average estimate calculated.
 - B mark used was harmless to the fish.
 - C second capture was done long after the first capture.
 - D owner of the dam did not grant permission for the investigation to be done.
- 1.1.9 Study the diagram below showing various parameters that influence the size of a population.



Which ONE of the following parameters is indicated by **W**?

- A Migration
 - B Natality
 - C Predation
 - D Competition
- 1.1.10 The table below shows the birth and death rates of four different countries in a particular year.

Country	Birth rate (per 1 000 of population)	Death rate (per 1 000 of population)
1	15	16
2	60	24
3	40	15
4	42	10

Which country showed the highest population growth in that year?

- A Country 1
 - B Country 2
 - C Country 3
 - D Country 4
- (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 number (1.2.1 to 1.2.6) in the ANSWER BOOK.

1.2.1 The physical count of every individual in a population

1.2.2 The maximum number of individuals that can be supported by an environment under prevailing conditions

1.2.3 A group of populations living together in the same habitat

1.2.4 The structural changes that some insects undergo before they can resemble the adult form

1.2.5 The structure in angiosperms that develops into a seed

1.2.6 The structure in a flower that supports the stigma

(6)

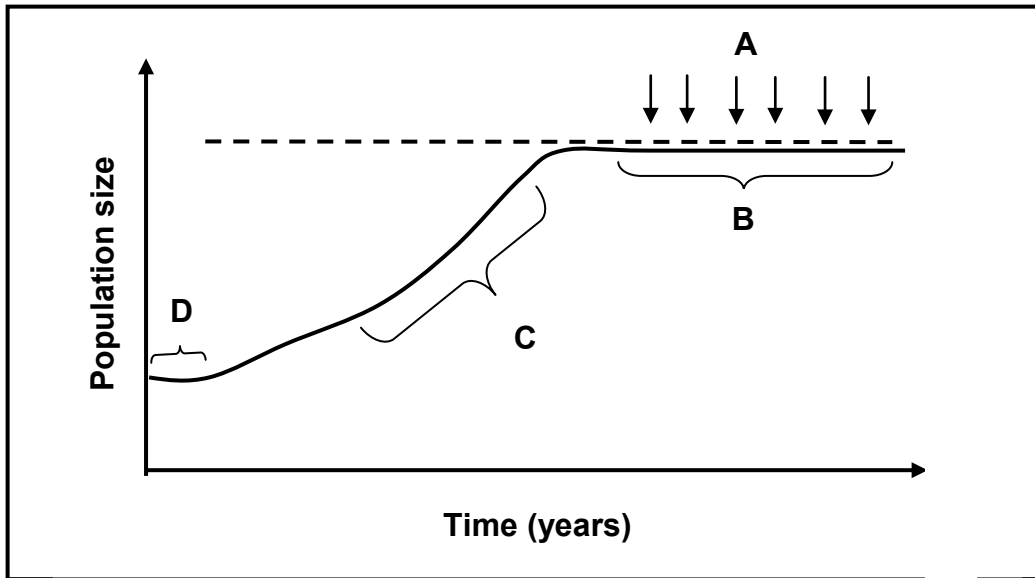
1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number (1.3.1 to 1.3.7) in the ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Importance of seeds	A: Source of food B: Protect the embryo
1.3.2 Organisms that are able to produce their own food by means of photosynthesis	A: Decomposers B: Primary consumers
1.3.3 A type of asexual reproduction in plants	A: Pollination B: Vegetative
1.3.4 Used in the treatment of middle ear infections	A: Cochlear implants B: Grommets
1.3.5 The transfer of pollen from an anther to a stigma of the same flower	A: Cross-pollination B: Self-pollination
1.3.6 Pollination involving flowers with petals that are reduced or absent	A: Insect B: Wind
1.3.7 Restricts heat loss from the blood	A: Vasoconstriction B: Vasodilation

(7 x 2)

(14)

1.4 Study the graph below.



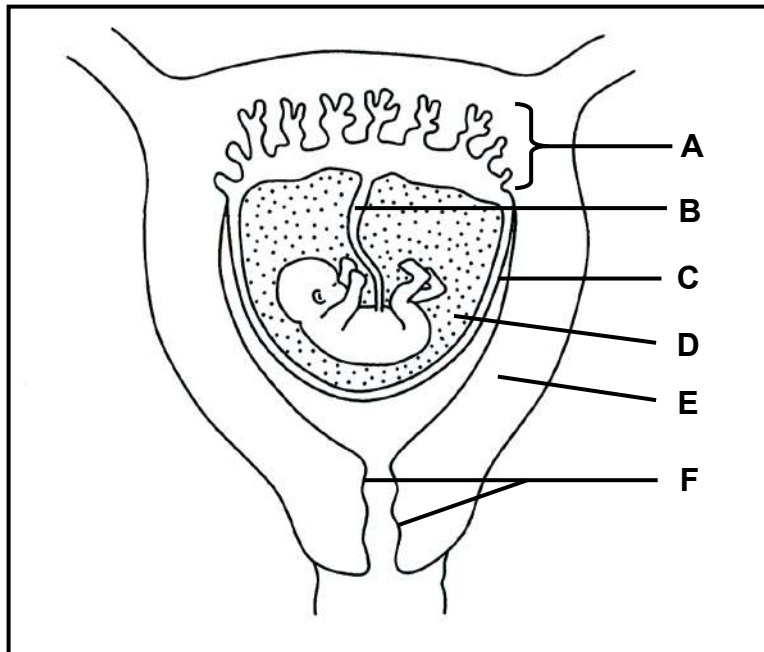
1.4.1 Name the following phases:

- (a) **B** (1)
- (b) **C** (1)
- (c) **D** (1)

1.4.2 What do the arrows at **A** represent in the graph? (1)

1.4.3 What type of growth curve is represented by the graph? (1)
(5)

1.5 Study the diagram below.



Match the structures (A to F) with the descriptions (1.5.1 to 1.5.5) below, for example 1.5.6 G. A letter may be used more than once, or not at all.

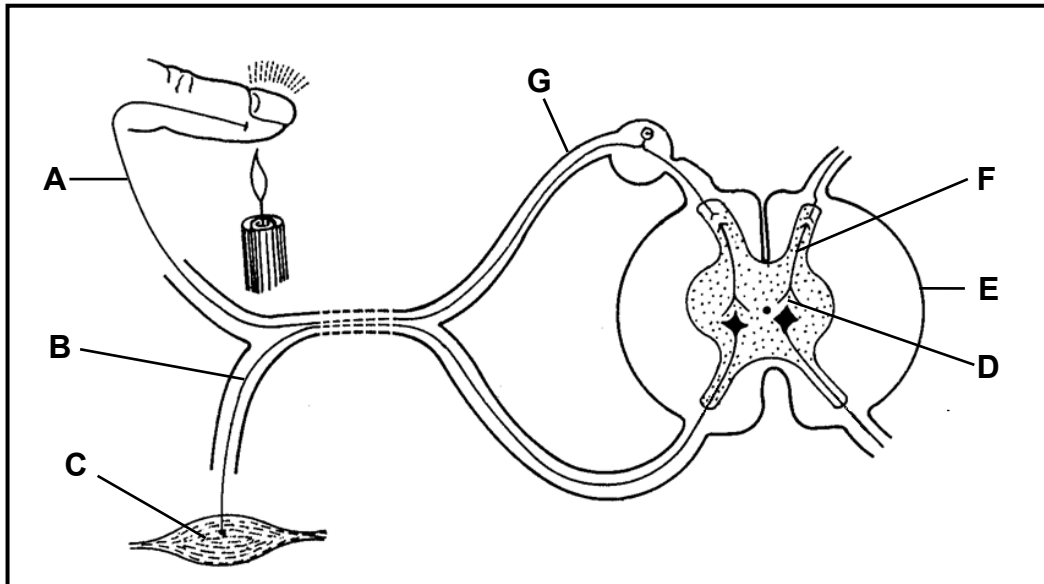
- 1.5.1 Where gaseous exchange occurs between the mother and the foetus (1)
- 1.5.2 Removes excretory products from the foetus (1)
- 1.5.3 Contains strong muscles which will push the foetus out during birth (1)
- 1.5.4 Clamped and cut after the baby is born (1)
- 1.5.5 Acts as a shock absorber for the developing foetus (1)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below shows a part of the central nervous system.



2.1.1 Give labels for each of the following:

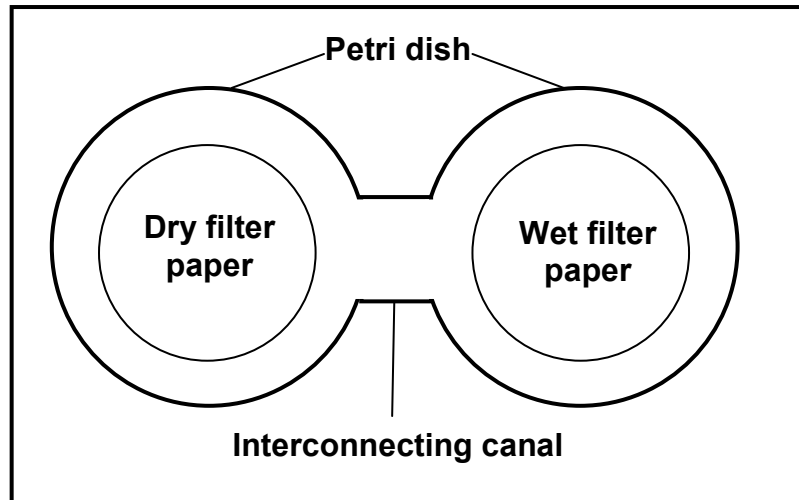
- (a) **C**
- (b) Microscopic gap **D**
- (c) **E**
- (d) **F**
- (e) **G** (5)

2.1.2 Explain ONE consequence for the body if **A** is damaged. (2)

2.1.3 Give TWO examples of reflex actions. (2)

2.1.4 Draw a labelled diagram of neuron **B** to show its structure. (5)
(14)

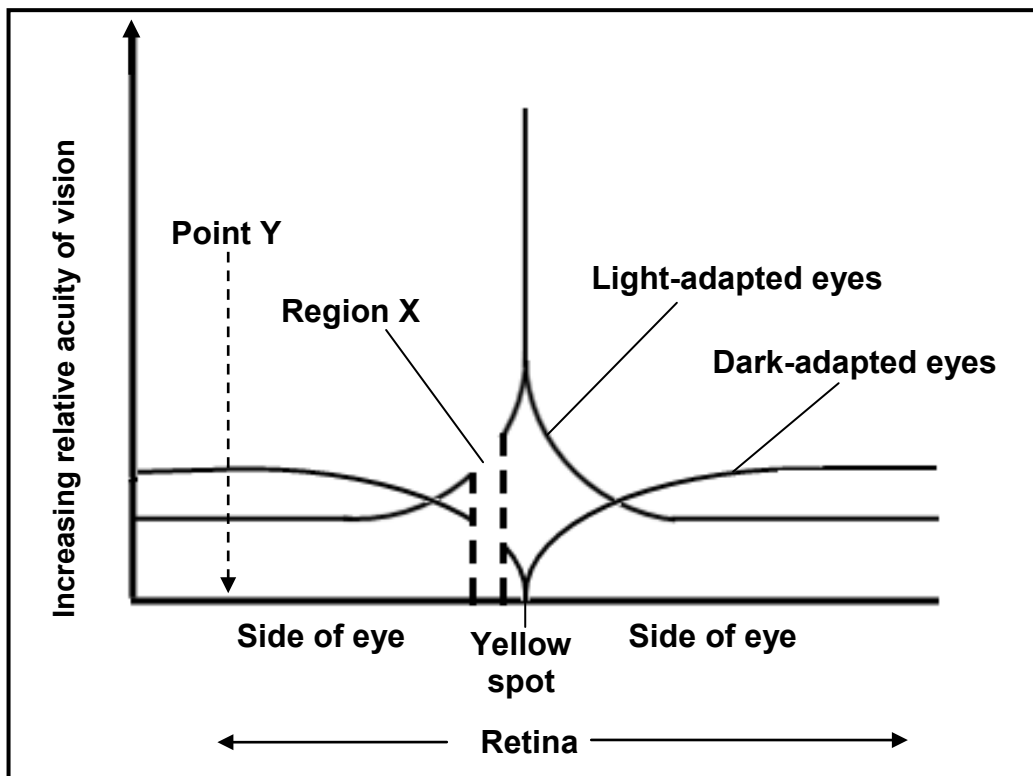
- 2.2 A learner wanted to investigate whether wood lice preferred to live in dry or moist conditions. He used two petri dishes that were interconnected so that the wood lice could move between the two petri dishes. Twenty wood lice were used in his investigation.



- 2.2.1 State FOUR planning steps that the learner must consider before the above investigation on wood lice is undertaken. (4)
- 2.2.2 For the investigation above, state the following:
- (a) Dependent variable (1)
 - (b) Independent variable (1)
- 2.2.3 State TWO factors that should be kept constant during the investigation above. (2)
- (8)

2.3 When a person moves from bright light into almost total darkness, he is temporarily blinded. After a few minutes, the rod cells in each retina respond and he can see fairly well. His eyes are now dark-adapted. When he returns to bright light he cannot see clearly for a short period until the cone cells in each retina respond. Then he can see properly again and his eyes are now light-adapted.

The degree of sharpness of detail seen by an eye is called its visual acuity. The graph below shows the visual acuity of a dark-adapted and a light-adapted eye.

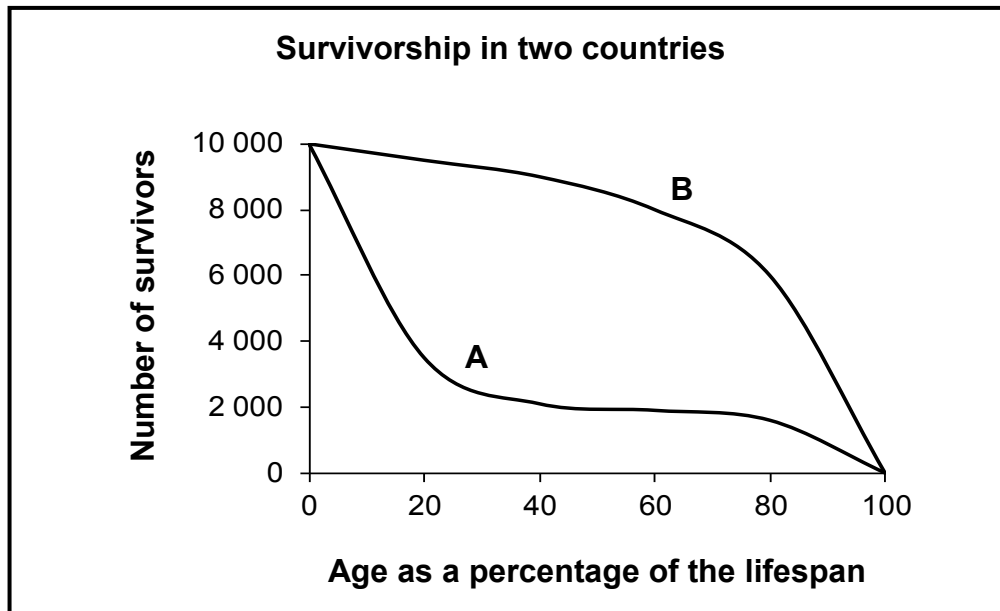


- 2.3.1 Explain the difference between a *light-adapted* and a *dark-adapted* eye. (2)
- 2.3.2 In which type of eye is the relative acuity (sharpness) of vision the greatest at the:
 - (a) Yellow spot (2)
 - (b) Side of the eye at point Y (2)
- 2.3.3 Identify region X on the graph. (1)
- 2.3.4 Give the reason why the acuity of vision for both types of eye is zero at region X on the retina. (1)

(8)
[30]

QUESTION 3

3.1 The graph below shows the survivorship in two countries (**A** and **B**).



- 3.1.1 Which curve (**A** or **B**) represents survivorship in a developing country? (1)
- 3.1.2 Give TWO explanations for your answer to QUESTION 3.1.1. (4)
(5)

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

Statistics on rhino poaching in South Africa show that rhino poaching is on the increase. In 2005, 13 rhinos were poached. This figure has steadily risen every year, and 448 rhinos were poached in 2011.

The rhino horns are smuggled to some countries in the East, where they are sold illegally and at very high prices.

These rhino horns are used to make aphrodisiacs (sexual stimulants), as well as ornaments. They are also used to make medicines which are thought to cure cancer and other ailments.

[Adapted from *the iol news*, April 2012]

- 3.2.1 What is *poaching*? (1)
- 3.2.2 Give ONE reason stated in the text above for the increase in rhino poaching in South Africa. (1)
- 3.2.3 State TWO ways in which Eastern countries use these rhino horns. (2)
- 3.2.4 Explain why we should be concerned about the increasing rhino poaching problem in South Africa. (2)
- 3.2.5 Explain TWO ways in which the South African government can prevent rhino poaching. (4)
- (10)**

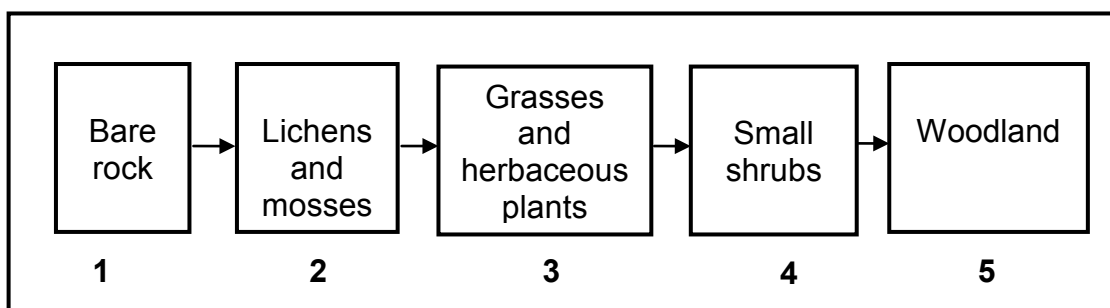
- 3.3 Two sea-birds, *Phalacrocorax aristotelis* (commonly known as the shag) and *Phalacrocorax canbo* (commonly known as the cormorant), feed in the same area and build their nests on the same mountain cliffs.

The table below shows the percentages of different prey eaten by each of these types of birds.

Prey		% of prey taken by each	
		Shag	Cormorant
Swimming near the surface of the water	Sand eel	49	2
	Herring	48	4
Swimming near the bottom of the water	Flat fish	1	42
	Shrimp	2	52

- 3.3.1 Explain why the shags and the cormorants are not in direct competition with each other, although they feed in the same area. (2)
- 3.3.2 Name the phenomenon explained in QUESTION 3.3.1. (1)
- 3.3.3 State ONE resource mentioned above for which the two species compete with each other. (1)
- 3.3.4 Name the type of competition that occurs between the two species for the resource mentioned in QUESTION 3.3.3. (1)
- (5)**

- 3.4 The flow diagram below shows a certain type of plant succession that starts on bare rock that has never been inhabited/colonised previously.



- 3.4.1 Name the type of succession involving the organisms in the diagram. (1)
- 3.4.2 Give a reason for your answer to QUESTION 3.4.1. (1)
- 3.4.3 Write down the collective term given to the plants in box 2 based on their role in succession. (1)
- 3.4.4 State ONE role of the organisms mentioned in QUESTION 3.4.3 in succession. (1)
- (4)**

- 3.5 A type of seaweed (*Caulerpa taxifolia*) was accidentally introduced into a new environment. In this new environment these seaweeds grew at twice the rate of the local seaweeds. Herbivores could not eat *C. taxifolia* as it produced a chemical which made it inedible. Scientists initially used chlorine to kill *C. taxifolia*, but are now considering introducing sea slugs (marine snails), which feed on the seaweed.
- 3.5.1 Explain what might happen to the population size of the carnivorous fish that feed on the herbivores if the local seaweeds are replaced by *C. taxifolia*. (3)
- 3.5.2 Suggest a reason why it may not be advisable to use chlorine to kill *C. taxifolia*. (1)
- 3.5.3 Explain a possible disadvantage of introducing sea slugs to control the *C. taxifolia* population. (2)
- (6)**
[30]
- TOTAL SECTION B: 60**

SECTION C

QUESTION 4

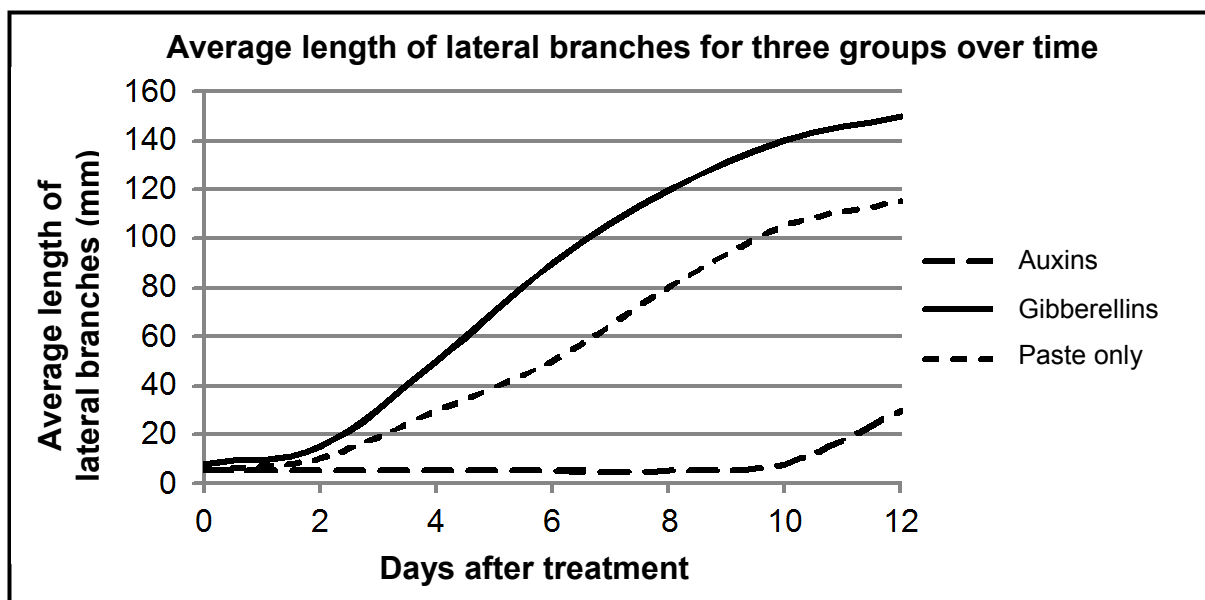
4.1 A learner investigated the effects of two plant growth substances, gibberellins and auxins, on apical dominance. The apical buds of nine pea plants of the same species, age and height were removed. These plants were then divided equally into three groups. In each group the cut surface of the remaining shoot (growing stem) of the pea plants was treated in one of the following ways:

- Group 1: Coated with a paste containing gibberellins of the same concentration
- Group 2: Coated with a paste containing auxins of the same concentration
- Group 3: Coated with a paste only (containing no plant growth hormones)

The hormones diffuse into the plant until no more hormones remain in the paste.

The treated plants were all grown under the same conditions in the laboratory. The length of the lateral branches of each plant was measured after every two days for a period of 12 days. Measurements were taken at the same time for all treated plants and the average for each group was calculated.

The results of the investigation are shown in the graph below.



4.1.1 State ONE function of the gibberellins that led to the results obtained in the investigation. (1)

4.1.2 Calculate the difference in the average length of the lateral branches between the plants treated with gibberellins and the plants treated with the paste only on the 8th day after the treatment. Show ALL working. (3)

4.1.3 State TWO ways in which the reliability of the investigation could be increased. (2)

4.1.4 Use the results to explain the effect of auxins on the growth of the lateral branches. (4)
(10)

4.2 Diabetes mellitus is usually linked to the body mass index (BMI), which is calculated as follows:

$$\text{BMI} = \frac{\text{mass (kg)}}{\text{height}^2 (\text{m}^2)}$$

An investigation was done to determine the relative risk of developing diabetes mellitus in females for each BMI.

The results are shown in the table below.

Body mass index (BMI) (kg/m ²)	Relative risk of developing diabetes mellitus in females (%)
<20	7,5
20–25	18,0
26–30	37,5
31–35	57,0
>35	74,5

[Adapted from American Diabetics Association, March 2007]

4.2.1 Draw a histogram using the data in the table above. (6)

4.2.2 Name the hormone that results in diabetes mellitus when it is deficient. (1)

4.2.3 Name the organ that secretes the hormone mentioned in QUESTION 4.2.2. (1)

4.2.4 State TWO other hormones (except the one mentioned in QUESTION 4.2.2) that influence the glucose level of the blood. (2)
(10)

4.3 Describe the menstrual cycle and how it is influenced by different hormones.

Content: (17)
Synthesis: (3)
(20)

NOTE: NO marks will be awarded for answers in the form of flow charts or diagrams.

TOTAL SECTION C: 40
GRAND TOTAL: 150



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

LIFE SCIENCES P2

NOVEMBER 2013

MEMORANDUM

MARKS: 150

This memorandum consists of 11 pages.

PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2013

1. **If more information than marks allocated is given**
Stop marking when maximum marks is reached and put a wavy line and 'max' in the right-hand margin.
2. **If, for example, three reasons are required and five are given**
Mark the first three irrespective of whether all or some are correct/incorrect.
3. **If whole process is given when only part of it is required**
Read all and credit relevant part.
4. **If comparisons are asked for and descriptions are given**
Accept if differences/similarities are clear.
5. **If tabulation is required but paragraphs are given**
Candidates will lose marks for not tabulating.
6. **If diagrams are given with annotations when descriptions are required**
Candidates will lose marks
7. **If flow charts are given instead of descriptions**
Candidates will lose marks.
8. **If sequence is muddled and links do not make sense**
Where sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links become correct again, resume credit.
9. **Non-recognised abbreviations**
Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of answer if correct.
10. **Wrong numbering**
If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.
11. **If language used changes the intended meaning**
Do not accept.
12. **Spelling errors**
If recognisable accept provided it does not mean something else in Life Sciences or if it is out of context.
13. **If common names given in terminology**
Accept provided it was accepted at the national memo discussion meeting.
14. **If only letter is asked for and only name is given (and vice versa)**
No credit.

15. **If units are not given in measurements**
Candidates will lose marks. Memorandum will allocate marks for units separately.
16. Be sensitive to the **sense of an answer, which may be stated in a different way.**
17. **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.
18. **Code-switching of official languages (terms and concepts)**
A single word or two that appears in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited, if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.
19. No changes must be made to the marking memoranda without consulting the provincial internal moderator who in turn will consult with the national internal moderator (and the external moderators where necessary)
20. Only memoranda bearing the signatures of the national internal moderator and the UMALUSI moderators and distributed by the National Department of Education via the provinces must be used.

SECTION A**QUESTION 1**

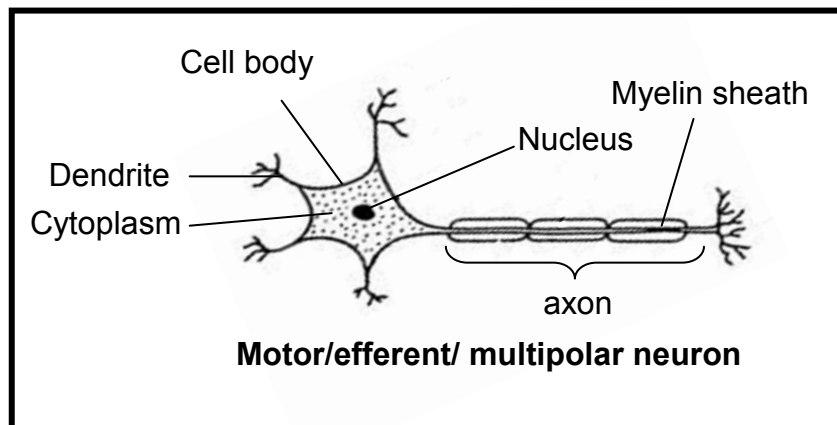
1.1	1.1.1	D✓✓		
	1.1.2	B✓✓		
	1.1.3	C✓✓		
	1.1.4	C✓✓		
	1.1.5	D✓✓		
	1.1.6	D✓✓		
	1.1.7	C✓✓		
	1.1.8	C✓✓		
	1.1.9	B✓✓		
	1.1.10	B✓✓	(10 x 2)	(20)
1.2	1.2.1	Census✓		
	1.2.2	Carrying capacity✓		
	1.2.3	Community✓		
	1.2.4	Metamorphosis✓		
	1.2.5	Ovule✓		
	1.2.6	Style✓		(6)
1.3	1.3.1	Both A and B✓✓		
	1.3.2	None✓✓		
	1.3.3	B only✓✓		
	1.3.4	B only✓✓		
	1.3.5	B only✓✓		
	1.3.6	B only✓✓		
	1.3.7	A only✓✓	(7 x 2)	(14)
1.4	1.4.1	(a) Equilibrium✓/stationary		(1)
		(b) Accelerating✓/logarithmic/exponential/ geometric		(1)
		(c) Lag✓/establishment		(1)
	1.4.2	Environmental resistance✓/limiting factors		(1)
	1.4.3	Logistic ✓/sigmoid /S-curve		(1)
				(5)
1.5	1.5.1	A✓		(1)
	1.5.2	A✓ /B		(1)
	1.5.3	E✓		(1)
	1.5.4	B✓		(1)
	1.5.5	D✓		(1)
				(5)
TOTAL SECTION A:				50

SECTION B

QUESTION 2

- 2.1 2.1.1 (a) C - Effector✓/muscle
 (b) D - Synapse✓
 (c) E - Spinal cord✓
 (d) F - Connector neuron✓/interneuron
 (e) G - Dorsal root✓/spinal nerve (5)
- 2.1.2 Impulse will not reach the CNS✓/the body will be unaware of the stimulus
 and no reflex action✓
 will occur, causing harm to the body✓ Any (2)
- 2.1.3 Pulling your hand away from a hot object✓/blinking/coughing/
 sneezing//knee-jerk/ any appropriate stimulus and response/
 (swallowing/peristalsis/breathing/heartbeat/dilation and constriction
 of blood vessel/pupillary mechanism/ yawning/salivation)
(Mark first TWO only) Any (2)

2.1.4



Mark allocation for diagram:

- Correct caption✓
 Correct type of neuron drawn✓
 Any 3 correct labels✓✓✓ (5)
(14)

- 2.2 2.2.1 Make a decision on:
 - a place to do the investigation✓
 - the time and duration✓
 - the sample size✓
 - where to obtain woodlice✓
 - the apparatus needed✓
 - how to create moist and dry conditions✓
 - factors to keep constant✓/ example
 - the number of times that the investigation should be repeated✓
 - how to record the results✓
(Mark first FOUR only) Any (4)

- 2.2.2 (a) number of wood lice✓ (1)
- (b) amount of moisture✓/(dry and moist conditions) (1)
- 2.2.3 - Light intensity✓/ temperature/ any environmental condition
 - Size/type of petri dish✓
 - Size/type of filter paper✓
 - Size of the woodlice✓
 - Species of the woodlice✓
(Mark first TWO only) Any (2)
(8)
- 2.3 2.3.1 In **light-adapted** eyes the **cone cells** respond✓ in bright light
 While in **dark-adapted** eyes the **rod cells** respond✓ in low light conditions
- OR**
- In light-adapted eyes the pupil is constricted✓
 In dark-adapted eyes the pupil is dilated✓ Any 1x2 (2)
- 2.3.2 (a) Light-adapted✓✓ (2)
- (b) Dark-adapted✓✓ (2)
- 2.3.3 Blind spot✓ (1)
- 2.3.4 Rods and cones/photoreceptors are absent✓ at X (1)
(8)
[30]

QUESTION 3

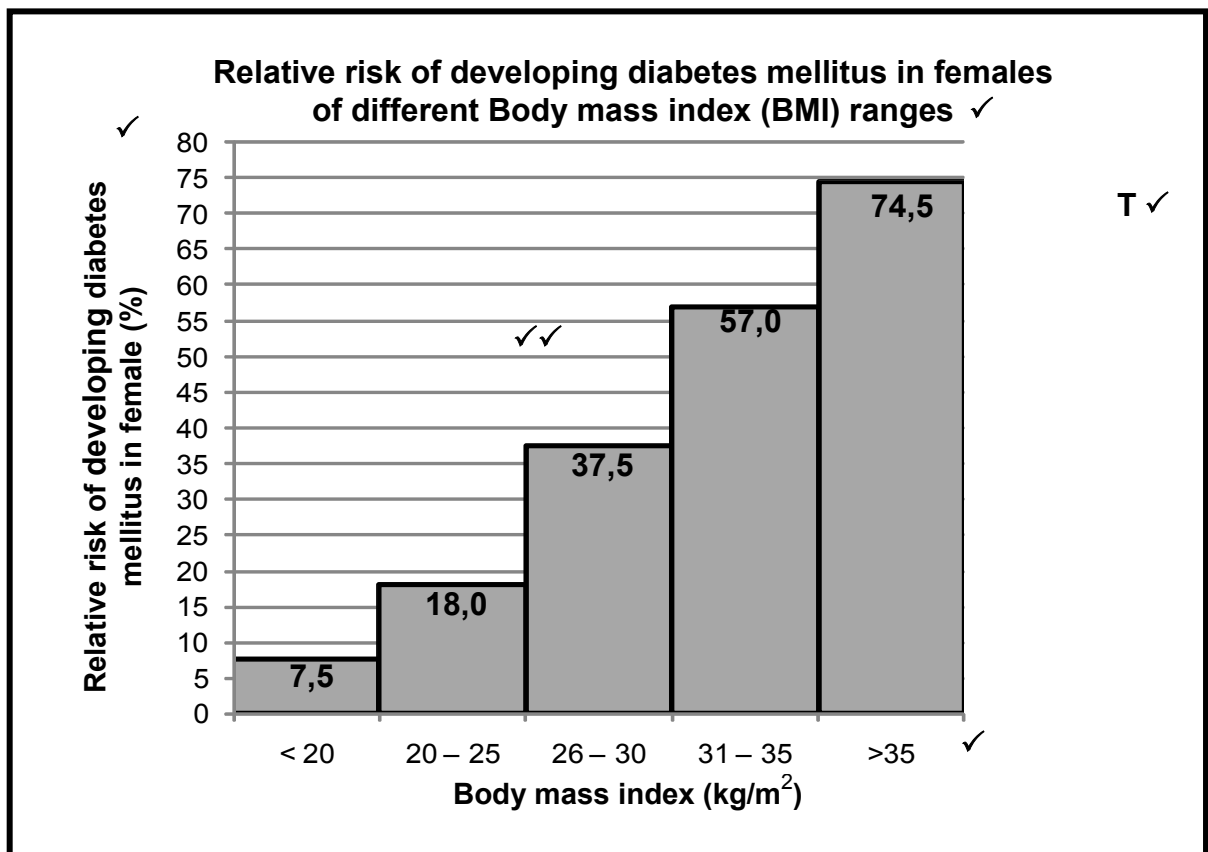
- 3.1 3.1.1 A✓ (1)
- 3.1.2 High mortality amongst the young people✓✓
Low percentage of people towards the end of their lifespan✓✓/Low life expectancy
(Mark first TWO only) 2 x 2 (4)
(5)
- 3.2 3.2.1 Illegal killing✓/stealing of protected organisms (1)
- 3.2.2 They are sold at very high prices✓/increased demand for rhino horns (1)
- 3.2.3 Medicinal purpose✓/example
Making ornaments✓
Making an aphrodisiac✓
(Mark first TWO only) Any (2)
- 3.2.4 Rhino species could become extinct✓
thus reducing biodiversity✓
upsetting the balance in community structure✓/ food web
also affecting tourism✓/economy Any (2)
- 3.2.5 Legalise the selling and exporting of rhino horns✓ thus decreasing its demand✓
Removing horns✓ to prevent killing ✓of rhinos
Strict penalties✓/imprisonment to discourage✓ illegal poaching
Developing new technology✓ to improve monitoring✓
Employ more people✓ for stricter monitoring✓/security
Inject substances in the horn✓ to decrease its utility value✓
Educating✓ people about the importance of conservation✓ of the rhino species
(Mark first TWO only) Any 2 x 2 (4)
(10)
- 3.3 3.3.1 Shag will eat prey mostly from the surface ✓/sand eel and herring and cormorant eat prey mostly from the bottom✓/ flat fish and shrimp
OR
They feed generally at/on different✓ depths✓/species in the ocean (2)
- 3.3.2 Resource partitioning ✓/spatial partitioning/niche partitioning (1)
- 3.3.3 Space✓ /Nesting area (1)
- 3.3.4 Interspecific✓ competition (1)
(5)

3.4	3.4.1	Primary✓ succession		(1)
	3.4.2	Lichens colonise a habitat/bare rock for the first time✓		(1)
	3.4.3	Pioneers ✓		(1)
	3.4.4	- Forms a layer of soil✓ - Modifies/improves the environment✓for organisms to follow - Enriches the soil with nutrients and gases✓		
		(Mark first ONE only)	Any	(1) (4)
3.5	3.5.1	The carnivorous fish population will decrease✓ because the herbivore population will decrease✓ as there will be no food✓/ seaweed for the herbivores		(3)
	3.5.2	Chlorine may affect other organisms✓		(1)
	3.5.3	They may not have natural predators✓/ they may feed on the local seaweeds as well Leading to an increase in population size of the sea slugs✓ This could lead to an imbalance in food chains✓	Any	(2) (6) [30]
TOTAL SECTION B:				60

SECTION C**QUESTION 4**

- 4.1 4.1.1 Gibberellins stimulates cell elongation✓/cell enlargement/ growth in stems/elongation of internodes
(Mark first ONE only) Any (1)
- 4.1.2 (120 – 80)✓mm = 40 ✓mm✓ (3)
- 4.1.3 Increase the number of plants used in each treatment✓
Repeat the investigation✓
Increase the period of the investigation✓
(Mark first TWO only) Any (2)
- 4.1.4 Auxins diffused from the paste into the plants✓
inhibiting growth of the lateral branches✓
Once all the auxins were used up✓ from the paste
the growth of the lateral branches increased ✓ (4)
(10)

4.2 4.2.1



Check list for the mark allocation of the graph

Correct type of graph (T)	1
Title of graph	1
Correct label , appropriate scale for X-axis and width of the bars for X-axis (including unit)	1
Correct label and appropriate scale for Y-axis (including unit)	1
Plotting of bars	1-1 to 4 bars plotted correctly 2-all 5 bars plotted correctly

NOTE:

If the wrong type of graph is drawn:

- Marks will be lost for 'correct type of graph'

If axes are transposed:

- Marks will be lost for labelling of X-axis and Y-axis
- Marks will be lost for plotting of bars

(6)

4.2.2 Insulin✓

(1)

4.2.3 Pancreas✓

(1)

4.2.4 Glucagon✓
Adrenalin ✓
Thyroxin✓

(Mark first TWO only)

(in any order)

Any

(2)
(10)

- 4.3
- The menstrual cycle is a series of events that occur in the female body to prepare it for possible pregnancy✓
 - Which involves ovarian cycle✓
 - and the uterine cycle✓
 - It takes an average of 28 days✓
 - The pituitary gland✓/hypophysis
 - secretes FSH✓
which stimulates the development of a primary follicle✓ in the ovary
 - The developing follicle✓/Graafian follicle
 - secretes oestrogen✓
which stimulates the thickening of the lining of the uterus✓/endometrium
 - Around day 13 pituitary gland✓/hypophysis
 - secretes LH✓
 - which cause ovulation to occur✓
 - The remains of the Graafian follicle develops into the corpus luteum✓
which secretes the progesterone✓
which continues to stimulate the thickening of the uterus✓
 - High levels of progesterone✓
 - inhibits the production of FSH✓
so that the ovaries are no longer stimulated to produce another follicle✓
 - If fertilisation does not occur, the corpus luteum degenerates✓
and stops producing progesterone✓
 - The pituitary gland/hypophysis is no longer inhibited in its production of FSH✓ and a new follicle develops
 - The thick endometrium is no longer maintained✓/ it degenerates
and is shed together with blood/menstruation takes place

Any (17)

Content: (17)

Synthesis: (3)

(20)

ASSESSING THE PRESENTATION OF THE ESSAY

Criterion	Relevance	Logical sequence	Comprehensive
Elaboration	All information provided is relevant to the topic	Ideas are arranged in a logical/cause-effect sequence	All aspects required by the essay have been addressed
Mark	1	1	1
Paper 2	Only information relevant to the <i>menstrual cycle</i> or the <i>role of hormones of the menstrual cycle</i> is given. (There is no irrelevant information)	The events of the menstrual cycle are presented in the correct sequence and the hormones linked to the appropriate events	The role of all 4 hormones in the menstrual cycle are mentioned

R✓

L✓

C✓

TOTAL SECTION C: 40
GRAND TOTAL: 150