



# basic education

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P1**

**NOVEMBER 2010**

**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 your ANSWER BOOK.
3. Start the answers to each question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams 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 may use a non-programmable calculator, protractor and a compass.
11. Write neatly and legibly.

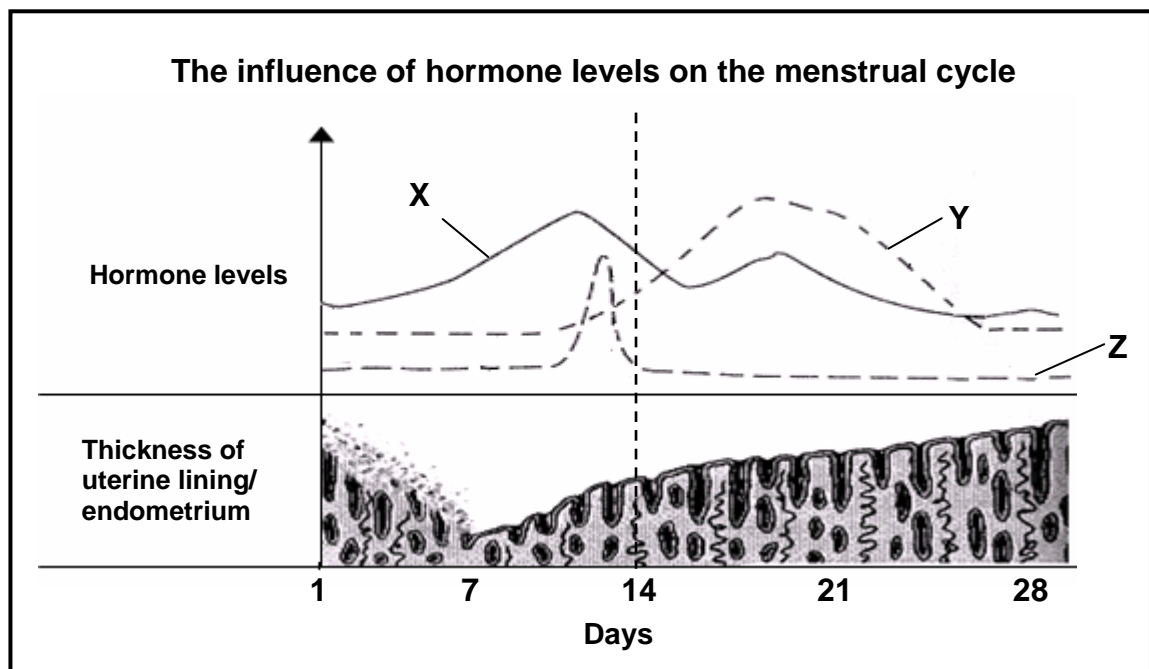
**SECTION A****QUESTION 1**

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 1.1.5) in your ANSWER BOOK, for example 1.1.6 D.

1.1.1 Each somatic (body) cell in the human has ...

- A 23 different chromosomes.
- B 46 similar chromosomes.
- C 23 pairs of chromosomes.
- D 46 pairs of different chromosomes.

QUESTION 1.1.2 and QUESTION 1.1.3 refer to the graph below which shows the menstrual cycle and the influence that different hormones have on it.



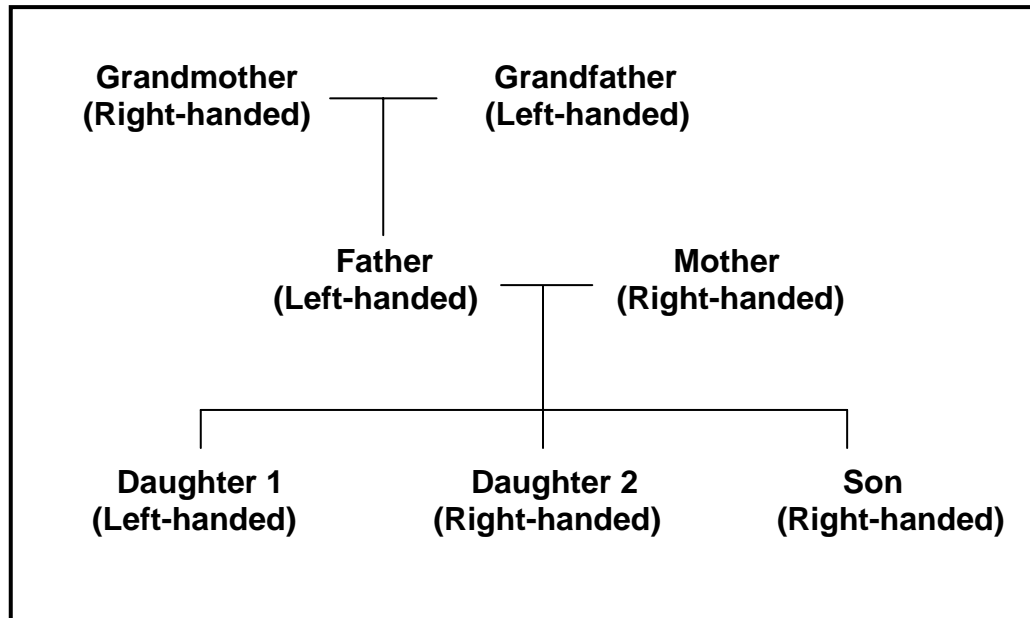
1.1.2 On which TWO days are the level of hormones X and Y the same?

- A 12 and 13
- B 14 and 21
- C 15 and 26
- D 7 and 27

1.1.3 Which of the following shows the pattern/trend of the level of hormones X and Z from days 13 to 14?

- A X decreases and Z increases
- B Both decrease
- C X and Z are at their optimum level
- D Both increase

- 1.1.4 In a human family, the gene for right-handedness (**R**) is dominant over the gene for left-handedness. The pedigree diagram of three generations is shown below.



Which is the correct expression of the genotypes of the following three individuals shown in the pedigree diagram?

	Grandmother	Mother	Daughter 1
A	Rr	Rr	RR
B	Rr	RR	rr
C	RR	Rr	rr
D	Rr	Rr	rr

- 1.1.5 A pregnant woman was told by a genetic counsellor that her baby had equal chances of having blood type A or blood type AB. This means that the genotypes of the woman and her husband must have been ...

- A  $I^A I^A$  and  $I^B i$   
 B  $I^A I^B$  and  $I^B i$   
 C  $I^A i$  and  $I^B I^B$   
 D  $I^A I^B$  and  $I^A i$

(5 x 2) (10)

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 1.2.7) in your ANSWER BOOK.

- 1.2.1 The physically and physiologically expressed characteristics of an organism determined by its genotype and also by its environment
- 1.2.2 The disease caused by uncontrolled division of cells
- 1.2.3 The two parts of a chromosome held together by a centromere
- 1.2.4 The process by which sperms and eggs are produced
- 1.2.5 Paired chromosomes that are similar in structure and in the set of genes they carry
- 1.2.6 The process by which the DNA molecule duplicates itself
- 1.2.7 A sex-linked condition where blood fails to clot properly

(7)

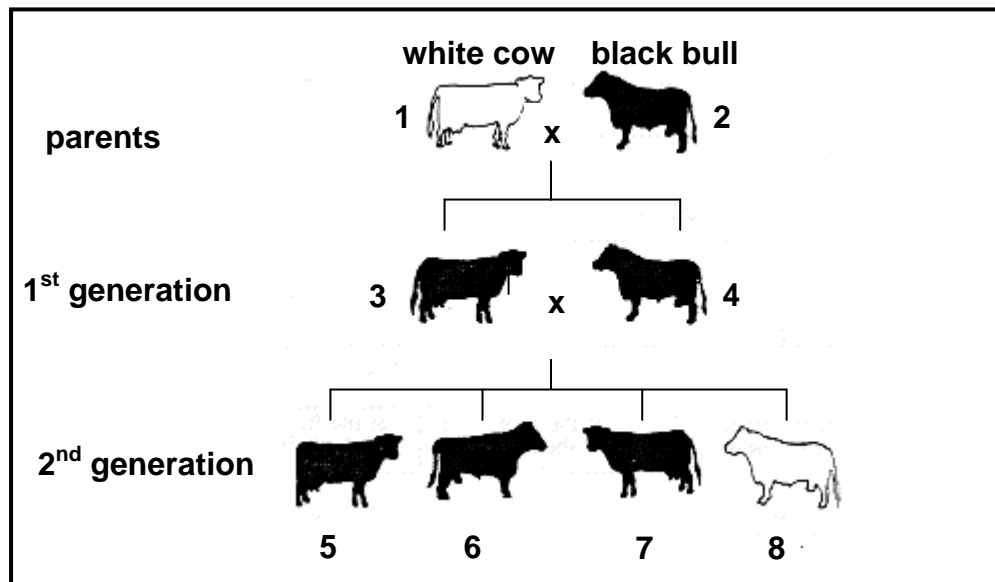
1.3 Choose an item from COLUMN II that matches a description in COLUMN I. Write only the letter (A to H) next to the question number (1.3.1 to 1.3.5) in your ANSWER BOOK, for example 1.3.6 J.

COLUMN I		COLUMN II	
1.3.1	Alleles of an organism for a particular trait	A	haploid
1.3.2	Two alleles that are equally expressed in an organism	B	genotype
1.3.3	A cell which has a single set of chromosomes	C	translation
1.3.4	The formation of mRNA (messenger RNA) from a DNA template	D	nucleolus
1.3.5	Sudden changes in the genetic make up of an organism	E	mutation
		F	transcription
		G	co-dominance
		H	phenotype

(5 x 1)

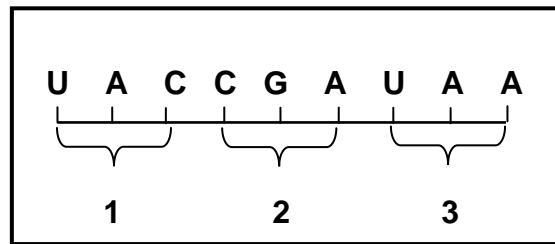
(5)

- 1.4 The diagram below shows the offspring of crosses between a pure-bred black coat bull and a pure-bred white coat cow. The coat colours of the offspring of the first and second generations are also shown. Coat colour is controlled by two alleles, one for black and one for white coat colour.



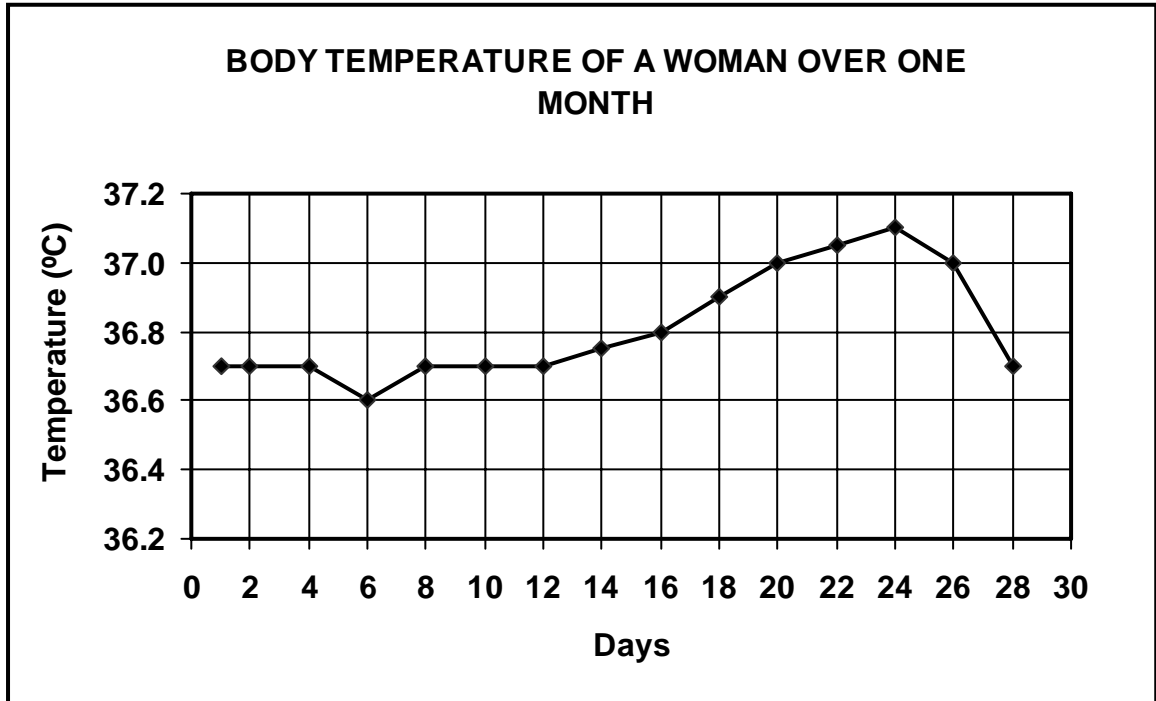
- 1.4.1 Use the letters **B** and **b** and state which gene is responsible for the following:
- (a) Black coat colour (1)
- (b) White coat colour (1)
- 1.4.2 Which animal(s) (1 to 8) in the diagram **must be** homozygous for coat colour? (3)  
(5)

1.5 The diagram below shows part of a mRNA (messenger RNA) molecule.



- 1.5.1 How many codons are shown in the diagram of this section of mRNA? (1)
- 1.5.2 Write down the complementary base sequence of the DNA strand that formed codon 1 of the mRNA strand in the above diagram. (1)
- 1.5.3 Explain the purpose of a specific sequence of codons in a mRNA molecule. (2)
- 1.5.4 A tRNA (transfer RNA) molecule carries complementary bases for a particular codon.
- (a) Write down the complementary base sequence of a tRNA for codon 1 in the mRNA sequence shown in the above diagram. (1)
- (b) Briefly describe the role of tRNA molecules in the translation process of protein synthesis. (3)
- (8)**

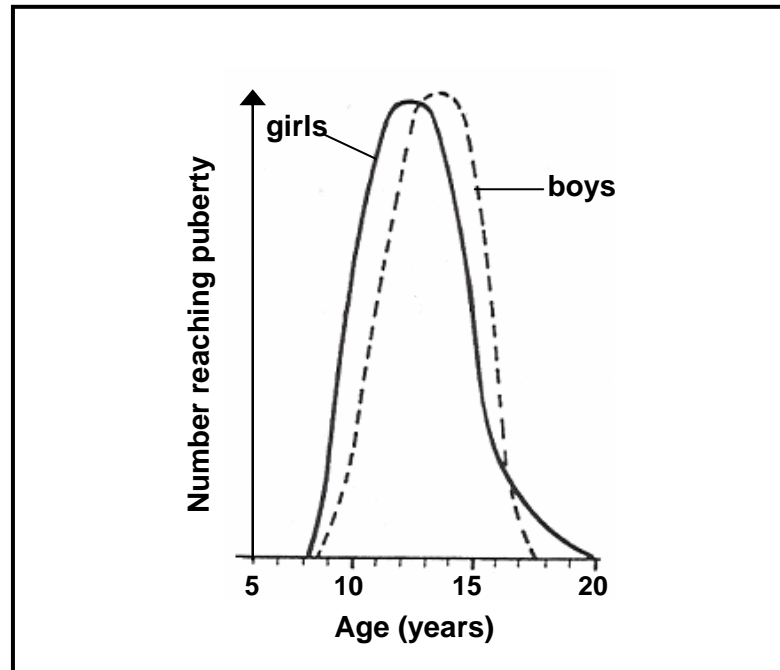
1.6 The graph below shows a woman's body temperature taken every second day as soon as she wakes up. From the results/evidence it is assumed that ovulation occurred on day 14.



- 1.6.1 What is the body temperature of the woman on day 2? (2)
- 1.6.2 By how much did the temperature (°C) rise between day 16 and day 24? (1)
- 1.6.3 Explain how the information in the graph above can be used to predict the days when the woman is fertile. (3)  
(6)



- 1.7 The graph below represents the age when puberty is reached by boys and girls in a population.

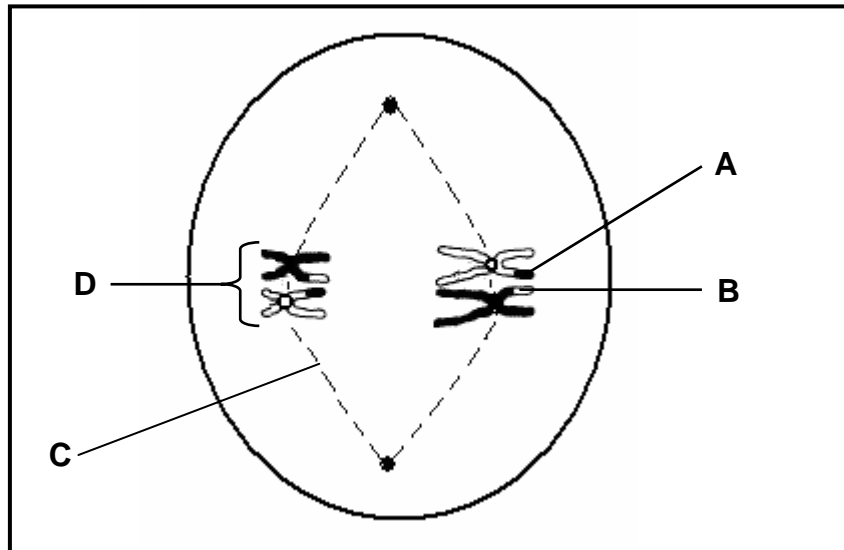


- 1.7.1 At what age does the largest number of boys reach puberty? (1)
- 1.7.2 Use the graph to compare the average age at which puberty occurs in most boys and most girls. (2)
- 1.7.3 Mary is sixteen years old but she has not reached puberty yet. Explain why she and her parents should not be worried. (2)
- 1.7.4 Although boys and girls who have reached puberty can have children, give TWO reasons explaining why you would advise teenagers not to have children at a young age. (4)

**(9)****TOTAL SECTION A: 50**

**SECTION B****QUESTION 2**

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



- 2.1.1 Label **C** and **D**. (2)
- 2.1.2 (a) Identify the phase represented in the diagram above. (1)
- (b) Give a reason for your answer to QUESTION 2.1.2 (a). (2)
- 2.1.3 Name the process which resulted in parts **A** and **B** being different from each other. (1)
- 2.1.4 Describe how the process referred to in QUESTION 2.1.3 occurs. (3)
- 2.1.5 State the importance of the process named in QUESTION 2.1.3. (1)
- 2.1.6 (a) How many cells will be formed at the end of the first division of the cell drawn in the diagram above? (1)
- (b) How many chromosomes will each daughter cell have when the cell, drawn in the diagram above, has completed meiosis? (1)
- (12)**

2.2 In humans, the gene for curly hair is dominant over that for straight hair. Use the letter **H** to represent the gene for curly hair and the letter **h** to represent the gene for straight hair.

2.2.1 Explain why the statement below is TRUE:

A person with curly hair may be heterozygous or homozygous for this characteristic. (2)

2.2.2 Show diagrammatically, by means of a genetic cross, how a man with curly hair, who marries a woman with curly hair, may have a child with straight hair. (6)

(8)

2.3 Tabulate THREE structural differences between DNA and RNA. (7)

2.4 Analysis of DNA samples from a patient with an illness showed that there were two different types of DNA present. One was double-stranded human DNA and the other was single-stranded virus DNA. The two types of DNA were isolated and put into separate test tubes. The analyses of the nitrogenous base composition of each test tube is shown in the table below.

	Nitrogenous base composition (%)			
	Adenine	Cytosine	Guanine	Thymine
Test tube 1	22.1	27.9	27.9	22.1
Test tube 2	31.1	31.3	18.7	18.9

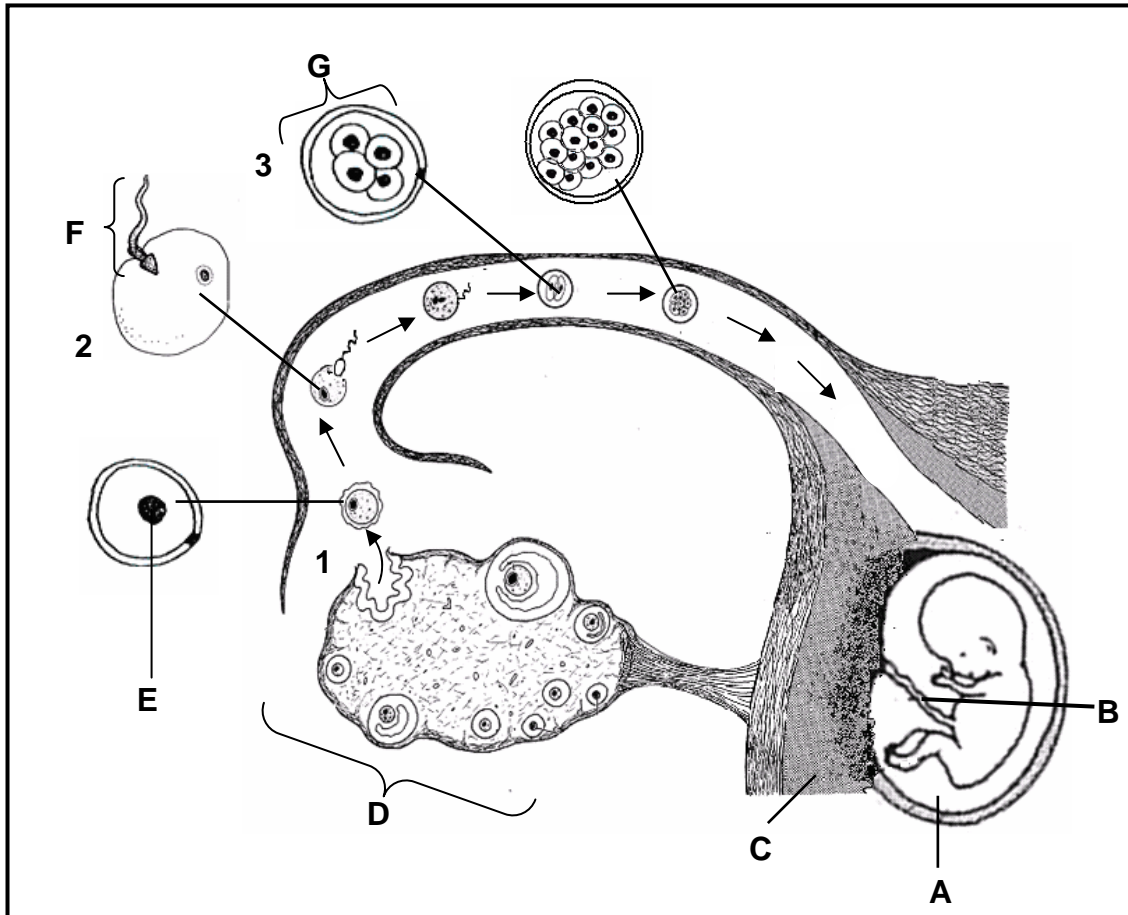
2.4.1 Which test tube (1 or 2) contains virus DNA? (1)

2.4.2 Explain your answer to QUESTION 2.4.1. (2)

(3)  
[30]

**QUESTION 3**

3.1 The diagram below shows part of the female reproductive system. Structures **B** to **G** and processes **1**, **2** and **3**, occurring in the Fallopian tube and uterus, are magnified.



- 3.1.1 Label **C** and **D**. (2)
- 3.1.2 State which processes are taking place at **1**, **2** and **3** respectively. (3)
- 3.1.3 State how many chromosomes are present in the following structures:
- (a) **E** (1)
  - (b) Each cell of structure **G** (1)
- 3.1.4 Draw an enlarged labelled diagram of structure **F** to show its details. (5)
- 3.1.5 State TWO functions of fluid **A**. (2)
- 3.1.6 Structure **B** transports substances to and from the foetus.
- (a) Name ONE useful substance transported to the foetus. (1)
  - (b) Name ONE waste product transported from the foetus. (1)
- (16)**

3.2 Name TWO types of twins formed in humans and explain how each type is formed during fertilisation. (6)

3.3 The flowers of the African savanna tree are pollinated by different animals.

The tree produces about 200 flower buds at the end of each branch. However, not all the flower buds open at the same time. On any one night in the flowering season, about 40 flowers open per branch. Each flower lives for a short while and then it withers and dies.

In an investigation into the pollination of the flowers, the following observations were made:

Time	State of flowers	Animals visiting the flowers
17:00	Closed	None
17:30	Flowers begin to open and nectar production begins	Honey bees feed on the nectar
19:30	Flowers fully open	First bats visit the flowers
21:30	Very large amounts of nectar produced	Many bats visit the flowers
00:30	Anthers widely spaced and little nectar produced	Fewer bats visit the flowers
05:30	Very little nectar produced	Bats stop visiting flowers and honeybees collect pollen
06:30	No more pollen	Birds feed on remaining nectar
11:30	Flowers wither and die	None

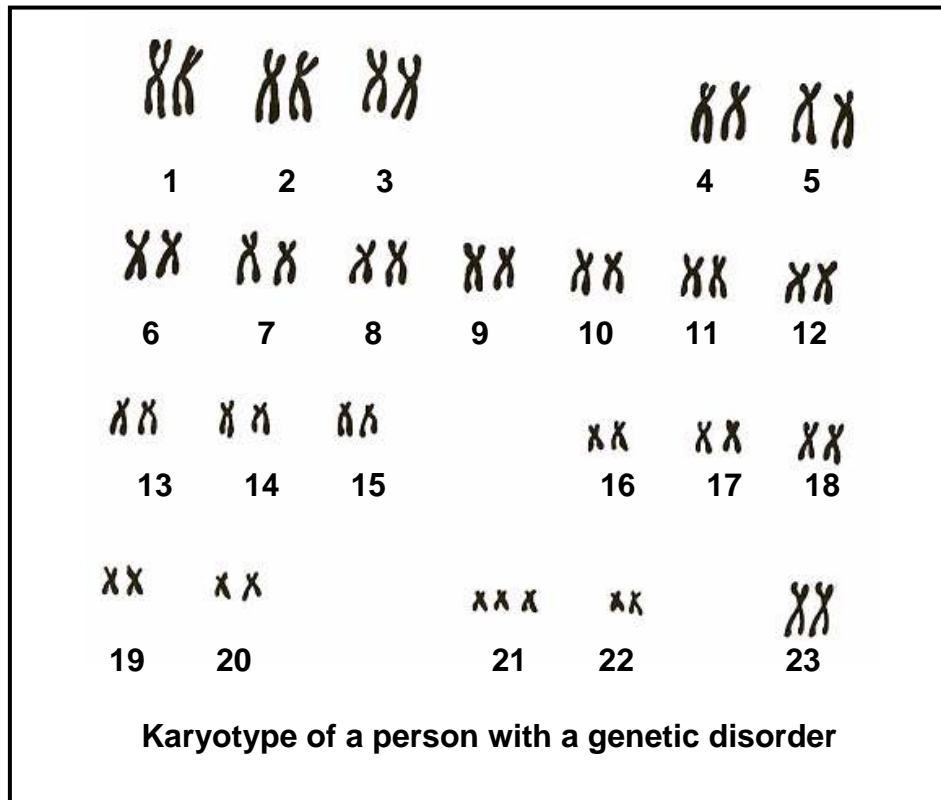
- 3.3.1 For how many hours do the flowers live after they open? (1)
- 3.3.2 Which are the first animals to visit the flowers? (1)
- 3.3.3 State why the bats stop visiting the flowers. (1)
- 3.3.4 State how the plant benefits from producing nectar. (1)
- 3.3.5 Explain the advantage to the plant of having only a small number of flowers open each evening. (2)
- 3.3.6 After pollination, fertilisation usually occurs. Name what the following parts of the flower will develop into after fertilisation:
- (a) Ovule (1)
- (b) Ovary (1)
- (8)**  
**[30]**

**TOTAL SECTION B: 60**

**SECTION C**

**QUESTION 4**

4.1 Study the karyotype of a human below and answer the questions based on it.



- 4.1.1 Is this karyotype that of a male or a female? (1)
  - 4.1.2 Give a reason for your answer to QUESTION 4.1.1. (1)
  - 4.1.3 Name the genetic disorder that the individual with this karyotype has. (1)
  - 4.1.4 Give a reason for your answer to QUESTION 4.1.3. (2)
- (5)**

4.2 The table below shows the results obtained by first crossing a pure-bred black furred mouse with a brown furred mouse. The gene for black fur is dominant over the gene for brown fur. The F<sub>1</sub> generation was used as parents (consisting of 4 breeding pairs) of the F<sub>2</sub> generation.

	Number of black mice	Number of brown mice
<b>Parents</b>	1	1
<b>F<sub>1</sub> generation</b>	8	0
<b>F<sub>2</sub> generation</b>		
Offspring of 1 <sup>st</sup> breeding pair	8	0
Offspring of 2 <sup>nd</sup> breeding pair	7	1
Offspring of 3 <sup>rd</sup> breeding pair	5	3
Offspring of 4 <sup>th</sup> breeding pair	4	4

- 4.2.1 From the data, calculate the phenotypic ratio of the mice with black fur and the mice with brown fur in the F<sub>2</sub> generation. Show ALL your workings. (2)
- 4.2.2 Suggest why it is better to use the four sets of offspring to calculate the ratio rather than using only one set. (2)
- 4.2.3 Draw bar graphs on the same system of axes to represent the phenotypic results of the F<sub>2</sub> generation offspring of each breeding pair shown in the table above. (9)  
**(13)**
- 4.3 The blood bank wants to carry out an investigation to determine the distribution of blood groups of 1 200 learners in a high school. They decide to use a sample to do their investigation in order to save costs and time. They also want to get a reliable result.
- 4.3.1 State any FOUR planning steps that the blood bank should put in place to do this investigation, before they draw blood from the learners, using a syringe. (4)
- 4.3.2 State THREE precautions that the blood bank should take when drawing blood from the learners. (3)  
**(7)**
- 4.4 Describe what stem cells are, and give TWO sources from which human stem cells may be harvested. Also explain TWO arguments, with reasons, for the use of stem cells and TWO arguments, with reasons, against the use of stem cells in humans. (12)  
Synthesis: (3)  
**(15)**

**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 2010**

**FINAL MEMORANDUM**

**MARKS: 150**

**This memorandum consists of 12 pages.**



**PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2010**

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-recognized 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. Indicate that the candidate's numbering is wrong.
11. **If language used changes the intended meaning**  
Do not accept.
12. **Spelling errors**  
If recognizable 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**  
Memorandum will allocate marks for units separately, except where it is already given in the question.
16. Be sensitive to the **sense of an answer, which may be stated in a different way.**
17. **Caption**  
Credit will be given for captions to all illustrations (diagrams, graphs, tables, etc.) except where it is already given in the question.
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. In exceptional cases, the Provincial Internal Moderator will consult with the National Internal Moderator (and the External moderators if necessary).
20. Only memoranda bearing the signatures of the National Internal Moderator and the UMALUSI moderators and distributed by the National Department of Basic Education via the Provinces must be used in the training of markers and in the marking.

**SECTION A****QUESTION 1**

1.1	1.1.1	C✓✓		
	1.1.2	C✓✓		
	1.1.3	B✓✓		
	1.1.4	D✓✓		
	1.1.5	A✓✓	(5 x 2)	<b>(10)</b>
1.2	1.2.1	Phenotype✓		
	1.2.2	Cancer✓		
	1.2.3	Chromatids✓/daughter chromosomes		
	1.2.4	Gametogenesis ✓		
	1.2.5	Homologous✓/bivalent/tetrad/homologues		
	1.2.6	Replication✓		
	1.2.7	Haemophilia✓		<b>(7)</b>
1.3	1.3.1	B✓		
	1.3.2	G✓		
	1.3.3	A✓		
	1.3.4	F✓		
	1.3.5	E✓		<b>(5)</b>
1.4	1.4.1	(a) B✓		(1)
		(b) b✓		(1)
	1.4.2	1✓ 2✓ 8✓		(3)
		<b>(Mark first THREE only)</b>		<b>(5)</b>
1.5	1.5.1	3✓		(1)
	1.5.2	ATG✓		(1)
	1.5.3	It determines the codes✓ for the <b>sequence of amino acids</b> ✓ which determines the <b>type of protein</b> ✓	max	(2)
	1.5.4	(a) AUG✓		(1)
		(b) - tRNA picks up specific amino acids✓ - its anticodon✓ matches up with the codon of mRNA - therefore the amino acids are arranged in a particular sequence✓ - to form particular polypeptides✓/proteins <i>(If any examples of anticodons and codons are given, consult the Senior Marker)</i>	any	(3)
				<b>(8)</b>

- 1.6 1.6.1 36.7<sup>0</sup>C✓ (2)
- 1.6.2 0.3✓ (1)
- 1.6.3 The woman is fertile from day 12✓/ 14/ovulation occurs because the temperature✓rises✓ (3)  
(6)
- 1.7.1 Accept any ONE value between 13.5 to14✓ years (1)
- 1.7.2 Most girls✓ reach puberty before✓ boys/  
Boys✓ reach puberty after✓ girls

**OR**

Most girls reach puberty at age 12 -13✓ years and boys at age 14 -15✓ years/ Most boys reach puberty at age 14 -15✓ years and girls at age 12 – 13✓ years (2)

- 1.7.3 Some girls✓ reach puberty at a later stage✓

**OR**

Not all girls✓ of 16 have reached puberty✓/any correct physiological reason e.g. hormonal imbalance, diet, strenuous training programme (2)

- 1.7.4 - **Emotionally immature**✓not easy to change from being a teenager to a parent✓/not responsible yet  
- **Not yet financially independent**✓and the costs✓/medical/clothes/food of raising a baby is high  
- **Need education**✓/qualifications to get a good job✓  
- **To raise a baby needs time**✓/effort and no freedom✓for the teenager/cannot keep baby  
- **Teenager's body not physically ready**✓and pregnancy may lead to complications✓  
- **Girls will be stigmatised**✓and chances of finding a partner are reduced✓  
(Do not accept STD's in answer) any 2 x 2  
**(Mark first TWO only)** (4)  
(9)

**TOTAL SECTION A: 50**

**SECTION B**

**QUESTION 2**

- 2.1 2.1.1 C – spindle threads✓/spindle fibres  
D – **homologous chromosomes**✓/bivalent/tetrad/homologues (2)
- 2.1.2 (a) **Metaphase 1**✓ (1)  
(b) Chromosomes are aligned at the equator✓ in homologous pairs✓/bivalent/tetrad/homologues (2)
- 2.1.3 Crossing over✓ (1)
- 2.1.4 Homologous chromosomes/bivalent/tetrad line up ✓ at the equator  
**Chromatids from homologous chromosomes overlap**✓/cross  
Part/s of one chromatid become exchanged✓/genetic material for part/s of its homologous partner✓ max (3)
- 2.1.5 Promotes genetic variation✓ in the gametes/offspring will be different from the parents (1)
- 2.1.6 (a) 2✓ (1)  
(b) 2✓ (1)  
**(12)**
- 2.2 2.2.1 The gene for curly hair is dominant✓ and the dominant condition shows up✓ in either the homozygous or heterozygous condition (2)

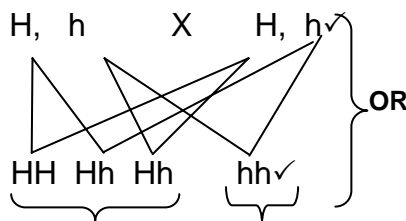
2.2.2

		Man	X	Woman
<b>P<sub>1</sub></b>	Phenotype	Curly hair	X	Curly hair✓
	Genotype	Hh	X	Hh✓

*Meiosis*  
**Gametes/G**

*Fertilisation*

**F<sub>1</sub>** Genotype



Gametes	H	h
H	HH	Hh
h	Hh	hh

1 mark for correct gametes  
1 mark for correct genotypes

Phenotype Curly hair Straight hair✓

1 mark for stating P<sub>1</sub> and F<sub>1</sub>  
1 mark for stating meiosis and fertilisation

*If another letter is used, candidates will lose marks for P<sub>1</sub>  
F<sub>1</sub> genotypes*

any (6)  
**(8)**

2.3

DNA	RNA
1. Double✓ stranded molecule/ paired bases	Single✓ stranded molecule/ unpaired bases
2. Contains deoxyribose✓ sugar	Contains ribose✓ sugar
3. Contains the nitrogenous base thymine✓	Contains the nitrogenous base uracil✓
4. A is proportional to T and G is proportional to C✓	Different relative numbers of A, T, C, G✓
5. Longer✓	Shorter✓
6. Helix shape✓	No Helix✓

*(Mark first THREE only)*

Any 3 x 2  
+ 1 for presenting a table **(7)**

2.4 2.4.1 Test tube 2✓ **(1)**

2.4.2 Percentage of A does not equal T and percentage of C does not  
equal G✓ in test tube 2 therefore no base pairing✓

**OR**

The percentages of A is equal to T and C is equal to G✓ in test  
tube 1 therefore base pairing✓

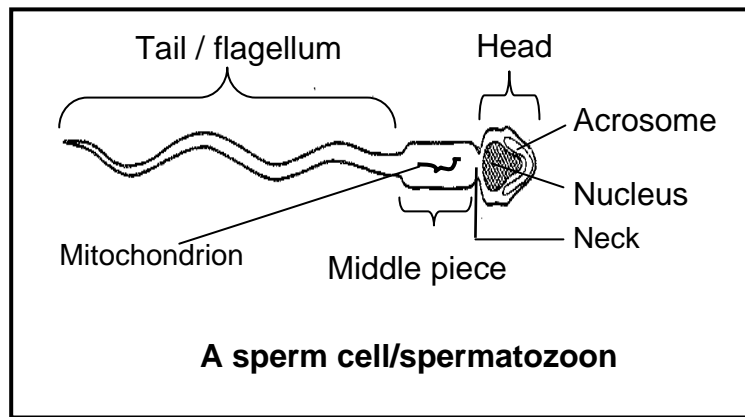
Therefore test tube 2 contains the single stranded virus  
DNA molecule

**(2)**  
**(3)**  
**[30]**

**QUESTION 3**

- 3.1 3.1.1 C - Endometrium✓/placenta /uterus/uterine wall/myometrium  
D - Ovary✓ (2)
- 3.1.2 1 - Ovulation✓  
2 - Fertilisation✓  
3 - Mitosis✓/ cell division/growth/cleavage (3)
- 3.1.3 (a) 23✓ (1)  
(b) 46✓/23 pairs (1)

3.1.4



Caption: 1 mark

Label: any 4 correct labels: 4 marks (5)

- 3.1.5 Shock absorber✓/prevents physical or mechanical damage  
Protects the foetus from drying out✓  
Insulates the foetus against temperature fluctuations✓  
Allows foetal movement for growth and development✓  
**(Mark first TWO only)** any (2)
- 3.1.6 (a) Oxygen✓  
(Dissolved) food✓ (examples e.g. glucose, amino acids, water)  
Antibodies✓  
**(Mark first ONE only)** any (1)
- (b) Metabolic waste✓  
Carbon dioxide✓  
Nitrogenous waste/(examples e.g. urea, ammonia, uric acid)  
Water ✓ any (1)  
**(Mark first ONE only)** (16)
- 3.2 Non-identical✓/fraternal/dizygotic twins (1)  
are produced when **(two egg cells)✓** are **(fertilised by two sperms)✓** (2)
- Identical✓/monozygotic twins/(Siamese/conjoined) (1)  
are formed when **(one sperm)✓ fuses with (one egg cell)✓**  
to form a zygote which then splits up into two (incomplete split) (2)  
**(6)**

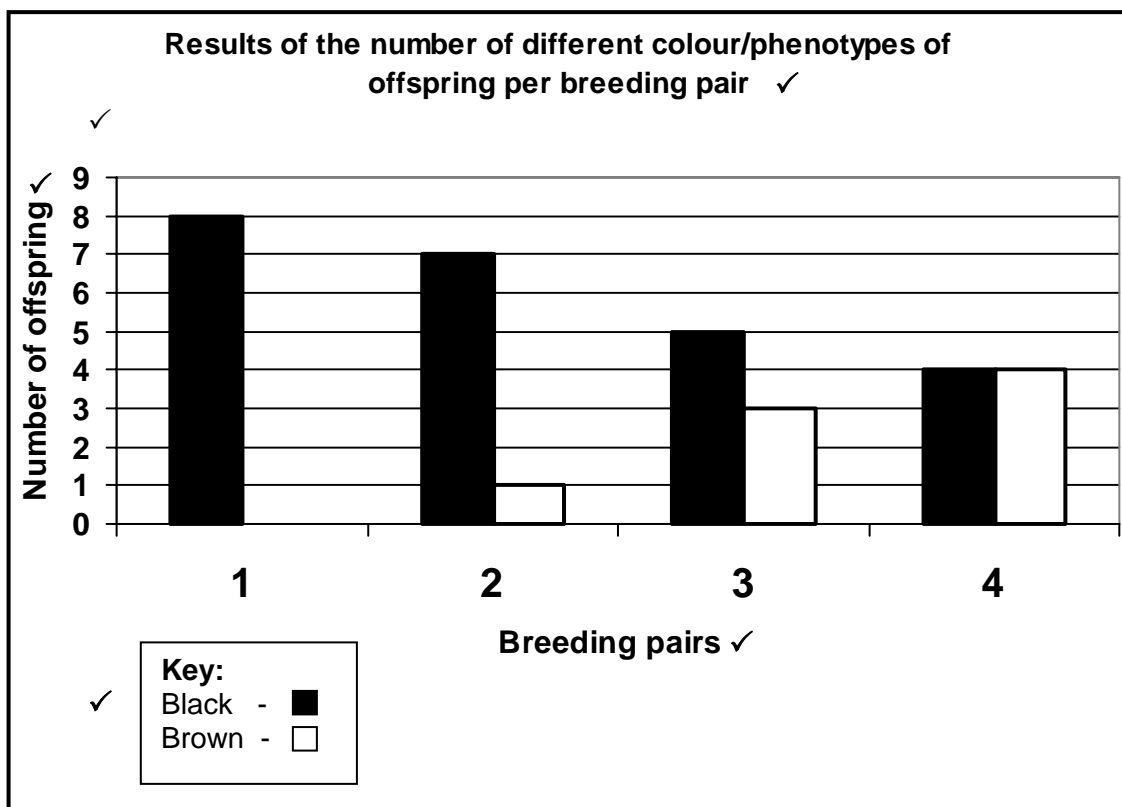
3.3	3.3.1	18✓	(1)
	3.3.2	Honey bees✓	(1)
	3.3.3	Very little nectar✓/food available/bats go off to sleep/nocturnal	(1)
	3.3.4	Attracts pollinators✓/for pollination	(1)
	3.3.5	Pollination occurs over more days✓ ensures that most flowers✓ get pollinated/increases the chances of pollination/not to attract too many pollinators at once to prevent damage to the flowers	(2)
	3.3.6	(a) Seed✓	(1)
		(b) Fruit✓	(1)
			<b>(8)</b>
			<b>[30]</b>
		<b>TOTAL SECTION B:</b>	<b>60</b>



**SECTION C**

**QUESTION 4**

- 4.1 4.1.1 Female✓ (1)
- 4.1.2 Has two X chromosomes✓/XX/chromosomes number 23 are similar/ no Y chromosome (1)
- 4.1.3 Down's✓ Syndrome/trisomy 21 (1)
- 4.1.4 Carries 3✓/extra chromosome(s) on number 21✓ (2)
- OR**
- 47✓ chromosomes (allocate 1 mark) (5)
- 4.2 4.2.1 24 : 8✓(accept different correct working) = 3 : 1✓ (2)
- 4.2.2 To increase the reliability of the results✓✓ (2)
- OR**
- 4.2.3 Reduces chances of errors✓✓ any (2)



T✓  
D ✓✓✓

**NOTE:**

**If the wrong type of graph is drawn:**

- Marks are forfeited for 'correct type of graph' ; 'drawing of graph'

**If graphs are not drawn on the same system of axes:**

- Mark the first graph only using the given criteria –  
Candidates will lose 2 marks for the incorrect drawing of the pair of bars

**Mark allocation of the graph**

Correct type of graph (T)	1
Caption for graph	1
Correct label for X-axis	1
Graphs labelled/key provided for 2 graphs	1
Correct label for Y-axis	1
Appropriate scale for Y-axis	1
Drawing of bars (D)	1 mark if 1 pair of bars plotted correctly 2 marks if 2 to 3 pairs of bars plotted correctly 3 marks if all 4 pairs of bars are plotted correctly

(9)  
(13)

- 4.3 4.3.1 Communicate to learners/parents/school/education department about purpose, procedures and safety✓  
Permission from education department✓/parent/learner/school  
Determine what sample size is appropriate✓  
Random sample must be taken (not gender and age)  
Arrange all logistics such as:  
- necessary equipment✓  
- venue✓  
- trained personnel✓/coordinator at school  
- budget available✓  
- storage needed✓  
- transport of equipment✓  
- Inform school of the day and time✓ that the research will take place  
- draw up a table✓/recording sheet to record information  
Ensure confidentiality✓ any (4)  
(Accept any correct answer with PLANNING before drawing blood)  
**(Mark first FOUR only)**
- 4.3.2 Personnel should wear gloves✓  
Sterilise the learner's arm✓/finger  
Use new/sterile syringes✓/lancets/cotton wool etc. for every learner tested  
Apply pressure to stop bleeding✓  
Monitor learners while and after drawing blood✓  
Avoid injury to learners✓/draw blood from vein not artery  
Safe disposal of waste✓  
**(Mark first THREE only)** any (3)  
(7)

## 4.4 Possible answer

Stem cells are (actively) dividing<sup>✓</sup> cells that are not yet differentiated<sup>✓</sup>/  
not yet mature could give rise to different types of cells (2)

Source: Embryo<sup>✓</sup>

Blood in umbilical cord<sup>✓</sup>/cord blood

Placenta<sup>✓</sup>

Bone marrow<sup>✓</sup>

any (2)

**(Mark first TWO only)**

- Arguments for use of stem cells
  - **Provide replacements for tissues**<sup>✓S</sup> /organs damaged by age<sup>✓R</sup>/trauma/disease/improve quality of life
  - **Used for research**<sup>✓S</sup> to see whether it can cure different diseases<sup>✓R</sup> e.g. cancer/more reliable results when human stem cells are used
  - **Stem cells from e.g. the blood from the umbilical cord can be stored**<sup>✓S</sup> when needed in future because it would not be rejected<sup>✓R</sup> by the body's immune system any 2 x 2 (4)  
**(Mark first TWO only)**
- Arguments against use of stem cells
  - **Expensive**<sup>✓S</sup> research money could be used for other needs<sup>✓R</sup>
  - **Only rich people**<sup>✓S</sup> /**expensive** can afford to store<sup>✓R</sup> stem cells for later use
  - **Interfere with religion** <sup>✓S</sup>/**culture/creation** because it is immoral<sup>✓R</sup> /unethical/we cannot play God
  - **Moral**<sup>✓S</sup> /**ethical objection** because we are destroying a human life<sup>✓R</sup>
  - **The dangers**<sup>✓S</sup> of using stem cells are unknown and may be a risk<sup>✓R</sup>
  - **Can lead to illegal trade**<sup>✓S</sup> in embryos /the placentas of new-born babies/ to make money<sup>✓R</sup>
  - **Embryos conceived and then aborted**<sup>✓S</sup> /abandoned/ to use<sup>✓R</sup> the stem cells from the placenta any 2 x 2 (4)  
**(Mark first TWO only)**

## ASSESSING THE PRESENTATION OF THE ESSAY

Marks	Description
3	Explains 2 valid arguments for and 2 against the use of stem cells
2	Explains 1 valid argument for and 1 argument against the use of stem cells <b>OR</b> Explains 2 valid arguments for and 1 against the use of stem cells <b>OR</b> Explains 1 valid argument for and 2 against the use of stem cells
1	Describe at least 1 statement for and 1 statement against the use of stem cells <b>OR</b> explains 1 valid argument for <b>OR</b> 1 argument against the use of stem cells
0	Has not attempted/has not written anything other than question number/no correct information

Synthesis (3)

(15)

TOTAL SECTION C: 40

GRAND TOTAL: 150



# basic education

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Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

## **NATIONAL SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES P2**

**NOVEMBER 2010**

**MARKS: 150**

**TIME: 2½ hours**

**This question paper consists of 14 pages.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in your ANSWER BOOK.
3. Start the answers to each question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions at 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 all drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator, a protractor and a compass.
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 – D) next to the question number (1.1.1 – 1.1.5) in your ANSWER BOOK, for example 1.1.6 D.

1.1.1 Which ONE of the following refers to small genetic changes within a species?

- A Macro-evolution
- B Micro-evolution
- C Natural selection
- D Artificial selection

1.1.2 Which of the following are sources of phenotypic variation?

- (i) Random fertilisation
- (ii) Crossing over
- (iii) Random assortment of chromosomes in Metaphase 1
- (iv) Mutation

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

1.1.3 The name of the one big mass of land, that all the present continents originated from, is ...

- A Laurasia.
- B Gondwanaland.
- C Antarctica.
- D Pangaea.

1.1.4 Most scientists agree that ... mass extinctions occurred in the history of life on earth.

- A 5
- B 7
- C 3
- D 8

1.1.5 The study of fossils is called ...

- A anthropology.
- B ecology.
- C palaeontology.
- D geology.

**(5 x 2) (10)**

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 – 1.2.6) in your ANSWER BOOK.

- 1.2.1 Reproduction between closely-related individuals of the same species
- 1.2.2 Organisms that are able to interbreed and produce fertile offspring
- 1.2.3 Dating fossils by measuring atomic decay
- 1.2.4 A diagrammatic representation of possible ancestral relationships between species
- 1.2.5 The taxonomic order to which monkeys, apes and humans belong
- 1.2.6 The process which results in all the individuals of a particular species dying out

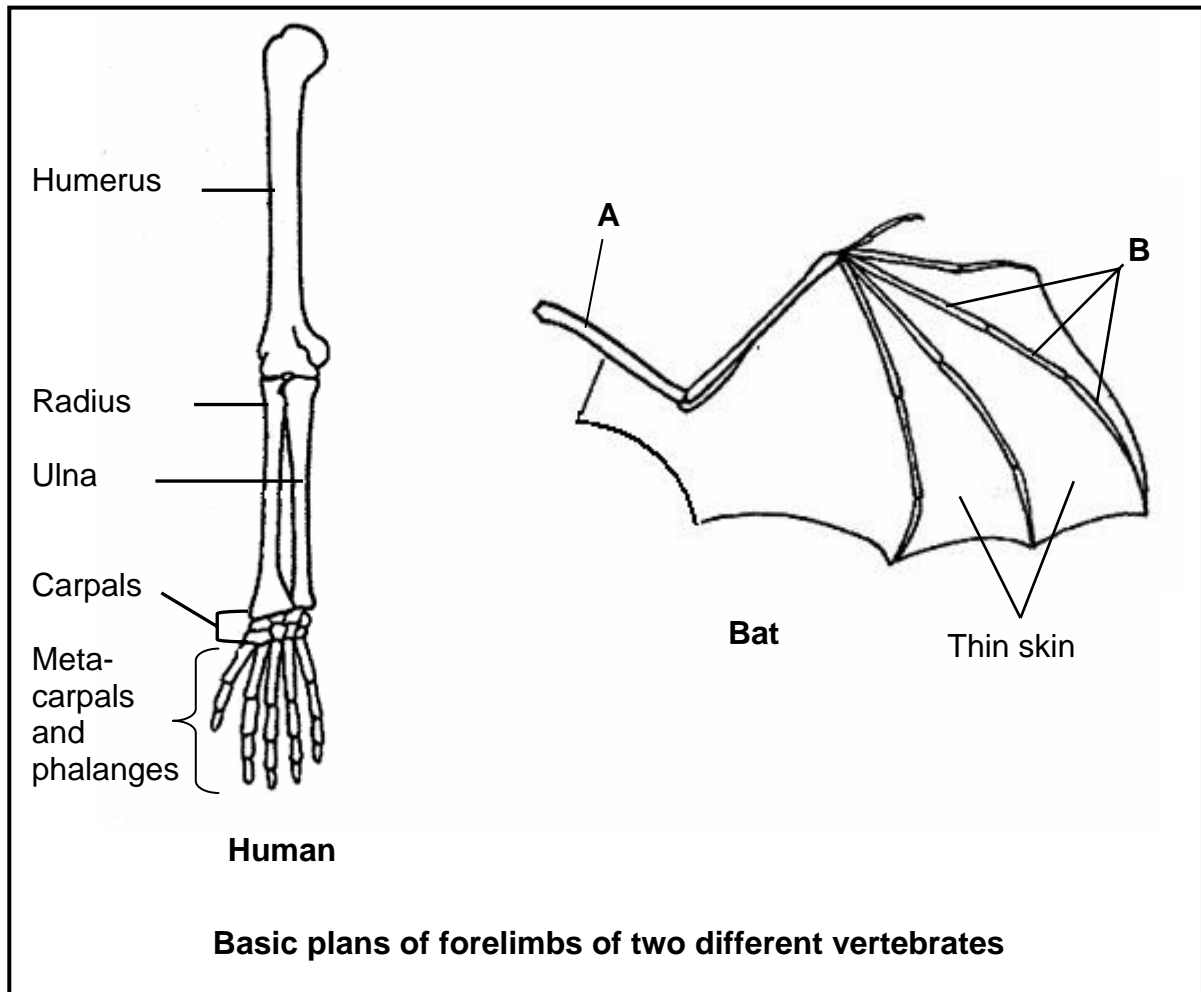
(6)

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 – 1.3.6) in your ANSWER BOOK.

COLUMN I	COLUMN II
1.3.1 Fossil(s) of <i>Australopithecus</i> found in South Africa	A: Mrs Ples B: Lucy
1.3.2 Similarities between <i>Homo sapiens</i> and apes	A: Opposable thumb B: Two mammary glands
1.3.3 Evidence from comparative embryology supporting the theory of evolution	A: Similar sequence of genes B: Presence of embryonic gill slits
1.3.4 Study of ancient humans and their cultural activities	A: Biogeography B: Archaeology
1.3.5 Possible cause(s) of mass extinctions	A: Volcanic eruptions B: Freezing of parts of the earth
1.3.6 Mutation(s) that influence(s) biodiversity	A: Neutral B: Lethal

(6 x 2) (12)

1.4 Study the basic plans of the forelimbs of two different vertebrates shown below.

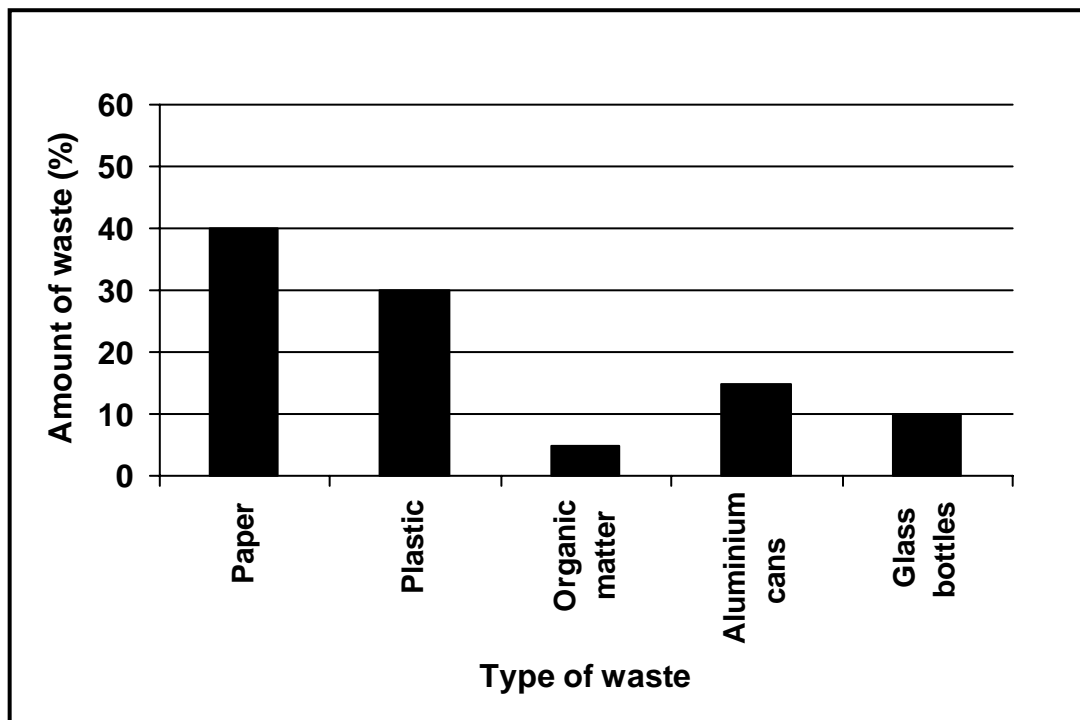


- 1.4.1 Are the above forelimbs homologous or analogous structures? (1)
  - 1.4.2 Explain your answer to QUESTION 1.4.1. (2)
  - 1.4.3 Using the labels on the forelimb of a human as a guide, give the names of the letters **A** and **B**. (2)
  - 1.4.4 State TWO ways in which the forelimb of the bat is adapted for flying. (2)
- (7)**





- 1.6 The graph below shows the percentages of various types of waste found on the grounds of a school.



- 1.6.1 Draw a table to illustrate the percentages of waste shown in the graph above. (5)
- 1.6.2 The school wants to manage the large amount of waste generated on a daily basis. They decide to recycle the waste.
- (a) Define *recycling*. (2)
- (b) Give TWO reasons why the recycling of waste is advantageous. (2)

(9)

**TOTAL SECTION A: 50**

**SECTION B****QUESTION 2**

- 2.1 The table below shows how the yield of grass varies when different amounts of nitrate fertiliser are added to the crop.

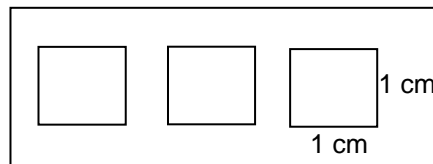
<b>Amount of nitrate fertiliser added to crop (kg/hectare)</b>	<b>Yield of grass (100 kg/hectare)</b>
0	8
225	14
425	18
650	20
700	20
750	19

- 2.1.1 Give ONE reason why farmers use fertiliser. (1)
- 2.1.2 What was the yield (100 kg/hectare) of grass when 225 kg of nitrate fertiliser was added? (1)
- 2.1.3 Use the table to determine the minimum amount of fertiliser that has to be added to the grass crop in order to achieve maximum yield. (2)
- 2.1.4 Describe the relationship between the amount of fertiliser added and the yield of grass. (3)
- 2.1.5 Explain why fertilisers should not be added to the soil immediately before and during the rainy season. (2)
- 2.1.6 Describe the effect of the excessive use of nitrate fertilisers on rivers, dams and lakes. (3)
- (12)**

- 2.2 A group of learners performed the following investigation to measure the presence of particles which cause pollution in the air in their town.

The following procedure was followed:

1. Three squares of  $1 \text{ cm}^2$  were drawn on each of three glass microscope slides, using a permanent marking pen, as shown in the diagram below.



**Microscope slide**

2. The other side of each microscope slide was covered with a thin layer of petroleum jelly/Vaseline.
3. The microscope slides were placed, with the side covered with petroleum jelly/Vaseline facing up, in three different outdoor locations A, B and C, and left for one week.

Location A: Central area in the town

Location B: 20 km away from the centre of town

Location C: A fishing spot 40 km away from the centre of town

4. After a week the slides were collected and examined using a hand lens (magnification  $\times 20$ ).
5. The visible particles in each square were counted and recorded in a table.
6. The average number of visible particles per square ( $1 \text{ cm}^2$ ) for each of the three locations were then calculated.

- 2.2.1 Formulate a hypothesis for this investigation. (3)
- 2.2.2 State the dependent variable. (1)
- 2.2.3 Explain the purpose of the squares drawn on the microscope slides. (2)
- 2.2.4 Why were the squares drawn on the back of the microscope slides? (1)
- 2.2.5 Suggest why THREE squares were drawn on each microscope slide and not one. (1)
- 2.2.6 Name THREE ways in which the validity of the investigation can be improved. (3)
- (11)**

- 2.3 Read the following passage on Rooibos (*Aspalanthus linearis*) and answer the questions that follow.

The Rooibos plant is used to make herbal tea. South Africa is the only commercial grower of Rooibos plants in the world. Rooibos tea is a caffeine-free beverage with health and medicinal benefits. Some of the benefits of drinking Rooibos tea are: it has a calming effect, it helps with digestion problems and it helps with infant colic.

- 2.3.1 Name any TWO health benefits of Rooibos tea. (2)
- 2.3.2 Describe TWO ways in which over-exploitation of plants, such as Rooibos, impacts on life forms and the environment. (2)
- 2.3.3 Describe THREE strategies to prevent the over-exploitation of plants, such as Rooibos. (3)
- (7)**  
**[30]**

**QUESTION 3**

3.1 Read the following passage and answer the questions that follow.

Thousands of wildebeest were migrating across the great plains of the Serengeti in Africa. Some of them were large, some small, some strong and some weak. Lions followed the wildebeest, catching and eating the slowest ones. Water was scarce and only the strongest were brave enough to stop to drink from the waterholes.

3.1.1 Identify ONE phrase in this passage which describes variation among the wildebeest. (1)

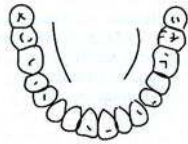


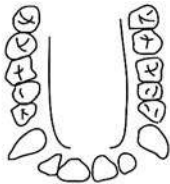


3.1.2 Explain how Darwin's idea of evolution by natural selection can be applied to this passage. (5)  
**(6)**

3.2 Lamarck based his theory of evolution on two principles, ideas or 'laws'.

3.2.1 Name and describe TWO principles that Lamarck used to explain how evolution took place. (6)

3.2.2 Give ONE reason why Lamarck's theory is NOT accepted. (2)  
**(8)**

3.3 Study the diagrams below of the upper jaw, skull and the foot of two organisms **A** and **B**. The diagrams are NOT drawn to scale.

Organism	Upper jaw	Skull (bottom view)	Foot
<b>A</b>		Foramen magnum 	
<b>B</b>		Foramen magnum 	

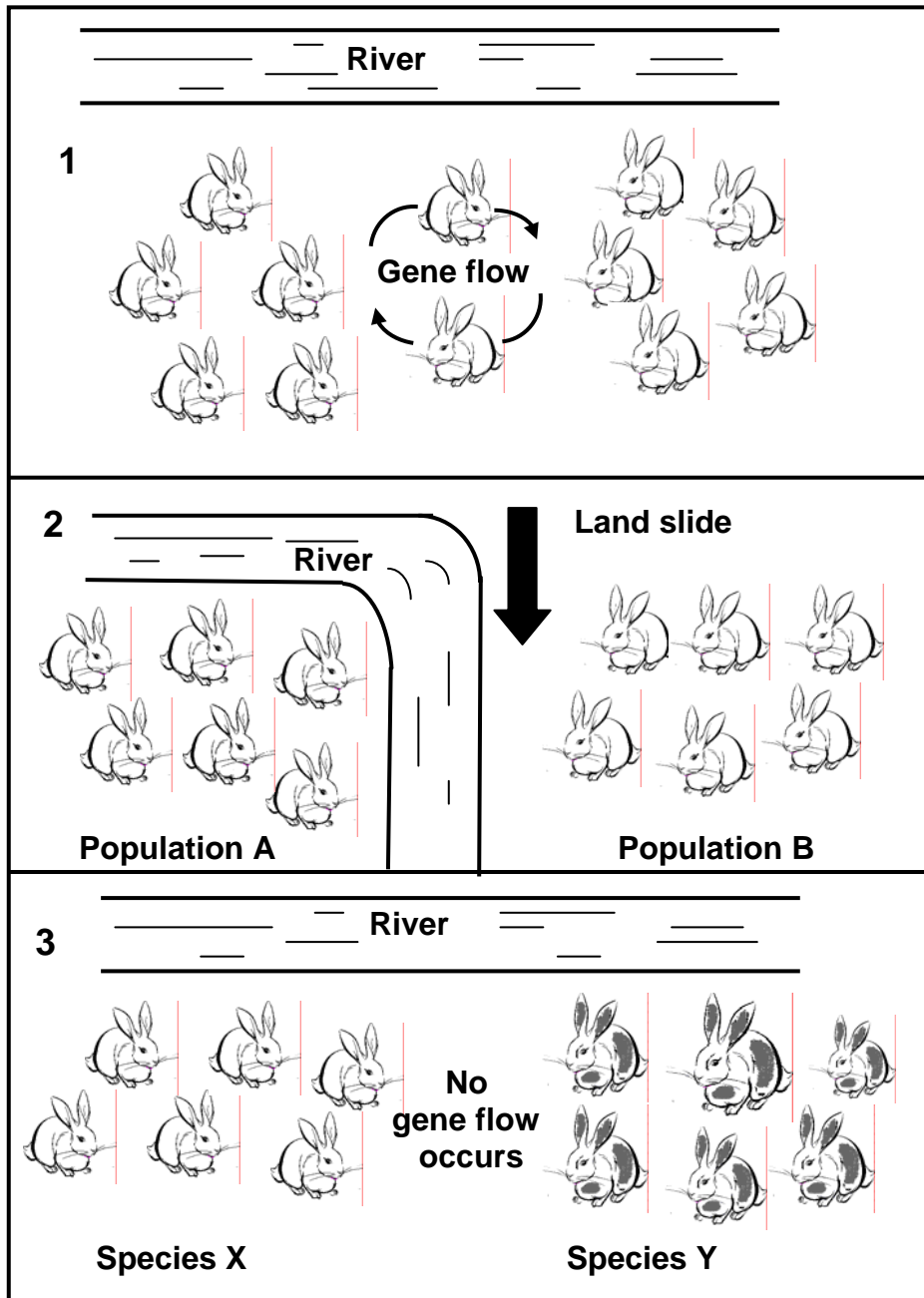
3.3.1 With regard to the drawings above:

- (a) Tabulate TWO visible differences between the upper jaws of organisms **A** and **B**. (5)
- (b) Name ONE visible difference between the feet of organisms **A** and **B**. (2)

3.3.2 Which organism (**A** or **B**) is more likely to be bipedal? (1)

3.3.3 Give a reason for your answer to QUESTION 3.3.2. (2)  
**(10)**

3.4 Study the diagrams below showing a process of evolution. DIAGRAMS 1, 2 and 3 show the sequence of events that occurred in rabbit populations over many thousands of years.



3.4.1 Name the evolutionary process represented by the sequence of events shown in DIAGRAMS 1, 2 and 3 above. (1)

3.4.2 Describe the process stated in QUESTION 3.4.1 using the diagrams above. (5)  
(6)  
[30]

TOTAL SECTION B: 60



**SECTION C****QUESTION 4**

- 4.1 Study the table below that represents the amount of carbon dioxide emissions from different countries in 2002.

Countries	Total annual CO <sub>2</sub> emission in 2002 (million tons CO <sub>2</sub> /yr)	Proportion of world total (%)
USA	5 673	22
China	3 733	15
Russian Federation	1 477	6
India	1 106	5
South Africa	364	2
Other countries	X	50
<b>Total</b>	<b>24 706</b>	<b>100</b>

[Adapted from: *World Resources Institute*, 2006]

- 4.1.1 Calculate the total annual CO<sub>2</sub> emission in other countries (X) from the table above. Show ALL workings. (3)
- 4.1.2 The Kyoto Protocol was drafted by the United Nations (UN) in 1997 to provide a global action plan to reduce carbon dioxide emissions by the year 2012. The United States of America (USA) is not implementing the Kyoto Protocol.
- (a) Explain the impact that this decision by the USA has on the rest of the world. (2)
- (b) If you were working for the UN, explain TWO arguments that you would use to persuade the USA to implement the Kyoto Protocol. (4)
- 4.1.3 South Africa has the highest annual emission of CO<sub>2</sub> in Africa. Give THREE reasons for this. (3)
- 4.1.4 Draw a pie chart to show the proportion of CO<sub>2</sub> emissions from the different countries, as shown in the table above. Show ALL calculations. (13)  
(25)
- 4.2 Explain SIX strategies to reduce the amount of air pollution entering the atmosphere from human activity. (12)  
Synthesis: (3)  
(15)

**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 2010**

**FINAL MEMORANDUM**

**MARKS: 150**

**This memorandum consists of 14 pages.**

**PRINCIPLES RELATED TO MARKING LIFE SCIENCES 2010**

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 becomes correct again, resume credit.
9. **Non-recognized 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 recognizable, 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**  
Memorandum will allocate marks for units separately, except where it is already given in the question.
16. Be sensitive to the **sense of an answer, which may be stated in a different way.**
17. **Caption**  
Credit will be given for captions to all illustrations (diagrams, graphs, tables, etc.) except where it is already given in the question.
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. In exceptional cases, the Provincial Internal Moderator will consult with the National Internal Moderator (and the External moderators if necessary).
20. Only memoranda bearing the signatures of the National Internal Moderator and the UMALUSI moderators and distributed by the National Department of Basic Education via the Provinces must be used in the training of markers and in the marking.



1.6 1.6.1

**Percentages/amount of types of waste on a school ground**

Type of waste	Percentages (%)
Paper	40
Plastic	30
Organic matter	5
Aluminium cans	15
Glass bottles	10

**Checklist for marking table:**

Caption✓

Labelled all rows correctly✓

Labelled both columns correctly✓

All 5 percentages correct✓✓/3 to 4 percentages correct✓/

Less than 3 correct - 0 marks

(5)

1.6.2 (a) The process by which waste materials✓ are treated in such a way that they can be used again✓/reused (2)

1.6.2 (b) - To avoid over-exploitation of the limited natural resources✓  
 - To save/raise money✓/(create jobs)  
 - To reduce the amount of waste material✓/cleaner environment  
 - Less energy✓used/ Reduce carbon footprint  
 - Fewer landfill sites✓

(2)

**(Mark first TWO only)****(9)****TOTAL SECTION A: 50**

**SECTION B****QUESTION 2**

- 2.1 2.1.1 To enrich the soil✓/increase crop yield/plants grow better/to increase productivity (1)  
**(Mark first ONE only)**
- 2.1.2 14✓ OR 1 400 kg/hectare✓ (1)
- 2.1.3 650✓ kg/hectare✓ (2)
- 2.1.4 As the fertiliser increases to 650 kg/hectare the yield of grass increases✓  
Further increase up to 700 kg/hectare causes the yield to remain the same✓/constant  
With increases beyond 700 kg/hectare there is a decrease✓ in yield  
**IF GENERAL TRENDS ARE GIVEN WITHOUT SPECIFIC FIGURES, AWARD A MAXIMUM OF 2 MARKS**  
any (3)
- 2.1.5 Much of the fertiliser will be wasted✓/ because of increase run-off  
Leads to pollution✓/eutrophication/ algal bloom in the water✓ any (2)
- 2.1.6 - Leads to eutrophication✓/over enrichment of the water/ pollution  
- Overgrowth of microscopic algae✓/algal bloom  
- Many algae and other organisms die✓  
- Their bodies are broken down by bacteria✓  
- Bacteria need oxygen therefore oxygen levels in water gets further depleted✓  
- Lack of oxygen causes animals to die✓ any (3)  
**(12)**
- 2.2 2.2.1 As you move away from✓/towards town the amount of particle pollution✓ decreases✓  
**OR**  
As you move away✓/towards from town the amount of particle pollution✓ increases✓  
**OR**  
As you move away✓/towards town there is no influence✓ on the amount of particle pollution✓  
**OR**  
Higher✓/lower pollution at A✓/B/C than the other two✓  
**OR**  
Highest✓/lowest pollution✓ at A✓/B/C (3)

- 2.2.2 Amount of visible particle pollution✓/number of particles (1)
- 2.2.3 To have clear defined blocks✓ to count the particles accurately✓ (2)
- 2.2.4 So that petroleum jelly does not remove✓/dissolve the ink/  
does not interfere with the results (1)
- 2.2.5 To get an average✓/ to make the results more reliable/accurate (1)
- 2.2.6 - All other environmental conditions in A, B and C must be similar✓/the slides must be similarly exposed  
- Increase the number of glass slides✓ placed at each location  
- Use more locations between the centre of town and the fishing spot✓/repeat the investigation  
- Decrease the time✓ of exposure of the slides from a week to daily  
- Increase the period✓ of time/different seasons  
- Use one counter✓/trained counters  
- Ensure that non-particle pollutants and material sticking on the slide do not interfere✓ with the particle collection  
- Use more advanced equipment✓ to collect and measure data (3)  
**(Mark first THREE only)** (11)
- 2.3 2.3.1 - has a calming effect✓  
- helps with digestion problems✓  
- helps with infant colic✓  
- anti-inflammatory✓  
- anti-oxidants✓  
- anti-ageing✓  
- reduces hypertension✓  
- treatment of allergies✓  
- increase immunity✓/resistance to diseases  
- reduces headache✓ (2)  
**(Mark first TWO only)**
- 2.3.2 - Plants can become extinct✓/lead to loss in biodiversity  
- Food chains/webs can be destroyed✓/altered  
- Could lead to degradation of the environment✓  
- Erosion of ground surface if too many plants are removed✓  
- Increase run-off of water✓  
- Alien plant invasion✓in the habitats from which the plants are removed  
- Upset the balance of oxygen and carbon dioxide✓/global warming if too many plants are removed (2)  
**(Mark first TWO only)**



## 2.3.3

- Sustainable harvesting✓
- Impose quotas✓/limit numbers
- Limit area✓ where plants are harvested
- Limit size of plants harvested✓
- Limit time/seasons of collection✓
- Research done to look at reproductive cycle✓/alternative source of active ingredient /cloning
- Legislation to control harvesting✓/ Controlling exploitation of indigenous plants
- Permits to control harvesting✓
- Monitoring of harvest✓
- Penalties✓ for breaking legislation
- Education✓/campaign on the impact and consequences of over-exploitation
- Establish nurseries✓/seed banks - to replace plants harvested
- Establish more nature reserves✓ to conserve indigenous plants

**(Mark first THREE only)**

(3)

(7)

[30]

**QUESTION 3**

3.1 3.1.1 “some large, some small”✓/ “some strong and some weak” (1)

3.1.2 - **Variation in the wildebeest population**✓\* (1)

slow and weak✓, were eaten by the lions✓ and do not pass on their characteristics to their offspring✓	<b>OR</b>	some large and strong✓ survive✓ and pass on their favourable characteristics to their offspring✓	max (3)
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- **If this process continues from generation to generation the characteristic of the population will change**✓\* (1)

**\* compulsory marks** (6)

3.2 3.2.1 **\*Principle of use and disuse**✓/**adaptation to the environment**  
**\* compulsory mark** (1)

- Structures of individuals in a population that are used more frequently✓ became better✓/adapted
- Structures of individuals in a population that are used less frequently✓ becomes smaller✓/disappear max (2)

**\*Principle of inheritance of acquired characteristics**✓  
**\* compulsory mark** (1)

- Acquired characteristics developed by the organism in its lifetime✓ are passed on to its offspring✓ (2)

3.2.2 Acquired characteristics✓ are not inherited✓/do not cause any change to the DNA of an organism's gametes (sperms or ova)

**OR**

Organisms did not evolve because they wanted to evolve✓✓/  
Lamarck’s theory is deterministic✓✓ (2)  
**(8)**

3.3 3.3.1 (a) **Differences in jaws**

A	B
1. Smaller canines✓/more uniform teeth	1. Larger canines✓/different kinds of teeth
2. Smaller/no spaces/no diastema between the teeth✓	2. Larger spaces/diastema between the teeth✓
3. Jaws with teeth on a gentle/round curve✓	3. Jaws with teeth in a rectangular/U shape✓
4. Less protruding jaw✓	4. More protruding jaw✓

**(Mark first TWO only)**

any 2 x 2  
+1 for Table (5)

3.3.1 (b) **Differences in Feet**

In A the big toe is close to the other 4 smaller toes✓/faces forward

In B the big toe is apart/opposable from the other 4 smaller toes✓/points outwards

**OR**

In A the heel bone is relatively larger✓ and in B it is relatively smaller✓

**OR**

In A the bones in the foot are straight✓ and in B they are curved✓

**OR**

In A phalanges are relatively shorter✓ and in B they are relatively longer✓

any 1 x 2

(2)

**(Mark first ONE only)**

**(7)**

3.3.2 A✓

(1)

3.3.3 Foramen magnum✓ more towards the centre✓ of the skull in A/ more forward

**OR**

In B the foramen magnum✓ more towards the back✓ of the skull

(2)

**(10)**

3.4 3.4.1 Speciation✓

(1)

- 3.4.2
- **In diagram 1** the rabbits were able to interbreed✓/genes can flow freely in the population
  - **In diagram 2** the two populations were separated by the river✓/geographic barrier
  - The two populations cannot interbreed✓/no gene flow
  - Within each of the two separated populations there was variation✓
  - Each group underwent natural selection✓independently✓ as a result of varying environmental conditions✓
  - Each group becomes genotypically✓ and phenotypically✓different
  - **In diagram 3** the geographic separation no longer exist✓
  - but the two populations do not interbreed✓/no gene flow even though they can mix
  - because of the presence of reproductive isolating mechanism✓
  - They are now 2 different species✓

any

(5)

**(6)**

**[30]**

**TOTAL SECTION B: 60**

**SECTION C****QUESTION 4**

4.1      4.1.1      
$$\left. \begin{array}{l} 5\,673 + 3\,733 + 1\,477 + 1\,106 + 364 = 12\,353 \\ 24\,706 - 12\,353 = 12\,353 \end{array} \right\} \checkmark$$

$X = 12\,353 \checkmark$  million tons CO<sub>2</sub>/yr $\checkmark$

**OR**

Credit any other  
correct working  $\checkmark$

$\frac{50}{100} \times 24\,706 \checkmark = 12\,353$

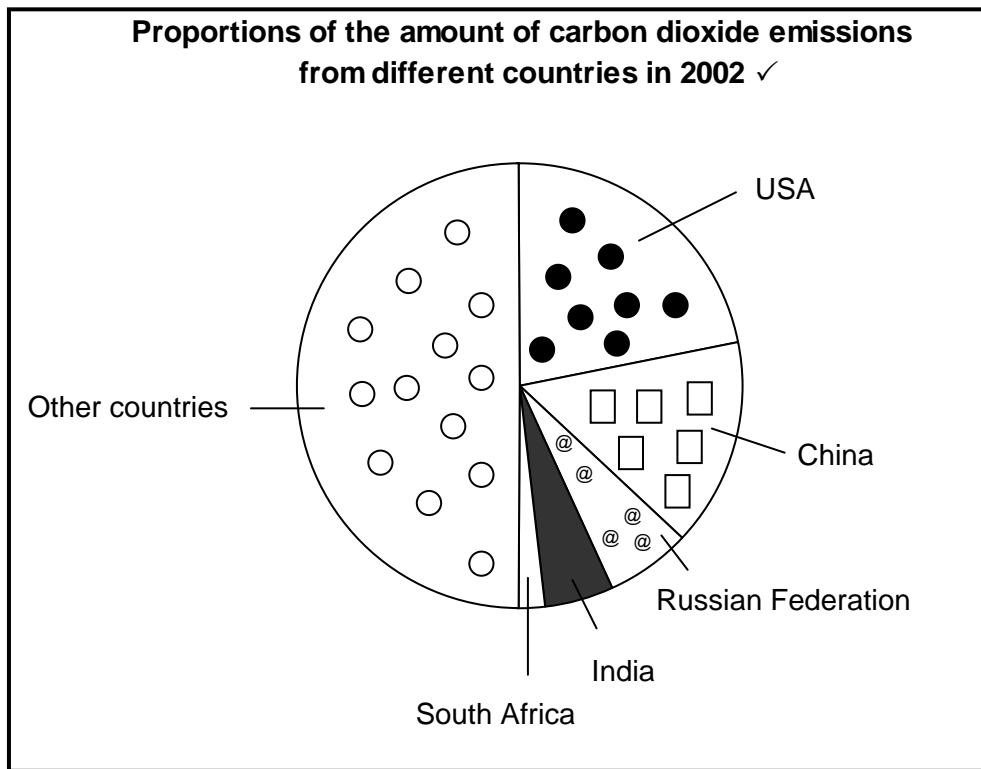
$X = 12\,353 \checkmark$  million tons CO<sub>2</sub>/yr $\checkmark$  (3)

- 4.1.2 (a) - USA causes more pollution than other countries $\checkmark$   
 - contributes more to global warming $\checkmark$   
 - which affects all the other countries in the world $\checkmark$   
 - setting a bad example $\checkmark$  any (2)

- (b) - Remind USA of the implications/examples of their non-participation $\checkmark$  that will affect all the other countries in the world $\checkmark$  including themselves  
 - USA must reduce their emissions of carbon dioxide $\checkmark$  otherwise they can be excluded from the UN $\checkmark$   
 - Stiff penalties $\checkmark$  to be imposed on USA to force them to reduce emissions $\checkmark$   
 - Impose sanctions $\checkmark$ /not buy USA products until they reduce emissions $\checkmark$  2 x 2 (4)
- (Mark first TWO only)**

- 4.1.3 More  
 - industries $\checkmark$  that releases CO<sub>2</sub>  
 - cars $\checkmark$  that release exhaust fume  
 - more urban areas $\checkmark$  greater use of natural resources  
 - burning of coal $\checkmark$ /coal power stations for electricity  
 - burning of wood $\checkmark$  to prepare food, etc.  
 Poor implementation $\checkmark$ /monitoring of legislation  
 Less legislation $\checkmark$ /penalties for non-compliance (3)  
**(Mark first THREE only)** (12)

4.1.4



T ✓  
K ✓✓  
P ✓✓✓

Other countries: $\frac{50}{100} \times \frac{360}{1} = 180^\circ \checkmark$	$\frac{12\ 353}{24\ 706} \times \frac{360}{1} = 180^\circ \checkmark$
USA: $\frac{22}{100} \times \frac{360}{1} = 79,2^\circ \checkmark / 79^\circ$	$\frac{5\ 673}{24\ 706} \times \frac{360}{1} = 82,6^\circ / 83^\circ \checkmark$
China: $\frac{15}{100} \times \frac{360}{1} = 54^\circ \checkmark$	$\frac{3\ 733}{24\ 706} \times \frac{360}{1} = 54,4^\circ / 54^\circ \checkmark$
Russian Fed: $\frac{6}{100} \times \frac{360}{1} = 21,6^\circ \checkmark / 22^\circ$	$\frac{1\ 477}{24\ 706} \times \frac{360}{1} = 21,5^\circ / 22^\circ \checkmark$
India: $\frac{5}{100} \times \frac{360}{1} = 18^\circ \checkmark$	$\frac{1\ 106}{24\ 706} \times \frac{360}{1} = 16,1^\circ / 16^\circ \checkmark$
SA: $\frac{2}{100} \times \frac{360}{1} = 7,2^\circ \checkmark / 7^\circ$	$\frac{364}{24\ 706} \times \frac{360}{1} = 5,3^\circ / 5^\circ \checkmark$

OR

6 x 1 (6)

**Mark allocation of the pie chart**

Correct type of graph (pie chart) (T)	1
Correct proportion of slices (P)	1: 1 - 2 correct 2: 3 - 4 correct 3: 5 - 6 correct
Label/key for each slice (K)	1: 1 to 3 2: 4 to 6
Caption	1
Calculations	1 x 6

(7)

**NOTE: If the wrong type of illustration is drawn: marks will be lost for "correct type of graph" as well as for drawing the slices in correct proportions.**

(13)

(25)

## 4.2 Possible answers:

**Strategies to reduce air pollution**

- **Introduce legislation**<sup>✓<sup>S</sup></sup> to force societies to reduce air pollution<sup>✓<sup>R</sup></sup>/ change behaviour
- **Monitor emissions from industries**<sup>✓<sup>S</sup></sup> to ensure that legislation is being followed<sup>✓<sup>R</sup></sup>
- **Impose heavy fines**<sup>✓<sup>S</sup></sup> to discourage repeated acts of pollution<sup>✓<sup>R</sup></sup>
- **Implementation of tax**<sup>✓<sup>S</sup></sup> **on CO<sub>2</sub> emissions** to encourage the use of smaller cars<sup>✓<sup>R</sup></sup>
- **Provide incentives to companies**<sup>✓<sup>S</sup></sup> / **subsidise the purchase and use of clean energy** to encourage them to reduce air pollution<sup>✓<sup>R</sup></sup>
- **Educate**<sup>✓<sup>S</sup></sup> **people about the ill effects of air pollution** so that they behave responsibly<sup>✓<sup>R</sup></sup>
- **Research new technologies**<sup>✓<sup>S</sup></sup> to find more efficient methods of energy production<sup>✓<sup>R</sup></sup> without releasing greenhouse gases for example solar panels, wind turbines
- **Increase/improve the use of public transport**<sup>✓<sup>S</sup></sup> so that fewer people use private vehicles<sup>✓<sup>R</sup></sup>
- **More fuel efficient cars/bicycles**<sup>✓<sup>S</sup></sup> so that less fuel is burnt<sup>✓<sup>R</sup></sup>
- **Increasing the efficiency of electricity use**<sup>✓<sup>S</sup></sup> **at home/industries** which will decrease the amount of coal burnt<sup>✓<sup>R</sup></sup> in electricity production
- **Reduce, re-use and recycle**<sup>✓<sup>S</sup></sup> to conserve energy<sup>✓<sup>R</sup></sup> to lower pollution
- **Switch from fuels**<sup>✓<sup>S</sup></sup> **that produce a lot of greenhouse gases (coal)** to those that produces less (natural gas) as alternative energy source<sup>✓<sup>R</sup></sup>
- **Preventing deforestation**<sup>✓<sup>S</sup></sup> / **loss of other functioning ecosystems** will prevent carbon stored in vegetation of being released in the environment<sup>✓<sup>R</sup></sup>
- **Restoring forests**<sup>✓<sup>S</sup></sup> / **wetlands/other ecosystems** will remove carbon dioxide from the air because plants absorb carbon dioxide<sup>✓<sup>R</sup></sup>
- **Methods to break down**<sup>✓<sup>S</sup></sup> **toxic waste** before it is released into the atmosphere<sup>✓<sup>R</sup></sup>
- **Regulate smoking/use of fires**<sup>✓<sup>S</sup></sup> because it produces smoke which contributes<sup>✓<sup>R</sup></sup> to pollution
- **More landfill sites for waste material**<sup>✓<sup>S</sup></sup> instead of using incinerators<sup>✓<sup>R</sup></sup>

*(Mark any SIX x 2 only and not random points)*

maximum 6 x 2

(12)

**ASSESSING THE PRESENTATION OF THE ESSAY**

Marks	Description
3	Describe 5 - 6 strategies with appropriate reasons
2	Describe 3 - 4 strategies with appropriate reasons
1	List 1- 6 strategies with no appropriate reasons <b>OR</b> Describe only 1-2 strategies with appropriate reasons
0	Has not attempted/has not written anything other than question number/no correct information

**Synthesis**(3)  
(15)**TOTAL SECTION C:****40****GRAND TOTAL:****150**

NSC – Final Memorandum  
Calculations Method 1

Method 1

Calculations Method 2

