



**KWAZULU-NATAL PROVINCE**

EDUCATION  
REPUBLIC OF SOUTH AFRICA

# **CURRICULUM GRADE 10-12 DIRECTORATE**

**NCS (CAPS)**

**EDUCATOR DOCUMENT**

**GRADE 12**

**LIFE SCIENCES**

**SPRING CLASSES**

**2025**

**CONTENTS**

<b>No.</b>	<b>TOPIC</b>	<b>PAGE NO.</b>
1.	Plant response to the environment	3-10
2.	General Evolution	11-26
3.	Human Evolution	27- 35
4.	Biological Term Paper 1 Solutions	36-42
5.	Biological Term Paper 2 Solutions	43-49

**TOPIC: PLANT RESPONSE TO THE ENVIRONMENT****Activity 1**

No.	Description	Biological Term
1.1	Growth or bending reaction by plants in response to light stimuli.	<b>Phototropism</b>
1.2	A plant hormone that promotes apical dominance.	<b>Auxin</b>
1.3	The plant hormone that causes leaves to fall off trees in Autumn.	<b>Abscisic acid</b>
1.4	A Chemical used by farmers to kill weeds.	<b>Herbicide</b>
1.5	Promotes sprouting of buds.	<b>Gibberellins</b>
1.6	Inhibition of the growth of lateral buds by auxins present in apical buds.	<b>Apical dominance</b>
1.7	A movement of part of a plant in response to gravity.	<b>Geotropism</b>
1.8	Plant growth responses to external stimuli.	<b>Tropism</b>
1.9	Sharp structures found in plants for protection from herbivores.	<b>thorns</b>
1.10	The plant hormone that stimulates the germination of seeds.	<b>Gibberellins</b>
		10x1 <b>(10)</b>

**Activity 2**

2.1	B only ✓✓
2.2	Both A and B ✓✓
2.3	B only ✓✓
2.4	B only ✓✓

**Activity 3**

- 3 3.1 Geotropism✓/gravitropism (1)
- 3.2 - Auxins✓
- accumulate at the lower✓part of the stem
  - because of gravity✓
  - The higher concentration of auxins at the lower part of the stem stimulates cell elongation✓/growth on the lower side of the stem
  - The lower concentration of auxins at the upper part of the stem inhibits cell elongation✓/growth on the upper side of the stem
- (Any 4) (4)

- 3.3 - The leaves and stem will be carried in such a way that they receive maximum sunlight✓  
- for photosynthesis✓

**OR**

- Exposes the flowers more favourably✓  
- for pollination✓/seed dispersal (2)
- 3.4 The roots will grow downwards✓/towards gravity (1)

**(8)****Activity 4**

- 4 4.1 - (Apical) tip of the stem ✓/apical bud  
- (Apical) tip of the root ✓  
(Mark first TWO only) (2)
- 4.2 - Stimulate cell division✓/mitosis  
- Stimulate cell elongation✓  
(Mark first TWO only) (2)
- 4.3 Gibberellins✓ (1)  
(Mark first ONE only)
- 4.4 - Increased plant growth✓  
- saves species that are facing extinction✓ (2)

**(7)****Activity 5**

- 5 5.1 Rate of seed germination ✓  
Percentage of seed germination ✓ (2)
- 5.2 -Same amount of water ✓  
-Same species!/type of seed ✓  
-Same light intensity✓/darkness ✓  
-Same temperature ✓  
-Same time period (24 hours) for all 3 groups ✓  
- Seed mixtures were treated in the same way ✓/filtered and rinsed with cold, distilled water for 2 minutes (Any 3)

- 5.3 Same volume ✓/amount of gibberellins that the seeds were soaked in (1)
- 5.4 - So that the average percentage and rate of seed germination could be calculated ✓  
- in order to improve the reliability ✓ of the results (4)
- 5.5 - Seeds usually germinate under the soil ✓  
- in the absence of light ✓ (2)
- (10)**

**Activity 6**

6	6.1	Gibberellins stimulates cell elongation ✓/cell enlargement/ growth in stems/elongation of internodes <b>(Mark first ONE only)</b> Any	(1)
	6.2	$(120 - 80) \checkmark \text{ mm} = 40 \checkmark \text{ mm} \checkmark$	(3)
	6.3	Increase the number of plants used in each treatment ✓ Repeat the investigation ✓ Increase the period of the investigation ✓ <b>(Mark first TWO only)</b> Any	(2)
	6.4	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)
			<b>(10)</b>

**Activity 7**

- 7 7.1 (a) Amount of abscisic acid ✓ (1)  
(b) Seed germination ✓ (1)
- 7.2 Promotes seed dormancy ✓/inhibits growth (1)
- 7.3 As the days increase the hormone concentration decreases ✓✓ (2)

7.4 - Decrease in abscisic concentration✓

- which allows seed germination✓/growth.

(2)

7.5 - Same type of seeds✓.

- Same age of seeds ✓

- Same measuring instrument✓.

- Same person taking measurements✓

**(Mark the FIRST TWO only)**

(2)

7.6 - As the setup was placed in the dark cupboard✓

- there was no effect of light✓

- Force of gravity✓acts on the seedlings

- the stem is negatively geotropic ✓

- hence it grows straight upwards✓

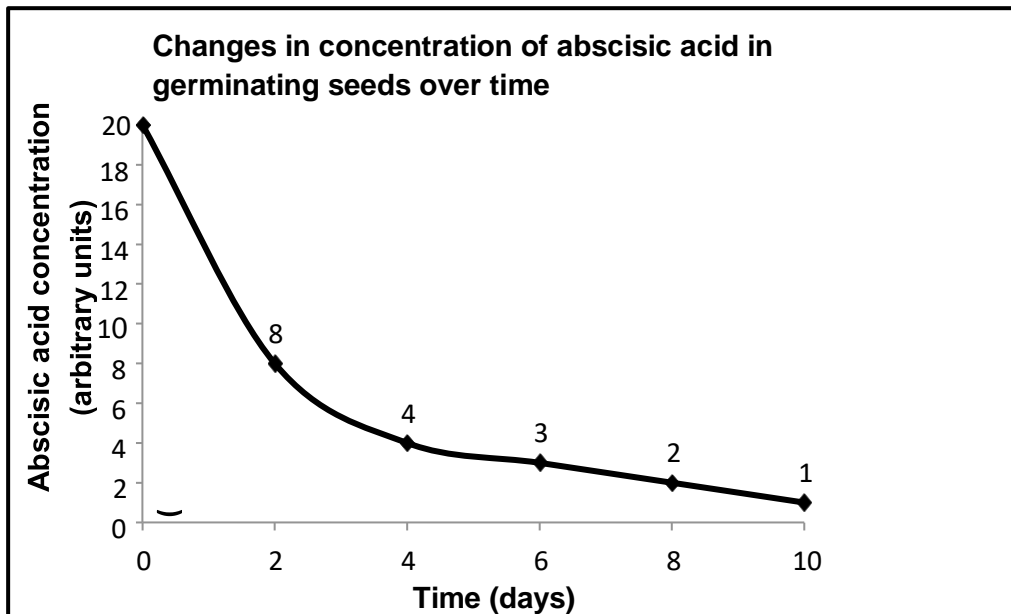
(Any 4)

(4)

**(13)**

**Activity 8**

8 8.1



**Mark allocation of the graph**

Criteria	Mark Allocation
Correct type of graph including the joining of points	1
Title of graph	1
Correct scale, label and unit for X-axis	1
Correct scale, label and unit for Y-axis	1
Drawing of the graph	0: No points plotted correctly 1: 1 to 5 points plotted correctly 2: All 6 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 only for labelling of X-axis and Y-axis (6)

8.2 (a) Decreased ✓ (1)

8.3 (b) Increased✓

(1)

8.3 - Auxins are sensitive to light✓

- Light stimulus from one side causes auxins to move to the shaded side✓/destroyed on the illuminated side

- Auxin concentration is higher on the shaded side ✓

- This promotes cell elongation ✓on shaded side of plant

- resulting in more growth ✓on this side

- Stem grows towards the light stimulus✓

- This is called phototropism ✓

(Any 4)

(4)

**(12)****Activity 9**

9 9.1 Auxins✓

(1)

9.2 The growth movement of part of a plant in response to a unilateral light stimulus. ✓✓

(2)

9.3 - Auxins diffuse through the agar to the stem ✓

- Auxins are light sensitive ✓ /are destroyed by light/Auxins move away from light

- There is a higher concentration of auxins on the dark side of the stem✓

- Growth is stimulated✓ on the dark side which

- grows faster✓

- causing the stem to grow/bend towards the light✓

(Any 6)

(6)

9.4 - Light will not reach the tip of the stem ✓

- Therefore, auxins are distributed evenly✓ throughout the tip of the stem

- The stem will grow straight up ✓/ no bending towards the light

(3)

**(12)**

**Activity 10**

- 10 10.1 To expose the leaves to light for photosynthesis ✓ (1)
- 10.2 Geotropism✓/ gravitropism (1)
- 10.3 To eliminate the effect of gravity✓ / expose the stem to gravity on all sides (1)
- 10.4 - Auxins will move to the lower side of the growing tip ✓  
 - There will be a high concentration of auxin in the lower side ✓stem  
 - which will stimulate cell elongation / ✓growth  
 - Therefore, the lower side will grow faster✓  
 - This will cause the stem to bend upwards✓ (5)
- 10.5 - The auxins ✓  
 - produced at the tip of the stem ✓ will be removed  
 - Therefore, stem will not grow ✓  
 - Lateral branches will develop ✓  
 - in the absence of apical dominance ✓ (Any 4 x 1) (4)
- (12)**

**Activity 11**

- 11 11.1 (a) (Presence/absence of) auxins✓ (1)
- (b) Growth of lateral branches ✓ (1)
- 11.2 - To ensure that the results are caused only by the presence of auxins✓ which  
 - increases the validity✓ of the investigation (2)
- 11.3 - It acts as a control✓  
 - to show that the results of Plant D✓  
 - are caused by the (presence of) auxins✓  
 - and not the agar jelly✓ ANY 3 (3)
- 11.4 The presence of auxins slows down the growth of lateral branches✓✓  
 OR  
 The absence of auxins stimulated the growth of lateral branches✓✓ (2)
- (9)**

**Activity 12**

- 12 12.1 (a) Geotropism ✓ / Gravitropism (1)
- (b) Auxins ✓ (1)
- 12.2 - Due to gravity ✓  
 - there is a high concentration of auxins on the lower side ✓ of the root

- which inhibits growth ✓
- Therefore , growth will occur mainly on the upper side ✓
- causing the root to bend/grow downwards ✓ (5)

- 12.3 - The seedling must be rotated constantly ✓ (2)
- to remove the effect of gravity ✓

**(9)**

**TOPIC: GENERAL EVOLUTION****Activity 1**

<b>No.</b>	<b>DESCRIPTION</b>	<b>TERM</b>
1.1	Organisms that are able to interbreed and produce fertile offspring	<b>Biological species</b>
1.2	A type of variation where there is a range of phenotype for the same characteristics	<b>Continuous variation</b>
1.3	Present day distribution of living organisms	<b>Biogeography</b>
1.4	The selection of desirable characteristics by humans	<b>Artificial selection/ selective breeding</b>
1.5	The process whereby new species are formed	<b>Speciation</b>
1.6	The type of variation in a population with no intermediate phenotype	<b>Discontinuous variation</b>
1.7	An evolution consisting of long periods of little/no change alternating with short periods of rapid change	<b>Punctuated Equilibrium</b>
1.8	The permanent disappearance of species from earth	<b>Extinction</b>
1.9	An explanation for something that has been observed in nature and which can be supported by facts, laws and tested hypothesis	<b>Theory</b>
1.10	Organisms with similar characteristics, able to interbreed randomly and produce fertile offspring	<b>Species</b>
1.11	The process that enables organisms with desirable characteristics to survive and reproduce in a particular environment	<b>Natural selection</b>
1.13	The type of evidence for human evolution that includes tool-making	<b>Cultural evidence</b>
1.14	Change of living organisms over successive generation through genetic variation and natural selection	<b>Biological evolution</b>
	(14 x 1)	<b>(14)</b>

**Activity 2**

2.	2.1	A✓✓	(2)
	2.2	B✓✓	(2)
	2.3	Both A and B✓✓	(2)
	2.4	B✓✓	(2)
	2.5	B✓✓	(2)

			(5 X 2)	<b>(10)</b>
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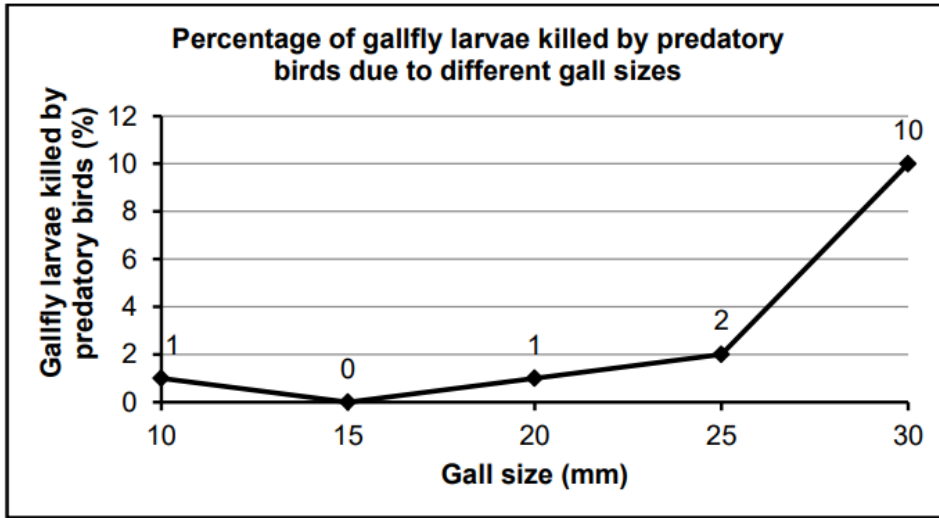
**Activity 3**

3.	3.1	Genetic✓ evidence	(1)
	3.2	1 – A✓      C 2 – C✓ OR A 3 – B✓      B	(3)
			<b>(4)</b>

**Activity 4**

4.	4.1	(a)	Gall size✓	(1)
		(b)	Percentage of gallfly larvae killed✓	(1)
	4.2		- Nutrition✓/food - Protection✓ - Space✓ Any <b>(Mark first ONE only)</b>	(1)
	4.3		- There is a range of (intermediate) values✓ in gall size	(1)
	4.4		- Larvae in 30mm galls are eaten more✓ - since they are more visible✓ to birds and - contain more/larger larvae✓ <b>OR</b> - Larvae in galls that are 25mm and smaller are eaten less✓ - since they are less visible✓ to birds and - contain fewer/smaller larvae✓	(3)

	4.5		<b>(6)</b>
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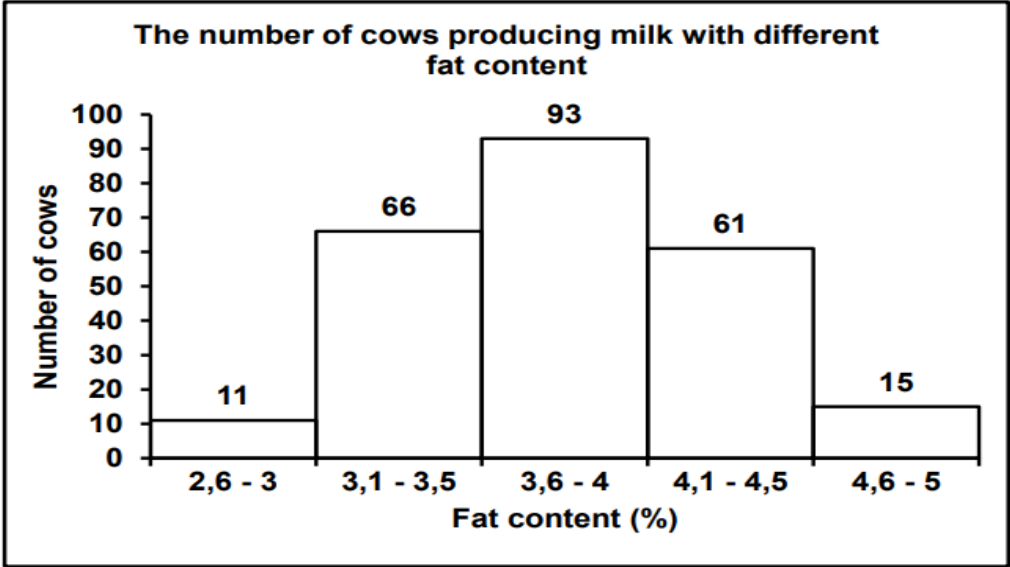


**Guideline for the assessing of the graph**

CRITERIA	ELABORATION	MARK
Correct type of graph <b>(T)</b>	Line graph drawn	1
Caption of graph <b>(C)</b>	Both variables included	1
Axes labels <b>(L)</b>	Correct labels and units on X- and Y-axes	1
Scale for X- and Y-axes <b>(S)</b>	Equal spacing between intervals for each axis	1
Plotting of points <b>(P)</b>	1 to 4 points plotted correctly	1
	All 5 points plotted correctly	2

			<b>(13)</b>
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**Activity 5**

5.	5.1	Continuous✓ variation	(1)																					
	5.2	There is range of intermediate phenotypes✓ /the fat content % is a range	(1)																					
	5.3	$\frac{11}{246} \times 100 = 4,47\%$ (Accept 4,5)	(3)																					
	5.4	<p style="text-align: center;"><b>The number of cows producing milk with different fat content</b></p>  <p style="text-align: center;"><b>Guideline for assessing the graph</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">CRITERIA</th> <th style="text-align: center;">ELABORATION</th> <th style="text-align: center;">MARK</th> </tr> </thead> <tbody> <tr> <td>Correct type of graph (T)</td> <td>Histogram drawn</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Caption of graph (C)</td> <td>Both variables included</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Axes labels (L)</td> <td>X- and Y-axis correctly labelled with units</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Scale for X- and Y-axis (S)</td> <td>- Same width of bars for X-axis and - Correct scale for Y-axis</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Plotting of bars (P)</td> <td>1 to 4 bars plotted correctly</td> <td style="text-align: center;">1</td> </tr> <tr> <td></td> <td>All 5 bars plotted correctly</td> <td style="text-align: center;">2</td> </tr> </tbody> </table>	CRITERIA	ELABORATION	MARK	Correct type of graph (T)	Histogram drawn	1	Caption of graph (C)	Both variables included	1	Axes labels (L)	X- and Y-axis correctly labelled with units	1	Scale for X- and Y-axis (S)	- Same width of bars for X-axis and - Correct scale for Y-axis	1	Plotting of bars (P)	1 to 4 bars plotted correctly	1		All 5 bars plotted correctly	2	(6) <b>(11)</b>
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**Activity 6**

6.	6.1	<ul style="list-style-type: none"> <li>- There is variation amongst the offspring in a population✓</li> <li>- Some have favourable characteristics and some do not✓</li> <li>- When there is a change in the environmental conditions✓/there is competition</li> <li>- organisms with a favourable characteristic survive✓</li> <li>- whilst organisms with an unfavourable characteristic die✓</li> <li>- The organisms that survive, reproduce✓</li> <li>- and pass on the allele for the favourable characteristic to their offspring✓</li> <li>- The next generation will therefore have a higher proportion of individuals with the favourable characteristic✓</li> </ul>	(Any 7) (7)
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6.2	<table border="1"> <thead> <tr> <th>Lamarckism</th> <th>Darwinism</th> </tr> </thead> <tbody> <tr> <td>1 Variation of the offspring occurs when individuals in the population change. ✓</td> <td>1 Variation in the offspring is inherited. ✓</td> </tr> <tr> <td>2 Change occurs because of adaptation to the environment/ Law of use and disuse. ✓</td> <td>2 Natural selection – individuals best suited to the environment survive. ✓</td> </tr> <tr> <td>3 Individuals in the population change. ✓</td> <td>3 The population as a whole changes. ✓</td> </tr> <tr> <td>4 Acquired characteristics are inherited by offspring. ✓</td> <td>4 Characteristic are passed on from generation to generation to enable individuals to survive in the environment. ✓</td> </tr> </tbody> </table>		Lamarckism	Darwinism	1 Variation of the offspring occurs when individuals in the population change. ✓	1 Variation in the offspring is inherited. ✓	2 Change occurs because of adaptation to the environment/ Law of use and disuse. ✓	2 Natural selection – individuals best suited to the environment survive. ✓	3 Individuals in the population change. ✓	3 The population as a whole changes. ✓	4 Acquired characteristics are inherited by offspring. ✓	4 Characteristic are passed on from generation to generation to enable individuals to survive in the environment. ✓	(7) <b>(14)</b>
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4 Acquired characteristics are inherited by offspring. ✓	4 Characteristic are passed on from generation to generation to enable individuals to survive in the environment. ✓												
<p>(Mark first THREE only) (Any (3 x 2) + 1 for table)</p>													

**Activity 7**

7.	7.1	<p><b>Law of use and disuse</b> ✓*</p> <p>-As an organism uses a body part/organ regularly it becomes better developed or enlarged in that organism ✓</p> <p>-If an organism does not use the body/organ frequently it becomes less developed or reduced in size and may disappear altogether in that organism ✓</p> <p><b>The inheritance of acquired characteristics</b> ✓*</p> <p>-Characteristics developed during the life an individual ✓</p> <p>-can be passed on be passed on to their offsprings ✓</p>	(6)
	7.2	<p>-Acquired characteristics ✓ are not inherited ✓ / do not cause any change to the DNA ✓ of an organism gametes (sperms or ova) ✓</p> <p>-Organisms did not evolve because they want to evolve ✓ ✓ /</p> <p>Lamarck’s theory is deterministic ✓ ✓</p>	( Any 4) (4)
			<b>(10)</b>

**Activity 8**

8.	8.1	<ul style="list-style-type: none"> <li>- He would use his of use and disuse ✓</li> <li>- and law of inheritance of acquired characteristics ✓</li> <li>- The ancestor of spider monkeys had short tails ✓</li> <li>- to be able to hold onto tree branches ✓</li> <li>- As a result their tails became longer ✓</li> <li>- and this characteristic was passed on to the next generation ✓</li> </ul>	( Any 6) (6)
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	8.2	<ul style="list-style-type: none"> <li>- Evolution occurs by natural selection✓</li> <li>- There was variation in the ancestral population</li> <li>- Some spider monkeys had short tails✓</li> <li>- and some had long tails✓</li> <li>- The spider monkeys with long tails were able to hold onto tree branches✓ /did not</li> <li>- fall to the ground</li> <li>- and survived✓ /were not attacked by predators</li> <li>- Those with short tails could not hold onto tree branches✓ /fell on the ground</li> <li>- They died✓ /were attacked by predators</li> <li>- The characteristic for long tails was passed to the offspring✓</li> </ul>	(Any 8)	(8)
				<b>(14)</b>

**Activity 9**

9.	9.1	<ul style="list-style-type: none"> <li>- Crossing over✓</li> <li>- Random arrangement of chromosomes✓</li> <li>- Random mating✓</li> <li>- Random fertilisation✓</li> <li>- Chromosomal mutations✓</li> </ul> <p><b>(Mark first THREE only)</b></p>	(Any 3)	(3)
	9.2	<p>(a) Mutant gene✓ /inherited from their ancestors</p> <p>(b) Influenced by altitude✓ /level of oxygen</p>		(1) (1)
	9.3	<ul style="list-style-type: none"> <li>- More haemoglobin present✓</li> <li>- to allow for maximum absorption of the available oxygen✓</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>- More oxygen will be available✓</li> <li>- to meet their energy needs✓</li> </ul>		(2)
	9.4	<ul style="list-style-type: none"> <li>- Originally the amount of red blood cells was similar in all humans✓ /the Tibetans did not produce a large number of red blood cells</li> <li>- As a result of low oxygen content at high altitudes✓</li> <li>- the red blood cells tried to increase the amount of oxygen absorbed✓</li> <li>- As a result ancestral Tibetans produced more red blood cells✓ /developed ways of using oxygen more efficiently to increase the availability of oxygen to the body</li> <li>- This acquired characteristic✓</li> <li>- was the passed on to their offspring✓</li> <li>- All Tibetans now produce more red blood cells✓ /use oxygen more efficiently to survive at high altitudes</li> </ul>	( Any 6)	(6) <b>(13)</b>

**Activity 10**

10.	10.1	<ul style="list-style-type: none"> <li>- They measured the jaw size of lizards on both islands✓ and</li> <li>- determined the average jaw size for each population✓</li> <li>- They calculated the difference✓ between the two</li> </ul>	(3)
	10.2	<ul style="list-style-type: none"> <li>- A larger jaw allows for better muscle attachment✓</li> <li>- Thereby increasing the bite force✓/ability</li> <li>- to break down the fibrous plant material✓</li> </ul>	(3)
	10.3	<ul style="list-style-type: none"> <li>- They allowed the lizards of the two islands to mate✓</li> <li>- and determined if they were able to interbreed✓ and</li> <li>- give rise to fertile offspring✓</li> </ul>	Any (2)

	10.4	<ul style="list-style-type: none"> <li>- Biodiversity remains the same✓/there is no effect</li> <li>- because the number of species remains the same✓/a new species has not been formed</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>- Biodiversity decreases✓</li> <li>- because some species of plants eaten on Island <b>B</b> could become extinct✓</li> </ul>	(2)
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	10.5	<ul style="list-style-type: none"> <li>- There is variation in the size of the lizards' jaws✓</li> <li>- Some have small jaws and others have large jaws✓</li> <li>- Due to the larger supply of plants✓/fewer insects</li> <li>- the lizards with the larger jaws will have more food✓</li> <li>- and survive✓</li> <li>- while those with smaller jaws will be unable to feed✓</li> <li>- and die✓</li> <li>- The lizards that survive will reproduce✓ and</li> <li>- the allele for larger jaws will be passed on to the offspring✓</li> <li>- The next generation will have a higher proportion of lizards with larger jaws✓</li> </ul>	Any (7) <b>(17)</b>
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	11.1	Ambulocetus✓	(1)
	11.2	It had flipper-like large feet and a tail✓✓ (Mark first ONE only)	(2)
	11.3	- They share characteristics/have intermediate characteristics of the ancestor/Pakicetu✓s and the present-day species/ ✓Balaena <b>OR</b> - They have legs like Pakicetus a✓and - flippers of the present day Balaena✓	(2)
	11.4	- Ancestral species of whales all had legs✓/lived on land - As more time was spent in the water✓in search of food - the legs were used less a✓and disappeared - the acquired characteristic was passed on to the nextgeneration✓ (Any 3)	(3)
			<b>(8)</b>

### Activity 11

11.	11.1	Ambulocetus✓	(1)
	11.2	It had flipper-like large feet and a tail✓✓ (Mark first ONE only)	(2)
	11.3	- They share characteristics/have intermediate characteristics of the ancestor/Pakicetu✓s and the present-day species/ ✓Balaena <b>OR</b> - They have legs like Pakicetus a✓and - flippers of the present day Balaena✓	(2)
	11.4	- Ancestral species of whales all had legs✓/lived on land - As more time was spent in the water✓in search of food - the legs were used less a✓and disappeared - the acquired characteristic was passed on to the nextgeneration✓ (Any 3)	(3)
			<b>(8)</b>

**Activity 12**

12.	12.1	- It is characterised by long periods of little or no change✓ - alternating with short periods of rapid change✓ - during which new species may form✓	(3)
	12.2	They contain toxins✓ which kill the snakes <b>OR</b> Too large✓ to be swallowed	(Any 1) (1)
	12.3	- Having a small jaw✓ - means cane toads cannot be consumed✓ - thereby protecting the snakes from ingesting the toxins✓	(3)
	12.4	Since the snake’s jaws were used less✓ /not used the snakes developed smaller jaws✓ This characteristic (of a smaller jaw) was inherited by the offspring✓ Over many generations the jaw of the snake became smaller✓	(4)
			<b>(11)</b>

**Activity 13**

13.	13.1	(a)	(Presence or absence of) tall trees✓	(1)
		(b)	(Presence or absence of) wings on the stoneflies✓	(1)

	13.2	- Type of net/ apparatus used to catch the insects✓ - Season of collection✓/collection was done in summer - Time of day for collection✓/collection was done in the morning - Type of location for each category✓ - Number of locations for each category✓ - Labelling of samples was done according to the area of collection✓ <b>(Mark first TWO only)</b>	(Any 2) (2)
	13.3	- Collected thousands of stoneflies✓ - Three (3) locations for each category✓ <b>(Mark first TWO only)</b>	(2)
	13.4	- Flying is dangerous✓ in areas without trees - However, stoneflies with no wings survived since they could not fly✓ - Therefore, they reproduced✓ - Passing the allele for no wings to the next generation✓	(4)
	13.5	- All stoneflies had wings✓ - Due to strong winds✓ /since it was dangerous to fly in cleared areas - They stopped using their wings✓/flying - The wings became smaller✓/disappeared - The acquired characteristic of no wings was passed on to the offspring✓ - All offspring in the next generation had no wings✓	(Any 5) (5)
			<b>(15)</b>

**Activity 14**

14.	14.1	1900✓	(1)								
	14.2	$\left\{ \frac{80}{20} \right\} \checkmark \times 100 \checkmark = 400 \checkmark \%$ <p style="text-align: center;"><b>OR</b></p> $\left\{ \frac{(100-20)}{20} \right\} \checkmark \times 100 \checkmark = 400 \checkmark \%$	(3)								
	14.3	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Natural selection</th> <th style="text-align: center;">Artificial selection</th> </tr> </thead> <tbody> <tr> <td>The environment or nature is the selective force✓</td> <td>Humans represent the selective force✓</td> </tr> <tr> <td>Selection is in response to suitability to the environment✓</td> <td>Selection is in response to satisfying human needs✓</td> </tr> <tr> <td>Occurs within a species✓</td> <td>May involve one or more species✓ (as in cross breeding)</td> </tr> </tbody> </table> <p><b>(Mark first TWO only)</b> 1 for Table + Any 2 x 2</p>	Natural selection	Artificial selection	The environment or nature is the selective force✓	Humans represent the selective force✓	Selection is in response to suitability to the environment✓	Selection is in response to satisfying human needs✓	Occurs within a species✓	May involve one or more species✓ (as in cross breeding)	(5)
Natural selection	Artificial selection										
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Occurs within a species✓	May involve one or more species✓ (as in cross breeding)										
			<b>(9)</b>								

**Activity 15**

15.	15.1	<ul style="list-style-type: none"> <li>- The farmer interbred✓</li> <li>- mealie plants with a high protein content✓</li> <li>- over 50/many generations✓</li> </ul>	(3)
	15.2	12,8✓ % (Accept 12,7 - 12,9%)	(1)
	15.3	$\frac{20 \checkmark}{14} = 1,43 \checkmark$ times	(2)
	15.4	<ul style="list-style-type: none"> <li>- Artificial selection: organisms with a desired characteristic are interbred✓</li> <li>- Genetic engineering: genes coding for the desired characteristic are inserted into an organism✓</li> </ul> <p><b>(Mark first ONE only)</b></p>	(2)
			<b>(8)</b>

**Activity 16**

16.	16.1	Artificial selection✓ /selective breeding	(1)
	16.1	-They chose dogs with desirable traits✓ - and interbred✓ them to - produce offspring with these traits✓	(3)
	16.3	- Allow them to interbreed with each other✓ - and see whether they produce fertile offspring✓ <b>OR</b> -Analysis of DNA✓ -to check for matching sequences✓	(2)
	16.4	-Rhodesian ridgeback✓ -is strong, athletic and fast✓ -is able to catch the prey✓	(Any 2) (2)
	16.5	-Due to reduction in gene pool✓/variation -they will not be able to hunt✓/find shelter/defend themselves -as well as wolves are able to✓ -therefore unable to survive in the wild✓	(3) (3)
			<b>(11)</b>

**Activity 17**

		<ul style="list-style-type: none"> <li>- If a population of a single species becomes separated by a geographical barrier✓ (sea, river, mountain, lake)</li> <li>- then the population splits into two✓</li> <li>- There is no gene flow between the two populations✓</li> <li>- Each population may be exposed to different environmental conditions✓/the selection pressure may be different</li> <li>- and therefore natural selection occurs independently✓</li> <li>- such that the individuals of the two populations become different✓ genotypically and phenotypically✓</li> <li>- Even if these populations were to mix again✓</li> <li>- they will not be able to interbreed✓</li> <li>- because they are now different species✓</li> </ul>	Any 7 (7)
			<b>(7)</b>

**Activity 18**

18.	18.1	<ul style="list-style-type: none"> <li>- There was once one large continent✓ and</li> <li>- the common ancestor existed throughout this continent✓</li> <li>- When Madagascar separated✓</li> <li>- the common ancestor was found in both✓ regions</li> </ul>	(4)
-----	------	---	-----

	18.2	<ul style="list-style-type: none"> <li>- The common ancestor became separated into two <b>groups</b> by the ocean✓*</li> <li>- There was no gene flow between the two <b>groups</b>✓</li> <li>- Each <b>group</b> experienced different environmental conditions✓</li> <li>- and underwent natural selection independently✓</li> <li>- The individuals in each <b>group</b> became different✓</li> <li>- genotypically and phenotypically✓</li> <li>- to form the pottos and lemurs✓*</li> <li>- Eventually if the two groups are mixed again, they cannot interbreed✓/produce fertile offspring.   *2 Compulsory + Any 4 </li> </ul>	(6)
			<b>(10)</b>

**Activity 19**

19.	19.1	Biogeography✓	(1)
	19.2	<ul style="list-style-type: none"> <li>- Similar organisms✓</li> <li>- that can interbreed✓</li> <li>- to produce fertile offspring✓</li> </ul>	(3)
	19.3	<ul style="list-style-type: none"> <li>- The original population /common ancestor once lived on a large continent✓</li> <li>- and became separated by continental drift✓/oceans - There was no gene flow amongst the three populations✓*</li> <li>- Each population experienced different environmental conditions✓ - and underwent natural selection independently✓</li> <li>- The individuals in each population became different✓ - genotypically and phenotypically✓</li> <li>- Even if the (three) populations are mixed again✓</li> <li>- they would not be able to interbreed✓/produce fertile offspring - forming the different species, the coyote, jackal, and dingo✓ *</li> </ul> <p style="text-align: right;">( 2 compulsory* + any 5)</p>	(7)
			<b>(11)</b>

**Activity 20**

20.	20.1	<ul style="list-style-type: none"> <li>- A group of organisms of the same species✓</li> <li>- occupying the same habitat✓</li> <li>- at the same time✓</li> </ul>	(3)
	20.2	They produce infertile offspring✓ <b>(Mark first ONE only)</b>	(1)
	20.3	<ul style="list-style-type: none"> <li>- Breeding at different times of the year✓</li> <li>- Species-specific courtship behaviour✓</li> <li>- Adaptation to different pollinators✓</li> <li>- Prevention of fertilisation✓</li> </ul> <p style="text-align: right;">(Any 3)</p>	(3)
			<b>(7)</b>

**Activity 21**

21.	21.1	<p>Datura flowers:</p> <ul style="list-style-type: none"> <li>- release a powerful fragrance✓</li> <li>that attracts hawk moths✓</li> <li>- release a highly addictive nectar✓</li> <li>that ensures that the hawk moths only visit it✓/stays longer in the flower</li> <li>- open in the evening✓</li> <li>and this ensures visit by moth✓</li> <li>- are adapted to a specific pollinator✓</li> <li>since they attract hawk moths✓</li> </ul> <p><b>(Mark first TWO only)</b></p>	Any (2 x 2)	(4)
	21.2	<ul style="list-style-type: none"> <li>- Reproduction is at different times of the year✓</li> <li>- Infertile offspring✓</li> <li>- Prevention of fertilisation✓</li> </ul> <p><b>(Mark first TWO only)</b></p>	(Any 2)	(2)
				<b>(6)</b>

**Activity 22**

22.	22.1	<ul style="list-style-type: none"> <li>- As the wings were used less✓</li> <li>- they became reduced in size✓/less developed</li> <li>- and could not be used for flying✓</li> <li>- This acquired characteristic was passed on to the offspring✓</li> </ul>		(4)
	22.2	<ul style="list-style-type: none"> <li>- Breeding at different times of the year✓</li> <li>- Species-specific courtship behaviour✓</li> <li>- Adaptations to different pollinators✓</li> <li>- Infertile offspring✓</li> <li>- Prevention of fertilisation✓</li> </ul> <p><b>(Mark first THREE only)</b></p>	( Any 3)	(3)
				<b>(7)</b>

**Activity 23**

	<p><b>MUTATIONS AND EVOLUTION IN PRESENT TIMES</b></p> <ul style="list-style-type: none"> <li>- In a population of insects✓/bacteria/Hi viruses/Galapagos finches</li> <li>- mutations are a source of variation✓</li> <li>- which may make some organisms more resistant✓/better suited</li> <li>- to insecticides✓/antibiotics/antiretroviral medication/drought</li> <li>- Those individuals that are not resistant/suited will die✓ whereas</li> <li>- those that are resistant/well suited, will survive✓</li> <li>- This is known as natural selection✓</li> <li>- As a result, individuals of the future generations will be resistant to the</li> <li>- insecticides✓/antibiotics/antiretroviral/adapted to drought</li> </ul>		(Any 8)	<b>(8)</b>
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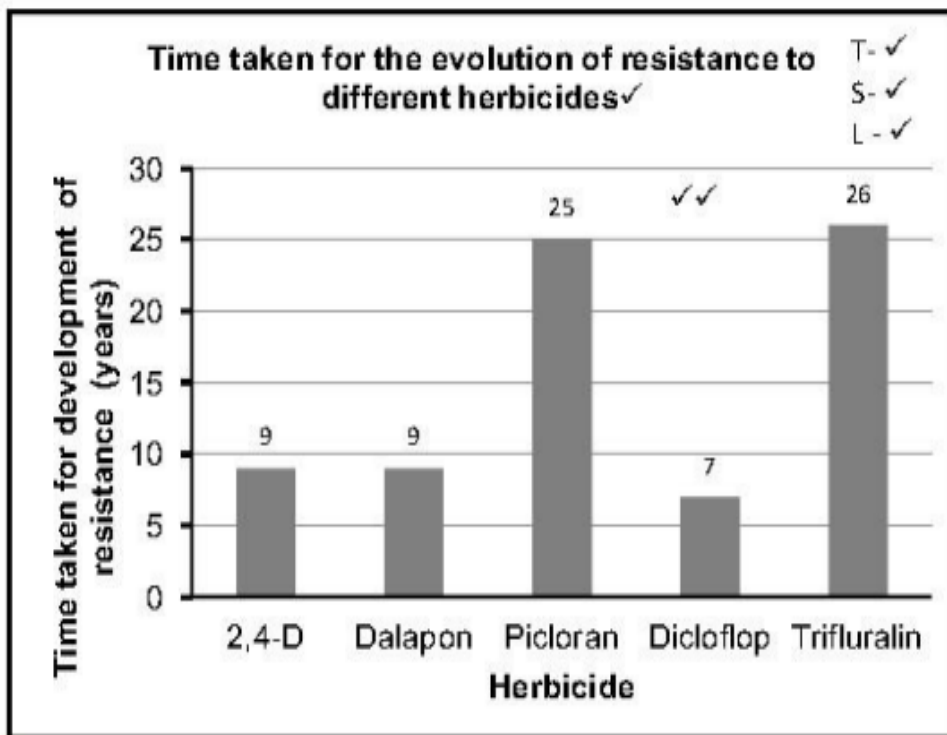
**Activity 24**

24.	24.1	(a) Probability of developing resistance to antiretroviral drugs✓ (b) Number of missed treatments✓	(1) (1)
	24.2	Treatment must not be missed✓	(1)
	24.3	The probability of HIV developing resistance to antiretroviral drugs✓ increases with the increase in the number of missed treatments✓ <b>OR</b> The more the days of missed treatment, ✓ the greater the probability of the virus developing resistance to antiretroviral drugs✓	(2)
	24.4	- There is variation in the resistance of the HI virus to antiretroviral drugs✓ - Some viruses are resistant to the drugs✓ and - others are not resistant✓ - Those that are not resistant do not survive✓ - When treatments are missed✓ - the resistant viruses survive and reproduce✓ - passing the resistance to their offspring✓	(Any 5) (5)
			<b>(10)</b>

**Activity 25**

25	25.1	-They invade farm fields✓ -They outcompete the crop plant for space✓	(Any 1) (1)
	25.2	(a) Type of herbicide ✓	(1)
		(b) Time taken for development of resistance✓	(1)
	25.3	(a) Dicloflop✓	(1)
		(b) Trifluralin✓	(1)
	25.4	(a) They would apply the herbicide to the weed✓ and -observe if the weed survives✓ over many generations	(2)
		(b) They used the same weed species as other weed species may have developed resistance to that herbicides✓ Each weed species may respond differently✓ to a herbicide <b>OR</b> It allows for a single variable✓ to which all results can be attributed✓	(2)
			<b>(9)</b>

25.5



**Guideline for assessing the graph**

Type: Bar graph drawn (T)	1
Title of graph	1
Correct: - Scale for Y-axis and (S) - Width and interval of bars on X-axis	1
Correct: - Label for X-axis and - Label and unit for Y-axis (L)	1
Plotting of bars	1- 1 to 4 bars plotted correctly 2- All 5 bars plotted correctly

(6)

(15)

**Activity 26**

26.	26.1	<ul style="list-style-type: none"> <li>- It decreases the number of harmful bacteria the most✓</li> <li>- thereby preventing disease in cattle✓/resulting in less medical expenses</li> <li>- Decreasing mortality✓/maintaining the number of cattle</li> <li>- to sell✓/breed /increase profit</li> </ul>	(4)
	26.2	<ul style="list-style-type: none"> <li>- Natural selection✓ occurs - There is variation✓/mutation in the population of bacteria</li> <li>- Some are resistant to antibiotics, some are non-resistant ✓</li> <li>- When antibiotic is added✓ to the animal feed</li> <li>- The bacteria that are non-resistant are killed by the antibiotic✓</li> <li>- Those that are resistant survive and reproduce✓</li> <li>- The characteristic for resistance to antibiotics is passed on to the offspring✓</li> <li>- The next generation will have a higher proportion of antibiotic resistant bacteria✓</li> </ul>	(Any 6) (6)
			<b>(10)</b>

**TOPIC: HUMAN EVOLUTION**

<b>Misconceptions</b>	<b>Solutions</b>
Most learners are able to do the calculations to show the period of coexistence of e.g Q3.4.2 Nov 2023 <i>A. afarensis</i> and <i>A. africanus</i> lost marks when they did not convert their answer to million years.	Determining the correct time scale on cladograms must be taught as a skill. Include cladograms as part of daily assessment.
In Q3,5.3 in Nov.2023 Learners could not identify pelvis A as belonging to <i>A. sediba</i> , neither could they explain why pelvis A was transitional between B and C. Many mentioned the height <i>or</i> width in their comparisons instead of the height <i>and</i> width.	Teachers must expose learners to high order questions. Learners must be given multiple exposure to questions that relate to comparison of anatomical structures.
Learners could not clearly explain the significance of the change from <i>A. sediba</i> to <i>H. sapiens</i> .	Teachers must teach the significance of each fossil type to show the differences amongst them, as specified by in the Examination Guideline.

**Activity 1**

<b>No.</b>	<b>Description</b>	<b>Biological Term</b>
1.1	A diagrammatic representation showing possible evolutionary relationships between different species	<b>phylogenetic</b>
1.2	Similar structures that perform different functions in different organisms	<b>Homologous</b>
1.3	Remains of life forms preserved in rocks, ice and dried sap trees	<b>Fossil</b>
1.4	The opening in the base of the skull through which the spinal cord passes	<b>Foramen magnum</b>
1.5	An upright posture and walking only on two legs	<b>Bipedalism</b>
1.6	Family to which humans belong	<b>Hominidae</b>
1.7	The type of evidence for human evolution that includes tool-marking	<b>Cultural evidence</b>
1.8	Genus to which Little Foot and Mrs Ples belongs	<b>Australopithecus</b>
1.9	The type of vision shared by apes and humans that allows for depth perception	<b>Stereoscopic vision</b>
1.10	The act of walking on all four limbs	<b>Quadrupedal</b>
1.11	Having a protruding jaw	<b>Prognathous</b>
1.12	Large, pointed teeth in African apes that are used for tearing food	<b>Canine</b>
		12X1 (12)

**Activity 2**

2.	2.1	Phylogenetic tree		(1)
	2.2	(a)	P✓	(1)
		(b)	R✓	(1)
	2.3	(a)	Bonobo✓ Chimpanzee✓ <b>(Mark first TWO only)</b>	(2)
		(b)	Orang-utan✓ Gorilla✓ Bonobo✓ Chimpanzee <b>(Mark first TWO only)</b>	(2)
	2.4	-Foramen magnum at more backward position✓ -C-shaped spine✓ -Pelvis long and narrow✓ <b>(Mark first THREE only)</b>		(3)
				<b>(4)</b>

**Activity 3**

3.1	3.1	H.erectus✓	(1)
	2.2	3,2-2,7✓=0,5✓ my	(2)
	3.3	H. habilis✓	(4)
	3.4	-Scraping ✓ -Pounding✓ -Chopping✓ <b>(Mark first TWO only)</b>	(2)
	3.5	-H. sapiens✓ -H.neanderthalensis✓ <b>(Mark first TWO only)</b>	(2)
	3.6	-Increased brain size✓ led to -increased intelligence ✓leading to✓ -the development of complex tools✓	
			<b>(11)</b>

**Activity 4**

4.	4.1	Phylogenetic tree ✓/cladogram	(1)
	4.2	2✓ /Two	(1)
	4.3	(a) <i>Homo habilis</i> ✓ (b) <i>(Homo) naledi</i> ✓	(1) (1)
	4.4	<i>(Homo) sapiens</i> ✓	(1)
	4.5	- Fossil ✓evidence - Cultural ✓evidence - Genetic ✓ evidence Any <b>(Mark first TWO only)</b>	(2)
	4.6	- A large cranial capacity ✓ in <i>Homo sapiens</i> - indicates a larger brain ✓ - leading to greater intelligence ✓  OR - A small cranial capacity ✓ in <i>Australopithecus africanus</i> - indicates a smaller brain ✓ - leading to lower intelligence ✓	(3)
	4.7	- Fossils of <i>Australopithecus spp.</i> were found in Africa only ✓ and - fossils of <i>species X/Homo habilis</i> were found in Africa only ✓ - The oldest fossils of <i>Homo erectus</i> were found in Africa ✓/the younger fossils were found elsewhere - indicating that modern humans originated in Africa and migrated out of Africa ✓	(4)
			<b>(14)</b>

**Activity 5**

5.	5.1	<ul style="list-style-type: none"> <li>- Bare fingertips✓/nails instead of claws</li> <li>- Opposable thumbs✓/ gripping ability</li> <li>- Fingerprints✓</li> <li>- Five fingers✓</li> </ul> <p style="text-align: right;">Any</p> <p><b>(Mark first ONE only)</b></p>	(1)																												
	5.2	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;"><b>Differences between African apes and humans</b></th> </tr> <tr> <th style="width: 50%; text-align: center;"><b>African apes</b></th> <th style="width: 50%; text-align: center;"><b>Humans</b></th> </tr> </thead> <tbody> <tr> <td>- Small cranium✓</td> <td>- Large cranium✓</td> </tr> <tr> <td>- Brow ridges are well developed✓</td> <td>- Brow ridges are not well developed✓</td> </tr> <tr> <td>- Large canines✓</td> <td>- Small canines✓</td> </tr> <tr> <td>- Palate is long and rectangular✓ / U-shaped</td> <td>- Palate is small and semi-circular✓/ C-shaped</td> </tr> <tr> <td>- Large jaws✓</td> <td>- Small jaws✓</td> </tr> <tr> <td>- More protruding jaws✓/ prognathous</td> <td>- Less protruding jaws✓/non-prognathous</td> </tr> <tr> <td>- Cranial ridges present✓</td> <td>- No cranial ridge✓</td> </tr> <tr> <td>- Foramen magnum in a backward position✓</td> <td>- Foramen magnum in a forward position✓</td> </tr> <tr> <td>- Sloping face✓</td> <td>- Flat face✓</td> </tr> <tr> <td>- Less developed zygomatic arch✓</td> <td>- More developed zygomatic arch✓</td> </tr> <tr> <td>- Less developed chin✓</td> <td>- More developed chin✓</td> </tr> <tr> <td>- Diastema between the teeth✓</td> <td>- No diastema between the teeth✓</td> </tr> </tbody> </table> <p><b>(Mark first THREE only)</b> <span style="float: right;">Table 1 + (3 x 2)</span></p>	<b>Differences between African apes and humans</b>		<b>African apes</b>	<b>Humans</b>	- Small cranium✓	- Large cranium✓	- Brow ridges are well developed✓	- Brow ridges are not well developed✓	- Large canines✓	- Small canines✓	- Palate is long and rectangular✓ / U-shaped	- Palate is small and semi-circular✓/ C-shaped	- Large jaws✓	- Small jaws✓	- More protruding jaws✓/ prognathous	- Less protruding jaws✓/non-prognathous	- Cranial ridges present✓	- No cranial ridge✓	- Foramen magnum in a backward position✓	- Foramen magnum in a forward position✓	- Sloping face✓	- Flat face✓	- Less developed zygomatic arch✓	- More developed zygomatic arch✓	- Less developed chin✓	- More developed chin✓	- Diastema between the teeth✓	- No diastema between the teeth✓	(7)
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	5.3	<ul style="list-style-type: none"> <li>- Short✓ and</li> <li>- wide✓/broad</li> <li>- Cup-shaped✓</li> </ul> <p style="text-align: right;">Any</p> <p><b>(Mark first TWO only)</b></p>	(2)																												
			<b>(10)</b>																												

**Activity 6**

6..	6.1	<ul style="list-style-type: none"> <li>- To show a possible common ancestor ✓</li> <li>- To identify trends in evolution ✓</li> </ul> <p style="text-align: right;">Any</p>	(1)
	6.2	<ul style="list-style-type: none"> <li>- Both have opposable thumbs✓</li> <li>- to allow for a power grip✓ /precision grip/ any example thereof</li> </ul>	(2)
	6.3	<ul style="list-style-type: none"> <li>- Humans have small teeth ✓/canines whereas African apes have large teeth ✓/canines</li> <li>- There are no gaps ✓/diastema between the teeth in humans whereas African apes have gaps ✓/diastema between the teeth</li> </ul> <p style="text-align: right;"><b>(Mark first ONE only)</b> (Any 1 x 2)</p>	(2)
			<b>(5)</b>

**Activity 7**

7.	7.1	Walking on two legs✓✓	(2)
	7.2	(a) - Foramen magnum moved to a more forward position✓ - to allow the spinal cord to enter vertically✓	(2)
		(b) - Pelvic girdle is short and wide✓/broad - to support the upper body✓	(2)
		(c) - Spine is more curved✓/S shaped - to absorb shock✓/allow flexible movement/support	(2)
			<b>(8)</b>

**Activity 8**

8.	8.1	<table border="1"> <thead> <tr> <th>Skull 1</th> <th>Skull 2</th> </tr> </thead> <tbody> <tr> <td>Brow ridges pronounced✓</td> <td>Brow ridges less pronounced✓</td> </tr> <tr> <td>More protruding jaws✓/prognathous</td> <td>Less protruding jaws✓/non-prognathous</td> </tr> <tr> <td>Larger jaws✓</td> <td>Smaller jaws✓</td> </tr> <tr> <td>Smaller cranium size✓</td> <td>Larger cranium size✓</td> </tr> <tr> <td>Larger teeth✓/ canines</td> <td>Smaller teeth✓/canines</td> </tr> <tr> <td>Poorly developed chin✓</td> <td>Well developed chin✓</td> </tr> <tr> <td>Sloping face✓</td> <td>Flat face✓</td> </tr> </tbody> </table>	Skull 1	Skull 2	Brow ridges pronounced✓	Brow ridges less pronounced✓	More protruding jaws✓/prognathous	Less protruding jaws✓/non-prognathous	Larger jaws✓	Smaller jaws✓	Smaller cranium size✓	Larger cranium size✓	Larger teeth✓/ canines	Smaller teeth✓/canines	Poorly developed chin✓	Well developed chin✓	Sloping face✓	Flat face✓	
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Sloping face✓	Flat face✓																		
		(Mark first <b>THREE</b> only)	Table 1 + (3 x 2)																
	8.2	<ul style="list-style-type: none"> <li>- Freely rotating arms✓</li> <li>- Long upper arms✓</li> <li>- Rotation around elbow joints✓</li> <li>- Rotation around the wrists✓</li> <li>- Opposable thumbs✓</li> <li>- Bare fingertips✓/ nails instead of claws</li> <li>- Five fingers✓/pentadactyl limb</li> <li>- Fingerprints present✓</li> </ul>	Any (4)																
	8.3	<ul style="list-style-type: none"> <li>- Since the cranium houses the brain✓</li> <li>- a large cranial volume indicates a larger brain✓/more brain cells</li> <li>- which suggests greater intelligence✓</li> </ul>	(3)																
			<b>(14)</b>																



**Activity 11**

11.	11.1	Australopithecus✓	(1)
	11.2	S ✓-shaped spine	(1)
	11.3	-An organism that has intermediate /common characteristics✓ -between two genera✓/species	(2)
	11.4	A✓	(1)
	11.5	-A has a pelvis that is intermediate ✓/transitional -Between B and C✓ OR -A has a shorter and wider pelvis than B✓ but not as short and wider as C✓ OR -A has a longer and narrower pelvis than C✓ But not as long and narrower as B✓	(2)
	11.6	-A sediba was prognathous✓ /more prognathous while -H. sapiens are non-prognathuos✓ /less prognathuos -This is due to a smaller teeth✓ and -reduced chewing muscles✓ -caused by a changed diet to eating soft/cooked food✓	(5)
			<b>(12)</b>

**Activity 12**

12.	12.1	<ul style="list-style-type: none"> <li>- The jaw is large in the chimpanzee✓ and small in <i>Homo sapiens</i>✓</li> <li>- The jaw/ palate is rectangular in the chimpanzee✓ and rounded in <i>Homo sapiens</i>✓</li> <li>- Large spaces between the teeth in the chimpanzee✓ and small/no spaces in <i>Homo sapiens</i>✓</li> <li>- Large canines/teeth in the chimpanzee✓ and small canines/teeth in <i>Homo sapiens</i>✓</li> </ul> <p style="text-align: right;">Any 1 x 2</p> <p><b>(Mark first ONE only)</b></p>	(2)
	12.2	<ul style="list-style-type: none"> <li>- The diet changed from eating raw food✓ in <i>Australopithecus</i></li> <li>- to a diet of cooked food✓ in <i>Homo sapiens</i></li> </ul>	(2)
	12.3	<p>(a) A transitional species shows intermediate characteristics between two genera/species✓</p> <p style="text-align: center;"><b>OR</b></p> <p>It has characteristics common to both the ancestor species and the species that follows✓</p> <p>(b) The jaw is smaller than that of the chimpanzee but larger than that of <i>Homo sapiens</i>✓✓</p> <p style="text-align: center;"><b>OR</b></p> <p>The canines/ teeth are smaller than those of the chimpanzee but larger than those of <i>Homo sapiens</i>✓✓</p>	(1)

		<b>OR</b>	
		<p>The jaw/ palate shape is more rounded than that of the chimpanzee but less rounded than that of <i>Homo sapiens</i>✓✓                  Any 1 x 2</p> <p><b>(Mark first ONE only)</b></p>	(2)
			<b>(7)</b>

**Activity 13**

13.	13.1	(a)	<ul style="list-style-type: none"> <li>- The foramen magnum was in a backward position✓ in the ape-like beings</li> <li>- but in more forward position✓ in modern humans</li> </ul>	(2)
		(b)	<ul style="list-style-type: none"> <li>- Modern humans have larger cranium✓ than ape-like beings</li> <li>- Modern humans have less sloping forehead✓ than ape-like being</li> <li>- Modern humans have cranium that is more rounded✓ than ape- like being.</li> </ul> <p style="text-align: right;">Any</p>	(2)
	13.2		<p><b>Foramen magnum</b></p> <ul style="list-style-type: none"> <li>- This shows a change from quadrupedalism in ape-like beings to bipedalism in humans✓*</li> <li>- This creates increased awareness of the environment in sensing danger✓/food</li> <li>- Freeing hands to use implements✓/carry offspring</li> <li>- Exposure of large surface area for thermoregulation✓</li> <li>- Display of sex organs/breast as part of courtship behaviour✓</li> </ul> <p style="text-align: right;"><b>1* compulsory + Any 1</b></p>	(2)
	13.3		<p><b>Cranium</b></p> <ul style="list-style-type: none"> <li>- This allows space for larger brain✓* in humans than ape-like beings which makes the following possible:</li> <li>- Better co-ordination of movement✓</li> <li>- Processing of large amount of information✓</li> <li>- Processing of information faster✓</li> <li>- Development of spoken and written languages to communicate</li> </ul> <p style="text-align: right;"><b>1* compulsory + Any 1</b></p>	(2)
				<b>(8)</b>

**Activity 14**

14.	14.1	(a)	- <i>Sahelanthropus</i> ✓ - <i>Australopithecus</i> ✓ - <i>Homo</i> ✓ <b>(Mark first TWO only)</b>	Any	(1)
		(b)	- Taung child✓ - Mrs Ples✓ - Little foot✓ <b>(Mark first TWO only)</b>	Any	(1)
		(c)	<i>Sahelanthropus</i> ✓		(1)
	14.2	<i>Homo neanderthalensis</i> ✓			(1)
	14.3	650 ✓cm <sup>3</sup>			(1)
	14.4	2,0 mya ✓/ 2 000 000 years ago			(1)
	14.5	Genetic evidence✓ Cultural evidence✓			(2)
					<b>(10)</b>

**Activity 15**

15.	15.1	Karabo			(1)
	15.2	<i>Australopithecus africanus</i>			(1)
	15.3	(a)	Lee) Berger		(1)
		(b)	Raymond) Dart		(1)
					<b>(4)</b>

**Activity 16**

16.	16.1	- Modern humans originated in Africa✓ and - then migrated to other continents✓			(2)
	16.2	<i>Hominidae</i> ✓			(1)
	16.3	<i>Mitochondrial DNA</i> ✓			(1)
	16.4	- Fossils of <i>Ardipithecus</i> were found in Africa only✓ - Fossils of <i>Australopithecus</i> were found in Africa only✓ - Fossils of <i>Homo habilis</i> were found in Africa only✓ - The oldest fossils of <i>Homo erectus</i> were found in Africa✓ - The oldest fossils of <i>Homo sapiens</i> were found in Africa✓			Any (4)

**BIOLOGICAL TERMS - MEMORANDUM  
PAPER 1**

**LOGICAL TERMS: PAPER 1**

**Give the correct biological term for the following descriptions.**

Description	Biological term
<b>Description</b>	<b>Biological term</b>
1. The period of development of an embryo in the uterus between fertilisation and birth.	pregnancy
2. Disease characterised by a lack of insulin production.	diabetes mellitus
3. Tube that connects the pharynx and the middle ear.	eustachian tube
4. A stage in the development of humans in which the embryo consists of a layer of cells surrounding a cavity.	Blastocyst/blastula
5. The structure at the tip of a sperm cell containing enzymes and which makes contact with the egg cell during fertilisation.	acrosome
6. The gland in the male reproductive system of humans that produces an alkaline fluid to counteract the acid environment of the vagina.	Prostate gland
7. The duct leading from the testis to the urethra in human males.	Vas deferens/sperm duct
8. The process by which the ovum is formed through meiosis in the ovary.	oogenesis
9. The membranes which protect the central nervous system.	meninges
10. A plant growth hormone that stimulates seed germination.	gibberellins
11. The nervous system which consists of cranial and spinal nerves.	Peripheral nervous system
12. A branch of the autonomic nervous system that decreases the heartbeat back to normal.	parasympathetic
13. The outermost extra-embryonic membrane surrounding the embryo.	chorion

14. The hormone that regulates the salt concentration in the human body.	aldosterone
15. The blood vessel in the umbilical cord that carries blood rich in oxygen and nutrients.	Umbilical vein
16. The hormone inhibited by an increased level of thyroxin.	TSH
17. The structure in the ear that equalises the pressure on either side of the eardrum.	Eustachian tube
18. The watery fluid that supports the cornea and the front chamber of the eye.	Aqueous humour
19. The hormone produced by the Graafian follicle.	oestrogen
20. The hormone responsible for the formation of the corpus luteum.	LH
21. The receptors in the ear that detect changes in the direction and speed of any movement of the body.	cristae
22. The type of fertilisation associated with viviparous reproduction.	internal
23. The series of changes that take place in the shape of the lens and the eyeball in response to the distance of an object from the eye.	Eye accommodation
24. The part of the brain that controls the heart rate.	Medulla oblongata
25. The maintenance of a constant internal environment in the body within certain limits.	homeostasis
26. The plant hormone that promotes seed dormancy.	Abscisic acid
27. A hormone that stimulates the maturation of sperm.	testosterone
28. The type of development in birds in which the young is capable of moving around on its own soon after hatching.	Precocial development
29. A Disorder which results in the myelin sheath of the neurons being damaged.	Multiple sclerosis
30. A liquid between the cornea and the lens in the human eye.	Aqueous humour
31. The formation of ova by meiosis.	oogenesis
32. A long, coiled tube in human males that lies at the top of the testes, which stores sperm.	epididymis

33. A hormone that promotes the absorption of water in the kidneys.	ADH
34. A type of reproduction in humans where the foetus develops inside the uterus.	viviparous
35. Structures found only in animal cells that form the spindle during cell division.	centriole
36. The movement of part of a plant in response to gravity.	geotropism
37. The stage in humans when sexual maturity is reached in males and females.	puberty
38. A change in the internal or external environment that will be detected by a receptor and converted into an impulse.	Stimulus
39. Small tubes placed in the tympanic membrane to drain liquid from the middle ear.	grommets
40. Part of the human ear that directs sound waves into the auditory canal.	pinnae
41. A type of fertilisation in which the nucleus of a sperm fuses with the nucleus of an ovum outside the body of the female.	External fertilisation
42. The growth of part of a plant in response to light.	phototropism
43. The condition of the blood vessels in the skin in humans when the environmental temperature is low.	vasoconstriction
44. The sensory receptors found in the semi-circular canals.	cristae
45. A layer inside the eye that absorbs light, thus reducing reflection.	choroid
46. The part of the brain that receives nerve impulses from the semi-circular canals.	cerebellum
47. The innermost layer of the eye where a light stimulus is converted into a nerve impulse.	Retina
48. The phase in the cell cycle when DNA replication occurs.	interphase
49. The part of the peripheral nervous system that controls involuntary actions.	Autonomic system
50. A plant hormone that causes leaves to fall off trees in autumn.	Abscisic acid

51. The division of the cytoplasm through the constriction of the cell membrane at the end of cell division.	cytokinesis
52. The structure in the amniotic egg that stores wastes.	Allantois
53. The inner lining of the uterus where implantation of the embryo occurs.	endometrium
54. Part of the female reproductive system where fertilisation occurs.	Fallopian tubes
55. The diploid cell formed by the process of fertilisation.	zygote
56. A fluid that protects the human embryo against injuries and large scale temperature changes.	Amniotic fluid
57. A disorder of the nervous system that is characterised by the breakdown of the myelin sheath of neurons.	Multiple sclerosis
58. A hormone produced by the hypophysis that stimulates milk production in human females.	prolactin
59. A blood vessel in the umbilical cord that transports nutrients to the foetus.	Umbilical vein
60. A part of the neuron that conducts impulses towards the cell body.	dendrites
61. A disease that results from the body's inability to produce insulin.	Diabetes mellitus
62. The part of the sperm cell that contains enzymes to digest the membrane of the ovum	acrosome
63. The hormone that prepares the human body for an emergency situation.	adrenalin
64. A hormone that stimulates the maturation of sperm and puberty in males.	testosterone
65. The tube in the male reproductive system that connects the epididymis with the urethra	Vas deferens/sperm duct
66. The hormone which regulates the salt balance in humans	aldosterone
67. The hormone that stimulates the mammary glands to secrete milk	prolactin
68. The division of the cytoplasm through the constriction of the cell membrane at the end of cell division.	cytokinesis

69. The plant hormone that stimulates the germination of seeds.	gibberellins
70. A type of fertilisation in which the nucleus of a sperm fuses with the nucleus of an ovum outside the body of the female.	External fertilisation
71. The point where two chromatids overlap during prophase I	chiasma
72. A hormone which regulates the salt balance in the human body.	aldosterone
73. The maintenance of a constant internal environment in the human body within certain limits.	homeostasis
74. A type of egg where the embryo develops inside a fluid-filled sac which is surrounded by a shell.	Amniotic egg
75. A hormone that stimulates the development of the corpus luteum.	LH
76. A disorder of the eye caused by the curvature of the lens or cornea being uneven, resulting in distorted images.	astigmatism
77. The nerve that carries impulses from the retina to the brain.	Optic nerve
78. Collective name for the membranes that protect the brain and spinal cord.	meninges
79. The part of the female reproductive system where fertilisation takes place.	Fallopian tubes
80. The part of the ear that converts pressure waves into nerve impulses.	Cochlea
81. A hollow ball of cells formed from the zygote	Blastocyst/blastula
82. The hormone responsible for osmoregulation	ADH
83. The vesicle which contains enzymes found in the head of the sperm cell	acrosome
84. The hormone that stimulates milk production for breastfeeding in humans	prolactin
85. The part of the nervous system made up of cranial and spinal nerves.	Peripheral nerves

86. The part of the male reproductive system that secretes testosterone.	testes
87. A disorder of the brain that is characterised by memory loss and confusion.	Alzheimer's' disease
88. The system in the body that regulates processes by secreting hormones directly into the blood.	Endocrine system
89. The production of male gametes through meiosis.	spermatogenesis
90. The hormone that stimulates the production of milk in a mother after the birth of a baby.	prolactin
91. Sharp structures found in plants for protection from herbivores.	thorns
92. A plant growth response to an external stimulus	Tropism
93. The type of egg produced by reptiles that has extra-embryonic membranes.	Amniotic egg
94. The type of development in birds where the hatchlings' eyes are open and their bodies are covered with down feathers.	Precocial development
95. The part of the brain that receives impulses from the maculae.	cerebellum
96. The dark pigmented layer of the eye.	Choroid
97. The structure that connects the left and right hemispheres of the brain.	Corpus callosum
98. The part of the brain that controls body temperature.	hypothalamus
99. The gas in the blood which, when increased, causes an increase in the breathing rate.	CO <sup>2</sup>
100. Plant growth responses to external stimuli.	tropisms
101. A substance containing plant hormones used to kill unwanted plants.	herbicides
102. The structures formed by the centrioles during cell division.	Spindle fibres
103. Receptors that provide information about the position of the head.	Maculae
104. A hormone that regulates the water balance in the body.	ADH

105. The part of the brain that regulates breathing.	Medulla oblongata
106. The process of maintaining a constant internal environment in the human body.	Homeostasis
107. The membrane that together with the endometrium, forms the placenta.	Chorion
108. The structure in the head of a sperm containing digestive enzymes.	Acrosome

**BIOLOGICAL TERMS - SOLUTIONS  
PAPER 2**

**LOGICAL TERMS: PAPER 2**

**Give the correct biological term for the following descriptions.**

Description	Biological term
1. An allele that does not influence the phenotype when found in the heterozygous condition.	Recessive allele

2. The position of a gene on a chromosome.	Locus
3. The physical and functional expression of a gene.	Phenotype
4. Chromosomes that are not responsible for sex determination.	Autosomes
5. The process of finding a desirable gene, isolating it and then moving it into the cells of another organisms.	Genetic modification
6. The two parts of a chromosome held together by a centromere.	Chromatids
7. A section of a DNA molecule that codes for a specific characteristic.	Gene
8. The production of genetically identical copy of an organism using biotechnology.	Cloning
9. The deliberate breeding of organisms for desirable characteristics selected by humans.	Artificial selection/ selective breeding
10. The explanation that species experience long periods without physical change, followed by short periods of rapid physical change.	Punctuated equilibrium
11. The phase of meiosis during which homologous chromosomes separate and start moving towards opposite poles.	Anaphase I
12. The defect in cell division that leads to Down syndrome.	Non-dysjunction
13. The structure that is made up of two chromatids joined by a centromere.	Chromosome
14. An explanation for something that has been observed in nature and which can be supported by facts, laws and tested hypotheses.	Theory
15. Similar structures on different organisms that suggest they have a common ancestor.	Homologous structures
16. The complete set of chromosomes in the cell of an organism.	karyotype
17. A bar code pattern formed from DNA.	DNA Profiling
19. The bonds formed between amino acids.	Peptide bonds
20. A representation of the number, shape and arrangement of all the chromosomes in the nucleus of a somatic cell.	Karyotype

21. Openings in the nuclear membrane that allow mRNA to leave the nucleus.	Nuclear pores
22. A tentative explanation of a phenomenon that can be tested.	Hypothesis
23. The distribution of species in different parts of the world.	Biogeography
24. Chromosomes that carry the same set of genes.	Homologous chromosomes
25. Two or more alternative forms of a gene at the same locus.	Allele
26. The structure responsible for pulling chromosomes to the poles of an animal cell during cell division.	Spindle fibres
27. A phase in the cell cycle that occurs before cell division.	Interphase
28. A diagrammatic representation showing possible evolutionary relationships among different species.	Phylogenetic diagram/ Cladogram
29. The type of vision shared by apes and humans that allows for depth perception.	Binocular vision
30. A genetic cross involving two characteristics.	Dihybrid cross
31. A genetic disorder characterised by the absence of a blood-clotting factor.	Haemophilia
32. The present –day distribution of organisms.	Biogeography
33. A nucleic acid that carries amino acids to the ribosome for protein synthesis.	tRNA
34. The natural shape of a DNA molecule.	Double helix
35. A section of DNA that codes for a specific protein.	Gene
36. Evolution with long periods of no change followed by short periods of rapid change.	Punctuated equilibrium
37. The sex chromosomes of an organism.	Gonosomes
38. Descent with modification over time.	Evolution
39. A group of organisms of the same species in a specific habitat.	Population
40. The family to which humans belong.	Homonidae
41. A human disorder caused by a non-disjunction of chromosome pair 21.	Down syndrome

42. The stage of protein synthesis during which mRNA forms from DNA.	Transcription
43. The type of variation in a population with no intermediate phenotypes.	Discontinuous variation
44. The type of inheritance where the dominant allele masks the expression of the recessive allele in the heterozygous state.	Complete dominance
45. The variety of life forms that exist on Earth.	Biodiversity
46. The opening in the skull through which the spinal cord enters.	Foramen magnum
47. A testable statement that can be rejected or accepted.	Hypothesis
48. Total disappearance of a species from Earth.	Extinction
49. A segment of a chromosome that codes for a particular characteristic.	Gene
50. The ability to walk on two limbs.	Bipedal
51. The organelle in the cytoplasm which is the site of protein synthesis.	Ribosomes
52. The name of the bond that forms between amino acids in a protein molecule.	Peptide bonds
53. The process by which a DNA molecule makes identical copies of itself.	DNA replication
54. The name of the process when homologous chromosome pairs fail to separate during meiosis.	Non-disjunction
55. The permanent disappearance of a species from earth.	Extinction
56. A testable statement that may be rejected or accepted.	Hypothesis
57. The type of nucleic acid that carries a specific amino acid.	tRNA
58. The selection and breeding of organisms with desirable characteristics by humans.	Artificial selection/ selective breeding
59. An allele that is not shown/expressed in the phenotype when found in the heterozygous condition.	Recessive allele
60. A sudden change in the sequence/order of nitrogenous bases of a nucleic acid.	mutation

61. Explanation of an observation that is supported by facts, models and laws.	Theory
62. The breeding of organisms over many generations in order to achieve a desirable phenotype.	Selective breeding
63. The type of sugar found in a RNA molecule.	Ribose
64. Type of evolution involving long periods of time when species do not change and short periods of rapid change.	Punctuated equilibrium
65. The hypothesis which supports migration of human ancestors from the point of origin.	Out of Africa Hypothesis
66. The mineralised remains of organisms that have lived in the past.	Fossils
67. The position of a gene on a chromosome.	locus
68. The genus of the fossil "Little Foot"	<i>Australopithecus</i>
69. A diagram showing the inheritance of genetic disorders over many generations.	Pedigree diagram
70. The bond that forms between amino acids.	Peptide bond
71. The phase in the cell cycle during which DNA replication occurs.	Interphase
72. The first <i>Homo</i> species to use tools	<i>Homo habilis</i>
73. Undifferentiated cells that develop into any type of cell.	Stem cells
74. A breeding process used for the domestication of plants and animals.	Selective breeding
75. Nitrogenous base found only in RNA molecules.	Uracil
76. The use of biological processes, organisms or systems to improve the quality of human life.	Biotechnology
77. Type of variation within a population in which there is a range of intermediate phenotypes.	Continuous variation
78. An upright posture and walking only on two legs.	Bipedalism
79. A sugar molecule found in a nucleotide of DNA.	Deoxyribose
80. Genetic disorder resulting in the abnormal clotting of blood.	Haemophilia
81. Study of fossils.	Palaeontology

82. Present-day distribution of living organisms across the continents.	Biogeography
83. Family to which humans belong.	Hominidae
84. The type of RNA containing anticodons.	tRNA
85. The process during which genetically identical organisms are formed using biotechnology.	Cloning
86. Undifferentiated animal cells that can form any type of tissue.	Stem cells
87. Type of inheritance where none of the two alleles is dominant over the other and an intermediate phenotype is produced.	Incomplete dominance
88. The breeding of organisms by humans to achieve a desirable phenotype.	Selective breeding/ Artificial selection
89. The point of crossing over between two adjacent chromosomes.	chiasmata
90. The organelle in a cell where translation occurs.	ribosomes
91. The variety of living organisms on Earth.	biodiversity
92. A diagrammatic representation of possible evolutionary relationships amongst species.	Phylogenetic diagram/ cladogram
93. The splitting of the cytoplasm during cell division.	cytokinesis
94. The process whereby DNA makes an exact copy of itself.	DNA Replication
95. A type of variation where there is a range of phenotypes for the same characteristic.	Continuous variation
96. The present-day distribution of living organisms.	Biogeography
97. The failure of chromosome pairs to separate during meiosis.	Non-disjunction
98. Similar structures in different species that show modification by descent.	Homologous structures
99. An individual having two non-identical alleles for a characteristic.	Heterozygous
100. A testable statement that may be accepted or rejected.	Hypothesis

101. The bonds between nitrogenous bases in a DNA molecule.	Hydrogen bonds
102. All the genes that make up an organism.	Genome
103. The type of evidence for human evolution that includes tool-making.	Cultural evidence
104. The process whereby new species are formed.	speciation
105. An inherited disorder where blood fails to clot properly.	Haemophilia
106. The opening at the base of the skull through which the spinal cord passes.	Foramen magnum
107. Two or more alternative forms of a gene at the same locus.	Allele
108. The type of variation in a population with no intermediate phenotypes.	Discontinuous variation
109. Chromosomes involved in sex determination.	Gonosomes
110. Type of inheritance where both alleles are expressed equally in the phenotype.	Co-dominance
111. The analysis of DNA samples to identify individuals that may be related.	DNA Profile
112. The sugar found in RNA	Ribose
113. The structure in an animal cell that forms spindle fibres.	Centrioles
114. Undifferentiated animal cells that can give rise to specialised cell types.	Stem cells
115. The division of the cytoplasm after a cell nucleus has divided.	Cytokinesis
116. A diagram representing possible evolutionary relationships between species.	Phylogenetic diagram/ cladogram