KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

CURRICULUM DIRECTORATE GRADES 10-12

NCS CAPS

TEACHER SUPPORT DOCUMENT

GRADE 12

LIFE SCIENCES

FINAL PUSH REVISION

2025

PREAMBLE

This document has been prepared as support material for 2025 Grade 12 Life Sciences.

This document takes the following into account:

1. Focus on **core concepts and content** per topic as well as the relevant Life Sciences skills.
2. Activity based Revision sessions and constant feedback on assessments/activities given.
3. **Scaffolding of concepts** according to **cognitive levels and degrees difficulty** and a differentiated approach to cater for learners with different abilities.
4. Addressing the **common errors & misconceptions** in each topic as per **diagnostic report**.
5. Providing multiple opportunities for learners to master concepts through multiple exposure using different source stimuli.
6. A focus on **scientific investigations** for each topic.
7. Consolidating and supplementing topics through the use of previous examination question papers.

STRATEGIES FOR PLANNING AND CONDUCTING REVISION

1. Use the past papers (Start with the recent papers) and provincial revision documents
2. Arrange questions according to their topics.
3. Organize questions from low-order and high-order.
4. Group learners according to their performance status (Learners at risk, Average and High-Flyers)
5. Conduct weekly tests for the work covered
6. Start your revision with topics that have bigger weightings (reproduction, responding to environment, genetics and evolution).
7. Cover Life sciences skills especially the ones learners lack as per Diagnostic report such as:
8. **Scientific investigation skills** (variables, validity, reliability, aim, control, trend, conclusion, relationship, graphs, tables, planning steps).
9. **Calculation**: percentage, average and percentage increase/decrease
10. **Drawing** (structures and graphs): marking criteria
11. Familiarize learners with key words such as:
12. Explain (cause and effect / what happened and why it happened)
13. Describe (sequence of events)
14. Tabulate
15. Identify, name, state and label
16. Provide learners with assessment feedback.
17. Unpack answers to learners, show them step by step how the examiners arrived to a particular answer.
18. Use of mnemonics and mind maps for consolidation
19. Conduct MOCK EXAM for P1 and P2 before learners' seat for Preparatory and Final Examinations.

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TOPIC: DNA – CODE OF LIFE

Activity 1

1

1.1 DNA Replication✓ (1)

1.2 - The DNA double helix unwinds✓ and
- unzips✓/hydrogen bonds break
- to form two separate strands✓
- Both DNA strands serve as templates✓
- to build a complementary DNA strand✓/ A pairs with T and C pairs with G
- using free DNA nucleotides✓ from the nucleoplasm
- this results in two identical DNA molecules✓ Any (6)

1.3 4✓ (1)

1.4 (a) Double helix✓ (1)

(b) Interphase✓ (1)

(c) Uracil✓ (1)

1.5 (a) Hydrogen✓ bond (1)

(b) Ribose✓ (1)

(12)

Activity 2

2

2.1 Interphase✓ (1)

2.2 Nucleus✓ (1)

2.3 **DNA Replication**✓*
- The DNA double helix unwinds✓ and
- unzips✓/hydrogen bonds break
- to form two separate strands✓
- Both DNA strands serve as templates✓
- to build a complementary DNA strand✓/ A pairs with T and C pairs with G
- using free DNA nucleotides✓ from the nucleoplasm
- this results in two identical DNA molecules✓

***1 compulsory mark** + Any 6 (7)

2.4 - the genetic material/DNA is doubled✓
- so that each cell receives the same amount of DNA✓
- to ensure that all the daughter cells are (genetically) identical✓ (3)

(12)

Activity 3

3

3.1 3✓ (1)

3.2 - 3/some bands of the girl's DNA profile✓
- match with those of the mother's✓ DNA profile
- All the remaining bands of the girl match with the bands of male 3's✓ (3)

3.3 - Tracing missing persons✓
- Identification of genetic disorders✓
- Establishing family relations✓
- Matching tissues for organ transplants✓

(Mark first TWO only) Any (2)

(6)

Activity 4

4

4.1 2✓ (1)

4.2 - 4/some bands of the boy's✓ DNA profile
- match with those of the mother's✓ profile
- The remaining bands of the boy match with the bands of male 2's✓
DNA profile/fewer bands match with male 1's DNA profile (3)

4.3 - Tracing missing persons✓
- Identification of genetic disorders✓
- Establishing family relations✓
- Matching tissues for organ transplants✓

(Mark first ONE only) Any (1)

(5)

Activity 5

5

5.1 None/neither✓ (1)

5.2 - All the DNA bands✓
- from the crime scene must match with the suspect's DNA bands ✓ (2)

(3)

Activity 6

6

6.1 Heila✓ and Leo✓ (2)
(Mark first TWO only)

6.2 - All of the (DNA) bands from Heila and Leo✓
- match with the (DNA) bands of the mother and the father✓
OR
- None of the (DNA) bands from Priya✓
- match with the (DNA) bands of the mother and the father✓ (2)

6.3 - Tracing missing persons✓
- Identification of genetic disorders✓
- Identification of suspects in a crime✓
- Matching tissues for organ transplants✓
- Identifying dead persons✓

(Mark first THREE only) Any (3)
(7)

Activity 7

7

7.1 (a) Transcription✓ (1)
(b) Translation✓ (1)

7.2 - Double helix DNA unwinds✓ and
- (the double-stranded DNA) unzips✓/weak hydrogen bonds break
- to form two separate strands✓
- One strand is used as a template✓
- to form mRNA✓
- using free RNA nucleotides✓from the nucleoplasm
- The mRNA is complementary to the DNA✓/ (A-U, G-C)
- mRNA now has the coded message for protein synthesis✓

Any (7)
(9)

Activity 8

8

8.1
- Double helix DNA unwinds✓ and
- (the double-stranded DNA) unzips✓/weak hydrogen bonds break
- to form two separate strands✓
- One strand is used as a template✓
- to form mRNA✓
- using free RNA nucleotides✓from the nucleoplasm
- The mRNA is complementary to the DNA✓/ (A-U, G-C)
- mRNA now has the coded message for protein synthesis✓ Any (5)

8.2

Transcription	DNA replication
Only one strand acts as a template✓	Both strands act as templates✓
(Free) RNA nucleotides✓ are complementary	(Free) DNA nucleotides✓ are complementary
Adenine complements uracil✓/(A complements U)	Adenine pairs with thymine✓/ (A pairs with T)
A mRNA molecule is formed✓	Two identical DNA molecules are formed✓

(Mark first TWO only) 1 mark for table + (Any 2 x 2) (5)

8.3
- copies the coded information from the DNA molecule✓
- to the ribosome✓ (2)

(12)

Activity 9

9

9.1
- Transfers amino acids✓to the ribosome
- according to the (mRNA) codon✓ (2)

9.2 (a) GUA✓ (1)

(b) CAT✓ (1)

(4)

Activity 10

10

10.1 - the sequence of bases on a DNA molecule changes✓
- from CCT to CGT✓/second base in DNA triplet changed from C to G✓
- The codon GGA changed to GCA✓
- the tRNA molecule with the anticodon CCU✓
- is now replaced by a tRNA molecule with the anticodon CGU✓
- the sequence of amino acids changes✓ and
- a different protein is formed **(7)**

Activity 11

11

11.1 - The anticodon will be CAU✓ instead of CAG
- The sequence of amino acid would not change✓/tRNA still carry valine to the ribosome
- resulting in a same protein✓ **(3)**

Activity 12

12

12.1 Gene✓mutation (1)

12.2 There is a change in the sequence (of nitrogenous bases) from CCG to CUG✓ (1)

12.3 (a) 5✓ (1)

(b) UAU✓ (1)

(c) - the codon CCG changed to CUG✓/4th codon has changed
- the anticodon/tRNA sequences changed✓
- the amino acid proline✓
- was replaced by leucine✓
- this resulted in a different protein✓/no protein being formed

Any (4)
(8)

TOPIC: MEIOSIS

Activity 1

1

1.1 - Four (daughter) cells will be formed✓ of which
- two will each have five chromosomes✓ and
- the other two will each have three chromosomes✓ **(3)**

Activity 2

2

2.1 - One gamete will have extra chromosome 21✓/24 chromosomes
- and when it fertilises a normal gamete✓/gamete with 23 chromosomes
- The zygote will have 3 copies of chromosome 21✓/47 chromosomes
- Resulting in Down syndrome✓ **(4)**

Activity 3

3 - Failure of a homologous pair 21/ chromosome 21 to separate✓
- during Anaphase I/II✓
- leads to a gamete with 24 chromosomes✓/ an extra chromosome
- The fertilisation of this gamete with a normal gamete✓/ with 23 chromosomes
- results in a zygote with 47 chromosomes✓/ an extra chromosome/ Trisomy 21

(5)

Activity 4

4

4.1 Autosomes✓ (1)

4.2 - A person with Down syndrome will have 3 chromosomes✓
- at position number 21✓ (2)

(3)

Activity 5

5

5.1 Ages of the mother✓in years (1)

5.2 45✓ (years) (1)

5.3 -Likelihood of an egg containing an abnormal chromosome rises significantly as a woman gets older✓
-Higher chances of abnormal cell division during egg formation✓ (1)

5.4 As the age of the mothers increases✓the greater the chances of getting the babies with a genetic disorder✓ (2)

(5)

Activity 6

6

6.1 (a) Chromosomal mutation✓ (1)

(b) Non-disjunction✓ (1)

(c) Mitosis✓ (1)

6.2 - The chromosome pair/chromatids failed to separate✓
- at position 21✓
- during anaphase✓(I or II)
- resulting in one daughter cell having an extra chromosome✓/24 chromosomes
- Fusion of a gamete with 24 chromosomes
- and a normal gamete✓/gamete with 23 chromosomes
- results in a zygote with 47 chromosomes✓/extra chromosome at position 21

Any (5)

6.3 - In Trisomy 21 there is an extra chromosome✓/three copies of chromosome 21 in each somatic cell
In Mosaic Down syndrome there is an extra chromosome only in some cells✓
-Trisomy 21 occurs during meiosis✓/before fertilisation
Mosaic Down syndrome occurs during mitosis✓/after Fertilisation

(Mark the first two) Any 2×2 (4)

(12)

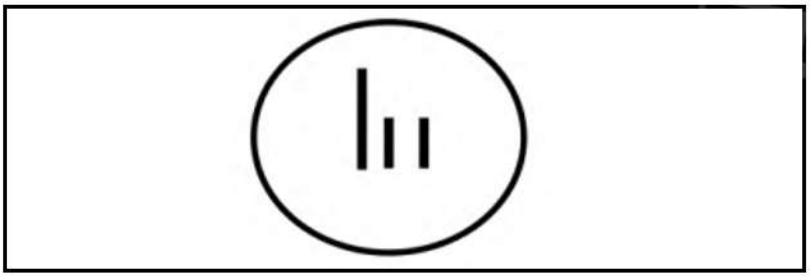
Activity 7

7

7.1 Anaphase I✓ (1)

7.2 Chromosomal mutation✓ (1)

7.3



- Three single stranded chromosomes drawn✓
- Correct size of three chromosomes✓ (2)

(4)

TOPIC: REPRODUCTION

Activity 1

1

1.1 - Mitochondrion
- provides energy ✓
- for the sperm cell to swim towards the egg✓ for fertilisation (2)

1.2 - fusion of the nuclei ✓
- of the haploid sperm and haploid egg✓
- to produce a diploid zygote✓ (3)

1.3 - the fertilised ovum (zygote) undergoes mitosis ✓
- to form a solid ball of cells ✓
- called a morula✓
- morula further undergoes mitosis
- to form a hollow ball of cells ✓
- called a blastula/blastocyst ✓ Any (4)

(9)

Activity 2

2

2.1 Mitosis ✓ (1)

2.2 - After implantation the chorion✓
- develops many finger-like outgrowths✓
- called chorionic villi✓
- The endometrium✓
- together with the chorionic villi forms the placenta✓
- The umbilical artery✓
- and the umbilical vein✓ develops
- inside a hollow tube✓ to form the umbilical cord between the foetus and the placenta Any (6)

(7)

Activity 3

3

3.1 Oestrogen ✓ (1)

3.2 Ovary ✓ (1)

3.3 Ovarian Cycle ✓ (1)

3.4 -It further thickens the endometrium ✓
-to maintain the pregnancy ✓ (2)

3.5 - progesterone levels will increase ✓
-there will be a decrease in release of FSH ✓
-no new follicle will develop ✓ (3)

(8)

Activity 4

4

4.1 Day 13 ✓ (1)

4.2 Oestrogen ✓ (1)

4.3 It thickens the endometrium ✓ (1)

4.4 No ✓ (1)

4.5 - Corpus luteum disintegrated✓/follicle size decreases towards day 28
- Causing progesterone levels to drop✓
- And endometrium will break down ✓ (3)

(7)

Activity 5

5

5.1 - Stimulates ovulation ✓
- Stimulates the formation of the Corpus luteum ✓ (2)

5.2 - The increase in oestrogen / Part C ✓
- caused an increase in the thickness of the endometrium ✓ (2)

5.3 - increase in hormone B/ progesterone:
- is to maintain the lining of the endometrium ✓
- for implantation/pregnancy ✓ (2)

5.4 a) Between Day 0 to 7, the uterine lining/endometrium is breaking down/shedding ✓✓ (2)

b) Between day 8 to 14,

- the uterine lining/endometrium is starting to thicken ✓
- becomes vascular✓
- becomes glandular✓

(Mark first TWO only) (2)

(10)

Activity 6

6

6.1 Ovulation ✓ (1)

6.2 FSH/ Follicle Stimulating Hormone ✓

Oestrogen ✓ (2)

6.3 - the follicle is increasing in size / getting bigger/ getting larger ✓

- the endometrium is beginning to thicken ✓ (2)

6.4 - The corpus luteum does not break down ✓

- the endometrium remains thick / continues to thicken ✓ (2)

6.5 -progesterone levels remain high ✓

- to maintain the pregnancy ✓
- therefore FSH is inhibited / pituitary gland decreases the release of FSH✓
- no new follicle will be developed✓ (4)

6.6 - endometrium thickens✓

- becomes glandular✓
- and vascular ✓ (3)

(14)

Activity 7

7

7.1 - Oestrogen thickens the endometrium ✓

- in preparation for the implantation of a fertilised ovum ✓ (2)

7.2 - progesterone further thickens the endometrium ✓

- in preparation for the implantation of a fertilised ovum ✓ (2)

(4)

Activity 8

8

8.1 - the fertilised ovum (zygote)/ Structure B undergoes mitosis ✓
- to form a solid ball of cells ✓
- called a morula / Structure D✓
- morula further undergoes mitosis
- to form a hollow ball of cells ✓
- called a blastula/blastocyst / Structure E✓ Any (4)

(4)

Activity 9

9

9.1 The endometrium is thick ✓ (1)

9.2 endometrium becomes glandular ✓ and vascular ✓ (2)

(3)

Activity 10

10 10.1 -after ovulation, the corpus luteum is formed ✓
-and it secretes progesterone ✓ (2)

10.2 - endometrium thickens✓
- becomes glandular✓
- and vascular ✓ (3)

(5)

TOPIC: GENETICS AND INHERITANCE

Activity 1

1

1.1 (a) White✓ fur (1)

(b) Black✓fur (1)

1.2 (a) X✓ and Z✓ (2)

(b) X✓ (1)

(5)

Activity 2

2

2.1 Co-dominance✓ (1)

2.2

P_1	Phenotype	Black	x	White ✓
	Genotype	BB	x	WW ✓
Meiosis				
	G/gametes	B,B	x	W,W ✓
Fertilisation				
F_1	Genotype	BW ,BW ,BW ,BW ✓		
	Phenotype	All black with patches of white✓		

P_1 and F_1 ✓

Meiosis and fertilization ✓

Any (6)

Punnet square can also be used

(7)

Activity 3

3

3.1 - Both alleles for black feathers and white feathers ✓ (2)
- are equally dominant ✓/expressed in the phenotype of the erminette chicken

3.2 (Blood group) AB✓ (1)

3.3

P1	Phenotype	White	x	Erminette✓
	Genotype	WW	x	BW✓
Meiosis				
	G/gametes	W, W	x	B, W✓
Fertilisation				
F1	Genotype	BW , WW , BW , WW✓		
	Phenotype	Erminette, white✓*		

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark** + any 5

OR

P1	Phenotype	White	x	Erminette✓
	Genotype	WW	x	BW✓

Meiosis

Fertilisation

Gametes	W	W
B	BW	BW
W	WW	WW

1 mark for correct gametes
1 mark for correct genotypes

F1	Phenotype	Erminette, white✓*

P_1 and F_1✓
Meiosis and fertilisation✓

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

(9)

Activity 4

4

4.1 Purple ✓ (1)

4.2 -When purple-flowering plants and white-flowering plants are crossed ✓
– all the offspring have purple flowers ✓/have no white flowers (2)

4.3 The two alleles for a characteristic✓
– separate during meiosis✓
so that – each gamete contains only one allele✓for that characteristic (3)

4.4

P_1 Phenotype: Purple x Purple✓
Genotype: Dd x Dd✓

Meiosis

G/gametes: D, d x D, d✓

Fertilisation

F_1 Genotype: DD; Dd; Dd dd✓

Phenotype: Purple : White✓*

P_1 and F_1✓
Meiosis and fertilisation✓

*Compulsory 1 + Any 5

OR

P_1 Phenotype: Purple x Purple✓
Genotype: Dd x Dd✓

Meiosis

Fertilisation

Gametes	D	d
D	DD	Dd
d	Dd	dd

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype: Purple: White✓*

P_1 and F_1✓
Meiosis and fertilisation✓ (6)

(12)

Activity 5

5

5.1 Incomplete dominance✓ (1)

5.2 - The pink flower colour is an intermediate phenotype✓/ a blend of red and white indicating that neither of the alleles is dominant✓ (2)

5.3

P_1 Phenotype: Pink x Pink✓
Genotype: RW x RW✓
Meiosis
G/gametes: R, W x R, W✓
Fertilisation
F_1 Genotype: RR; RW; RW; WW✓
Phenotype: 1 Red: 2 Pink: 1 White✓*
P_1 and F_1✓
Meiosis and fertilisation✓

OR

P_1 Phenotype: Pink x Pink✓
Genotype: RW x RW✓
Meiosis
Fertilisation

Gametes	R	W
R	RR	RW
W	RW	WW

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype: 1 Red: 2 Pink: 1 White✓*
P_1 and F_1✓
Meiosis and fertilisation✓

1* compulsory + Any 5

(6)

(9)

Activity 6

6

6.1 Dihybrid✓ cross (1)

6.2 Red spots✓ and black eyes✓ (2)

6.3 (a) RRee✓✓ and Rree✓✓ (4)

(b) Red spots, black eyes ✓ (1)

(c) re✓ (1)

(9)

Activity 7

7

7.1 ffHh✓ (1)

7.2 (a) FfHh✓✓ (2)

(b) 3✓ (1)

(c) h✓ (1)

(d) Long fingers and continuous hairline✓✓ (2)

(7)

Activity 8

8

8.1 Dihybrid ✓cross (1)

8.2 TTrr✓✓ (2)

8.3 TR✓, Tr✓, tR✓, tr✓ (4)

(7)

Activity 9

9

9.1

P_1	Phenotype	Male	x	Female✓	
	Genotype	XY	x	XX✓	
Meiosis					
	G/gametes	X, Y	x	X, X✓	
Fertilisation					
F_1	Genotype	XX;	XX;	XY;	XY✓
	Phenotype	female	:	male✓	

P_1 and F_1✓
Meiosis and fertilisation✓

OR

P_1	Phenotype	Male	x	Female✓
	Genotype	XY	x	XX✓

Meiosis

Fertilisation

Gametes	X	Y
X	XX	XY
X	XX	XY

1 mark for correct gametes
1 mark for correct genotypes

F_1	Phenotype	female: male✓	

P_1 and F_1✓
Meiosis and fertilisation✓ Any 6

9.2 Normal females have two X✓chromosomes
- Normal males have one X and one Y✓
- The female always provides X in the egg✓
- If an egg cell is fertilized by an X bearing sperm ✓a female/girl✓is formed
- If an egg is fertilized by a Y bearing sperm✓

- a male/boy✓ is formed

(5)
(11)

Activity 10

10

10.1 3✓/ Three (1)

10.2 - Complete dominance✓
- The allele for blood group B/ I^B is dominant✓ and
- the allele for blood group O/ i is recessive ✓ (3)

10.3

P_1	Phenotype:	Blood group AB	x	Blood group B✓		
	Genotype:	I^AI^B	x	I^Bi✓		
Meiosis						
	G/gametes	I^A	I^B	x	I^B	i✓
Fertilisation						
F_1	Genotype:	I^AI^B	I^Ai		I^BI^B	I^Bi✓*
	Phenotype:	Blood group:				
		AB;	A;		B✓*	

P_1 and F_1✓

Meiosis and fertilisation✓

Compulsory 2*+ Any 4

OR

P_1 Phenotype: Blood group AB x Blood group B✓
Genotype: I^AI^B x I^Bi✓

Meiosis

Fertilisation

Gametes	I^A	I^B
I^B	I^AI^B	I^BI^B
i	I^Ai	I^Bi

1 mark for correct gametes
1 mark for correct genotypes*

(6)

F_1 Phenotype: Blood group:
AB; A; B✓*

P_1 and F_1✓
Meiosis and fertilisation✓

Compulsory 2*+ Any 4

10.4 The blood group of a child is determined by the alleles received from both parents ✓
The blood group of a mother, the child and the possible father is determined✓
The blood group of a mother and the possible father cannot lead to the blood group of the child✓
The man is not the father✓
The blood group of a mother and the possible father can lead to the blood group of the child✓
- The man might be the father✓
- This is not conclusive✓
- Because many men have the same blood group✓

Any (6)
(16)

Activity 11

11

11.1 954 000✓ (1)

11.2 1 800 000✓ – (954 000 + 180 000 + 54 000) ✓
= 612 000✓people

OR

1 800 000✓ - 1 188 000✓
= 612 000✓people

OR

$\frac{34}{100}$✓ x 1 800 000✓ = 612 000✓people

(3)

11.3 - The allele for blood group A/ I^A is inherited from one parent✓ and

- the allele for blood group B/ I^B is inherited from the other parent✓
  therefore
- the child has blood group AB✓/genotype I^AI^B

(3)
(7)

Activity 12

12

12.1 To determine which blood group was the most common in their community ✓ (2)

12.2 (a) - Obtain permission from the school /clinic to conduct the investigation - Decide on the sample size✓
- Decide on the method for recording results✓
- Decide on time/date to collect data from the clinic
(Mark first THREE only) (3)

(b) - Sampled 3/all blood donor clinics in the community✓
- 200 donors per clinic sampled✓ /600 donors Any
(Mark first ONE only) (1)

(c) First time donors' blood groups are not known yet✓/ not in the database (1)

12.3 $\frac{15}{100}$ x ✓600✓ = 90✓ participants
(3)

12.4 (a) (Blood group) O✓ (1)

(b) (Blood group) AB✓ (1)

12.5 $I^A I^A$ ✓
$I^A i$ ✓ (2)
(14)

Activity 13

13

13.1 Pedigree✓ diagram (1)

13.2 3✓/Three (1)

13.3 3✓/Three (1)

13.4 I^Ai, I^Bi, ii ✓✓
(2)

13.5 ii✓ (1)

13.6 Ann✓✓ (2)
(8)

Question 14

14

14.1 (a) Pedigree✓diagram (1)

(b) Y✓chromosome (1)

14.2 - Low levels of phosphate✓
- can cause rickets✓
(Mark first TWO only) (2)

14.3 3✓/Three (1)

14.4 (a) X^hY ✓ (1)

(b) X^HX^h ✓ (1)

14.5 - Individual 1 is a male with hypophosphatemia ✓
- and has the genotype X^HY✓
- The daughters inherit the dominant allele/X^H from their father✓
- Individual 2 is a female who does not have hypophosphatemia ✓
- and has the genotype X^h X^h ✓
- The daughters inherit the recessive allele/X^h from their mother✓
- The X^h from the mother/individual 2 is masked by the X^H from the father✓/ all daughters will have X^HX^h genotype

Any 7 **(13)**

Activity 15

15

15.1 Three✓/3 (1)

15.2 (a) Male without muscular dystrophy✓ (1)

(b) X^DX^d✓ (1)

15.3 -Males only have one X chromosome✓/XY and
-need only one recessive allele to have muscular dystrophy✓
-The X^d allele on a male cannot be masked by a dominant allele✓
-Females have two X-chromosomes✓ and
-need two recessive alleles to have muscular dystrophy✓/ X^dX^d
-In females, a dominant allele on one X chromosome would mask the effect of the recessive allele✓/X^D masks X^d

Any (5) (5)

15.4

P_2	Phenotype	Female without muscular dystrophy	x	Male without muscular dystrophy✓
	Genotype	X^DX^d	x	X^DY✓
Meiosis	Gametes	X^D, X^d	x	X^D, Y✓
Fertilisation				
F_2	Genotype	$X^D X^D$ $X^D Y$, $X^D X^d$, X^dY ✓		
	Phenotype	(50%) females without muscular dystrophy (25%) male without muscular dystrophy (25%) male with muscular dystrophy ✓		
		25✓*% chance of muscular dystrophy child		

P_2 and F_2✓
Meiosis and fertilisation✓

***1 compulsory mark** + Any 5

OR

P_2	Phenotype	Female without muscular dystrophy	x	Male without muscular dystrophy✓
	Genotype	X^DX^d	x	X^DY✓

Meiosis

Fertilisation

Gametes	X^D	X^d
X^D	$X^D X^D$	$X^D X^d$
Y	$X^D Y$	X^dY

1 mark for correct gametes
1 mark for correct genotypes

F_2	Phenotype	(50%) females without muscular dystrophy (25%) male without muscular dystrophy (25%) male with muscular dystrophy ✓
		25✓*% chance of muscular dystrophy child

P_2 and F_2✓
Meiosis and fertilisation✓

***1 compulsory mark** + Any 5

(6)
(14)

Activity 16

16

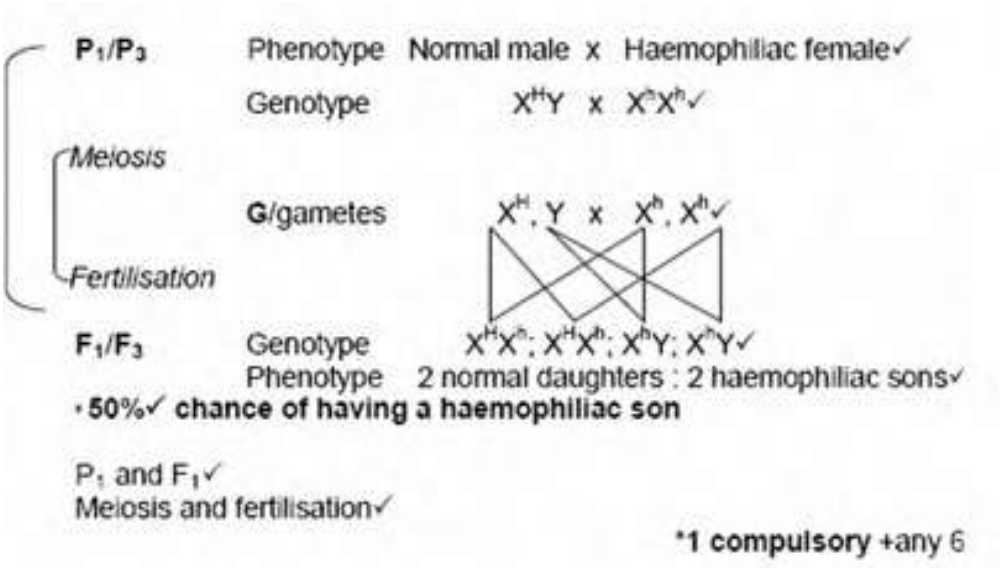
16.1 (a) Normal female✓ (1)

16.2 (b) X^HX^h✓✓ (2)

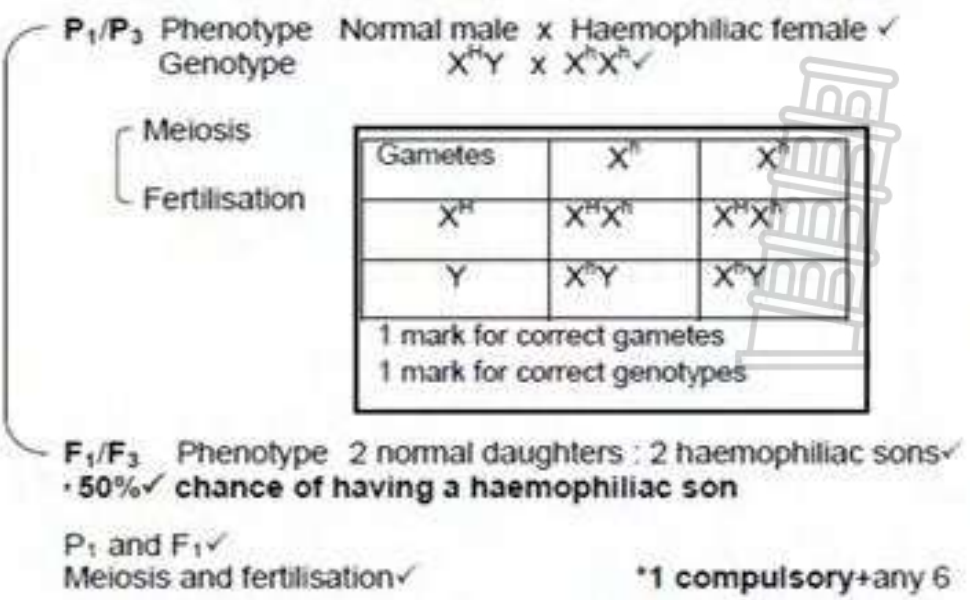
16.2
- Haemophilia is caused by a recessive allele✓
- Carried on the X chromosome✓
- Females have two X chromosomes ✓/ males have only one X chromosome
- Females must inherit two copies of the recessive allele to affected✓/females who inherit only one recessive allele are still normal

Any (3)

16.3



OR



(7)

(13)

Activity 17

17

17.1 -An individual inherits one allele from each parent✓
- The Y chromosome was inherited from the father✓✓
- and the recessive allele/X^h was inherited from the mother✓✓
- since the mother has two recessive alleles/X^h X^h ✓
- A son only needs to get one recessive allele to be haemophiliac✓
- Y-chromosome does not carry any allele to mask the haemophilia allele✓

Any (4)

17.2

P_1	Phenotype	Non-haemophilic female	x	Haemophiliac ✓ male
	Genotype	X^HX^h	x	X^hY✓
Meiosis	Gametes	X^H, X^h	x	X^h, Y✓
Fertilisation				
F_1 *generation*	Genotype	X^HX^h, X^HY		X^hX^h, X^hY✓
	Phenotype	non-haemophilic daughter; non-haemophilic son haemophiliac daughter: daughter; haemophiliac son✓		
	Phenotypic ratio	1:1:1:1✓*		

P_1 and F_1✓
Meiosis and fertilisation✓ Compulsory mark 1* + Any 5

OR

P_1	Phenotype	Non-haemophilic female	x	Haemophiliac ✓ male
	Genotype	X^HX^h	x	X^hY ✓

Meiosis

Gametes	X^H	X^h
X^h	X^HX^h	X^hX^h
Y	X^HY	X^hY

1 mark for correct gametes
1 mark for correct genotypes

Fertilisation

F_1 *generation*

Phenotype	non-haemophilic daughter; non-haemophilic son haemophiliac daughter: daughter; haemophiliac son✓
Phenotypic ratio	1:1:1:1✓*

P_1 and F_1✓
Meiosis and fertilisation✓ Compulsory mark 1* + Any 5 (6)

(10)

Activity 18

18

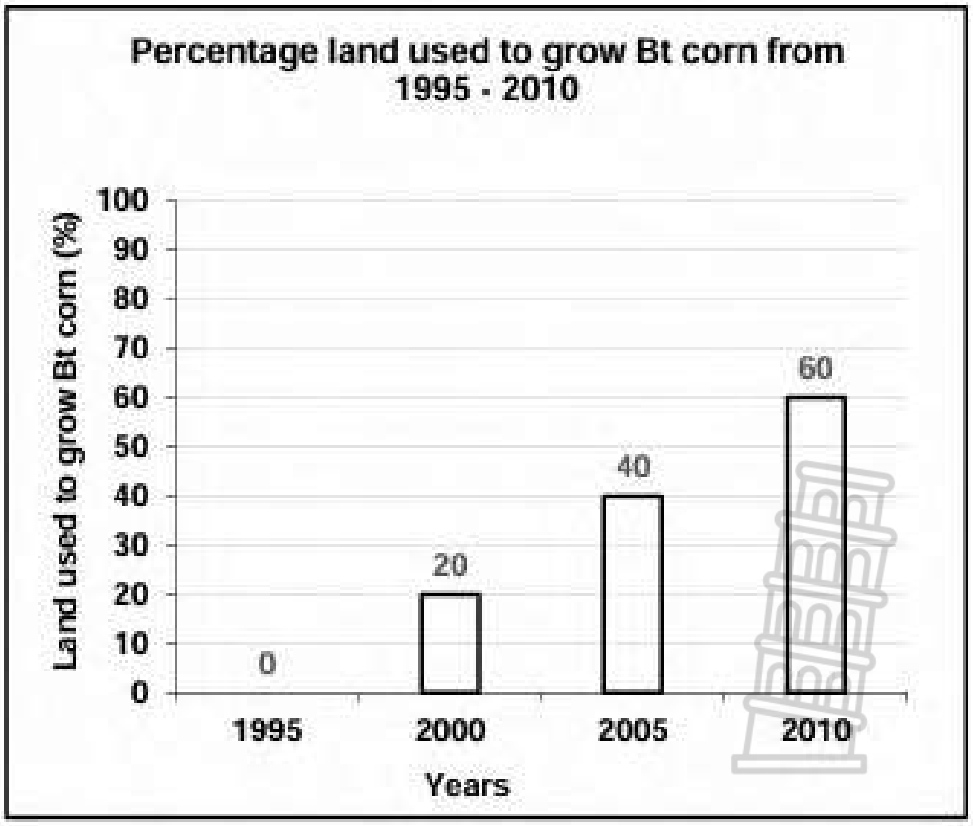
18.1 - The gene for insect resistance is isolated from another species ✓
- and inserted into the DNA of corn ✓where it is expressed (2)

18.2 As (the percentage of) land used to grow Bt corn increases the amount of insecticide used decreases✓✓ (2)

18.3 - Longer shelf-life ✓
- Drought resistance✓
- More nutrients ✓
- Frost-resistant ✓
- Increased size ✓
- Increased crop yield✓
- Herbicide-resistant ✓
- No allergens ✓
- Heat-tolerant ✓
- Disease-resistant✓

(Mark first TWO only) Any (2)

18.4



Criteria for marking of the graph:

Criteria	Mark allocation
Bar graph is drawn (**T**)	1
Caption of the graph includes both variables (**C**)	1
Correct labels on the X-axis and Y-axis with correct unit on the Y-axis (**L**)	1
Correct scale for Y-axis and bars of equal width and spaces for X-axis **(S)**	1
Plotting (**P**) correctly done for: 1- 3 years All 4 required years	 1 2

If a histogram or line graph is drawn, marks will be lost for:

- Type of graph
- Scale

If axes are transposed:

- Can get all marks if labels are also swopped and bars are horizontal
- If labels are not corresponding, then:
  - Marks will be lost for labels and scale
  - Plotting can get credit if coordinates are correct for given labels

(6)
(12)

Activity 19

19

19.1 - The manipulation of genetic material✓
- to produce a genetically different✓/identical organism/repair tissues and organs

OR

-The manipulation of genetic material✓
-to produce something of benefit to humans✓/society (2)

19.2 - A plasmid/ circular DNA is removed from the bacterial cell ✓
- It is cut✓ using enzymes
-The insulin gene is removed from a human cell✓ and
-inserted into the plasmid✓to form the recombinant DNA (4)

19.3 Bacteria reproduce very rapidly✓,
- forming many copies of the gene✓ in a short period of time

OR

- Bacteria reproduce asexually✓/by mitosis,
- forming identical copies of itself✓

OR

- The bacterial DNA is in the form of a plasmid✓,
- for easy insertion of genes✓

OR

- Bacteria exist everywhere✓,
- so they can be obtained with no difficulty✓/expense

OR

- Bacteria are simple organisms✓, - so their use is unlikely to raise ethical issues✓

Any 1x 2 (2)

19.4 - Expensive✓/ research money could be used for other needs
- Interfering with nature✓/ immoral
- Potential health impacts✓
- Unsure of long-term effects✓

(Mark first THREE only) Any (3)
(11)

Activity 20

20

20.1 Animals
-The nucleus is removed from the ovum ✓
- The nucleus of a donor somatic cell is removed✓
- and inserted into the ovum✓
- Electric shock is used to activate mitosis✓
- An embryo develops✓
- and is implanted into the surrogate mother✓

OR

Plants:
- A plant with the desired characteristic is selected✓
- A vegetative part of the parent plant structure is removed✓
- and placed inside a growth medium✓
- to supply nutrients✓/ hormone
- to stimulate growth✓

Any (5)

20.2 - (Exact copies) of the most productive livestock✓ are made
- (Exact copies) of animals with the desired characteristics✓ are made
- Conservation of endangered species✓
- Replacement of damaged tissues/organs✓

(Mark the first THREE only) Any (3)
(8)

Activity 21

21.1 - Embryos✓
- Umbilical cord✓
- Bone marrow✓
(Mark first THREE only) (3)

21.2 - Stem cells are undifferentiated✓
- and have the potential to develop into any type of cell✓
- to replace affected/defective cells✓ causing a disorder

Any (2)

21.3 - Heart diseases✓
- Spinal injuries✓

(Mark the first ONE only) (1)
(6)

TOPIC: HUMAN NERVOUS SYSTEM

Activity 1

1

1.1 (a) Peripheral nervous system✓ (1)

(b) Autonomic nervous system✓ (1)

1.2 Spinal nerves✓ (1)

1.3 E✓ – Parasympathetic✓ nervous system (2)

1.4 -increase heart rate✓
-dilate blood vessels of the skeletal muscles✓
-dilate the pupil✓
-Constrict the blood vessels of the gut and skin✓
-to increase breathing rate✓
-stimulates the adrenal gland✓
-to produce more adrenalin✓
-stimulate the secretion of sweat✓

Any (5)

1.5 -Every organ and gland is controlled by two sets of nerves ✓
-that act antagonistically✓
-to control involuntary events✓ / brings about homeostasis
-Sympathetic nerves✓
-which stimulates responses✓
-Parasympathetic nerves✓
-Which inhibits a response✓ (4)

(14)

Activity 2

2

2.1 -Radial muscles of the iris contract✓
-Circular muscles of the iris relax ✓
-The pupil dilates ✓
-More light enters the eye ✓ (4)

2.2 -it is more convex✓
-so that light rays are refracted more✓
-to focus on the retina✓/to form clear image on the retina (3)

2.3 -elastic✓
-to change shape✓ to focus light rays on the retina (2)

(9)

Activity 3

3

3.1 (a) Different light conditions✓ (1)

(b) Diameter of the pupil✓ (1)

3.3 (a) 5 ✓ mm (1)

(b) 3✓ (1)

3.2 Only one person participated✓ /small sample size
-the experiment was not repeated✓ (2)

3.4 $\left\{\frac{8-5}{8}\right\}$ ✓ x $\frac{100}{1}$ ✓

= 37,5 ✓% (3)

3.5 Pupillary mechanism✓
-circular muscles of the iris relax✓
-radial muscles of the iris contract✓
-pupil dilates✓
-more light enters the eye✓

Any 4 + compulsory (5)

(14)

Activity 4

4

4.1 As the distance from the eye increased up to 100 cm, the thickness of the lens decreased , after which it remained constant✓✓ (2)

4.2 -Suspensory ligaments✓
- ciliary muscles✓ (2)

4.3 -Suspensory ligaments become taut✓
-tension on the lens increases✓
-the lens becomes less convex✓
-the refractive power of the lens is decreased✓
-light rays are focused on the retina✓ to form clear image

Any (4)

(8)

Activity 5

5

5.1 -Cristae are stimulated✓
-to convert the stimuli to impulses✓
-the impulses are sent to the cerebellum✓
-where they are interpreted✓
-the cerebellum sends impulses to the skeletal muscles ✓to restore balance

Any (3)

5.2 -maculae✓
-are stimulated by a change in the position of the head✓
-to generate an impulse✓
-which are transmitted by the auditory nerve✓
-to the cerebellum✓ for interpretation

Any 4+ compulsory (5)

5.3 -Cristae✓
-are stimulated ✓
- stimulus converted to the impulses✓
-which are transmitted by the auditory nerve✓
-to the cerebellum✓ for interpretation
-impulses are sent to the skeletal muscles✓ to restore balance

Any (5)
(13)

Activity 6

6

6.1 -collect sound waves✓
-direct sound wave to the auditory canal✓ Any (1)

6.2 -Part D/ the ossicles do not vibrate✓
-Fewer/ no vibrations will be sent to the oval window✓/inner ear
-Fewer/no pressure waves will be set up on the cochlea✓
-The receptor/ organ of Corti will be stimulated less✓/not stimulated
-The cerebrum is stimulated differently✓/not stimulated
-which leads to hearing loss✓*

Any (5)

6.3 -equalises pressure✓
-set up on the either side of the tympanic membrane✓ (2)

6.4 They convert the stimulus/pressure waves to an impulse✓ and transfer it to the auditory nerve✓ (2)

6.5 Ossicles will not vibrate freely ✓/fewer/no vibrations will be carried to the oval window
-There is a decreased amplification✓ of sound
-fewer / no pressure waves will form in the cochlea✓
-receptors in the cochlea will not be stimulated✓/stimulated less
-less/no impulses will reach the cerebrum✓*

1 compulsory + Any 3 (4)
(14)

TOPIC: HUMAN ENDOCRINE GLANDS AND HOMEOSTASIS

Activity 1

1

1.1 - The blood glucose levels will remain high✓
- because the cells will not be able to absorb glucose ✓from the blood
- excess glucose cannot be converted to glycogen by the liver✓/ muscles (3)

1.2 - Adrenalin stimulates the liver✓
- to convert glycogen to glucose ✓
- to increase the blood glucose levels✓ (3)

(6)

Activity 2

2

2.1 - To allow the carbon dioxide levels in the blood to go back to normal✓
- so that each phase will have the same carbon dioxide level as a starting point✓ (2)

2.2 - To act as a control ✓/baseline
- To see if it is the facemask that affects the carbon dioxide levels and not the physical activity Any (1)

2.3
- Receptors in the carotid artery are stimulated✓and
- impulses are sent to the medulla oblongata✓
- The medulla oblongata stimulates the heart ✓
- to beat faster✓ causing
- more carbon dioxide to be taken to the lungs ✓
- The breathing muscles✓/intercostal muscles and diaphragm
- contract more actively✓ and
- the rate/ depth of breathing increases✓
- More carbon dioxide is exhaled✓
- The carbon dioxide level in the blood decreases✓/returns to normal Any (7)

(10)

Activity 3

3

3.1 - Receptors are stimulated✓
- and send impulses to the hypothalamus✓
- The hypothalamus sends impulses to the blood vessels in the skin✓
- and to the sweat glands✓
- The blood vessels in the skin dilate✓/vasodilation takes place
- More blood flows to the surface of the skin✓/sweat glands so that
- (More) heat is lost from the body✓
- More sweat is produced✓ and
- (More) heat is lost when sweat evaporates✓
- The temperature of the body returns to normal✓ Any (7)

3.2 Blood vessels are constricted ✓
- Less blood is sent to the skin✓/sweat glands
- Less sweat is formed✓/less evaporation occurs
- and less heat is lost✓ Any (3)

(10)

Activity 4

4

4.1 3✓ (1)

4.2 - The blood will have a high salt content✓
- and therefore less/no aldosterone will be secreted✓
- resulting in less salt reabsorbed into the blood✓/more salt excreted in the urine
- The blood will have less water than normal✓
- and therefore more ADH will be secreted✓
- making the kidney tubules more permeable✓
- resulting in more water reabsorbed into the blood✓/less water will leave the body with the urine Any (5)

(6)

Activity 4

5

5.1 71.53 – 34.72✓ = 36.81✓ml/h (2)

5.2 - The high level of ADH ✓at night
- Increases the permeability of the renal tubules✓/collecting duct/distal convoluted tubules in the kidney
- More water is re-absorbed✓/less water is excreted
- Less urine is produced✓ (4)

5.3 Water will not be reabsorbed from the renal tubules ✓
- The volume of water in the blood will be low ✓
- The pituitary gland will be stimulated✓
- to release more ADH✓ all the time Any (3)

(9)

TOPIC: PLANT RESPONSE TO THE ENVIRONMENT

Activity 1

1

1.1 - Auxins promote the development of roots ✓
- It brings about (general) root growth✓ causing their downward✓ growth/positive geotropism (3)

1.2 - In the stem, the auxins stimulate growth ✓on the lower side causing the stem to grow/bend upwards ✓
- In the root, the auxins inhibit growth✓ on the lower side causing the root to grow/bend downwards✓ (4)

(7)

Activity 2

2

2.1 (a) Geotropism ✓/Gravitropism (1)

(b) Auxins✓ (1)

2.2 - Due to gravity✓
- there is a higher 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)

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

(9)

Activity 3

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)**

Activity 4

4

4.1 Treatment✓ of plant shoot (1)

4.2 - Same type of plant ✓
- Placed in the same environment ✓
- Same amount of time✓
- Tip removed at the same length✓
- Same concentration of auxins ✓
- Same type of agar✓ **(Mark first TWO only)** (2)

4.3 (a) - Shoot B would show upward growth✓
- Auxins in the agar gel diffused downwards✓ into the shoot
- leading to cell elongation✓ (3)

(b) - No growth in shoot C✓
- Shoot tip contains NO auxins✓ (2)

4.4 - Repeat the investigation ✓
- Use more than 1 plant per investigation✓/increase sample size
(Mark first TWO only) Any (2)

(10)

Activity 5

5

5.1 Geotropism✓ (1)

5.2 - 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 (4)

5.3 The roots will grow downwards ✓/towards gravity (1)

(6)

Activity 6

6

6.1 Auxins✓ (1)

6.2 (a) Light ✓ (1)

(b) Gravity ✓ (1)

6.3 Plant structure **B** has bent towards the light✓ /towards **A**/positively phototropic (1)

6.4 - Auxins accumulated on the lower side✓ of the root
- The high concentration of auxins on the lower side of the root inhibits Growth✓
- The lower concentration of auxins on the upper side stimulates

growth✓
- causing uneven growth✓/the root to bend downwards/positive geotropism Any (3)
(7)

Activity 7

7

7.1 - The investigation was only done once✓ /not repeated
- Only one plant was used in each set-up✓ /the sample size was too small **(Mark first ONE only)** Any (1)

7.2 (a) B ✓ (1)
(b) A ✓ (1)

7.3 - The auxins moved away from the light✓ /were destroyed by the light
- so that the darker side had a high concentration of auxins✓
- and the lighted side had a low concentration of auxins ✓ (3)
(6)

Activity 8

8

8.1 Stem growth ✓ (1)

8.2 - To remove the source of auxins✓
- The tip produces auxins✓ Any (1)

8.3 To increase the reliability✓/validity of the results (1)

8.4 B ✓and C ✓ (2)

8.5 - The presence of auxins✓ in the tip of the stem
- stimulate upward growth✓
- and inhibit development of lateral branches ✓ (3)
(8)

TOPIC: GENERAL EVOLUTION

Activity 1

1

1.1 **Law of use and disuse**✓*
- As an organism uses a body part/organ regularly it becomes better developed or enlarged in that organism✓
- 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✓

The inheritance of acquired characteristics✓*
- Characteristics developed during the life an individual✓
- can be passed on to their offsprings✓ (6)

1.2
- Acquired characteristics✓ are not inherited✓ /do not cause any change to the DNA✓ of an organism gametes (sperms or ova) ✓
- Organisms did not evolve because they want to evolve✓✓
- Lamarck's theory is deterministic✓✓ Any (4)

(10)

Activity 2

2
- All stickleback fish had spikey fins✓ originally
- In the lakes there were less/ no predators✓
- The fish did not use the spikey fins anymore✓ /they used their fins less and their spikes disappeared✓
- The acquired characteristic of no spikes was then passed on to the next generation✓
- Eventually all the fish had no spikes✓ Any (5)

(5)

Activity 3

3
- Originally the amount of red blood cells was similar in all humans✓ /the Tibetans did not produce a large number of red blood cells
- As a result of low oxygen content at high altitudes✓ the red blood cells tried to increase the amount of oxygen absorbed✓
- As a result ancestral Tibetans produced more red blood cellsΠ✓ /developed ways of using oxygen more efficiently to increase the availability of oxygen to the body
- This acquired characteristic was passed on to their offspring✓
- All Tibetans now produce more red blood cells✓ /use oxygen more efficiently to survive at high altitudes Any (6)

(6)

Activity 4

4

4.1
- The ancestor of spider monkeys had short tails✓
- to be able to hold onto tree branches✓
- As a result their tails became longer✓
- and this acquired characteristic was passed on to the next generation✓ (4)

4.2
- There was variation in the (ancestral) population of spider monkeys✓
- Some spider monkeys had short tails✓
- and some had long tails✓
- Those with short tails could not hold onto tree branches✓ fell on the ground
- They died✓ /were attacked by predators
- The spider monkeys with long tails were able to hold onto tree branches✓ /did not fall to the ground
- and survived✓ / were not attacked by predators
- The organisms that survive, reproduce✓
- and pass on the allele for the for long tails to their offspring✓
- The next generation therefore have a higher proportion of spider monkeys with the long tail Any (7)

(11)

Activity 5

5

- There is variation amongst the offspring in a population✓
- Some have favourable characteristics and some do not✓
- When there is a change in the environmental conditions✓ /there is competition✓
- organisms with a favourable characteristic survive✓
- whilst organisms with an unfavourable characteristic die✓
- The organisms that survive, reproduce✓
- and pass on the allele for the favourable characteristic to their offspring✓
- The next generation will therefore have a higher proportion of individuals with the favourable characteristic✓ Any

(7)

Activity 6

6

6.1
- They allowed the lizards of the two islands to mate✓
- and determined if they were able to interbreed✓ and
- give rise to fertile offspring✓ (3)

6.2
- There is variation in the size of the lizard's jaws✓
- Some have small jaws and others have large jaws✓
- Due to the larger supply of plants✓ /fewer insects
- the lizards with the larger jaws will have more food✓
- and survive✓
- while those with smaller jaws will be unable to feed
- and die✓
- The lizards that survive will reproduce✓ and
- the allele for larger jaws will be passed on to the offspring✓
- The next generation will have a higher proportion of lizards with larger jaws✓ Any (7)

(10)

Activity 7

7

- There was variation amongst the population of the wolves✓
- Some had the mutation which made them immune to cancer and some did not✓
- When exposed to radiation✓
- the wolves without the mutation/ immunity died✓
- Those with the mutation/ immunity survived✓
- and reproduced✓
- passing the allele for the mutation/ immunity to their offspring✓
- The next generation had a higher proportion of wolves with the mutation✓ /immunity to cancer Any (7)

Activity 8

8
- If a population of a single species becomes separated by a
- geographical barrier✓ (sea, river, mountain, lake)
- then the population splits into two✓
- There is no gene flow between the two populations✓
- Each population may be exposed to different environmental conditions✓/the selection pressure may be different
- and therefore natural selection occurs independently✓
- such that the individuals of the two populations become different✓
- genotypically and phenotypically✓
- Even if these populations were to mix again✓
- they will not be able to interbreed✓
- because they are now different species✓ Any (7)

Activity 9

9

9.1
- There was once one large continent✓ and
- The common ancestor existed through this continent✓
- When Madagascar separated✓
- The common ancestor was found in both✓ regions

(4)

9.2
- The common ancestor became separated into two groups✓
- by the ocean✓*
- There was no gene flow between the two groups✓
- Each group experienced different environmental conditions✓
- and underwent natural selection independently✓
- The individuals in each group became different ✓
- genotypically and phenotypically✓
- To form the pottos and lemurs✓*
- Eventually if the two groups are mixed again, they cannot interbreed✓ /produce fertile offspring.

*__2 Compulsory__ + Any 4 (6)

(10)

Activity 10

10

10.1 Datura flowers:
- release a powerful fragrance✓ that attracts hawk moths✓
- release a highly addictive nectar✓ that ensures that the hawk moths only visit it✓ /stays longer in the flower
- open in the evening✓ and this ensures visit by moth✓
- are adapted to a specific pollinator✓ since they attract hawk moths✓

(Mark first TWO only) Any (2 x2) (4)

10.2
- Reproduction is at different times of the year✓
- Infertile offspring✓
- Prevention of fertilisation✓

(Mark first TWO only) Any (2)

(6)

Activity 11

11

11.1
- The farmer interbred✓
- mealie plants with a high protein content✓
- over 50/many generation✓

(3)

11.2
- Artificial selection: organisms with a desired characteristic are interbred✓
- Genetic engineering: genes coding for the desired characteristic are inserted into an organism✓

(Mark first ONE only) (2)

11.3

Natural selection	Artificial selection

The environment or nature is the selection 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) ✓

(Mark first TWO only) Any (2 x 2) + 1 Table (5)

(10)

Activity 12

12

12.1 Artificial selection✓ /selective breeding (1)

12.2
- They chose dogs with desirable traits✓
- and interbred✓ them to
- produce offspring with these traits✓

(3)

(4)

TOPIC: HUMAN EVOLUTION

Activity 1

1

1.1
- There was variation in the malaria parasite population✓
- Some parasites were resistant to the antimalarial drugs✓ and
- others were not✓
- When parasites were exposed to the antimalarial drugs✓
- Those that were not drug resistant did not survive✓ /died
- Those that were resistant to the drugs survived✓ and
- reproduced✓ and
- passed the allele for drug resistance to their offspring✓
- The next generation had a higher proportion of parasites with drug resistance✓ Any (7)

(7)

Activity 2

2

3.1 - There is variation in the resistance of the HI virus to antiretroviral drug ✓
- 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)

Activity 3

3

3.1 - In a population of insects ✓/bacteria/Hi viruses/Galapagos finches
- mutations are a source of variation✓
- which may make some organisms more resistant✓/better suited
- to insecticides✓/antibiotics/antiretroviral medication/drought
- Those individuals that are not resistant/suited will die✓ whereas
- those that are resistant/well suited, will survive✓
- This is known as natural selection✓
- As a result, individuals of the future generations will be resistant to the
- insecticides✓/antibiotics/antiretroviral/adapted to drought Any (8)

(8)

Activity 4

4

4.1 - It decreases the number of harmful bacteria the most✓
- thereby preventing disease in cattle✓/resulting in less medical expense
- Decreasing mortality✓/maintaining the number of cattle
- to sell✓/breed /increase profit (4)

4.2 - Natural selection✓ occurs
- There is variation✓/mutation in the population of bacteria
- Some are resistant to antibiotics, some are non-resistant✓
- When antibiotic is added✓ to the animal feed
- The bacteria that are non-resistant are killed by the antibiotic✓
- Those that are resistant survive and reproduce✓
- The allele for resistance to antibiotics is passed on to the offspring✓
- The next generation will have a higher proportion of antibiotic
- resistant bacteria✓ Any (6)

(10)

Activity 5

5

5.1 2 mya ✓ (1)

4.2 - (Fossil of) A. africanus were found in Africa only ✓
- (Fossil of) H. habilis were found in Africa only ✓
- Oldest fossils of H. erectus/ H. sapiens were found in Africa ✓
- while the youngest fossils were found in the other parts of the world ✓ (4)

4.3 - H. sapiens have a bigger brain volume than H. habilis ✓, therefore
- H. sapiens are more intelligence than H. habilis ✓
- leading to H. sapiens developing more complex tools ✓/ H. sapiens made more specialised tools (3)

(8)

Activity 6

6

6.1 3,2 – 2,7✓ = 0,5✓ my (2)

6.2 - Increased brain size✓led to
- increased intelligence✓ leading to
- the development of complex tools✓ (3)

(5)

Activity 7

7

7.1 Phylogenetic tree ✓ (1)

(a) P ✓ (1)

(b) R ✓ (1)

(a) -Bonobo ✓
-Chimpanzee ✓ (2)

(b) -Orang-utan✓
-Gorilla✓
-Bonobo✓
-Chimpanzee✓ **(Mark first TWO only)** (2)

7.3 -Foramen magnum at more backward position✓
-C-shaped spine✓
-Pelvis long and narrow ✓ **(Mark first THREE only)** (3)

(10)

Activity 8

8

8.1 - A large cranial capacity✓ in Homo sapiens
- indicates a larger brain✓
- leading to greater intelligence ✓

OR

- A small cranial capacity✓in Australopithecus africanus
- indicates a smaller brain✓
- leading to lower intelligence✓ (3)

8.2 - Fossils of Australopithecus spp. were found in Africa only✓ and
- fossils of species X/Homo habilis were found in Africa only✓
- The oldest fossils of Homo erectus were found in Africa✓ /the younger fossils were found elsewhere
- indicating that modern humans originated in Africa and migrated out of Africa✓ (4)

(7)

Activity 9

9

9.1 - (Modern) humans originated in Africa✓ and
- then migrated to other continents ✓ (2)

9.2 - Fossils of Ardipithecus were found in Africa only✓
- Fossils of Australopithecus were found in Africa only✓
- Fossils of Homo habilis were found in Africa only✓
- The oldest fossils of Homo erectus were found in Africa ✓
- The oldest fossils of Homo sapiens were found in Africa ✓ (Any four) (4)

(6)

Activity 10

10

10.1 - The ***oldest*** fossils of Homo erectus were found in Africa✓ , while
- the younger fossils were found in other parts of the world✓ /Asia
- indicating that Homo erectus migrated out of Africa✓

(3)

10.2 - Ardipithecus fossils were found in Africa only✓
- Australopithecus fossils were found in Africa only✓
- Fossils of Homo habilis were found in Africa only✓
- The oldest fossils of Homo sapiens were found in Africa✓
- The younger fossils of Homo sapiens were found in other parts of the world✓ (Any four)

(4)

10.3

Homo erectus	Homo sapiens
Small brain✓	Large brain✓
Prominent brow ridges✓	Reduced brow ridges✓

(Mark first TWO) (2 x 2) + (1) table✓ (5)

10.4 The foramen magnum was in a (more) forward position✓ (1)

(7)