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SECONDARY SCHOOL IMPROVEMENT PROGRAMME (SSIP)



GAUTENG PROVINCE

EDUCATION

REPUBLIC OF SOUTH AFRICA

GRADE 12

SUBJECT: LIFE SCIENCES

ANSWER BOOKLET 2018

(Page 1 of 64)

Check your answers Set 1 (Master 40%)

Life Sciences Paper 1 – answers to the questions

Meiosis

Question 2

- 2.1 Spermatogenesis✓ (1)
- 2.2 Testis✓ (1)
- 2.3 (a) 23✓ (1)
- (b) 23✓ (1)
- 2.4 - Crossing over✓ (2)
- Random assortment of chromosomes✓ (any order) (1)
- 2.5 2✓ (1)
- 2.6 Sperm cells✓/spermatozoa/male gametes (1)

(8)

Question 3

- 3.1 (a) Chromosome✓ (1)
- (b) Spindle fibre✓ (1)
- (c) Centromere✓ (1)
- 3.2 Metaphase II✓ (1)
- 3.3 Chromosomes lying independently✓/singly at the equator✓ (2)

(6)

Question 4

- 4.1 Prophase II✓/Telophase I (1)
- 4.2 (a) D✓ - centriole✓/(centrosome) (2)
- (b) B✓ - chromosome✓ (2)
- (c) E✓ - centromere✓ (2)
- 4.3 (a) 4✓ (1)
- (b) 2✓ (1)

(9)

Question 5

- 5.1 Anaphase II✓ (1)
- 5.2 (a) Centriole✓ (1)
- (b) Centromere✓ (1)
- (c) Spindle fibre✓ (1)
- 5.3 The chromatids separate✓/centromere splits (1)
- 5.4 Crossing over✓ (1)
- 5.5 Reduces genetic variation✓ (1)

- 5.6 (a) Four✓/4 (1)
 (b) 23✓ (1)
 (9)

Human reproduction

Question 2

- 2.1 (a) Nucleus✓ (1)
 (b) Tail✓ (1)
 2.2 - C/ middle piece contains mitochondria✓ that provides energy for movement✓
 - Has a tail✓ for swimming✓
 - Torpedo shape✓ reducing friction✓ Any (1 x 2) (2)
 2.3 - No acrosome✓ will be present in the sperm cell
 - therefore no enzymes present✓
 - Sperm cell will be unable to penetrate the ovum✓
 - *therefore no fertilisation will occur✓ *compulsory mark + any other 2 (3)
 (7)

Question 3

- 3.1 (a) Jelly✓ layer/zona pellucida (1)
 (b) Cell membrane✓/plasma-lemma/plasma membrane (1)
 (c) Cytoplasm✓/cytosol (1)
 (d) Nucleus✓ (1)
 3.2 (a) G✓ - Middle piece✓/neck
 OR
 C✓ - Cytoplasm✓ (2)
 (b) E✓ - Acrosome✓ (2)
 (c) D✓ - Nucleus✓ (2)

Responding to the environment (Humans)

Question 2

- 2.1 (a) Medulla oblongata✓ (1)
 (b) Corpus callosum✓ (1)
 (c) Cerebellum✓ (1)
 2.2
 - Controls all voluntary activities✓/example
 - It contains centres that receives and interprets all the sensations✓/example
 - It is the seat of higher mental functions✓/example
 - Influences emotional behaviour/ example (Any 3) (3)
 (6)

Question 3

- 3.1 A – Ciliary✓muscle/(body)
 B – Iris✓
 E – Choroid✓ (3)
 3.2 (a) F✓ (1)
 (b) D✓ (1)

- (c) C✓ (1)
 (d) A✓ (1)
(7)

Question 4

- 4.1 A - Pinna✓
 D - Semi-circular canal✓ (2)
 4.2 (a) B✓ (1)
 (b) G✓ (1)
 (c) F✓ (1)
 (d) C✓ (1)
 (e) E✓ (1)
(7)

Question 5

- 5.1 Motor✓/multi-polar /efferent (1)
 5.2 - Transmits impulse away from the cell body✓
 - Transmits impulse to effector✓ Any 1 (1)
(2)

Question 6

- 6.1 Reflex arc✓ (1)
 6.2 (a) B - Motor✓ neuron/multipolar neuron (1)
 (b) C - Interneuron✓/connector neuron (1)
 (c) E - Sensory✓ neuron/Unipolar neuron (1)
 6.3 (a) F✓ (1)
 (b) A✓ (1)
 6.4 (a) D✓ - Synapse✓ (2)
 (b) G✓ - Myelin sheath✓ (2)
(10)

Human endocrine system and Homeostasis in Humans

Question 2

- 2.1 The process by which the human body is able to maintain a constant✓internal environment✓ (2)
 2.2 (a) Kidney✓ (1)
 (b) Adrenal✓ gland (1)
 (c) Aldosterone✓ (1)
 2.3 - Walls of renal tubules✓

- become more permeable✓
- allowing for a greater re-absorption of sodium ions✓
- from the filtrate✓/into the blood capillaries

Any 2 (2)
(7)

Question 3

When thyroxin levels decrease

- The pituitary gland is stimulated✓
- to produce more TSH✓
- High TSH levels stimulate the thyroid gland✓
- to secrete more thyroxin✓
- The thyroxin levels thus increase back to normal✓

(5)

Question 4

4.1 Adrenalin✓

(1)

- 4.2
- Increases the heart rate✓
 - Increases blood pressure✓
 - Stimulates the conversion of glycogen into glucose✓
 - Increases the blood supply to the heart/skeletal muscles✓
 - Increases muscle tone✓
 - Increases the rate/depth of breathing✓
 - Dilates/increases the diameter of the pupils✓
 - Decreases blood flow to the digestive system✓
 - Decreases blood flow to the skin✓
- (Mark first THREE only)

Any (3)
(4)

Question 5

- Blood glucose levels rise above normal✓
- The pancreas✓/islets of Langerhans
- secrete insulin✓ into the blood
- which travels to the liver✓/muscle cells
- and stimulates the conversion of excess glucose into glycogen✓
- which decreases the blood glucose levels✓ to normal

Any (5)

Responding to the environment (Plants)

Question 2

- 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)

Human impact on the environment

Question 2

2.1

- Food security refers to the access✓
- of adequate✓/safe/nutritious food
- to all people at all times✓ (Any 2) (2)

2.2

- Price is added to cover the cost of transportation✓ over long distances
- No competition✓ between dealers in rural areas
- Decrease demand✓ for goods in rural areas (Any 1) (1)

2.3

- Decreased need to buy food✓
- Selling of excess produce to earn some money✓ (2)

2.4

- Making people aware of the benefits of farming✓
 - Providing resources✓/example
 - Developing skills for farming✓
 - Providing incentives✓ to encourage farming (Any 2) (2)
- (7)**

Question 3

3.1 Methane✓ (1)

3.2

- Cooking food✓
- Heating✓
- Generating electricity✓

(Mark first ONE only) Any (1)

3.3

- Reduce pests✓/rats/flies
- Reduce bad smells✓

(Mark first ONE only) Any (1)

3.4 It is full✓/It has reached ground level
(Mark first ONE only) (1)

3.5 (a)

- Golf course✓
- Recreational park✓
- Car park✓
- Forestry✓

(Mark first TWO only) Any (2)

(b)

- Reuse✓ waste materials
- Recycle✓ waste materials

- Reduce the amount of waste produced✓
(Mark first TWO only)

Any (2)
(8)

Life Sciences Paper 2 – answers to the questions

DNA: Code of Life

Question 2

- 2.1 (a) W – Nucleotide✓ (1)
U – DNA✓ (1)
(b) X – Phosphate✓/phosphate ion (1)
Y – Deoxyribose✓sugar (1)
(c) Z – Hydrogen✓ bond (1)
(d) V – Adenine✓ (1)
2.2 Nucleus ✓ (1)
2.3 Interphase ✓ (1)
(8)

Question 4

- 4.1 Translation✓ (1)
4.2 X - tRNA✓/ transfer RNA (1)
Y - mRNA✓/ messenger RNA (1)
4.3 Anticodon✓ (1)
4.4 ATA✓ (1)
4.5 Tyrosine✓✓ (2)
4.6
- The process is transcription✓*
- The double stranded DNA molecule unwinds✓/unzips
- When the hydrogen bonds break✓
- One strand is used as a template✓
- to form mRNA ✓
- Using free nucleotides✓ from the nucleoplasm
- The mRNA is complementary to the DNA✓/ A-U, C-G
- This process is controlled by enzymes✓ (5)

Question 5

- 5.1 (a) Ribosome✓ (1)
 (b) W – mRNA✓
 Y – tRNA✓ (2)
 (c) Nucleotide ✓ (1)
- 5.2 (a) Cytoplasm✓/endoplasmic reticulum (1)
 (b) Nucleus✓ /nucleoplasm (1)
(6)

Genetics

Question 3

P₁ phenotype Black x Brown✓
 genotype Bb x bb✓

Meiosis

G B, b x b ✓

Fertilisation

F₁ genotype Bb and bb✓
 phenotype Black and brown✓

gametes	b
B	Bb
b	bb

1 mark for correct gametes
 1 mark for correct genotypes

1 mark for stating P₁ and F₁
 1 mark for stating meiosis and fertilisation

any **(6)**

Question 4

- 4.1 I^A✓, I^B✓, i✓ (3)
- 4.2 2✓ (1)
- 4.3
- Any individual inherits one allele✓
 - from each parent✓ (2)
- 4.4
- Each child✓
 - has an equal✓/25% chance of having
 - any blood group✓/ A, B, AB, or O. (3)
- (9)**

Evolution:

Question 1

1.1. A group of organisms of the **same** species✓
that can interbreed to produce **fertile** offspring✓ (2)

1.2

- Crossing over✓
- Random arrangement✓ of chromosomes
- Independent assortment ✓/random segregation / random assortment
- Mutations✓
- Chance fertilization✓/Random fertilization
- Random mating✓

} Meiosis✓

(Any 4) (4)

1.3

(a) Speciation✓ (1)

(b)

- The **rocky island**✓* /**geographic barrier**
- separated the fish into two populations✓
- with different environmental conditions✓ on each side
- Each group underwent natural selection independently✓
- and developed differently✓
- Each group became genotypically✓
- and phenotypically✓ different
- which prevented them from interbreeding✓ leading to the formation of a new species

(6)

Question 2

2.1

- Characteristics that are desirable/beneficial to humans✓ are being selected
- The characteristics are chosen by humans✓/It is an artificial process
- It is not necessarily beneficial for the organism✓

Any 2 (2)

2.2

- The long-term effects on health are unknown✓ which could lead to health problems in the future✓
- The long-term effects on the environment are unknown✓ leading to environmental damage✓/loss of biodiversity/ damaging ecosystems/nature

- People are morally opposed✓ as humans are interfering with nature✓/playing God/interfering with the rights of every species
- Initially it is an expensive process✓ and many people/countries may not be able to afford it✓

(Any 2 x 2) (4)

(6)

Question 3

3.1 Phylogenetic tree✓ (1)

3.2

(a) 2✓ (1)

(b) 7✓ (1)

3.3

- *A. boisei* and *A. robustus* share a more recent✓
- common ancestor✓ (2)

3.4 *Homo habilis*✓ (1)

3.5

Taung child✓
Mrs Ples✓
Karabo✓/*A. sediba*
Little foot✓ /*A. prometheus*

Any 2 (2)

3.6

- The **oldest** fossils of *Homo*✓/*Homo habilis* /*Homo erectus*
- are found only in Africa ✓
- The **younger** fossils of *Homo*✓/*Homo erectus*
- were found in Africa and other parts of the world✓
- This implies that earliest *Homo* sp. evolved in Africa✓/*Homo erectus* migrated out Africa

Any 3 (3)

(11)

Question 4

4.1 A✓ and D✓ (2)

4.2

- The pelvis is wide✓/cup-shaped
- to support the weight✓ of an organism walking upright (2)

4.3

Diagram A

- The foramen magnum is located centrally✓/more forward position below the skull
- so that the vertebral column arises from beneath the skull✓
- for bipedalism✓

Any 2 (2)

Diagram B

- The foramen magnum is located towards the back✓ of the skull
- so that the vertebral column arises from the back of the skull✓
- for quadrupedal locomotion✓

Any 2 (2)

4.4

Diagram A	Diagram B
Gently curved✓/C-shaped jaw	Rectangular✓/U-shaped jaw
Small jaws✓	Large jaws✓
Smaller canines✓/(teeth)	Larger canines✓/(teeth)
No diastema/Fewer spaces between the teeth✓	Diastema present/Larger spaces between the teeth✓

Table format 1 + Any 3 x 2 (7)

4.5

- Freely rotating arm✓
- Rotation around elbow joints✓
- Rotation around the wrist✓
- Bare fingertips/nails instead of claws✓
- Long upper arms✓
- Opposable thumbs✓
- Five fingers✓

Any 3 (3)
(18)

Question 5

5.1 X - Foramen magnum✓

Y - Canine✓ (2)

5.2

- The foramen magnum is located in a more forward position✓below the skull
- showing that organism C is bipedal✓
- This allows for the vertebral column/spine to extend vertically✓from the base of the skull
- to balance the body weight in upright walking✓ Any 3 (3)

5.3

- (a) B✓ (1)
- (b) A✓ (1)

5.4

- There is an increase✓
- in the cranium size✓ from organism B to organism C
- This will allow it to house a larger brain✓/cerebrum which suggests greater intelligence (3)

5.5

Skull B	Skull C
Brow ridges pronounced✓	Brow ridges are not as pronounced✓
More protruding jaws✓/larger jaws	Less protruding jaws✓/smaller jaws

Table1 + (2 x 2) (5)
(15)

Question 6

6.1

- Eyes in front/binocular vision✓
- Freely rotating arms✓
- Long upper arms✓
- Bare fingertips or nails✓
- Opposable thumb✓
- Upright posture ✓

(Any 5) (5)

6.2

- (a) More curved spine✓/S-shape in humans but less curved✓/C-shaped in apes (2)
- (b) Short and wide✓ pelvis in humans but long and narrow✓ pelvis in apes ✓ (2)

6.3

- Canines have changed from large✓
- to small✓.
- This is due to a change from eating raw✓ food
- to eating cooked✓ food

(4)

(13)

Question 7

HYPOTHESIS

- **All modern humans✓/Homo sapiens**
- **originated in Africa✓**
- and migrated to other parts✓ of the world

FOSSIL EVIDENCE✓

- Fossils of *Ardipithecus* were found **ONLY** in Africa✓/Rift Valley/Ethiopia/South Africa
- Fossils of *Australopithecus* were found **ONLY** in Africa✓/Rift Valley/Ethiopia/South Africa
- The fossils of *Homo habilis* were **ONLY** found in Africa✓
- The **OLDEST** fossils of *Homo erectus* were found in Africa✓
- The **OLDEST** fossils of *Homo sapiens* were found in Africa✓

GENETIC EVIDENCE✓

- Mitochondrial DNA✓
- Is inherited only from the maternal line✓
- Analysis of mutations ✓ on this mitochondrial DNA
- shows that the oldest female ancestor were located in Africa✓
- and that all humans descended from her✓/mitochondrial Eve

BIPEDALISM

The fossils of all three genera indicate that:

- The foramen magnum✓
- is located in a more forward position✓
- The pelvis✓
- is wider and shorter✓

- The spine✓
- is S-shaped✓

Content: (17)

Synthesis: (3)

(20)

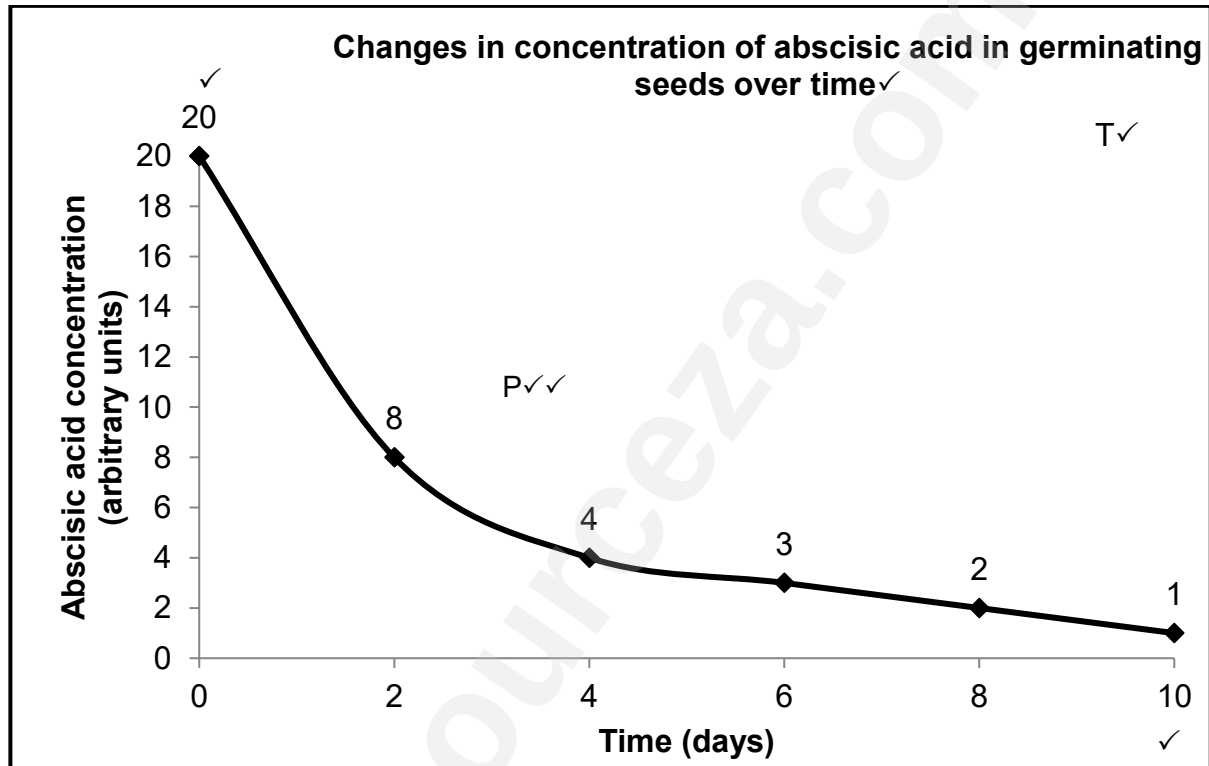
Criterion	Relevance (R)	Logical sequence (L)	Comprehensive (C)
Generally	All information provided is relevant to the question.	Ideas are arranged in a logical sequence.	All aspects of the essay have been sufficiently addressed.
In this essay in Q4	Only information relevant to the 'Out of Africa' hypothesis and bipedal fossils of the three genera are described. No irrelevant information included.	The description of the evidence for the 'Out of Africa' hypothesis and the evidence of bipedalism is presented in a logical and sequential manner.	At least the following marks should be obtained: - 7/11 for the 'Out of Africa' hypothesis and the evidence - 4/6 on evidence for bipedalism.
Mark	1	1	1

Check your answers Set 2

PAPER 1 MEMORANDUM

Question 1

1.1



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

(6)

- 1.2 (a) Increased✓
(b) Decreased✓

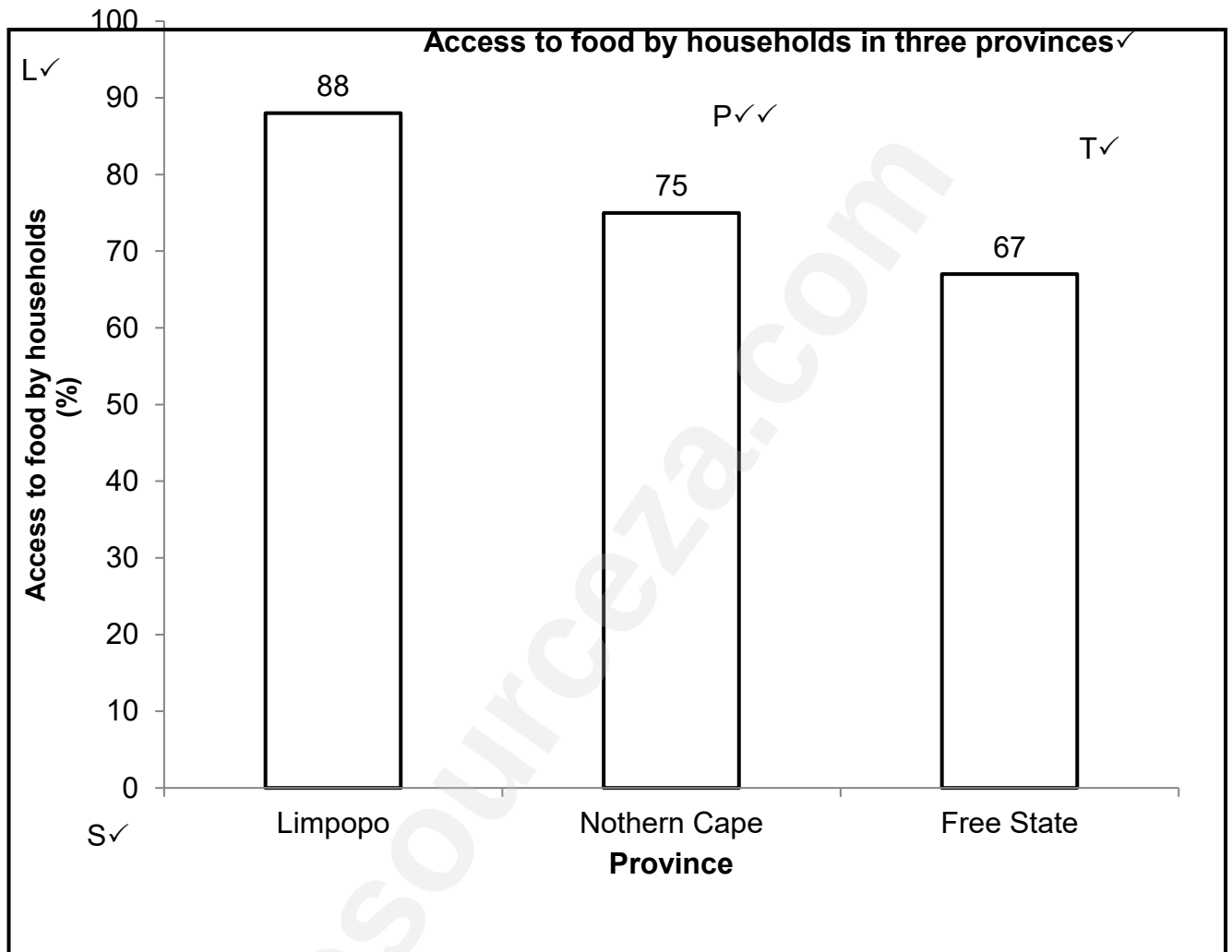
(1)

(1)

(8)

Question 2

2.1



Mark allocation of the graph

Criteria	Mark Allocation
Bar graph drawn (T)	1
Title of graph	1
Correct scale for X-axis (equal width and spacing of the bars) and Y-axis (S)	1
Correct label and unit for X-axis and Y-axis (L)	1
Plotting of the bars (P)	0: No bars plotted correctly 1: 1 to 2 bars plotted correctly 2: All 3 bars plotted correctly

Question 3

3.1

Calculations:

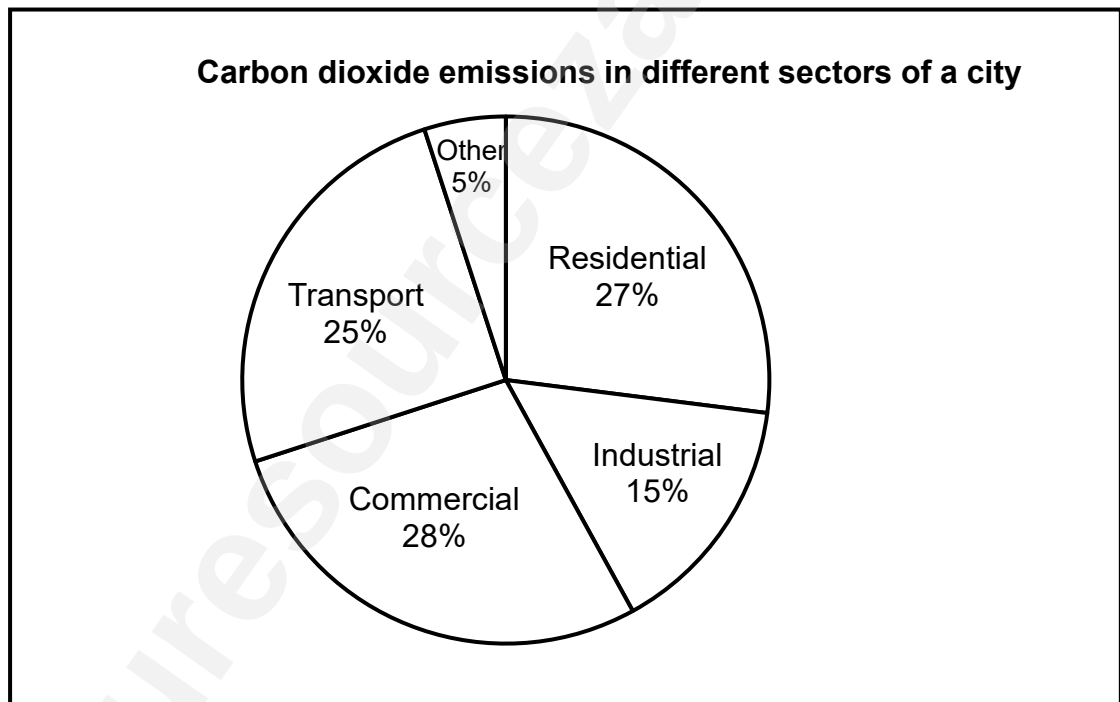
Transport = $25/100 \times 360^\circ = 90^\circ$

Residential = $27/100 \times 360^\circ = 97,2^\circ$

Industrial = $15/100 \times 360^\circ = 54^\circ$

Commercial = $28/100 \times 360^\circ = 100,8^\circ$

Other = $5/100 \times 360^\circ = 18^\circ$



Mark allocation for the pie chart

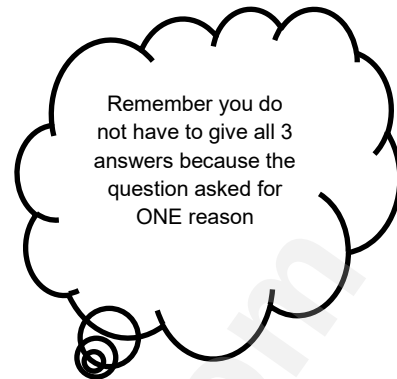
(7)

Correct type of graph	1
Title of graph(CO ₂ emission + Sector)	1
Calculations:	1: 1-4 calculations correct 2: All 5 calculations correct
Correct proportion for each labelled slice	1: 1 to 2 slices correct 2: 3 slices correct 3: 4-5 slices correct

Question 2

4.1

- Food security refers to the access✓
- of adequate✓/safe/nutritious food
- to all people at all times✓



(3)

4.2

- Price is added to cover the cost of transportation✓ over long distances
- No competition✓ between dealers in rural areas
- Decrease demand✓ for goods in rural areas

(Any 1)

(1)

4.3

- Decreased need to buy food✓
- Selling of excess produce to earn some money✓

(2)

4.4

- Making people aware of the benefits of farming✓
- Providing resources✓/example
- Developing skills for farming✓
- Providing incentives✓ to encourage farming

(Any 2)

(2)

Question 5

5.1

- Poor infrastructure✓
- Climate change✓
- Wastage✓
- Pollution of water sources✓

(Any 2)

(2)

5.2

- The need of water for irrigation will be reduced✓

(1)

5.3

- Decreased production✓
- will lead to loss of profit✓

(2)

5.4

- More revenue for fixing poor infrastructure✓/building dams
 - Less water wastage✓by individuals and companies
- (2)

(7)

Question 6

6.1 Apical tips✓/stem tips/root tips/bud (1)

6.2 Promotes cell elongation✓ (1)

6.3

- Only kills part of a plant✓/leaves and stems leaving the chance of the roots to grow again✓
 - Poisonous✓
can be harmful to other organisms✓
- (4)

6.4

- It could kill the beans as well✓
 - thus reducing the yield of the crop✓
- (2)

Question 7

7.1 They are fuels that can be depleted✓/Millions of years required to replace (1)

7.2 - CO₂ is released✓ when coal is burned to generate electricity/
No CO₂ is released when renewable energy or nuclear power is generated (1)

7.3

Methane✓/ CH ₄	Carbon monoxide✓/CO
Sulphur dioxide✓/ SO ₂	Water vapour✓/H ₂ O(g)
Nitrous oxide✓/ N ₂ O	Ozone✓/O ₃

(MARK FIRST ONE ONLY) (Any 1) (1)

7.4

- An increase in CO₂ leads to global warming✓
- which causes climate change✓/changes in rainfall patterns
- that leads to more droughts✓/floods in certain areas
- resulting in crop losses✓
- and livestock deaths✓
- Therefore less food is produced✓

(Any 4) (4)

Question 8

8.1 Metaphase I✓ (1)

8.2

- Crossing over has taken place✓
 - and genetic material was exchanged ✓
- (2)

8.3 Anaphase II✓ (1)

8.4

- The spindle fibres contract✓
- The centromeres split✓
- and pull the daughter chromosomes✓/chromatids
- to the opposite poles of the cells✓
- Cytokinesis begins✓ (Any 3) (3)

8.5 Testes✓ (1)

(8)

Question 9

9.1

- (a) ADH✓/antidiuretic hormone (1)
- (b) Hypothalamus✓/Pituitary gland (1)
- (c) Kidneys✓ (1)

9.2

- An increase in ADH causes the walls of the kidney tubules✓
 - to become more permeable✓ to water
 - More water is reabsorbed✓
 - and the blood volume increases✓
 - Less urine is produced✓
 - and the urine is more concentrated✓ (4)
- (7)

Question 10

10.1 (a) Diagram 1✓ (1)

(b) Diagram 2✓ and Diagram 3✓ (2)

(c) Diagram 1✓ and Diagram 2✓ (2)

10.2 Amniotic✓ egg (1)

(6)

Question 11

- FSH✓/follicle stimulating hormone
- is secreted by the pituitary gland✓
- FSH stimulates the development of a primary follicle✓
- into a Graafian follicle✓

- As the follicle develops it secretes **oestrogen**✓
- which causes the lining of the uterus✓/endometrium
- to become thicker✓/more vascular
- in preparation for a possible implantation of the embryo✓/development of the foetus

- The pituitary gland✓
- secretes **LH**✓
- which causes the Graafian follicle to rupture and release the ovum✓
- This is called ovulation✓

- The empty follicle changes and becomes a corpus luteum✓
- which begins to secrete **progesterone**✓
- which causes further thickening✓
- of the endometrium✓

- High levels of progesterone✓
- inhibits the secretion of FSH✓
- which prevents development of a new follicle in the ovary✓

- If there is no fertilisation, the corpus luteum degenerates✓
- which leads to a drop in progesterone✓
- The endometrium disintegrates and is shed during menstruation✓

- If fertilisation occurs, the corpus luteum remains intact✓
- which leads to the levels of progesterone remaining high✓
- to maintain pregnancy✓

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

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the topic.	Ideas arranged in a logical/cause-effect sequence.	Answered all aspects required by the essay.
All information relevant to the events of the menstrual cycle only (no pregnancy) and the hormones FSH, LH, oestrogen and progesterone.	All events of the menstrual cycle are in sequence.	All FOUR correct hormones mentioned with their functions.
1 mark	1 mark	1 mark

Question 12

Hearing

- Pinna traps/directs the sound waves✓
- into the ear canal✓/meatus
- This causes the tympanic membrane to vibrate✓
- The vibration is transmitted to the auditory ossicles✓
- The ossicles amplify the vibration✓
- and transmit it to the oval window✓
- The oval window vibrates✓

- creating waves✓
- in the fluid/endolymph of the cochlea✓
- which stimulates the Organ of Corti✓
- to convert the wave into an impulse✓
- The impulse travels along the auditory nerve✓
- to the cerebrum✓ where it is interpreted as the roar of the lion

Role of Adrenalin

- More adrenalin is secreted✓
- Adrenalin increases muscle tone✓
- And causes the liver/muscles to convert glycogen into glucose✓
- The heart rate increases✓
- so that the muscles receive more glucose✓
- and oxygen✓
- needed for cellular respiration✓
- to provide the energy✓ for the muscles to contract efficiently
- The rate of breathing increases✓
- and the depth of breathing increases✓
- to exhale carbon dioxide from the muscles faster✓
- and inhale oxygen faster✓
- Constriction of blood vessels to the gut✓/skin
- and dilation of blood vessels to the vital organs✓/brain/muscles
- allowing more blood to be supplied to vital organs✓/brain/muscles

Content: (17) Synthesis: (3)

(20)

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay
All the information provided is relevant to hearing and how adrenalin ensures that muscles function efficiently There is no irrelevant information	All the information regarding hearing and how adrenalin ensures that muscles function efficiently is arranged in a logical manner	At least the following marks should be obtained for each of the following: - Hearing (7/10) - How adrenalin ensures that muscles function efficiently (4/7)
1 mark	1 mark	1 mark

Question 13

Increasing the metabolic rate

- To increase the metabolic rate the level of thyroxin must increase ✓
- The pituitary gland is stimulated ✓
- To secrete more TSH ✓
- Which stimulates the thyroid gland ✓
- To secrete more thyroxin ✓

(Any 4) (4)

Increasing the level of glucose

- As a result of the decrease in glucose level the pancreas is stimulated ✓
- To secrete glucagon ✓

- Which stimulates the conversion of stored glycogen to glucose ✓
- In the liver ✓/muscles
- The glucose is then released into the bloodstream ✓
- The glucose level in the blood increases ✓ and returns to normal (Any 5) (5)

Decreasing the level of CO₂

- High CO₂ levels stimulate the receptor cells in the carotid artery ✓
 - The stimulus is converted to an impulse ✓
 - And sent to the medulla oblongata ✓
 - Which stimulates the heart ✓
 - To beat faster ✓
 - Bringing blood with CO₂ quickly to the lungs ✓
 - It also stimulates the breathing muscles ✓
 - To increase the depth and rate of breathing ✓
 - CO₂ is exhaled quickly from the lungs ✓
 - The CO₂ level in the blood decreases ✓ ✓ and returns to normal (Any 8) (8)
- Content: (17) Synthesis: (3) (20)

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay
All the information provided is relevant to the: - Mechanism to increase metabolic rate - Mechanism to increase glucose level - Mechanism to decrease CO₂ level There is no irrelevant information	All the information regarding the: - Mechanism to increase metabolic rate - Mechanism to increase glucose level - Mechanism to decrease CO₂ level is arranged in a logical manner	At least the following points should be included: - Mechanism to increase metabolic rate (3/4) - Mechanism to increase glucose level (3/5) - Mechanism to decrease CO₂ level (5/8)
1 mark	1 mark	1 mark

Question 14Nourishment of the embryo in amniotic eggs

- The egg contains yolk✓/albumin
- which provide nutrients✓ to the embryo

Max (4)

Gaseous exchange and nourishment of the foetus in humans (F)

- In the placenta✓
- the mothers blood comes into close contact with the foetal blood✓
- Oxygen✓
- and nutrients✓
- diffuse from the mothers blood into the foetal blood✓
- in the umbilical veins✓
- This nutrient rich blood is carried to the foetus through the umbilical cord✓
- Carbon dioxide diffuses from the foetal blood✓
- in the umbilical artery✓
- into the maternal blood✓

Max (7)

Protection of the foetus in humans (P)

- The foetus develops inside the uterus✓
- and is protected by the mothers body✓
- Antibodies from the mothers blood✓
- pass into the foetus' blood and provide immunity✓
- The placenta acts as a microfilter✓
- preventing toxins from the mother entering the foetal blood✓
- The foetus is enclosed in the amnion✓
- which contains amniotic fluid✓
- The amniotic fluid provides protection against dehydration✓
- and acts as a shock absorber✓
- It provides a suitable temperature✓ for the developing embryo

Max (6)

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

ASSESSING THE PRESENTATION OF THE ESSAY

Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information provided is relevant to: - Gaseous exchange and nourishment in amniotic eggs - Gaseous exchange, nourishment and protection in the human foetus There is no irrelevant information	All the information regarding the: - Gaseous exchange and nourishment in amniotic eggs - Gaseous exchange, nourishment and protection in the human foetus is arranged in a logical manner.	At least the following points should be included: - Gaseous exchange and nourishment in amniotic eggs (2/4) - Gaseous exchange and nourishment in the human foetus (5/7) - Protection in the human foetus (4/6)
1 mark	1 mark	1 mark

PAPER 2 MEMORANDUM**Question 1**

1.1

(a) DNA✓ molecule (1)

(b) Amino acid✓ (1)

1.2 Transcription✓ (1)

1.3

- The sequence of nitrogen bases on molecule W/DNA will change✓

- This would cause a corresponding change on the molecule X✓/mRNA
- The amino acid brought in by tRNA will be different✓
- A different protein will form✓ (4)

1.4

- (a) UCU✓ (1)
- (b) Arginine✓ ; Methionine✓ ; Glycine✓ (3)
- (Must be in the correct order)

(11)

Question 2

2.1

- DNA contains coded information for protein synthesis✓
- DNA carries hereditary information✓ (Any 1) (1)

2.2 ACA ✓ (1)

2.3 Threonine✓; Cysteine✓ (must be in correct order) (2)

2.4

- Both ATG and ATA✓
- Code for the same amino acid/tyrosine✓ (2)

2.5

- The anticodon on the tRNA matches the codon on the mRNA✓
- tRNA brings the required amino acid✓
- to the ribosome✓
- amino-acids are joined by peptide bonds✓
- to form the required protein✓ (5)

(11)

Question 3

3.1 Lindiwe✓ and Bandile✓ (2)

3.2 They have DNA bands which correspond✓
with the banding patterns from both parents✓/ Zinhle and Ayanda (2)

3.3

- To investigate crimes✓/ resolve disputes
- To identify organisms from their remains✓
- To identify family relationships other than paternity✓, e.g. siblings or cousins
- To test for the presence of specific alleles✓/ genes that cause a genetic disorder

- To establish matching tissues for organ transplants✓

Any 2 (2)
(6)

Question 4

- 4.1 DNA profile✓ (1)
- 4.2 Q✓ (1)
- 4.3 All the DNA bands match the DNA bands of the blood on the broken glass✓ (1)
- 4.4
- Human error could give incorrect results✓
 - Only a small amount of DNA was used✓ and may not be reliable
 - Framing✓/planting false evidence
 - Suspect can have an identical twin✓ with the same DNA profile
- (Mark first TWO only) Any 2 (2)
(5)

Question 5

- 5.1
- (a) White ✓fur (1)
- (b) Black ✓ fur (1)
- 5.2
- (a) 1✓ and 3✓ (2)
- (b) 1✓ (1)
- 5.3

P₁ Phenotype Black X White✓
Genotype BB X bb✓

Meiosis G/gametes B, B X b, b✓

Fertilisation

F₁ Genotype Bb; Bb; Bb; Bb ✓
Phenotype All black
*0✓%white

P₁ and F₁✓
Meiosis and fertilisation✓

(*compulsory mark + 5)

OR

P₁ Phenotype Black X White✓
Genotype BB X bb✓

Meiosis

Fertilisation

Gametes	B	B
b	Bb	Bb
b	Bb	Bb

1 mark for correct gametes
1 mark for correct genotypes

F₁ Phenotype All black
*0✓% white

P₁ and F₁✓
Meiosis and fertilisation✓

(* compulsory mark + 5)

(6)
(11)

Question 6

P₂ Phenotype Grey male x White female✓
Genotype Gg x gg✓

Meiosis G/gametes G, g x g, g✓

Fertilisation

F₂ Genotype Gg; Gg; gg; gg ✓
Phenotype 2 grey rabbits : 2 white rabbits ✓

Phenotypic ratio of offspring is *1 : 1✓

P₂ and F₂✓
Meiosis and fertilisation✓

*1 compulsory + any 6

OR

P₂	Phenotype	Grey male	x	White female✓
	Genotype	Gg	x	gg✓
<i>Meiosis</i>				
<i>Fertilisation</i>				

Gametes	G	g
g	Gg	gg
g	Gg	gg

1 mark for correct gametes
1 mark for correct genotypes

F₂ Phenotype 2 grey rabbits : 2 white rabbits ✓

Phenotypic ratio of offspring is *1 : 1✓
P₂ and F₂✓
Meiosis and fertilisation✓

*1 compulsory + any 6

(7)

Question 7

7.1 2✓ (1)

7.2 (a) X^DX^d✓✓ (2)

(b) X^dX^d✓✓ (2)

(5)

Question 8

8.1 2✓ (1)

8.2

(a) Albino female✓ (1)

(b) Aa✓✓ (2)

8.3

(a) 50%✓ (1)

(b) 25%✓ (1)

(6)

Question 9

9.1 Dihybrid✓ cross (1)

9.2 (a) Black✓ (1)

(b) Black without white patches✓ (1)

(c) Grey with white patches✓ (1)

9.3 - They can have the genotype BBtt✓/homozygous dominant for coat colour or
- they can have the genotype Bbtt✓/heterozygous for coat colour (2)

9.4 - Alleles of a gene for one characteristic segregate independently✓
- of the alleles of a gene for another characteristic✓

- The alleles for each gene will therefore come together randomly✓ during gamete formation

(3)
(9)
[40]

Question 10

10.1

- Coat is light brown✓ on the upper side
- Dark brown belly✓
- White stripes on the back and mane✓
- Black and white patches on the rest of the body✓
- The tip of the tail is black✓

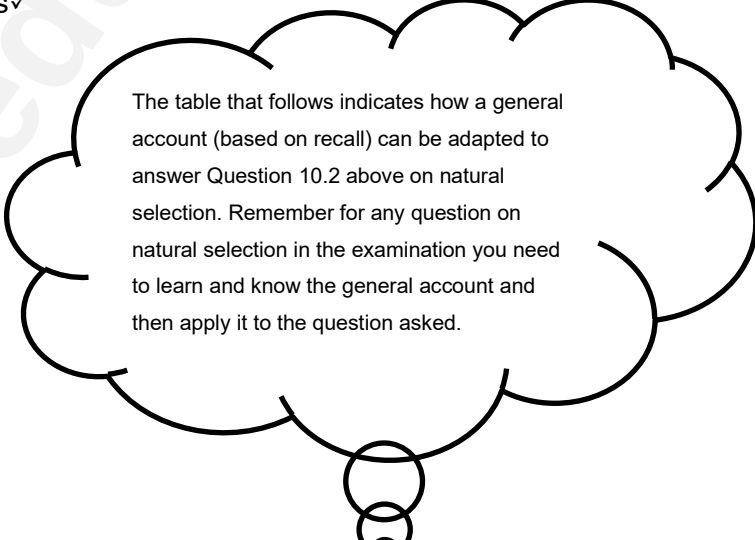
Any 2

(2)

10.2

- There is variation✓ amongst the Bongo population
- Some have horns that can be laid on their backs✓
- while others do not have horns that can be laid on their backs✓
- The antelope must move through dense vegetation✓ without their horns getting entangled in the vegetation
- Those with horns that cannot be laid on their backs become entangled✓/ die
- Those with horns that can be laid on their backs do not become entangled and escape predators✓/survive
- Those with horns that can be laid back will reproduce✓
- and pass the gene for horns that can be laid on their backs to the next generation✓
- Over many years the proportion of animals that are able to lay their horns on their backs, increases✓

(5)



The table that follows indicates how a general account (based on recall) can be adapted to answer Question 10.2 above on natural selection. Remember for any question on natural selection in the examination you need to learn and know the general account and then apply it to the question asked.

General Account on Natural Selection	Natural Selection in the Bongo/antelope
There is variation amongst the offspring	There is variation amongst the Bongo population
Some have desirable characteristics and some do not	Some have horns that can be laid on their backs whilst others cannot lay their horns down on their backs
Sometimes there is a change in the environmental conditions which acts a selection pressure	The antelope has to move through dense vegetation without becoming entangled to avoid being trapped and then caught by predators
Organisms with characteristics that make them less suited to the environment, die	Those with horns that cannot be laid on their backs become entangled and die
Organisms with characteristics which make them more suited to the environment, survive	Those with horns that can be laid on their backs do not become entangled and survive

Question 11

- There is variation✓ in colour amongst the lizards
- ***Red and brown✓** lizards
- ***are not camouflaged✓/cannot warm up fast enough to have energy to run away**
- are killed by predators✓
- ***The black lizards✓**
- ***are better camouflaged✓/warm up faster to have energy to avoid predators**
- and survive✓/reproduce
- The allele for black colour is passed on to the next generation✓
- to produce more black lizards✓ in the next generation

(6)

The table that follows indicates how a general account (based on recall) can be adapted to answer Question 11 above on natural selection. Remember for any question on natural selection in the examination you need to learn and know the general account and then apply it to the question asked.

General Account on Natural Selection	Natural Selection in the Lizard Population
There is variation amongst the offspring	There is variation amongst the lizard population
Some have favourable characteristics and some do not	Some are black and are better camouflaged/warm up faster to have energy to avoid predators, whilst others are red or brown and are NOT camouflaged/cannot warm up fast enough to have energy to run away from predators
Sometimes there is a change in the environmental conditions which acts a selection pressure	Predation acts as the selection pressure. Survival depends on the colour of the lizards.
Organisms with characteristics that make them less suited to the environment, die	Red and brown lizards are caught by predators and die
Organisms with characteristics which make them more suited to the environment, survive	Black lizards survive
The organisms that survive, reproduce	The surviving black lizards will reproduce
They will pass on the favourable characteristic to their offspring	The allele for black colour will be passed on to the next generation
Over many generations, the proportion of individuals with the favourable characteristic, increases	Over many generations the proportion of lizards that are black, increases

Question 12

12.1

- The common ancestor✓/original camel population
- was separated✓ into different populations
- ***by the sea✓/due to continental drift**
- There was no gene flow✓ between the populations
- Each population was exposed to different environmental conditions✓/selection pressures
- Natural selection occurred independently✓ in each population

Remember the only difference between the general account of speciation is the geographical barrier which would be stated in the examination question. The geographical barrier in this question is the **sea** or separation **due to continental drifting**.

- The individuals of each population became different✓ from each other over time
- genotypically and phenotypically✓
- Even if the three populations were to mix again✓
- they would not be able to interbreed✓

(6)

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Check your answers Set 3

PAPER 1 MEMO

MEIOSIS

Question 1

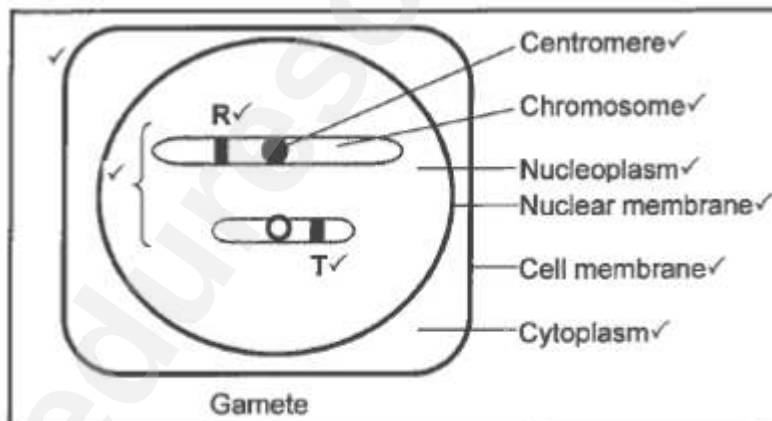
1.1

- (a) - Crossing over has taken place✓
- And genetic material was exchanged✓
- (b) Anaphase II ✓
- (c) - The spindle fibres contract ✓
- The centromeres split✓
- and pull the daughter chromosomes/chromatids ✓
- to the opposite poles of the cells✓
- Cytokinesis begins✓

(Any 3)

Question 2

- 2.1(a) Human somatic cells have 23 pairs✓/46 chromosomes and this cell has only 2 pairs✓/4 chromosomes.
- (b) Rt ✓ and RT ✓
- (c)



Criteria to mark diagram

Single cell is drawn	1
Only 2 unreplicated chromosomes in drawing	1
Short unreplicated chromosome indicating T	1
Long unreplicated chromosome indicating R	1
Any ONE correct label	1

d) Crossing over✓

Genetic material exchanged between homologous chromosomes✓
Random✓/independent assortment of chromosomes arrange themselves randomly/independently on either side of equator in metaphase 1✓

2.3. - Down syndrome✓

- Two homologous chromosomes✓ do not separate✓
- Both chromosomes move to the same pole✓
- This will result in a gamete with extra✓ chromosome

Question 3

Genetic variation is brought about in gametes through meiosis✓ in two ways:

Crossing over✓

- During Prophase✓
- Homologous chromosomes✓ /bivalents pair up
- Each chromosome has 2 chromatids✓
Chromatids of homologous pair crossover✓
- Points at which crossing-over takes place are referred to as chiasmata✓
- Genetic material chromatids✓
after the process of crossing-over , chromosomes have genes from its homologous partners✓
- This means that each gamete formed will have a mixture of genes from maternal and paternal parents. ✓
- *random arrangement of chromosomes at the equator✓
- During Metaphase I✓
- Each pair of homologous chromosomes✓
- *may line up randomly on the equator of the spindle fiber✓
- *Independently of what the other pairs are doing✓/independent assortment
- During Metaphase II✓
- Each individual chromosome✓
- *may line up either way✓/flipped on the equator of the spindle
- *This means that gametes will have differing number/mix of maternal and paternal chromosomes✓/chromatids

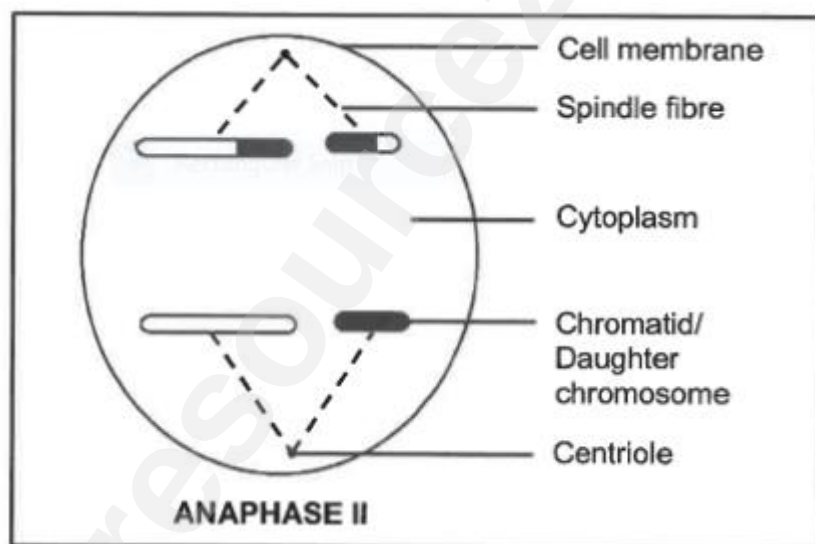
(at least 1 of the *compulsory and any 4 which could include compulsory points)

Formation of an ovum

- During oogenesis✓
- diploid cells✓
- in the ovary✓
- undergo meiosis✓
- to form a primary oocyte✓
- consisting of haploid cells✓
- One cell✓ develops into an ovum

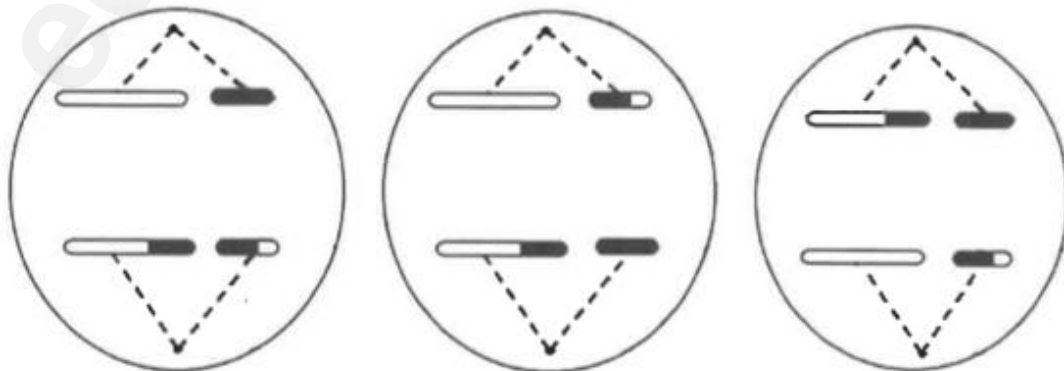
Relevance	Logical sequence	Comprehensive
All information provided is relevant to the question	Ideas arranged in a logical/ cause-effect sequence	Answered all aspects required by the essay in sufficient detail
All the information provided is relevant to crossing over, random arrangement and development of an ovum. There is no irrelevant information	All the information regarding crossing over, random arrangement and development of an ovum is arranged in a logical manner.	At least the following marks should be obtained: - Crossing over (5/7) - Random arrangement (3/5) - Development of an ovum (3/5)
1 mark	1 mark	1 mark

Question 4



OR

ANY ONE OF THE FOLLOWING ARRANGEMENTS INCLUDING CORRECT LABELS



MARK ALLOCATION FOR DIAGRAM

Correct phase drawn/chromatids separating (P)	1
Correct shading of chromatids (S)	1
Correct number and size of individual chromatids/daughter chromosomes (2 short and 2 long) (N)	1
Any TWO correct labels	2
TOTAL	5

Reproduction in vertebrates

Question 1

- The female sea horse lays eggs externally,
- the male fertilises the eggs externally✓ in his pouch.
- baby seahorses develop and hatch from eggs in male body.✓
- In normal ovovivipary, internal fertilisation takes place✓ in female body,
- the fertilised eggs develop inside mother✓, hatch and are born alive.✓ (5)

Question 2

C

(2)

Question 3

- 3.1 The eyes are still closed✓
- The body is still naked, without a downy feather covering✓ (2)
- 3.2 The embryo is directly connected to the mother✓ as it receives nutrients through the placenta✓ which consists of embryonic and maternal tissues. (2)
- 3.3 The development time is longer✓ in hatchling B, therefore more yolk will be needed to supply nourishment to the developing embryo.✓ (2)
- (6)**

Human reproduction

Question 1

- 1.1 D (2)
- 1.2 D (2)

Question 2

- 2.1 - High levels of LH✓
- stimulates ovulation✓ (2)
- 2.2 - To monitor their fertile periods✓
- to prevent pregnancy✓/to increase chances of falling pregnant (2)
- 2.3 - Oestrogen✓

- levels rise✓ (2)
- 2.4 Between 16 and 18✓✓ (2)
- 2.5 - Progesterone only rises✓
 - after ovulation✓
 - this shows that the fertility period has already passed✓/when fertility is low (3)
(11)

Question 3

- 3.1 A vasectomy will decrease/increase the testosterone level in GA rats. ✓✓
OR
 A vasectomy will have no influence in the testosterone level in GA rats✓✓ (2)
- 3.2 The rats in Group 3 serves as the control group ✓ (1)
- 3.3 (a) $5.35 - 2.26 = 3.09$ ✓/3.1 g ✓ (2)
- (b) $\frac{68.2 - 0.35}{68.2} \times 100$ ✓ for subtraction
 $= \frac{67.85}{68.2} \times 100$ ✓ for fraction and percentage
 $= 99.5$ ✓ % for correct answer only (3)
- 3.4 - The vasectomy caused a decrease in testosterone ✓level
 - it also decreased the testosterone level of the other normal testis.✓ (2)
- 3.5 - Repeat the experiment ✓
 - Increase the sample size ✓ / number of rats (2)
- 3.6 - When a vasectomy is done, the testosterone level will decrease ✓
 - which will affect the secondary male characteristics ✓of the whole body/
 (muscle mass, growth of hair and beard etc.) (2)
(14)

Question 4

- 4.1 B – Placenta✓ (1)
- 4.2 A – Umbilical cord✓ (1)
- 4.3

Vein	Artery
Carries oxygenated blood/oxygen content is high✓	Carries deoxygenated blood/oxygen content is low✓
High nutrient content✓	Low nutrient content✓
CO ₂ content is low✓	CO ₂ content is high✓
Low amounts of nitrogenous waste✓	High amounts of nitrogenous waste✓

(5)

(7)

Question 5

- 5.1 - Provides watery medium for the foetus to move freely✓ and develop/ allows movement for growth and development✓
 - Prevents dehydration of the embryo✓
 - Protects the foetus against temperature fluctuation✓/Keeps foetus at a constant temperature
 - Acts as shock absorber✓ (3)
- 5.2 Allantois✓
 Yolk sac✓ (2)
- 5.3 Excretory system✓, respiratory system✓, digestive system✓, endocrine system✓
 ANY TWO (2)
 (7)

Question 6

- 6.1 - High level of progesterone✓
 - inhibits hypophysis✓
 - from secreting FSH✓
 - therefore no primary follicle can develop✓ Any THREE (3)
- 6.2 Decreases✓ drastically (1)
- 6.3 - The placenta responsible for the secretion of progesterone during gestation✓
 - tears loose from the uterine wall✓ (2)
 (6)

Question 7

- 7.1 - As a result of the blocked Fallopian tube✓
 - the sperm cannot reach the ovum✓
 - therefore fertilisation cannot take place✓ (Any 2) (2)
- 7.2 (a) FSH✓/follicle stimulating hormone (1)
 (Mark first ONE only)
- (b) Oestrogen (1)
 (Mark first ONE only)
- 7.3 - a zygote✓ is formed
 - which divides by mitosis✓
 - forming a ball of cells✓
 - called the morula✓
 - which further divides to form a hollow ball of cells✓ (Any 4) (4)
- 7.4 - Progesterone levels would fall✓
 - The endometrium would no longer be maintained✓
 - A miscarriage would occur✓ (3)
 (11)

Question 8

- 8.1 - The endocrine disruptors/malfunctioning of endocrine glands
- Life style/life style variations. Driving a vehicle for prolonged periods (Any 1) (1)
- 8.2 - Long distance drive extends the period sitting at a fixed position causing male reproductive organ to remain tightly squeezed between the thighs for a considerable period of time.✓
- As the temperature rises✓ in the area, the scrotum is unable to pull the testis away from the body due to lack of spacing,
- hence the testes remain in contact with the body and maintain a higher temperature causing a disruption of spermatogenesis.✓ (3)
- 8.3 The low sperm count reduces the chances of fertilisation✓ and may led to male infertility. ✓ (2)
- 8.4 - Use of tight underwear✓
- Sitting in a hot tub for a long time as daily routine✓ (Any 1) (1)
(7)

Question 9

Development of Graafian Follicle

- The hypophysis✓/pituitary gland
- secretes FSH✓
- which stimulates the development of a primary follicle✓
- in one of the ovaries✓
- Only one follicle develops to full maturity in every cycle✓
- into a mature Graafian follicle✓
- Around day 14✓
- the Graafian follicle is fully developed✓
- The mature Graafian follicle moves to the surface of the ovary✓
- forming a slight swelling✓
- There is a sharp increase in the concentration of LH✓
- The wall of the ovary ruptures✓
- The ovum✓/haploid secondary oocyte is released
- which is known as ovulation✓
- After ovulation the remains of the Graafian follicle✓ develop
- into a mass of yellow cells✓ the corpus luteum (Any 9)

Oogenesis

- A diploid✓ cell/2n
- in the ovary
- undergoes meiosis✓/meiosis I to
- form a primary oocyte
- reducing the number of chromosomes to haploid✓/n
- Only one cell develops into an ovum✓ (Any 4)

Prevention of follicle development

- Progesterone levels are high✓

- being secreted by the placenta✓
- It inhibits✓
- the secretion of FSH✓
- Therefore preventing the stimulation of development of primary follicle✓ (Any 4)

ASSESSING THE PRESENTATION OF THE ESSAY

Criterion	Elaboration		Mark
Relevance (R)	All information provided is relevant to the question	Only information with regard to development of the Graafian follicle until corpus luteum is formed, oogenesis and the prevention of follicle development during pregnancy.	1
Logical sequence (L)	Ideas are arranged in a logical/cause-effect sequence	The sequence of events in development of the Graafian follicle until corpus luteum is formed, oogenesis and the prevention of follicle development during pregnancy is correct.	1
Comprehensive (C)	Answered all aspects required by the essay in sufficient detail	Development of the Graafian follicle until corpus luteum is formed (7/9) oogenesis (3/4) and The prevention of follicle development during pregnancy (3/4).	1

(20)

Responding to the environment: Humans

The Nervous system

Question 1

- 1.1 - The bigger/wider the diameter✓
- the faster✓ the conduction of the impulse
- 1.2 - Unmyelinated: 3✓ m/s
- Myelinated: 8✓ m/s
- 1.3 - Myelin sheath✓
- The increase in the conduction velocity is faster✓ and higher✓ with the Myelin sheath

Question 2

- 2.1 (a) A
- 2.2 (a) D
- 2.2 (b) B

Question 3

- 3.1 Reflexes allow the rapid✓/ involuntary responses to an external stimulus thus preventing /reducing damage✓ to the body
- 3.2 The type of activity✓performed
- 3.3 - Same age participants✓
- Same gender✓
- The reaction time was tested using the same method✓
- 3.4 - Repeat the investigation✓
- Increase sample size
- 3.5 The hypothesis should be accepted✓
- The results show that sending text message increases the time taken to react the most ✓
- therefore if a people text while driving they react much more slowly✓which could lead to an accident.

Question 4

- 4.1 0,038✓ s ✓
- 4.2 - As blood alcohol content increases✓
- the braking response time increases✓
- OR**
- The braking response time increases✓
- as the blood alcohol content increases✓
- 4.3 - The motorist cannot judge the distance of an obstacle✓
- and will therefore not be able to stop in time to avoid the accident✓

OR

- Cannot judge boundaries of a lane✓
- and may therefore drive in the wrong lane✓
- 4.4 - Acts as a control✓/baseline assessment
- so that the results can be attributed to the alcohol content in the blood and not any other factor✓

Question 5

- 5.1 Myelin sheaths are fatty membranes✓enclosing nerve fibres.
It insulates nerve fibres✓and accelerates the transmission of nerve impulse✓
- 5.2 (a) - **D** is responsible for controlling the breathing rate✓
- thus the person will not be able to breathe✓
- OR**
- **D** is responsible for controlling the heart rate/beat✓
- thus the heart would stop beating✓
- (Any 1 x 2)

5.2(b) Receptors✓/pain receptors in his skin are stimulated and convert the stimulus into an impulse✓

- The impulse is transmitted along a sensory neuron✓ to the spinal cord✓where it makes synaptic contact✓with an interneuron✓which makes synaptic contact with a motor neuron✓
- The impulse then moves to the effector✓/muscles in the leg
- Muscles will contract✓ and the leg is thus lifted away from the glass.

(Any 6)

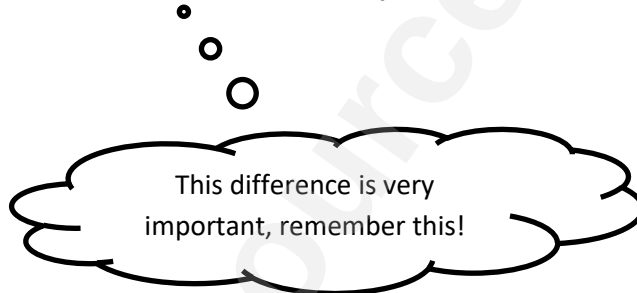
Question 6

6.1 Sensation would be felt✓ but there would be no response✓

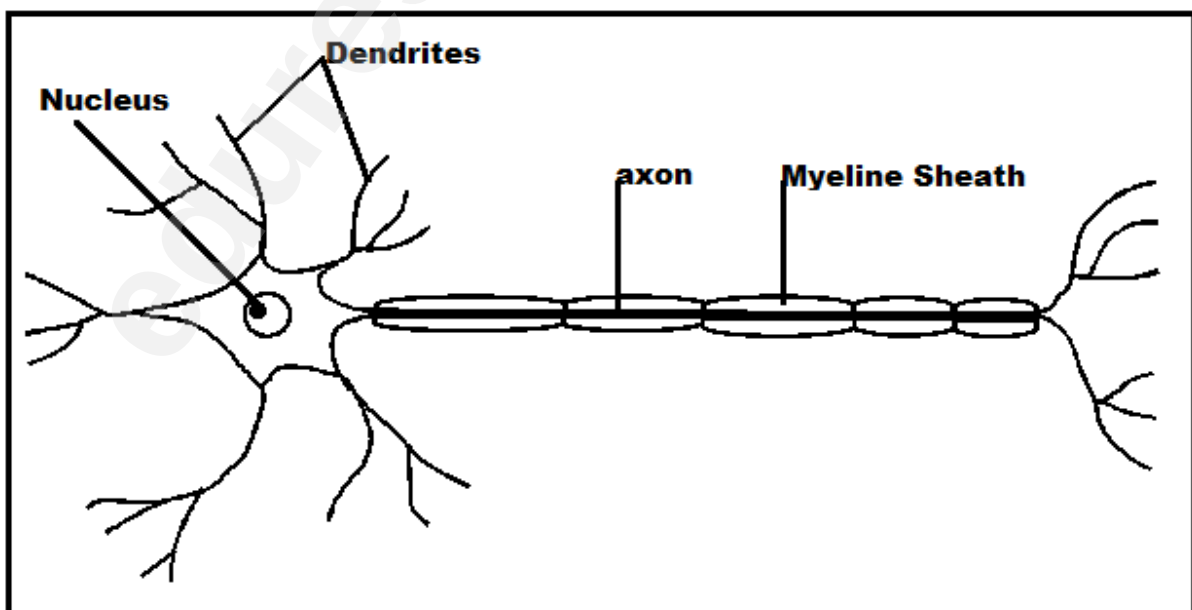
6.2 Helps to protect the body✓by reacting quickly✓

6.3 . Reflex arc- pathway of a nerve impulse✓ from receptor to effector✓

Reflex action- automatic, ✓involuntary response to a stimulus✓



6.4 Structure of motor neuron



Criteria to mark diagram

Caption	1
Correct diagram	1
Any 3 correct labels	3

The Eye

Question 1

- 1.1 6/12✓ / 6:12 (1)
- 1.2 - Validity/ People cannot learn the pattern✓/arrangement/sizes
And therefore cheat on the test✓ (2)
- 1.3 - The ciliary muscles contract✓
- and tension on the suspensory ligaments is released/
suspensory ligaments slacken✓
- The lens becomes more convex/bulges✓
- And its refractive power increases✓
- So that a clear image is formed on the retina ✓ Any (4)
(7)

Question 2

C✓ (2)

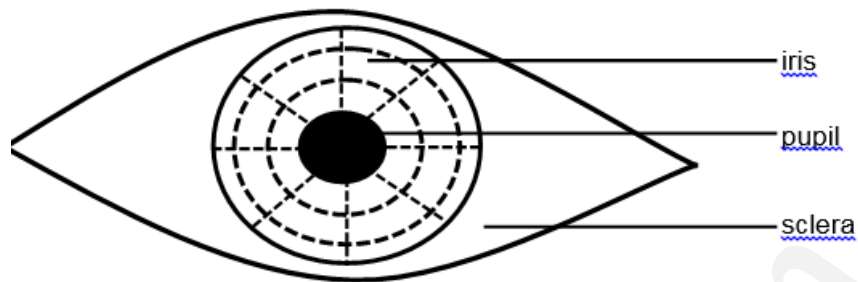
Question 3

- 3.1 (a) B✓ (1)
- (b) A✓ (1)
- 3.2 - Can change its shape✓
- to focus image onto the yellow spot✓
- irrespective of the distance from the eye✓/
For near distant vision✓/for accommodation✓ (mark first 3) (3)
(5)

Question 4

- 4.1 Iris✓/radial and circular muscles (1)
- 4.2 (20 – 30)✓s (1)
- 4.3 - Radial muscles contract✓
- Circular muscles relax✓
- Pupil increases in diameter✓/dilates (3)

4.4



Correct drawing of the front view of an eye✓

Pupil = 6 mm✓

Any 2 correct labels✓✓

(4)

(9)

Question 5

- 5.1 (a) Diameter of the pupil✓ (1)
 (b) Distance✓ between the eye and the bulb (1)
- 5.2 Between 7 and 8✓ (1)
- 5.3 4✓ (1)
- 5.4 - Diameter of pupil is the widest✓/6mm wide open
 - to allow the maximum amount of light✓ to enter the eye
 - to fall on the retina✓/yellow spot
 - enabling the woman to see during the lower light intensities✓ (Any 3) (3)
- 5.5 - To allow the eye/pupil to adjust✓
 - to the darkness of the room✓ and
 - to ensure validity✓ before the next reading is taken (Any 2) (2)
- 5.6 Repeat the investigation✓ Increase the sample size✓ (Any 1) (1)
 (10)

The Ear

Question 1

C (2)

Question 2

- 2.1 - Air will not be taken in✓/released
 - to equalise pressure✓
 - on both sides of the tympanic membrane✓
 - This may lead to the tympanic membrane bursting✓
 - and therefore could lead to hearing loss✓/deafness (4)

- 2.2 Changes in the direction and speed of movement:
- Causes the endolymph in part D/semi-circular canals to move✓
 - The cristae✓ are stimulated
 - and converts the stimulus into an impulse✓
 - which is transmitted via the auditory nerve✓
 - to the cerebellum
 - from which impulses are transmitted via motor neurons✓
 - to the skeletal muscles✓/effector
 - to restore balance of the body✓
- (5)

- 2.3 Sound vibrations✓ would not pass through to the inner ear✓ and hearing would be affected. (2)
- (11)

Question 3

- 3.1 Both✓ (1)
- 3.2 4000✓Hz✓ (2)
- 3.3
- Earwax builds up in the auditory canal✓
 - and presses against the tympanic membrane✓
 - preventing it from vibrating freely✓/preventing the transmission of sound waves
- (3)
- 3.4
- The round window absorbs✓ sound waves from the inner ear
 - to prevent interference with subsequent waves✓/reduce pressure in cochlea
- (2)
- (8)

Human endocrine system and Homeostasis

Question 1

- Excess carbon dioxide is formed✓
 - Mudulla oblongata is stimulated✓
 - it sends impulses to the heart✓
 - and the breathing muscles✓
 - Blood can be taken to the lungs at a faster rate✓
 - to eliminate the excess carbon dioxide formed✓
 - as a result of high respiratory rate✓
 - and to collect more oxygen✓
- (4)

Question 2

- 2.1 As humans get older, there is a progressive decline in the secretion of growth hormone.✓✓ (2)
- 2.2 The amounts of growth hormone secreted between the ages of 13 and 19 is

comparatively higher✓ than the amounts of hormone secreted during the rest of the life of the person. (1)

- 2.3 (a) Gigantism✓ (1)
(b) Dwarfism✓ (1)

- 2.4 - The rapid development of stronger muscles✓
- Growth in size and mass of skeletal system✓ (1)
(6)

Question 3

- 3.1 - Body temperature increases✓
- Pulse rate increases✓
OR
Both increase✓✓ (2)

- 3.2 30✓ minutes (1)

- 3.3 **Vasoconstriction**
- Less blood reaches the surface of the skin✓
- and less heat is lost✓
OR
- Less blood reaches the sweat glands✓
- And less heat is lost✓

Increase in metabolism
- Results in an increase in respiration✓
- Which generates more heat✓ (4)

- 3.4 - Amount of energy drink✓
- Length of time when measurements were taken✓
- Amount of caffeine in the energy drink✓
- Type of energy drink✓
- The level of activity of all participants✓
- Gender✓/only men (2)
(9)

Question 4

- 4.1 Comparison of the blood glucose of two people✓ over 5 hours✓/before and after ingesting glucose (2)
- 4.2 (145 – 125) ✓
= 20✓ mg/100cm³ (2)
- 4.3 (a) Thabiso✓ (1)
(b) - His glucose level is higher than the normal range✓
- It takes longer for his glucose level to come down to its original level✓ (1)
- 4.4 - When his glucose level is high✓
- insulin✓ is secreted into the blood

- to convert excess glucose into glycogen✓ in the liver
- and to stimulate the cells to absorb more glucose✓
- thus decreasing the blood glucose level✓
- below normal levels✓

(4)
(10)

Question 5

5.1 (a) Volume of urine✓

(1)

- (b)
- Decide on a time✓/date/place to conduct the investigation
 - Decide on the apparatus✓/materials that need to be used
 - Decide how to record the data✓
 - Advertise for volunteers to participate✓
 - Decide on the number of participants to include✓
 - Decide what factors to keep constant✓/example of factor to be kept constant

(Mark first TWO only)

Any

(2)

- (c)
- The same room✓/environment/ temperature
 - The same apparatus✓
 - The same investigator✓
 - No other liquid intake by both groups✓
 - The same level of activity✓

(Mark first TWO only)

Any

(2)

- (d)
- They used a large sample✓/12 men/6 men in each group
 - The average volume of urine produced was calculated✓

(Mark first TWO only)

(2)

- 5.2
- Alcohol inhibits/reduces the secretion of ADH✓
 - Less ADH in the blood causes the renal tubules✓/distal convoluted tubules and collecting ducts
 - to become less permeable to water✓
 - Less water is reabsorbed✓ back into the blood
 - A larger volume of urine is produced✓

Any

(4)

(11)

Responding to the environment: Plants

Question 1

1.1

- To allow for time for the auxins from the tip✓
- to diffuse into the agar jelly ✓

(2)

1.2

- Auxins from the agar jelly ✓
- diffused into the shoot/coleoptile on one side/the left side only ✓
- the cells on this side were stimulated to grow ✓/elongate
- the cells on the other side/right side did not receive auxins✓
- and grew more slowly✓
- the uneven growth ✓caused the stem to bend to the right

Any

(4)

- 1.3 - remove the agar jelly completely✓ /use agar jelly
 - that does not contain auxins
 - and place a black box ✓around the tip of the coleoptile (2)
- 1.4 (a) distribution of auxins ✓ (1)
 (b) direction of growth ✓ (1)
- 1.5 - repeat the investigation ✓
 - increase the number of coleoptiles used✓/sample size✓ (2)
- 1.6 - the uneven distribution of auxins on the side where the agar jelly was placed✓
 - caused the coleoptile stem to bend ✓
 - even though there was no exposure to light ✓ (3)

(15)

Question 2

- 2.1 To ensure unilateral light✓/the plant receives light from one direction only (1)
- 2.2 Auxins✓ (1)
- 2.3 ✓

Plant A	Plant B
The stem of the plant will bend towards the light✓	The stem of the plant will grow straight✓/will not bend towards the light
Does not have lateral branches✓/Only lower lateral branches will start to grow	All the lateral branches will grow✓ along the whole stem
The plant will be taller✓	The plant will be the same height as at the start✓

(Mark first TWO only)

1+ (2 x 2)

(5)

- 2.4 - The gibberellins cause the stem/plant to grow longer✓/taller
 - because gibberellins stimulate the elongation/growth of the internodes✓ (2)

(9)

Human Impact on the environment

Question 1

- 1.1 Species of plants that have been introduced✓ into an area/did not originally occur in that area ✓ (1)
- 1.2 - Employing people to remove the vegetation✓
 - Buying chemicals to kill the plants✓
 - Providing equipment to cut down the plants✓
 - Researching biological control species✓
 - Alien vegetation may be widespread✓
 - Alien vegetation may be growing in inaccessible areas✓
 - A large amount of alien vegetation needs to be removed✓

(Any 2) (2)

- 1.3 - The biodiversity in the dam decreases✓

- Alien plants cover the surface of the water✓
- and block out the sunlight✓
- Less photosynthesis occurs✓
- and less oxygen is released into the water✓
- Other organisms die✓/suffocate due to a lack of oxygen ✓

(Any 5) (5)

- 1.4. - They deplete the topsoil of water✓/nutrients
- so that food crops do not grow well✓
 - They invade land✓
 - decreasing the space available to grow crops✓

(4)
(12)

Question 2

2.1 A site where (solid wastes) domestic and industrial wastes are buried. ✓ (1)

2.2 R120 000 000 ✓/one hundred and twenty million rands (1)

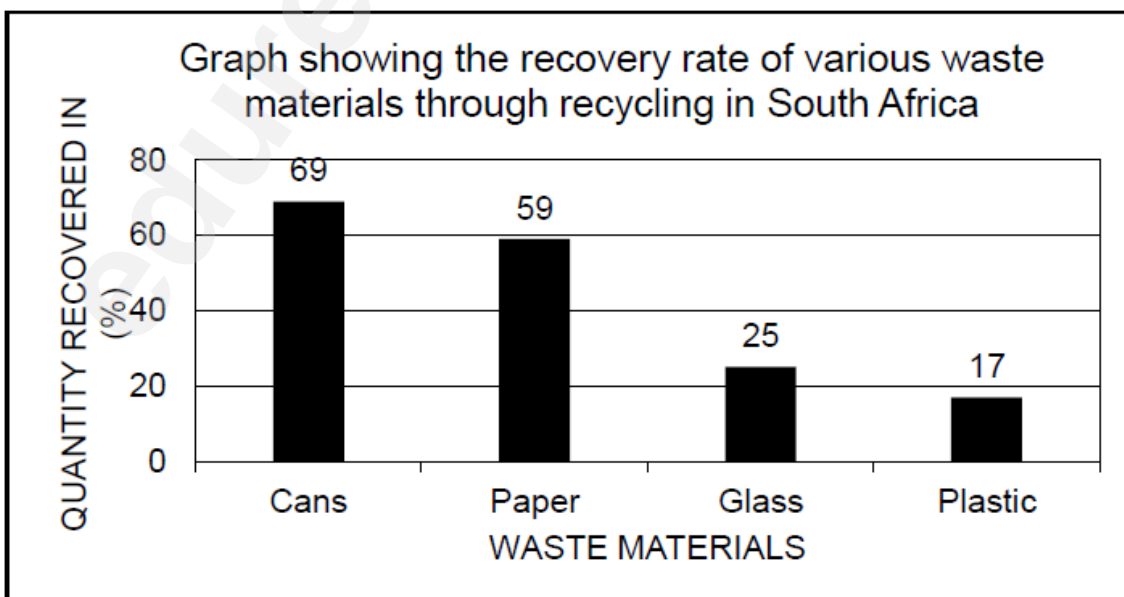
2.3 Energy can be saved✓by recycling because the raw materials used to manufacture certain waste materials such as glass do not have to be dug from the earth and melted together at very high temperatures.

Reduces environmental pollution✓because manufacturing of new products use large quantities of fossil fuels as a source of energy. (2)

2.4 Re-use shopping bags✓/using an item for the same purpose more

2.5. Decomposition of organic ✓/household waste✓
causes the release of greenhouse gases ✓such as CO₂ and methane✓
that trap more heat from the sun ✓causing increased global warming
cause enhanced greenhouse effect. ✓ (Any 2 x 1)(2)

2.6



Mark allocation of graph:	
Criteria	Mark Allocation
Bar graph drawn (T)	1
Title of graph (C) include both variables	1
Correct scale for X-axis (equal width and spacing of the bars) and Y-axis (S)	1
Correct labels and unit for X-axis and Y-axis (L)	1
Plotting of the bars (P)	0: No bars plotted correctly 1 : 1 to 2 bars plotted correctly 2 : 3 to 4 bars plotted correctly

Question 3

3.1. Number of kilograms of wheat per hectare/yield✓ (1)

3.2. To compare✓the yield obtained when using two types of fertiliser with the yield of the hectare with no fertiliser✓

OR

It acts as a control✓ to ensure that the results obtained are due to the addition of fertilisers✓and not any other factor.

Any (1x2) (2)

3.3. - She could have increased the sample size✓/number of plots/ number of plants for each type of fertiliser used

- Repeat the investigation ✓ (mark first one only) (1)

3.4 - nutrients in the soil✓

- Leads to decrease in yield✓

- Increases pests✓

- Leads to soil erosion✓

- Decreases biodiversity✓

Any 3 (3)

3.5.

- the excessive use of fertilisers increases the nutrient content of the surrounding river/eutrophication occurs/water becomes polluted✓

- This causes an increase in algal growth/algal bloom✓

- The algae block out light✓

- Reducing photosynthesis✓

- Plants and animals depending on them die✓

- Increasing decomposition✓

- Leading to a depletion of oxygen✓

- And reducing the biodiversity /reducing the number of animal and plant species in the river✓

(4)
(11)

PAPER 2**Meiosis**

Refer to the questions and answers in Paper 1

DNA: Code of life

Question 1

- 1.1 (a) uracil ✓ (1)
 (b) ribose ✓ (1)
 1.2 10 ✓ (1)
 1.3

DNA nucleotide	RNA nucleotide
- Sugar part is deoxyribose ✓	- Sugar part is ribose ✓
- Nitrogen base part is thymine / A, C, G and T ✓	- Nitrogen base part is uracil/ A, C, G and U ✓

Any (1x2)

Question 2

- 2.1 (a) DNA replication ✓ (1)
 (b) X – phosphate ✓
 Y – deoxyribose ✓ (2)
 (c) Hydrogen bond ✓ (1)
 (d) Adenine ✓ (1)
 2.2 Interphase ✓ (1)
 2.3 - DNA replication ✓ is taking place
 - the double helix DNA unwinds ✓
 - the double stranded DNA unzips ✓
 - due to the breaking of weak hydrogen bonds ✓
 - to form two separate strands ✓
 - free DNA nucleotides line up opposite each strand ✓
 - in a complimentary way ✓ / A – T and C – G
 - bonds form between the two strands and they wind up once more ✓
 - two new molecules of DNA are formed identical to each other ✓ Any (6)
 (12)

Question 3

- 3.1 (a) Polypeptide chain ✓ (1)
 (b) Ribosome ✓ (1)
 3.2 (a) 2 ✓ (1)
 (b) 5 ✓ (1)
 (c) 7 ✓ (1)

Translation is process where the tRNA molecules read the code on the mRNA and bring amino acids together in a particular sequence to form a required protein

- 3.3 - Translation ✓
- The mRNA attaches to the ribosome ✓
 - each tRNA carries a specific amino acid ✓
 - When each anti-codon ✓ of the tRNA
 - matches with the codon ✓ on the mRNA
 - the tRNA brings the required amino acid to the ribosome ✓
 - When the different amino acids are brought in sequence ✓
 - adjacent amino acids are linked by peptide bonds ✓
 - to form the required protein ✓ / polypeptide
- Any (5)

- 3.4 - tRNA has one free base triplet called an anti-codon ✓
- which determines the specific amino acid it carries. ✓
 - This anti-codon matches a specific codon on mRNA ✓
 - and therefore the tRNA places an amino acid in a specific sequence ✓
 - depending on the code of the gene ✓ on the DNA
- Any (4)

3.5 CCT ✓ (1)

- 3.6 - A DNA molecule carries thousands of genes that code for different proteins ✓
- Therefore the DNA is much larger than a protein ✓
 - When a protein is synthesised only one gene on the DNA ✓
 - is required to form mRNA ✓
 - for the for the required protein ✓ to be synthesized
- (5)

3.7

DNA Nucleotide	RNA Nucleotide
Sugar part consists of deoxyribose ✓	Sugar part consists of ribose ✓
Nitrogen bases are adenine, thymine, guanine and cytosine ✓	Nitrogen bases are adenine, uracil, guanine and cytosine ✓

(2x2) (4)
(25)

Question 4

- 4.1 GUC ✓ (1)
- 4.2 Valine ✓ (1)
- 4.3 - During replication the base triplet CAG on the DNA occurs more than 36 times. ✓
- this causes a change in the gene that forms m RNA. ✓
 - the mRNA code causes a change in the amino acid sequence ✓
 - and a different protein is formed called the 'Huntington protein' ✓
- (4)
(6)

Question 5

- 5.1 DNA profiling ✓ (1)
 5.2 Male 3 ✓ (1)
 5.3 - the bands of the child's DNA is a combination of the DNA from each parent ✓
 - Three bands are identical to that of the mother ✓
 - The remaining three bands correspond with those of male 3 ✓ (3)
 5.4 - To investigate crimes ✓ / resolve disputes
 - to identify organisms ✓ / missing persons from their remains ✓
 - to identify family relationships other than paternity e.g. siblings or cousins ✓
 - to test for the presence of specific alleles ✓ / genes that cause a genetic disorder
 - To establish matching tissues for organ transplants ✓ Any (2)
 (7)

Genetics and Heredity

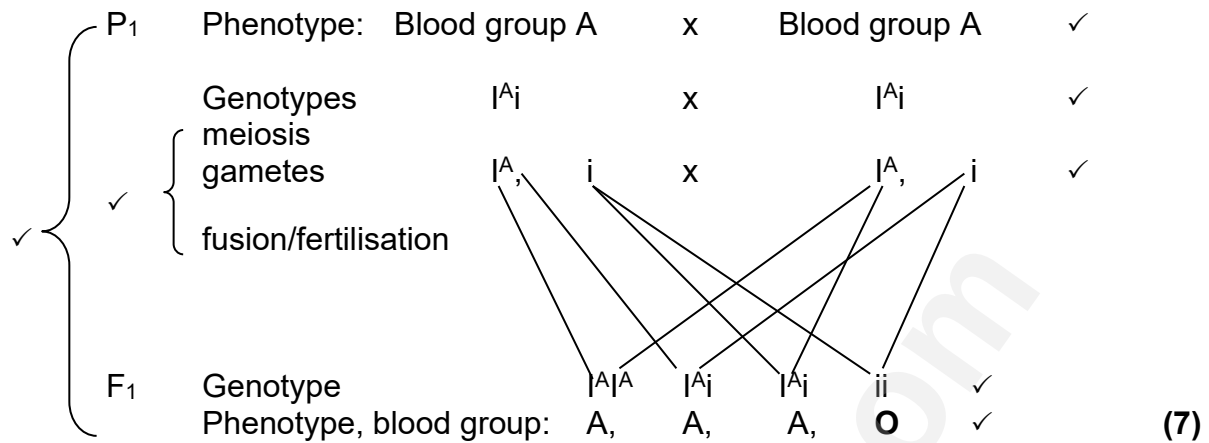
Question 1

- 1.1. A ✓ ✓
 1.2. D ✓ ✓
 1.3. B ✓ ✓
 1.4. C ✓ ✓
 1.5. C ✓ ✓
 1.6. A ✓ ✓
 1.7. C. ✓ ✓

Question 2

P₁ ✓	Phenotype:	Blood group A	x	Blood group A	✓
	Genotypes	I ^A i	x	I ^A i	✓
	meiosis				
	gametes	I ^A , i	x	I ^A , i	✓
	fusion/fertilisation				

OR

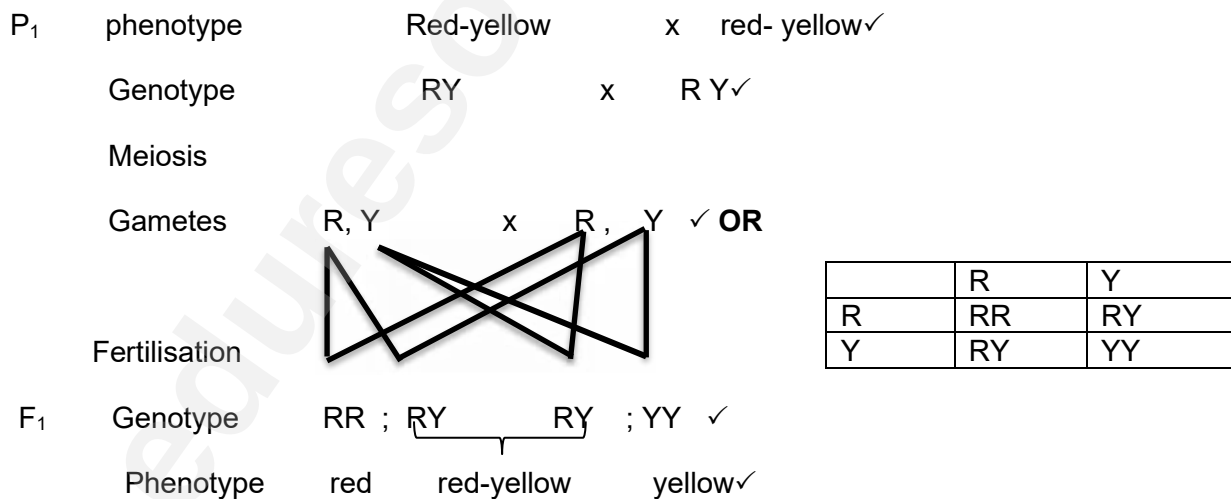


Question 3

- 3.1. $(11/100) \times 2000 = 220$ ✓ (3)
 3.2. - Repeat the investigation
 - Use a larger sample size / more dogs / increase number of dogs
 Any 2 (2)
 3.3. The breed of the dogs ✓ (1)
 3.4. - The disorders are inherited ✓
 - and therefore does not change with age ✓ (2)
 3.5. Autosomal recessive inheritance causes most of the genetic disorders in dog ✓ ✓ (2)

Question 4

4.1



P_1 and F_1 ✓

Meiosis and fertilisation ✓ (any 6) (6)

4.2. 50% / half ✓ (1)

4.3. A tree with red apples ✓ should be crossed with a tree with yellow apples ✓ (2)

Question 5

5.1 Incomplete dominance✓

(1)

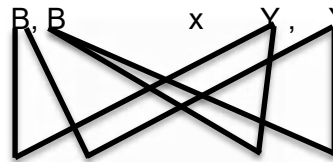
5.2 P₁ phenotype Blue x yellow✓

Genotype BB x YY✓

Meiosis

Gametes B, B x Y, Y ✓ OR

Fertilisation



	Y	Y
B	BY	BY
B	BY	BY

F₁ Genotype BY ; BY ; BY BY✓

Phenotype 100% green/ all green✓

P₁ and F₁✓ Meiosis and fertilisation✓

(any 6)

Question 6

6. 1 (a) Only seen in males / not in females ✓

(b) unaffected mother / parents yet they have a son that has colour-blindness✓

6.2 (a) 5 = X^dY ✓

(b) 7 = X^DX^d ✓ AND X^DX^D ✓

(c) 8 = X^DX^d ✓

6.3

P ₁	phenotype	Normal male	x	Normal female ✓
	genotype	X ^D Y	x	X ^D X ^d ✓
	Meiosis			
	G/gametes	X ^D , Y	x	X ^D ; X ^d ✓
	Fertilisation			
F ₁	genotype	X ^D X ^D ; X ^D X ^d ; X ^D Y; X ^d Y ✓		
	phenotype	2 normal females and 1 Normal male, 1 affected male ✓ *25% or 1 in 4 ✓		

Parents and offspring✓/P₁ and F₁

Meiosis and fertilisation✓

Any 5 + 1*(Compulsory)

OR

P₁	phenotype	Normal male	x	Normal female ✓
	genotype	X ^D Y	x	X ^D X ^d ✓
	<i>Meiosis</i>			
	G/gametes	X ^D , Y	x	X ^D ; X ^d ✓
	<i>Fertilisation</i>	Gametes	X ^D	Y
		X ^D	X ^D X ^D	X ^D Y
		X ^d	X ^D X ^d	X ^d Y
			✓✓	
F₁	genotype	X ^D X ^D ; X ^D X ^d ; X ^D Y; X ^d Y✓		
	phenotype	2 normal females and 1 Normal male, 1 affected male✓ *25% or 1 in 4 ✓		

Parents and offspring✓/P₁ and F₁

Meiosis and fertilisation✓

Any 5 + 1*(Compulsory)

Question 7

- 7.1 High yield✓
Short stem✓ (2)
- 7.2 hT✓ (1)
- 7.3 HHtt ✓, Hhtt✓ (2)
- 7.4 It is stronger✓/to carry a bigger yield/withstand windy conditions without breaking (1)
- 7.5 The plant breeder must cross✓ plants of variety A with plants of variety A✓ (2)

Question 8

The genes of a specie which have drought resistant genes can be artificially selected ✓ and used for inbreeding ✓ to obtain many organisms/population that do not need a lot of water (2)

Question 9

- 9.1
- Her father had brown tooth enamel.✓
 - Therefore his genotype must have been X^bY✓.
 - She could only inherit the recessive allele X^b✓ from her father.
 - She had white teeth so she must have one dominant allele X^B✓ therefore she must be heterozygous.
- (4)

9.2	P₁/P₂	Phenotype	Brown enamel✓	x	White enamel✓
		Genotype	X ^b Y	x	X ^B X ^b ✓
		Meiosis			
		G/gametes	X ^b , Y	x	X ^B , X ^b ✓
		Fertilisation			
	F₁/F₂	Genotype	X ^B Y, X ^b Y, X ^B X ^b , X ^b X ^b ✓		
		Phenotype	1 white enamel son, 1 son with brown enamel 1 white enamel daughter, 1 daughter with brown enamel✓		
	P₁ and F₁✓/P₂ and F₂	Meiosis and fertilisation			

Question 10

- 10.1 a) Bbll✓
b) white✓ with long hair✓
- 10.2 BBLL✓; BbLI✓

If you counted from the women's father this will be the grandchildren and thus F₂ but if you only looked at the man and woman the children will be F₁

any6

(1)
(2)
(2)
(5)

Question 11

11.1. Eyebrows not connected ✓

(1)

11.2.

- Parents A and B or C and D produce children with connected eyebrows✓
- and not connected eyebrows✓
- Only parents both carrying the dominant allele can
- produce offspring with both phenotypes✓

OR

- A and B or C and D have eyebrows that are not connected, produce a child with eyebrows which are connected✓
- then the allele for connected eyebrows was present in both parents✓,
- but masked, so eyebrows that are connected is recessive. **Any two**

(2)

11.3. Two ✓ fertilised ova

(1)

11.4 - One child is male and the other is female ✓

(1)

- One child has eyebrows that are connected and the other-has eyebrows that are not connected. ✓

(2)

(6)

Question 12

12.1. Suspect 2 ✓ (1)

12.2. 3 of his/her DNA bands match the evidence from the crime scene while none of the other suspects match. ✓ (1)

12.3

- Identification of relatives ✓ e.g. paternity suits/tracing siblings separated at birth/identifying unrecognisable bodies of dead people.
 - Test for alleles that can cause inherited genetic disorders. ✓
 - To determine matching tissues for organ transplants ✓
 - Can be used in research into variation in populations ✓
- (Any 1 x 1) (1)

12.4

- DNA samples may be planted ✓ / person can be framed with the use of false evidence.
 - Human error ✓ can lead to false results/ small amount of DNA is analysed therefore not necessarily unique to an individual/ done in private labs so testing standards may not be followed.
 - Invasion of privacy ✓ / revealing personal information.
- (2)
(5)

Question 13

(a) Smith's - Baby 3 ✓ (1)

(b) Jones' - Baby 2 ✓ (1)
(2)

Question 14

Gene mutation involves the change in a single nitrogen base ✓ of a DNA molecule ✓

Chromosome aberration involves a change ✓ in the structure or number of chromosomes ✓ (4)

Question 15

15.1. Since legalisation of abortions in 1997 the number of live births of babies with genetic defect have increased/decreased ✓✓

OR

Legalising abortions had no effect on the number of babies with genetic diseases ✓✓ (2)

15.2. Identify hospitals and clinics from which you can collect data ✓

get permission from the hospitals/clinics/government to collect the data ✓

Decide on the data and time to visit the hospitals and clinics ✓

Design a table to record the results ✓ (3)

- 15.3. Babies with genetic diseases✓ (1)
- 15.4. Repeat the investigation/ use a larger sample size✓ (1)
- (7)

Question 16

16.1.

- Stem cells are undifferentiated ✓
- and have the potential to develop into any type of cell✓
- to replace the affected/defective cells✓causing the disorder (3)

16.2.

- To produce ova✓ which could be used
- in cases where females do not have functional ovaries✓
- and are therefore infertile✓ and thereby
- allowing them to have children✓

OR

- Woman that have hormonal imbalances✓ because of a dysfunctional ovary✓could be
 - cured by replacing it with a functional ovary✓
 - which secretes the correct doses of hormones✓ (3)
- (6)

Question 17

- 17.1 a) Cloning✓ (1)
- b) Oogenesis✓/gametogenesis/meiosis (1)
- 17.2 - the donor horse has the desired characteristics✓
- that need to be copied✓
- and be present in the offspring✓/next generation Any 2 (2)
- 17.3 The nucleus contains all the genetic information ✓✓/ (2)
- Hereditary characteristics/chromosomes of the champion horse
- 17.4. a) 64✓
- b) 32✓
- c) 64✓ (3)
- 17.5. - A gamete is generally haploid✓
- this ovum is diploid✓since
- it has the nucleus of a somatic cell✓ Any 2 (2)
- (11)

Evolution

Question 1

- 1.1 (a) 25✓mya (accept 24 to 25) (1)
- (b) 63✓mya (1)

1.2 Old World monkeys ✓ and apes ✓ (2)

1.3 Lorises ✓ (1)

1.4 Apes ✓ (1)

(6)

Question 2

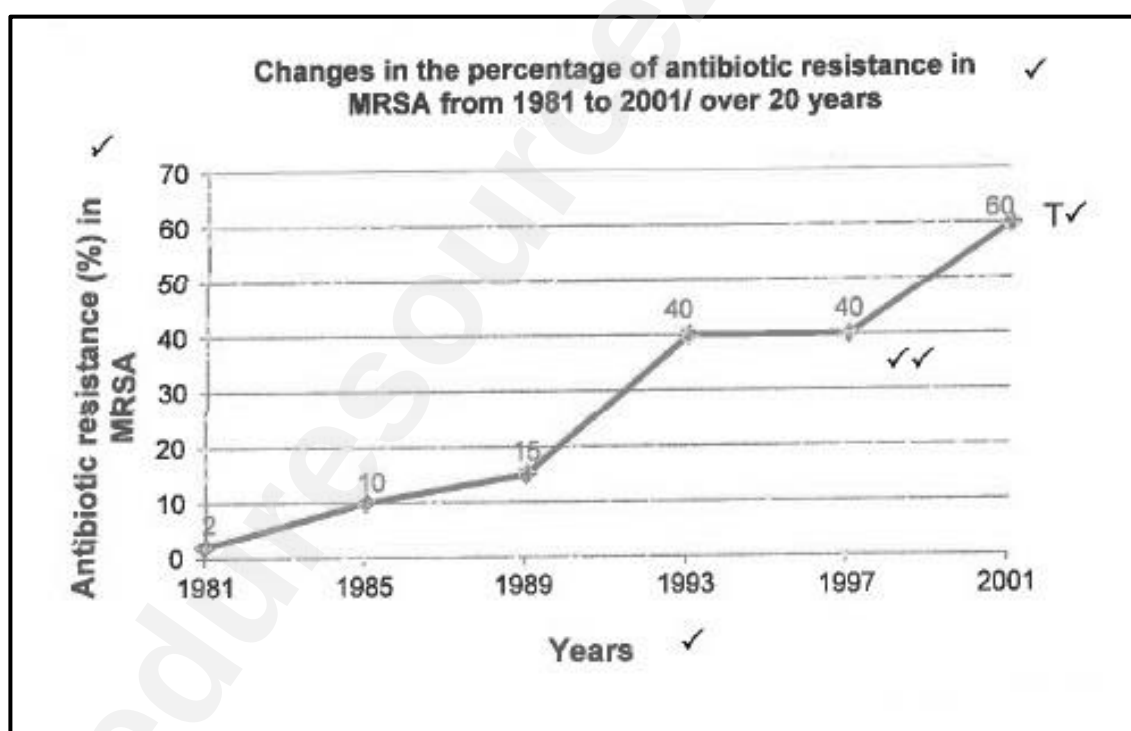
2.1 (a) MRSA ✓ (1)

(B) FQRP ✓ (1)

$$2.2 \quad \frac{(20-5)}{5} \times \frac{100}{1} \text{ OR } \frac{(15)}{5} \times \frac{100}{1}$$

$$= 300 \text{ } \%$$
 (3)

2.3



Mark allocation for the graph

Criteria	Mark Allocation
Correct type of graph (line graph)	1
Title of graph including both variables	1
Correct label and scale for X-axis	1
Correct label and scale for Y-axis	1
Plotting of points	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'
- 'plotting of points'

If the axes are transposed:

The learner will lose 2 marks for correct label and scale for X and Y axes if learners draw all 3 graphs on the same system of axes:

- Learners will lose the mark for the title
- Learners will lose 1 mark for correct label and scale for Y axis
- If all three graphs drawn are labelled, mark the correct MRSA graph
- If all three graphs drawn are not labelled, marks for plotting will be lost

(6)
(11)

Question 3

- The baobab population has been separated into two groups✓
- **by a geographical barrier**✓
- ***sea/continental drift**✓
- Environmental conditions on the continents may have been different✓
- Each population underwent natural selection independently✓
- and they become **genotypically** and **phenotypically**✓ different ✓
- This prevented them from interbreeding✓ leading to the formation of new species.
- ***e.g. of a geographical barrier is the compulsory mark**

Any 5 + 1*

(6)

Question 4

- 4.1 Change in diet (from insectivorous to vegetarian)✓,
larger body✓ and
thicker tail✓
bigger bite force✓
(Mark first THREE only) (3)
- 4.2 They do not need to move quickly✓ to catch insects✓/plants are
sedentary (2)
- 4.3
- There is variation in the head size amongst wall lizards in the population✓
 - some have large heads✓/bigger bite force and other
 - have smaller heads✓/smaller bite force
 - Insects became scarce on the island✓/competition occurred for food
 - lizards with smaller heads that fed on insects struggled to obtain food and died✓ of hunger
 - While those with the larger heads fed on plants/

- vegetation, and had enough food to eat and survived✓
- Those with larger heads reproduced✓
- and passed on the favourable gene to the next generation✓
- Resulting in an increase in number in the population✓

(6)

(11)

Question 5

- 5.1
- Determined time/day to collect data ✓
 - selected an area ✓ on the island
 - randomly captured ✓ a number of birds of the same species
 - measured their beaks✓
 - before the drought✓
 - and during the drought ✓
 - recorded ✓ the number of birds with each beak size
- Any (4)
- 5.2 Number of finches before and during the drought✓/ (beak size) (1)
- 5.3 During the drought there were more finches with larger beaks ✓✓

OR

During the drought there were fewer finches with smaller beaks ✓✓ (2)

- 5.4
- During the drought only hard woody seeds remained✓
 - Finches with bigger beaks could crack open the seeds more easily✓
 - and had sufficient food✓
 - therefore they survived ✓ and reproduced.

OR

- During the drought, there were no small, soft seeds✓
 - Finches with smaller beaks could not crack open the hard woody seeds ✓
 - and had no food✓
 - therefore they did not survive✓ to reproduce
- Any (3)

- 5.5 accept a range of 9,8 to 10,3✓ mm /larger (1)

(11)

Question 6

- 6.1
- the mutation caused variation✓ among the clover plants
 - some produced cyanide✓/poison and
 - others do not produce cyanide✓/poison
 - the non-cyanide producing plants survive the lower temperatures✓
 - whereas the cyanide producing plants are killed at lower temperatures✓
 - Therefore they do not reproduce ✓ and
 - the allele for cyanide production is not passed onto the next generation✓
 - there are fewer cyanide producing clover plants ✓ in the next generation

Any (6)

Question 7

- 7.1. A transitional fossil shows characteristics✓ of two✓ / between genera/species (2)
- 7.2. Bipedalism/ stood upright ✓ (1)
- 7.3. - The foramen magnum is located more forward beneath the skull✓, so that
 - The vertebral column extends beneath✓ the skull
 - The spine is S-shaped✓ to
 - Support an upright posture✓
 - The pelvis is short and wider✓
 - To support the body above✓ the pelvis
- Any (2x 2) (4)**
- 7.4. -there was a change in diet
 - from tough/✓raw to
 -softer ✓ /cooked food (3)
- 7.5. No/Less intelligent✓. The skulls of *Homo naledi* is half of humans skulls size which indicates a smaller brain ✓. (2)

(12)

Question 8

- 8.1 A✓, E✓, F✓ (3)
- 8.2. In A the big toe is close to the other 4 smaller toes/faces forward
 In B the big toe is apart/opposable from the other 4 smaller toes/points outwards✓
- OR** In A the heel bone is relatively larger and in B it is relatively smaller
- OR** In A the bones in the foot are straight and in B they are curved
- OR** In A phalanges are relatively shorter and in B they are relatively longer **Any one (1)**
- 8.3. Diagram C is adapted for tree climbing/quadripedalism / whereas diagram F is adapted for bipedalism/upright walking✓ (1)
- 8.4. The foramen magnum in diagram A is more forward / towards the centre than diagram B✓ which indicates that diagram A is bipedal/ diagram B is quadropedal. ✓
 The pelvic girdle in Diagram E is flatter and more bowl shaped / diagram D is long and narrow✓ is which indicates bipedalism in diagram E / that diagram D is quadropedal✓ (4)

(9)

Question 9

- 9.1 35 000✓ (1)
- 9.2 (a) *Homo habilis*✓
 (b) *Australopithecus africanus*✓ and *Australopithecus afarensis*✓
 (c) *Homo erectus*✓
 (d) Pelvis – wide and short✓ and bowl shape✓ holding the weight✓ of the body making upright walking possible✓ (4)

(5)

Question 10

There is a great deal of variation✓ among the mosquito offspring.

Some were resistant to DDT and others were not✓

DDT was sprayed and only mosquitos that were resistant to DDT survived.

Those that were not resistant to DDT died✓

The mosquitos that survived reproduce ✓ and passed on the favourable characteristics to their offspring. ✓

The next generation therefore have a bigger proportion✓ of individuals that are resistant to DDT (7)

Question 11

- 11.1 - 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)
- 11.2 They contain toxins✓ which kill the snakes
 OR
 Too large✓ to be swallowed Any 1 (1)
- 11.3 - Having a smaller jaw✓
 - means cane toads cannot be consumed✓
 - thereby protecting the snakes from ingesting the toxins✓ (3)
- 11.4 - Since the snakes' 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)
 (11)