GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JUNE EXAMINATION
GRADE 12

2025

LIFE SCIENCES

LIFE SCIENCES P1

TIME: 2½ hours

MARKS: 150

20 pages

C2831E

X05

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a new page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Do ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, flow charts or tables only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You may use a non-programmable calculator, protractor and a compass where necessary.
11. Write neatly and legibly.

SECTION A

QUESTION 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A – D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

1.1.1 In external fertilisation …

A a dry environment is required for fertilisation.
B sperm cells are released into the female body.
C fewer gametes are released.
D predation of eggs can easily occur.

1.1.2 Which is NOT a function of the placenta?

A It is the point of attachment of the foetus to the mother.
B It allows for the diffusion of nutrients from the mother to the foetus.
C It allows for the diffusion of oxygen from the mother to the foetus.
D It allows for the diffusion of waste from the mother to the foetus.

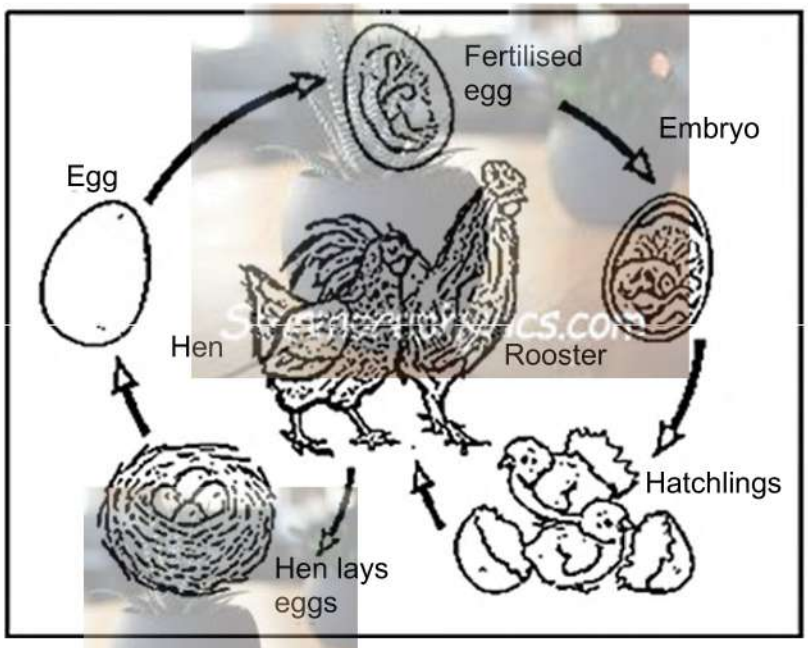
1.1.3 Into which part of the ear are grommets inserted?

A Oval widow
B Round window
C Tympanic membrane
D Cochlea

1.1.4 The microscopic space between two adjacent neurons is a/an …

A axon.
B synapse.
C dendrite.
D cell body.

1.1.5 Study the diagram below of the life cycle of a chicken together with the statements that follow.



[Adapted from *Chicken life cycle hi-res stock photography and images – Alamy*]

i. The embryo develops outside of the female body.
ii. The embryo develops inside the female body.
iii. The yolk is the primary source of nutrition for the developing embryo.
iv. The young receive nutrition from the mother's body through the placenta.

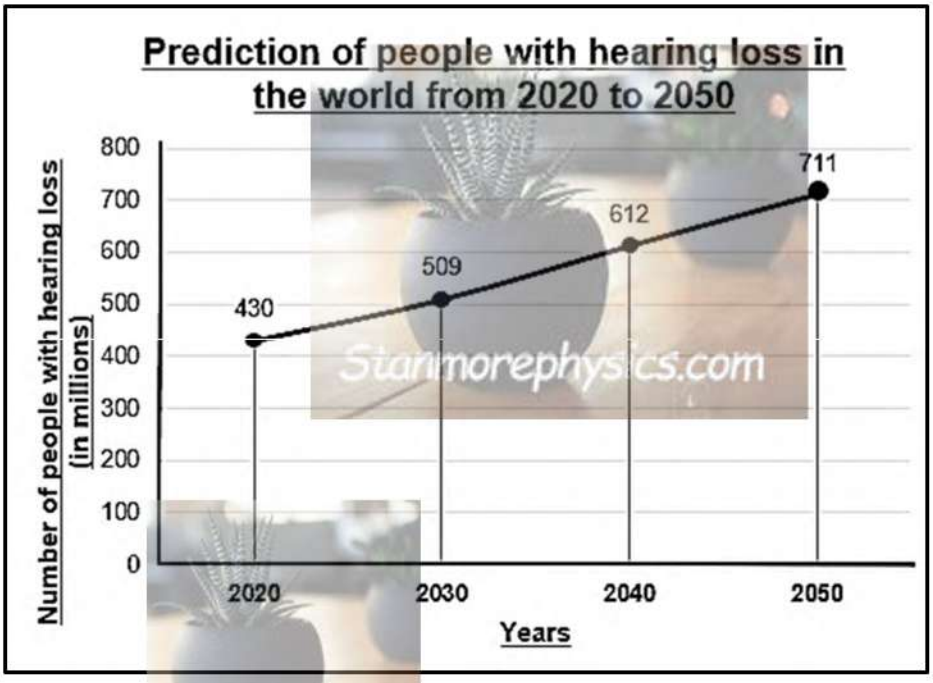
Which combination of descriptions of the reproductive strategy provided above is correct for the life cycle of the chicken?

A i and iii
B i and iv
C ii and iv
D ii and iii

1.1.6 Which statement about the body's structure and its response to changes in speed and direction of body movement is INCORRECT?

A The three semi-circular canals are positioned in three different planes (directions).
B The endolymph fluid moves in at least one of the semi-circular canals.
C The movement of endolymph fluid stimulates the maculae to generate impulses that are sent to the cerebellum.
D The cerebellum sends impulses to the skeletal muscles to restore balance.

1.1.7 Study the graph below which predicts the number of people worldwide who will suffer from hearing loss from 2020 to 2050.



What is the predicted percentage increase in hearing loss from 2020 to 2030?

A 18,37
B 65,38
C 79
D 281

1.1.8 Which part of the amniotic egg stores the waste that is produced by the developing embryo?

A Allantois
B Yolk sac
C Chorion and amnion
D Shell

1.1.9 Refer to the diagram below and choose the correct option regarding the hormone production at specific stages of the menstrual cycle.

Menstrual cycle

[Source: *https://c8.alamy.com/comp/2DHMH1G/menstrual-cycle-chart-increase-and-decrease-of-the-hormones-the-graph-also-depicts-the-growth-of-the-follicle-fluctuation-of-hormones-2DHMH1G.jpg*]

	Day 1 to 6	Day 13 to 15	Day 16 to 28
A	FSH	Oestrogen	LH
B	FSH	LH	Progesterone
C	Oestrogen	Progesterone	FSH
D	Progesterone	LH	Oestrogen

1.1.10 The table below shows the percentage of nitrogenous bases in a DNA sample. The sample contains 17 300 nucleotides.

SAMPLE	NITROGENOUS BASE			
	A	T	G	C
Percentage (%)	19	?	?	?

Which of the following shows the correct number of guanine in this sample?

A 31
B 3 287
C 5 363
D 10 726

(10 x 2) **(20)**

1.2 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers (1.2.1 to 1.2.8) in the ANSWER BOOK.

1.2.1 A receptor which receives the stimulus of sound

1.2.2 Photoreceptor cells found in the retina of the eye, which are sensitive to dim light and help with black and white vision

1.2.3 The genetic composition of an organism

1.2.4 A type of dominance where both alleles of a gene are equally dominant

1.2.5 The natural shape of the DNA molecule

1.2.6 The branch of the nervous system responsible for the fight or flight function in emergency situations

1.2.7 The structure responsible for secreting progesterone during the menstrual cycle

1.2.8 The site of meiosis in female animals (8 x 1) **(8)**

1.3 Indicate whether each of the statements in COLUMN I applies to **A ONLY**, **B ONLY**, **BOTH A and B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B**, **or none**, next to the question numbers (1.3.1 to 1.3.3) in the ANSWER BOOK.

COLUMN I		COLUMN II
1.3.1	Hormone levels during pregnancy	A: Low progesterone B: High FSH
1.3.2	Significance of meiosis	A: To introduce haploid sperm cells into the female B: To maintain a constant number of chromosomes from one generation to the next.
1.3.3	Stimulus picked up in the ear	A: Sound B: Change in position of the head relative to gravity

(3 x 2) **(6)**

1.4 Read the extract below and answer the questions that follow.

Multiple sclerosis is an autoimmune disease, where the body mistakenly attacks the brain and the spinal cord. It does this by damaging the myelin sheath, which is the protective coating around the nerves. When the myelin sheath is damaged, communication between the brain and the rest of the body is interrupted.

The resulting symptoms include extreme tiredness, loss of concentration and memory, numbness, sensitivity to heat and cold, difficulty walking and balancing, spasms, difficulty breathing, dizziness, and mood changes.

[Source: *www.mayoclinic.org/disease-conditions/multiple-sclerosis/symptoms-causes*]

1.4.1 Name TWO structures mentioned in the passage that make up the central nervous system. (2)

1.4.2 State the collective name of the membranous layers that surround the two parts mentioned in QUESTION 1.4.1. (1)

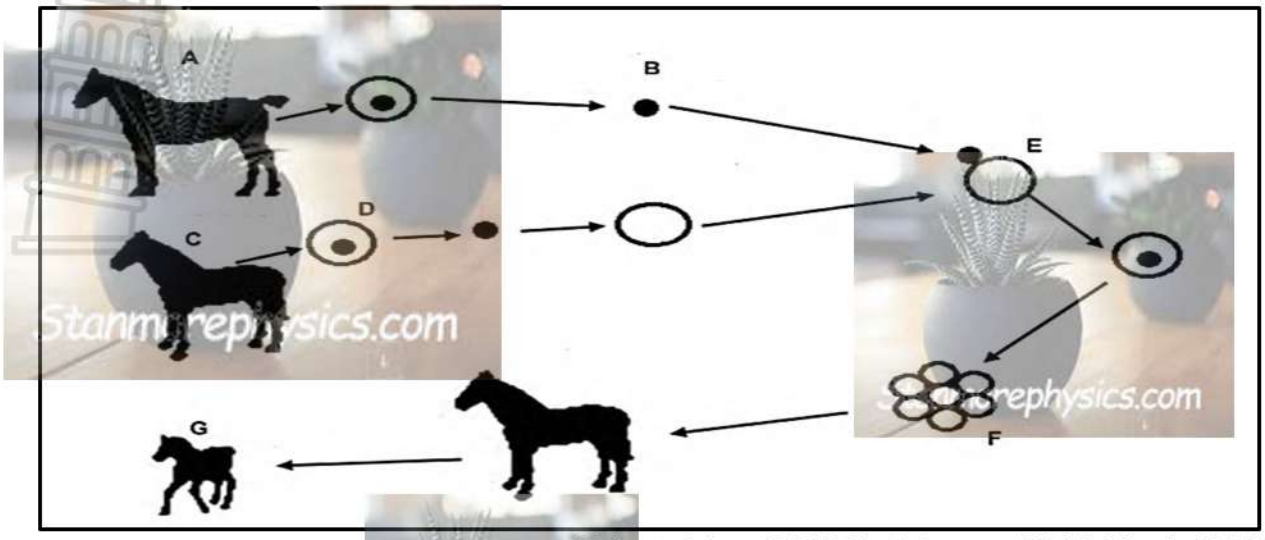
1.4.3 Identify the part of the brain that would be damaged for the following symptom to occur:

(a) Memory Loss (1)
(b) Difficulty breathing (1)
(c) Difficulty with balance (1)

1.4.4 From the passage:

(a) Name the category of disease to which multiple sclerosis belongs. (1)
(b) Name the part of the neurons that is damaged (1)
(8)

1.5 The diagram below shows a genetic engineering process. Study the diagram and answer the questions that follow.



[Adapted from DBE Life Sciences P2 Feb-March 2017]

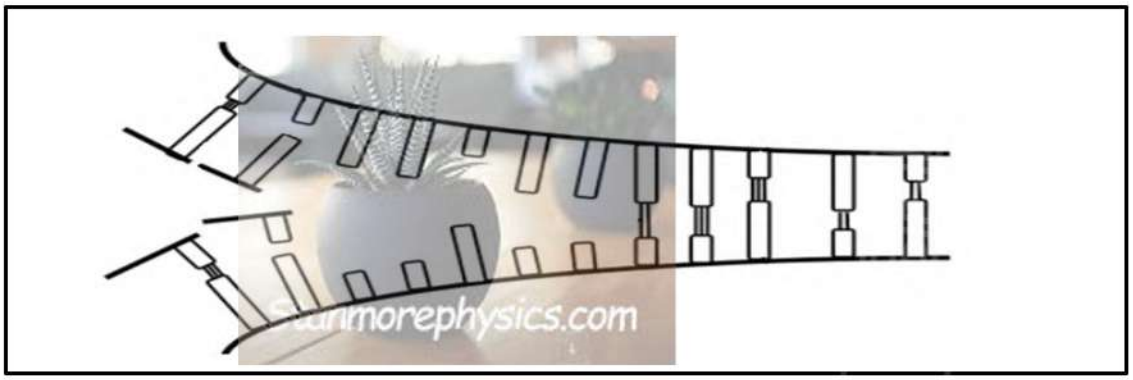
1.5.1 Name the genetic engineering process shown in the diagram above. (1)

1.5.2 Give the letter that represents:

(a) The offspring (1)
(b) The individual being cloned (1)

1.5.3 Which natural process is imitated from **E**? (1)
(4)

1.6 The diagram below shows an important process occurring in a cell. Study the diagram and answer the questions that follow.



[Adapted from DBE Life Sciences P2 Feb-March 2015]

1.6.1 Identify the process shown above. (1)

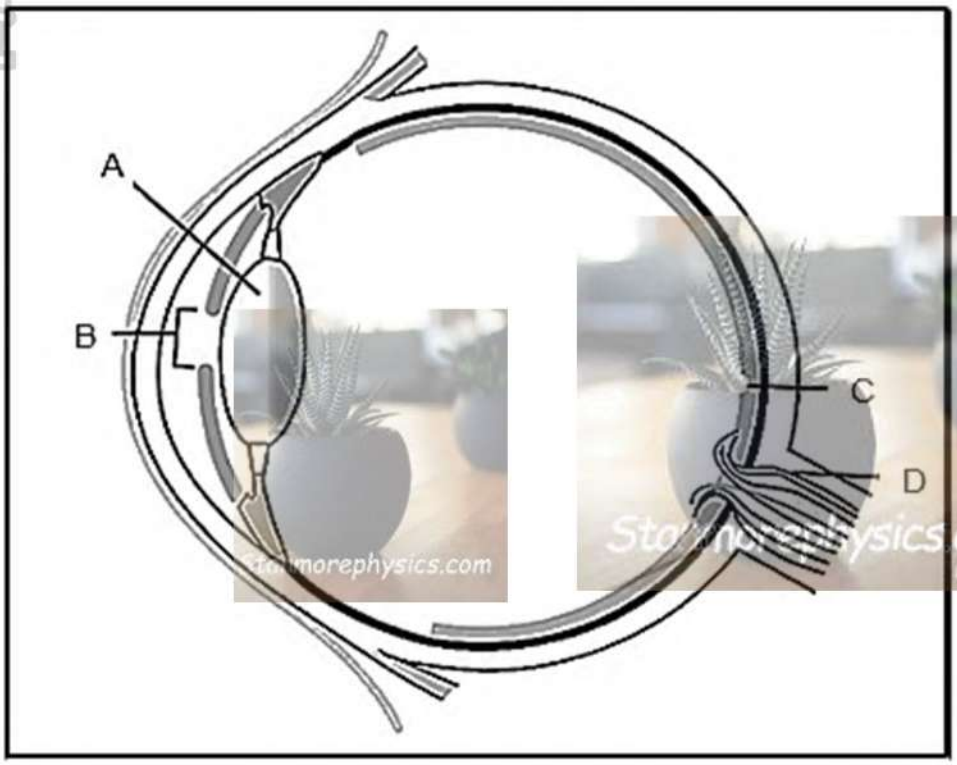
1.6.2 List THREE organelles where the process mentioned in QUESTION 1.6.1 may take place in a plant. (3)
(4)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The digram below shows the structrure of the human eye. Study the diagram and answer the questions that follow.



[Adapted from *https://www.bing.com/images/blob?bcid= qHbVluktH. oHY7w8jMPWZzqRcqxJ ...3o*]

2.1.1 Explain the structural suitability of part **C.** (2)

2.1.2 A man was looking at a distant tree and then decided to watch a TikTok video on his phone.

Identify the LETTER and NAME of the part of the eye that will be adjusted so that he can see his phone clearly. (2)

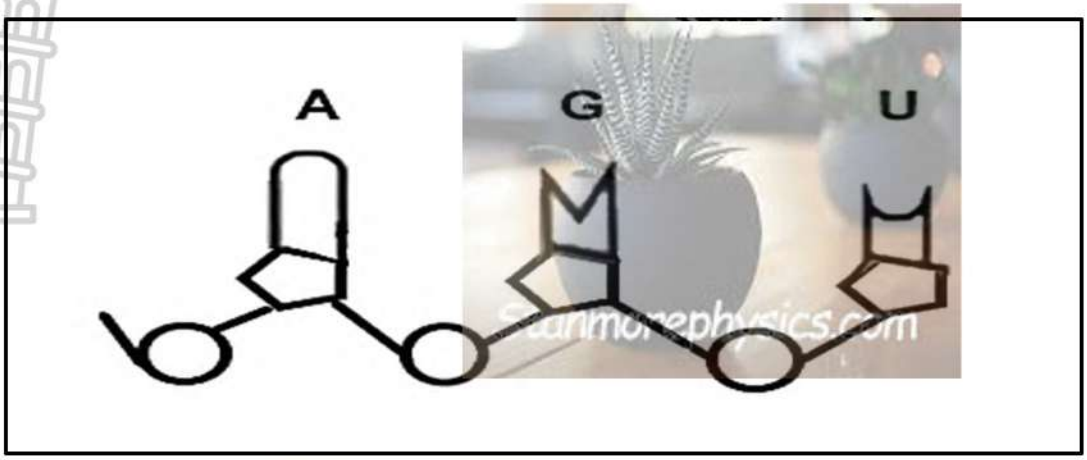
2.1.3 The phone brightness setting was high while he was watching the TikTok video.

Name and describe the mechanism of the eye that would allow the person to still be able to watch this video despite the brightness setting. (4)

2.1.4 Glaucoma is an eye condition characterised by high pressure in the eye. If left untreated it can damage the part that takes impulses to the brain, which can result in blindness.

Give the LETTER and NAME of the part that can be damaged. (2)
(10)

2.2 The diagram below shows a portion of an mRNA strand. Study the diagram and answer the questions that follow.



[Adapted from DBE Life Sciences P2 May-June 2017]

2.2.1 Write down the complementary DNA base triplet to the molecule shown above, from left to right. (1)

2.2.2 Name and describe the process that led to the production of the molecule above. (5)

2.2.3 State TWO structural differences of DNA nucleotides and RNA nucleotides. (4)

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

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

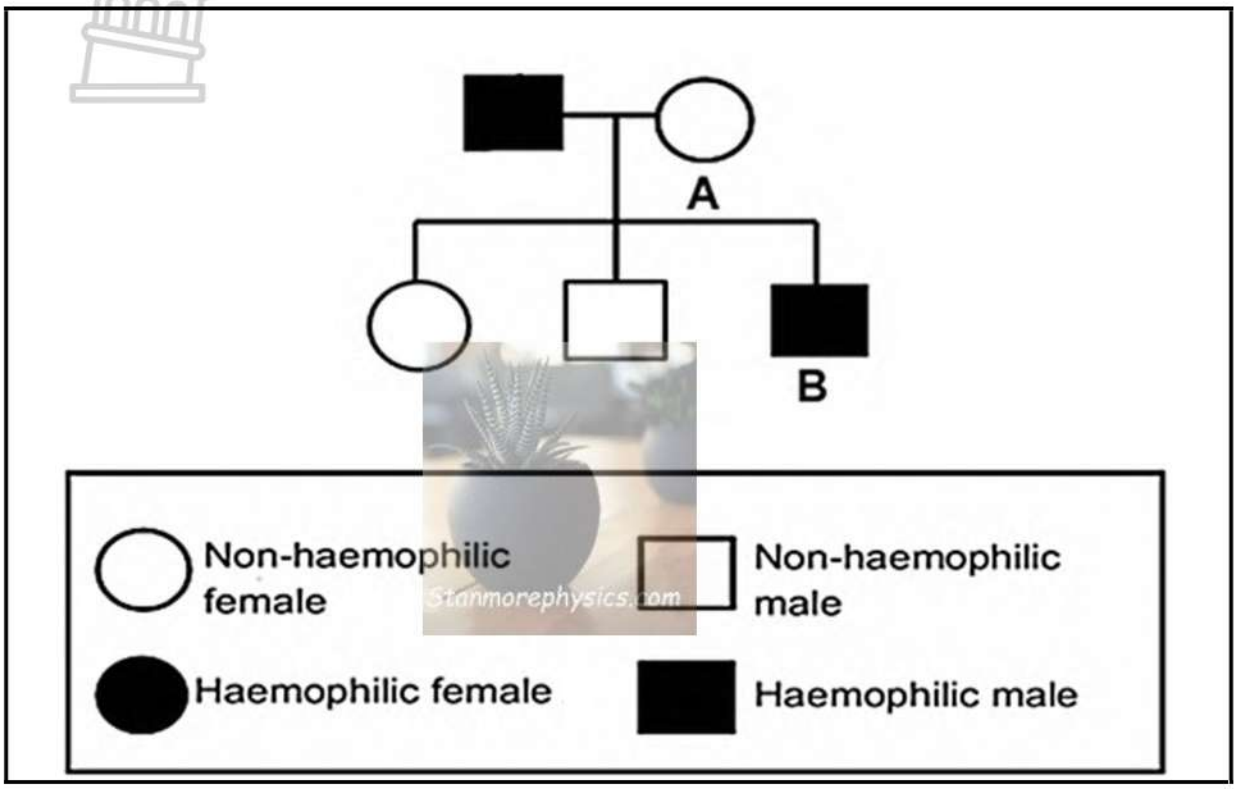
During the formation of the molecule in the diagram above, a DNA mutation occurred that changed the nitrogenous bases from AGU to AUG.

Using the table above, describe how this would affect the protein that will be formed. (3)

(13)

2.3 Haemophilia is a genetic disorder that results in the abnormal clotting of blood. It is caused by a recessive allele carried on the X-chromosome. The allele for normal clotting is X^H and the allele for haemophilia is X^h.

The inheritance of haemophilia in a family is shown in the diagram below.



[Adapted from DBE Life Sciences P2 May-June 2017 Eng]

2.3.1 Name the type of diagram shown above. (1)

2.3.2 Differentiate between the terms *gene* and *allele*. (2)

2.3.3 In the diagram above:

(a) How many generations are shown? (1)
(b) How many females are carriers of haemophilia (heterozygous)? (1)

2.3.4 Provide the possible genotype/s for individuals **A** and **B.** (2)

2.3.5 Mother **A** is expecting a baby girl. Using a genetic cross, show the percentage chance that her daughter will have haemophilia. (6)
(13)

2.4 An investigation was conducted to explore the effects of marijuana use on male fertility.

Marijuana (*Cannabis sativa*), commonly called cannabis, is widely used for both recreational and medicinal purposes. However, its impact on male fertility has raised concerns among researchers and healthcare professionals.

- A total of 400 men were selected, with two groups of 200 men each.
- One group consisted of marijuana users and the second group consisted of men who did not use marijuana.
- All 400 men were of the same ethnicity and age group.
- The measurements were conducted annually for five years.

The data collected is shown in the table below.

Parameters (Average)	Marijuana Users	Non Users	Impact on Marijuana Users
Semen Volume (mL)	2,5	3,0	Decreased
Sperm Concentration (million/mL)	40	60	Decreased
Testosterone Levels (ng/dL)	400	500	Decreased
Sperm Motility (%)	45	60	Decreased

[Adapted from *www.cannabisevidence.org*]

2.4.1 Identify:

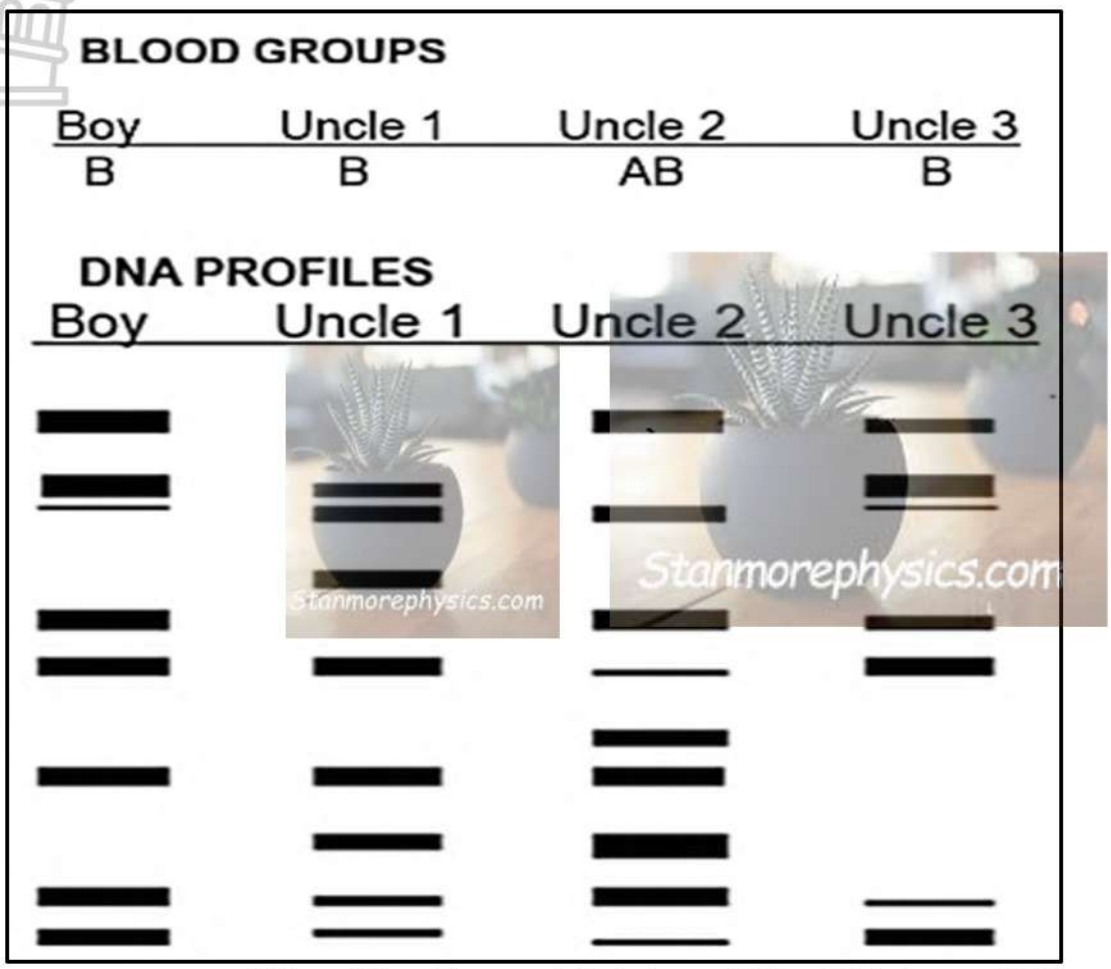
(a) The dependent variable (1)
(b) The independent variable (1)
(c) One variable that was controlled (1)

2.4.2 Identify TWO ways in which the reliability of this investigation was ensured. (2)

2.4.3 Suggest reasons why men who do not smoke were included in this investigation. (2)
(7)

2.5 A boy needs a kidney transplant. His biological mother sought help from her three brothers because her kidneys were also dysfunctional. Blood groups and DNA profiles of the boy and his three uncles were used to determine the best match for a kidney donor.

The results of the two procedures are shown below.



[Adapted from Limpopo Life Sciences P2 Pre-Trial, August 2024]

2.5.1 Name ONE other procedure in which both blood groups and DNA profiling can be used. (1)

2.5.2 Using the information provided, identify which individual is the best match for a kidney donor. (1)

2.5.3 Explain your answer to QUESTION 2.5.2 (3)

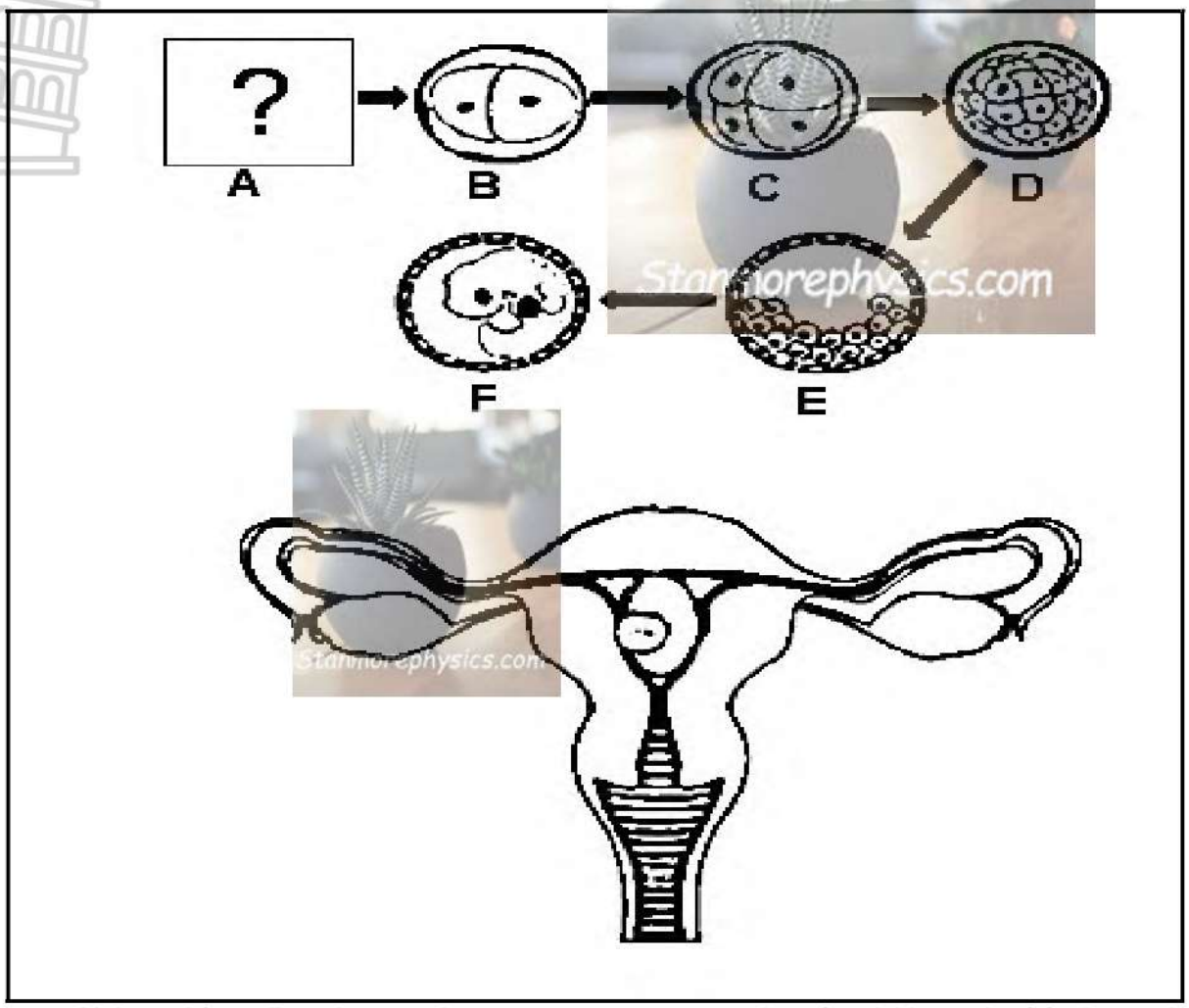
2.5.4 If the boy's maternal grandfather was blood group A, what is/are the possible blood group/s of the maternal grandmother? (2)

(7)

[50]

QUESTION 3

3.1 The diagram below shows the embryonic development in a female human. Study the diagram and answer the questions that follow.



[Adapted from *Female reproductory system anatomy chart Stock Vector by ©Sudowoodo 178166266*]

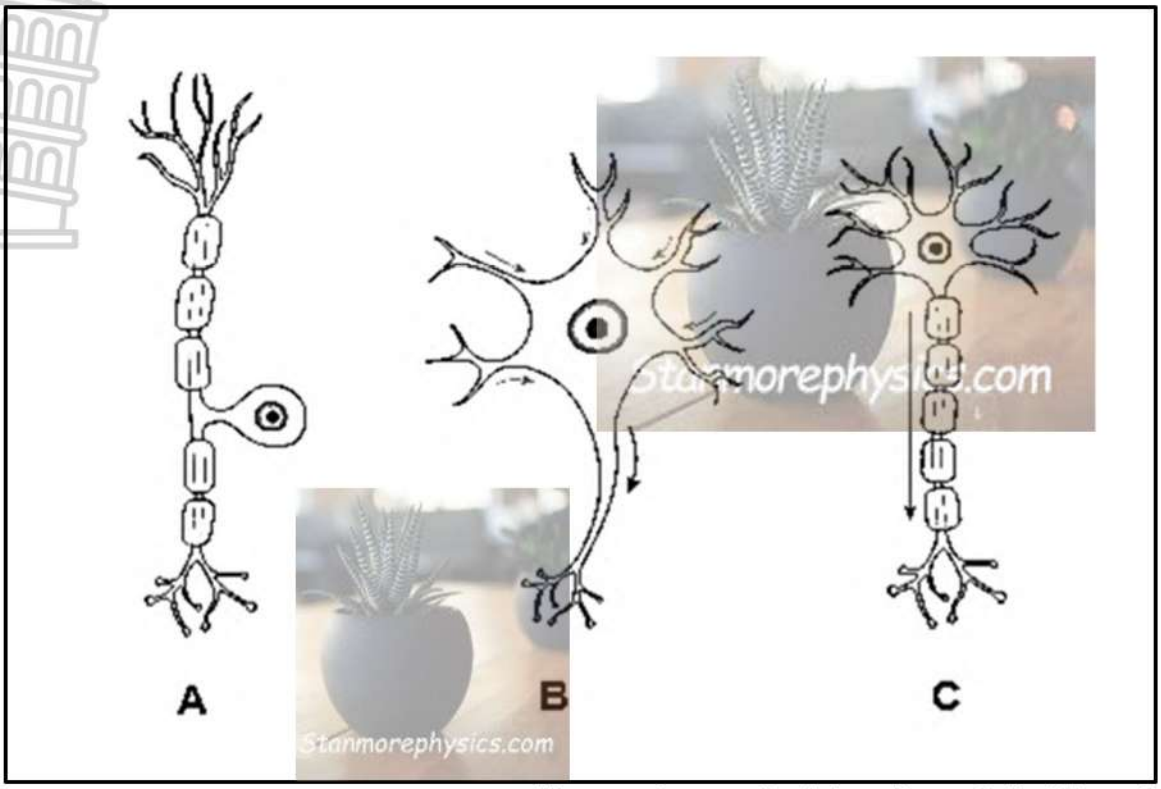
3.1.1 Name and describe structure:

(a) **D** (2)
(b) **E** (2)

3.1.2 Name and describe the process that structure **E** underwent at the uterus so that structure **F** can be positioned correctly within the uterus. (2)

3.1.3 Draw a fully labelled scientific diagram of the gamete found at **A** that would have been fertilised. (4)
(10)

3.2 The diagram below show THREE different neurons. Study the diagram and answer the questions that follow.



[Source: *Lesson Explainer: Nerve Cells* | *Nagwa*]

3.2.1 Identify neurons **A** and **C**. (2)

3.2.2 Define *a reflex action*. (2)

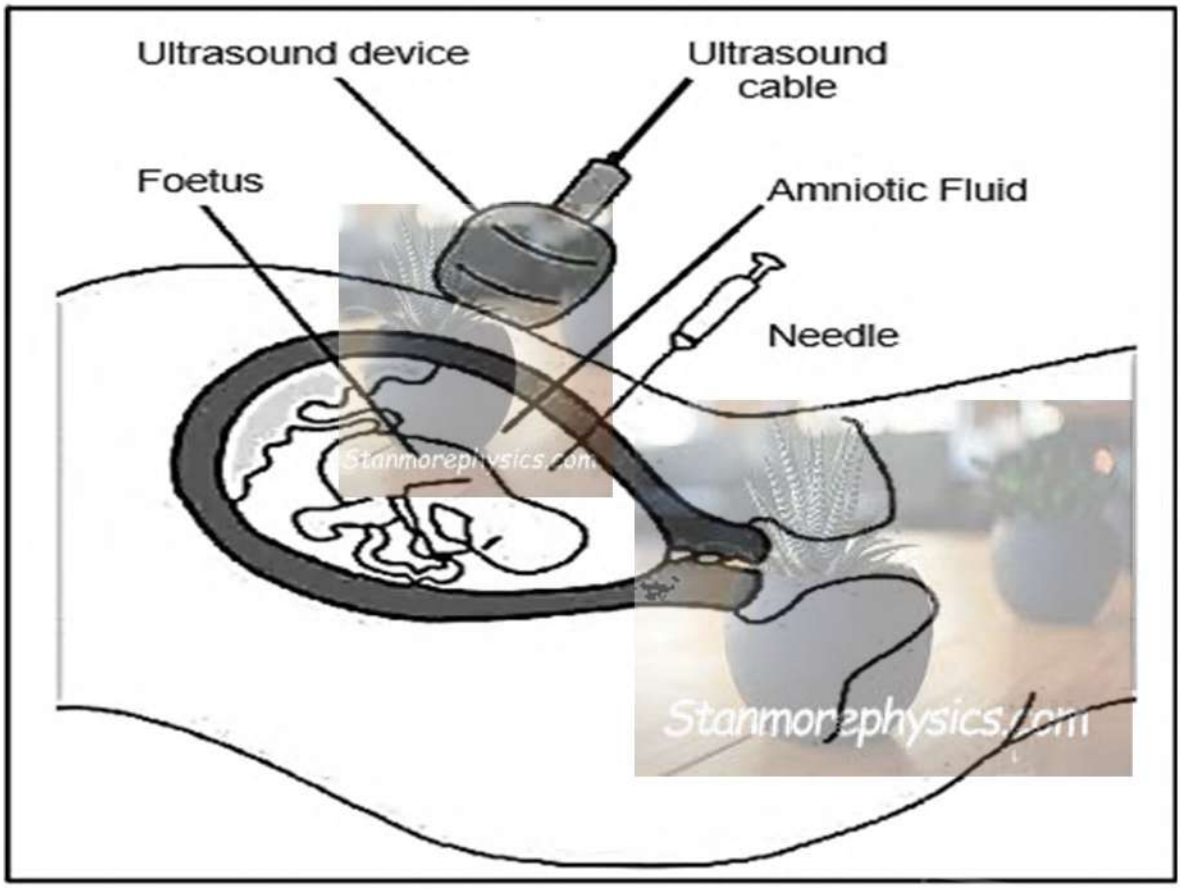
3.2.3 Tshepo's mother had just removed the pot after cooking when he accidentally touched the hot store plate.

Describe the pathway that the impulse would take in response to the stimulus, so that he would remove his hand quickly and avoid severe injury. (5)

3.2.4 Name the pathway described in QUESTION 3.2.3 (1)
(10)

3.3 Study the information below and answer the questions that follow.

Amniocentesis is a test that may be offered during pregnancy to check if a child has a genetic or chromosomal condition, such as Down's syndrome. Guided by an ultrasound (a device that provides an image of the interior of the body), the healthcare provider inserts a thin, hollow needle through the abdominal wall and into the uterus. A small amount of amniotic fluid which contains some foetal cells, is drawn into a syringe. The needle is then removed.



[Adapted from *https://www.swus.com.au/sites/swus.com.au/files/amnio.jpg*]

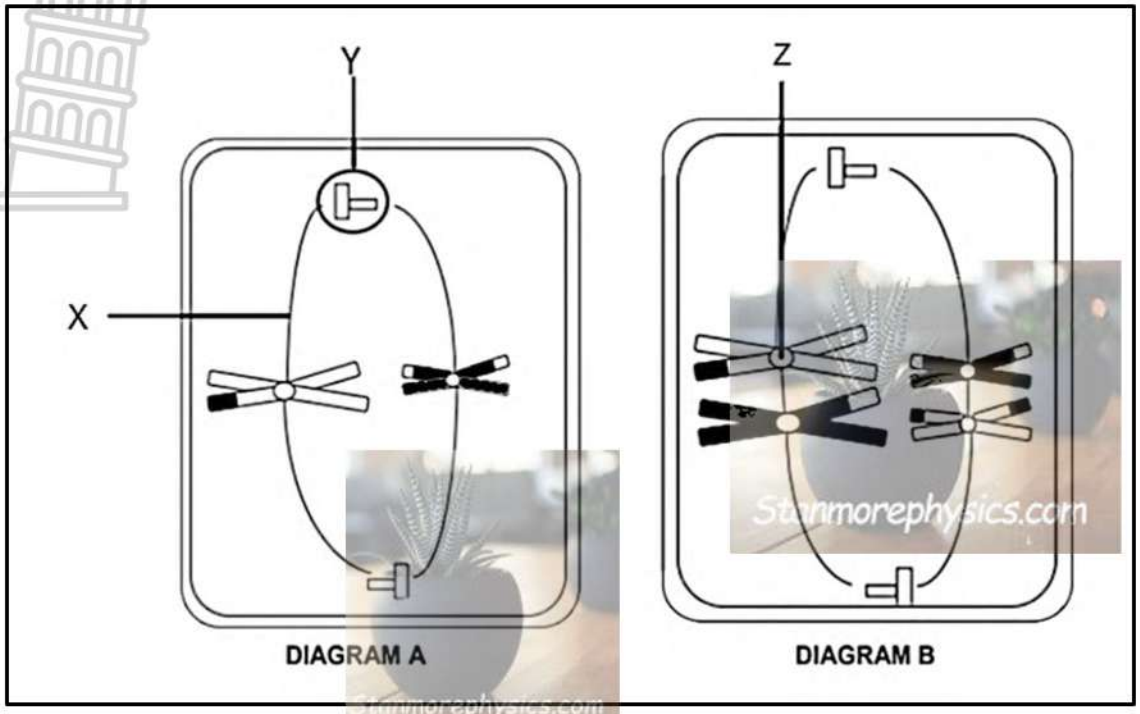
3.3.1 Using the information given, state the purpose of an amniocentesis. (1)

3.3.2 Name TWO membranes which can rupture that surround the foetus. (2)

3.3.3 State TWO functions of amniotic fluid. (2)

3.3.4 State the difference in the genetic composition of a baby with Down's syndrome compared to an unaffected baby. (2)
(7)

3.4 The diagrams below show two phases of meiosis in a plant cell. Study the diagrams and answer the questions that follow.



3.4.1 Identify parts labelled **X**, **Y** and **Z** respectively. (3)

3.4.2 Tabulate TWO differences between *meiosis I* and *meiosis II*. (5)

3.4.3 Describe the term *non-disjunction*. (2)

3.4.4 Name the phase that will follow immediately after the phase represented by diagram **B.** (1)

3.4.5 Non-disjunction occurs in the phase mentioned in QUESTION 3.4.4.

Compare the number of chromosomes that will be present in each cell at the end of telophase I. (2)
(13)

3.5 Bt cotton is a crop that has been genetically modified to be insect-resistant.

Scientists conducted an investigation which compared the crop yield of Bt and non-Bt cotton between 1999 and 2007 in a certain country. However, due to unforeseen circumstances the results of the years; 2002, 2003 and 2005 were not recorded.

The table below shows the data from the investigation.

YEAR	BT COTTON (g/m^2)	NON-BT COTTON (g/m^2)
1999	330	350
2000	300	180
2001	340	300
2004	270	170
2006	330	250
2007	290	230

[Adapted from *https://www.researchgate.net/publication/235251419*]

3.5.1 State the aim of this investigation. (2)

3.5.2 Explain ONE financial benefit that farmers will have when using Bt cotton. (2)

3.5.3 Draw a line graph on the same set of axes to represent the crop yield of Bt and non-Bt cotton from 1999 to 2001. (6)

(10)

[50]

TOTAL SECTION B: 100

TOTAL: 150

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JUNE EXAMINATION
GRADE 12

2025

MARKING GUIDELINES

LIFE SCIENCES

11 pages

PRINCIPLES RELATING TO THE MARKING OF LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks are reached and place a wavy line and 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark only the first three irrespective of whether all or some are correct/incorrect.

3. **If whole process is given when only part of it is required**
   Read all and credit relevant part.

4. **If comparisons are asked for and descriptions are given**
   Accept if differences/similarities are clear.

5. **If tabulation is required but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links become correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognisable, accept, provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
Accept, provided it was accepted at the memo discussion meeting.

14. **If only the letter is asked for, but only the name is given (and vice versa)**
Do not credit.

15. **If units are not given in measurements**
Candidates will lose marks. Marking guidelines will allocate marks for units separately.

16. **Be sensitive to the sense of an answer, which may be stated in a different way.**

17. **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.

18. **Code-switching of official languages (terms and concepts)**
A single word or two that appear(s) in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited, if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.

19. **Changes to the marking guidelines**
No changes must be made to the marking guidelines without consulting the provincial internal moderator.

Additional notes:

NB these are to assist markers, some content is as a concession and should not be indicated/taught to learners.

Wherever there are two ticks at the end of a response, it is two or nothing, learners cannot get one mark for an incomplete response.

If a learner gives two processes when one is asked for, mark the first process and ignore the second irrespective of which is correct.

Markers are reminded to read and apply ALL 19 marking principles which are at the start of the marking guidelines.

QUESTION 1
Q1.1
If a learner gave more than one answer, no marks will be awarded irrespective of whether the first is correct. E.g. 1.1.3 C /D X
Q1.2
If the learner gives any slashes, no marks will be awarded irrespective of whether the first is correct. E.g. 1.2.2 Rods /cones X
1.2.3 Genome not accepted. The genome is the **entire** set of DNA instructions found in a cell (all chromosomes). The genetic composition of an organism is the genotype.
1.2.6 No mark for Autonomic … as the question states **"in** emergency situations"
Q. 1.3

1.3.2 Accept just B✓✓ (without only)
1.3.3. Accept Both✓✓ (without A and B), A and B✓✓ (without both); A, B✓✓
No mark for A/B X

QUESTION 2

2.1.1. Second bullet accept **clearest** image✓
2.1.3 Bullet 1 and 2 MUST include the word iris in at least one of them
2.2.2. Both double helix AND DNA need to be there for the mark.
The last bullet MUST have RNA nucleotides (not just nucleotides)
2.2.4 accept: the wrong protein is formed✓.
No mark for: a new protein is formed X
No mark for: no protein is formed. X
2.3.4 Accept X^h X^H as a concession (heterozygous is still shown)
2.3.5 No mark for P2 and F2.
Phenotype: NO mark for Normal/affected/unaffected. NO mark if the sex/gender is not included with haemophilia/haemophiliac. NO mark if genotype reference is included in the phenotype e.g Heterozygous Non-haemophilic femaleXX
Phenotype: Accept references to gender e.g Haemophilic father x Non-haemophilic mother✓
Accept male with haemophilia etc. (in place of haemophiliac.)
2.4.1 (b) The word use MUST be there. NO mark if the learner wrote "**effect of** marijuana use" XX
2.5.1 Accept: maternity testing✓

QUESTION 3

3.1.2 Accept: The embryo/blastocyst/blastula sinks into the endometrium ✓ (for the second bullet).
3.1.3 Drawing (D)- Accept if the cell membrane is rounded but the jelly layer is uneven
Labels (L)- Accept zona pellucida/corona radiata
Only credit for the labels given in the marking guidelines.
3.2.3 NO marks for an answer given as a flow diagram
The synapse mark can be given at a number of places, but the other bullets sequence is important.
3.3.4 accept: Down Syndrome – has an extra chromosomes at pair 21 ✓/trisomy 21
For Normal human- the learner has to indicate 2 chromosomes at pair 21 ✓
3.5.1 A variety of verbs could be acceptable. e.g To show, to prove, to compare, to investigate etc.
The aim cannot be in the past tense and cannot be stated as a question.

SECTION A

QUESTION 1

1.1 1.1.1 D ✓✓

1.1.2 D ✓✓

1.1.3 C ✓✓

1.1.4 B ✓✓

1.1.5 A ✓✓

1.1.6 C ✓✓

1.1.7 A ✓✓

1.1.8 A ✓✓

1.1.9 B ✓✓

1.1.10 C ✓✓

(10 x 2) **(20)**

1.2 1.2.1 Organ of Corti ✓

1.2.2 Rods ✓

1.2.3 Genotype ✓

1.2.4 Co-dominance ✓

1.2.5 Double helix ✓

1.2.6 Sympathetic ✓nervous system

1.2.7 Corpus luteum ✓

1.2.8 Ovaries ✓/Ovary

(8 x 1) **(8)**

1.3 1.3.1 None ✓✓

1.3.2 B only ✓✓

1.3.3 Both A and B ✓✓

(3 x 2) **(6)**

1.4 1.4.1 - Spinal Cord ✓ and Brain ✓
(Mark first TWO only) (2)

1.4.2 Meninges ✓ (1)

1.4.3 (a) Cerebrum✓ (1)
(b) Medulla oblongata✓ (1)
(c) Cerebellum ✓ (1)

1.4.4 (a) Autoimmune ✓ (1)
(b) Myelin sheath ✓ (1)
(8)

1.5 1.5.1 Cloning✓ (1)

1.5.2 (a) G✓ (1)
(b) A✓ (1)

1.5.3 Fertilisation✓ (1)
(4)

1.6 1.6.1 DNA replication ✓ (1)

1.6.2 - Nucleus ✓
- Mitochondrion ✓ /Mitochondria
- Chloroplast ✓
(Mark first THREE only) (3)
(4)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 2.1.1 - It has the highest concentration of cones (photoreceptors) ✓/only has cones
- to create clearest vision ✓ (2)

2.1.2 - A ✓ lens ✓ (2)

2.1.3 Pupillary mechanism ✓ * (compulsory mark)
- radial muscles of the iris relax ✓
- circular muscles of the iris contract ✓
- the pupil constricts ✓
- the amount of light entering the eye is reduced ✓

1 *compulsory mark + any 3 (4)

2.1.4 - D ✓ optic nerve ✓ (2)
(10)

2.2 2.2.1 TCA ✓ (1)

2.2.2 Transcription✓*
- The double helix DNA unwinds✓
- 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✓

1*complementary mark + any 4 (5)

2.2.3 - DNA has deoxyribose sugar ✓ and RNA has ribose sugar ✓
- DNA has thymine ✓ and RNA has uracil ✓

(Mark first TWO only) (4)

2.2.4 - The DNA base triplet changes from TCA to TAC ✓
- the tRNA anti-codon changes from UCA to UAC ✓
- Amino acid will change from Serine to Methionine ✓
- a different protein will be formed ✓ Any 3 (3)
(13)

2.3 2.3.1 Pedigree ✓ diagram (1)

2.3.2 - A gene is a segment of DNA (in a chromosome) that contains the code for a particular characteristic ✓/protein
- Alleles are alternative forms of a gene ✓ that occur at the same locus on homologous chromosomes (2)

2.3.3 (a) Two ✓ /2 (1)
(b) Two ✓ /2 (1)

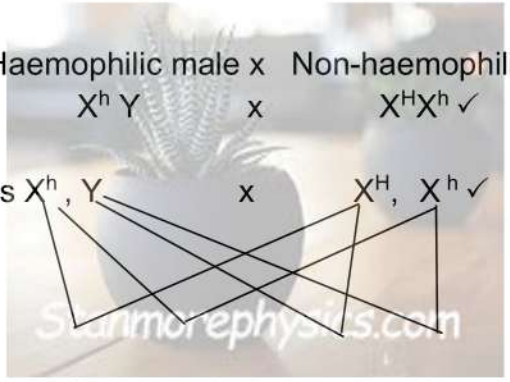
2.3.4 **A** – $X^H X^h$ ✓
B – $X^h Y$ ✓ (2)

2.3.5 **P_1**

Phenotype: Haemophilic male x Non-haemophilic female ✓
Genotype: $X^h Y$ x $X^H X^h$ ✓

Meiosis

G/gametes X^h, Y x X^H, X^h ✓



Fertilisation

F_1 Genotype: $X^H X^h$; $X^h X^h$ ✓; ($X^H Y$; $X^h Y$)
Phenotype: Non-haemophilic female; haemophilic Female ✓; (non-haemophilic male; haemophilic male)
50% ✓* haemophilic female

P_1 and F_1 ✓
Meiosis and Fertilisation ✓ * **compulsory** + Any 5

OR

P_1

Phenotype: Haemophilic male x Non-haemophilic female ✓
Genotype: $X^h Y$ x $X^H X^h$ ✓

Meiosis

Fertilisation

Gametes	X^H	X^h
X^h	$X^H X^h$	$X^h X^h$
Y	($X^H Y$)	($X^h Y$)

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype: Non-haemophilic female; haemophilic Female ✓(; non-haemophilic male; haemophilic male)
50% ✓* haemophilic female

P_1 and F_1 ✓
Meiosis and Fertilisation ✓ * **compulsory** + Any 5 (6)
(13)

2.4 2.4.1 (a) Male fertility ✓ (1)
(b) Marijuana use ✓/Cannabis use (1)
(c) -Number of men per group ✓/ 200 participants per group (1)
- Ethnicity ✓
- Age group ✓
- Duration of investigation for both groups ✓
(Mark first ONE only)

2.4.2 - A sample of 200 men was used ✓
- The investigation was conducted for five years ✓
(Mark first TWO only) (2)

2.4.3 Acts as a control group ✓/increases validity
To compare fertility of those who smoke marijuana ✓
To confirm if male fertility is affected by the use of marijuana ✓ Any 2 (2)
(7)

2.5 2.5.1 Paternity testing ✓ (1)

2.5.2 Uncle 3 ✓ (1)

2.5.3 - Four/more bands of the boy match with the bands of Uncle 3's ✓ DNA profile
- Only two/fewer bands match with uncle 1's DNA profile ✓
- both are blood group B ✓ / Uncle 2's blood group does not match. (3)

2.5.4 Type B ✓ OR
Type AB ✓
(Mark first TWO only) (2)
(7)
[50]

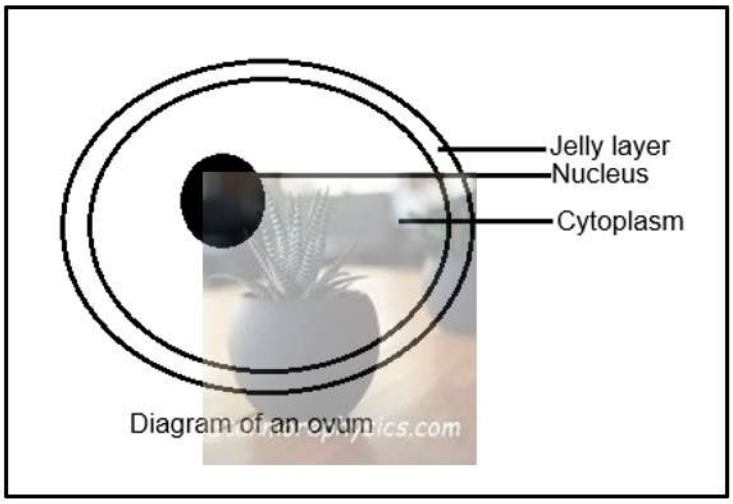
QUESTION 3

3.1 3.1.1 (a) Morula ✓ – solid ball of cells ✓ (2)

(b) Blastula ✓/Blastocyst
hollow ball of cells✓/fluid filled ball of cells (2)

3.1.2 - Implantation ✓
- The embryo/blastocyst/blastula attaches (using the chorionic villi) to the endometrium ✓ (2)

3.1.3



Criterion	Elaboration	Symbol	Mark
Caption	"Ovum" mentioned	C	1 Mark
Drawing	Rounded ovum cell drawn with a nucleus.	D	1 Mark
Labels	Any 1 correct Any 2 correct	L	1 mark 2 marks
			Total: 4 marks

(4)
(10)

3.2 3.2.1 A – Sensory ✓ neuron
C – Motor ✓ neuron (2)

3.2.2 A quick, automatic response to a stimulus ✓✓ (2)

3.2.3 - The nerve impulse is transmitted along the sensory neuron ✓
- through the dorsal root ✓
- to an interneuron ✓ in the spinal cord
- via a synapse, ✓
- Then to the motor neuron ✓ exiting
- via the ventral root ✓
- to the effector. ✓ Any 5 (5)

3.2.4 - Reflex arc✓ (1)
(10)

3.3 3.3.1 - It is to detect a genetic/chromosomal condition ✓ during pregnancy. (1)

3.3.2 - Chorion ✓ and Amnion ✓
(Mark First TWO only) (2)

3.3.3 - Protects the foetus against mechanical injury ✓/shock-absorber
- Prevents dehydration of the foetus ✓
- Maintains the temperature of the foetus ✓
- Allows for free-movement of the foetus ✓ as it grows and develops
(Mark First TWO only) Any 2 (2)

3.3.4 Down Syndrome – has 3 chromosomes at pair 21 ✓
Normal human – has 2 chromosomes at pair 21 ✓ (2)
(7)

3.4 3.4.1 - X – Spindle fibre ✓ /spindle thread
- Y – Centrosome ✓/centriole
- Z – Centromere ✓ (3)

3.4.2

Meiosis I	Meiosis II ✓
Crossing over takes place ✓	Crossing over does not take place ✓
In prophase/metaphase, Chromosomes arranged in homologous pairs ✓	In prophase/metaphase, chromosomes are arranged individually ✓
(Whole) chromosomes move to opposite poles of the cell ✓	Chromatids move to opposite poles of the cell ✓
Two cells are formed at the end of this division ✓	Four cells are formed at the end of this division ✓
The chromosome number is halved ✓	The chromosome number remains the same ✓
*** Table must have correct column headings or no mark will be awarded for tabulation.**	
(Mark first TWO only) Any 2 x 2 + 1 Table	

(5)

3.4.3 When chromosomes/chromatids fail to separate ✓ during anaphase✓ (2)

3.4.4 Anaphase I✓ (1)

3.4.5 - One cell will have three ✓ chromosomes.
- Another cell will have one ✓ chromosome.

OR

- One cell will have four ✓ chromosomes.
- Another cell will have none ✓ chromosome. (2)

OR

- One cell with an extra chromosome ✓
- One cell with one less chromosome ✓

(13)

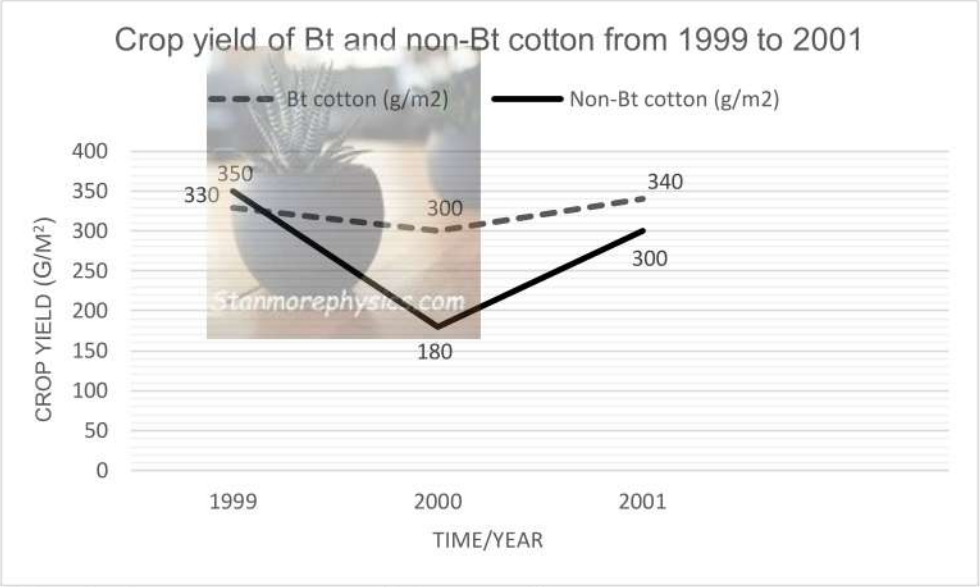
3.5 3.5.1 To determine the crop yield of Bt and non-Bt cotton ✓✓ over time in a certain country.
(Must have To, a verb and both variables) (2)

3.5.2
- An increase in crop yield ✓, will increase profit ✓ since more cotton is sold.
- Less use of insecticides ✓ thus saving money from buying insecticide ✓

(MARK FIRST ONE)

(2)

3.5.3



Criteria for assessment of the graph

Criterion	Elaboration	Symbol	Marks
Type of graph	DOUBLE Line graph drawn	(T)	1
Caption	Includes Crop yield of Bt AND non-Bt cotton AND specific years (1999-2001)	(C)	1
Axes labels	Correct label for x-axis and y-axis (including unit g/m^2)	(L)	1
Scale	Consistent scale and spacing on x and y-axes	(S)	1
Plotting	1 to 5 points correctly plotted ONLY 6 points correctly plotted (1999-2001)	(P)	1 2
		TOTAL:	**6**

(6)

- If any points for 2004 to 2007 are plotted, allocate only 1 mark for plotting (P).
- If a bar graph/histogram is drawn, the candidate will lose the marks for type (T) AND scale (S).
- If the axes are swapped/transposed, the candidate will lose marks

for axes labels (L) and Plotting (P).

- If the years are not in the correct order, no marks will be awarded for scaling (S) but the plotting (P) can be awarded if it corresponds correctly.
- If the two lines are not labelled (BT cotton and Non-BT cotton) no marks will be awarded for plotting (P).

(10)
[50]

TOTAL SECTION B: 100

TOTAL: 150