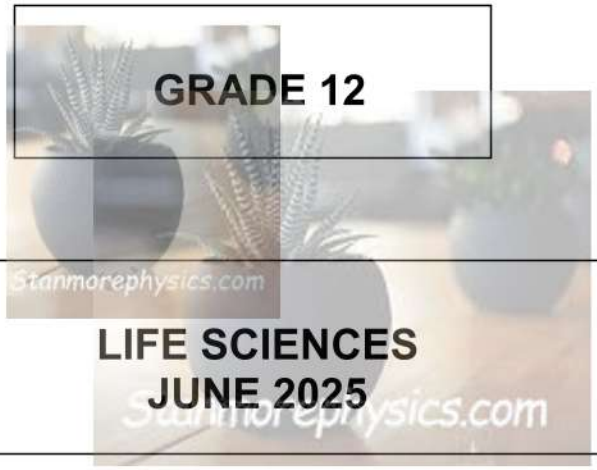
education

MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12



LIFE SCIENCES
JUNE 2025

Stanmorephysics.com

MARKS: 150
TIME: 2½ HOURS

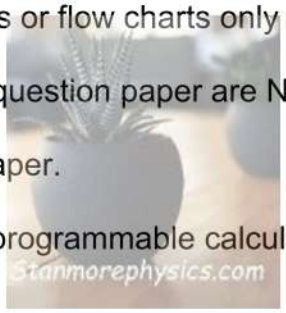
This question paper consists of 17 pages.

Copyright reserved

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 to the numbering system used in the 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, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass, where necessary.
11. Write neatly and legibly.



Copyright reserved

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 to 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 Calculate the percentage of Guanine in a DNA molecule if Thymine and Adenine makes up 72% of the DNA molecule.

A 14%
B 28%
C 72%
D 7%

1.1.2 The table below shows the number of each type of nitrogenous base that occurs in some nucleic acid molecules. The letters **W**, **X**, **Y** and **Z** represent each of the four types of nitrogenous bases.

	W	**X**	**Y**	**Z**
Molecule 1	98	76	54	108
Molecule 2	715	523	523	715
Molecule 3	78	95	95	87
Molecule 4	103	89	89	103

Which ONE of the following combinations correctly refers to the type of nucleic acid represented by the molecules numbered **1** to **4**?

	Molecule 1	**Molecule 2**	**Molecule 3**	**Molecule 4**
A	RNA	RNA	DNA	DNA
B	DNA	DNA	RNA	RNA
C	RNA	DNA	RNA	DNA
D	DNA	RNA	RNA	DNA

1.1.3 The correct sequence of phases that results in the formation of two genetically unidentical cells.

A Prophase I → Prophase II → Metaphase I → Anaphase
B Prophase II → Anaphase I → Telophase II→ Metaphase I
C Prophase I →Metaphase I→Anaphase I→Telophase I
D Prophase II→Metaphase II→Anaphase II→Telophase II

1.1.4 Which of the following hormones is inhibited should fertilisation occur?

A Oestrogen.
B Progesterone.
C Follicle stimulating hormone.
D Luteinizing hormone.

1.1.5 The following structures combine to form the placenta.

A Chorionic villi and endometrium
B Chorionic villi and amnion
C Chorionic villi and allantois
D Chorionic villi and maternal sinuses

Stanmorephysics.com

1.1.6 Four different blood groups are possible in the children if the parents blood groups are ...

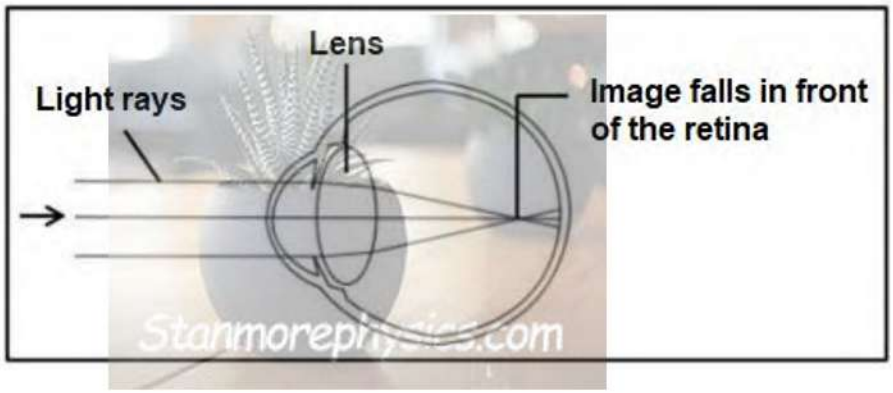
A AB and O.
B A and B.
C O and B.
D B and AB.

Stanmorephysics.com

1.1.7 Polydactyly (an extra finger) in humans is rare but it is due to a dominant allele. When one parent is normal and the other parent is homozygous for polydactyly, what is the chance that their children will be normal?

A 0%
B 25%
C 50%
D 75%

1.1.8 The diagram below shows a visual defect



How can this visual defect be corrected

A Surgery to replace the lens with a synthetic lens.
B Wearing glasses with lenses shaped to correct the distortion.
C Wearing glasses with biconvex lens.
D Wearing glasses with biconcave lens.

1.1.9 Parents will often tell children NOT, for even a few minutes, to stare at the sun because…

A bright light causes damage to the retina.
B the bright light will damage the sclera.
C it dries out the aqueous humour
D the light energy changes to heat energy in the eye.

1.1.10 Which of the following would be affected by a disease that damages the autonomic nervous system?

A The ability to move the arms and legs.
B The heart rate and breathing rate.
C Hearing and sight.
D Higher thought processes

(10 X 2) **(20)**

Copyright reserved

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 1.2.9) in the ANSWER BOOK

1.2.1 The sudden change in the sequence of nitrogenous bases on a DNA molecule.

1.2.2 The sugar portion found in RNA.

1.2.3 A mechanism that allows exchange of genetic material in order to bring about variation amongst species.

1.2.4 The strong membrane on the inside of the chorion that surrounds the amniotic cavity

Stanmorephysics.com

1.2.5 The male sex gland enclosed in the scrotum and suspends outside the male body

1.2.6 The cyclical changes in the ovary, that leads to ovulation and the formation of corpus luteum

1.2.7 The type of inheritance where the allele is carried only on the X-chromosome

1.2.8 Auto- immune condition that destroys the myelin sheath of the neurons of the brain and spinal cord.

1.2.9 A thin, dark, pigmented, vascular layer in the eye that provides the cells with oxygen and nutrients.

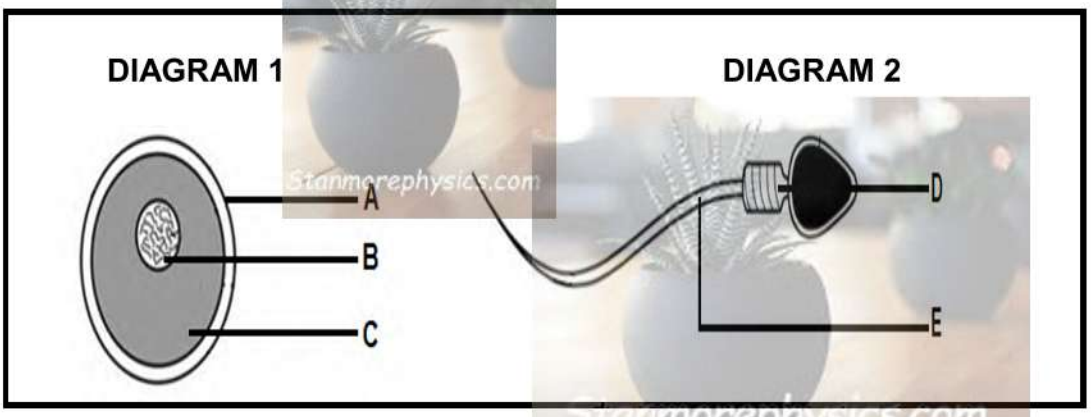
(9 X 1) **(9)**

1.3 Indicate whether each of the descriptions in COLUMN I apply 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 Diploid product of fertilization	A: Zygote B: Morula
1.3.2 Genetic disorder caused by absence of clotting factor	A: Haemophilia B: Colour blindness
1.3.3 Conduct impulses from the central nervous system to the involuntary muscles	A: Somatic nervous system B: Autonomic nervous system

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

1.4 The diagrams below represent both the female and male gametes.



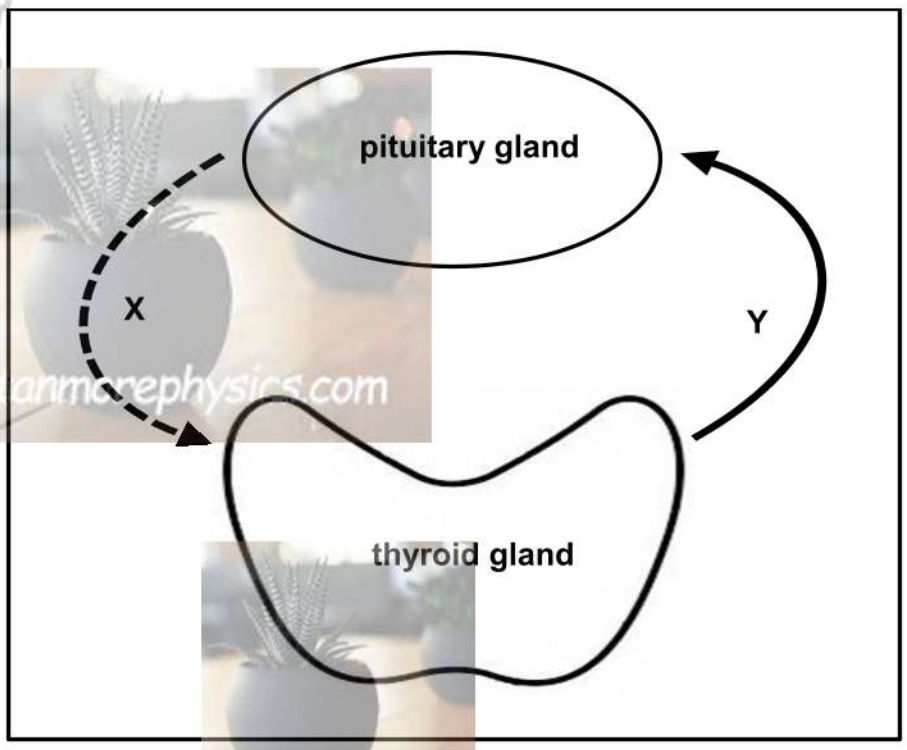
1.4.1 Name the parts labelled **A**, **C** and **E**. (3)

1.4.2 Provide the function of part labelled **B**. (1)

1.4.3 How is part **D** structurally suited to carry out its function? (2)

1.4 State ONE similarity between **DIAGRAM 1** and **DIAGRAM 2**. (1)
(7)

1.5 The diagram below represents an interaction between the pituitary gland and the thyroid gland to bring about homeostasis in the human body.



1.5.1 Identify hormone **X** and **Y**. (2)

1.5.2 State the position of the pituitary gland in the human body. (1)

1.5.3 Give the function of the pituitary gland when the levels of hormone **Y** in the blood is low. (2)

1.5.4 What will the consequence for a person be if the levels of hormone **Y** will remain high for an extended period of time? (2)

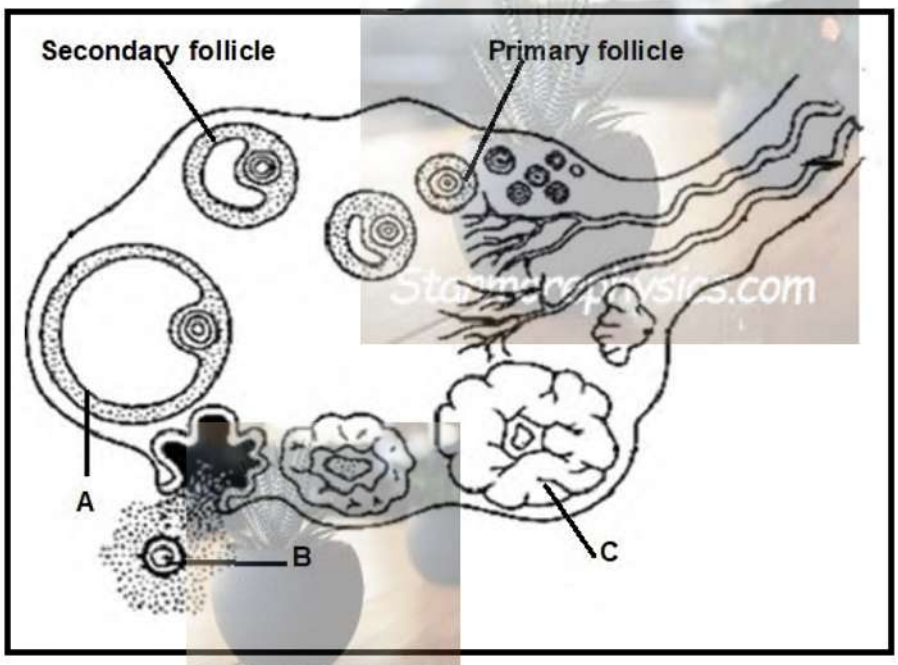
1.5.5 Name ONE hormone, other than hormone **X**, that are secreted by the pituitary gland (1)

(8)

TOTAL SECTION A: [50]

SECTION B
QUESTION 2

2.1 The diagram below shows events in the ovary of a human female during the menstrual cycle.



Stanmorephysics.com

2.1.1 Name the hormone responsible for the:

(a) Formation of structure **A** (1)

(b) Release of structure **B** (1)

2.1.2 Give the number of chromosomes found in the nucleus of structure **B**. (1)

2.1.3 Explain the implications for the ovarian cycle if structure **C** degenerates. (3)

2.1.4 Ovariotomy is a term used to describe the surgical removal of only the ovaries. They can be removed due to certain illnesses such as cancer.

Explain why a female who had an ovariotomy will not menstruate**.** (4)

2.1.5 Give the name of the gland, and the role this gland plays in the development of follicles (3)
(13)

2.2 Study the extract below and answer the questions that follow.

1. Researchers have found that *Chondrichthyes* (including sharks and rays) show a variety of reproductive strategies showing the evolution of this group of animals.

2. All of these species has been found to mate through copulation. However, the difference lies in the development of the embryos.
In original species, that lives in deeper waters close to the ocean floor and have smaller body sizes, the female lays eggs in a horny capsule called "mermaids purses" and attach them with filaments to seaweed.

3. Some develops a membrane-like egg around 3 to four embryos which are stored inside the female body for between 1 and 2 years. The embryos feed of a yolk sac, amniotic fluid or sometimes stronger embryos will even consume weaker individuals. When embryos reach full development the female expel the young into the ocean water by means of contractions. These species live in medium depth to shallow water and the females have large body sizes.

4. In some large shark species, the embryo feeds on the yolk sac in the female uterus, but once depleted the yolk sac becomes vascular and attaches to the inside of the uterus wall. This provides nutrients to the developing young directly through the blood until they are expelled to the outside world.

2.2.1 What type of fertilization is utilized by all *Chondrichthyes.* (1)

2.2.2 Identify the reproductive strategy used by species discussed in paragraph:

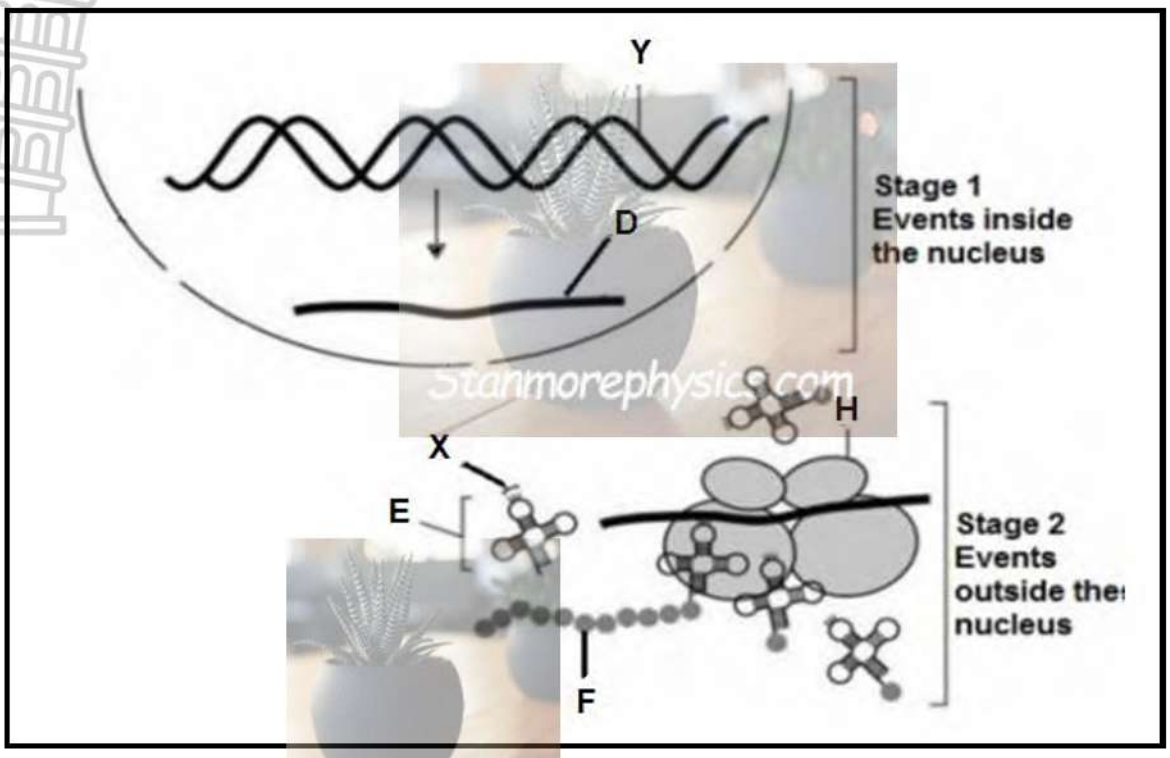
a) **3** (1)

b) **4** (1)

2.2.3 Define the reproductive strategy present in species discussed in paragraph **2**. (1)

2.2.4 Explain why the species discussed in paragraph **3** and **4** have larger body sizes than those discussed in paragraph **2**. (2)
(6)

2.3 The diagram below shows two molecules that are required for the production of proteins within a cell.



2.3.1 Identify **stage 1** in the above diagram (1)

2.3.2 Give the significance of molecule **Y** in this process. (1)

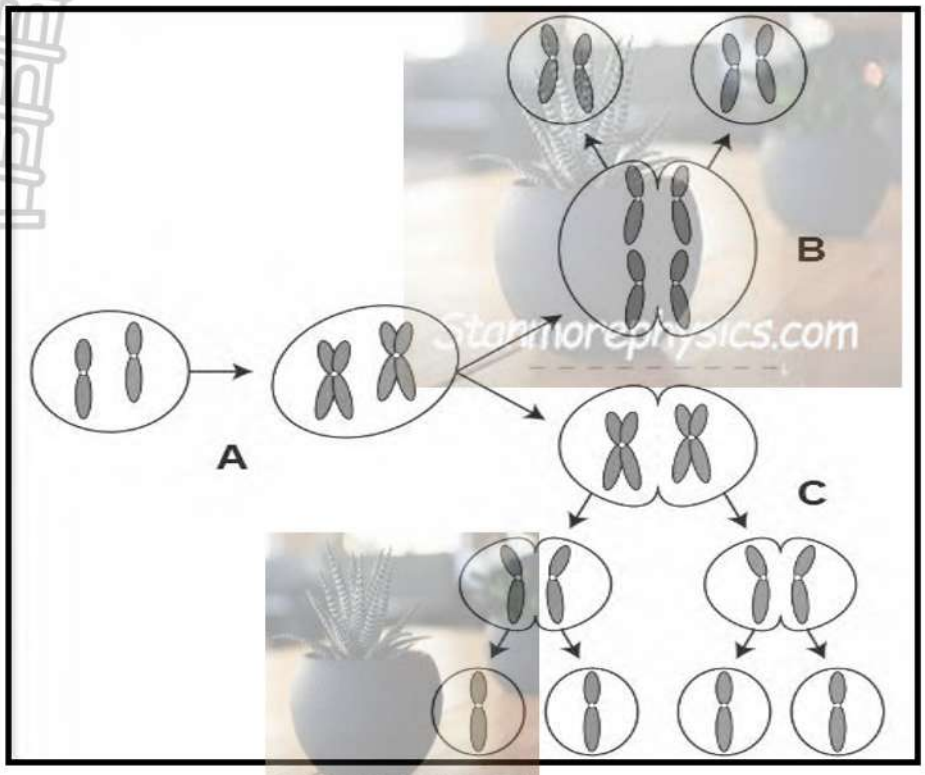
2.3.3 The base triplet **X** is AUU. Give the complementary bases on molecule **D**. (1)

2.3.4 Describe the events which take place in organelle **H** which result in the formation of molecule **F**. (5)

2.3.5 Explain how a mutation on molecule **Y** will affect the structure of a protein. (3)

2.3.6 Give TWO structural similarities between DNA and RNA. (2)
(13)

2.4 The diagram below represents the cell division processes in humans.



2.4.1 Identify:

a) The stage at **A**. (1)
b) The type of cell division at **B**. (1)
c) The cell division where non-disjunction is likely to occur. (1)

2.4.2 Give the importance of cell division **C**. (2)

2.4.3 Name ONE place in the body where cell division **B** takes place. (1)

2.4.4 Explain the process that takes place during prophase of cell division **C** that does not occur during cell division **B**. (4)

2.4.5 Describe the difference between the cells formed at the end of cell division **B** and a cell at the end of cell division **C**. (2)
(12)

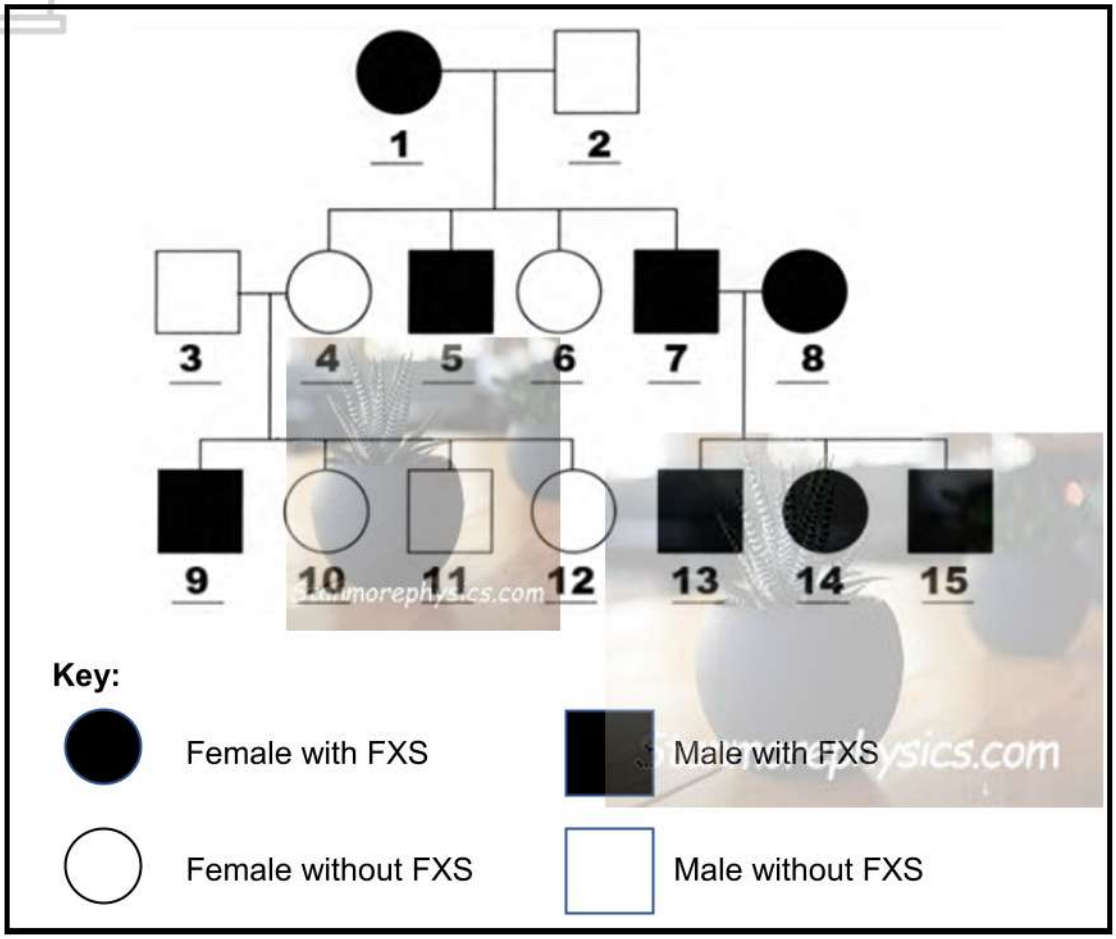
2.5 Draw a genetic cross to show the possibility of a mother who is heterozygous for blood group **B** and a father with blood group **AB** having a child with blood group **A**. **(6)**

[50]

QUESTION 3

3.1 Fragile X syndrome (FXS) is caused by a mutation in the FMR 1 gene carried on the X-chromosome (X^f). It causes an array of intellectual, behavioural and physical disabilities.

The diagram below represents the inheritance of this disease in a family.



3.1.1 Identify the above diagram. (1)

3.1.2 How many children does couple **1** and **2** have? (1)

3.1.3 Give the genotype of individual **6**. (2)

3.1.4 Give the phenotype of individual 15. (2)

3.1.5 Is this disease caused by a dominant or recessive allele? (1)

3.1.6 Explain your answer in QUESTION 3.1.5 using individuals **3**, **4** and **9**. (4)
(11)

Copyright reserved

3.2 Read the paragraph below regarding diabetes mellitus and answer the questions that follow.

> Type 1 diabetes is an autoimmune disease that destroys the islet cells that produces insulin. Just over a 100 years ago insulin was discovered and scientists began artificially producing it, changing diabetes form a terminal illness into a manageable disease. However, this treatment comes with constant injections and 24-hours a day monitoring.
>
> Recently scientists took stem cells form a woman and used it to create islets cells that was injected between the skin and abdominal muscles. In less than 3 months it was found to produce insulin eliminating the need for injections now for the past year. Scientists are optimistic that they have found a cure for diabetes mellitus.

3.2.1 What is the process called whereby biological processes are manipulated to treat people with type 1 diabetes? (1)

3.2.2 Give a brief overview of the process used to manufacture insulin for injection. (4)

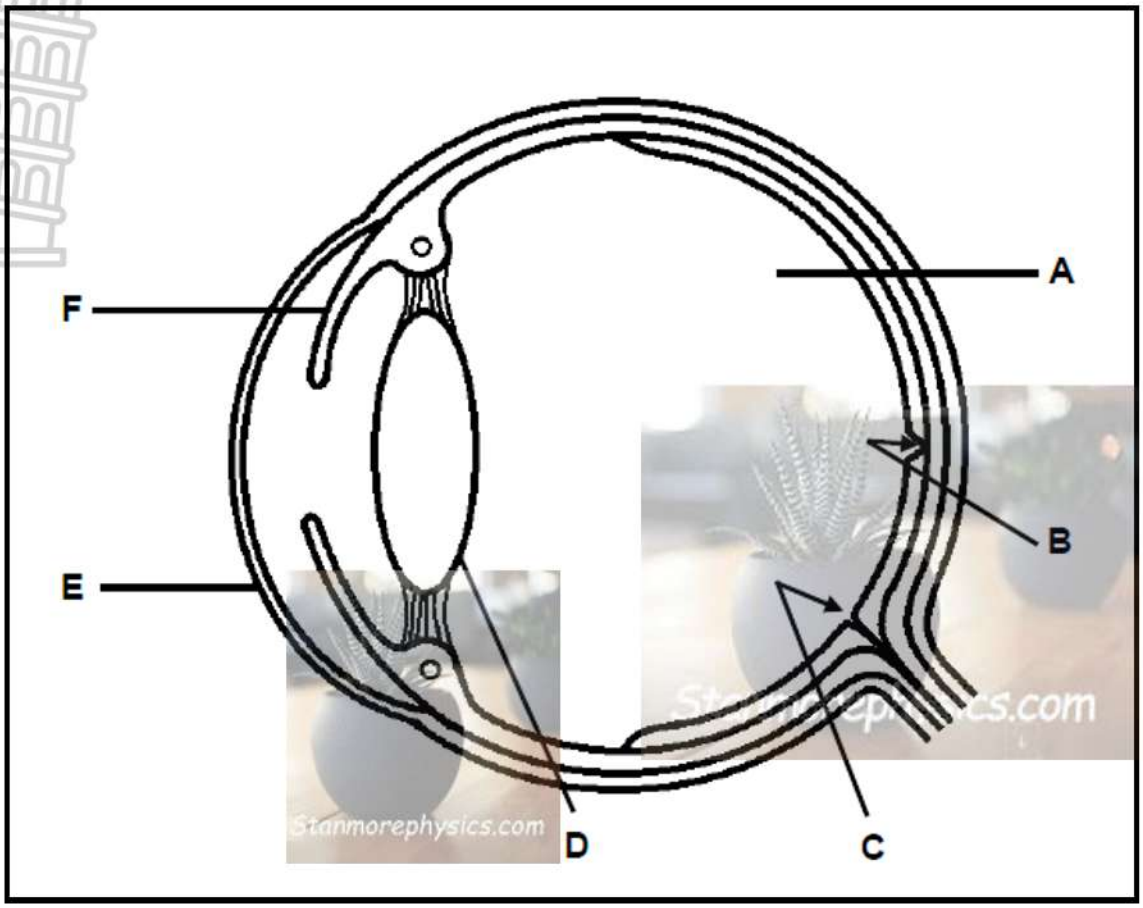
3.2.3 Give ONE benefit from the extract that this new stem cell research holds for patients. (1)

3.2.4 Why is it beneficial to use a patient's own stem cells instead of donor cells? (1)

3.2.5 Explain how stem cells can be used to treat diabetes. (3)
(10)

Stanmorephysics.com

3.3 The diagram below represents a human eye.



3.3.1 Identify the structure labelled **E**. (1)

3.3.2 Give the LETTER and NAME of the part that maintains the shape of the eye. (2)

3.3.3 How is part **D** adapted for its function? (2)

3.3.4 Describe the structural difference between part **B** and **C**. (2)

3.3.5 Describe the appearance of the various parts of label **F** in dim light. (2)
(9)

3.4 Describe the process of hearing. **(7)**

3.5 Each skin receptor can only convert one stimulus at a time into an impulse that will be interpreted by the brain as touch. If two points touch the same receptor the brain will interpret it as one point touching the skin. Two separate receptors must thus be stimulated for the brain to interpret the impulses as the skin being touched in 2 points. The distance apart that a person perceive one point as two separate points is known as the two-point threshold.

Learners set up an investigation to determine the two-point threshold of various body parts.

The experiment was conducted as follows.

- Let 10 learners sit with their eyes closed, arms laying palms up on the table in front of them.
- You need a compass divider to touch their skin with and a ruler to set the divider distance.



Compass divider that can lock in place

- Set the compass distance at 0 mm.
- Touch various parts of their skin with both points of the compass simultaneously and ask the participant every time whether they feel one or two points touching their skin.
- Increase the compass distance every time with 2mm and repeat.
- Record the distance in the table at which they are able to distinguish two points
- Calculate the average of the participant responses for every body part.

The table below indicate the results obtained.

Body Part	Two-point thresholds
Tip of index finger	6 mm
Back	68 mm
Forearm	35 mm

3.5.1 Which neuron is responsible for transporting the sensation picked up by the touch receptor to the brain for interpretation? (1)

3.5.2 Identify the:

a) Independent variable (1)

b) Dependent variable (1)

3.5.3 How was reliability ensured? (2)

3.5.4 Looking at the results, what conclusion can be drawn regarding the amount of receptors found in various body parts (2)

3.5.5 Draw a bar graph representing the two-point threshold of various body parts. (6)
(13)



[50]

TOTAL SECTION B: 100

GRAND TOTAL: 150

Copyright reserved