GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JUNE EXAMINATION
GRADE 12

2026

LIFE SCIENCES

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LIFE SCIENCES P1

C2831E

TIME: 2½ hours

MARKS: 150

18 pages

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, 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.

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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 Which process is used to produce an identical copy of an organism in the laboratory?

A Cloning
B Copying
C Genetic engineering
D Stem cells

1.1.2 The thyroid gland is located …

A below the kidneys.
B in the neck, just below the larynx.
C behind the stomach.
D at the base of the brain.

1.1.3 A female who has received an allele for haemophilia from each parent is described as being …

A homozygous.
B dominant.
C homologous.
D heterozygous.

1.1.4 Which hormone is secreted by the Islets of Langerhans?

A Aldosterone
B Glycogen
C Growth hormone
D Insulin

1.1.5 Identify the gland that releases a corrective hormone when blood salt levels drop too low.

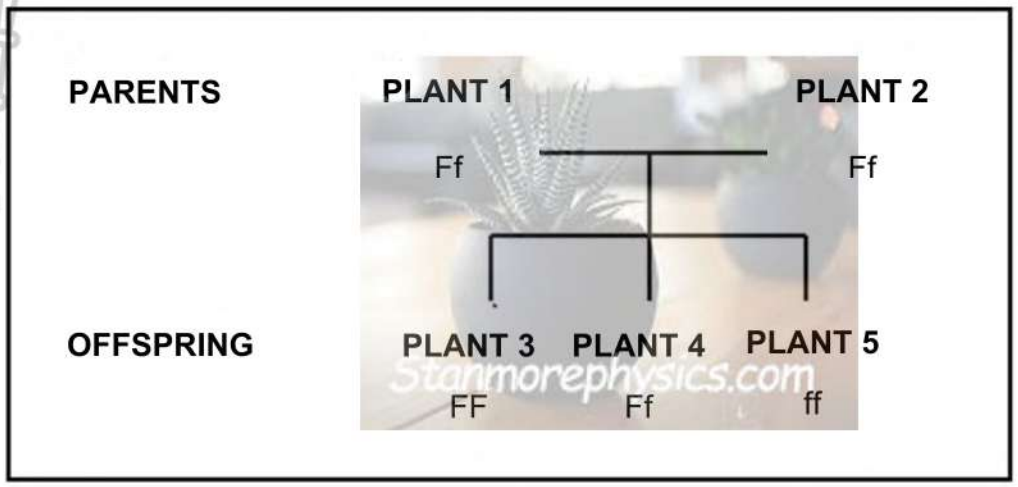
A Adrenal gland
B Pancreas
C Thyroid gland
D Pituitary gland

1.1.6 The function of thyroxin is to …

A control the blood salt level.
B control the blood water levels.
C control the body's metabolic rate.
D stimulate the breasts to produce milk.

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1.1.7 The diagram below shows two generations of plants and their genotypes.



[Source: Examiner's own drawing]

Identify ALL the plants that have the same phenotype.

A 1 and 2 only
B 1, 2 and 4 only
C 1, 2, 3 and 4 only
D 1, 2, 3, 4 and 5

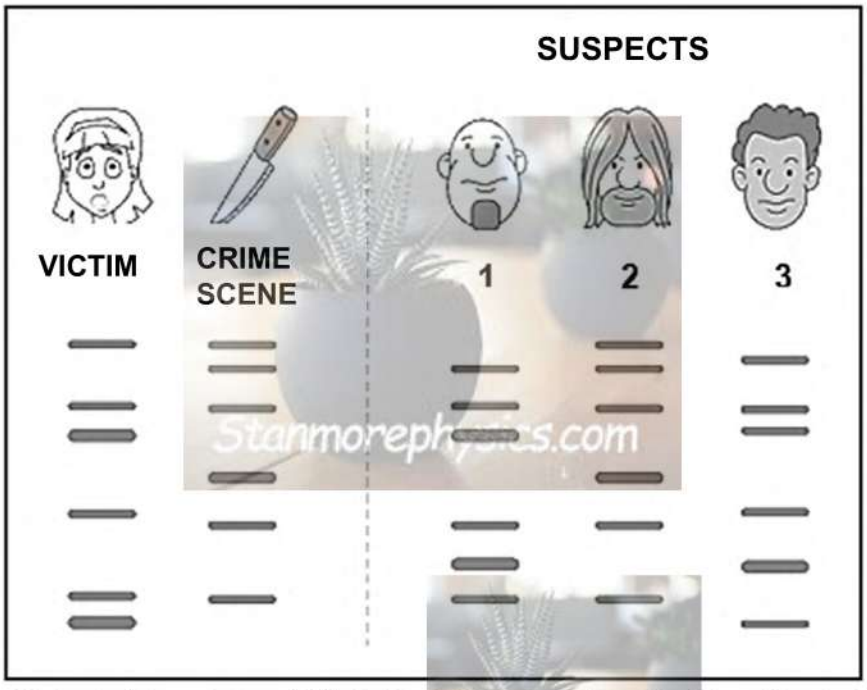
1.1.8 DNA from the cells of an animal was analysed and the following percentages of nitrogenous bases were found.

NITROGENOUS BASES			
X	**Y**	**ADENINE**	**Z**
31	19	31	19

Which of the following is a CORRECT indication of the bases above?

	X	Y	Z
A	Guanine	Cytosine	Thymine
B	Thymine	Guanine	Cytosine
C	Cytosine	Guanine	Thymine
D	Cytosine	Thymine	Guanine

1.1.9 Based on the DNA profiles shown below, who can be linked to the unidentified sample found at the crime scene?



[Adapted from *https://old-ib.bioninja.com.au/standard-level/topic-3-genetics/35-genetic-modification-and/dna-profiling.html*]

A Suspect 1
B Suspect 2
C Suspect 3
D Victim

1.1.10 In fruit flies, eyes are normally red in colour. Flies with white eyes are the result of a recessive X-linked mutation. The gonosomes of fruit flies are the same as those of humans.

In a cross between a homozygous red-eyed female and a white-eyed male, what percentage of male offspring will have white eyes?

A 100%
B 75%
C 50%
D 0%

(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 Three adjacent nitrogenous bases on mRNA

1.2.2 The undifferentiated cells in animals that have the potential to become any type of tissue

1.2.3 The genetic disorder characterised by the inability to distinguish between red and green

1.2.4 A hormone released in a 'fight-or-flight' situation

1.2.5 The monomer of RNA

1.2.6 The gland which secretes hormones that influence the uterine cycle

1.2.7 Organic compounds that act as messengers in the body

1.2.8 The process of converting the information in mRNA to a sequence of amino acids

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

1.3 Indicate whether each of the statements 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	Mitochondrial DNA	A: Is inherited from the mother B: Is inherited from the father
1.3.2	mRNA	A: Found in the nucleus B: Found in the cytoplasm
1.3.3	Develops finger-like projections and forms part of the placenta	A: Choroid B: Amnion

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

1.4 Three babies (**1**, **2** and **3**) from three different sets of parents were born in a hospital. The babies were suspected to have been swopped. Blood group analysis was used to determine which baby belonged to which set of parents.

The blood groups of the parents and their babies are shown in the table below.

SETS OF PARENTS	BABY	BLOOD GROUPS OF PARENTS AND BABIES		
		MOTHER	FATHER	BABY
Mr and Mrs Ndaba	1	AB	B	O
Mr and Mrs Twala	2	O	B	AB
Mr and Mrs Khumalo	3	B	A	A

1.4.1 State the blood group(s) that phenotypically display(s):

(a) The recessive allele (1)

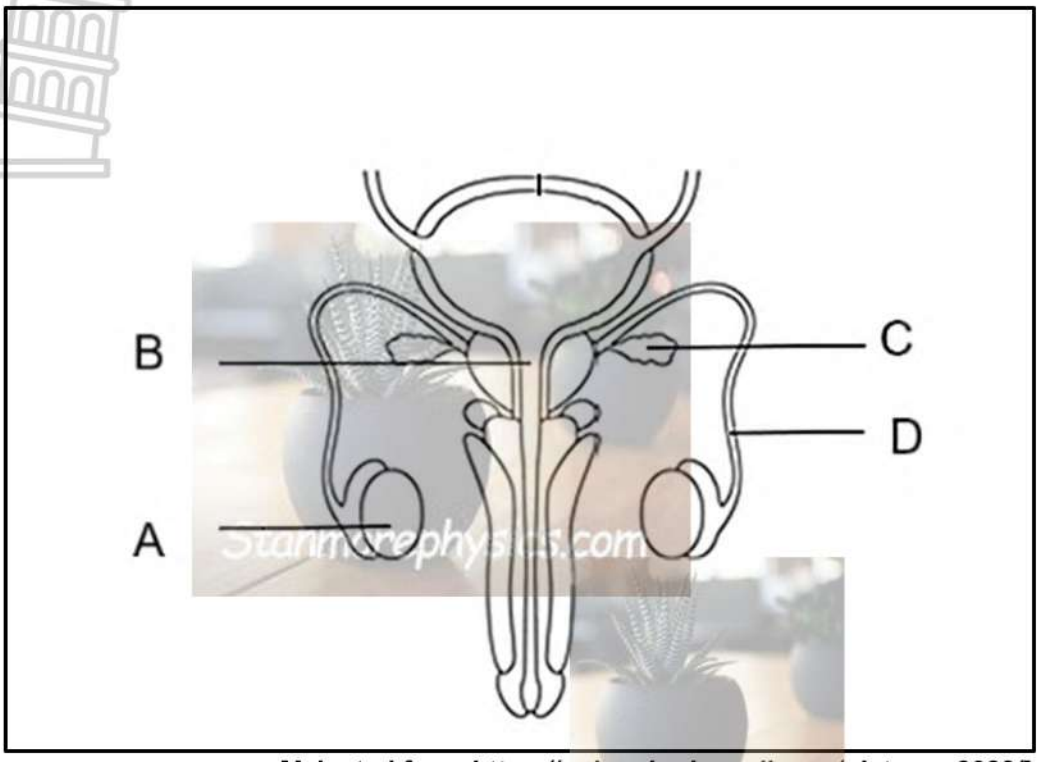
(b) Complete dominance (2)

(c) Co-dominance (1)

1.4.2 Identify the baby/babies (**1**, **2** or **3**) that is/are possibly with the correct parent(s). (1)

1.4.3 State the possible genotype(s) of the baby with blood group A. (1)
(6)

1.5 Study the diagram below which represents the front view of a section through a human reproductive system and answer the questions that follow.



[Adapted from *https://ar.inspiredpencil.com/pictures-2023/*]

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1.5.1 Identify the LETTER of the part:

(a) That transports sperm cells from the epididymis to the urethra (1)

(b) That secretes testosterone (1)

1.5.2 Give the LETTER and NAME of the structure that:

(a) Is an accessory gland (2)

(b) Forms part of both the urinary and reproductive systems (2)

(c) Contains seminiferous tubules (2)

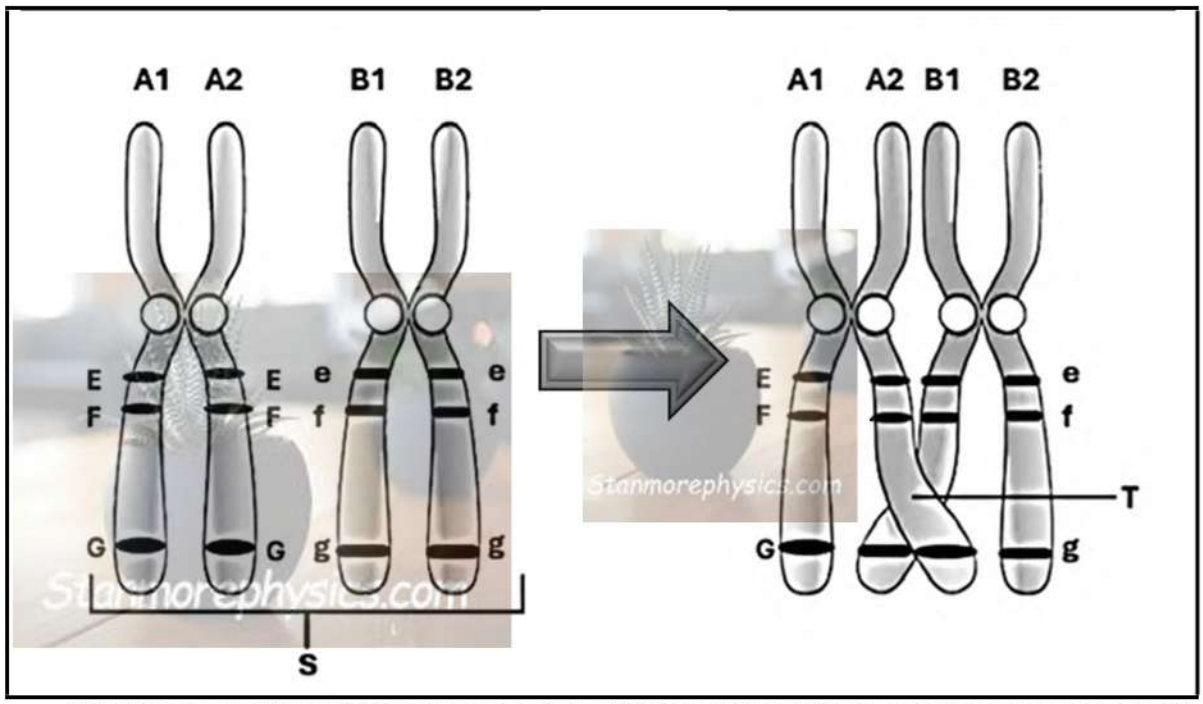
1.5.3 Name the TWO other accessory glands which are shown in the diagram above, but are not labelled. (2)
(10)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below shows chromosomes undergoing a process that occurs during meiosis. The letters (**e**, **f** and **g**) on chromosomes represent alleles. The chromatids are labelled with a letter AND a number. The two chromosomes on the left show their arrangement before the process and those on the right (after the arrow) show their arrangement during the process. Refer to the diagram below and answer the questions that follow.



[Adapted from *https://raider.pressbooks.pub/biology1/chapter/8-linkage-and-crossover/*]

2.1.1 Provide the label for **S**. (1)

2.1.2 (a) Label point **T**. (1)

(b) Name the process that is occurring at point **T**. (1)

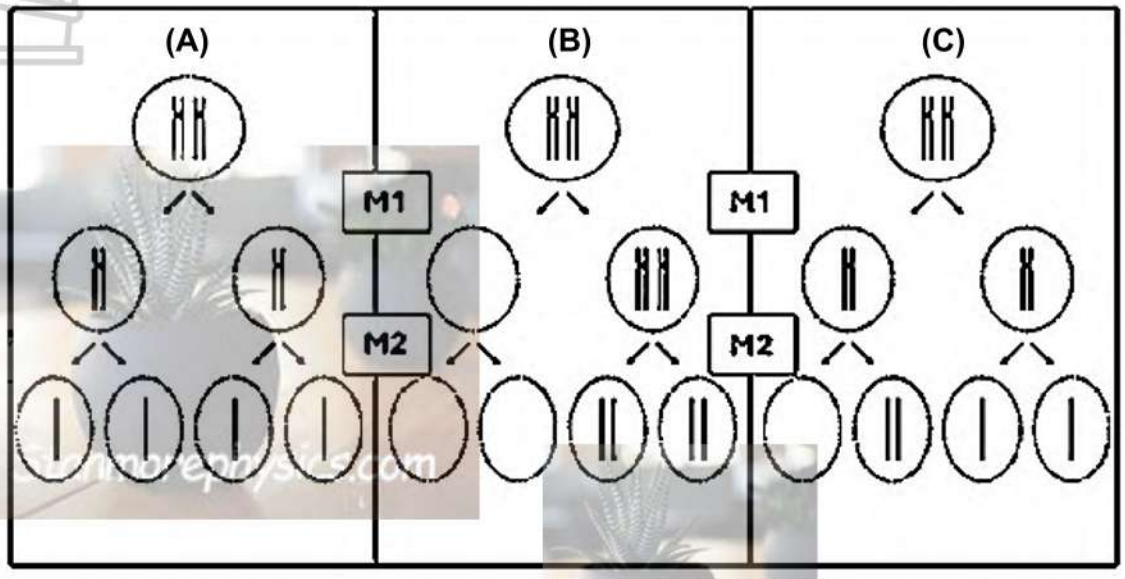
2.1.3 Rewrite the alleles on chromatids **A2** and **B2** respectively after the process stated in QUESTION 2.1.2 (b) has occurred. (2)

2.1.4 Alleles on the chromatids **A1** and **A2** are originally identical.

Identify the process that resulted in these alleles being identical. (1)

2.1.5 Name the phase of cell division wherein the process mentioned in QUESTION 2.1.4 occurs. (1)
(7)

2.2 The diagram below shows meiosis occurring in three different cells **A**, **B** and **C**. Each cell has a pair of human chromosomes completing meiosis 1 (**M1**) and meiosis 2 (**M2**). Refer to the diagram below and answer the questions that follow.



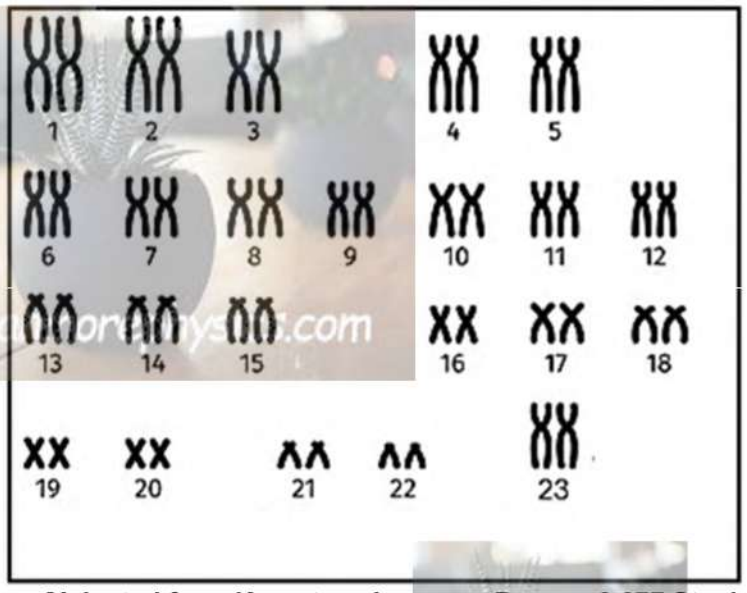
[Adapted from *https://www.researchgate.net/figure/Principles-of-meiosis-and-non-disjunction-For-simplicity-only-one-pair-of-newly_fig3_329379756*]

2.2.1 Define the term *non-disjunction*. (2)

2.2.2 State the phase in which non-disjunction occurs in cell **C**. (1)

2.2.3 Explain which cell will result in the greatest chance of producing offspring with abnormalities when any of its gametes are fused with a normal gamete. (2)

2.2.4 Study the diagram below which shows the karyotype of a human somatic cell and answer the questions that follow.



[Adapted from Karyotype Images – Browse 3,877 Stock Photos, Vectors, and Video | Adobe Stock]

(a) Give the scientific name for chromosome pair **23**. (1)

(b) How many X-chromosomes are shown above? (1)

(c) How would the karyotype above have differed if the person had Down syndrome? (1)
(8)

2.3 Consider a cross between two zebrafish strains. The female parent is homozygous for both a grey striped body (**G**) and a short tail (**t**) and the male parent is homozygous for both a spotted body (**g**) with a long tail (**T**). All F1 offspring have striped bodies with long tails.

The F1 offspring are then interbred, and the Punnet square below shows the possible F2 generation.

F2 GENERATION GENOTYPES

FEMALE GAMETES → MALE GAMETES ↓	GT	**1**	gT	**2**
GT	GGTT	GGTt	GgTT	GgTt
Gt	GGTt	GGtt	GgTt	Ggtt
gT	GgTT	GgTt	**3**	ggTt
gt	**4**	Ggtt	ggTt	ggtt

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2.3.1 Identify the type of genetic cross shown above. (1)

2.3.2 Give the genotype of the F1 generation. (2)

2.3.3 Identify the genotype of gametes:

(a) **1** (1)
(b) **2** (1)

2.3.4 State the phenotype of:

(a) **3** (1)
(b) **4** (1)

2.3.5 Indicate the expected simplified ratio of grey striped-body to spotted-body offspring in the F2 generation. (2)
(9)

2.4 Riverine rabbits are endemic to South Africa. They are one of the rarest mammals in the world and very little is known about their reproductive behaviour. It is known, however, that after a gestation period of around 35 days, the female gives birth to a single young underground. The kit (baby rabbit) is born naked, with eyes closed, helpless, and weighs between 40 and 50 grams. The helpless kit stays with the mother who feeds it, keeps it warm and protected until it can fend for itself. Very rarely are two kits born at once.

[Source: *https://animalia.bio/riverine-rabbit*]

2.4.1 Identify the type of development displayed by the kits after birth. (1)

2.4.2 From the passage above, quote TWO reasons for your answer to QUESTION 2.4.1. (2)

2.4.3 Using the information in the text above, explain the impact of the level of parental care on the number of offspring produced. (2)
(5)

2.5 Nkateko took part in an experiment comparing the eye's response to light from different distances. A torch light was placed at six consecutive positions (1 to 6) with equal distances from Nkateko's face.

The diameter of Nkateko's pupil was measured at each position and the results are shown below.

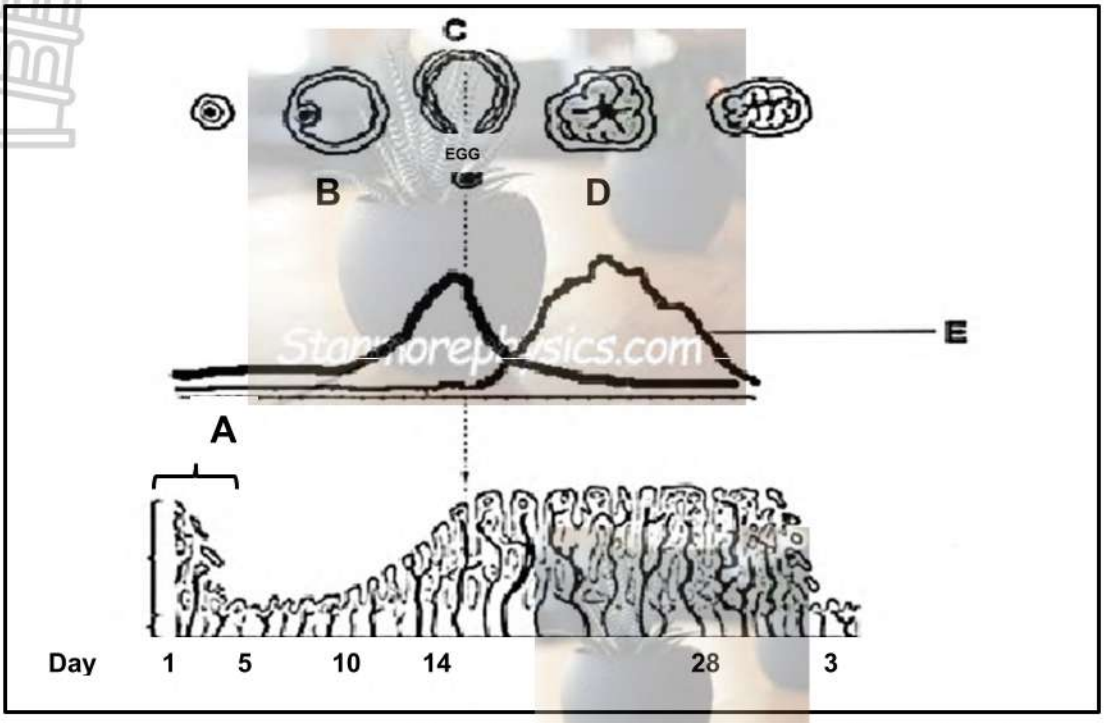
POSITION OF TORCH	DIAMETER OF PUPIL (mm)
1	1
2	2
3	2,5
4	3
5	4,5
6	5,5

2.5.1 Name the part of the autonomic nervous system that is responsible for the change in the pupil size observed in this experiment. (1)

2.5.2 State ONE way in which the validity of this experiment was ensured. (1)

2.5.3 Draw a line graph to represent the results shown in the table above. (6)
(8)

2.6 The following diagram represents a biological process that starts during puberty in females. Refer to the diagram below and answer the questions that follow.



[Adapted from *https://cdn.numerade.com/ask_images/76b3c24c6b2a4d5ca2a22e8233e6392b.jpg*]

2.6.1 Name the process labelled **A.** (1)

2.6.2 State which hormone is responsible for the formation of structure **D.** (1)

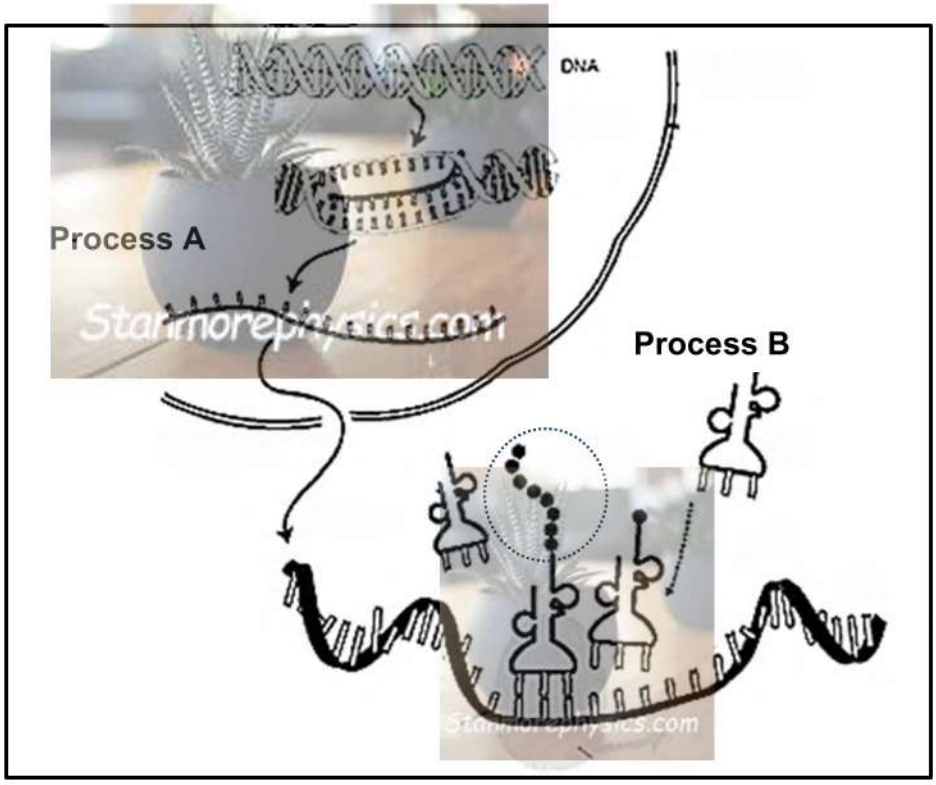
2.6.3 Name **TWO** changes that occur in female physical characteristics at puberty due to the hormone secreted by structure **B**. (2)

2.6.4 Explain how the decrease in hormone **E** will eventually result in process **C**. (6)
(10)

2.7 Tabulate ONE difference between *endocrine* and *exocrine* glands **(3)**
[50]

QUESTION 3

3.1 The hormone insulin is a protein that is synthesised through two sub-processes as shown below. Refer to the diagram below and answer the questions that follow.



[Adapted from *https://kylegrant76.wordpress.com/wp-content/uploads/2015/05/gene_expression.gif*]

In making insulin, a portion of the DNA unwinds and unzips and a section of one of the strands appears as follows: **GGA CAT GCT TGT**

3.1.1 Describe process **A,** where the strand above acts as a template. (3)

3.1.2 Based on the events in the nucleus, give a visible reason why process **A** cannot be DNA replication. (1)

3.1.3 Explain whether the group of joined amino acids, which is surrounded by a dotted circle in process **B,** is considered a protein. (2)

3.1.4 The table below gives the names of the amino acids that code for a portion of insulin.

DNA	AMINO ACIDS
GGA	Proline
CAT	Valine
GCT	Arginine
GAT	Leucine

Due to a mutation, the sequence coding for insulin is changed. In the mRNA codon GUA, the guanine is replaced by cytosine.

(a) State the type of mutation described above. (1)

(b) Identify the new amino acid that will now be formed. (1)

(c) Draw a stick diagram of the mutated mRNA codon that would be formed. Label ALL portions of the nucleotides. (5)
(13)

3.2 There are two alleles for hair texture, curly (**C**) or straight (**S**). If a person is homozygous, they either have curly hair or they have straight hair. However, if a person is heterozygous for hair texture, the person will have wavy hair. This is because the two alleles blend to create a unique intermediate phenotype.

3.2.1 Name the type of dominance in these alleles. (1)

3.2.2 Use a genetic cross to show the phenotypic ratio of hair texture in the F1 generation if both parents had wavy hair. (6)
(7)

3.3

Most human organs begin to form during the first trimester of gestation and continue to develop during the rest of the gestation period. Very early in gestation, a small sac forms in the developing embryo that will become the inner ear. Part of this sac grows into two small pouches called the sacculus and utriculus.
Inside these pouches, special spots called **maculae** begin to form.
By about the middle of pregnancy, these maculae are fully formed. They function like a natural level, telling the brain if the head is tilting or moving in a straight line, which is important for balance.

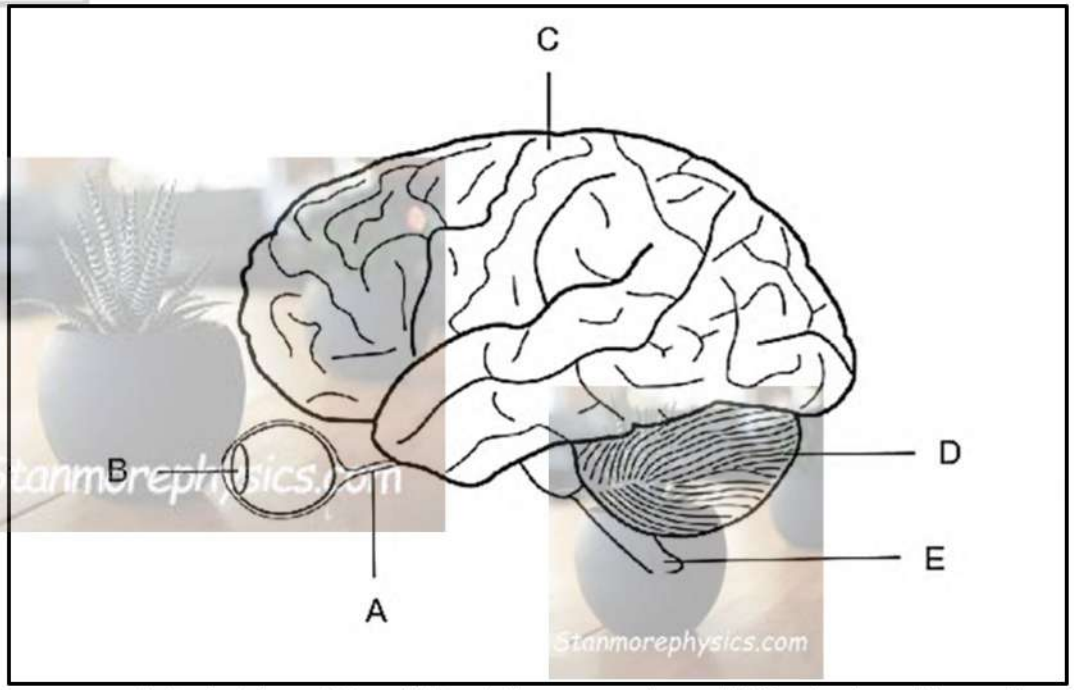
[Adapted from Larsen, W.J. 2001. *Human Embryology. 3rd ed.* Philadelphia: Churchill Livingstone]

3.3.1 Describe the development that happens after fertilisation until implantation. (5)

3.3.2 Name the other receptor for balance that is not mentioned in the text above. (1)

3.3.3 Explain the consequences for a child if the maculae did not form during gestation. (3)
(9)

3.4 The diagram below shows parts of a human brain and an eye. Refer to the diagram below and answer the questions that follow.



[Adapted from *https://clipart-library.com/search1/?q=brain+with+eye#gsc.tab=1&gsc.q=brain%20with%20eye&gsc.page=3*]

3.4.1 Identify parts:

(a) **D** (1)
(b) **A** (1)

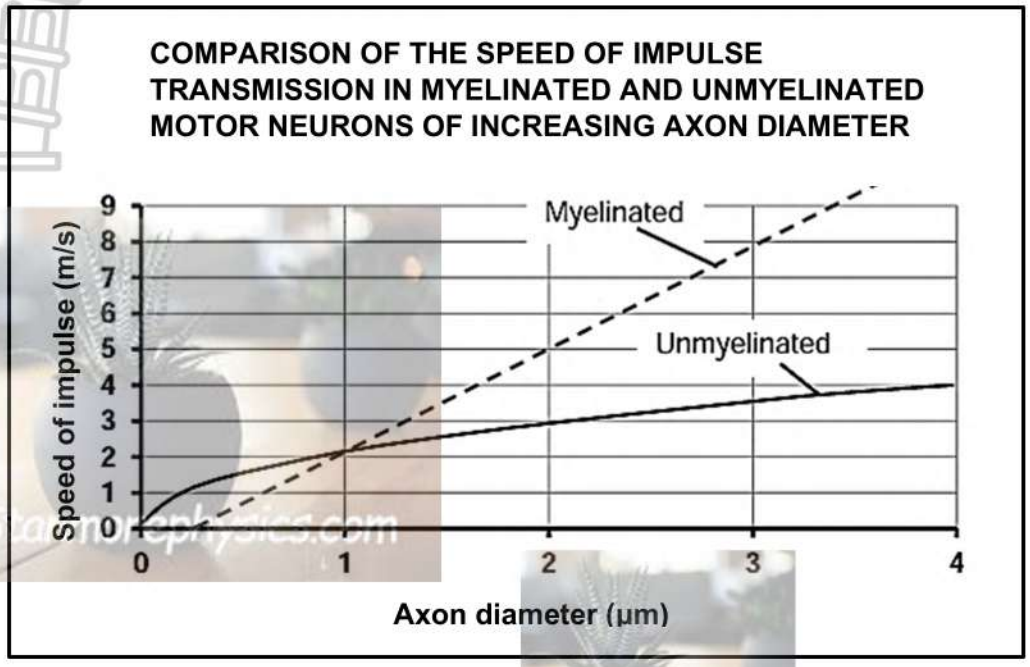
3.4.2 List THREE structures that protect part **E**. (3)

3.4.3 State TWO functions of part **C**. (2)

3.4.4 Part **B** is the lens.

Name and describe the process that allows part **B** to change its shape when looking at a nearby object. (6)
(13)

3.5 Study the graph below and answer the questions that follow.



[Adapted from DBE Life Sciences, November 2019, P1]

3.5.1 Name the functional gap through which impulses move in one direction. (1)

3.5.2 Give a suitable aim for the investigation that led to the results in the graph above. (2)

3.5.3 A person has a disease resulting in the demyelination (removal of myelin sheath) of motor neurons.

Use the graph to explain the effect of this disease on the reaction time of a sufferer whose motor neuron axons are greater than 1 µm in diameter as compared to a normal person. (2)

3.5.4 Calculate the percentage increase in the speed of impulse between 1 µm and 3 µm axon diameters of the myelinated axon. (3)

(8)

[50]

TOTAL SECTION B: 100

TOTAL: 150