LIMPOPO

PROVINCIAL GOVERNMENT

REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF

EDUCATION

NATIONAL

SENIOR CERTIFICATE

GRADE 12

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LIFE SCIENCES

JUNE EXAMINATION 2025

MARKS: 150

Time: 2½hours

This question paper consists of 17 pages including the cover page

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. ALL drawings should be done in pencil and labelled 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 correct answer and write only the letter (A-D) next to the question number (1.1.1 to 1.1.10) in the ANSWER BOOK, for example 1.1.11. D

1.1.1 Which ONE of the following CORRECTLY identifies the two nucleic acids?

A RNA is a double-stranded and DNA is single –stranded.

B DNA contains the sugar deoxyribose while RNA contains the sugar ribose.

C RNA has the nitrogenous base thymine, and DNA has the nitrogenous base uracil.

D DNA has a short chain while RNA has a long chain.

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1.1.2 Which ONE of the following correctly matches a reproductive structure and its function?

A Vagina – fertilisation.

B Fallopian tube – maturation of sperm cells.

C Uterus – development of the embryo.

D Seminal vesicle – development of an ovum.

1.1.3 Below is a list of events that occur during cell division.

(i) Homologous chromosomes line up in pairs at the equator of the cell.

(ii) Chromatids are pulled to opposite poles of the cell.

(iii) Chromosome pairs arrange themselves randomly at the equator of the cell.

(iv) Chromosomes line up in a single row at the equator of the cell

Which ONE of the following combinations occurs in both meiosis and mitosis?

A (ii), (iii) and (iv) only

B (i) and (iv) only

C (i), (iii) and (iv) only

D (ii) and (iv) only

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1.1.4 Which ONE of the following is a characteristic of hatchlings of birds that show altricial development?

A Eyes are open when they hatch.
B Able to move around after hatching.
C Able to feed themselves.
D Eyes are closed when they hatch.

1.1.5 The process by which DNA is copied before cell division is called…

A transcription
B translation
C mutation
D replication



1.1.6 Which ONE of the following processes is responsible for the production of male gametes?

A Oogenesis
B Ovulation
C Spermatogenesis
D Ejaculation

1.1.7 More males than females are colour-blind because…

A The allele for colour-blindness is recessive and located on the X-chromosome.
B Colour-blind males have two copies of the allele for colour-blindness.
C The allele for colour-blindness is recessive and located on the Y-chromosome.
D Fathers pass the allele of colour blindness to their sons only.



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1.1.8 Which of the following CORRECTLY represents the events involved in the secretion and action of ADH?

	Water level in blood relative to normal	**Amount of ADH produced relative to normal**	**Amount of water reabsorbed by the renal tubules**
A	Decrease	Decrease	Decrease
B	Decrease	Increase	Increase
C	Increase	Decrease	Increase
D	Increase	Increase	Decrease

1.1.9 Which ONE of the following scientists won the Nobel Prize for the discovery of the DNA structure?

A Watson and Franklin.
B Wilkins and Franklin.
C Watson and Crick.
D Crick and Franklin.

1.1.10 Which of the following statements is associated with the hormone TSH?

(i) Regulates the metabolic rate in the body cells

(ii) Is secreted by the pituitary gland

(iii) Stimulates the secretion of thyroxin

(iv) Decreases the glucose level in the blood

A (i), (ii) and (iii)
B (ii) and (iv) only
C (ii) and (iii) only
D (i), (ii), (iii) and (iv)

(10 x 2) (20)

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1.2 Give the correct biological term for each of the following descriptions. Write only the term next to the question number (1.2.1 to 1.2.10) in the ANSWER BOOK.

1.2.1 The structure that joins two chromatids together

1.2.2 The disease caused by the lack of insulin production in the body

1.2.3 An analysis of DNA samples to identify individuals that may be related

1.2.4 The structure at the tip of a sperm cell containing enzymes that help in breaking the wall of an ovum during fertilization

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1.2.5 The manipulation of biological processes to satisfy human needs

1.2.6 The structure where the production of egg cells takes place in females

1.2.7 A change in the DNA sequence that can lead to alterations in gene function

1.2.8 The hormone that regulates the salt concentration in the blood

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1.2.9 A fluid – filled structure in vertebrates that surrounds the embryo

1.2.10 A branch of the autonomic nervous system that increases heartbeat

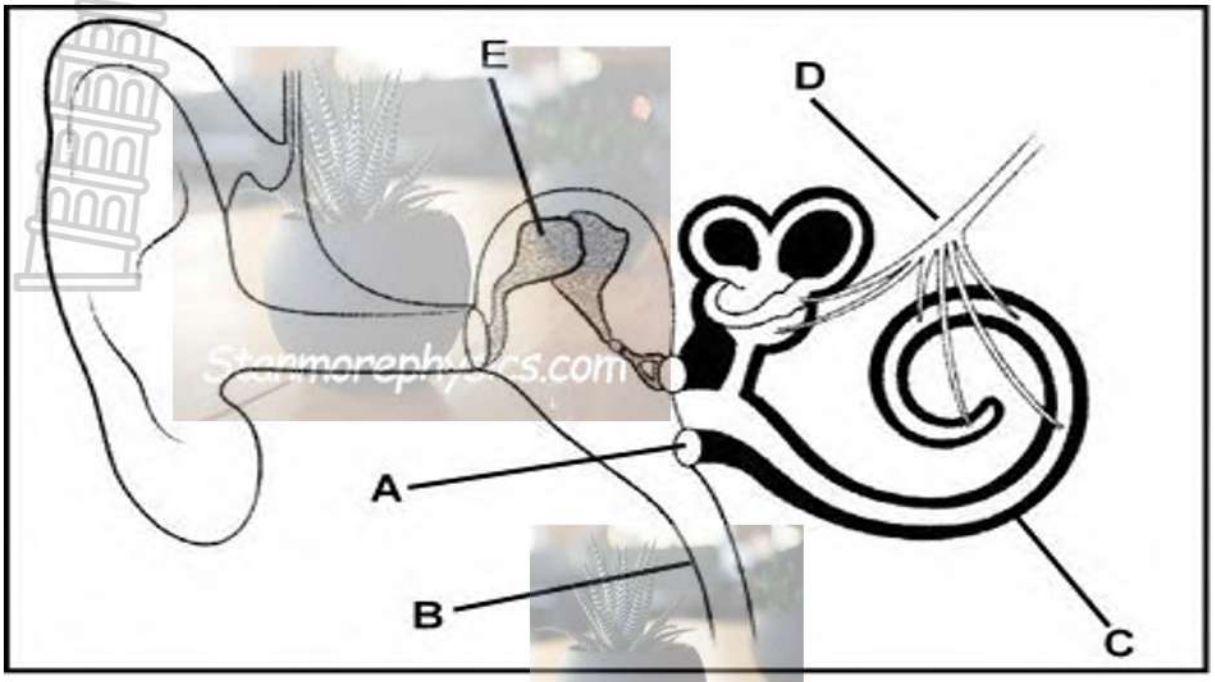
(10 x 1) (10)

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 number (1.3.1 to 1.3.3) in the ANSWER BOOK

	COLUMN I	**COLUMN II**
1.3.1	The process that produces gametes with half the number of chromosomes of the parent cell.	A: Mitosis B: Meiosis
1.3.2	The embryo obtains food from the yolk found in the egg.	A: Vivipary B: Ovovivipary
1.3.3	The hormone secreted by the pituitary gland.	A: Oestrogen B: Growth hormone

(3x2) (6)

1.4 The diagram below represents the human ear.



1.4.1 Identify part:

(a) **A** (1)

(b) **E** (1)

1.4.2 Give the LETTER and NAME of the part that:

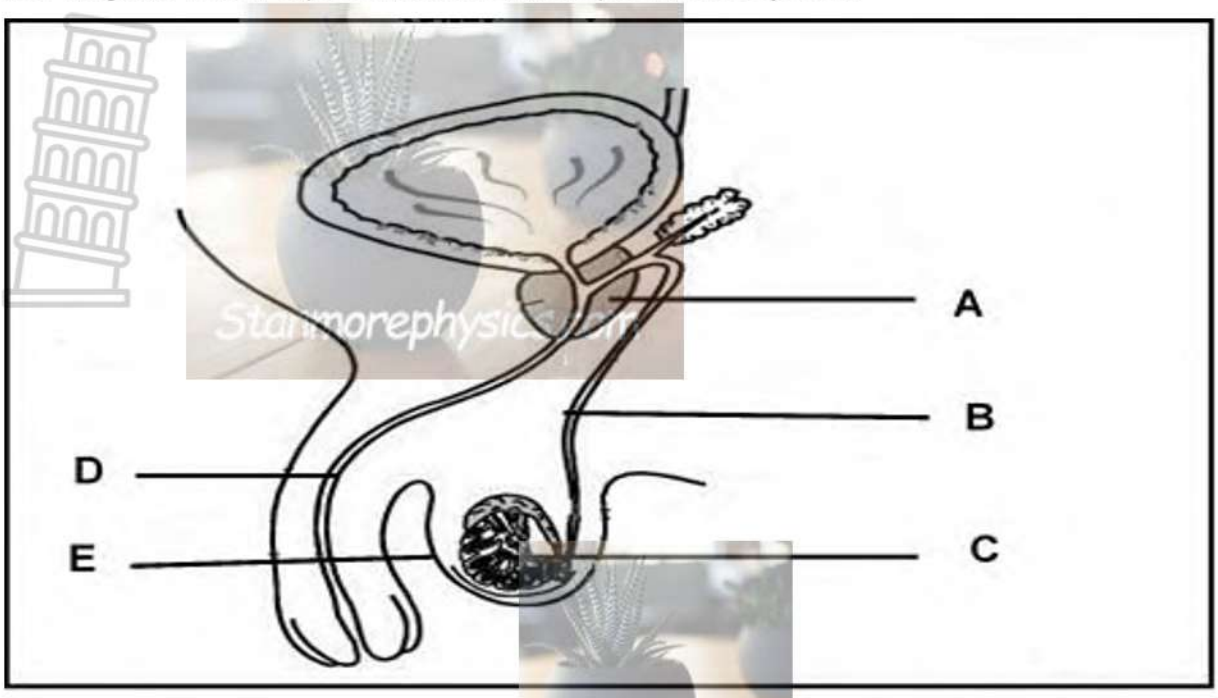
(a) Equalizes pressure on both sides of the tympanic membrane. (2)

(b) Has receptors for hearing. (2)

1.4.3 Give the LETTER of the part that will fail to send nerve impulses to the brain when damaged. (1)

(7)

1.5 The diagram below represents the male reproductive system.



1.5.1 Identify part:

(a) **B** (1)

(b) **D** (1)

1.5.2 Give the LETTER and NAME of the part that:

(a) Produces sperm cells. (2)

(b) Secretes an alkaline fluid to neutralize the acidity of the vagina. (2)

1.5.3 Name the hormone that is responsible for the onset of puberty in males. (1)

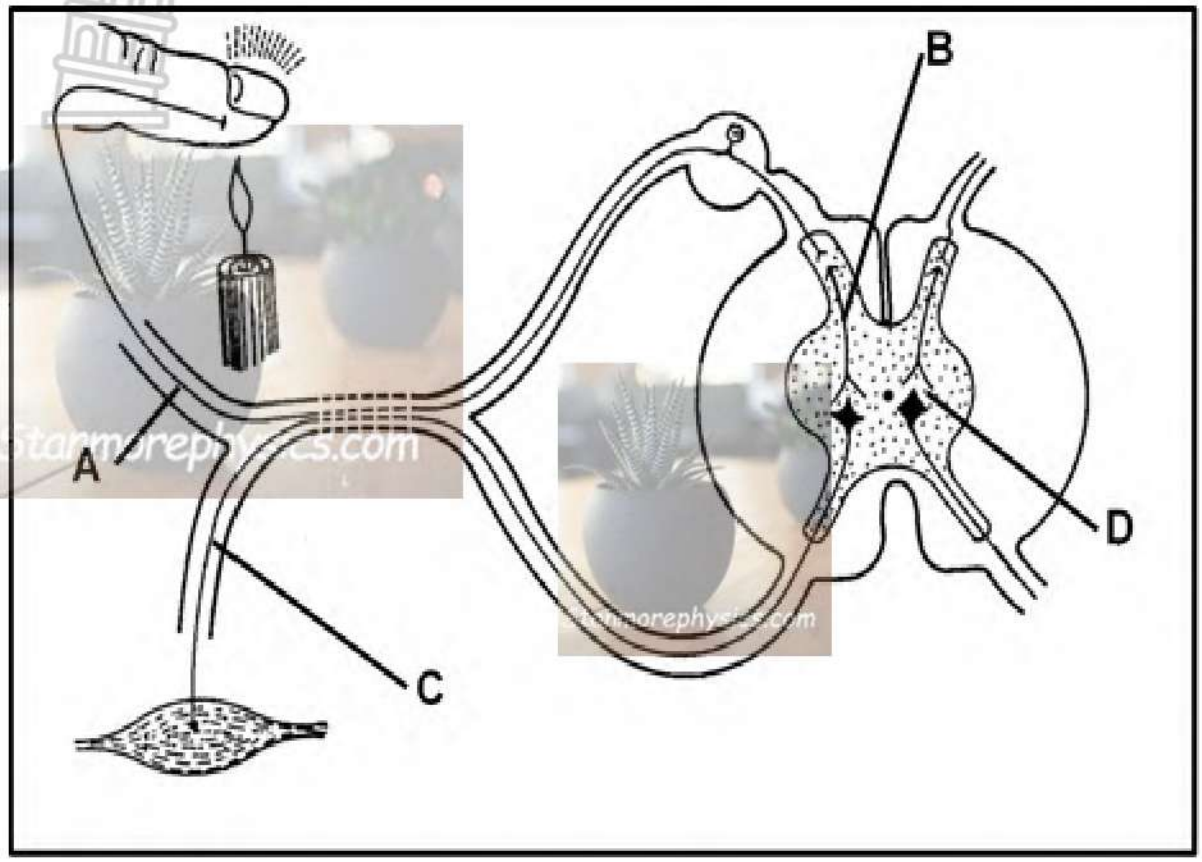
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below represents a part of the central nervous system.



2.1.1 Identify part:

(a) **A** (1)

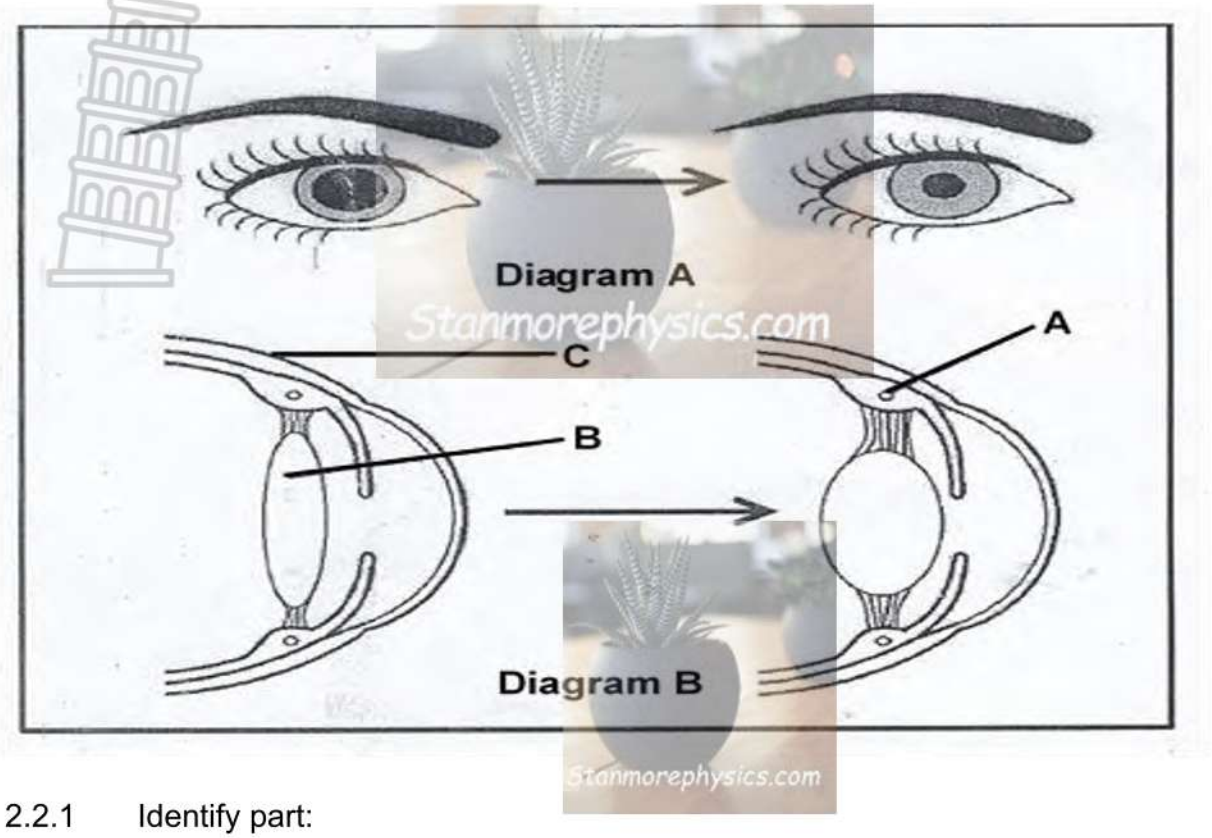
(b) **B** (1)

2.1.2 Explain ONE consequence for the body if part **C** is damaged. (2)

2.1.3 Explain what the effect will be on the reflex arc and reflexes of a person who suffers from multiple sclerosis. (2)

(6)

2.2 The diagram below shows the response of the human eye to two different conditions.



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2.2.1 Identify part:

(a) **A** (1)

(b) **C** (1)

2.2.2 State the process that is taking place in diagram **A**. (1)

2.2.3 Give the conditions responsible for the change in the process mentioned in QUESTION 2.2.2. (1)

2.2.4 Name the process and describe the change that takes place in diagram **B**. (6)

(10)

2.3 The table below shows the average rate of blood flow to the skin at different environmental temperatures.

Environmental temperature (°C)	Average of blood flow to the skin (ml/100ml tissue/min)
0	3,5
10	5
25	5,5
40	12
50	19
55	20

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2.3.1 At what environmental temperature was the average rate of blood flow to the skin the highest? (1)

2.3.2 Calculate the percentage increase in the blood flow to the skin between 10°C and 40°C. Show ALL your working. (3)

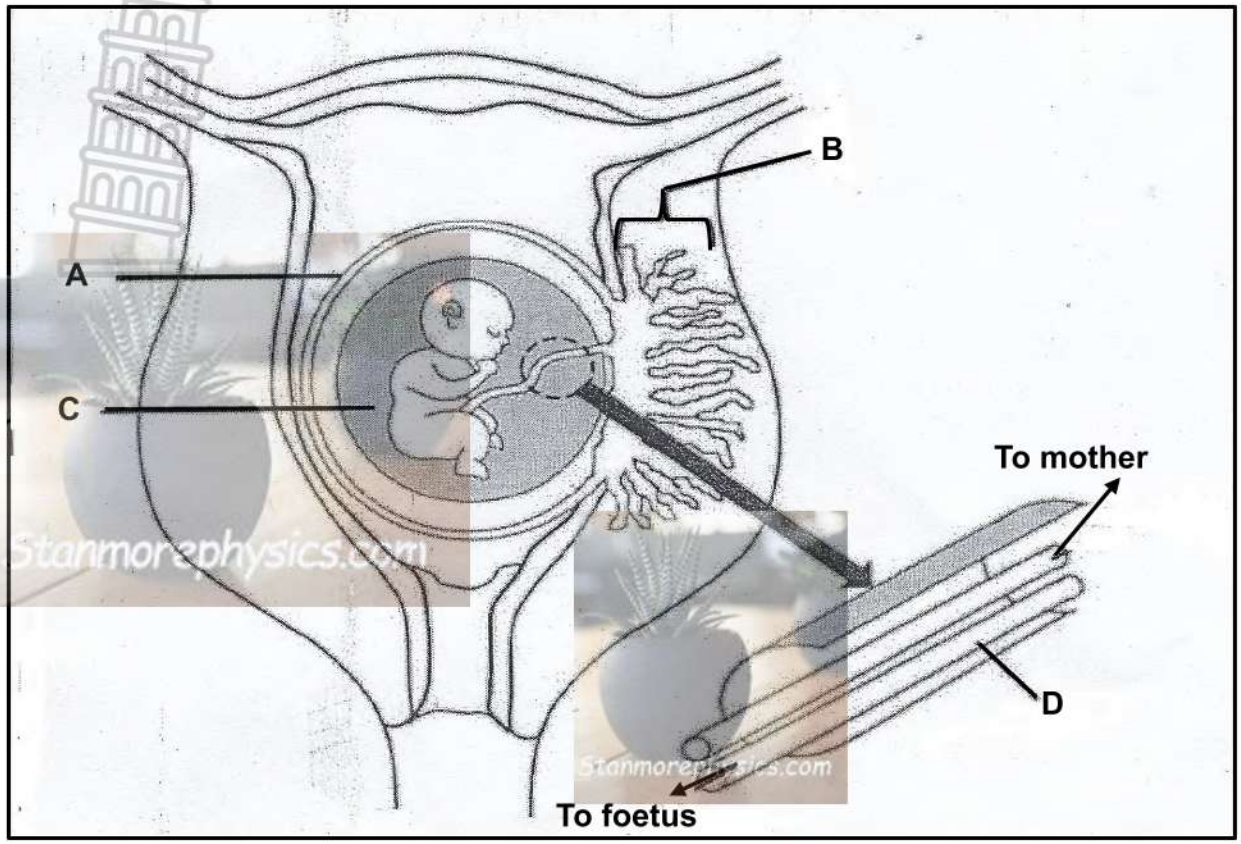
2.3.3 Describe the relationship between the environmental temperature and the average rate of blood flow to the skin. (2)

2.3.4 Frostbite is a condition where long term exposure to extreme cold conditions lead to death of tissue in areas like the nose and fingers.
Use the data in the table to explain why tissue may die. (3)

2.3.5 Explain the average rate of blood flow to the skin between 25°C and 50°C. (4)

(13)

2.4 The diagram below shows a developing human foetus.



2.4.1 Identify the following:

(a) Structure **A**. (1)

(b) Blood vessel **D** going to the foetus. (1)

2.4.2 State TWO ways in which part **B** functions in protecting the developing foetus. (2)

2.4.3 Name TWO systems in the body that will take over the functions of part **B** after birth. (2)

2.4.4 Describe the developmental changes in the fertilized ovum until implantation occurs in the uterus. (4)

(10)

2.5 In an investigation, a learner was asked to put a cotton thread through the eye of a needle 10 times with both eyes open, then with only the right eye open. This was done under the same light intensity and a distance of 40cm from the eyes.
The results are recorded in the table below.

Attempts	Time taken to thread the needle in seconds(s)	
	Both eyes open	Only right eye open
1	12	38
2	12	35
3	10	37
4	11	36
5	9	34
6	9	33
7	10	30
8	8	31
9	7	29
10	7	28

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2.5.1 Apart from the two factors mentioned, state TWO other factors that had to be kept constant during the investigation. (2)

2.5.2 State a general conclusion that can be drawn from the results above. (2)

2.5.3 Give a reason why more than one attempt was made in this investigation. (1)

(5)

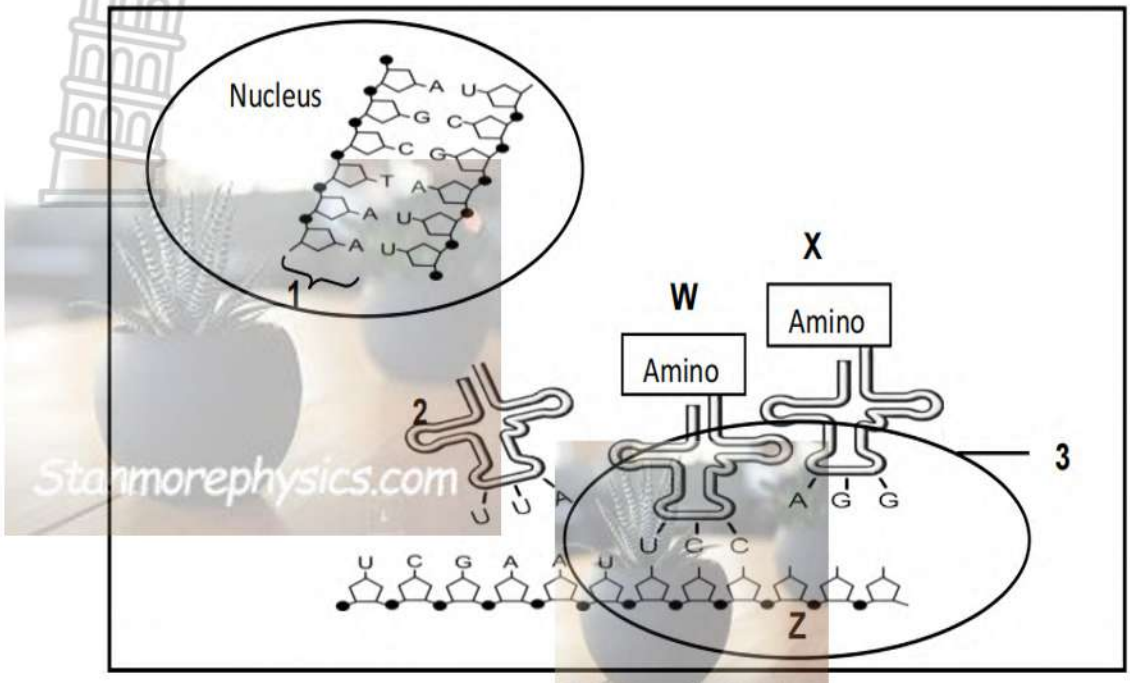
2.6 Describe how the sacculus and utriculus maintain balance in the human body. (6)

(6)

TOTAL QUESTION 2: 50

QUESTION 3

3.1 The diagram below illustrate a certain stage of protein synthesis.



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3.1.1 Identify and describe the stage of protein synthesis occurring at point **Z**. (6)

3.1.2 The table below shows some amino acids coded for by codons on mRNA

CODON	**AMINO ACID**
GAG	Glutamate
CAG	Histidine
AGG	Arginine
CUG	Leucine
UCC	Proline
GUG	Valine

Use the table above to identify amino acid **W** and **X**.

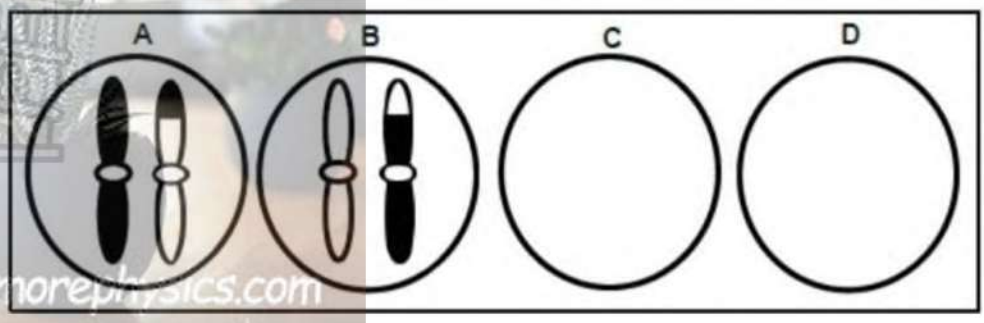
(2)

3.1.3 In a DNA molecule where 25% of the bases are Thymine, what is the ratio of Guanine to Adenine? Show and explain all your calculations.

(3)

(11)

3.2 The diagrams below show the distribution of chromosome pair 21 in gametes at the conclusion of meiosis II in a human.



3.2.1 Explain why the gametes shown in diagrams **C** and **D** lack chromosomes. (3)

3.2.2 Should gamete **A** participate in fertilization, explain how this could lead to the development of Down syndrome. (3)

3.2.3 As a result of the process of crossing-over chromosomes in diagrams **A** and **B** are different from one another.

Name the phase of meiosis during which crossing over occurs and describe the process. (3)

(9)

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3.3 A population of plants shows two phenotypes for flower colour: red (dominant, **R**) and white (recessive, **r**). Over several generations, the frequency of the red and white phenotypes was recorded in a controlled environment.

The data collected is shown below.

Generation	Red flower frequency (%)	White flower frequency (%
1	70	30
2	65	35
3	60	40
4	55	42
5	50	50

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3.3.1 Draw a bar graph showing the frequency of red flowers for each generation (6)

3.3.2 Identify the:

(a) Independent variable (1)

(b) dependent variable (1)

(c) Name the type of dominance if a red flowered plant is crossed with a white flowered plant. (1)

(9)

3.4 In a species of flowering plants, the allele for tall stems (**T**) is dominant to the allele for short stems (**t**), and the allele for purple flowers (**D**) is dominant to the allele for white flowers (**d**). A cross is performed between two plants that are heterozygous for both traits.

3.4.1 Use a genetic cross to determine the possible genotypes and phenotypes of the offspring. (6)

3.4.2 Calculate the probability of obtaining an offspring with tall stems and white flowers. (3)

(9)

3.5 A couple, where the mother has blood type **A** and the father has blood type **B**, are expecting a child.



3.5.1 List all possible genotypes of the father. (2)

3.5.2 State the possible phenotypes of their child. (2)

3.5.3 If the child has blood type **O**, explain how this is genetically possible, considering the parents' blood types. (5)

3.5.4 How many alleles control blood groups? (1)

3.5.5 Which two alleles are co-dominant? (1)

3.5.6 Name ONE use of DNA profiling apart from paternity testing (1)

(12)

TOTAL SECTION B: 50

GRAND TOTAL: 150

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