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KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

LIFE SCIENCES

COMMON TEST

JUNE 2024

MARKS: 150

TIME: 2½ hours

N.B. This question paper consists of 15 pages including this 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. Make 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.

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 to D) next to the question number (1.1.1 to 1.1.10) in your ANSWER BOOK, for example 1.1.11 D.

1.1.1 An RNA nucleotide consists of a ...

- A ribose sugar, four nitrogenous bases and a phosphate group.
- B ribose sugar, phosphate group and a nitrogenous base.
- C ribose sugar, phosphate and four nitrogenous bases.
- D deoxyribose sugar, a nitrogenous base and a phosphate group.

1.1.2 Which ONE of the following involves the development of the young inside the uterus of the mother and where it receives nutrients through the placenta?

- A Ovipary
- B Vivipary
- C Ovovivipary
- D Amniotic egg

1.1.3 Below is a list of terms relating to reproduction in vertebrates:

- (i) Precocial development
- (ii) Altricial development
- (iii) Amniotic egg
- (iv) Parental care

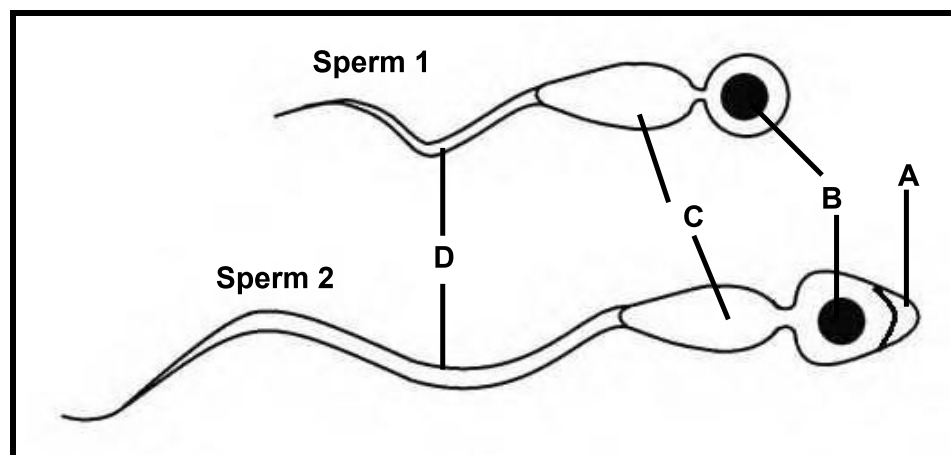
Which of the terms above refer to strategies used by birds that incubate their eggs in a nest and feed their young until they are able to fly?

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

1.1.4 Which ONE of the following is a function of ossicles?

- A Causes vibrations on the eardrum
- B Reduces pressure in the middle ear
- C Amplifies pressure waves in the inner ear
- D Amplifies vibrations in the middle ear

QUESTION 1.1.5 AND 1.1.6 ARE BASED ON THE FOLLOWING DIAGRAM OF TWO SPERM CELLS THAT ARE DRAWN TO SCALE.



1.1.5 Which part(s) play(s) a role in the movement of sperms?

- A **A** only
- B **B** only
- C **C** and **D**
- D **C** only

1.1.6 Which ONE of the following is the CORRECT MATCH of the differences between sperm 1 and sperm 2?

	Sperm 1	Sperm 2
A	Longer tail	Shorter tail
B	Has no acrosome	Has acrosome
C	Diploid nucleus	Haploid nucleus
D	More motile	Less motile

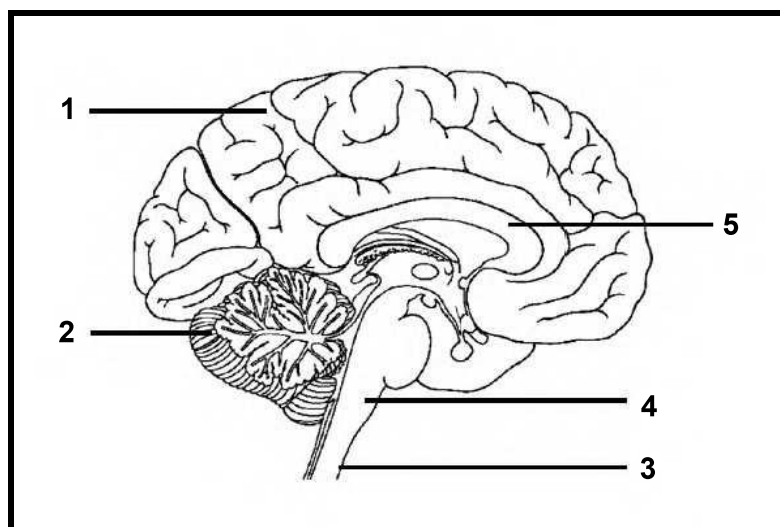
1.1.7 Below is a list of steps involved in protein synthesis

- (i) The coding part of DNA unwinds and unzips
- (ii) Peptide bonds are formed
- (iii) Adenine bases on the template strand pair off with Uracil bases from the nucleoplasm
- (iv) tRNA brings specific amino acids to the ribosome
- (v) mRNA molecule is formed

Which ONE of the following is the correct combination of events during transcription?

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

QUESTION 1.1.8 AND 1.1.9 ARE BASED ON THE DIAGRAM BELOW.



1.1.8 Which part connects two cerebral hemispheres?

- A 1
- B 2
- C 4
- D 5

1.1.9 Which one of the following is a possible symptom in a person whose part 1 is not functioning well?

- A Irregular heart beats
- B Memory loss
- C Poor muscle tone
- D Inability to maintain balance

1.1.10 Below is a list of events during hearing:

- (i) The organ of Corti is stimulated
- (ii) Impulses are sent via the auditory nerve to the cerebrum
- (iii) Pressure waves are set up in the endolymph
- (iv) Impulse is interpreted in the cerebrum
- (v) Sound waves strike the tympanic membrane

Which ONE of the following is a correct sequence of events during hearing?

- A (v) → (iii) → (ii) → (i) → (iv)
- B (v) → (i) → (iv) → (ii) → (iii)
- C (v) → (iii) → (i) → (ii) → (iv)
- D (v) → (ii) → (iv) → (i) → (iii)

(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 number (1.2.1 to 1.2.10) in the ANSWER BOOK.

- 1.2.1 The control centre for internal body temperature
- 1.2.2 A hormone responsible for milk production in human females
- 1.2.3 The membrane that, together with the endometrium, forms the placenta
- 1.2.4 Hormone that is produced after ovulation to thicken the endometrium
- 1.2.5 The part of the amniotic egg which stores waste
- 1.2.6 An inherited disorder where blood fails to clot properly
- 1.2.7 Alternative form of a gene at the same locus
- 1.2.8 All the genes that make up an organism
- 1.2.9 The part of the nervous system which increases breath rate during an exercise
- 1.2.10 A disorder caused by the degeneration of the myelin sheath of motor neurons

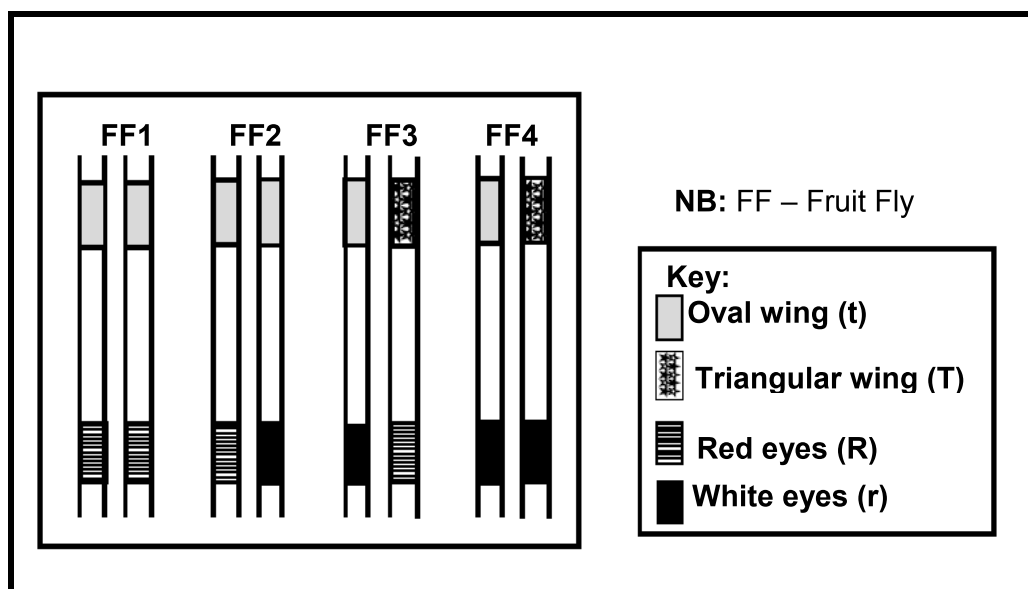
(10 x 1) **(10)**

1.3 Indicate whether each of the descriptions 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	Part of an ovum which contains a gonosome	A:	Mitochondrion
		B:	Nucleus
1.3.2	The innermost membrane surrounding the foetus	A:	Chorion
		B:	Cell membrane
1.3.3	The scientist(s) who first proposed the structure of the DNA molecule	A:	James Watson
		B:	Francis Crick

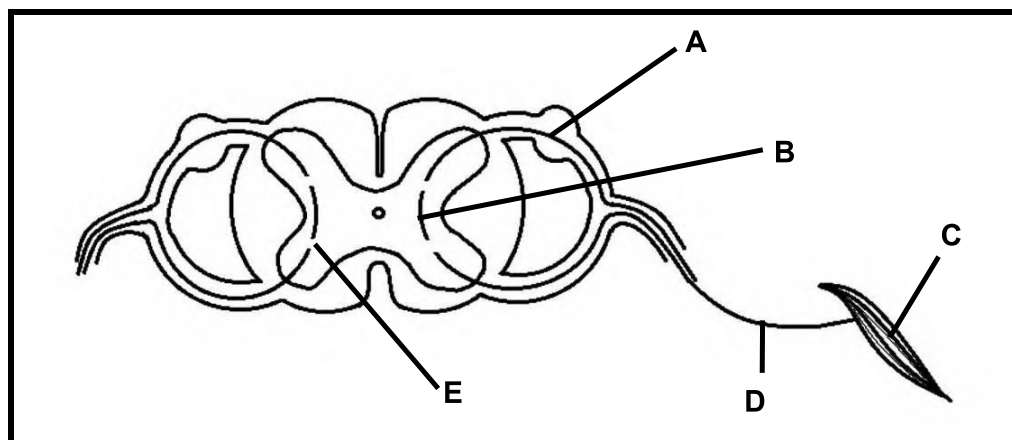
(3 x 2) **(6)**

- 1.4 The diagram shows one pair of homologous chromosomes found in each of four fruit flies. The alleles for wing shape (triangular or oval) and eye colour (red or white) are indicated on the chromosomes for each fruit fly.



- 1.4.1 Name the type of genetic cross involving two characteristics at a time. (1)
- 1.4.2 Write down the NUMBER only of a fruit fly that: (1)
- (a) Is heterozygous for both characteristics (1)
 - (b) Is homozygous for a recessive phenotype and also homozygous for a dominant phenotype. (1)
- 1.4.3 Write down the phenotype for fruit fly 4. (1)
- 1.4.4 What will be the phenotypic ratio in the offsprings if fruit fly 3 was crossed with a fruit fly with the same genotype as fruit fly 3? (2)
- 1.4.5 Write down the possible genotype of gametes from fruit fly 1. (1)
- (7)**

1.5 The diagram below shows part of a reflex arc.



1.5.1 Identify:

(a) Neuron **A** (1)

(b) Microscopic gap **E** (1)

1.5.2 Give the LETTER and the NAME of the part that brings about a response to stimuli received by the body. (2)

1.5.3 State ONE function of part **B**. (1)

1.5.4 State ONE consequence regarding reflex action if neuron **D** was completely cut. (1)

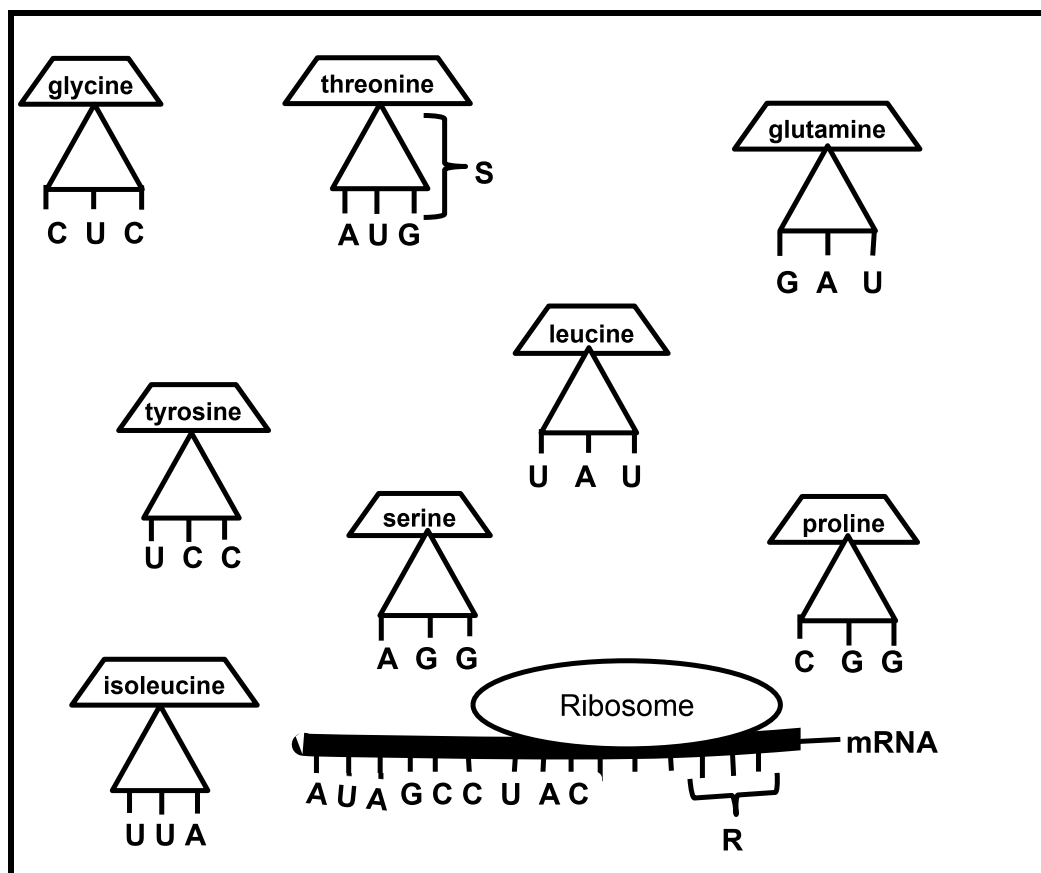
1.5.5 Give ONE function of a spinal cord. (1)
(7)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 The diagram below shows part of protein synthesis.



2.1.1 Identify:

- The part of protein synthesis that is represented in the diagram. (1)
- Molecule **S** (1)
- Collective name for three nitrogen bases indicated as **R**. (1)

2.1.2 Write down the nitrogen bases at **R** (from left to right) if it codes for glycine. (2)

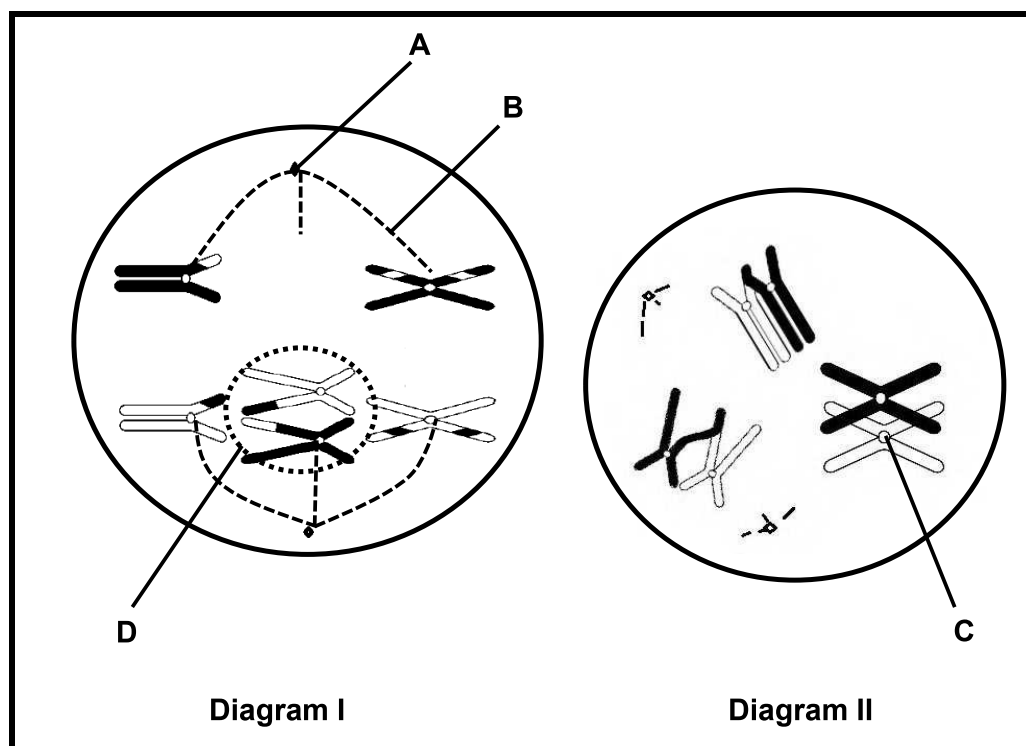
2.1.3 Describe the role of molecule **S** during the stage of protein synthesis shown in the diagram. (2)

2.1.4 The DNA base sequence which coded for the mRNA is **TATCGGATG** (read from left to right).

Explain the effect on the protein formed, if the first **T** in the DNA bases was replaced by **G** and the **C** was replaced by **A**.

(5)
(12)

2.2 The diagrams below show the same cell at different phases of meiosis.



2.2.1 Identify:

- (a) Part **B** (1)
- (b) The phase of meiosis shown in **Diagram II** (1)

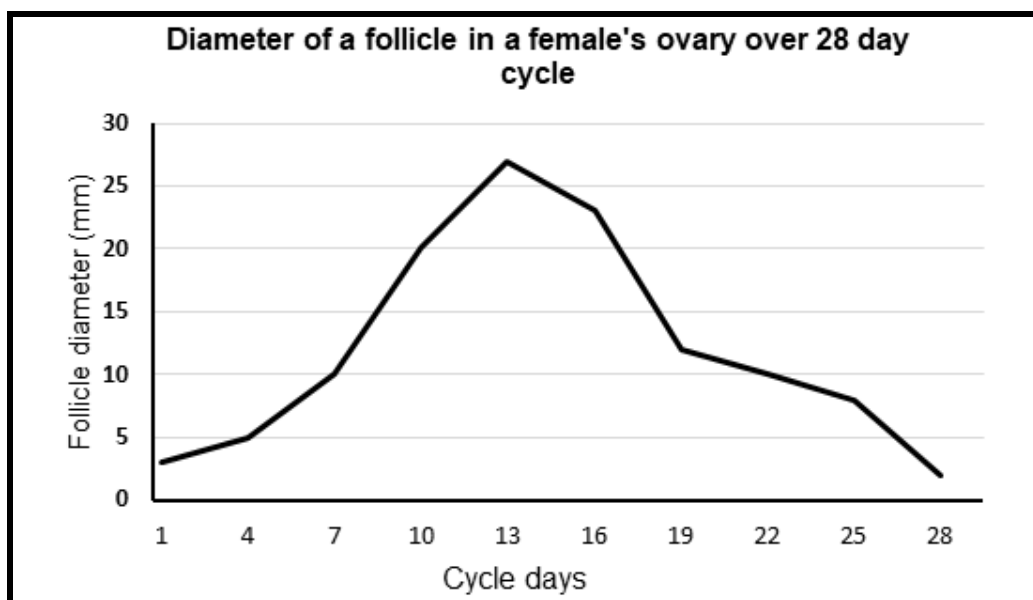
2.2.2 State ONE function of part:

- (a) **A** (1)
- (b) **C** (1)

2.2.3 Tabulate TWO differences between the phase shown in **Diagram I** and the same phase in meiosis II. (5)

2.2.4 Explain the effect of the abnormal process indicated by **D** if it occurred in chromosome pair number 21 in humans. (4)
(13)

2.3 The graph below shows the diameter of a follicle over a 28 day cycle.



2.3.1 According to this graph, on which day did ovulation take place? (1)

2.3.2 Give ONE reason for your answer. (1)

2.3.3 Name the hormone responsible for ovulation. (1)

2.3.4 Name the ovarian hormone that increases in the blood between days 7 to 13. (1)

2.3.5 Describe the role of the hormone named in QUESTION 2.3.4 in the uterine cycle. (1)

2.3.6 Did fertilisation take place during the 28 day cycle shown in the graph? (1)

2.3.7 Explain your answer to QUESTION 2.3.6 using the evidence from the graph. (3)

2.4 Describe the development of a fertilised ovum until implantation. (9)
(4)

2.5 Name and describe the process by which gametes are formed in human males. (4)

2.6 Endocrine glands play an important role in maintaining a constant internal environment regardless of the changes in the external environment.

2.6.1 Define *endocrine gland*. (2)

2.6.2 Describe the role of ADH when a person drinks a lot of water on a cold day. (6)

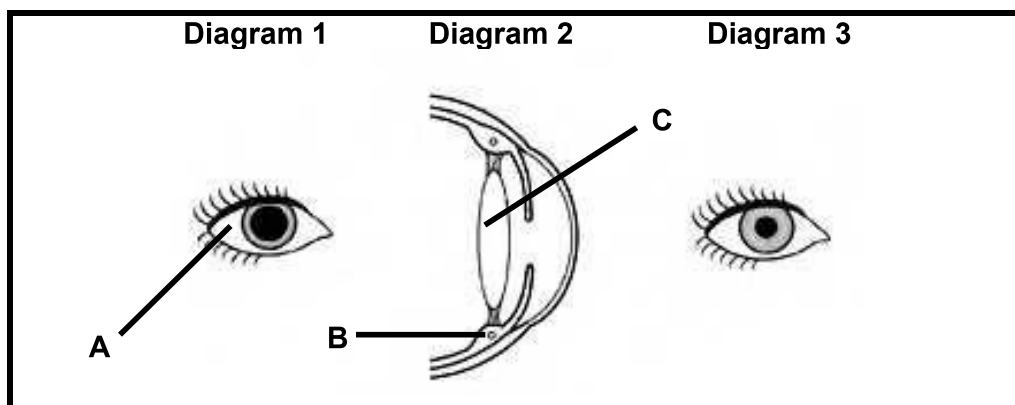
(8)

[50]



QUESTION 3

- 3.1 Diagrams **1** and **3** show an eye under different light conditions and a side view of part of an eye.



- 3.1.1 Identify part **A**. (1)
- 3.1.2 Name the eye defect that causes part **C** to be cloudy. (1)
- 3.1.3 State ONE method of treating the defect mentioned in QUESTION 3.1.2. (1)
- 3.1.4 Which diagram (**1** or **3**) shows an eye that is in bright light? (1)
- 3.1.5 Explain the evidence from the diagram which supports your answer to QUESTION 3.1.4. (3)
- 3.1.6 Describe the changes in the following parts of an eye when a person is reading a book. (2)
- (a) **B**
- (b) **C** (2)
- (11)
- 3.2 Describe how the ear plays a role in maintaining balance. (6)

3.3 The extract below is based on an endocrine disorder.

Congenital adrenal hyperplasia, or CAH, is an inherited group of conditions that affects the adrenal glands which produce adrenalin, androgens (male sex hormones) and other hormones. In many cases, a person who has CAH makes too many androgens and not enough adrenalin.

There are 2 main types of CAH.

- *Classic CAH* is the more severe form and is usually noticed during infancy or early childhood.
- *Non-classic CAH, or late-onset CAH*, is the milder form and is usually noticed in adolescence or early adulthood.

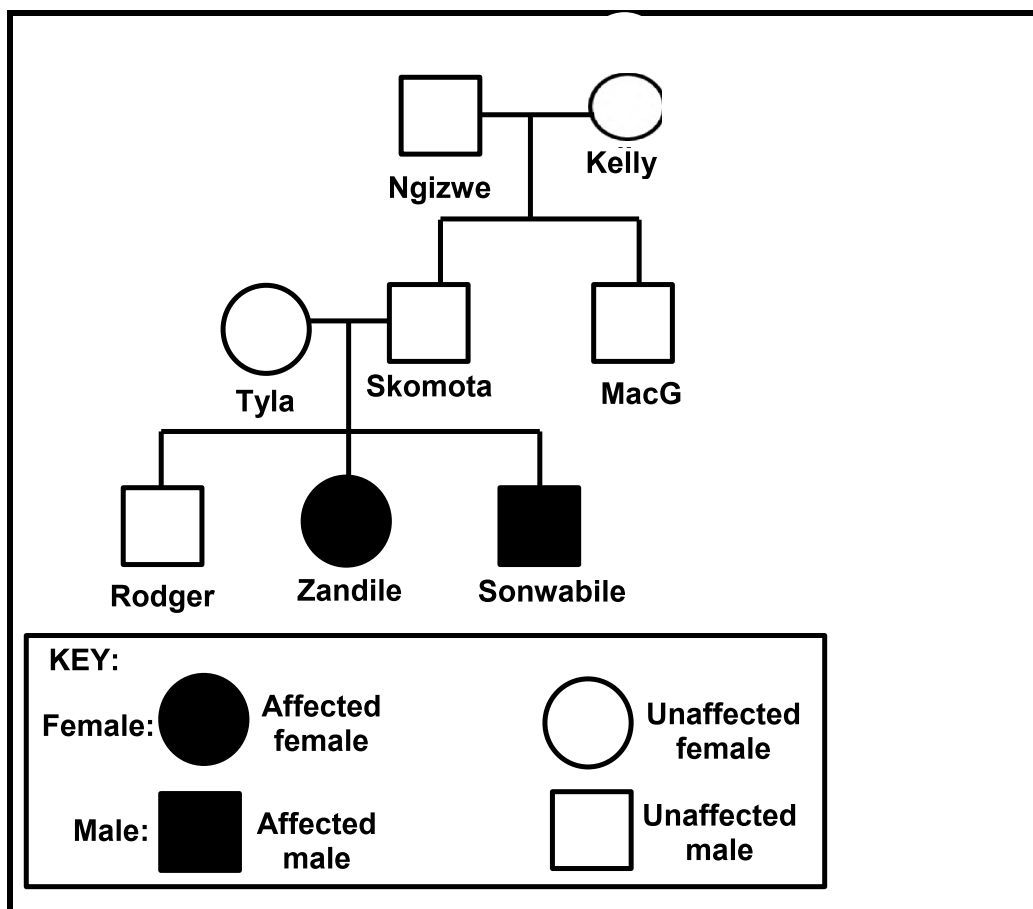
Signs and symptoms of classic CAH in infants include an enlarged penis for boys, poor weight gain or weight loss, dehydration.

Children and adults with either type of CAH can have rapid growth and early puberty, followed by shorter than average final height, irregular menstrual cycles, infertility, excessive facial or body hair, and a deep voice in females as well as severe acne.

An adrenal crisis usually occurs during times of physical stress where they feel very ill, weak and tired, and start vomiting. Seeing a medical practitioner is highly recommended at an early detection of the symptoms.

- 3.3.1 Name ONE other hormone, not mentioned in the passage, that is produced by the adrenal gland. (1)
- 3.3.2 Give THREE symptoms of CAH in infants from the passage. (3)
- 3.3.3 With reference to the extract, explain why:
- (a) Children with CAH can have early puberty. (2)
- (b) People with CAH may feel weak and tired at a time of physical stress. (6)
- (12)**

- 3.4 Galactosemia is caused by an autosomal recessive allele (**g**). People with galactosemia are unable to break down galactose, from dairy products like milk and cheese, into glucose.



3.4.1 Write down:

- (a) The phenotype of Ngizwe (1)
- (b) All the possible genotype(s) of Kelly (2)

3.4.2 Explain why Skomota is definitely heterozygous. (3)

3.4.3 Sonwabile marries an unaffected woman whose mother had galactosemia. Do a genetic cross to determine the percentage chance of them having a child who has galactosemia (6)
(12)

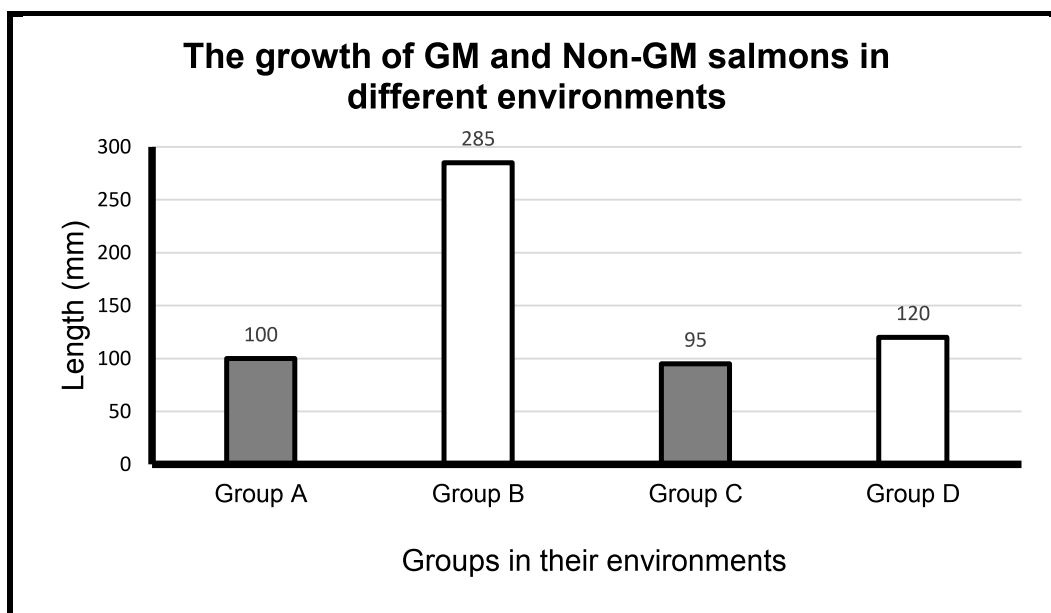
- 3.5 An investigation was done to determine the effect of the environment on the growth of genetically modified (GM) salmon.

The procedure was as follows:

- 20, five day old, hatchlings of salmon were used as classified below:
- **Group A:** 5 Non-GM salmon in a land-based hatchery
- **Group B:** 5 GM salmon in a land-based hatchery
- **Group C:** 5 Non-GM salmon in a simulated natural environment
- **Group D:** 5 GM salmon in a simulated natural environment
- Growth length was measured every month for 12 months.

NB: Hatchery is a dam-like place for breeding fish under controlled conditions.

The graph below shows the results of the investigation.



- 3.5.1 Write down the dependent variable for this investigation. (1)
- 3.5.2 Explain the role of groups **A** and **C** in this investigation. (2)
- 3.5.3 State ONE way in which the validity of this investigation was ensured. (1)
- 3.5.4 Calculate by how much percent is GM salmon larger than Non-GM salmon in simulated natural environment. Show ALL your working. (3)
- 3.5.5 State a conclusion based on the results. (2)

(9)
[50]

TOTAL SECTION B: [100]

GRAND TOTAL: [150]

