education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 12

LIFE SCIENCES

JUNE 2024

MARKS: 150

TIME: 2½ hours

This question paper consists of 16 pages.

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Write ALL the answers in your ANSWER BOOK.
3. Start the answer 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 all drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and 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 1.1.9) in the ANSWER BOOK, e.g 1.1.10 D.

1.1.1 Which ONE of the following parts control the amount of light entering the eye by influencing the size of the pupil?

A Sclera
B Cornea
C Retina
D Iris

1.1.2 Meiosis is best explained as a process that produce … daughter cells?

A two haploid
B two diploid
C four diploid
D four haploid

1.1.3 A list of functions of the brain is provided below:

(i) Interpret sensation
(ii) Regulates involuntary actions
(iii) Controls higher thought processes
(iv) Controls voluntary actions

Which ONE of the following combinations are the functions of the cerebrum?

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

1.1.4 During Anaphase II of meiosis, the two chromatids of a chromosome are pulled apart, each moving towards opposite poles at a rate of 1 micrometre per second.

The distance in micrometre between the chromatids after 45 seconds is

A 15.
B 25.
C 45.
D 90.

1.1.5 A red flowering plant is crossed with a white flowering plant. All the offspring have pink flowers. When the two pink flowering plants are crossed, the next generation of flowering plants will have flowers that are …

A pink only.
B red only.
C white only.
D pink, red and white.

1.1.6 A sample of DNA has 60 Guanine bases and 30 Adenine bases. How many phosphate molecules would you expect in this sample of DNA?

A 30
B 90
C 180
D 270

1.1.7 Grommets may be used in treatment of ...

A astigmatism.
B cataracts.
C middle ear infections.
D long-sightedness.

1.1.8 The part of the brain that regulates body temperature is the …

A medulla.
B cerebrum.
C cerebellum.
D hypothalamus.

1.1.9 It allows for gaseous exchange in the amniotic egg and forms the placenta in mammals.

A Allantois
B Chorionic villi
C Umbilical cord
D Chorion

(9 x 2) **(18)**

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 Two or more alternative forms of a gene at the same locus

1.2.2 An inheritance disorder where blood fails to clot properly

1.2.3 The structure that the Graafian follicle develops into after ovulation

1.2.4 The structure in a cell that forms the spindle fibre

1.2.5 A branch of the autonomic nervous system that decreases the heartbeat back to normal

1.2.6 A nerve cell that carries nerve impulses from receptors towards the central nervous system

1.2.7 The centre that controls sleep

1.2.8 The organelle found in large quantities in the neck region of a sperm cell

1.2.9 Type of egg where the embryo develops inside the fluid sac which is surrounded by a shell (9 x 1) **(9)**

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	Type of inheritance where both alleles are expressed equally in the phenotype	A: Incomplete dominance B: Complete dominance
1.3.2	Reproductive strategy in birds where hatchling are helpless and unable to move and feed themselves	A: Precocial B: Altricial
1.3.3	Type of reproduction in vertebrates where the foetus is attached to and develops inside the uterus	A: Ovipary B: Ovovivipary

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

1.4 In human, long finger (**F**) and continuous hairline (**H**) are dominant over short finger and widow's peak. A man and a woman, both heterozygous for the two characteristics, plan on having a child.

Gametes	**FH**	**Fh**	**fH**	**fh**
FH	FFHH	FFHh	FfHH	FfHh
Fh	FFHh	FFhh	FfHh	Ffhh
fH	FfHH	FfHh	ffHH	ffHh
fh	FfHh	**Z**	ffHh	ffhh

1.4.1 State the genotype at **Z**. (1)

1.4.2 Give the:

(a) Genotype of the parents (2)

(b) Number of genotypes that could result in offspring with long finger and a continuous hairline (1)

(c) Alleles for continuous hairline (1)

(d) Phenotype of a child who is homozygous recessive for both characteristics (2)
(7)

1.5 Human blood groups are controlled by multiple alleles.

1.5.1 How many alleles control blood groups? (1)

1.5.2 Which TWO alleles are codominant in the inheritance of blood groups? (2)

1.5.3 A man is heterozygous for blood group A and marries a woman who has blood group O.

Use a genetic cross to show the phenotypic ratio of their offspring. (7)
(10)

TOTAL SECTION A: 50

SECTION B

QUESTION 2

2.1 A mutation has occurred on the last codon of an mRNA molecule as shown below.

Original sequence	AUG	GAA	AUA	CCG	CCA	GGA
Mutated sequence	AUG	GAA	AUA	CCG	CCA	GGC

2.1.1 Name the type of mutation that has occurred. (1)

2.1.2 Give a reason to your answer in QUESTION 2.1.1 (2)

2.1.3 The table below shows some mRNA codons and amino acids that they code for.

mRNA codons	Amino Acid
AUA	Isoleucine
AUG	Methionine
CCA	Proline
CCG	Proline
CUG	Leucine
GAC	Glutamic acid
GGA	Glycine

(a) State the number of different amino acids coded for by the original sequence of the mRNA molecule given above. (1)

(b) Give the anticodon on tRNA molecule that carries the amino acids Methionine and Leucine. (2)

(c) Use the information in the table to describe the effect of the mutation on the protein formed. (4)

2.1.4 Describe the process of transcription in protein synthesis. (5)
(15)

2.2 Read the extract below about a medical condition in male babies called cryptorchidism.

> Cryptorchidism occur in new-borns when one or both of the testes do not descent into the scrotal sac at birth, but remain inside the abdominal cavity.
>
> Cryptorchidism occur in approximately 3 to 5% of full-term male infants while approximately one third of premature male babies are born with this condition.
>
> If the testes do not descent naturally by the age of one, treatment is needed. Treatment may involve administering testosterone, but the most common treatment is surgery.
>
> If cryptorchidism is not resolved, it may lead to infertility when both testes do not descent and increased the risk of testicular cancer by the age of 30 to 40 years.

2.2.1 State ONE function of testosterone not mention in the extract above. (1)

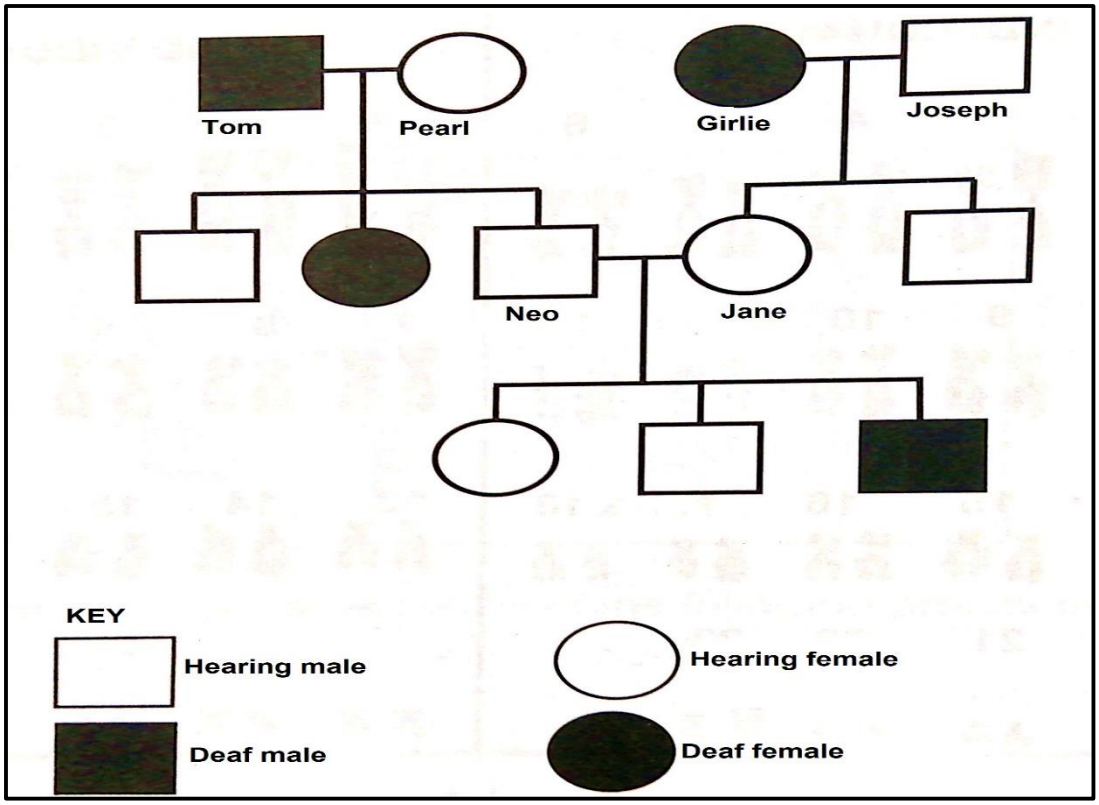
2.2.2 According to the extract, state TWO ways in which cryptorchidism is treated. (2)

2.2.3 What percentage of premature male babies are born with cryptorchidism? (1)

2.2.4. From the extract, give ONE reason, other than infertility, why cryptorchidism needs to be treated if the condition is not resolved naturally. (1)

2.2.5 Explain why undescended testes may lead to infertility in young males. (2)
(7)

2.3 One type of deafness in humans is carried on a single allele. The diagram below shows the inheritance of deafness in a family.



2.3.1. How many:

(a) Generations are represented in this pedigree diagram (1)

(b) Children of Tom and Pearl are able to hear (1)

2.3.2 Which genotype is dominant? (1)

2.3.3 Use the offspring of Neo and Jane to explain your answer to QUESTION 2.3.2. (4)

2.3.4 Use the letter '**A'** to represent the dominant allele and a letter **'a'** for recessive allele to give ALL the possible genotype for a hearing individual. (2)
(9)

2.4 Some mine workers are constantly exposed to loud noise for long periods. This can destroy the hair cells in the Organ of Corti and damage the auditory nerve, resulting in hearing loss.

A survey was conducted in Marikana Mines from 2010 to 2015, to establish the number of mine workers who suffered from hearing loss.

The results are shown in the table below.

YEARS	NUMBER OF MINE WORKERS WITH HEARING LOSS
2010	1500
2011	5000
2012	8000
2013	10000
2014	11000

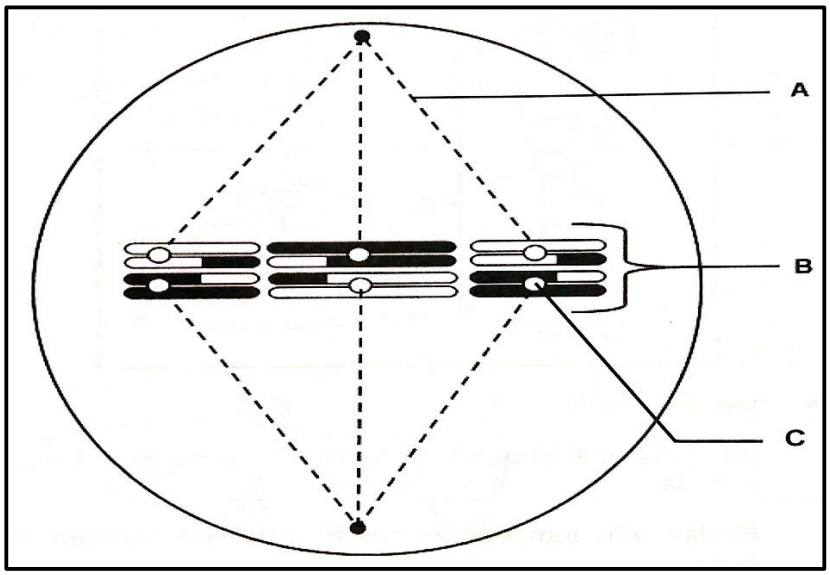
2.4.1 Name the location of the Organ of Corti. (1)

2.4.2 Calculate the percentage increase in the number of mine workers with hearing loss between 2010 and 2014. (3)

2.4.3 Suggest ONE reason for the increase in the number of mine workers with hearing loss caused by exposure to loud noise in this mine. (1)

2.4.4 Draw a bar graph to represent the data in the table. (6)
(11)

2.5 The diagram below show a phase during meiosis in an animal cell.



2.5.1 Identify part **C.** (1)

2.5.2 Part **B** represents homologous chromosomes.

What are homologous chromosomes? (1)

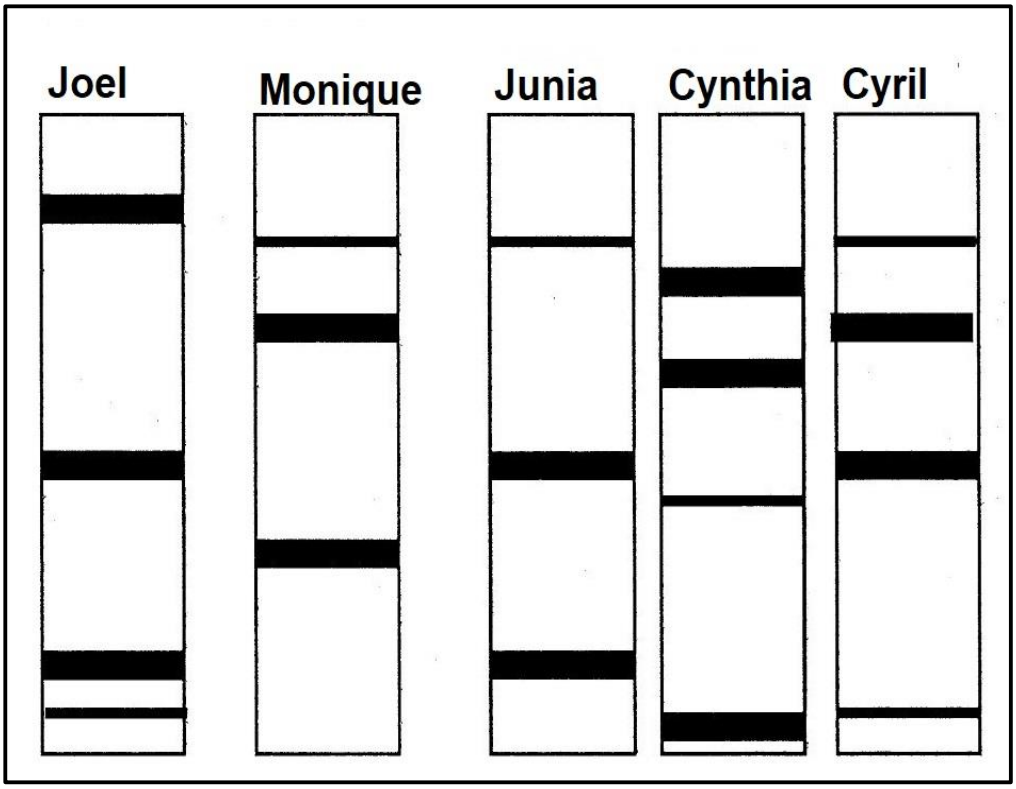
2.5.3 Name and describe the phase prior to the phase illustrated above. (3)

2.5.4 Describe the results at the end of meiosis, if the chromosomes at part **B** failed to separate. (3)
(8)
[50]

QUESTION 3

3.1 Joel and Monique have three children. One of the three children was adopted. A DNA profile for each member of the family was prepared to determine if Joel is the father of all three children (Junia, Cynthia and Cyril).

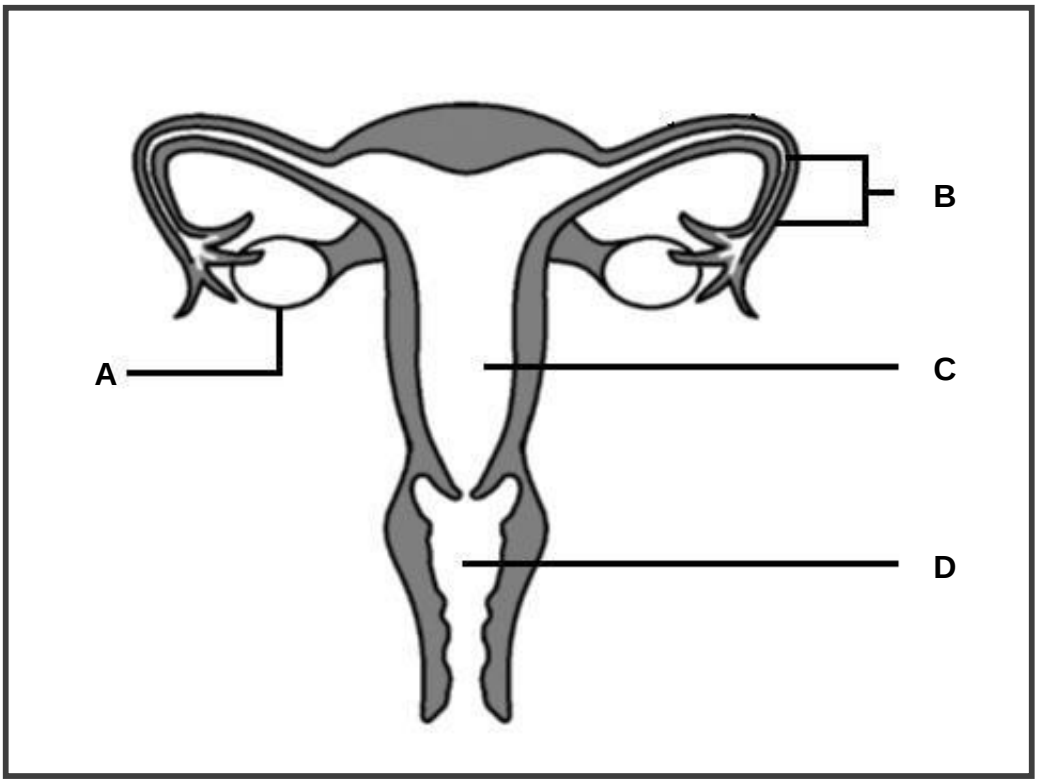
The DNA profiles are given below.



3.1.1 Which ONE of the children has been adopted? (1)

3.1.2 Explain your answer to QUESTION 3.1.1. (2)
(3)

3.2 The diagram below represents a part of the female reproductive system.



3.2.1 Identify part **C**. (1)

3.2.2 State TWO functions of part **D.** (2)

3.2.3 Name the hormone secreted by part **A** that stimulates puberty. (1)

3.2.4 State how the hormone named in QUESTION 3.2.3 influences the endometrium. (2)

3.2.5 Explain how reproduction will be affected if part **B** has a blockage on both sides. (3)

3.2.6 Explain ONE way in which part **C** is structurally suited for gestation. (2)

3.2.7 Describe the process of oogenesis in part **A**. (5)
(16)

3.3 Read the extract below.

ALZHEIMER'S DISEASE AND EXERCISE

Age and family history are the known risk factor for Alzheimer's disease. The most common symptom of Alzheimer's disease is a worsening ability to remember new information.

Regular exercise may help to reduce the risk of developing Alzheimer disease because it can improve blood flow to the brain and help to maintain the volume of the hippocampus. The hippocampus is located deep inside the cerebrum and plays a major role in learning ability and orientation.

Scientist conducted an investigation to determine if regular exercise reduces risk of Alzheimer's disease in humans.

They:

- Used 37 female participants between the ages of 65 and 75 in an exercise programme
- Used participants that did not show symptoms of Alzheimer disease at the start of the investigation
- Conducted the investigation three times a week for three months.

The results showed an improvement in higher-order thinking abilities and an increased blood flow to the cerebrum.

3.3.1 From the extract state:

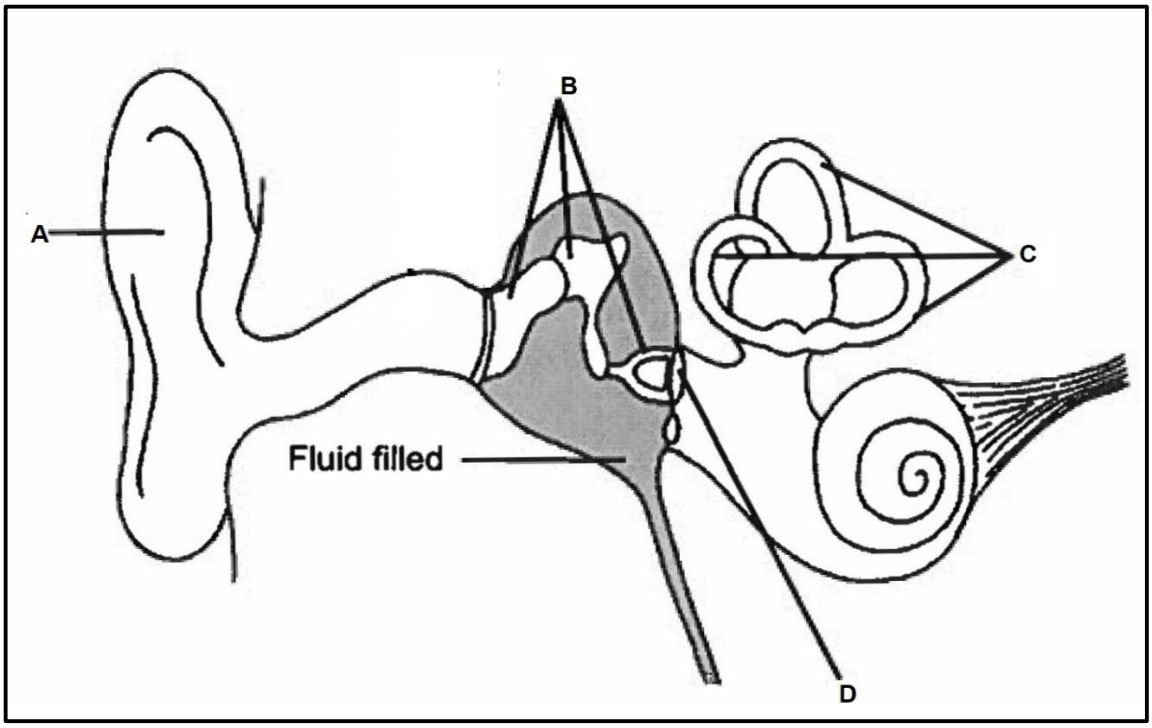
(a) Age group of female participants (1)

(b) ONE function of the hippocampus (1)

3.3.2 State the aim of this investigation. (2)

3.3.3 Explain why this investigation cannot be used to conclude that exercise reduces the risk of getting Alzheimer's disease. (3)
(7)

3.4 The diagram below represents part of the human ear with middle-ear infection.



3.4.1 Identify part:

(a) **A** (1)

(b) **D** (1)

3.4.2 State the function of the round window. (1)

3.4.3 Explain how middle ear infection could affect hearing. (2)

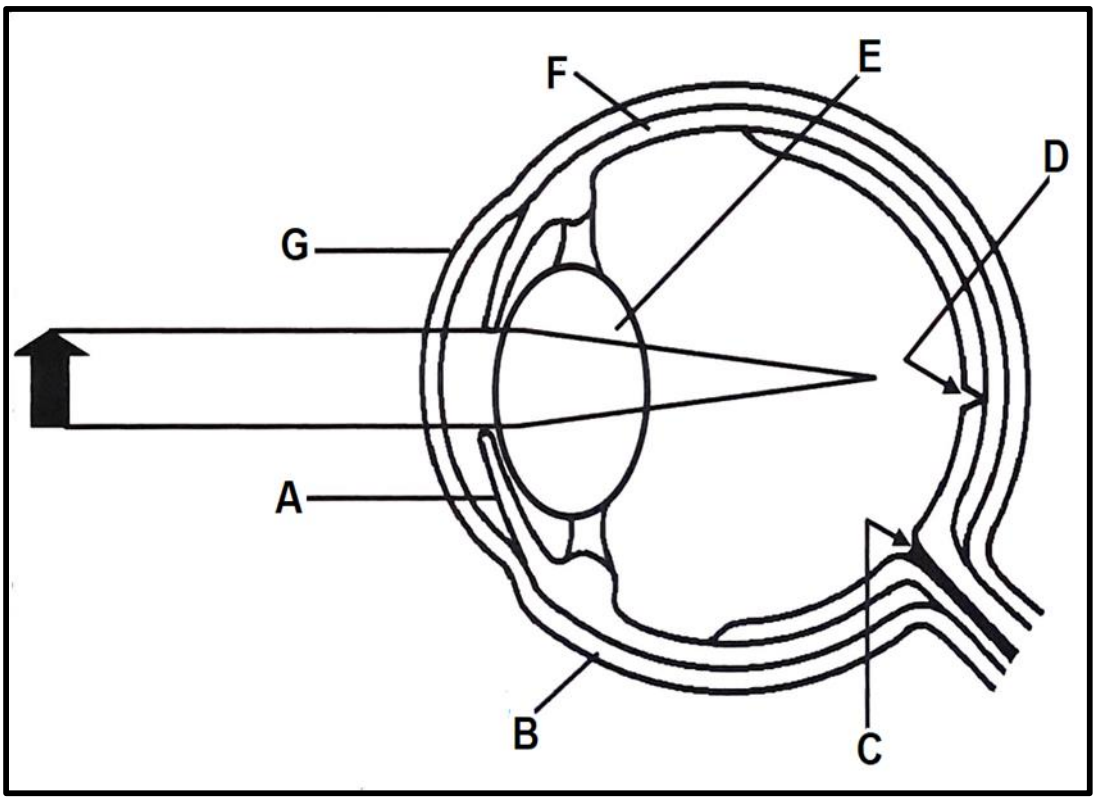
3.4.4 Describe the role of auditory nerve. (2)

3.4.5 Which hearing defect is caused by hardening of tissues of part **B?** (1)

3.4.6 Name the treatment for the hearing defect mentioned in QUESTION 3.4.5. (1)

3.4.7 Describe how part **C** is involve in maintaining balance when there is change in the speed and direction of movement of the head. (4)
(13)

3.5 The diagram below represents a type of visual defect.



3.5.1 Identify part **B**. (1)

3.5.2 Name the visual defect shown in the diagram above. (1)

3.5.3 Name and describe the visual defect that occurs when part **G** is uneven. (3)

3.5.4 Name the TWO muscles found in part **A.** (2)

3.5.5 Describe how the muscles mentioned in QUESTION 3.5.4 will regulate light while driving back from the stadium at 19h30 in summer. (4)

(11)

[50]

TOTAL SECTION B: 100
GRAND TOTAL: 150