

# 2024 SUBJECT WORKBOOK

## Grade 12



# LIFE SCIENCES

A joint initiative between the Western Cape Education Department and Stellenbosch University.



## BROADCAST SESSIONS

GRADE 12

LIFE SCIENCES

Session	Date	Time	Topic
1	08/04/2024	16h00-17h00	Genetics
2	17/07/2024	16h00-17h00	Human eye and ear
3	29/07/2024	16h00-17h00	Plant hormones



## SESSION 1 | GENETICS

### Types of dominance:

- **Complete dominance** – one allele is dominant and the other is recessive, such that the effect of the recessive allele is masked by the dominant allele in the heterozygous condition
- **Incomplete dominance** – neither one of the two alleles of a gene is dominant over the other, resulting in an intermediate phenotype in the heterozygous condition
- **Co-dominance** – both alleles of a gene are equally dominant whereby both alleles express themselves in the phenotype in the heterozygous condition

### The Law of Dominance:

- When two homozygous organisms with contrasting characteristics are crossed, all the individuals of the F<sub>1</sub> generation will display the dominant trait
- An individual that is heterozygous for a particular characteristic will have the dominant trait as the phenotype.

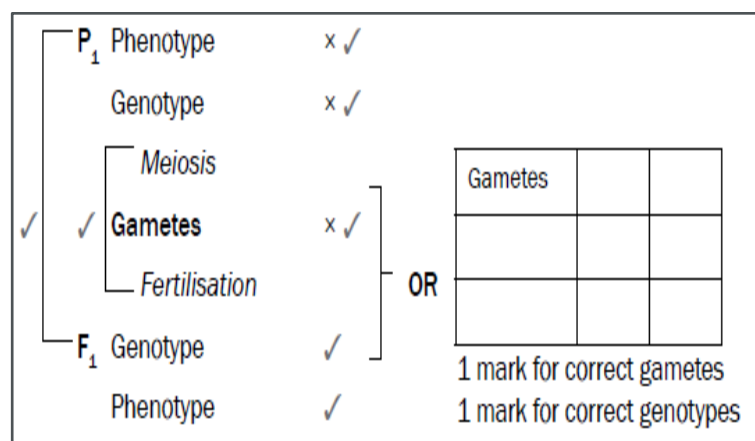
### Mendel's Principle of Segregation:

- An organism possesses two 'factors' which separate or segregate so that each gamete contains only one of these 'factors'

### Mendel's Principle of Independent Assortment:

- The various 'factors' controlling the different characteristics are separate entities, not influencing each other in any way, and sorting themselves out independently during gamete formation.

### Monohybrid crosses:

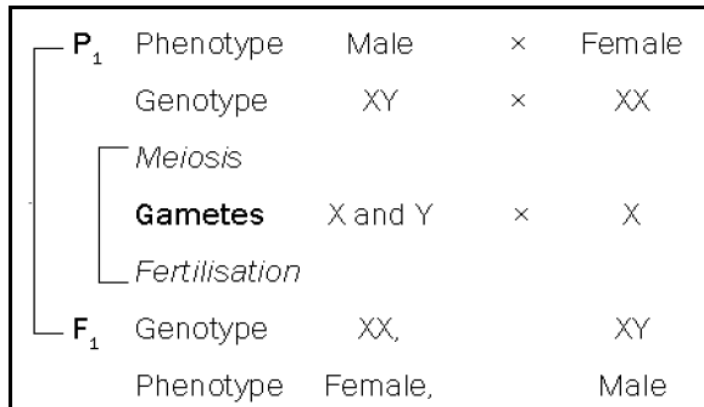




## SESSION 1 | GENETICS

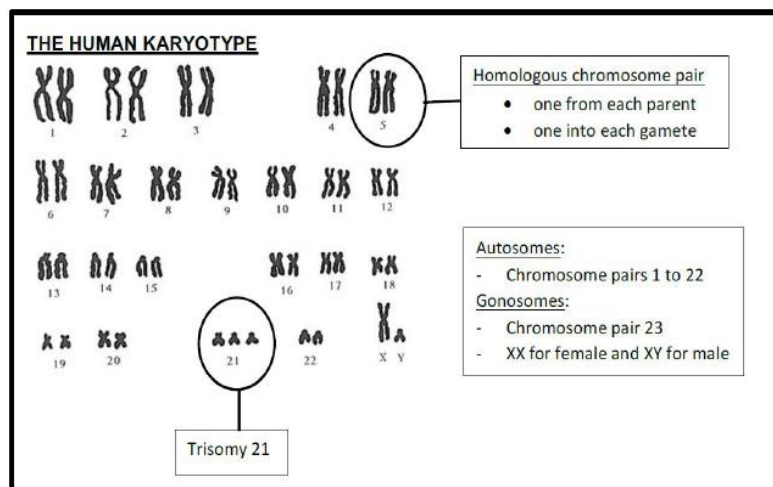
### Sex determination:

- 22 pairs of chromosomes in humans are **autosomes** and one pair of chromosomes are sex chromosomes/**gonosomes**.
- A human male has **X and Y** gonosomes and a female has two **X** gonosomes.



### Karyotypes:

- A **karyotype** is the number, shape and arrangement of all the chromosomes in the nucleus of a somatic cell.



### Sex-linked inheritance:

- Although most of the bodily characteristics are carried on the 22 pairs of autosomes, there are a few characteristics carried on the gonosomes only.
- Certain **sex-linked genetic disorders** are carried on the allele found on the X chromosome only. Two of these disorders are **colour blindness** and **haemophilia**.



## SESSION 1 | GENETICS

### Colour blindness:

- Colour blindness is a visual defect resulting in an inability to distinguish between certain colours.
- The allele for colour-blindness is recessive and is carried on the X-chromosome.

### Haemophilia:

- Haemophilia is the inability of the blood to clot due to lack of a blood clotting factor.
- The allele for haemophilia is recessive and is carried on the X-chromosome.

Genotype	Phenotype
$X^HX^H$	Normal female
$X^HX^h$	Normal female
$X^hX^h$	Haemophiliac female
$X^HY$	Normal male
$X^hY$	Haemophiliac male

### Blood grouping:

- There are four blood types in humans: A, B, AB or O.
- These phenotypes are controlled by **three alleles** ( $I^A$ ,  $I^B$  and  $i$ ) but each person only inherits two alleles.
- **Multiple alleles** – refers to more than two alternative forms of a gene at the same locus.
- Allele  $I^A$  and allele  $I^B$  is **dominant** over allele  $i$ .
- Allele  $I^A$  and allele  $I^B$  are **codominant**.

Blood group (phenotype)	Genotype
A	$I^AI^A$ or $I^Ai$
B	$I^BI^B$ or $I^Bi$
AB	$I^AI^B$
O	$ii$

### Dihybrid crosses:

- A genetic cross involving **two** characteristics
- In pea plants, the allele for tallness (**T**) is dominant and the allele for shortness (**t**) is recessive. The allele for purple flowers is dominant (**P**) and the allele for white flowers is recessive (**p**). Two plants, **heterozygous** for both tallness and purple flowers were crossed. Use a genetic cross to show all the possible genotypes and phenotypes of their offspring.

<b>P<sub>1</sub></b>	Phenotype	<b>Tall, purple</b>	x	<b>Tall, purple</b>																									
	Genotype	<b>TtPp</b>	x	<b>TtPp</b>																									
Meiosis	Gametes	<b>TP</b> <b>Tp</b> <b>tP</b> <b>tp</b>	x	<b>TP</b> <b>Tp</b> <b>tP</b> <b>tp</b>																									
Fertilisation		<table border="1"> <thead> <tr> <th>Gametes</th> <th><b>TP</b></th> <th><b>Tp</b></th> <th><b>tP</b></th> <th><b>tp</b></th> </tr> </thead> <tbody> <tr> <th><b>TP</b></th> <td>TTPP</td> <td>TTPp</td> <td>TtPP</td> <td>TtPp</td> </tr> <tr> <th><b>Tp</b></th> <td>TTPp</td> <td>TTpp</td> <td>TtPp</td> <td>Ttpp</td> </tr> <tr> <th><b>tP</b></th> <td>TtPP</td> <td>TtPp</td> <td>ttPP</td> <td>ttPp</td> </tr> <tr> <th><b>tp</b></th> <td>TtPp</td> <td>Ttpp</td> <td>ttPp</td> <td>ttpp</td> </tr> </tbody> </table>			Gametes	<b>TP</b>	<b>Tp</b>	<b>tP</b>	<b>tp</b>	<b>TP</b>	TTPP	TTPp	TtPP	TtPp	<b>Tp</b>	TTPp	TTpp	TtPp	Ttpp	<b>tP</b>	TtPP	TtPp	ttPP	ttPp	<b>tp</b>	TtPp	Ttpp	ttPp	ttpp
Gametes	<b>TP</b>	<b>Tp</b>	<b>tP</b>	<b>tp</b>																									
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<b>tp</b>	TtPp	Ttpp	ttPp	ttpp																									
<b>F<sub>1</sub></b>	Genotype	<b>9 different genotypes, as in the table above</b>																											
	Phenotype	<b>9 tall, purple flowered plants</b> <b>3 short, purple flowered plants</b> <b>3 tall, white flowered plants</b> <b>1 short, white flowered plant</b>																											
		<b>Phenotypic ratio: 9:3:3:1</b>																											



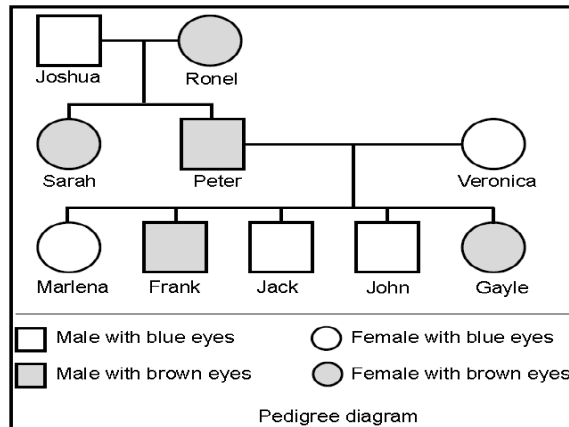
## SESSION 1 | GENETICS

### Genetic lineages/pedigrees:

- A genetic lineage/pedigree traces the inheritance of characteristics over many generations

### Example:

- The pedigree diagram below shows inheritance of eye colour in humans over three generations of a family. Brown eye colour (**B**) is dominant over blue eye colour (**b**).



- Squares represent males and circles represent females.
- The horizontal line between a square (Joshua) and a circle (Ronel) shows that they have mated.
- The vertical line flowing from the horizontal line represents the offspring (Sarah and Peter) of the two parents (Joshua and Ronel).

### Mutation:

- A sudden change in the genetic composition of an organism.

### Gene mutation:

- A change in the sequence of nitrogenous bases or nucleotides in DNA.

### Chromosomal mutation:

- A change in the normal structure or number of chromosomes.

### Genetic engineering:

- Genetic engineering is the manipulation or transfer of genes from one organism to another to make products that satisfy human needs.

### Stem cells:

Stem cells are undifferentiated and have the potential to develop into any type of cell to replace affected/defective cells causing a disorder.

### Cloning:

- Cloning is the process where genetically identical organisms are produced.



## SESSION 1 | GENETICS

### Questions:

1.1 Brown enamel of the teeth is a sex-linked trait. A dominant allele on the **X** chromosome causes brown teeth in humans.

1.1.1 Explain why more males than females have white teeth. (4)

1.1.2 A man with brown teeth married a woman with white teeth. Use a genetic cross to show the possible phenotypic ratios of their children. Use  $X^B$  for brown teeth and  $X^b$  for white teeth. (6)

### Answers to Question 1.1:

1.1.1 Males have only one X chromosome ✓ /The Y-chromosome does not have this allele and have to inherit only one recessive allele ✓ to have white teeth whereas females have two X chromosomes ✓ and have to inherit two recessive alleles to have white teeth ✓

1.1.2

<b>P<sub>1</sub></b>	Phenotype	Male with brown teeth	x	Female with white teeth ✓									
	Genotype	$X^B Y$	x	$X^b X^b$ ✓									
<i>Meiosis</i>													
<i>Fertilisation</i>	<table border="1"> <tr> <td>Gametes</td> <td><math>X^B</math></td> <td>Y</td> </tr> <tr> <td><math>X^b</math></td> <td><math>X^B X^b</math></td> <td><math>X^b Y</math></td> </tr> <tr> <td><math>X^b</math></td> <td><math>X^B X^b</math></td> <td><math>X^b Y</math></td> </tr> </table>				Gametes	$X^B$	Y	$X^b$	$X^B X^b$	$X^b Y$	$X^b$	$X^B X^b$	$X^b Y$
	Gametes	$X^B$	Y										
	$X^b$	$X^B X^b$	$X^b Y$										
$X^b$	$X^B X^b$	$X^b Y$											
1 mark for correct gametes 1 mark for correct genotypes													
<b>F<sub>1</sub></b>	Phenotype	1 female with brown teeth: 1 male with white teeth ✓*											
P <sub>1</sub> and F <sub>1</sub> ✓ Meiosis and fertilisation ✓													

**\*1 compulsory mark + Any 5 (6)**

1.2 The brinjal plant carries edible fruit. Scientists have been studying the inheritance of two genes, one for stem texture and the other for fruit shape.

The stems can be smooth (**N**) or prickly (**n**), while the fruit shape can be round (**R**) or elongated (**r**).

1.2.1 Name the type of cross that studies two characteristics. (1)

1.2.2 State the:

(a) Dominant characteristic for stem texture (1)

(b) Recessive characteristic for fruit shape (1)

1.2.3 Give the:

(a) Genotype of a plant with a prickly stem and elongated fruit (2)

(b) Phenotype of a plant with the genotype NnRR (2)

### Answers to Question 1.2:

1.2.1 Dihybrid ✓ cross

1.2.2 (a) Smooth ✓ stem

(b) Elongated ✓ fruit

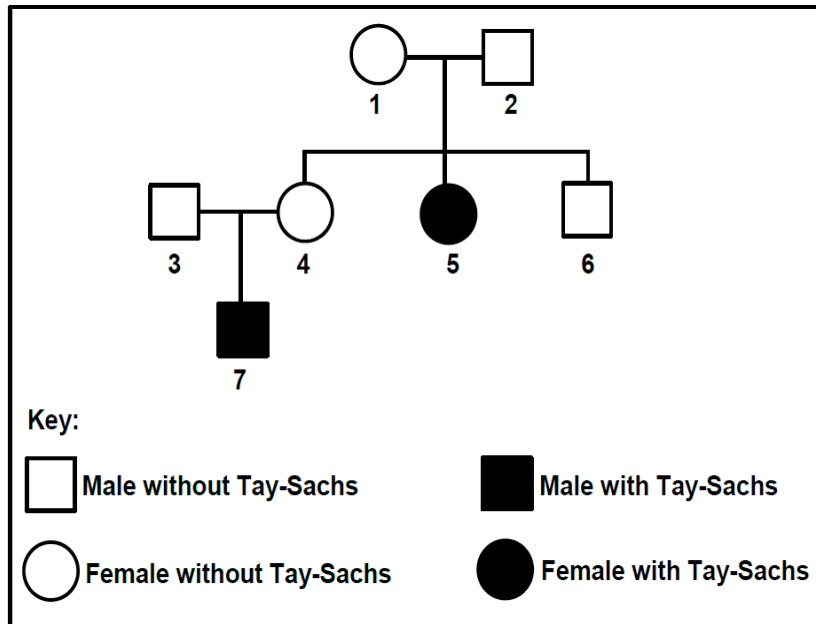
1.2.3 (a) nnr ✓ ✓ /nrnr/ rrrn

(b) Smooth stem round fruit ✓ ✓



## SESSION 1 | GENETICS

1.3 The diagram below shows the inheritance of Tay-Sachs, a rare disease which leads to the destruction of neurons. It is inherited as an autosomal disorder, controlled by two alleles, **(T)** and **(t)**.



- 1.3.1 Describe what is meant by an *autosomal disorder*. (2)
- 1.3.2 How many sons do individuals **1** and **2** have? (1)
- 1.3.3 Using individuals **3**, **4** and **7**, explain why it can be concluded that Tay-Sachs disease is controlled by a recessive allele. (5)
- 1.3.4 Individuals **1** and **2** can produce children with three possible genotypes. List ALL the genotypes that have a 25% chance of being produced. (2)

### Answers to Question 1.3:

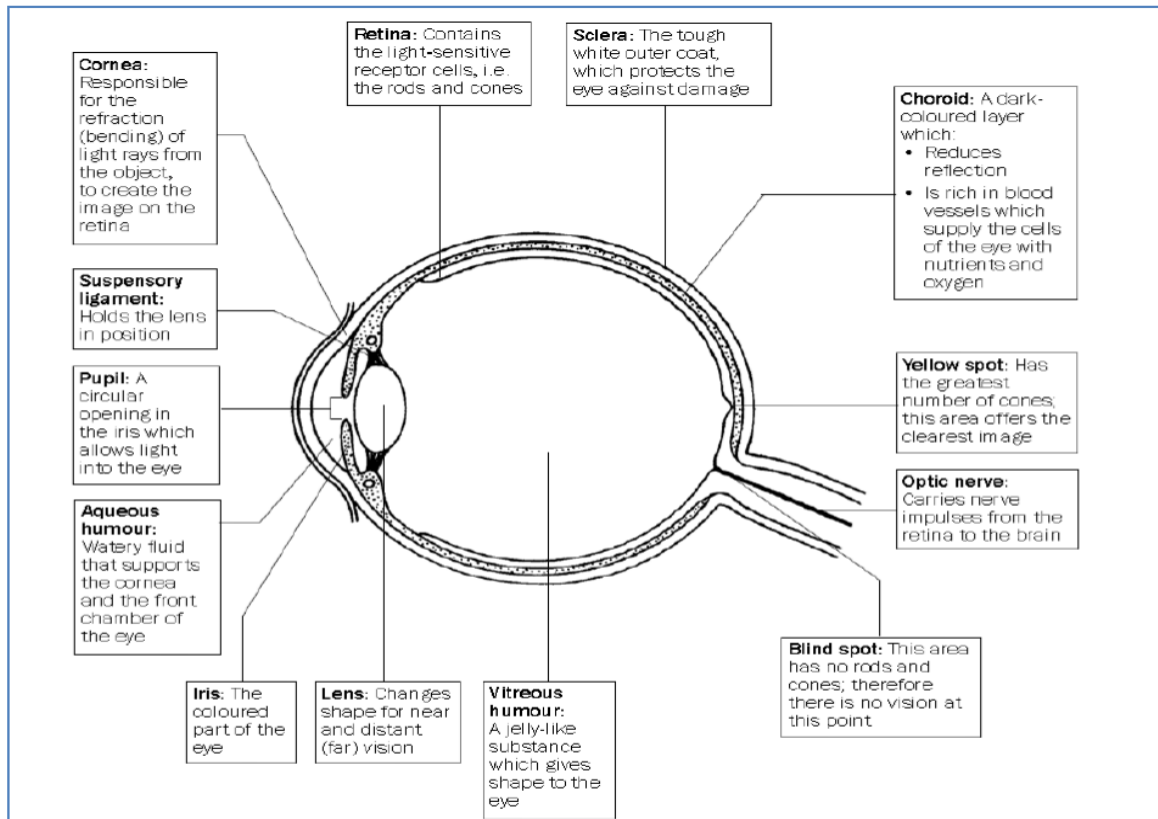
- 1.3.1 The disorder is controlled by alleles ✓ /genes that are located on the autosomes ✓
- 1.3.2 One ✓ /1
- 1.3.3 - Individuals 3 and 4 are both without Tay-Sachs disease ✓  
 - The child has Tay-Sachs ✓ /Individual 7 has Tay-Sachs  
 - which is only expressed in the phenotype in a homozygous condition ✓  
 - Each parent must carry a recessive allele ✓ /be heterozygous  
 - The child has two recessive alleles ✓  
 - One was received from each parent ✓
- 1.3.4 TT ✓  
 tt ✓





## SESSION 2 | HUMAN EYE AND EAR

### THE HUMAN EYE



### ACCOMMODATION

DISTANT VISION (OBJECTS FURTHER THAN 6M)	NEAR VISION (OBJECTS CLOSER THAN 6M)
Ciliary muscles relax	Ciliary muscles contract
Ciliary body moves further away from the lens	Ciliary body moves closer to the lens
Suspensory ligaments tighten (becomes taut)	Suspensory ligaments slacken
Tension on lens increases	Tension on lens decreases
Lens is less convex	Lens becomes more convex
Light rays are refracted less	Light rays are refracted more
Light rays are focused on the retina and image falls on the retina	Light rays are focused on the retina and image falls on the retina

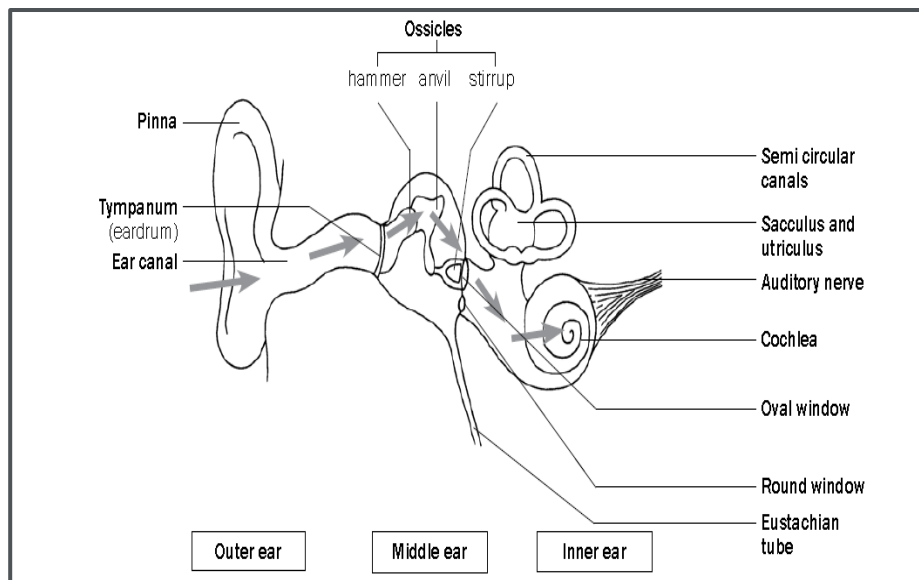
### PUPILARY MECHANISM

IN BRIGHT LIGHT	IN DIM LIGHT
Radial muscles of the iris relax	Radial muscles of the iris contract
Circular muscles of the iris contract	Circular muscles of the iris relax
Pupil constricts (becomes smaller)	Pupil dilates (enlarges)
Less light enters the eye	More light enters the eye



## SESSION 2 | HUMAN EYE AND EAR

### THE HUMAN EAR



### HEARING

- The pinna traps and directs the sound waves into the external auditory canal/ear canal/meatus.
- This causes the tympanic membrane to **vibrate**.
- The **vibrations** are transmitted to the auditory ossicles.
- The ossicles amplify the vibrations and transmit it to the oval window.
- The oval window vibrates creating **pressure waves** in the fluid/endolymph of the cochlea.
- This stimulates the organ of Corti to convert the wave into an **impulse**.
- The impulse travels along the auditory nerve to the **cerebrum** where it is interpreted.

### BALANCE

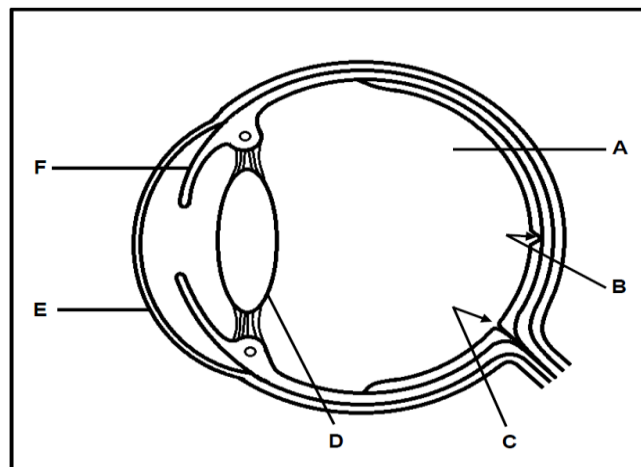
- The **maculae** in the **utricle and saccule** are stimulated by **changes in the position of the head**.
- The **crisae** in the **semi-circular canals** are stimulated by **changes in the direction and speed of movement**.
- When stimulated, the cristae and maculae convert the **stimuli** into nerve **impulses**.
- The nerve impulses are transmitted through the **auditory nerve** to the **cerebellum** where they are interpreted.
- The cerebellum then sends impulses via the motor neurons to the **skeletal muscles** to restore balance.



## SESSION 2 | HUMAN EYE AND EAR

### Questions:

1.1 The diagram below represents the human eye.



- 1.1.1 Identify structure **F**. (1)  
 1.1.2 State TWO functions of fluid **A**. (2)  
 1.1.3 Describe the structural difference between area **B** and area **C**. (2)  
 1.1.4 Name the visual defect that occurs when the curvature of part **E** is uneven. (1)  
 1.1.5 Explain how the sight of a person will be affected if cataracts developed in part **D**. (3)  
 1.1.6 Describe the process of accommodation that takes place when an object is less than 6 metres away from the eye. (6)

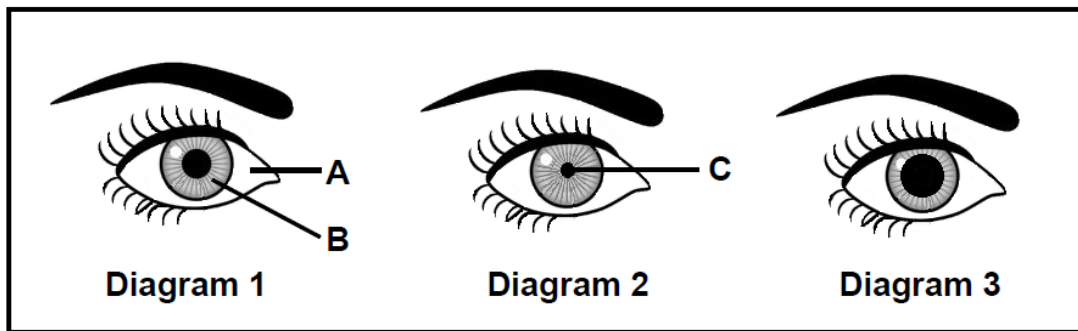
### Answers to Question 1.1:

- 1.1.1 Iris ✓  
 1.1.2 - Helps to maintain the shape of the eye ✓  
 - Plays a role in refraction of light ✓  
 - Allows the transmission of light ✓  
 - Prevents desiccation ✓ of structures in the eye  
 - Holds the retina in position ✓  
 - Nourishment ✓ of the eye  
 - Prevents mechanical injury ✓ in the eye (Any 2)  
 1.1.3 - Area B contains (a high concentration of) photoreceptors ✓ / cones  
 - Area C contains no photoreceptors ✓ / no rods & cones  
 1.1.4 Astigmatism ✓  
 1.1.5 - Because the lens will become cloudy ✓ /opaque  
 - no/less light will enter the eye ✓  
 - causing no sight ✓ /weak sight  
 1.1.6 - The ciliary muscle contracts ✓  
 - The ciliary body moves closer to the lens ✓  
 - The suspensory ligaments slacken ✓  
 - Tension on the lens decreases ✓  
 - The lens becomes more convex ✓ /rounded  
 - Light rays are refracted more ✓  
 - To focus the light on the retina ✓



## SESSION 2 | HUMAN EYE AND EAR

1.2 The diagrams below show the condition of the eyes for different light intensities when viewing the same object.



1.2.1 Give the LETTER and NAME of the part that:

- (a) Contains muscles (2)  
 (b) Is made up of tough white fibrous tissue (2)

1.2.2 Which diagram (1, 2 or 3) represents the eye of a person:

- (a) In a very bright area (1)  
 (b) Where the rods are stimulated the most (1)

Which muscles are:

- (a) Contracted in diagram 2 (1)  
 (b) Relaxed in diagram 3 (1)

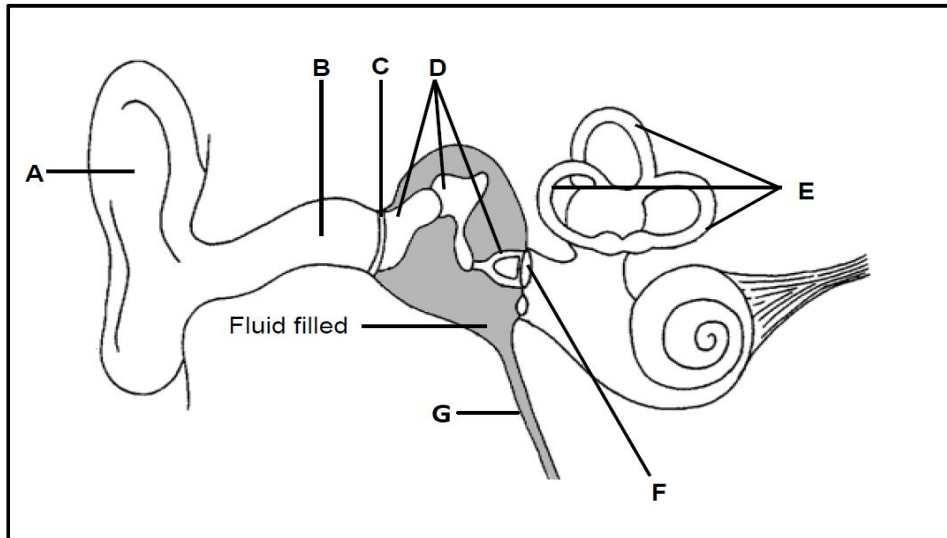
### Answers to Question 1.2:

- 1.2.1 (a) B ✓ - Iris ✓  
 (b) A ✓ - Sclera ✓
- 1.2.2 (a) 2 ✓  
 (b) 3 ✓
- 1.2.3 (a) Circular ✓ muscles  
 (b) Circular ✓ muscles



## SESSION 2 | HUMAN EYE AND EAR

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



1.3.1 Identify part:

- |              |     |
|--------------|-----|
| (a) <b>B</b> | (1) |
| (b) <b>C</b> | (1) |
| (c) <b>D</b> | (1) |
| (d) <b>F</b> | (1) |

1.3.2 State ONE function of part **A**.

(1)

1.3.3 Explain how middle-ear infection could affect hearing.

(4)

1.3.4 Describe the role of part **G**.

(2)

1.3.5 Describe how part **E** is involved in maintaining the balance when there is a change in the speed and direction of movement of the head.

(4)

### Answers to Question 1.3:

1.3.1 **B** – auditory canal✓; **C** – tympanic membrane✓; **D** – ossicles✓; **F** – oval window✓

1.3.2 Collects sound waves✓/directs sound waves towards the auditory canal

1.3.3 Part D/ossicles do not vibrate freely✓

Fewer/no vibrations will be sent to the oval window✓

Fewer/no pressure waves will be set up in the cochlea✓

The organ of Corti will be stimulated less✓

The cerebrum is stimulated differently✓/not stimulated which leads to hearing loss✓

1.3.4 It equalizes pressure ✓on either side of the tympanic membrane✓

1.3.5 The cristae are stimulated ✓to convert the stimuli to impulses✓

The impulses are sent to the cerebellum✓ where they are interpreted✓

The cerebellum sends impulses to the skeletal muscle✓ to maintain balance.



## SESSION 2 | HUMAN EYE AND EAR

1.4 Workers in some factories 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 a developing country from 2014 to 2018, to establish the number of factory workers who suffered from hearing loss.

The results are shown in the table below.

Year	Number of factory workers with hearing loss
2014	85 000
2015	100 000
2016	115 000
2017	120 000
2018	130 000

- 1.4.1 Name the structure in the ear where the organ of Corti is located. (1)
- 1.4.2 Calculate the percentage increase in the number of factory workers with hearing loss between 2014 and 2018. Show ALL workings. (3)
- 1.4.3 Suggest ONE reason for the increase in the number of factory workers with hearing loss caused by exposure to loud noise in this country. (1)
- 1.4.4 Explain why damage to the auditory nerve may result in hearing loss. (2)
- 1.4.5 Draw a bar graph to represent the data in the table. (6)

### Answers to Question 1.4:

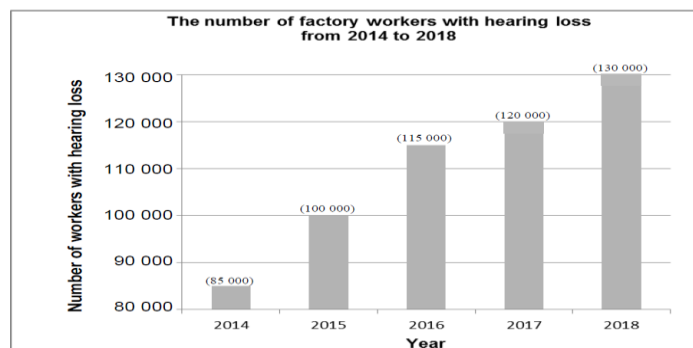
1.4.1 Cochlea ✓

1.4.2  $\frac{130\,000 - 85\,000}{85\,000} \times 100 = 52,94\%$  ✓

- 1.4.3
- More factories ✓ were built increase in supply & demand
  - More workers ✓ were employed
  - Extended exposure to loud sounds ✓
  - Lack of precautionary measures ✓ (Any 1)

- 1.4.4
- The impulse will not be transmitted to the cerebrum ✓
  - and will not be interpreted ✓

1.4.5



#### Criteria for marking graph:

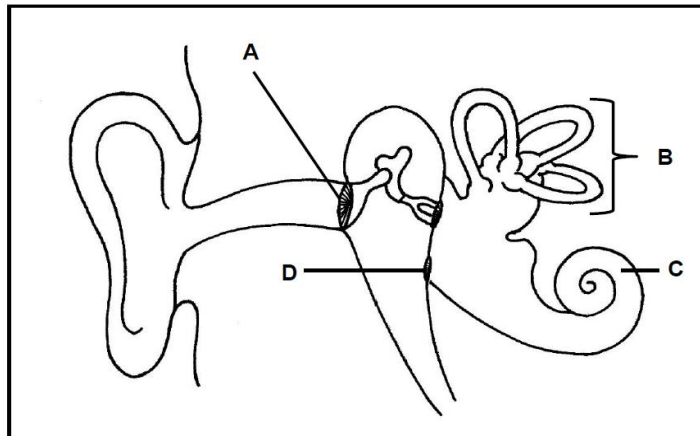
Criteria	Mark allocation
Type: Bar graph is drawn (T)	1
Caption of the graph includes both variables (C)	1
Correct labels on X-axis and Y-axis (L)	1
Correct scale for Y-axis	
Equal width of bars and spaces (S)	1
Plotting: (P)	
1- 4 co-ordinates are plotted correctly	1
All 5 co-ordinates are plotted correctly	2

(6)



## SESSION 2 | HUMAN EYE AND EAR

1.5 The diagram below represents a part of the human ear.



1.5.1 Identify part C. (1)

1.5.2 State ONE function of:

- (a) Part D (1)  
 (b) The receptors found in part C. (1)

1.5.3 Explain why a build-up of ear wax at part A may result in temporary hearing loss. (2)

1.5.4 A grommet is a small device that allows the air to move into and out of the middle ear. This prevents pressure build-up in the middle ear. Explain how the use of grommets in the treatment of middle-ear infections prevents hearing loss. (4)

1.5.5 Describe how the receptors in part B are involved in maintaining balance when there are changes in the speed and direction of movement of the head. (4)

### Answers to Question 1.5:

1.5.1 Cochlea ✓

1.5.2 (a) Absorbs excess pressure waves ✓ /releases pressure from the inner ear/ prevents an echo  
 (b) It converts stimuli/pressure waves into impulses ✓

1.5.3 - Part A/tympanic membrane will not be able to vibrate ✓ /vibrate freely  
 - No/less vibrations will be carried to the middle ear ✓ /ossicles

1.5.4 - Middle ear infections cause fluid build-up in the middle ear ✓  
 - which can block the Eustachian tube ✓  
 - The grommet will release the pressure ✓ that will build up in the middle ear/ drain the fluid from the middle ear  
 - The pressure on either side of the tympanic membrane is equalised ✓  
 - preventing the tympanic membrane from rupturing ✓ and  
 - allowing the ossicles to vibrate freely ✓

1.5.5 -The cristae are stimulated ✓ and  
 - convert the stimuli into impulses ✓  
 - The impulses are sent via the auditory nerve ✓  
 - to the cerebellum ✓  
 - which interprets the information ✓ and  
 - sends impulses to the skeletal muscles ✓ to restore balance



## SESSION 3 | PLANT HORMONES

### Auxins:

- Stimulate cell elongation
- Cause tropisms in stems and roots
- Stimulate the development of fruit
- Stimulate the development of adventitious roots in stem cuttings
- Inhibit the growth of lateral branches - **apical dominance**

### Gibberellins:

- Stimulate stem elongation
- Stimulate root growth
- Promote flowering
- Stimulate the germination of seeds

### Abscisic acid:

- Causes dormancy of terminal and lateral buds in winter
- Contributes to the dormancy of seeds by inhibiting germination
- Promotes the abscission of leaves and fruit

### The control of weeds using plant hormones

- Some weed killers contain high concentrations of auxins that accelerate the metabolism of broad-leaved dicotyledonous weeds.
- The weeds grow so fast that their water absorption and food production are insufficient, and they weaken and die.

### Role of auxins in phototropism and geotropism:

Tropisms are growth movements of a plant in response to a stimulus.

### Phototropism

- Phototropism is the growth movement of part of a plant in response to a unilateral light stimulus.
- Stems and leaves usually grow towards the light to absorb maximum light for photosynthesis.

### **What happens when the growing tip of a stem receives unilateral light?**

- Auxins move away from the light and accumulate towards the shaded side
- Auxins stimulate cell elongation on shaded side
- Shaded side grows faster
- Stem curves in the direction of the light.





## SESSION 3 | PLANT HORMONES

### Geotropism

- Geotropism is the growth movement of a plant or part of the plant in the response to a gravitational stimulus.
- When a pot plant is placed horizontally the roots will curve downwards and the stem will curve upwards.

***Explain why the root and the stem grow of a pot plant grow in different directions when the plant is placed horizontally on the ground and receive light equally from all directions.***

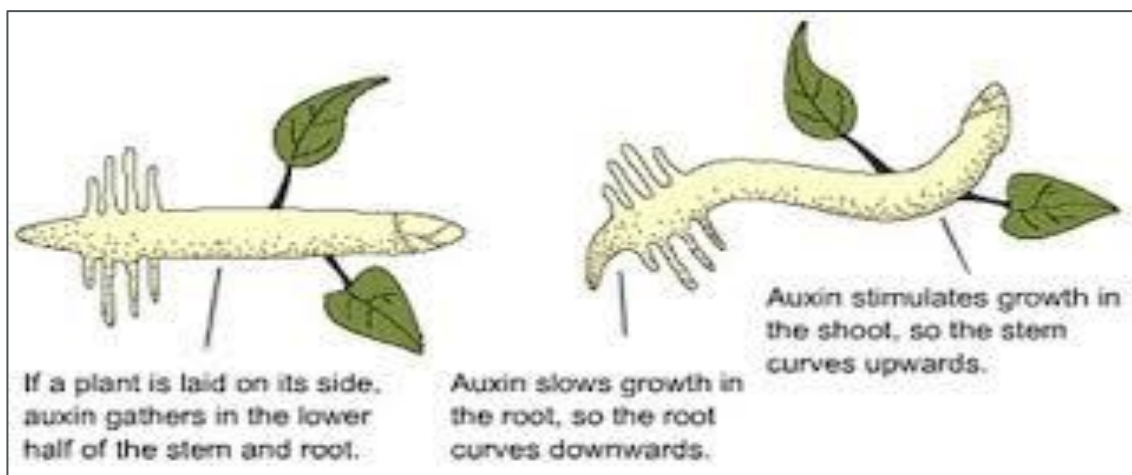
- Auxins will accumulate on the lower side of the stem and root because auxins are attracted by gravity.
- This leads to uneven distribution of auxins in the stem and root

### In the stem:

- There will be a higher concentration of auxins on the lower side of the stem.
- Growth on the lower side of the stem is stimulated.
- The lower side of the stem grows faster.
- This causes the stem to grow/bend upwards away from gravity.

### In the root:

- There will be a higher concentration of auxins on the lower side of the root.
- Growth on the lower side of the root is inhibited.
- This causes the upper side of the root to grow faster
- This will cause it to bend downwards towards gravity





## SESSION 3 | PLANT HORMONES

### Role of chemicals and thorns as plant defence mechanisms:

#### Chemicals:

- Many plants produce chemicals that play a role in the defence against herbivores
- Some of these chemicals are toxic or influence the digestibility of plant material

#### Thorns:

- Some plants e.g. cacti have thorns and spines that discourage herbivores from eating them.

### Questions:

1.1 Geotropism refers to the movement of a part of a plant in response to gravity. This tropism is controlled by auxins.

1.1.1 Describe the role of auxins in roots. (3)

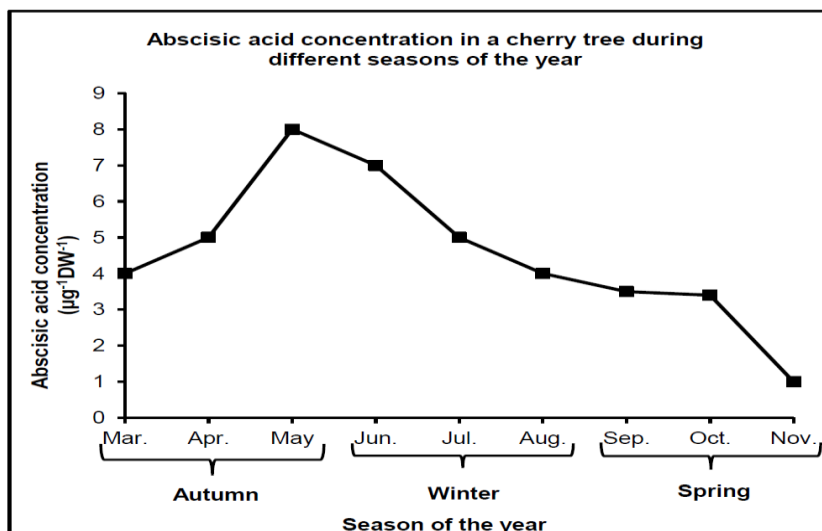
1.1.2 When a plant is placed horizontally, with light coming from all directions, the auxins will accumulate on the lower side of both the stem and the roots. Explain the difference in the response of the stem and the roots after a few days. (4)

### Answers to Question 1.1:

1.1.1 - Auxins promote the development of roots ✓  
 - It brings about (general) root growth ✓  
 - causing their downward ✓ growth/positive geotropism

1.1.2 - In the stem, the auxins stimulate growth ✓ on the lower side causing the stem to grow/bend upwards ✓  
 - In the root, the auxins inhibit growth ✓ on the lower side causing the root to grow/bend downwards ✓

1.2 The graph below shows the concentration of abscisic acid in a cherry tree during different seasons of the year. This tree species loses all its leaves in autumn and goes into a state of dormancy during the winter months.





## SESSION 3 | PLANT HORMONES

- 1.2.1 During which month was the abscisic acid concentration the lowest? (1)  
 1.2.2 Explain the trend of the graph from March to May. (3)  
 1.2.3 Suggest ONE reason for the dormancy in cherry trees during the winter months. (2)

### Answers to Question 1.2:

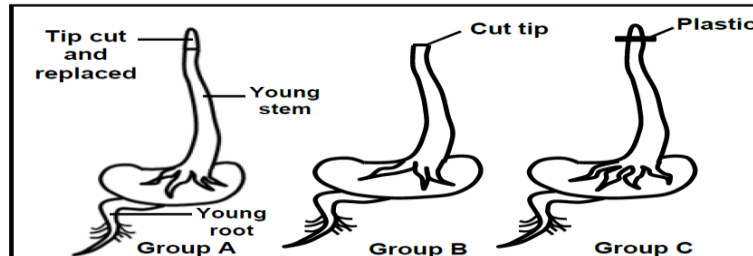
- 1.2.1 November ✓  
 1.2.2 - The concentration of abscisic acid increases ✓  
 - To stimulate the abscission ✓ /falling of leaves  
 - To prepare the tree for dormancy ✓  
 1.2.3 - Less sunlight ✓ / less water/ cold conditions therefore  
 - Decreased photosynthesis ✓ / reduced transpiration/ lower energy demand/ low growth rate

1.3 A group of learners conducted an investigation to determine the effect of auxins on the growth of stems in bean seedlings.

The procedure was as follows:

- 30 bean seeds were allowed to germinate for 5 days to produce seedlings.
- The seedlings were divided into 3 groups (A, B and C) of 10 seedlings each.
- The tips of all the seedlings were cut at the same length.
- In group A, the cut tip was placed back on top of the young stem.
- In group B, the tip was not placed back.
- In group C, a piece of plastic was placed on top of the cut surface and the tip was then placed on top of the plastic.
- The seedlings in all the groups were placed in a dark cupboard for a week.
- The growth of the stem was then observed.

The diagram below shows how the seedlings in each group were treated.




- 1.3.1 Identify the dependent variable in this investigation. (1)  
 1.3.2 Why did the learners cut the tips of the young stems? (1)  
 1.3.3 Give ONE reason why 10 bean seedlings were used in each group. (1)  
 1.3.4 Write down the LETTER(S) (A, B or C) of the group(s) where there will be no upward growth of the stem. (2)  
 1.3.5 Describe how auxins cause apical dominance. (3)

### Answers to Question 1.3:

- 1.3.1 Stem growth ✓  
 1.3.2 - To remove the source of auxins ✓  
 - The tip produces auxins ✓  
 1.3.3 To increase the reliability ✓ /validity of the results  
 1.3.4 B ✓ and C ✓  
 1.3.5 - The presence of auxins ✓ in the tip of the stem  
 - stimulate upward growth ✓  
 - and inhibit development of lateral branches ✓



## LINKS TO ONLINE RESOURCES

TOPIC	LINK AND QR CODE
Genetics	<p data-bbox="948 383 1321 421"><a href="https://bit.ly/3EyPB90">https://bit.ly/3EyPB90</a></p> 
Human eye and ear	<p data-bbox="963 884 1305 922"><a href="https://bitly.ws/ZX3Y">https://bitly.ws/ZX3Y</a></p> 
Plant hormones	<p data-bbox="948 1435 1321 1473"><a href="https://bit.ly/3O6EsiN">https://bit.ly/3O6EsiN</a></p> 