



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**CURRICULUM GRADE 10-12
DIRECTORATE
NCS (CAPS)**

LIFE SCIENCES

LEARNER SUPPORT DOCUMENT

GRADE 12

FINAL PUSH

EASY TO PASS

2026

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PREAMBLE

This document has been prepared as an Easy to Pass material for 2026 Grade 12 Life Sciences.

This document takes the following into account:

- Focus on **core concepts and content** per topic as well as the relevant Life Sciences skills.
- Activity based Revision sessions and constant feedback on assessments/activities given.
- **Scaffolding of concepts** according to **cognitive/difficulty levels** and a differentiated approach to cater for learners with different abilities.
- Addressing the **Common errors & misconceptions** in each topic.

STRATEGIES FOR PLANNING AND CONDUCTING REVISION

- Use the past papers (Start with the recent papers) and provincial revision documents
- Arrange questions according to their topics.
- Organize questions from low-order and high-order.
- Group learners according to their performance status (Learners at risk, Average and High-Flyers)
- Conduct weekly tests for the work covered
- Start your revision with topics that have bigger weightings (reproduction, responding to environment, genetics and evolution).
- Cover Life sciences skills especially the ones learners lack as per Diagnostic report such as:
 - **Scientific investigation skills** (variables, validity, reliability, aim, control, trend, conclusion, relationship, graphs, tables, planning steps).
 - **Calculation:** percentage, average and percentage increase/decrease
 - **Drawing** (structures and graphs): marking criteria
- Familiarize learners with key words such as:
 - Explain (cause and effect)
 - Describe (step by step)
 - Compare
 - Tabulate
- Provide learners with assessment feedback.
- Unpack answers to learners, show them step by step how the examiners arrived to a particular answer.
- Use of mnemonics and mind maps for consolidation
- Conduct MOCK EXAM for P1 and P2 before learners seat for Trial Exam and Final Exams.

PAPER 1

Activity 1

1. Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1. to 1.44) in the ANSWER BOOK, for example
1.45 D.

- 1.1 The part in the amniotic egg that provides nutrients to the developing embryo
- A Yolk
B Chorion
C Amnion
D Shell
- 1.2 Which ONE of the following is a reproductive strategy in birds where the young are born fully dependent on the parents?
- A Precocial development
B Altricial development
C Ovovivipary
D External fertilisation
- 1.3 Which ONE of the following are functions of the placenta?
- A Excretion and nutrition
B Gaseous exchange and protection against mechanical injury
C Nutrition and temperature regulation
D Temperature regulation and excretion



1.4. Eagles are birds that lay their eggs high up on mountain cliffs and feed their young once they hatch.

- (i) Internal fertilisation
- (ii) External fertilisation
- (iii) Precocial development
- (iv) Parental care
- (v) Ovipary

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

1.5 Which ONE of the following is a stage in human embryonic development?

- A Choroid
- B Amnion
- C Morula
- D Chorion

1.6 The jelly layer of a human ovum ...

- A secretes hormones required for fertilisation.
- B fuses with the nucleus of a sperm to form a zygote.
- C provides protection to the fertilised ovum.
- D secretes hormones required for implantation.



1.7 The following changes occur at puberty:

- (i) Growth of facial hair
- (ii) Deepening of the voice
- (iii) Onset of menstruation
- (iv) Oily skin

Which combination of characteristics occurs due to the secretion of testosterone?

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

1.8 The following is a list of male reproductive parts:

- (i) Prostate gland
- (ii) Seminal vesicle
- (iii) Urethra
- (iv) Cowper's gland

Which ONE of the following combinations is responsible for the formation of semen?

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



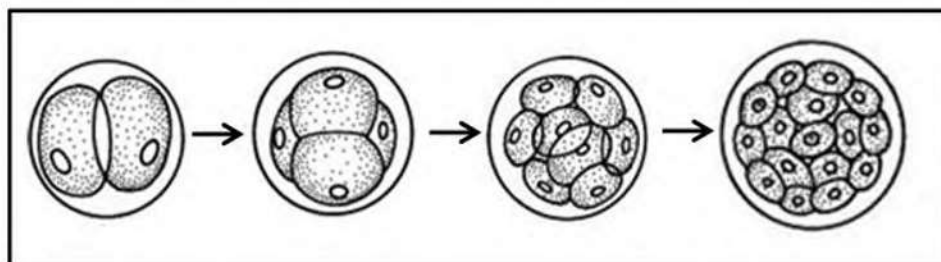
1.9 A man is fertile if his semen contains a minimum of 20 million sperm per cm^3 and at least 75% of the sperm cells are active.

The table below shows the results of a sperm analysis of four semen samples.

Identify the sample that was obtained from an infertile man.

	NUMBER OF SPERM IN SAMPLE (million/ cm^3)	INACTIVE SPERM (%)
A	23	30
B	25	20
C	22	25
D	20	15

1.10 The diagrams below represent events during human reproduction.

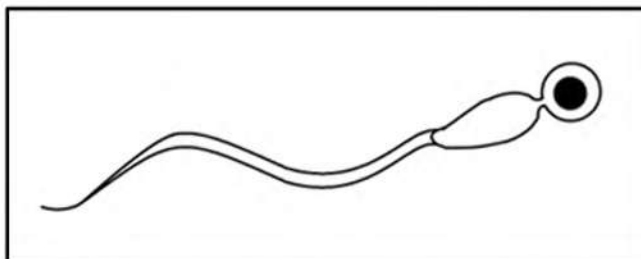


In which part of the female reproductive system will the events shown in the diagram above occur?

- A Fallopian tube
- B Cervix
- C Vagina
- D Ovary



1.11 The diagrams below represent a human sperm.



This sperm is NOT structurally suitable for fertilisation because of the ...

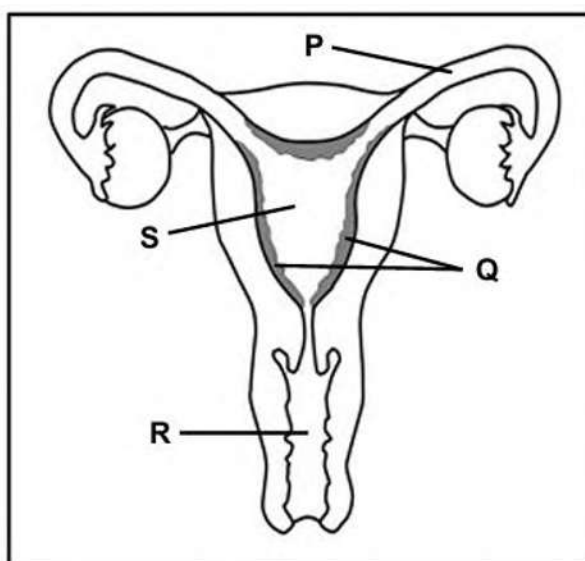
- A Absence of a nucleus to provide genetic material.
 - B Absence of an acrosome to improve motility.
 - C Presence of a long tail for the movement of the sperm.
 - D Absence of mitochondria to provide energy.
- 1.12 Which of the following structures provide nutrients for the developing foetus?
- A Placenta and umbilical artery
 - B Amnion and umbilical vein
 - C Placenta and umbilical vein
 - D Amnion and umbilical artery
- 1.13 The following is a list of factors regarding a developing foetus:
- (i) Temperature regulation
 - (ii) Protection
 - (iii) Free movement
 - (iv) Nutrition

For which combination of factors is the amniotic fluid responsible?

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



QUESTIONS 1.14 AND 1.15 ARE BASED ON THE DIAGRAM OF THE FEMALE REPRODUCTIVE SYSTEM.



- 1.14 Which ONE of the following combinations is CORRECT for a normal pregnancy?

	SITE OF FERTILISATION	SITE OF IMPLANTATION
A	P	S
B	S	Q
C	P	Q
D	R	P

- 1.15 In which part does the zygote develop into a morula?

- A S
B Q
C R
D P



1.16 The direction of the transmission of an impulse through a neuron is from the ...

- A cell body through the axon to the dendrites.
- B dendrites through the cell body to the axon.
- C axon through the cell body to the dendrites.
- D dendrites through the axon to the cell body.

1.17 A girl is barefoot and steps onto a thorn, causing a reflex action.

Which ONE of the following represents the CORRECT pathway of the reflex arc?

- A Pain receptor → motor neuron → sensory neuron → leg muscle
- B Foot muscle → sensory neuron → motor neuron → pain receptor
- C Foot muscle → motor neuron → sensory neuron → pain receptor
- D Pain receptor → sensory neuron → motor neuron → leg muscle

1.18 The cranial and spinal nerves are part of the ... nervous system.

- A central
- B peripheral
- C sympathetic
- D parasympathetic

1.19 The table below shows the reaction time of four learners to a stimulus.

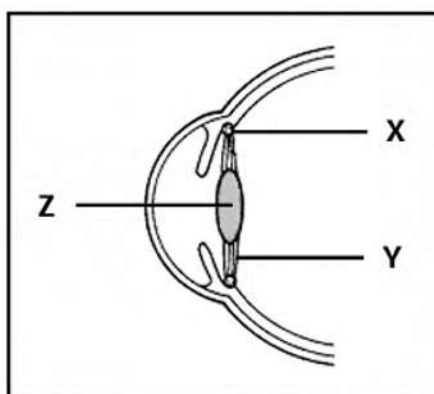
NAME OF LEARNER	REACTION TIME (SECONDS)
Temisha	0,7
Luke	0,6
Anika	0,8
Jordy	0,4



Which ONE of the following learners demonstrates the fastest response to the stimulus?

- A Temisha
- B Luke
- C Anika
- D Jordy

1.20 The diagram below represents a part of the human eye.

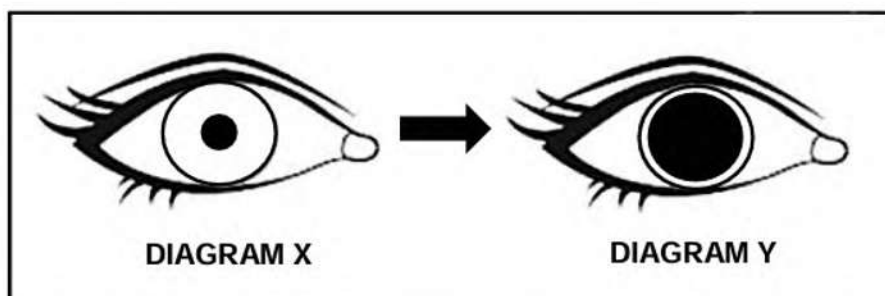


A spectator in a soccer stadium is seated 200 metres away from the field.

Which ONE of the following describes the condition of structures X, Y and Z when he looks at the ball placed in the middle of the field?

	MUSCLE IN X	STRUCTURE Y	PART Z
A	Relaxed	Slack	More convex
B	Contracted	Slack	Less convex
C	Relaxed	Taut	Less convex
D	Contracted	Taut	More convex

1.21 The diagrams below show the change in the size of the pupil from diagram X to diagram Y.



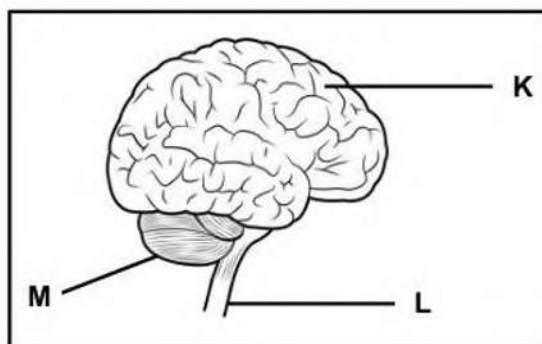


Which ONE of the following combinations of light conditions and muscle actions CORRECTLY describes the response shown above?

	LIGHT CONDITION	CIRCULAR MUSCLES	RADIAL MUSCLES
A	Bright light	Contract	Relax
B	Dim light	Contract	Relax
C	Bright light	Relax	Contract
D	Dim light	Relax	Contract

- 1.22 After an accident, a person can still walk, but has poor control and coordination of the skeletal muscles.

The diagram below represents part of the central nervous system of this person.

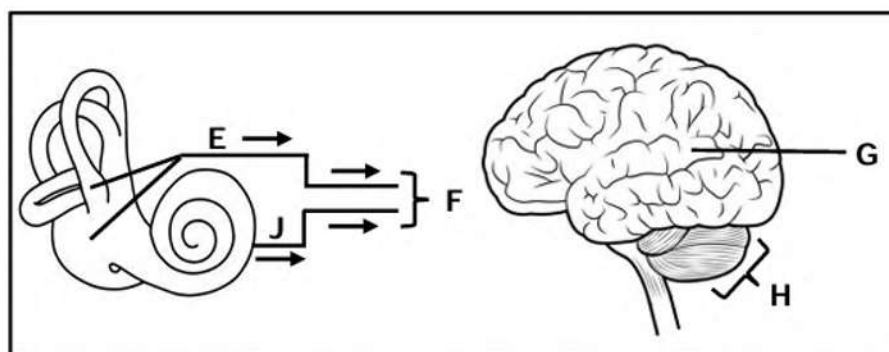


Which parts of the central nervous system are probably damaged?

- A **K, L and M**
- B **K and L**
- C **K and M**
- D **L and M**



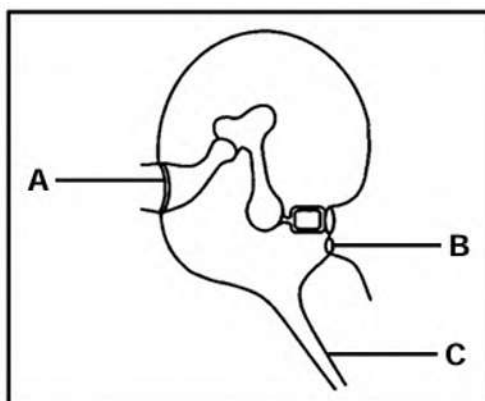
- 1.23 The diagrams below represent the transmission of impulses from a structure in the inner ear to the brain.



The nerve impulses for balance are transmitted as follows:

- A J → F → H
- B E → F → H
- C E → F → G
- D J → F → G

- 1.24 The diagram below shows a part of the human ear.



Which ONE of the following occurs when there are excess waves in the inner ear?

- A Pressure is released at A
- B Pressure is released at C
- C Pressure is absorbed at B
- D Pressure is absorbed at A and C



1.25 Which ONE of the following combinations is CORRECT for a visual defect of the eye?

	VISUAL DEFECT	NATURE	TREATMENT
A	Astigmatism	An irregular shaped cornea	Corrective lenses
B	Long-sightedness	Eyeball is longer than normal	Lens replacement surgery
C	Cataracts	Lens becomes inelastic	Lens replacement surgery
D	Short-sightedness	Eyeball is shorter than normal	Laser surgery

1.26 The following is a list of components associated with the nervous system:

- (i) Parasympathetic nervous system
- (ii) Spinal nerves
- (iii) Sympathetic nervous system
- (iv) Cranial nerves

Which ONE of the following combination of components forms part of the peripheral nervous system?

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

1.27 In plants, gibberellins are responsible for ...

- A tropisms.
- B seed dormancy.
- C growth of lateral branches.
- D seed germination



1.28 The following is a list of functions of plant hormones:

- (i) Promotes seed dormancy
- (ii) Acts as a weed killer
- (iii) Causes the falling of leaves
- (iv) Promotes cell division

Which combination of functions describes the role of abscisic acid?

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

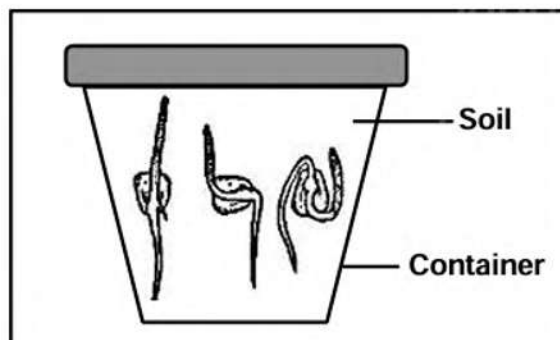
1.29 The following is a list of growth responses in plants:

- (i) Plants grow straight upwards
- (ii) No upward growth
- (iii) Increased number of lateral branches
- (iv) Stems bend towards unilateral light

Which ONE of the following combinations describes the growth responses that occur when apical buds of plants are removed?

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

1.30 The diagram below shows germinating seeds in a non-transparent (opaque) container.

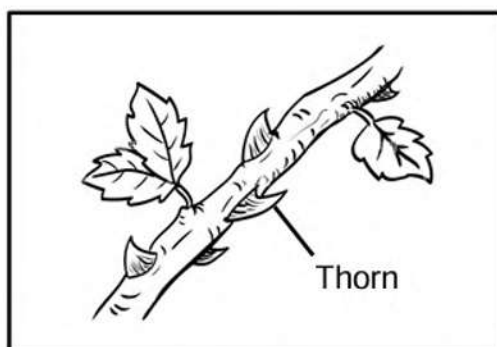




Which ONE of the following statements CORRECTLY describes the growth response of the seeds?

- A Stems grow upwards due to apical dominance.
- B Roots grow downwards due to geotropism.
- C Stems grow upwards due to phototropism.
- D Roots grow downwards due to phototropism.

1.31 The diagram below shows a part of the stem of a plant.



Which ONE of the following is shown by the stem of this plant?

- A Apical dominance
- B Dormancy of lateral buds
- C Plant defence mechanism
- D Fruit development

1.32 The hormone responsible for the regulation of salt content in the human body is ...

- A testosterone.
- B aldosterone.
- C prolactin.
- D glucagon.

1.33 The hormone that prepares the body for an emergency is ...

- A aldosterone.
- B progesterone.
- C adrenalin.
- D prolactin



1.34 Which gland is responsible for the secretion of prolactin?

- A Thyroid gland
- B Adrenal gland
- C Ovary
- D Pituitary gland

1.35 A high level of thyroxin in the blood will stimulate the ...

- A pituitary gland to secrete less TSH.
- B thyroid gland to secrete more TSH.
- C pituitary gland to secrete more TSH.
- D thyroid gland to secrete more thyroxin.

1.36 Which ONE of the following changes occurs under the influence of adrenalin?

- A An increased blood supply to the skeletal muscles
- B Decreased blood pressure
- C Decreased muscle tone of skeletal muscles
- D An increased blood supply to the digestive system

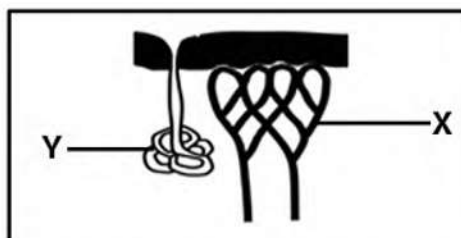
1.37 When the carbon dioxide level in the blood increases above normal, the ...

- A rate and depth of breathing decrease.
- B receptor cells in the diaphragm are stimulated.
- C heart beats slower.
- D receptor cells in the carotid artery in the neck are stimulated.



1.38

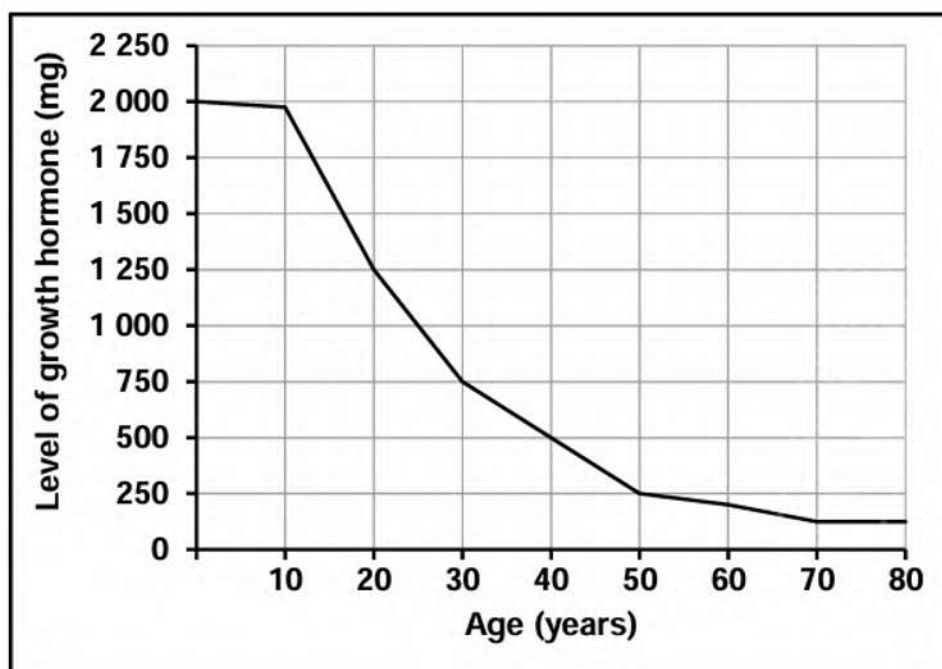
The diagram below shows structures in the skin that are involved in temperature regulation.



Which ONE of the following describes the role of structures **X** and **Y** on a hot day?

- A **X** dilates and **Y** produces less sweat
- B **X** dilates and **Y** produces more sweat
- C **X** constricts and **Y** produces less sweat
- D **X** constricts and **Y** produces more sweat

QUESTIONS 1.8 AND 1.9 ARE BASED ON THE GRAPH BELOW SHOWING THE AVERAGE AMOUNT OF GROWTH HORMONE SECRETED IN HUMANS AT DIFFERENT AGES.





1.39 Which ONE of the following statements describes the trend in the graph?

- A The secretion of the growth hormone increases with age.
- B The level of the growth hormone decreases more rapidly in the age group 50–70 years when compared to the age group 10–40 years.
- C The level of the growth hormone decreases more rapidly in the age group 10–40 years when compared to the age group 50–70 years.
- D The secretion of the growth hormone decreases at the same rate at all ages.

1.40 The percentage decrease in the level of growth hormone between the ages of 20 and 40 years is ...

- A 20%.
- B 60%.
- C 150%.
- D 250%.

1.41 A person has a disorder where she is unable to secrete ADH.

It is most likely that ...

- A the renal tubules will become more permeable to water.
- B the blood will have a higher volume of water.
- C large volumes of urine will be produced.
- D more water is reabsorbed by the renal tubules.

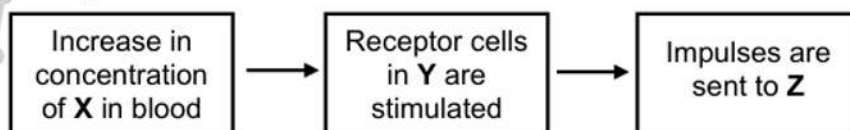
1.42 Which ONE of the following is CORRECT for a person who exercises on a hot day without taking in any liquids?

- A Increased ADH secretion and increased permeability of renal tubules
- B Increased ADH secretion and the production of dilute urine
- C Decreased ADH secretion and increased permeability of renal tubules
- D Decreased ADH secretion and the production of concentrated urine



1.43

The flow diagram below represents a part of the homeostasis of compound **X**.



Which ONE of the following combinations is CORRECT?

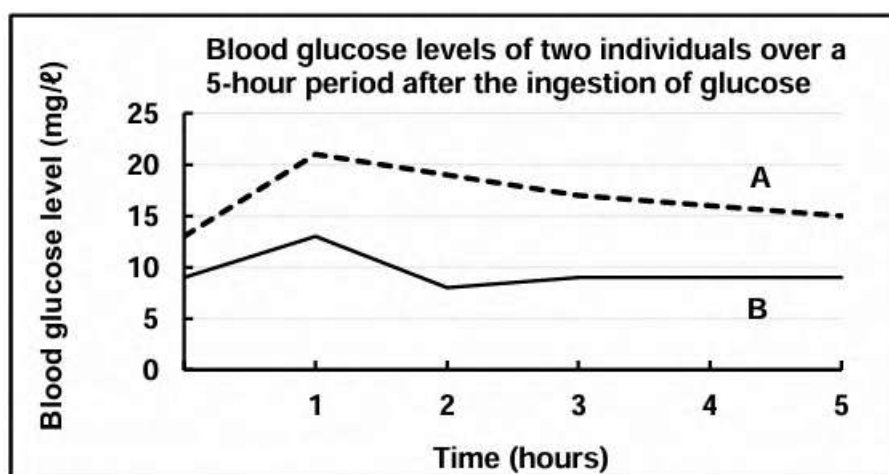
	X	Y	Z
A	Carbon dioxide	Hypothalamus	Pituitary gland
B	Water	Hypothalamus	Medulla oblongata
C	Carbon dioxide	Carotid artery	Medulla oblongata
D	Water	Carotid artery	Pituitary gland



1.44 Note the following for an investigation:

- Two individuals, **A** and **B**, had not eaten for four hours prior to the investigation.
- They then ingested 15 grams of pure glucose.
- One of the individuals has untreated diabetes mellitus.

The graphs below show the blood glucose levels of the two individuals over a period of 5 hours after the glucose has been ingested.



Which statement regarding the information in the graphs is CORRECT?

- A The insulin levels of individual **A** will remain high.
- B Individual **B** has diabetes mellitus because the glucose levels dropped to below 10 mg/l.
- C The insulin levels of individual **B** will remain constant.
- D Individual **A** has diabetes mellitus because the glucose levels remain above 10 mg/l.



Activity 2

- 2 Give the correct **biological term** for each of the following descriptions.

No.	Description	Biological Term
2.1	A reproductive strategy where the foetus develops inside the uterus	
2.2	The membrane in the amniotic egg that collects nitrogenous waste	
2.3	The inner lining of the uterus	
2.4	The structure in males that secretes testosterone	
2.5	A hormone that stimulates the production of milk in humans	
2.6	The part of a sperm cell that contains enzymes which dissolve the ovum membrane	
2.7	A mature follicle inside the ovary that contains the ovum	
2.8	The ovarian hormone that is secreted by the corpus luteum	
2.9	The production of ova by meiosis	
2.10	The release of an ovum from the ovary	
2.11	The extra-embryonic membrane that plays a role in the formation of the placenta	
2.12	The structure that connects the foetus to the placenta	
2.13	The part in the male that stores sperm cells until maturation	
2.14	The structure that develops from the remains of the Graafian follicle in the ovary	
2.15	The process where the change in the level of one hormone brings about an opposite response in the level of another hormone	
2.16	A brain disorder that results in confusion and memory loss	
2.17	The type of vision in which both eyes are used to see one image	
2.18	The part of the brain that joins the left and the right hemispheres of the cerebrum	
2.19	The part of the ear that receives sound waves from the auditory canal	
2.20	A visual defect caused by the uneven curvature of the cornea	
2.21	Receptors in the inner ear that are stimulated by a change in the position of the head	

2.22	The branch of the nervous system that comprises spinal and cranial nerves	
2.23	The part of the nervous system that consists of sympathetic and parasympathetic sections	
2.24	Receptors in the ear that detect changes in speed and direction of movement of the head	
2.25	The part in the inner ear where the organ of corti is located	
2.26	The eye defect that is characterised by a cloudy lens	
2.27	The part of the retina that contains no rods and cones	
2.28	Photoreceptors that react to low light intensity and are responsible for black and white vision	
2.29	The plant hormone that plays a role in the falling of leaves from trees	
2.30	The plant hormone used to control the growth of weeds	
2.31	The growth reaction of a plant in response to gravity	
2.32	A plant hormone that stimulates the germination of seeds	
2.33	A plant hormone responsible for seed dormancy	
2.34	Sharp, pointy structures found in plants that protect them from herbivores	
2.35	The inhibition of the growth of lateral buds by auxins present in apical buds.	
2.36	The maintenance of a constant internal environment within narrow limits	
2.37	The blood vessel in the neck that contains receptors which are sensitive to carbon dioxide levels in the blood	
2.38	The group of cells in the pancreas that perform an endocrine function	
		38x1 (38)

Activity 3

- 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 (3.1 to 3.38) in the ANSWER BOOK.

	COLUMN I	COLUMN II
3.1	A reproductive strategy where the young receives nutrients through the placenta	A: Ovipary B: Vivipary
3.2	A larger number of male and female gametes are produced	A: External fertilisation B: Internal fertilisation
3.3	An extra-embryonic membrane that stores waste in amniotic eggs.	A: Chorion B: Allantois
3.4	The type of development in birds where the young are incapable of moving and feeding themselves	A: Precocial B: Altricial
3.5	A reproductive strategy where the foetus is attached to and develops inside the uterus	A: Vivipary B: Ovovivipary
3.6	The hormone responsible for the development of secondary sexual characteristics during puberty	A: Oestrogen B: Testosterone
3.7	Contributes to the movement of sperm	A: Tail B: Mitochondrion
3.8	Acts as a micro-filter for the developing foetus	A: Placenta B: Cervix
3.9	The duct that transports semen and urine to the outside of the body	A: Ureter B: Urethra
3.10	The structure in a sperm that contains enzymes to dissolve the outer layer of the ovum	A: Acrosome B: Nucleus
3.11	The membrane that, together with the uterus, forms the placenta	A: Chorion B: Amnion
3.12	The structure in the male reproductive system that stores sperm cells temporarily until they mature	A: Testes B: Epididymis
3.13	Responsible for the secondary sexual characteristics during puberty	A: FSH B: LH
3.14	The site of fertilisation in the female reproductive system	A: Fallopian tubes B: Uterus
3.15	The structure in the female reproductive system that secretes progesterone	A: Corpus luteum B: Placenta

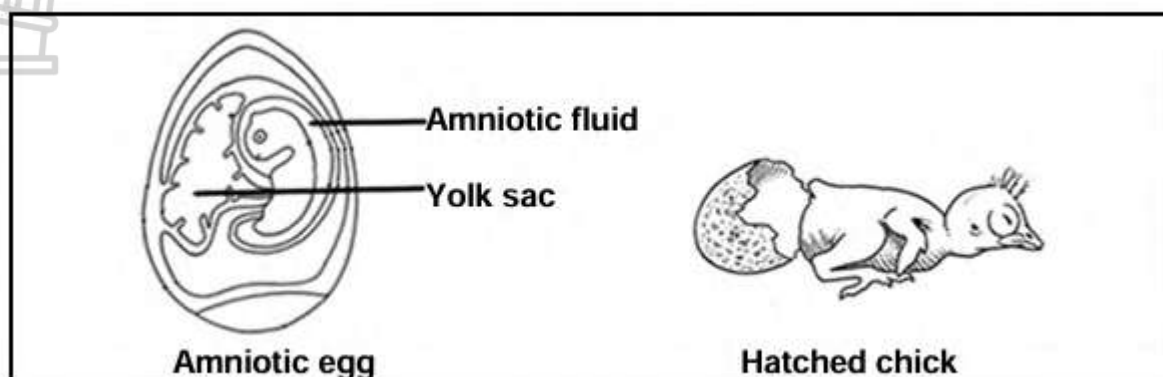
3.16	The area on the retina where there are no rods or cones	A: Yellow spot B: Blind spot
3.17	Plays a role in the pupillary mechanism	A: Ciliary muscles B: Radial muscles
3.18	The part of the brain that controls heart rate	A: Corpus callosum B: Medulla oblongata
3.19	The nerve that transmits impulses from the retina to the brain	A: Optic nerve B: Auditory nerve
3.20	A disease characterised by the degeneration of brain cells and memory loss	A: Myelin sheath B: Alzheimer's disease
3.21	Branch of the nervous system that is made up of spinal and cranial nerves	A: Peripheral nervous system B: Central nervous system
3.22	The pigmented layer of the eye that absorbs excess light	A: Choroid B: Chorion
3.23	Receptors that are stimulated by the change in the position of the head	A: Cristae B: Maculae
3.24	The functional connection between two consecutive neurons	A: Synapse B: Dendrites
3.25	The part of the skull that protects the brain	A: Meninges B: Cerebrospinal fluid
3.26	The part of the brain that connects the left and the right hemispheres of the cerebrum.	A: Corpus luteum B: Corpus callosum
3.27	The hormone that stimulates milk production in humans.	A: Progesterone B: Prolactin
3.28	The form in which excess glucose is stored in the liver	A: Glucagon B: Glycogen
3.29	A ductless gland that secretes hormones	A: Endocrine gland B: Exocrine gland
3.30	The part of the brain that controls body temperature	A: Hypothalamus B: Medulla oblongata
3.31	The condition of the blood vessels in the skin in humans when the environmental temperature is low	A: Vasodilation B: Vasoconstriction
3.32	The gas in blood which, when increased, causes an increase in the breathing rate	A: Oxygen B: Carbon dioxide
3.33	Stimulates the conversion of glycogen to glucose	A: Insulin B: Glucagon
3.34	A plant defence mechanism	A: Thorns B: Chemicals

3.35	The plant growth substance that stimulates the germination of seeds	A: Auxins B: Gibberellins
3.36	A chemical used by farmers to kill weeds.	A: Herbicides B: Pesticides
3.37	The hormone that promotes the ageing of leaves	A: Absciscic acid B: Gibberellins
3.38	The bending reaction in plants in response to light stimuli	A: Phototropism B: Tropism



Activity 4

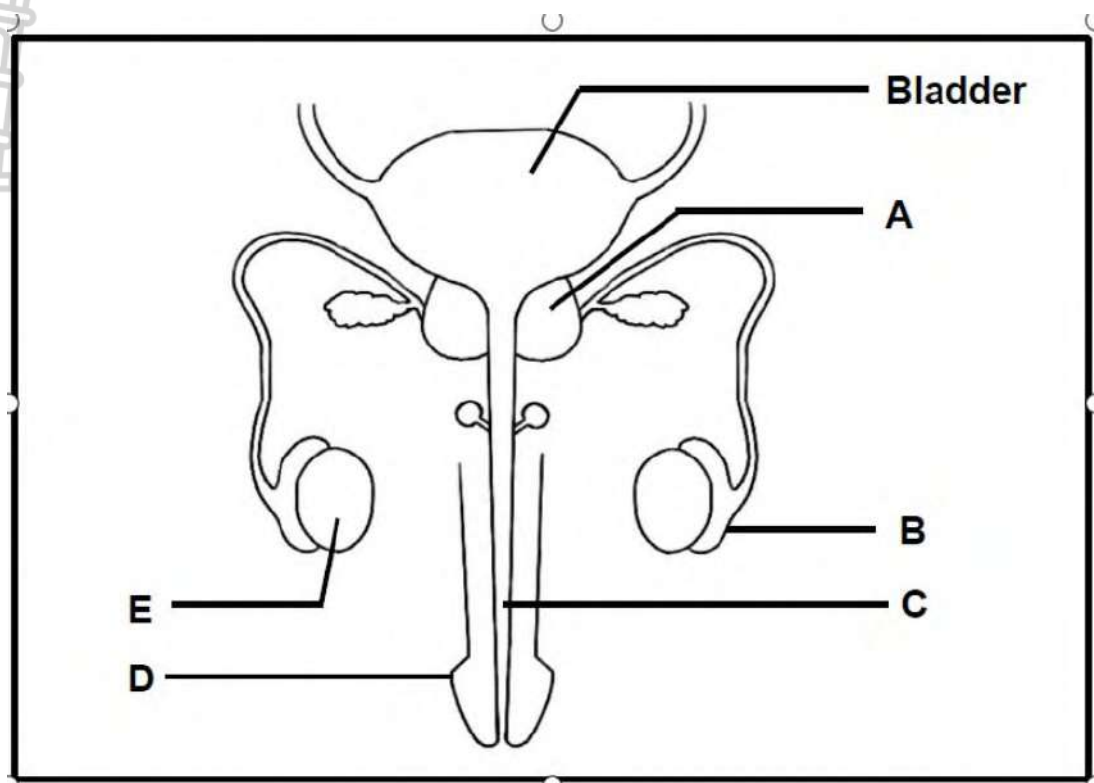
4. The diagrams below show the internal structures of an amniotic egg after fertilization, as well as the chick that hatched from the egg.



- 4.1 Name the type of fertilization that has taken place. (1)
- 4.2 State the type of reproductive strategy which is shown by the development of an embryo within an amniotic egg. (1)
- 4.3 Identify the type of development that the hatched chick shows. (1)
- 4.4 Give TWO functions of the amniotic fluid. (2)
- (5)**

Activity 5

5. The diagram below represents the front view of the human male reproductive system.



5.1 Give the LETTER and NAME of the structure that:

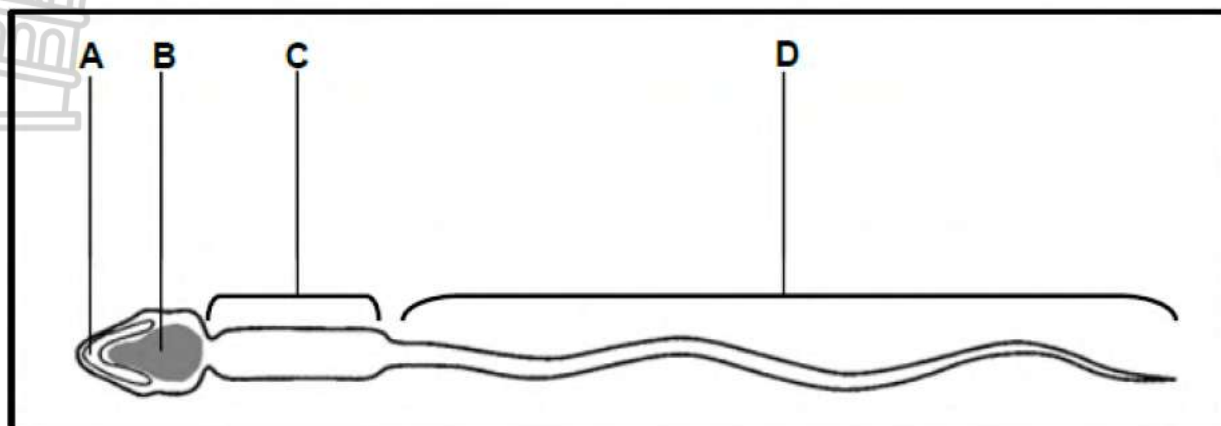
- (a) Forms part of both the urinary and reproductive systems (2)
- (b) Stores sperm temporarily (2)
- (c) Secretes testosterone (2)

5.2 Identify :

- (a) Part **A** (2)
 - (b) The type of gametogenesis that takes place in part **E** (2)
- (8)**

Activity 6

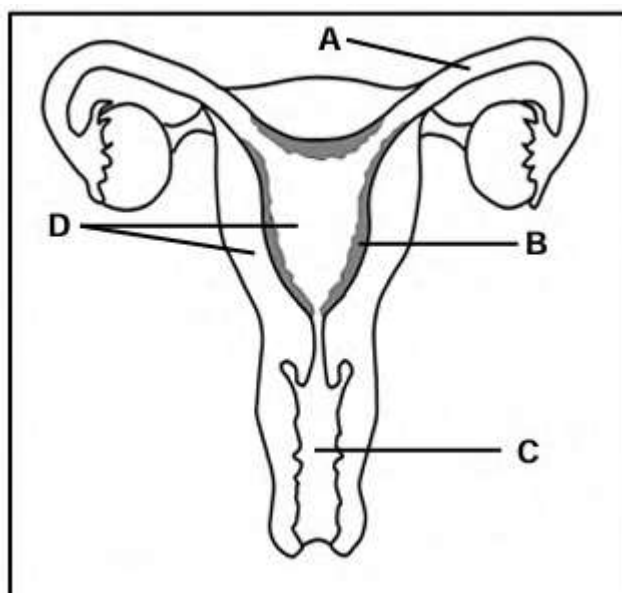
6. The diagram below shows a sperm.



- 6.1 Identify part **A**. (1)
- 6.2 Is a sperm cell haploid or diploid? (1)
- 6.3 Give a reason for your answer to QUESTION 5.2 (2)
- 6.4 State the function of part **D**. (1)
- 6.5 Describe spermatogenesis. (5)
- (10)**

Activity 7

7. The diagram below represents the female reproductive system.

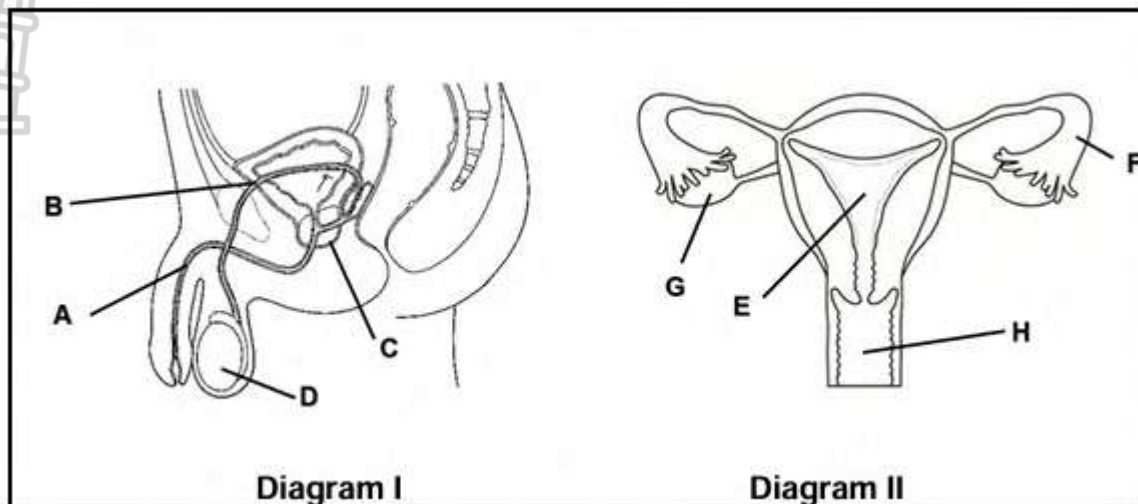


- 7.1 Identify part **B**. (1)
- 7.2 Name the process that takes place in part **A** that leads to zygote formation (1)
- 7.3 Describe the process named in QUESTION 6.2 (3)
- 7.4 Describe the development of the zygote until implantation occurs. (4)
- 7.5 Describe the process of oogenesis. (5)

(14)

Activity 8

8. The diagrams below represent the male and female reproductive systems.



8.1 Identify structure **A**. (1)

8.2 List TWO adaptations of part **E**. (2)

8.3 Write down the LETTER and NAME of parts where meiosis takes place:

(a) Diagram I (2)

(b) Diagram II (2)

8.4 Give the NAME of a part where:

(a) Sperms are stored to mature before release (1)

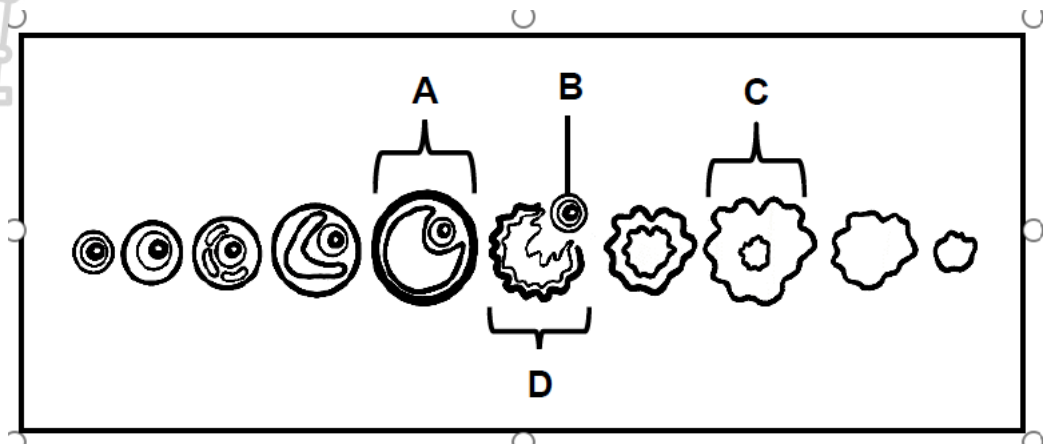
(b) Fertilisation takes place (1)

(c) Oestrogen is produced (1)

(d) A fluid is secreted for movement and nutrition of a sperm cell (1)

(11)

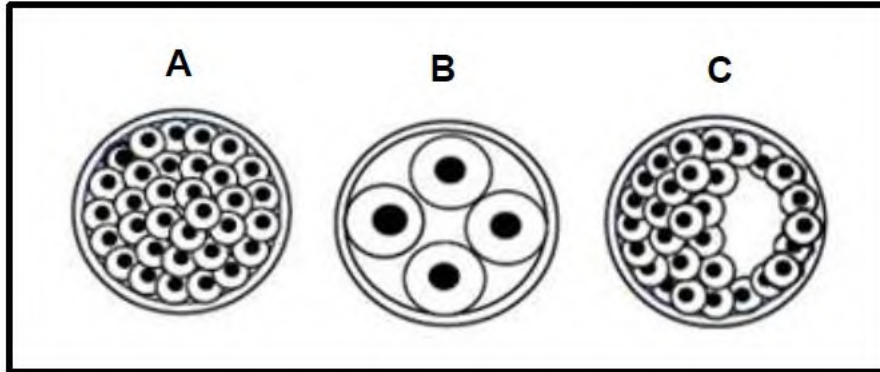
9



- e D 

Activity 10

10. Diagrams **A**, **B** and **C** below represent different stages of human embryonic development. The stages are NOT shown in the correct order.



10.1 Identify stage:

(a) **A** (1)

(b) **C** (1)

10.2 Identify the type of cell division responsible for the formation of the different stages. (1)

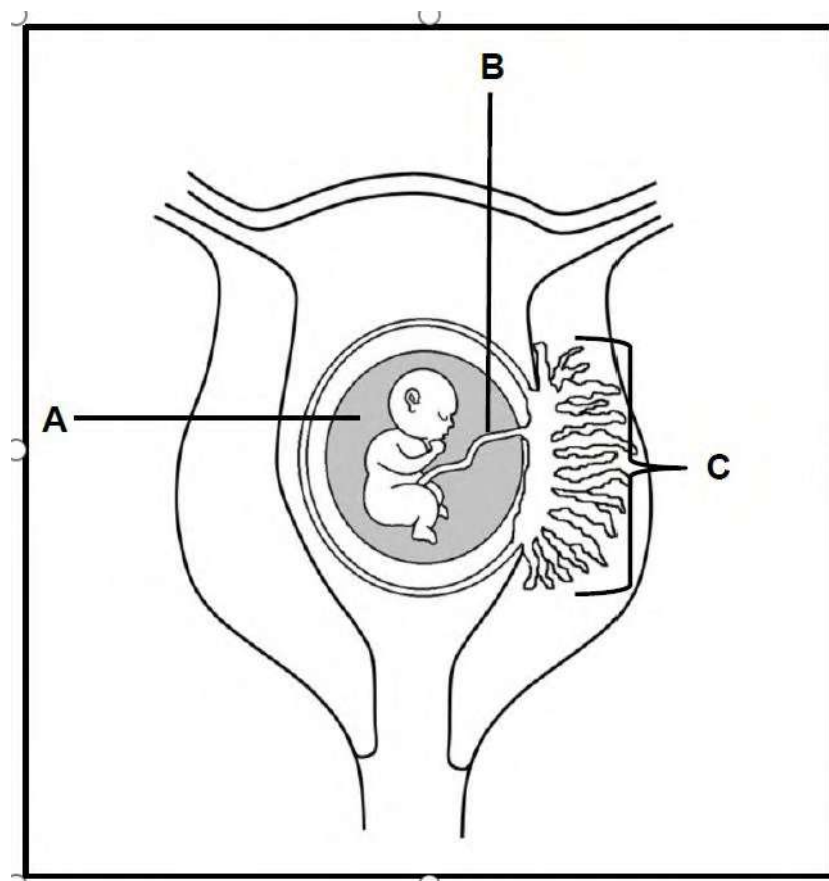
10.3 Give the LETTER of the embryonic stage that implants in the endometrium (1)

10.4 Use the letters **A**, **B** and **C** to arrange the stages in the CORRECT order of development. (2)

(6)

Activity 11

11. The diagram below represents a stage in human foetal development.



11.1 Identify:

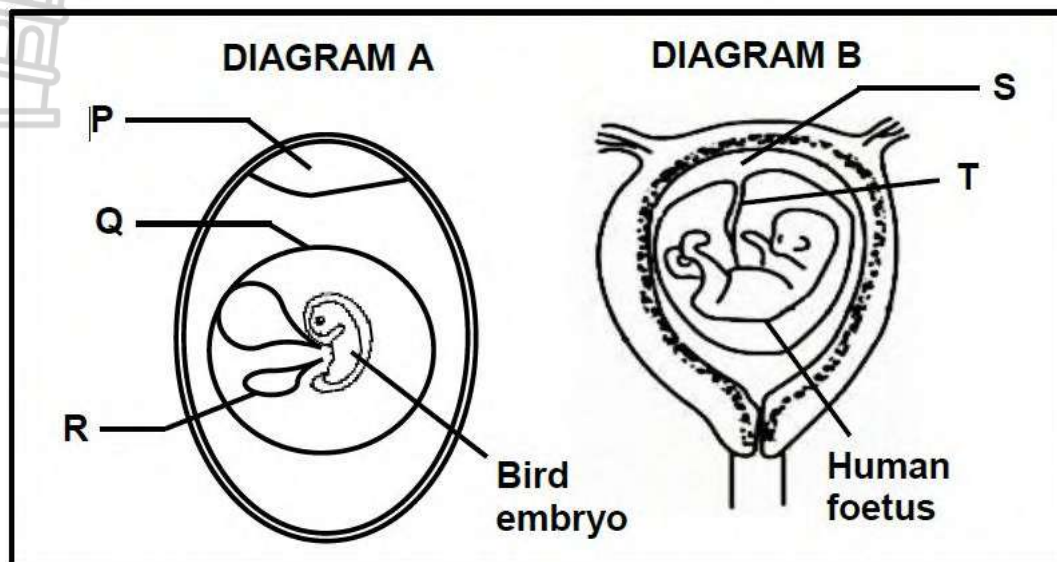
- (a) Fluid **A** (1)
- (b) Structure **C** (1)

11.2 Name:

- (a) The blood vessel in part B that transports oxygen to the developing foetus (1)
 - (b) TWO structures that play a role in the formation of structure **C** (2)
- (5)**

Activity 12

12 The diagrams below represent stages in the reproduction of vertebrates.



12.1 Identify P. (1)

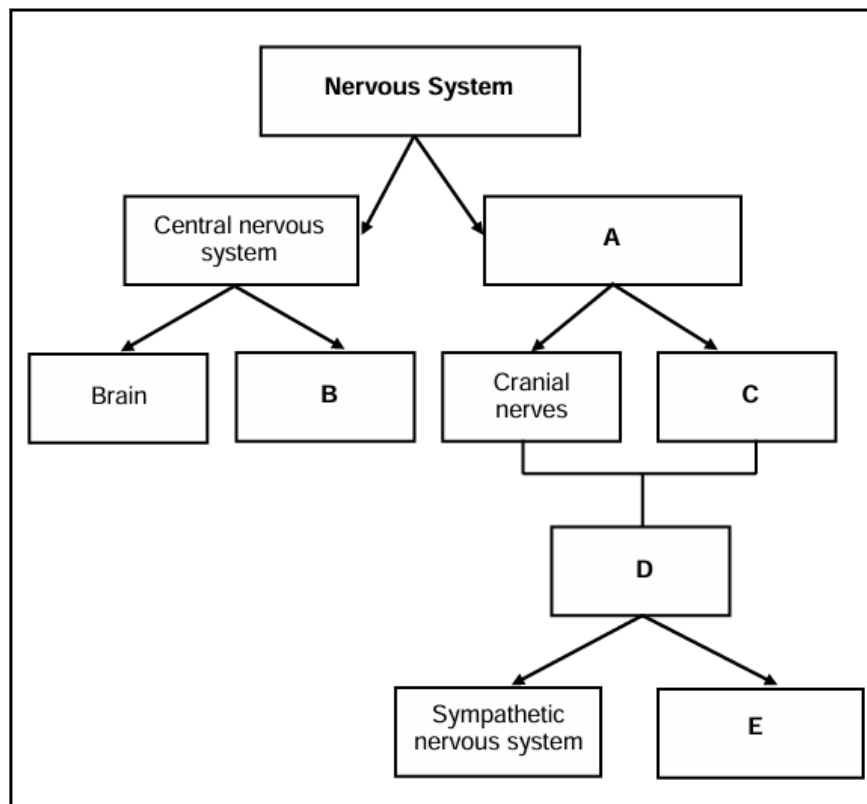
12.2 Write the LETTERS of ALL the parts that are involved with the removal of waste products from the developing embryo and foetus. (2)

12.3 Name TWO reproductive strategies that occur in humans. (2)

(5)

Activity 13

13 The flow diagram below represents the components of the nervous system.



13.1 Identify the component of the nervous system represented by:

(a) **A** (1)

(b) **D** (1)

13.2 Name the type of nerves found at **C**. (1)

13.3 Give the LETTER and NAME of the component that slows down the heart rate when an emergency situation has passed. (2)

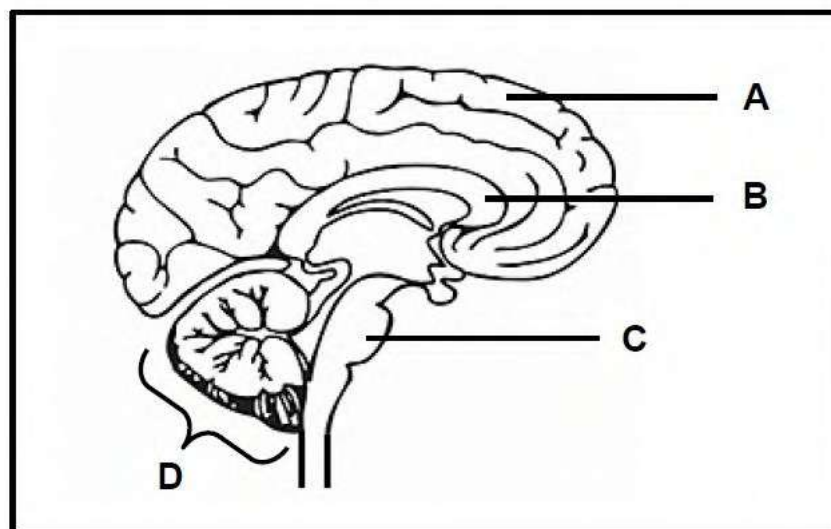
13.4 Name the nerve cells that make up nervous tissue. (1)

13.5 State TWO ways in which the brain is protected. (2)

(8)

Activity 14

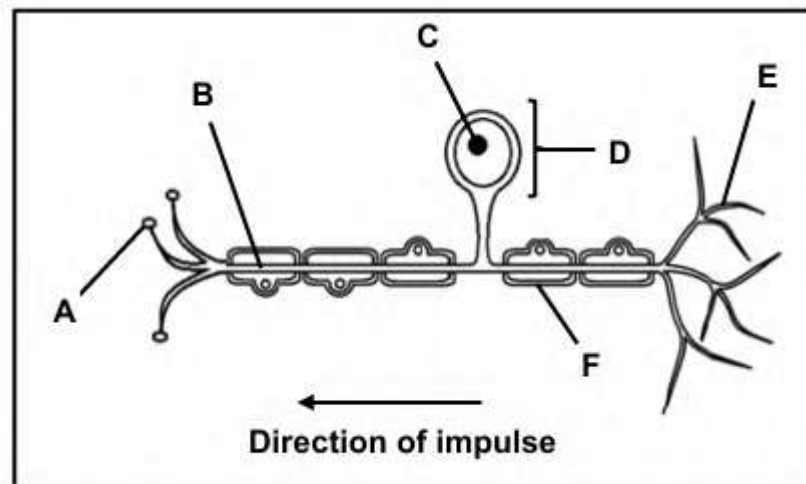
- 14 The diagram below represents parts of the central nervous system.



- 14.1 Name the TWO components of the central nervous system shown in the diagram. (2)
- 14.2 Identify part:
- (a) **B** (1)
- (b) **D** (1)
- 14.3 Give the LETTER and NAME of the part that controls:
- (a) The heartbeat (2)
- (b) Voluntary actions (2)
- (8)**

Activity 15

15 The diagram below shows the structure of a neuron.



15.1 Name the type of neuron represented by the diagram. (1)

15.2 Identify part:

(a) **B** (1)

(b) **D** (1)

(c) **E** (1)

15.3 Give the LETTER of the part that:

(a) Contains the genetic material of the neuron (1)

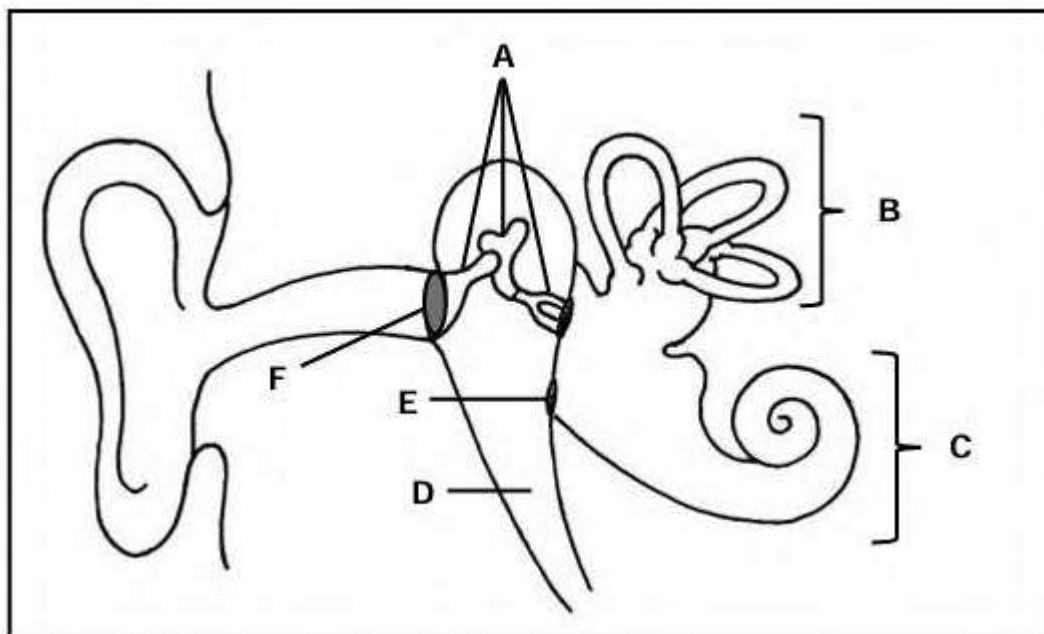
(b) Insulates the neuron (1)

(c) Makes synaptic contact with an interneuron (1)

15.4 Name the disorder that is associated with the degeneration of part **F**. (1)
(8)

Activity 16

16 The diagram below represents the human ear.



16.1 Identify part:

(a) **B** (1)

(b) **E** (1)

16.2 Give the LETTER and NAME of the part that:

(a) Is filled with air (2)

(b) Contains the organ of Corti (2)

16.3 Give the LETTER of the part that:

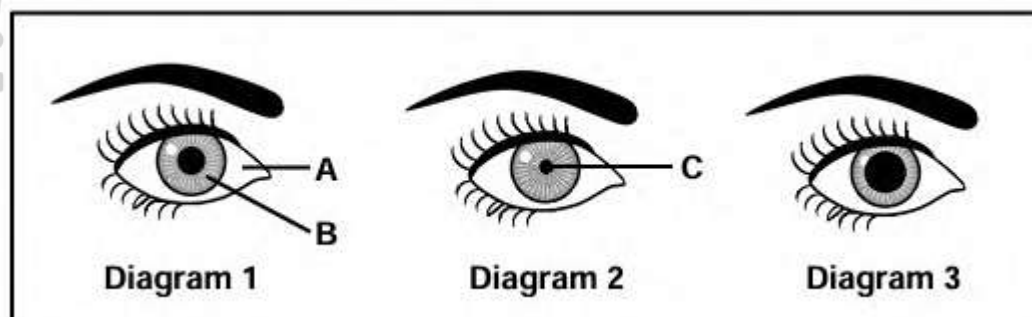
(a) Where grommets are inserted (1)

(b) That amplifies vibrations (1)

(8)

Activity 17

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



- 17.1 Give the LETTER and NAME of the part that:

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

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

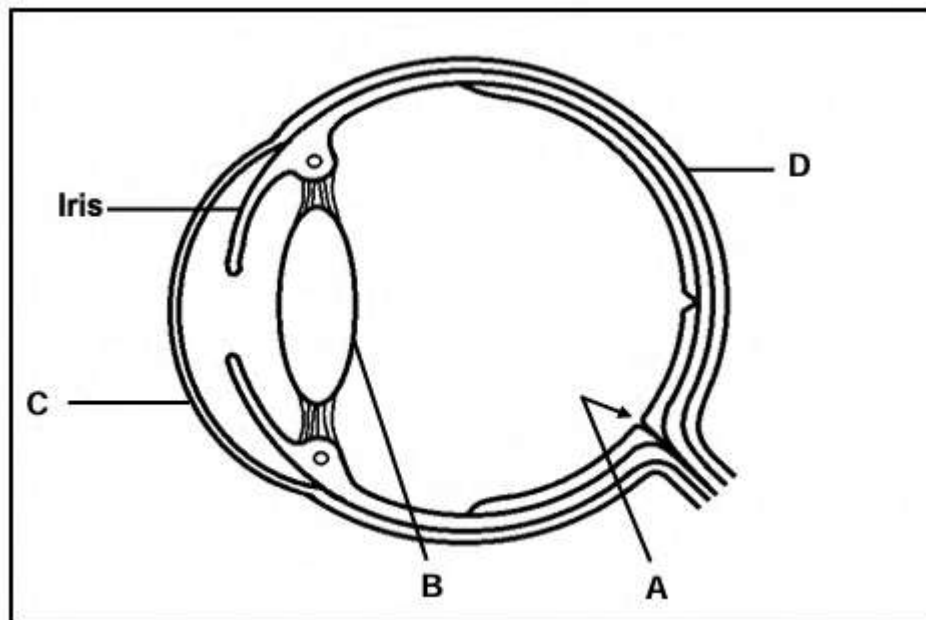
- (a) In a very bright area (1)
- (b) Where the rods are stimulated the most (1)

- 17.3 Which muscles are:

- (a) Contracted in diagram 2 (1)
 - (b) Relaxed in diagram 3 (1)
- (8)**

Activity 18

18 The diagram below represents the structure of a human eye.



18.1 Identify part:

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

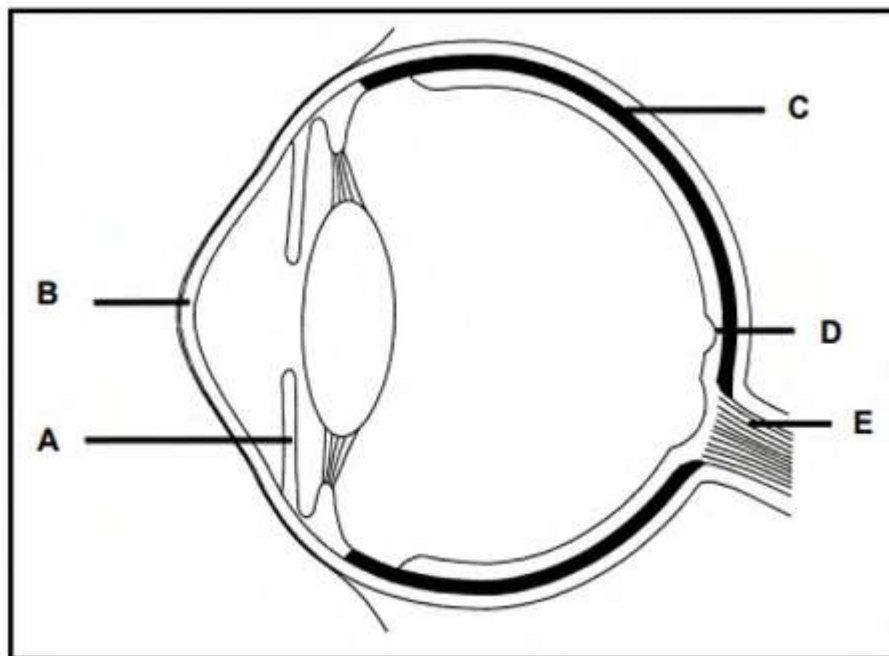
18.2 Describe how the muscles in the iris enable a person to see in dim light. (4)

18.3 Name the process that occurs in the eye when a person focuses on objects at different distances. (1)

18.4 Describe accommodation for near vision (5)
(13)

Activity 19

19. The diagram below represents the human eye.



19.1 Identify:

(a) **B** (1)

(b) **E** (1)

Give the LETTER of the

19.2 (a) Choroid (1)

(b) Iris (1)

19.3 Name the receptors found in part **D**. (1)

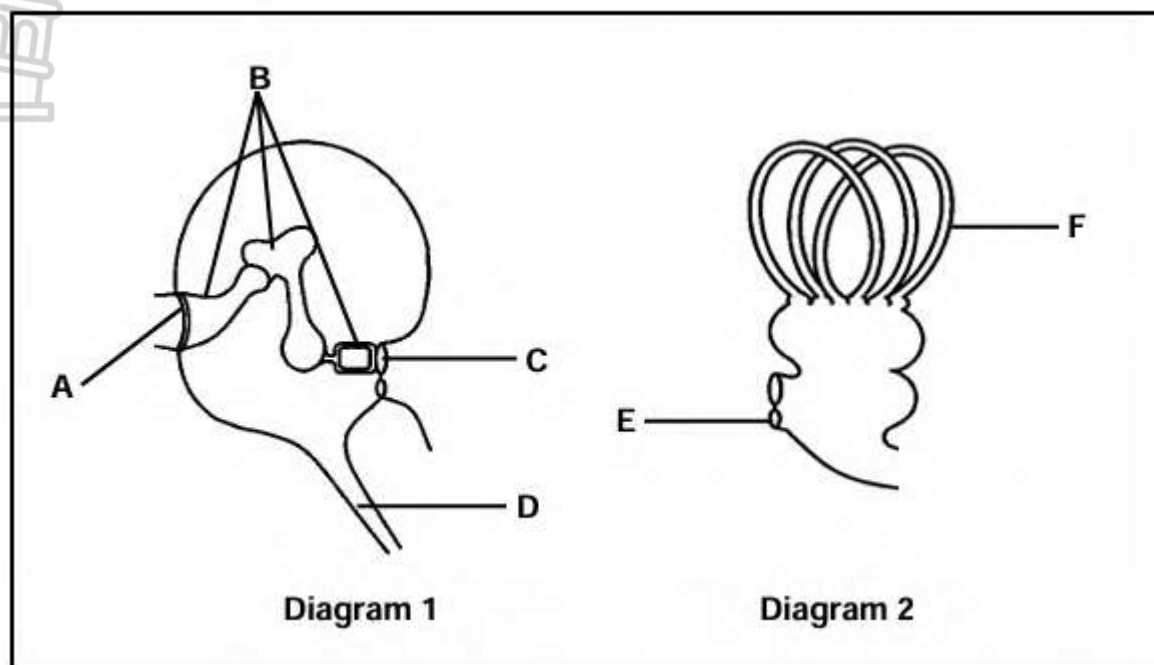
19.4 Name the parts of the eye that are involved in accommodation of the eye (3)

19.5 Name the defect if part **B** is uneven and images become distorted. (1)

(9)

Activity 20

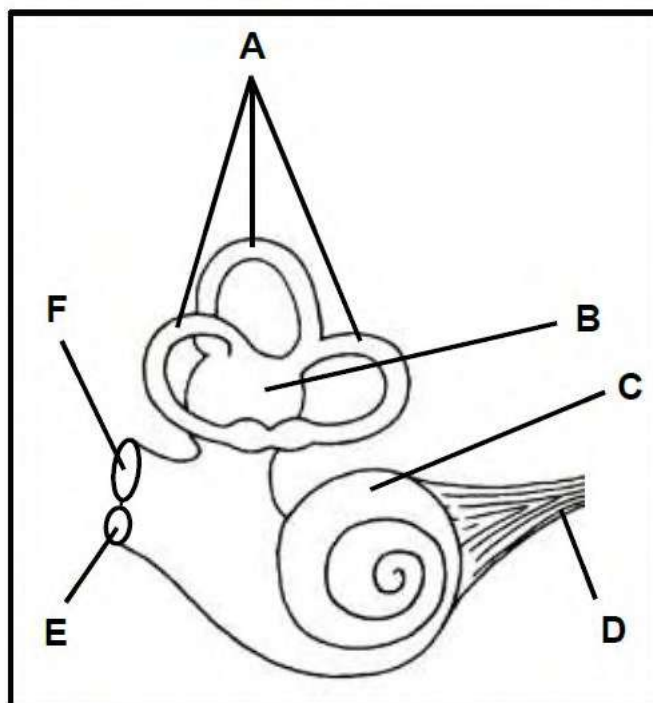
20 The diagrams below show parts of the middle and inner ear.



- 20.1 Identify part **F**. (1)
- 20.2 Give the collective term for bones **B**. (1)
- 20.3 Give the LETTER and NAME of the structure that:
- (a) Equalises pressure between the outer and middle ear (2)
 - (b) Creates pressure waves in the inner ear (2)
- 20.4 Name the receptors that are stimulated by a change in the:
- (a) Position of the head (1)
 - (b) Direction and speed of movement of the head (1)
- (8)**

Activity 21

21 The diagram below shows the structure of the inner ear



21.1 Identify part:

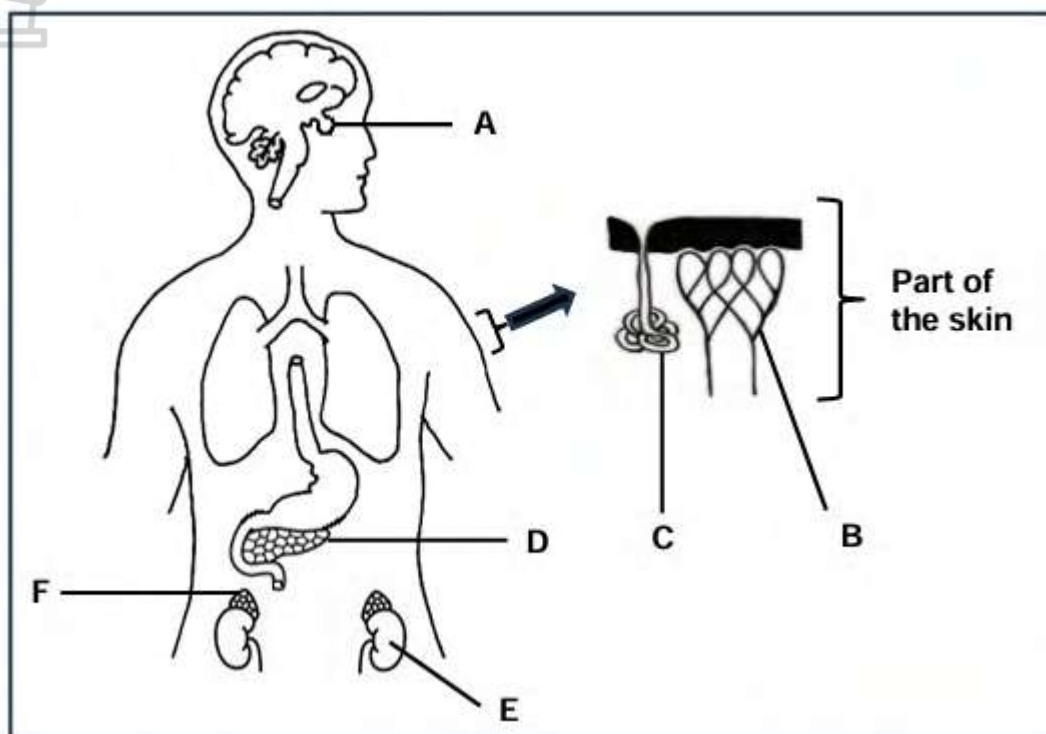
- (a) **A** (1)
- (b) **D** (1)

21.2 Give the LETTER and NAME of the part that:

- (a) Receives vibrations from the middle ear (2)
 - (b) Contains the organ of Corti (2)
- (6)**

Activity 22

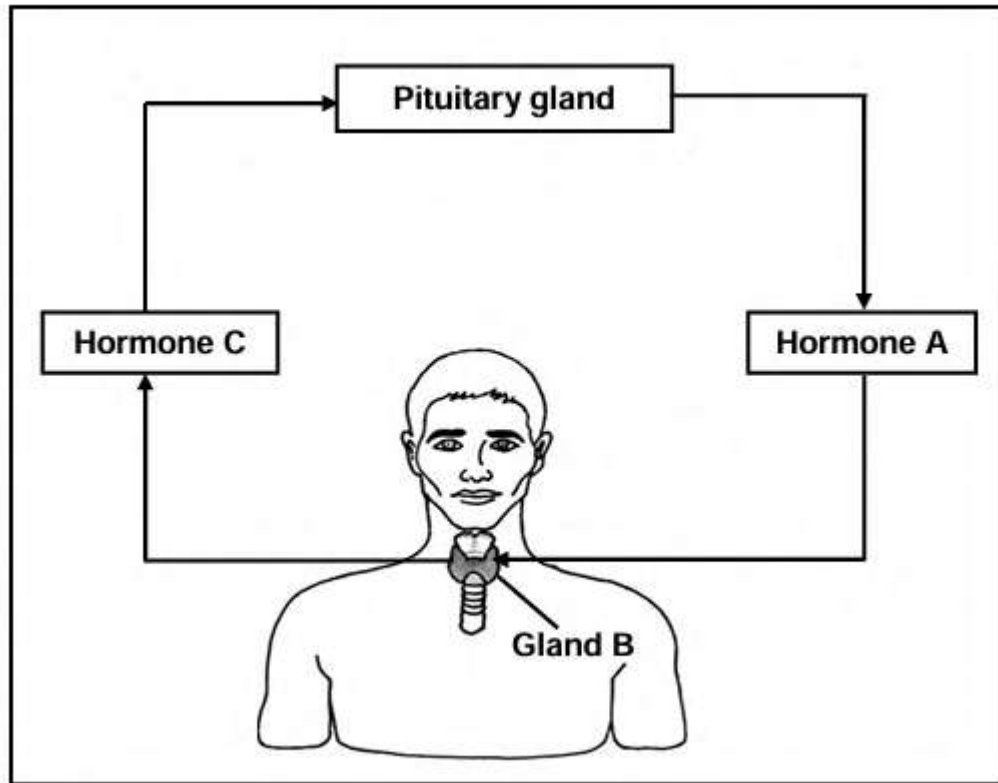
- 22 The diagram below represents some structures involved in homeostasis in the human body.



- 22.1 Write the LETTERS of the parts that serve as endocrine glands only. (2)
- 22.2 Give the LETTERS and NAMES of the parts responsible for the regulation of body temperature. (4)
- 22.3 Name the following with regard to the regulation of water content in the blood:
- (a) Hormone secreted by part A (1)
- (b) Target organ E (1)
- (8)**

Activity 23

23 The diagram below shows the interaction between two endocrine glands.



23.1 Name the type of interaction that occurs between hormone A and gland B. (1)

23.2 Identify:

(a) Gland **B** (1)

(b) Hormone **A** (1)

(c) Hormone **C** (1)

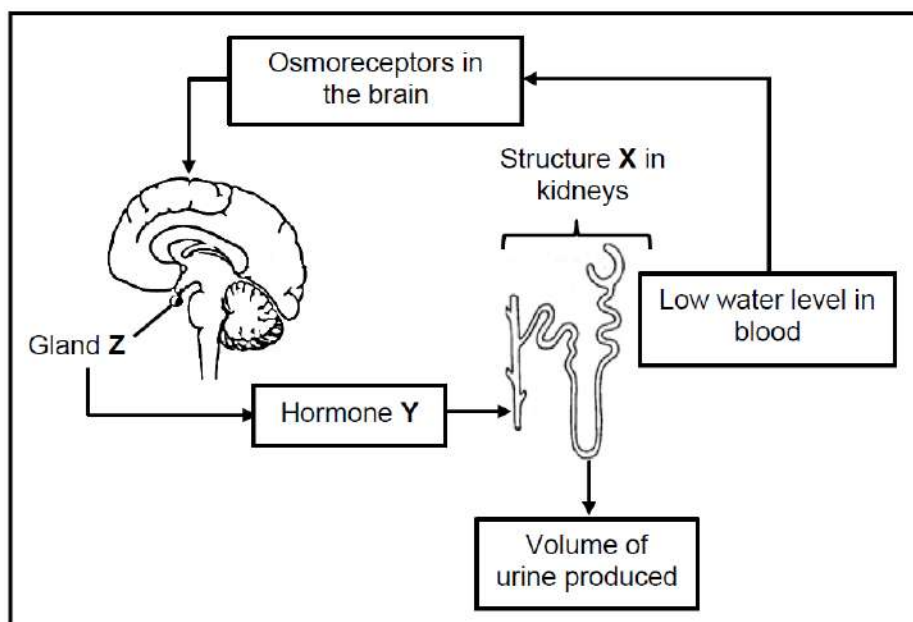
23.3 Name the disorder that results when gland B is overstimulated and becomes enlarged. (1)

23.4 Which hormone (**A or C**) will be expected to be high in the blood of the person with the disorder named in QUESTION 5.4? (1)

(6)

Activity 24

- 24 The diagram below represents a homeostatic mechanism in the human body when water levels are low.



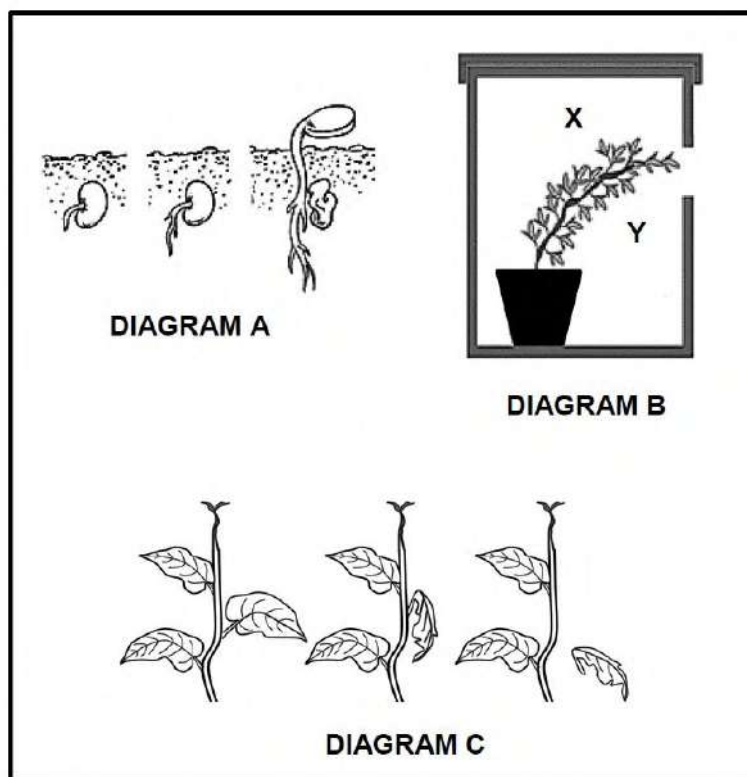
24.1 Identify:

- (a) The part of the brain where the osmoreceptors are located (1)
- (b) Gland Z (1)
- (c) Hormone Y (1)
- (d) Structure X (1)

- 24.2 State whether the volume of urine produced will increase or decrease for this individual (1)
- (5)**

Activity 25

25 The diagrams below represent different plant responses caused by hormones.



25.1 Give the LETTER(S) of the diagram(s) that represent a response due to:

- (a) Absciscic acid (1)
- (b) Auxins (2)
- (c) Gibberellins (1)

25.2 Identify the growth response shown:

- (a) By the roots in diagram **A** (1)
- (b) In diagram **B** (1)

25.3 Using X and Y in diagram **B**, state which side of the stem has the highest:

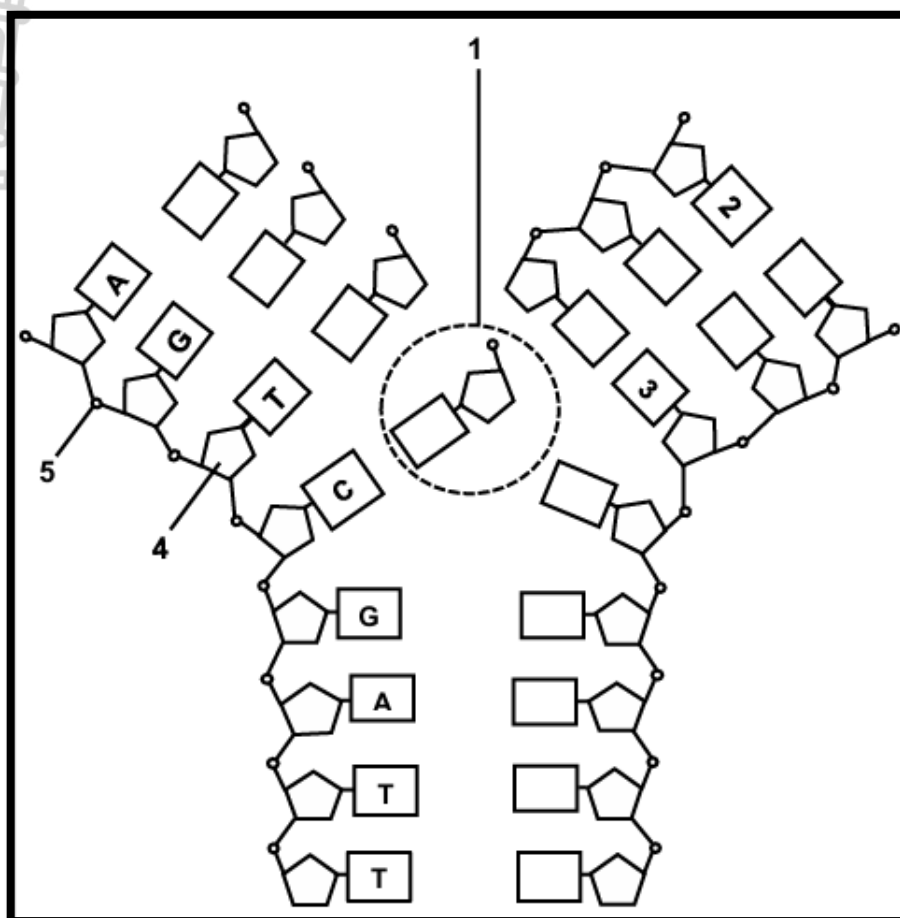
- (a) Concentration of auxins (1)
 - (b) Rate of cell division (1)
- (8)**

PAPER 2

Activity 1

1. Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A to D) next to the question number (1.1 to 1.7) in the ANSWER BOOK, for example 1.8 D.
 - 1.1 Which female scientist took X-rays of the DNA molecule and concluded that DNA is helix-shaped?
 - A Watson
 - B Franklin
 - C Crick
 - D Wilkins
 - 1.2 Which ONE of the following organelles is the site of protein synthesis?
 - A Ribosomes
 - B Chloroplasts
 - C Mitochondria
 - D Centrosomes
 - 1.3 Which ONE of the following is produced at the end of translation?
 - A A DNA molecule
 - B A messenger RNA molecule
 - C A protein
 - D An amino acid

QUESTIONS 1.4 AND 1.5 REFER TO THE DIAGRAM BELOW THAT REPRESENTS DNA REPLICATION.



- 1.4 Which ONE of the following combinations CORRECTLY identifies molecules 1, 4 and 5?

	Molecule 1	Molecule 4	Molecule 5
A	Nucleotide	Deoxyribose	Phosphate
B	Nitrogenous base	Phosphate	Deoxyribose
C	Nucleotide	Phosphate	Deoxyribose
D	Nitrogenous base	Deoxyribose	Phosphate



1.5 Which ONE of the following combinations is CORRECT for molecules 2 and 3?

	Molecule 2	Molecule 3
A	T	A
B	A	A
C	T	G
D	A	C

1.6 The police arrested two suspects accused of housebreaking. Their DNA profiles were analysed and compared to the profile of DNA evidence collected from the crime scene.



What conclusion can be drawn from the DNA analysis conducted by the police?

- A Suspect 1 is positively linked to the crime.
- B Suspect 2 is positively linked to the crime.
- C Both suspects are positively linked the crime.
- D Neither of the suspects are positively linked to the crime.





1.7 A segment of DNA contains:

- 31% of adenine in strand **1**
- 12% of cytosine in strand **2**
- 27% of guanine in strand **2**

In this segment of DNA, there will also be ...

- A 31% of adenine in strand **2**
- B 12% of cytosine in strand **1**
- C 31% of thymine in strand **2**
- D 27% of cytosine in strand **2**

1.8 A cell with 14 chromosomes undergoes meiosis

What is the number of chromatids in this cell at the beginning of meiosis?

- A 7
- B 14
- C 28
- D 56

1.9 A cell has 24 chromosomes at the start of meiosis. How many chromatids would there be in one daughter cell at the end of telophase I?

- A 24
- B 48
- C 12
- D 6

1.10 During which phase of the cell cycle does DNA replication take place?

- A Prophase II
- B Interphase
- C Telophase I
- D Anaphase I





1.11 The significance of DNA replication is that the cells formed at the end of mitosis will ...

- A be genetically identical.
- B contain half the number of chromosomes.
- C be genetically different.
- D have double the number of chromosomes.

1.12 Meiosis is a biologically important process because it...

- A produces diploid gametes.
- B doubles the chromosome number from generation to generation.
- C produces genetically identical gametes.
- D produces haploid gametes.

1.13 Which ONE of the following refers to the end product of mitosis of a human somatic cell?

- A Four haploid daughter cells
- B Four diploid daughter cells
- C Two haploid daughter cells
- D Two diploid daughter cells

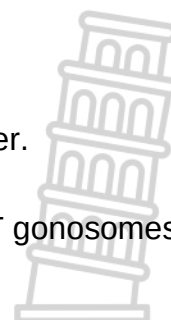
1.14 The phase in meiosis where chromatids are pulled towards poles is ...

- A anaphase I
- B telophase I
- C metaphase II
- D anaphase II

1.15 In humans, the gonosomes determine the gender.

Which combination below shows the CORRECT gonosomes for males and females?

	MALE GONOSOMES	FEMALE GONOSOMES
A	XY	YY
B	YY	XY
C	XY	XX
D	XX	XY





1.16 Down syndrome is a genetic disorder where an individual has an extra copy of chromosome 21.

Which ONE of the following may lead to Down syndrome?

- A Failure of chromosomes to replicate during mitosis
- B Failure of chromosome pairs to separate during meiosis
- C Failure of chromosomes to form pairs during fertilisation
- D Failure of chromosome pairs to cross over during meiosis

1.17 Which option in the table below shows the CORRECT comparison between mitosis and meiosis?

	MITOSIS	MEIOSIS
A	Produces four daughter cells	Produces two daughter cells
B	Produces genetically different cells	Produces genetically identical cells
C	The chromosome number remains the same	The chromosome number is halved
D	Two divisions occur	Four divisions occur

1.18 The following statements relate to cell division:

- (i) Crossing over occurs
- (ii) Contributes to genetic variation in a population
- (iii) Produces cells with a diploid number of chromosomes
- (iv) Produces somatic cells only

Which ONE of the following combinations of statements refer to meiosis?

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





1.19 In the inheritance of blood groups there are ...

- A two phenotypes controlled by three alleles.
- B three phenotypes controlled by two alleles.
- C four phenotypes controlled by three alleles.
- D four phenotypes controlled by two alleles.

1.20 An organism has the genotype **TT**.

The CORRECT term which describes this organism's genotype is ...

- A heterozygous dominant.
- B heterozygous recessive.
- C homozygous dominant.
- D homozygous recessive.

1.21 Which ONE of the following genotypes is homozygous dominant?

- A RW
- B Rr
- C $I^B I^B$
- D ii

1.22 How many alleles control blood groups in humans?

- A 1
- B 2
- C 3
- D 4

1.23 A gene is ...

- A the complete set of chromosomes of an organism.
- B a segment on a chromosome, coding for a characteristic.
- C the haploid number of chromosomes in a cell.
- D a triplet of bases that codes for an amino acid.





1.24 Which ONE of the following is an example of a heterozygous genotype?

- A X^rX^r
- B BB
- C RW
- D aa

QUESTIONS 1.25 AND 1.26 REFER TO THE INFORMATION IN THE DIHYBRID CROSS BELOW.

In a certain plant species, one gene controls stem colour and another controls plant height. The stem colour can be brown (**B**) or red (**b**), while the plant height can be tall (**T**) or short (**t**).

	STEM COLOUR	PLANT HEIGHT
Plant 1	Brown	Short
Plant 2	Red	Tall

When plant **1** was crossed with plant **2**, some of their offspring were red and short.

1.25 Which ONE of the following represents the genotypes of plant **1** and plant **2**?

	PLANT 1	PLANT 2
A	bbtt	BbTt
B	Bbtt	bbTt
C	BbTt	bbtt
D	bbTt	Bbtt

1.26 The number of possible **different** genotypes expected in the offspring from this cross is ...

- A 4.
- B 8.
- C 9.
- D 16.





1.27 The individual who is known as the 'father of genetics' is ...

- A Charles Darwin.
- B James Watson.
- C Gregor Mendel.
- D Francis Crick.

1.28 Stem cells are ...

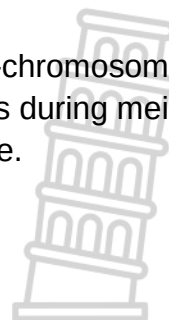
- A specialised cells that are found in bone marrow.
- B undifferentiated cells that are found in the umbilical cord.
- C cells that are formed by meiosis.
- D cells that are always haploid.

1.29 Which ONE of the following is a CORRECT description of stem cells?

- A Specialised cells that divide by mitosis to produce cells that may become further specialised for specific functions
- B Unspecialised cells that divide by mitosis to produce cells that may become specialised for specific functions
- C Unspecialised cells that divide by meiosis to produce cells that may become specialised for specific functions
- D Specialised cells that divide by meiosis to produce cells that may become specialised for specific functions

1.30 Haemophilia is ...

- A characterised by the inability to distinguish between red and green.
- B caused by a mutation of an allele on the X-chromosome.
- C caused by non-disjunction of chromosomes during meiosis.
- D caused by an allele carried on an autosome.





1.31 A plant with yellow (**y**) and round (**R**) peas is crossed with a plant with green (**Y**) and wrinkled (**r**) peas.

Which ONE of the following are the possible genotypes of the parents (P1)?

- A yyRR x YYRr
- B YyRR x yyrr
- C Yyrr x YYRR
- D yyRR x YYrr

1.32 A rare form of rickets is caused by a dominant allele on the X-chromosome.

Which ONE of the following statements is TRUE about the inheritance of this form of rickets?

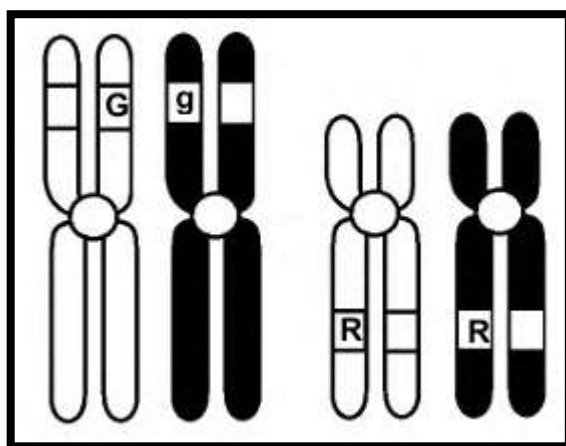
- A If the father is affected, all his sons will be affected.
- B It will be expressed more frequently in males than in females, since males have only one X-chromosome.
- C If the father is affected, all his daughters will be affected.
- D It will only be expressed in females, since they have two X-chromosomes.



QUESTIONS 1.33 AND 1.34 REFER TO THE INFORMATION AND THE TWO SETS OF HOMOLOGOUS CHROMOSOMES BELOW.

In tomato plants, the genes for fruit size and fruit colour are located on different chromosomes. The gene for fruit size has two alleles, large (**G**) and small (**g**). The gene for fruit colour also has two alleles, red (**R**) and yellow (**r**).

The diagram below shows the alleles from one tomato plant.



1.33 What is the CORRECT genotype and phenotype of this tomato plant?

	GENOTYPE	PHENOTYPE
A	GGRR	Large and red
B	GgRR	Large and red
C	GgRR	Small and yellow
D	GGRr	Small and yellow

1.34 This tomato plant is crossed with a tomato plant that has small, yellow fruit.

What is the expected phenotypic ratio in the offspring?

- A 1 : 1
- B 9 : 3 : 3 : 1
- C 1 : 1 : 1 : 1
- D 3 : 1



1.35 A gradual change in the characteristics of a species over time is known as ...

- A punctuated equilibrium.
- B genetic engineering.
- C speciation.
- D biological evolution.

1.36 Which ONE of the following is a reproductive isolation mechanism?

- A Adaptation to the same pollinator
- B Species-specific courtship behaviour
- C Production of fertile offspring
- D Breeding at the same time of the year

1.37 Analysis of mitochondrial DNA is an example of this line of evidence:

- A Fossil evidence
- B Modification by descent
- C Biogeography
- D Genetic evidence

1.38 Which ONE of the following is a characteristic of a bipedal organism?

- A A C-shaped spine
- B A short, wide pelvis
- C A long, narrow pelvis
- D A more backward foramen magnum

1.39 Which ONE of the following scientists discovered the fossil Taung Child?

- A Lee Berger
- B Ron Clarke
- C Raymond Dart
- D Robert Broom



1.40 Which ONE of the following characteristics do African apes and humans have in common?

- A Opposable thumbs
- B C-shaped spines
- C S-shaped spines
- D Short upper arms



1.41 The reproductive isolation mechanism characterised by an animal displaying a specific action to attract a mating partner is known as

- A breeding at different times of the year.
- B prevention of fertilisation.
- C infertile offspring.
- D species-specific courtship behaviour

1.42 Which ONE of the following is an example of discontinuous variation in humans?

- A Blood groups
- B Height
- C Skin colour
- D Hair colour

1.43 A list of different lines of evidence to support evolution is given below.

- (i) Evidence from biogeography
- (ii) Fossil evidence
- (iii) Genetic evidence
- (iv) Cultural evidence

Which ONE of the following options are used as evidence to support human evolution?

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

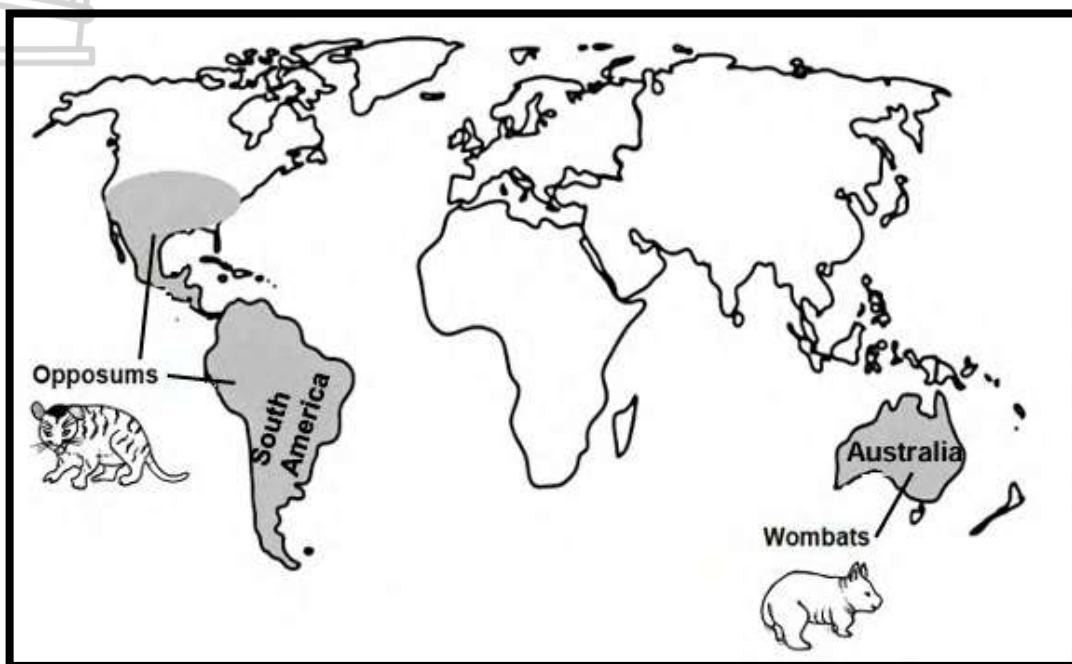
1.44 Which ONE of the following statements is a feature of punctuated equilibrium?

- A Individual organisms adapt to changes in the environment.
- B The inheritance of acquired characteristics.
- C There are long periods of little or no change in a population.
- D The more a structure is used, the more it develops.



1.45 The opossums and wombats are believed to have originated from a common ancestor.

The shaded parts of the diagram below show the distribution of these species.



The type of evidence for evolution that is represented in the diagram is ...

- A biogeography.
- B modification by descent.
- C genetics.
- D cultural.

1.46 Two people each gave four descriptions about themselves.

	PERSON 1	PERSON 2
P	I can roll my tongue.	I cannot roll my tongue.
Q	I am 150 cm tall.	I am 153 cm tall.
R	I have unattached earlobes.	I have attached earlobes.
S	My blood group is A .	My blood group is AB .



Which ONE of the following combinations are examples of discontinuous variation?

- A P, Q and S
- B P, R and S
- C Q, R and S
- D P, Q, R and S

1.47 Below is a list of reproductive isolating mechanisms.

- (i) Species-specific courtship behaviour
- (ii) Prevention of fertilisation
- (iii) Adaptation to different pollinators

Which ONE of the following combinations refers to reproductive isolation mechanisms in plants?

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





1.48 An investigation was done to determine the change in antibiotic resistance in bacteria over a number of generations.

The results are shown in the table below.

NUMBER OF GENERATIONS OF BACTERIA	ANTIBIOTIC-RESISTANT BACTERIA IN A POPULATION (%)
5	1
50	5
500	20
5 000	40
50 000	70

How many times did the percentage of antibiotic-resistant bacteria in a population increase between the 50th and 5 000th generation?

- A 8
- B 35
- C 45
- D 700



Activity 2

- 2 Give the correct **biological term** for each of the following descriptions.

No.	Description	Biological Term
2.1	Section of a DNA molecule that codes for a specific characteristic	
2.2	A pattern of black bars resulting from DNA analysis	
2.3	The DNA-containing cell organelle found only in plants	
2.4	The natural shape of a DNA molecule	
2.5	The bond that connects the two strands of DNA	
2.6	A nucleic acid that carries hereditary information	
2.7	The type of RNA that carries specific amino acids to the site of protein synthesis	
2.8	The analysis of DNA samples to identify individuals or relationships between individuals	
2.9	The bond formed between two amino acids during protein synthesis	
2.10	A change in the sequence of nitrogenous bases resulting in the formation of a different protein	
2.11	An allele that is expressed in a phenotype in the heterozygous condition	
2.12	The structure that joins two chromatids together	
2.13	The chromosome pairs 1 to 22 in a human somatic cell	
2.14	The division of the nucleus during meiosis	
2.15	The structure that joins two chromatids together	
2.16	The chromosome condition of a cell that has a single set of chromosomes	
2.17	The structure that holds the two chromatids of a chromosome together	
2.18	A representation of the number and structure of all the chromosomes that occur in the nucleus of a somatic cell	
2.19	The phase of meiosis where paired chromosomes are arranged at the equator	
2.20	Section of a DNA molecule that codes for a specific characteristic	
2.21	The production of a genetically identical copy of an organism using biotechnology	
2.22	Undifferentiated cells in animals that have the potential to become any type of tissue	
2.23	A genetic disorder that results in a person who cannot distinguish between the colours red and green	
2.24	A genetic disorder characterised by the absence of a blood-clotting factor	

2.25	An allele that is masked in the phenotype when found in the heterozygous condition	
2.26	The position of a gene on a chromosome	
2.27	The biotechnological process that produces genetically identical organisms	
2.28	Undifferentiated cells in animals that have the potential to become any type of tissue	
2.29	The position of an allele on a chromosome	
2.30	Evolution characterised by long periods of no change alternating with short periods of rapid change	
2.31	A group of organisms of the same species in a specific habitat at a particular time	
2.32	The permanent disappearance of a species from Earth	
2.33	A group of similar organisms that are able to interbreed to produce fertile offspring	
2.34	An organelle that contains DNA which is used in tracing female ancestry	
2.35	A type of variation with a range of intermediate phenotypes	
		35x1 (35)



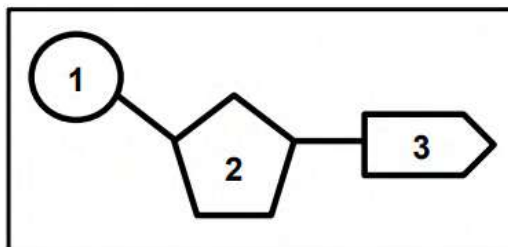
Activity 3

- 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 (3.1 to 3.6) in the ANSWER BOOK.

	COLUMN I	COLUMN II
3.1	The DNA-containing material in the nucleus of a non-dividing cell	A: Chromatid B: Chromatin
3.2	Location of DNA	A: Nucleus B: Mitochondria
3.3	Discovery of the structure of the DNA molecule	A: Franklin and Wilkins B: Lamarck and Darwin
3.4	The phase between two consecutive cell divisions	A: Prophase B: Telophase
3.5	Occurs during meiosis	A: Karyokinesis B: Cytokinesis
3.6	The phase of meiosis during which non-disjunction can occur	A: Anaphase I B: Anaphase II
3.7	A representation of the number, shape and arrangement of all the chromosomes in the nucleus	A: Phylogenetic tree B: Karyotype
3.8	The alleles of a gene separate into different gametes during meiosis	A: Law of independent assortment B: Law of segregation
3.9	The type of dominance in which neither of the two alleles is dominant over each other, resulting in an offspring with an intermediate phenotype	A: Complete dominance B: Co-dominance
3.10	The point where two chromatids overlap during crossing over	A: Chiasma B: Locus
3.11	The phase between two consecutive cell divisions	A: Prophase B: Telophase
3.12	The scientist who proposed the law of segregation	A: Darwin B: Lamarck
3.13	A source of genetic variation in a population	A: Random fertilisation B: Random mating
3.14	A characteristic that humans share with African apes	A: Eyes in front B: Longer upper arms
3.15	A feature that causes African apes to be prognathous	A: Larger jaw B: Bigger teeth
		15x2 (30)

Activity 4

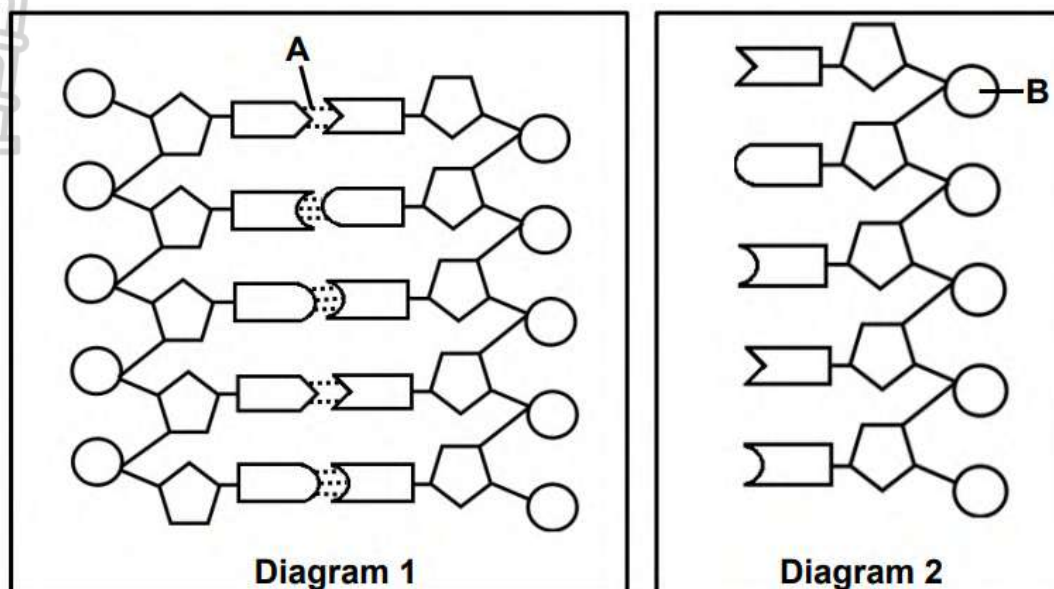
- 4 The diagram below represents a monomer of nucleic acids.



- 4.1 Name the monomer represented in the diagram. (1)
- 4.2 Identify molecule:
- (a) **1** (1)
- (b) **3** (1)
- 4.3 Give the name of molecule **2** that will be found in the following:
- (a) DNA (1)
- (b) RNA (1)
- 4.4 Name molecule **3** that will be found only in DNA (1)
- 4.5 Name TWO organelles in a human cell where DNA is located. (2)
- (8)**

Activity 5

5 The diagrams below represent two types of nucleic acids.



5.1 Identify the nucleic acid shown in diagram 1. (1)

5.2 Identify:

(a) **A** (1)

(b) **B** (1)

5.3 Name the type of sugar found in the nucleic acid represented in diagram 2. (1)

5.4 Which diagram (1 or 2) represents a nucleic acid that is used for:

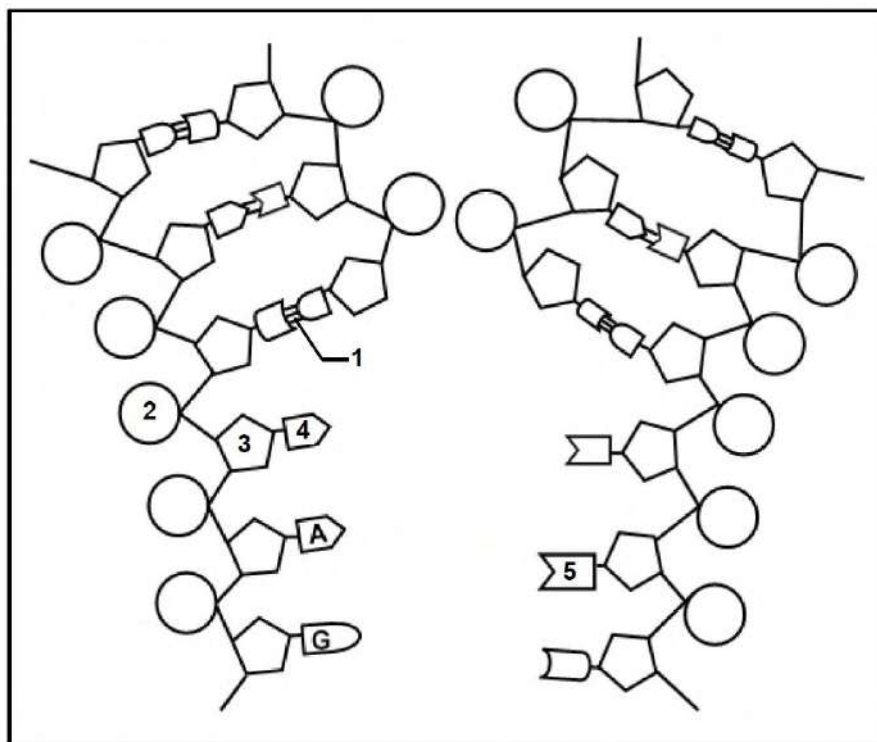
(a) Tracing of human ancestry (1)

(b) Paternity testing (1)

(6)

Activity 6

- 6 The diagram below represents a DNA molecule undergoing an important biological process.



6.1 Identify the:

- (a) Process shown in the diagram (1)
- (b) Chemical bond labelled **1** (1)

6.2 Give the:

- (a) Collective name for the parts labelled **2**, **3** and **4** (1)
- (b) Full name of the nitrogenous base labelled **5** (1)

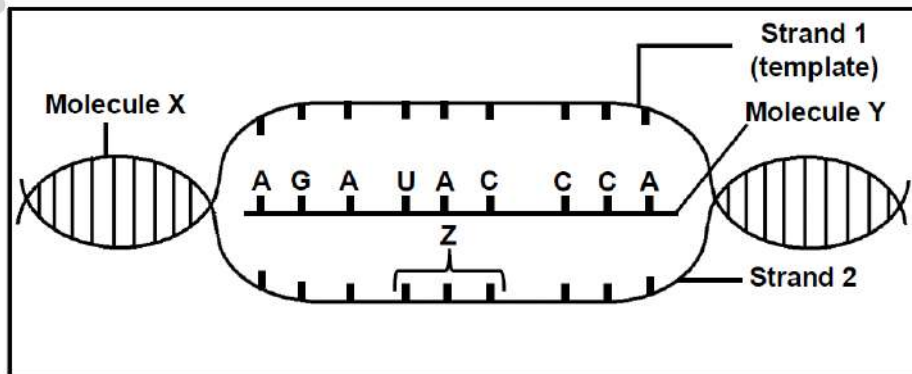
6.3 During which phase of the cell cycle does this process take place? (1)

6.4 Where in the cell does this process occur? (1)

6.5 Describe the biological process that occur above. (6)
(12)

Activity 7

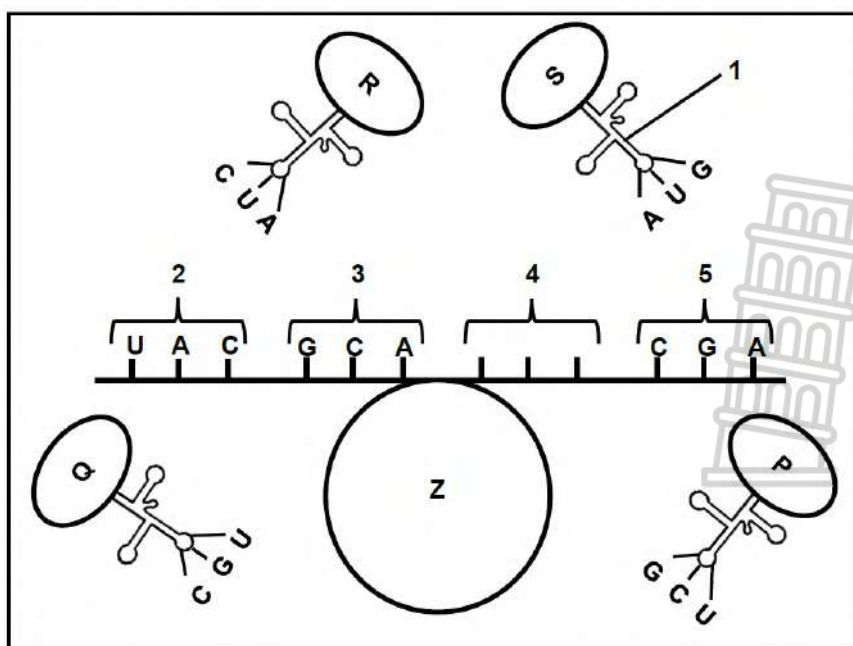
- 7 The diagram below represents a certain stage of protein synthesis. (The sequence of bases is read from left to right.)



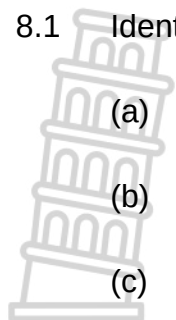
- 7.1 Identify molecule Y (1)
- 7.2 Describe the process that resulted in the formation of molecule Y. (6)
- (7)

Activity 8

- 8 The diagram below represents a stage of protein synthesis. Each amino acid (P, Q, R and S) is coded for by a different codon on this mRNA molecule



8.1 Identify:



- (a) The stage of protein synthesis represented (1)
- (b) Molecule **1** (1)
- (c) Organelle **Z** (1)

8.2 State the sequence of nitrogenous bases on the DNA molecule for codon:

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

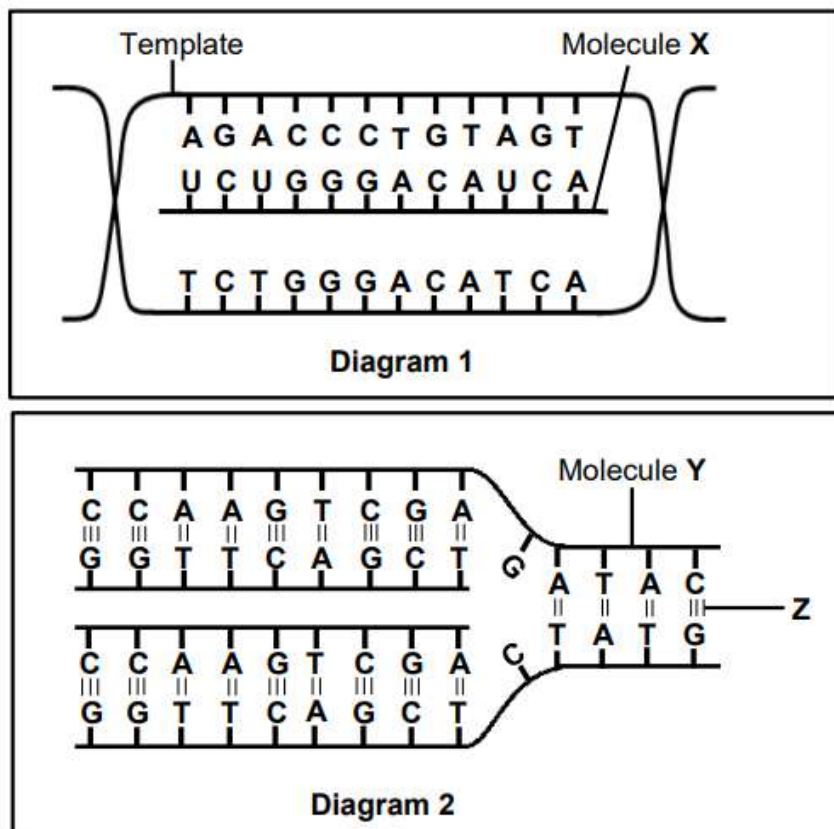
8.3 Which amino acid (**P**, **Q**, **R** or **S**) is coded for by codon **5**? (1)

8.4 Describe the stage of protein synthesis represented by the diagram above. (5)
(11)



Activity 9

- 9 The diagrams below represent two biological processes occurring in the nucleus.



9.1 Name the process represented by:

- (a) Diagram 1 (1)
- (b) Diagram 2 (1)

9.2 Identify molecule X. (1)

9.3 Give the:

- (a) Natural shape of molecule Y (1)
- (b) Phase of the cell cycle during which the process in Diagram 2 occurs (1)
- (c) Full name of the nitrogenous base that is found in molecule X, but not in molecule Y (1)

9.4 Name the:

(a) Sugar found in molecule X (1)

(b) Bond Z (1)

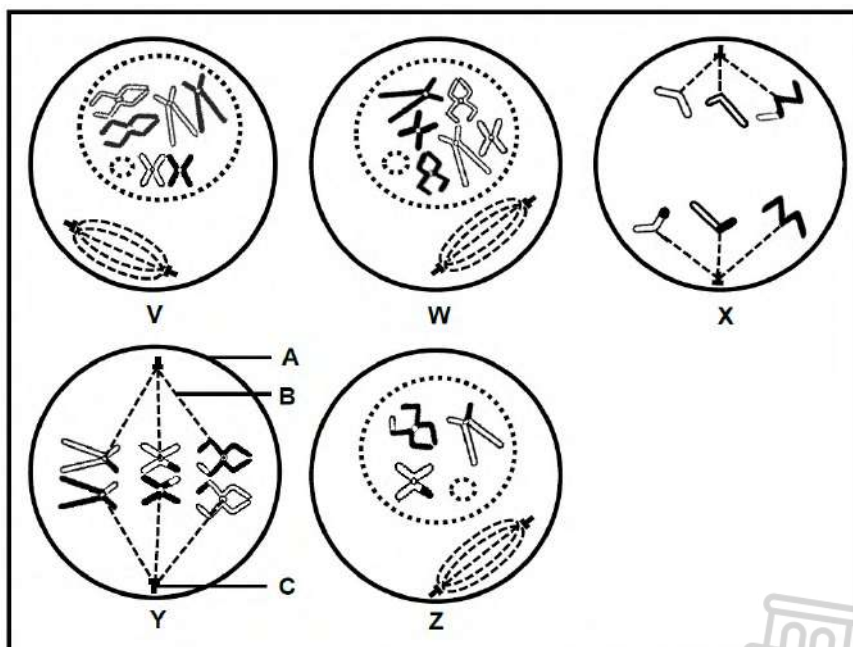
9.5 State the number of codons on molecule X.

(1)

(9)

Activity 10

10 The diagrams below represent cells from the same organism during different phases of mitosis and meiosis.



10.1 Identify part:

(a) A (1)

(b) B (1)

(c) C (1)

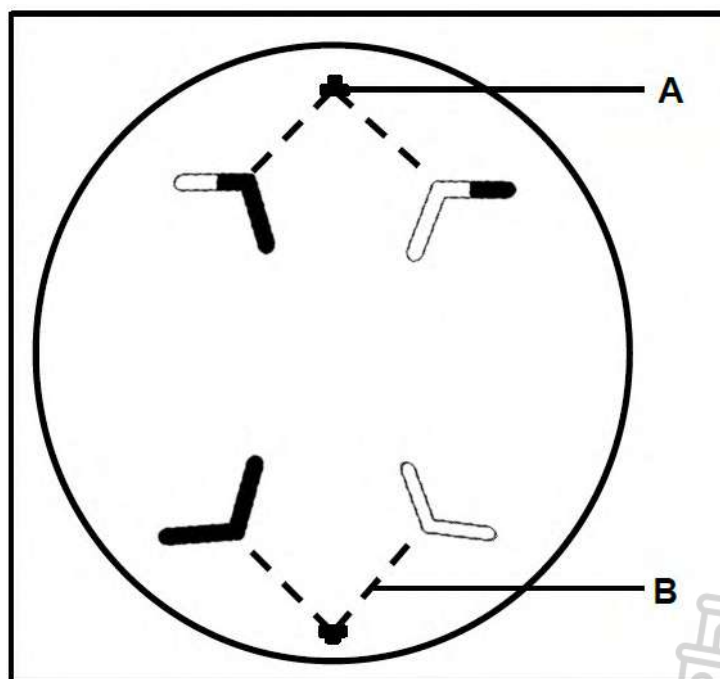
10.2 Which diagram (V, W, X, Y or Z) represents a cell during:

(a) Prophase of mitosis (1)

- (b) Metaphase I (1)
- (c) Prophase I (1)
- 10.3 How many chromosomes will there be in each cell at the end of:
- (a) Mitosis (1)
- (b) Meiosis I (1)
- (8)

Activity 11

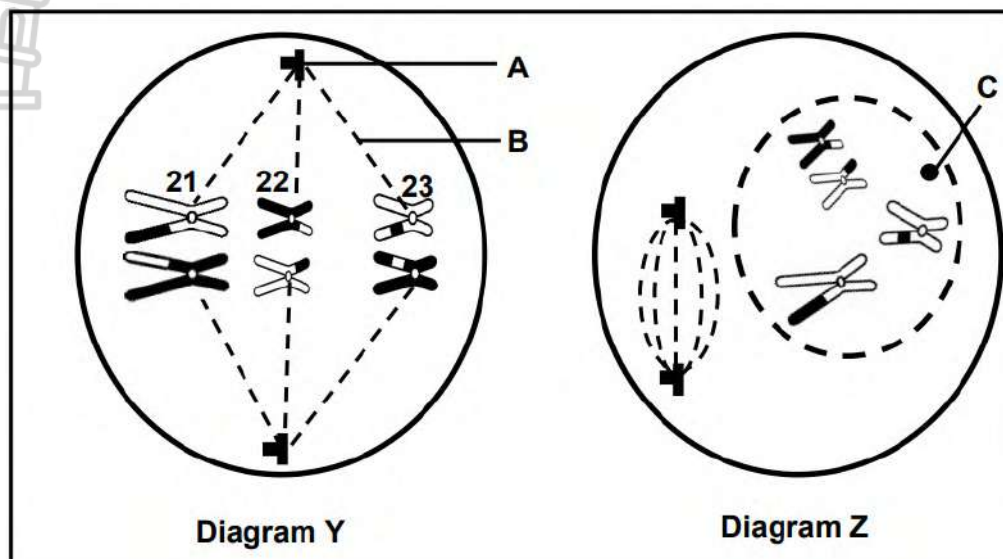
11 The diagram below represents a phase of meiosis II.



- 11.1 Identify the phase of meiosis shown. (1)
- 11.2 Identify structure:
- (a) **A** (1)
- (b) **B** (1)
- 11.3 Describe the role of structure **B** during cell division (2)
- (5)

Activity 12

- 12 The diagrams below show chromosomes **21**, **22** and **23** in a human cell in different phases of cell division.



12.1 Identify the:

- (a) Structure **B** (1)
- (b) Structure **C** (1)
- (c) The type of gamete that will be formed at the end of this cell division (1)

12.2 State ONE function of part **A** cell division. (1)

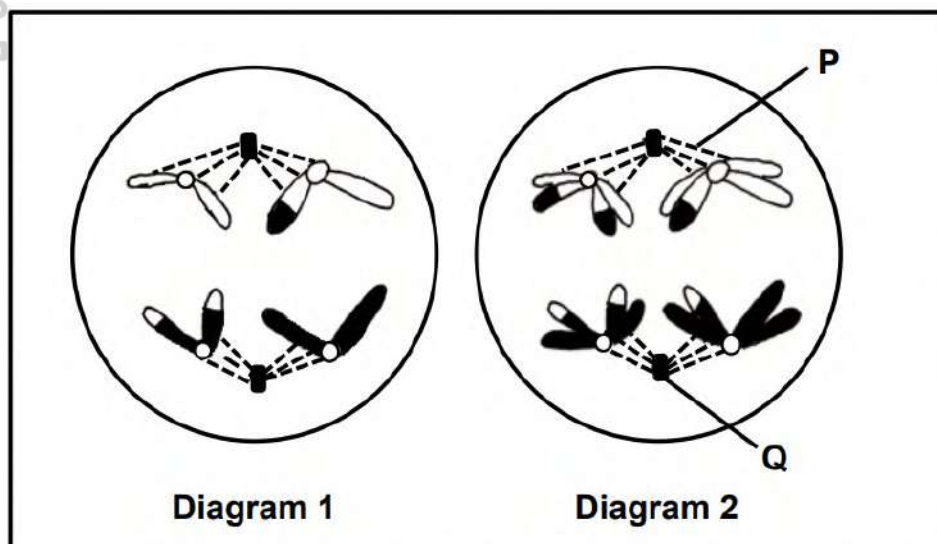
12.3 Identify the phase in diagram **Y** (1)

(5)

Activity 13

- 13 Diagrams **1** and **2** below show two cells of the same organism in different phases of meiosis.

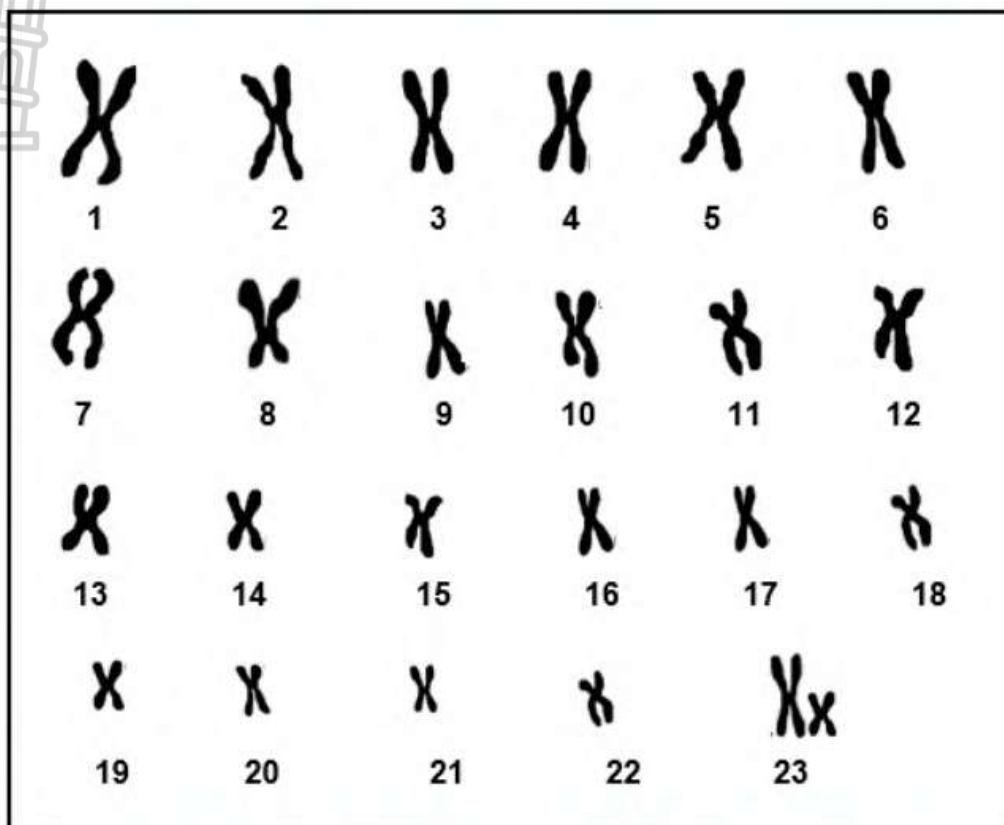
The phases are NOT necessarily shown in the correct order.



- 13.1 State ONE place in the human body where meiosis occurs. (1)
- 13.2 Identify:
- (a) Structure **P** (1)
- (b) Organelle **Q** (1)
- 13.3 Identify the phase of cell division represented in Diagram **2**. (1)
- 13.4 How many chromosomes will be found in a somatic cell of this organism? (1)
- (5)**

Activity 14

14 The diagram below shows the karyotype of a gamete of an individual.



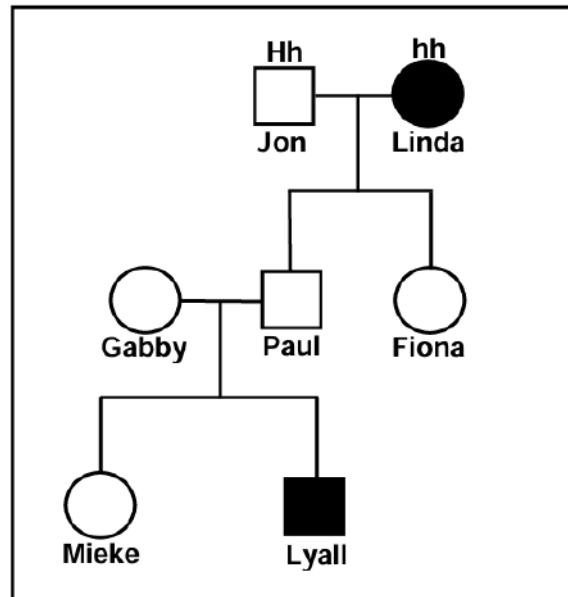
- 14.1 Name the type of mutation that occurred during the production of this gamete. (1)
- 14.2 What type of gamete is represented in the karyotype? (1)
- 14.3 In this gamete, give the number of:
 - (a) Autosomes (1)
 - (b) Gonosomes (1)
- 14.4 This gamete fuses with a normal gamete. Using X and Y representation, write the sex chromosomes of the offspring. (2)
(6)

Activity 15

- 15 Describe how non-disjunction leads to Down syndrome. (5)

Activity 16

- 16 The diagram below shows the pattern of inheritance of deafness in a family. The Letter (**H**) represents the allele for hearing and (**h**) represents the allele for deafness



- 16.1 How many of EACH of the following are represented in this diagram?

(a) Males (1)

(b) Generations (1)

- 16.2 Give the:

(a) Phenotype of Jon (1)

(b) Genotype of Paul (1)

(4)

Activity 17

- 17 Using genetic cross, show the possible genotype and phenotype of offspring when a homozygous tall plant (**R**) is crossed with short plant (**r**). (6)

Activity 18

- 18 In a certain species of butterfly, one gene control wing-spot colour and another controls eye colour. The wing-spot colour can be red spots (**R**) or grey spots (**r**), while eye colour can be black (**E**) or brown (**e**).

Butterflies that are heterozygous for both genes were crossed.

- 18.1 Name the type of cross represented above (1)

- 18.2 Give the dominant characteristic of EACH gene. (2)

The table below shows the phenotypes and all the possible genotypes of the offspring.

PHENOTYPES	ALL POSSIBLE GENOTYPES
Red spots, brown eyes	(X)
(Y)	RrEe
Grey spots, brown eyes	rree

- 18.3 Give:

- (a) ALL the possible genotypes at X (4)
- (b) The phenotype at Y (1)
- (c) The genotype of the gametes produced by a butterfly with grey spots and brown eyes (1)
- (9)

Activity 19

- 19 In a plant species, the gene coding for plant height has two alleles. The allele for tall plants (**T**) is dominant over the allele for dwarf plants (**t**). The gene for flower colour has two alleles where the allele for red flower colour (**R**) is dominant over the allele for white flower colour (**r**).

A dwarf, white-flowered plant is crossed with a plant that is homozygous tall and heterozygous for red flower colour.

19.1 State the characteristics that are being investigated in this cross. (2)

19.2 Give the genotype of the plant that is homozygous tall and heterozygous for red flower colour (2)

Below is an incomplete Punnett square representing the cross referred to above.

	TR	Tr
tr	X	Y

19.3 Identify the:

(a) Genotype of offspring **X** (1)

(b) Phenotype of offspring **Y** (2)

(7)

Activity 20

20 20.1 Give FIVE types of evidence that can be used for evolution (5)

20.2 Name TWO sources of variation (2)

20.3 State TWO differences between natural selection and artificial selection (4)

(11)

Activity 21

- 21 21.1 Describe Lamarck's theory of evolution (5)
- 21.2 Describe natural selection (6)
- 21.3 Tabulate TWO differences between Lamarckism and Darwinism (5)
- (16)**

Activity 22

- 22 22.1 Describe speciation through geographic isolation. (8)
- 22.2 Give THREE reproductive isolation mechanisms (3)
- (11)**

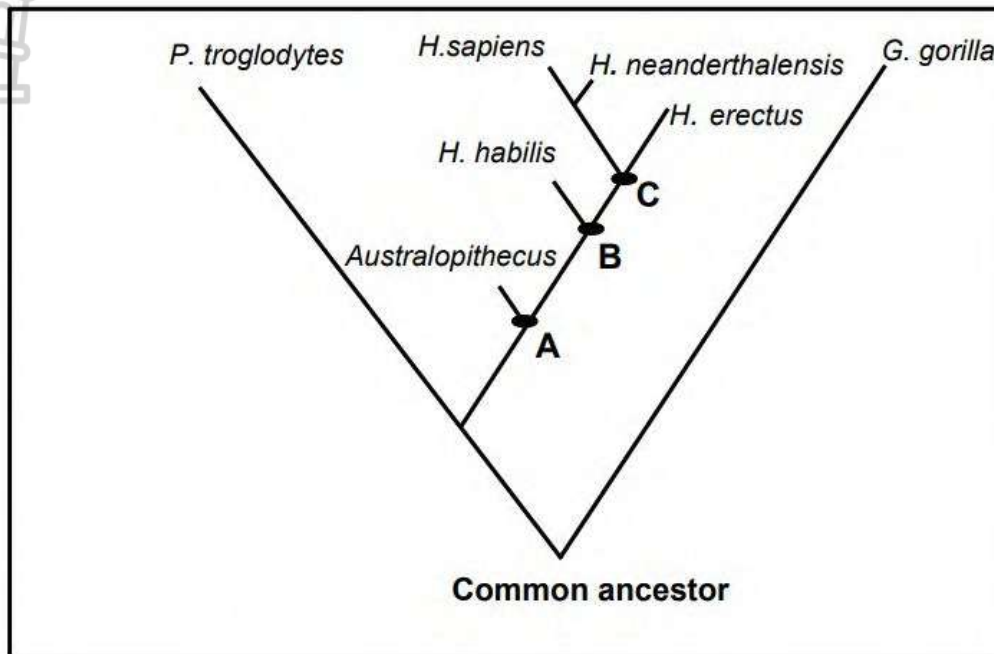
Activity 23

- 23 23.1 Give TWO similarities between the African apes and *Homo sapiens* (2)
- 23.2 Tabulate THREE differences between the African apes and *Homo sapiens* (7)
- (9)**



Activity 24

- 24 The diagram below shows the evolutionary relationship between different species.

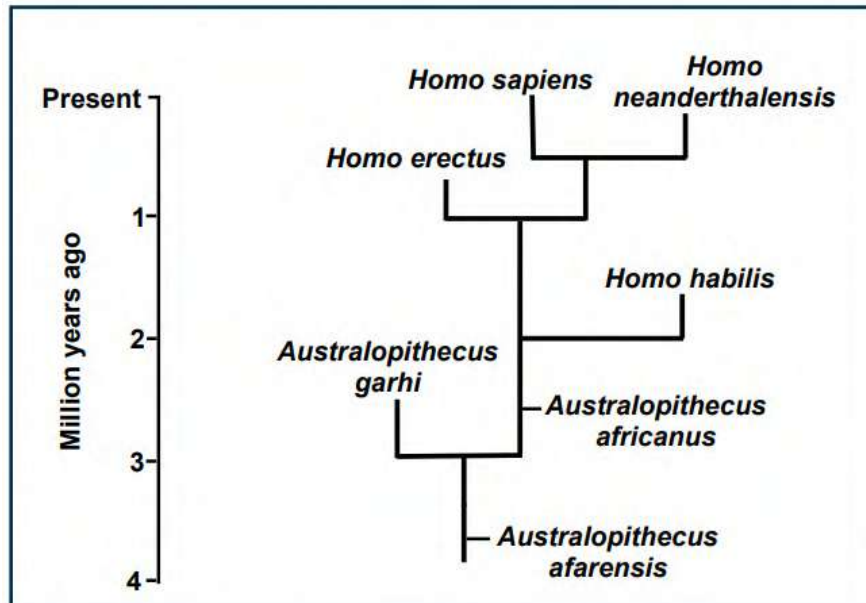


- 24.1 Identify the type of diagram shown above. (1)
- 24.2 Give the:
- (a) Genus that gave rise to the Australopithecus at **A** (1)
 - (b) LETTER that represents the most recent common ancestor for both H. sapiens and H. erectus (1)
- 24.3 Name TWO species that existed at the same time as H. erectus. (2)
- 24.4 Give ONE example of the fossil of Australopithecus africanus that was found in South Africa (1)

(6)

Activity 25

- 25 The diagram below shows the evolutionary relationships between some hominid species.



- 25.1 Identify the type of diagram shown above. (1)
- 25.2 Name the hominid genus that is thought to be the common ancestor of the Australopithecines. (1)
- 25.3 When (in mya) did the species, which was thought to be the first to make tools, appear on Earth? (1)
- 25.4 Which species is the most recent common ancestor of Australopithecus garhi and Homo habilis? (1)
- 25.5 Name ONE species that would have competed for the same resources with Homo sapiens if they had been living in the same area. (1)
- 25.6 Homo naledi is thought to be a transitional species between the Australopithecines and the Homo species. (1)

Between which TWO species would Homo naledi be placed in the diagram above?

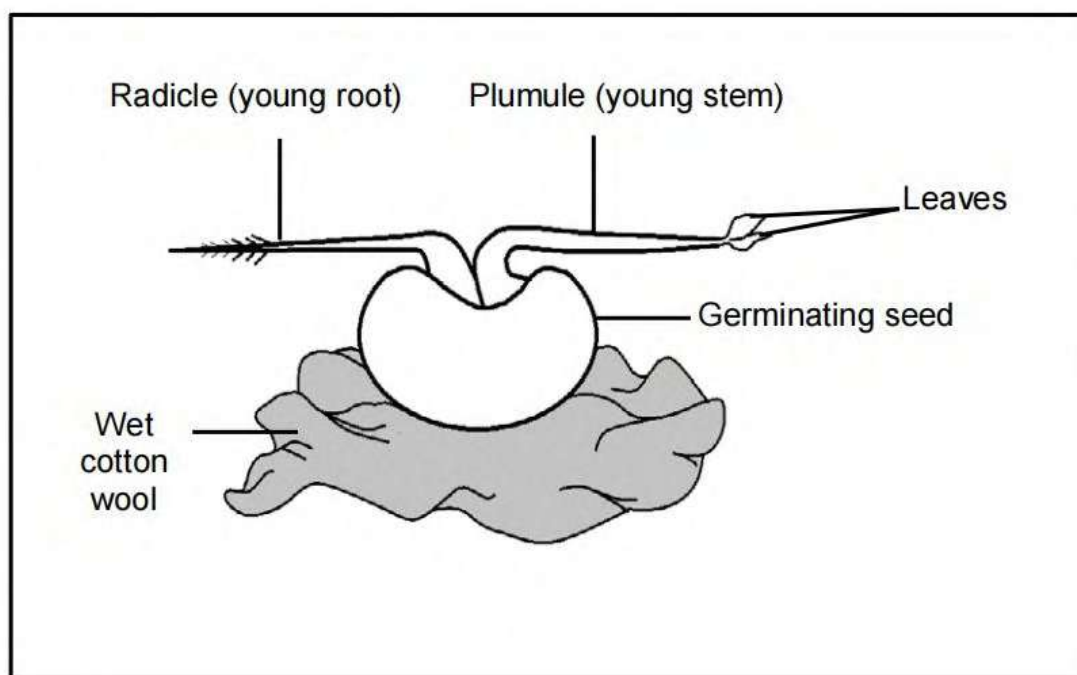
(2)
(7)

SKILLS

1. DIAGRAMS

Activity 1

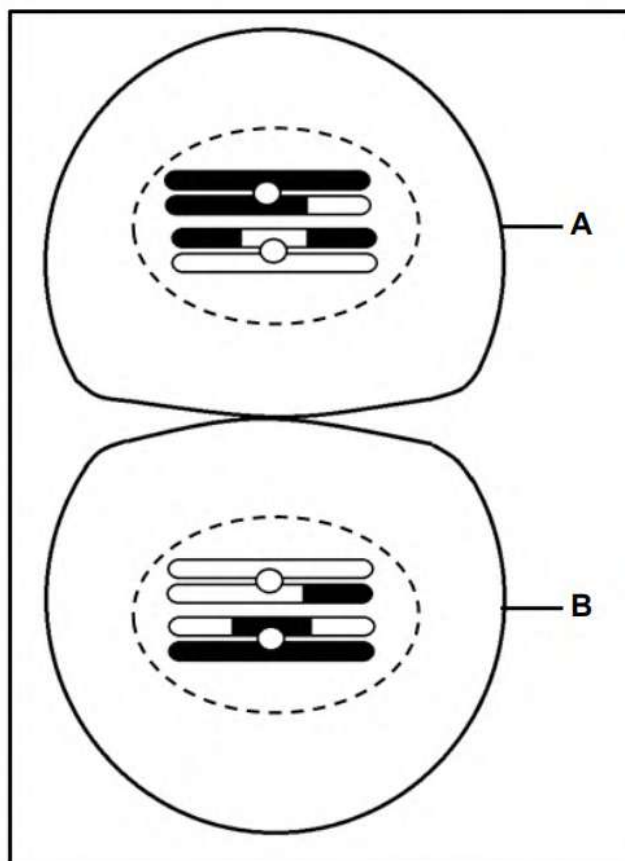
- 1 The diagram below represents a germinating seed. Assume that the radicle and plumule were exposed to uniform light from all directions.



- 1.1 Define tropism. (2)
 - 1.2 Draw a labelled diagram to show the position of the radicle and plumule in the seedling one week later. (4)
- (6)**

Activity 2

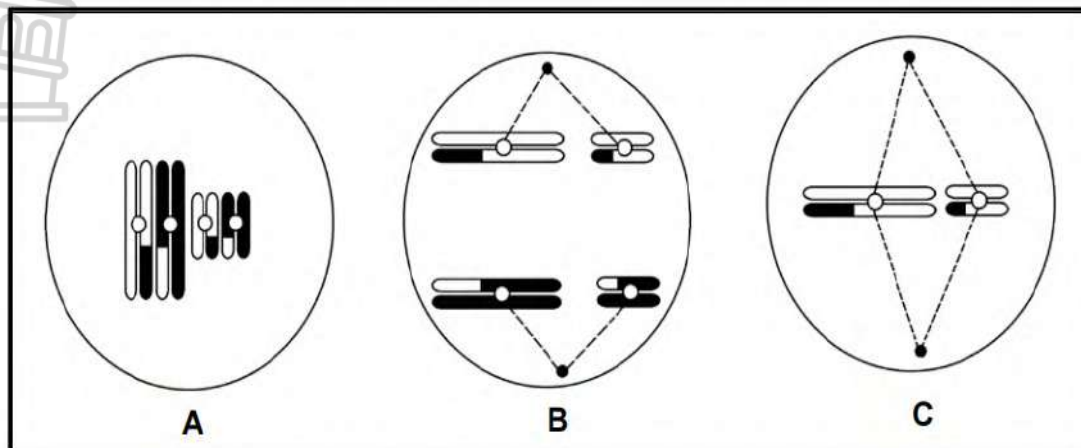
- 2 The diagram below represents a phase of meiosis.



- 2.1 Identify the phase of meiosis in the diagram above. (1)
- 2.2 Draw a diagram to show only the TWO gametes formed from cell A. (NO labels required.) (4)
- 2.3 Tabulate TWO differences between prophase I and prophase II. (5)
- (10)**

Activity 3

3 The diagrams below represent various phases of meiosis.



3.1 Identify the phase of meiosis in diagram:

(a) **A** (1)

(b) **B** (1)

3.2 Draw a labelled diagram to show the cells that will be formed at the end of meiosis from the cell in diagram **C**.

(5)

(7)

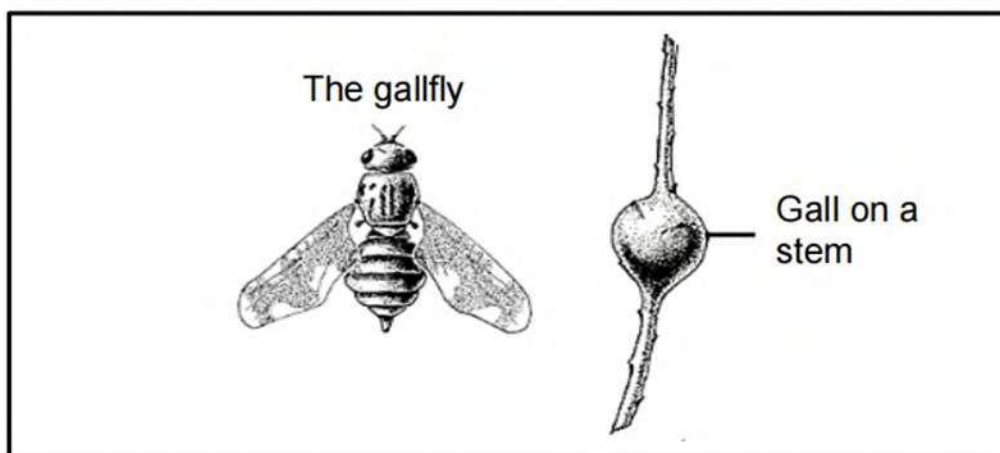
2. GRAPHS:

Activity 1

- 1 Female gallflies lay eggs on the stems of plants. The eggs hatch to form larvae that secrete a substance into the plant tissue. The secretions cause the plant cells to grow and form ball-like structures, called galls, which are high in nutrients. Predatory birds feed on the larvae in the galls.

The size of the galls produced actually depends on genetic variation in the gallfly.

The diagram below shows the gallfly and a gall on a plant stem.



Scientists wanted to investigate whether the size of the galls had an effect on the percentage of gallfly larvae killed by predatory birds.

The table below shows the results of their investigation.

Gall size (mm)	Gallfly larvae killed by predatory birds (%)
10	1
15	0
20	1
25	2
30	10



1.1 State the:

(a) Independent variable (1)

(b) Dependent variable (1)

1.2 Draw a line graph to represent the information in the table (6)
(8)

Activity 2

- 2 During a national census done in 2010 in a certain country, information was gathered on the number of people in the population who suffer from different eye diseases/disorders. The total population of this country was 142 million.

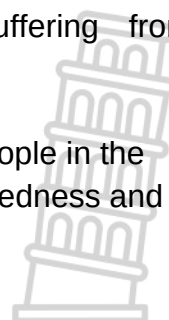
The results are shown in the table below.

TYPE OF EYE DISEASE/DISORDER	NUMBER OF PEOPLE (millions)
Macular degeneration (retina cells die)	2,1
Glaucoma (increased pressure in the eyeball)	2,7
Diabetic retinopathy (decreased blood flow to the retina)	7,6
Cataracts	24,4
Short-sightedness	34,1
Long-sightedness	14,1

2.1 Which eye disease/disorder is the least common in the population? (1)

2.2 What percentage of the population is suffering from long-sightedness? Show ALL your working. (3)

2.3 Draw a bar graph to represent the number of people in the population that suffer from cataracts, short-sightedness and long-sightedness. (6)
(10)



Activity 3

- 3 Weeds are problematic to farmers because they invade farm fields and outcompete crop plants for space. This reduces the crop yield.
- Farmers spray their fields with chemicals, known as herbicides, to kill the weeds. Some weeds, however, have evolved to be resistant to herbicides.
- Scientists investigated the time it took for a species of weed to develop resistance to five types of herbicides. The results are shown in the table below.

TYPES OF HERBICIDE	TIME TAKEN FOR WEEDS TO DEVELOP RESISTANCE (YEARS)
2,4-D	9
Dalapon	9
Picloran	25
Dicloflop	7
Trifluralin	26

- 3.1 Refer to the passage above and state how weeds act to reduce crop yield. (1)
- 3.2 Identify the:
- (a) Independent variable (1)
- (b) Dependent variable (1)
- 3.3 Draw a bar graph to show the time taken for the evolution of resistance to the herbicides. (6)
- (9)

Activity 4

- 4 Prostate cancer is one of the most common types of cancer among men.

The table below shows the number of men per 100 000 men of different age groups that were diagnosed with prostate cancer in a certain country over a period of 14 years.

AGE GROUP	NUMBER OF PROSTATE CANCER CASES (PER 100 000 MEN)
<49	5
50–54	135
55–59	288
60–64	488
65–69	720
70–74	764
75–79	693
>80	473

- 4.1 According to the table, which age group of men is most likely to develop prostate cancer? (1)
- 4.2 Draw a histogram to represent the data for men from the age group 60–64 to the age group 75–79. (6)
- (7)



Activity 5

- 5 The table below indicates the percentage of visually impaired people in the world suffering from different visual defects.

VISUAL DEFECT	PEOPLE (%)
Blindness	2
Long-sightedness	64
Short-sightedness	30
Other	4

- 5.1 Which visual defect in the table is the most common among the world population? (1)
- 5.2 In some cases where people are blind, the condition is caused by cataracts.
- (a) Explain why people with cataracts may become blind. (2)
- (b) State ONE way in which cataracts can be treated. (1)
- 5.3 Name a visual defect that is characterised by an uneven cornea or lens. (1)
- 5.2 Draw a pie chart to represent the data in the table. (6)

(11)

CALCULATIONS

Activity 1

- 1 Read the extract below.

Researchers have discovered that members of a particular family have high bone density that may be caused by a gene mutation. High bone density reduces the risk of bone fractures.

Twenty members of the family had their bone density measured and DNA samples taken. Seven had high bone density. The high bone density occurred throughout their bodies but especially in the spine and hips.

- 1.1 Describe what a gene mutation is. (2)
- 1.2 Calculate the percentage of the family members who had normal bone density. Show ALL your workings. (3)
(5)

Activity 2

- 2 Scientists use fossils as evidence for human evolution. The brain volume of some extinct primates have been estimated from their fossils and have been compared to the brain volumes of living primates.

The results are shown in the table below.

PRIMATE	PERIOD OF EXISTENCE (million years ago)	AVERAGE BRAIN VOLUME (cm ³)
<i>Ardipithecus ramidus</i>	5,8 to 4,4	400
<i>Australopithecus afarensis</i>	4 to 2,7	450
<i>Australopithecus africanus</i>	3 to 2	450
<i>Homo habilis</i>	2,2 to 1,6	750
<i>Homo erectus</i>	2 to 0,4	1 000
<i>Homo neanderthalensis</i>	0,3 to 0,23	1 500
<i>Homo sapiens</i>	0,2 to present	1 400
Modern apes	0,2 to present	500

- 2.1 Apart from fossil evidence, give TWO other types of evidence for human evolution. (2)
- 2.2 Which primate became extinct first? (1)

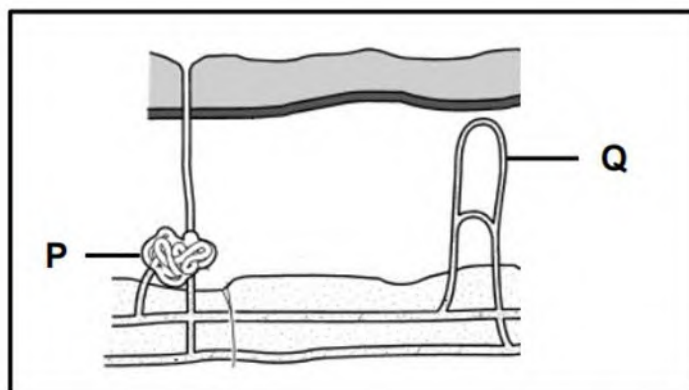
2.3 Calculate the difference in brain volume (in cm^3) between the two living primates. Show ALL calculations. (2)

2.4 Draw a bar graph to show the average brain volume of EACH of the species of the genus Homo. (6)
(11)

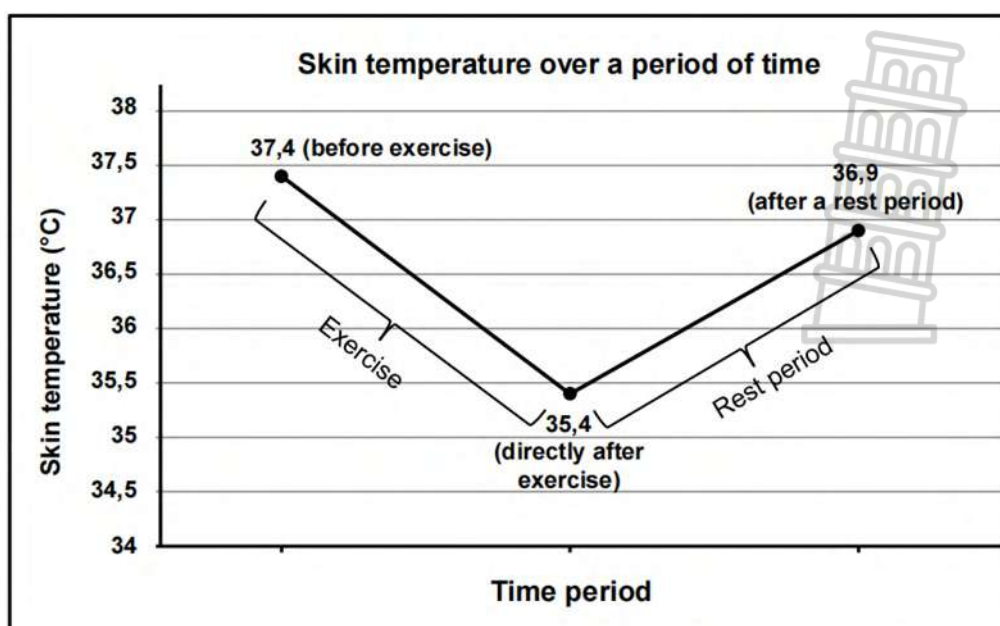
Activity 3

- 3 A twelve-year-old boy participated in physical exercise for 45 minutes, followed by a 15-minute rest period. The skin temperature of the boy was measured and the results were recorded.

The diagram below represents the skin of the boy before exercise.



The graph below shows the changes in skin temperature over a period of time.





3.1 Name the:

- (a) Homeostatic mechanism that brings about the change in skin temperature (1)
- (b) Part of the brain that is responsible for the mechanism named in QUESTION 3.1(a) (1)

3.2 Calculate the percentage decrease in the average skin temperature of the boy before and directly after exercise. Show ALL working. (3)
(5)



Activity 4

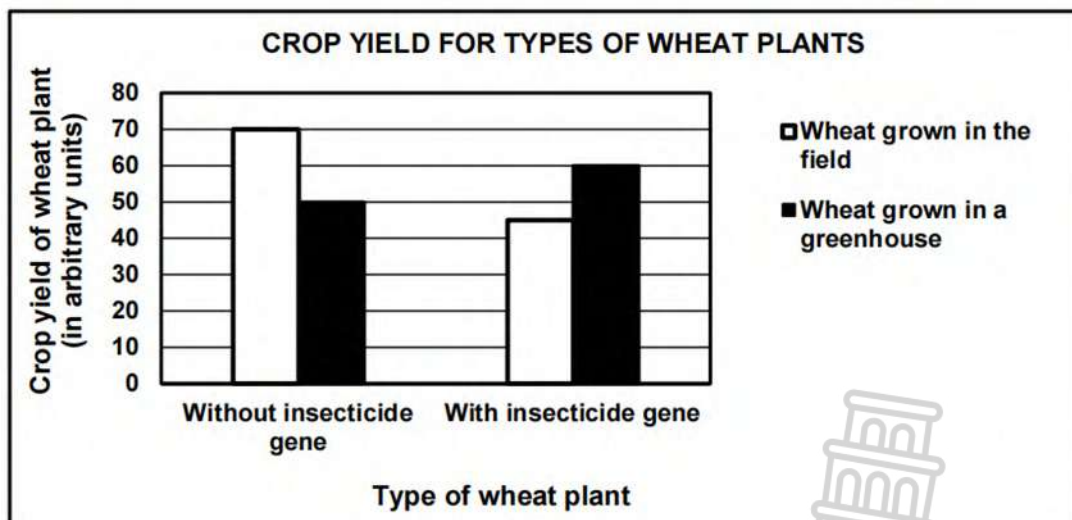
- 4 Farmers use insecticides to kill insects that damage their crops. In this way they are able to increase their crop yield.

They found a bacterium which contains a gene that produces insecticides. Scientists transferred the insecticide gene to wheat plants and wanted to investigate the effectiveness of this process in increasing crop yield.

Below are some of the steps they followed.

- Wheat plants with the insecticide gene were grown in a field and in a greenhouse.
- Wheat plants without the insecticide gene were grown in a field and in a greenhouse.
- The crop yield of the wheat plants was measured.

The results are shown in the graph below.



- 4.1 What is the process called where wheat plants are altered by the insertion of genes? (1)
- 4.2 Calculate the difference in yield between the wheat with the insecticide gene and the wheat without the insecticide gene grown in the field. Show ALL working. (2)

(3)

Activity 5

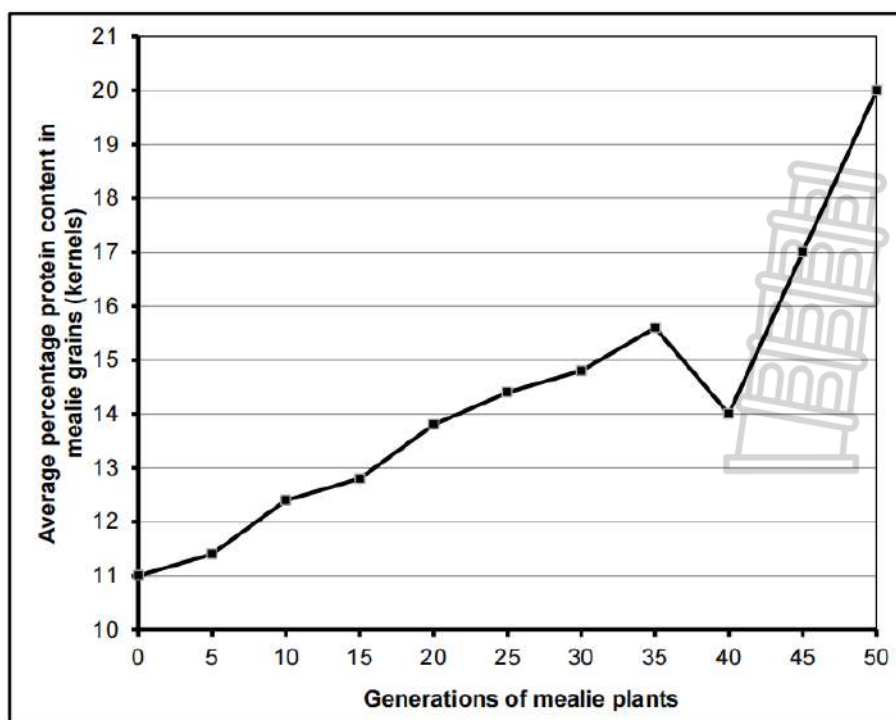
- 5 The table below shows information about blood groups in a certain population.

BLOOD GROUP	NUMBER OF PEOPLE	PERCENTAGE OF THE POPULATION
O	954 000	53
A	X	34
B	180 000	10
AB	54 000	3

- 5.1 How many people have the genotype ii? (1)
- 5.2 The population size is 1 800 000.
Calculate the value of X. Show ALL working. (3)
- (4)

Activity 6

- 6 The graph below shows the results of artificial selection for protein content in mealie plants over 50 generations



- 6.1 What was the average percentage of the protein content in the

mealie grains (kernels) at the 15th generation?

(1)

6.2 By how many times did the average percentage of the protein content in the mealie grains (kernels) increase between the 40th and 50th generation? Show ALL working

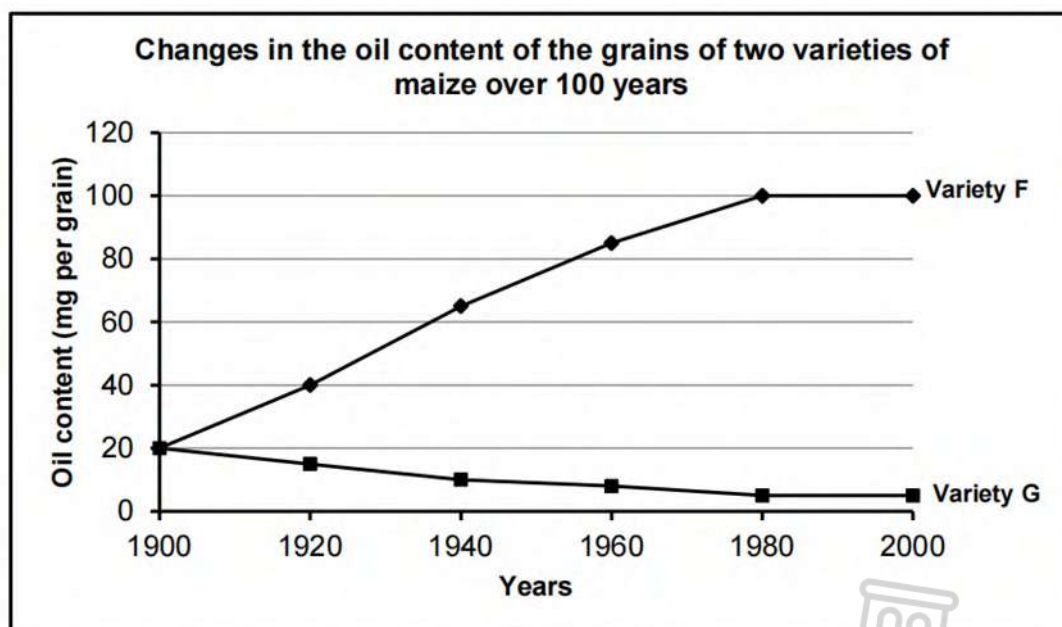
(2)

(3)

Activity 7

- 7 Artificial selection programmes have produced two varieties of maize. The one has grains with a high oil content (**Variety F**) and the other has grains with a low oil content (**Variety G**).

The graph below shows the changes in the oil content of the grains of the two varieties over 100 years of artificial selection.



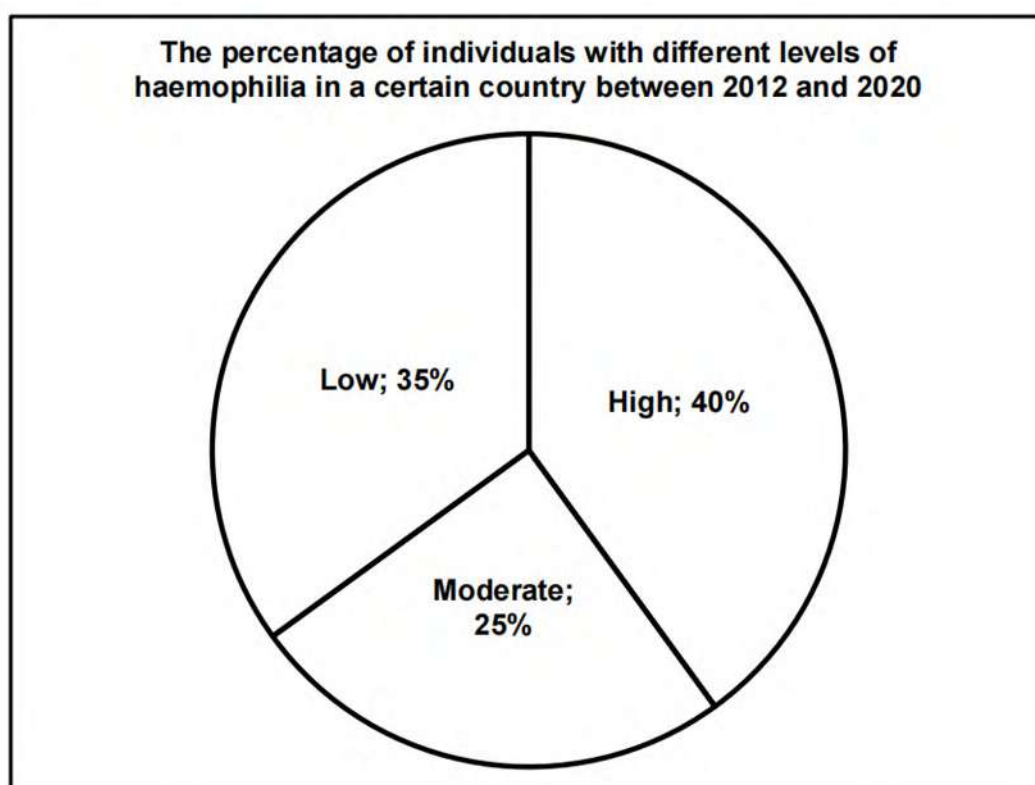
- 7.1 In which year did the two maize varieties have the same oil content? (1)
- 7.2 Calculate the percentage increase in the oil content of **Variety F** over the 100-year period. Show ALL working. (3)
- 7.3 Tabulate TWO differences between natural selection and artificial selection. (5)

(9)

Activity 8

- 8 In a certain country, 25 000 individuals were suffering from haemophilia between 2012 and 2020. Haemophilia is a genetic disorder that is caused by a mutation.

The pie chart below shows the percentage of individuals with different levels of haemophilia in this country.



- 8.1 Explain the effect of this mutation on an individual. (2)
- 8.2 Calculate the number of individuals who were moderately affected by haemophilia in this country. Show ALL working (2)
- (4)**