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PROVINCE OF KWAZULU-NATAL
DEPARTMENT OF EDUCATION

LEARNER ASSISTANCE REVISION BOOKLET

GRADE – 12

LIFE SCIENCES

MARCH 2020

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How to use this Revision Booklet

- You must use this Revision booklet together with the *Life Sciences Mind the Gap Study Guide,* which is a complementary booklet.
- Ensure you understand all the relevant concepts and content.
- THIS Revision Booklet focuses mainly on the core concepts of the topic and questions at recall and understanding cognitive levels.
- Over and above this, learners are advised to practise answering the following from past examination papers.
    - multiple choice questions
    - relevant terminology
    - matching questions
    - Drawing and interpreting of graphs
    - Interpreting tables
    - Interpreting and drawing of diagrams
    - Doing calculations
    - Writing essays in Life Sciences

NB: The document comprises of paper 1 and paper 2 topics

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TOPIC: REPRODUCTIVE STRATEGIES IN VERTEBRATES

Activity 1

Complete the following table by writing the correct biological term for the provided description.

1.1		**DESCRIPTION**	**BIOLOGICAL TERM**
	1.1.1	The fusion of the sperm and egg outside the body	
	1.1.2	The fusion of the sperm and egg inside the body	
	1.1.3	The development of the embryo inside an incubated egg that is laid.	
	1.1.4	The development of the embryo in the uterus and the young are born alive.	
	1.1.5	The complete development of the embryo inside an egg in the female body.	
	1.1.6	The development of the embryo in which very little energy is used and parental care is required.	
	1.1.7	The development of the embryo in which a lot of energy is used and the young are able to move directly after hatching.	
	1.1.8	Structure that provides nutrition to the embryo in the amniotic egg	
	1.1.9	Structure that stores waste for the embryo in the amniotic egg	
	1.1.10	Fluid filled bag around embryo	

(10)

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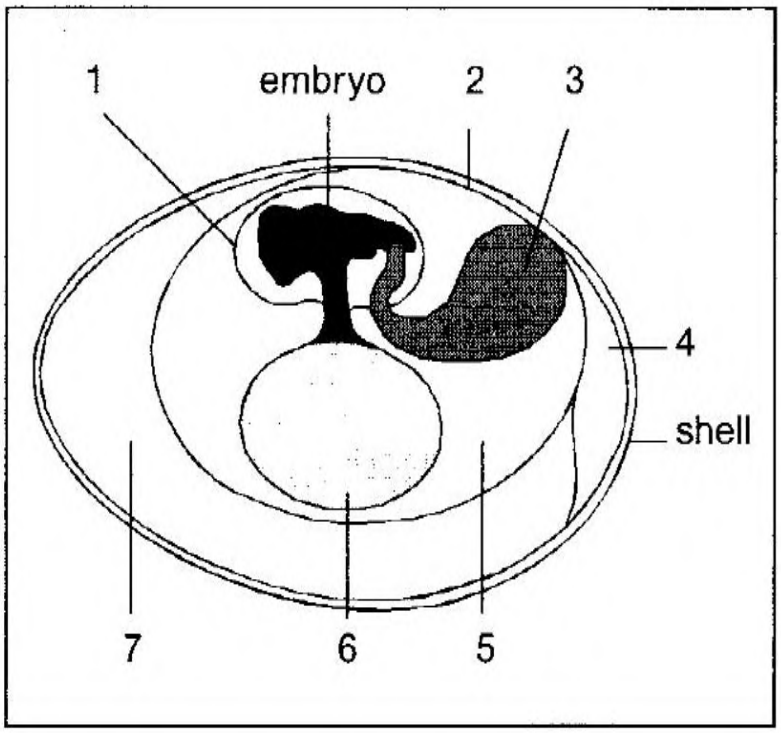
Activity 2

2.2 The following diagram represents a section through an amniotic egg:



2.2.1. Identify the extra- embryonic membranes numbered 1 and 2. (2)

……..

……..

2.2.2 What fills the space between the developing embryo and the membrane numbered 1? (1)

……

2.2.3 State the function of the fluid in the part labelled (2)

……..

2.2.4 State the NUMBER and NAME of the structure that:

(a) Stores waste ……..... (4)

(b) Provides nutrition ……

(9)

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Activity 2.3

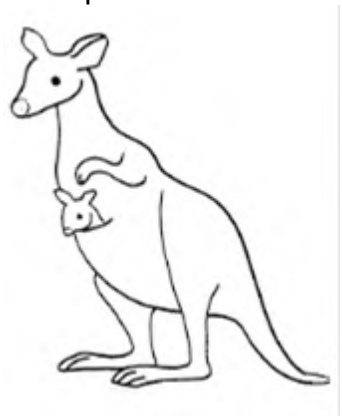
2.3 Read the passage below.

REPRODUCTIVE STRATEGY IN KANGAROOS

The red kangaroo reproduces by sexual reproduction. After mating, the fertilised egg undergoes gestation in the uterus. After 33 days of gestation, the red kangaroo gives birth to an offspring that is hairless, blind and only a few centimetres long.

The offspring moves from the vagina by following a trail of saliva secreted by the mother to a protective pouch where it remains for a year. During this time the offspring drinks milk from the mother who has teats in her pouch.

After 190 days it leaves the pouch.



[Adapted from *www.livescience.com*]

2.3.1 State whether the red kangaroo species displays:

(a) Internal or external fertilisation

…… (1)

(b) oviparous, ovoviviparous or viviparous

…… (1)

(2)

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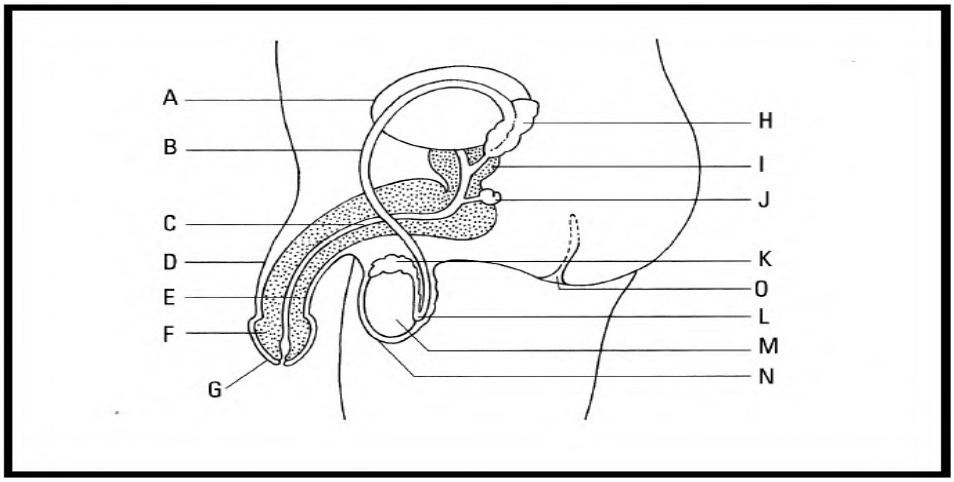
3. HUMAN REPRODUCTION

3.1 TERMINOLOGY: MALE REPRODUCTIVE SYSTEM

No	Description	Biological term
3.1.1	The structure that produces sperms	
3.1.2	Process that produces sperms	
3.1.3	The structure where testosterone is produced	
3.1.4	Sac-like structure that contains testes	
3.1.5	Structure where sperms are temporarily stored	
3.1.6	A tube that transfers sperms to the urethra	
3.1.7	A gland that provides nutrients for the sperms	
3.1.8	A gland that produces alkaline medium of semen	
3.1.9	A gland that lubricates end of penis	
3.1.10	Common tube for sperm and urine	

(10)

3.2 Study the diagram of the male reproductive system to answer the following questions.



Provide the LETTER and NAME of the structure that:

3.2.1 Produces sperms and testosterone (2)
……..

3.2.2 Structure where sperms are temporarily stored (2)
……

3.2.3 Common tube for semen and urine (2)
……

3.2.4 Gland that provides nutrients for the sperms (2)
……

3.2.5 Gland that secretes mucus that lubricates end of penis (2)
……

3.2.6 Gland that secrete alkaline fluid making semen alkaline (2)
……..

3.2.7 Sac-like structure that contains testes
……. (2) **(14)**

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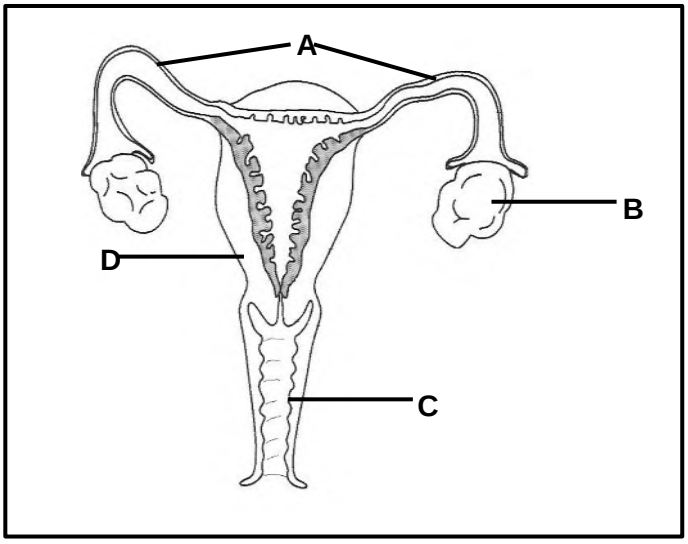
Activity 2

3.4 Study the diagram of the female reproductive system.



Provide the LETTER and NAME of:

3.4.1. The structure that produces egg cells (2)
...……

3.4.2 The gland where oestrogen and progesterone is produced (2)
……..

3.4.3 The Part of the female reproductive system where fertilisation occurs ……. (2)

3.4.4 The organ in which the foetus develop (2)
……

3.4.5 The inner lining of the uterus where implantation of the embryo occurs ……..……. (2)

3.4.6 The structure where penis is placed for copulation (2)
……

3.4.7 The birth canal (2)
……

(14)

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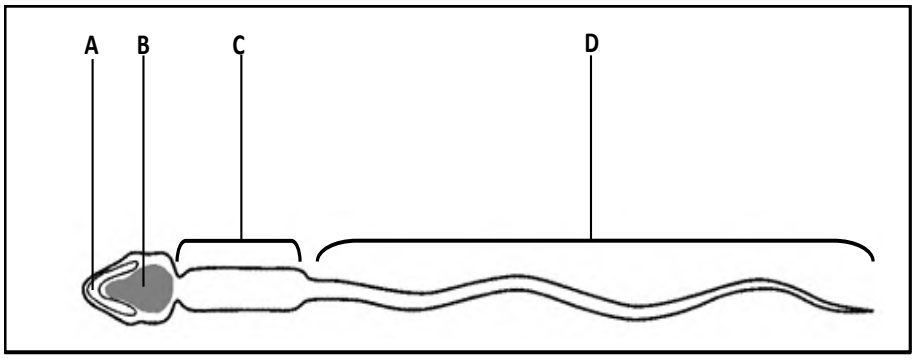
Activity 3

3.5 TERMINOLOGY: SPERM CELL AND EGG CELL

NO.	DESCRIPTION	BIOLOGICAL TERM
3.5.1	The vesicle which contains enzymes found in the head of a sperm cell	
3.5.2	The structure in the head of the sperm that contains genetic material	
3.5.3	The organelles in the sperm that provide energy for movement	
3.5.4	Structure that assists the sperm to move	
3.5.5	The organelle that contains the genetic information of the egg	
3.5.6	The jelly like substance on the inside of the egg	
3.5.7	The structure that protects the contents of egg	
3.5.8	The outermost layer of the egg	

(8)

3.6 Study the diagram of a sperm cell.



Provide the LETTER and NAME of:

3.6.1 The vesicle which contains enzymes found in the head of a sperm cell (2)
……

3.6.2 The structure in the head of the sperm that contains genetic material (2)
……

3.6.3 The part where organelles in the sperm that provide energy for movement …… (2)

3.6.4 The whip-like structure that assists the sperm to move (2)
……

(8)

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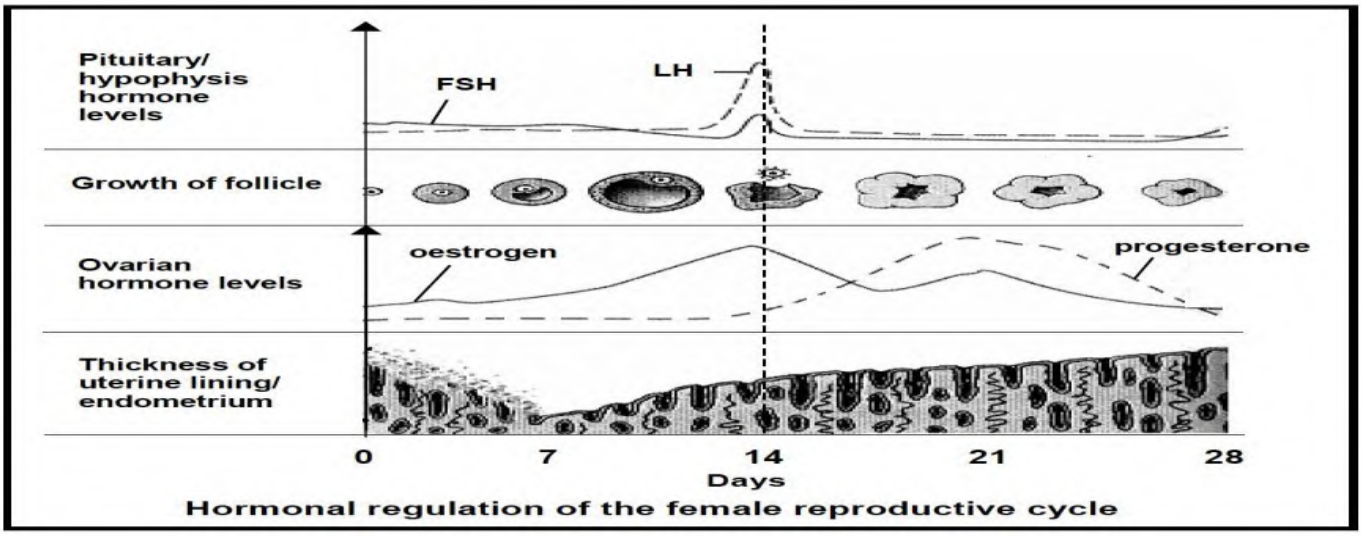
3.7 MENSTRUAL CYCLE



Hormonal regulation of the female reproductive cycle

Hormone	FSH	Oestrogen	LH	Progesterone
Gland/structure that produces				
Function				

3.8

3.8.1. Write an account of the role of the hormones and their functions.

……
……
……
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……
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(8)

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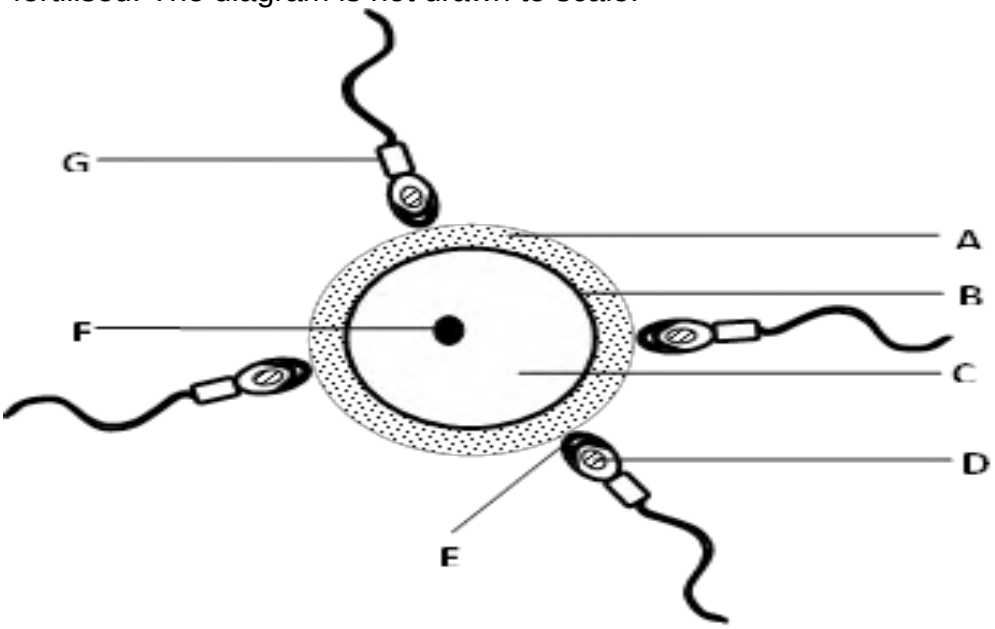
3.9 The schematic diagram below shows a human ovum that is about to be fertilised. The diagram is not drawn to scale.



3.9.1. Identify the part: (4)

A ……

B ……

C ……...

F ……

3.9.2 Give the LETTER and NAME of the part that:

(a) Contains the mitochondria ……

(b)Contains enzymes required to penetrate the ovum . ……..

(c) Will enter the ovum during fertilisation……

(6)

(10)

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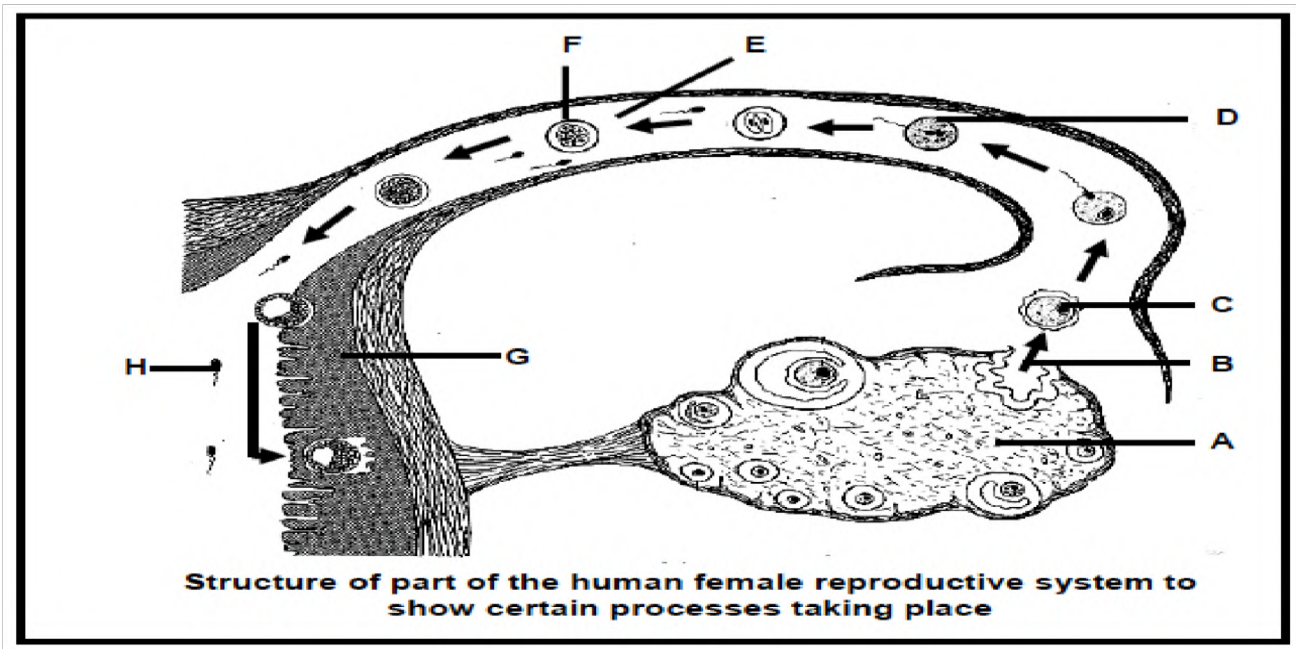
3.10 FERTILISATION AND DEVELOPMENT OF BLASTOCYST



Structure of part of the human female reproductive system to show certain processes taking place

Complete the following table by writing the correct biological term for the provided description.

NO	DESCRIPTION	BIOLOGICAL TERM
3.10.1	Fusion of sperm and egg	
3.10.2	Structure formed when sperm fertilizes egg	
3.10.3	A solid ball of cells	
3.10.4	A hollow ball of cells	
3.10.5	Embedding of blastocyst in the endometrium	

(5)

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3.11 DEVELOPMENT OF FOETUS

Complete the following table by writing the correct biological term for the provided description.

NO	DESCRIPTION	BIOLOGICAL TERM
3.11.1	Fluid filled bag around foetus	
3.11.2	Keeps foetus hydrated	
3.11.3	Maintains a constant temperature for foetus	
3.11.4	Acts as a shock absorber	
3.11.5	Allows for free movement of the foetus	
3.11.6	Extra embryonic membrane that attaches the foetus to the endometrium	
3.11.7	Cord that attaches foetus to placenta	
3.11.8	Produces progesterone after 3 months	
3.11.9	Provides nutrition and oxygen from mother to foetus	
3.11.10	Removes nitrogenous waste and carbon-dioxide from foetus	
3.11.11	Acts a micro-filter for pathogenic organisms	

(11)

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3.12. Study the diagram on the foetus

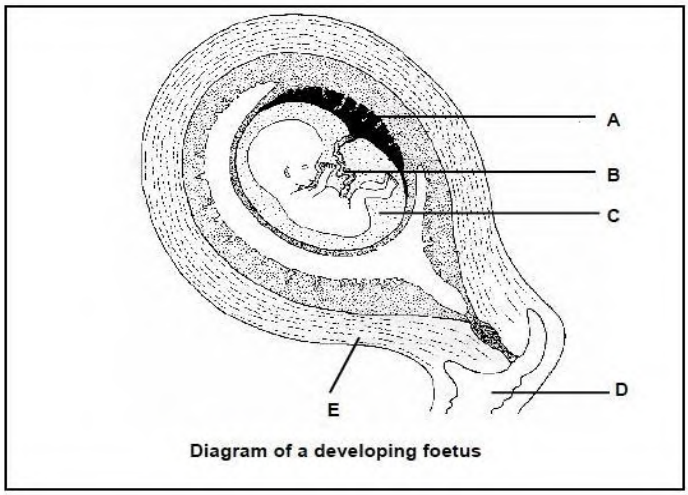

Diagram of a developing foetus

3.12.1. Fill the table below.

STRUCTURE	**LETTER**	**FUNCTION/S**
Amnion	…….	……..
Chorion	…….	……
Placenta	…….	…….. …….. …….. …… ……
Umbilical cord	…….	…….. ……

(12)

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Topic: Nervous system

HINT: You are required to know the following:

Location and functions of the following parts:

- Brain
  - Cerebrum
  - Cerebellum
  - Corpus callosum
  - Medulla oblongata
- Spinal cord

Activity 1

Use this table to complete the following terminology based on brain and spinal cord

	Description	**Terminology**
1.1	A collective name for the membranes that protect the brain	
1.2	A detectable change (e.g. pain, heat, light, sound) that will be received by a receptor and converted into an impulse	
1.3	The part of the peripheral nervous system that controls involuntary	
1.4	The part of the brain that controls the heart rate	
1.5	The part of the nervous system made up of cranial and spinal nerves	
1.6	The structure that connects the left and right hemispheres of the brain, allowing communication between them	

(6)

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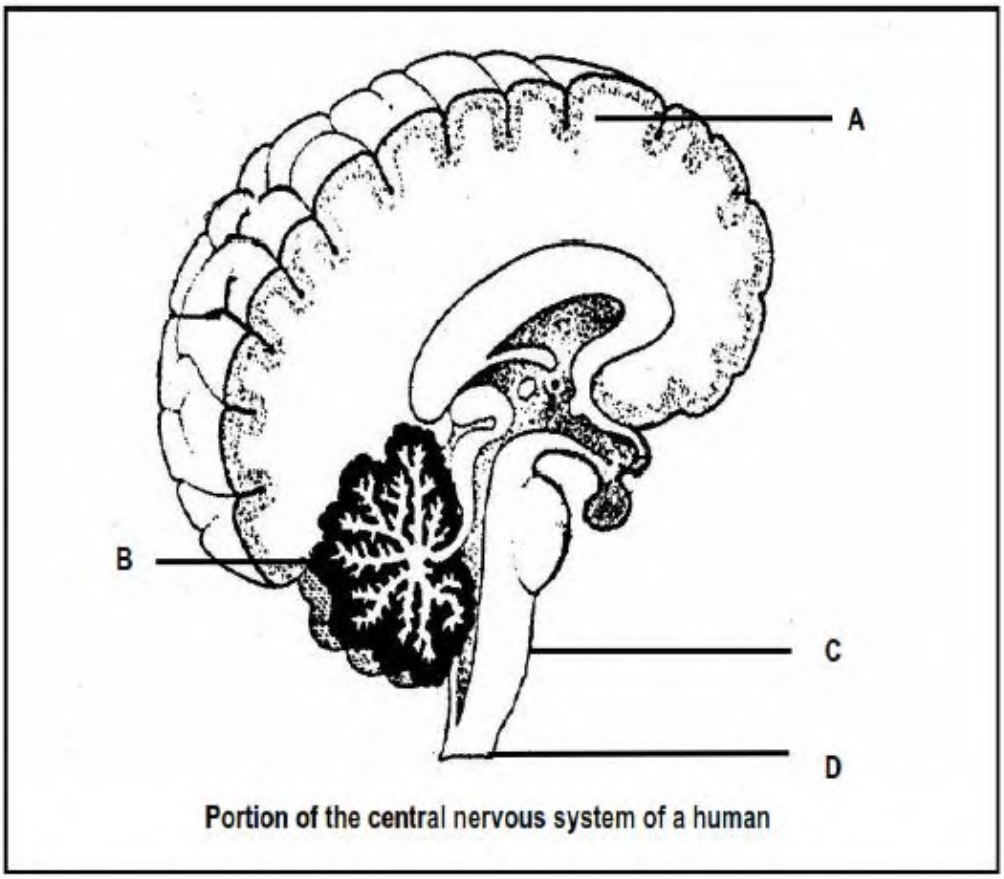
Activity 2

2.1 Study the diagram of the human brain below



Portion of the central nervous system of a human

Use the diagram above to complete the table below:

	Parts	Function
2.1.1	A-Cerebrum	
2.1.2	B-	
2.1.3	C-	Transmit nerve impulses between spinal cord and brain
2.1.4	D-Spinal cord	

(4)

2.2 Name the part of the brain that connects the two hemispheres of the brain

_____ (1)

(5)

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HINT: You are required to know the following:

- Functions of sensory and motor neurons
- Structure and functions of parts of sensory and motor neurons, using diagrams: nucleus, cell body, cytoplasm, myelin sheath, axon and dendrites

Activity 3

3.1		**Description**	**Terminology**
	3.1.1	Transmits impulses from the sense organs or receptors to the spinal cord and brain.	
	3.1.2	Transmits impulses from the brain and spinal cord to the effectors (muscles and glands).	
	3.1.3	Part that receives a stimulus and converts it into a nerve impulse.	
	3.1.4	Muscles or glands that bring about a response.	
	3.1.5	A part of the neuron that conducts impulses towards the cell body	
	3.1.6	Transmits impulses away from the cell body of the neuron	
	3.1.7	A reflex action is a quick, automatic action that involves the spinal cord and does not involve the brain.	
	3.1.8	The reflex arc is the path along which an impulse is transmitted to bring.	

(8)

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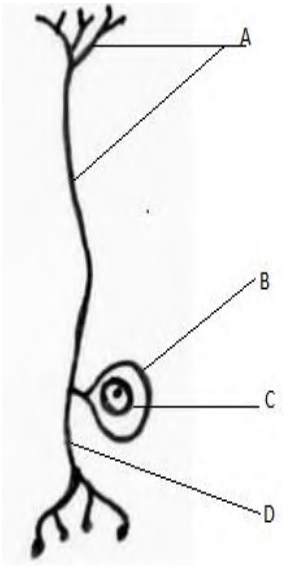
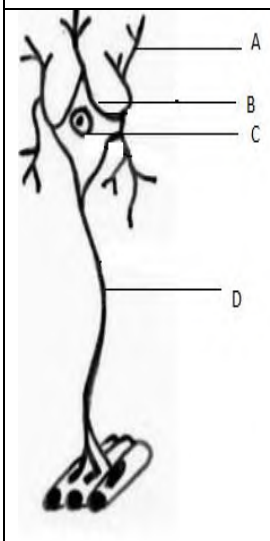
3.2 Types of neurons, namely sensory neuron, motor neuron and connector neuron

3.2.1 Identify the different type of neurons illustrated below and state their function.

	TYPE	FUNCTION
(a) 		
(b) 		

2

2

3.2.2 Refer to the table above and provide the LETTERS in each TYPE of neuron for the following parts.

(a) Dendrites _____ 2

(b) Axon _____ 2

(c) cell body _____ 2

(d) nucleus _____ 2

(e) cytoplasm _____ 2

(14)

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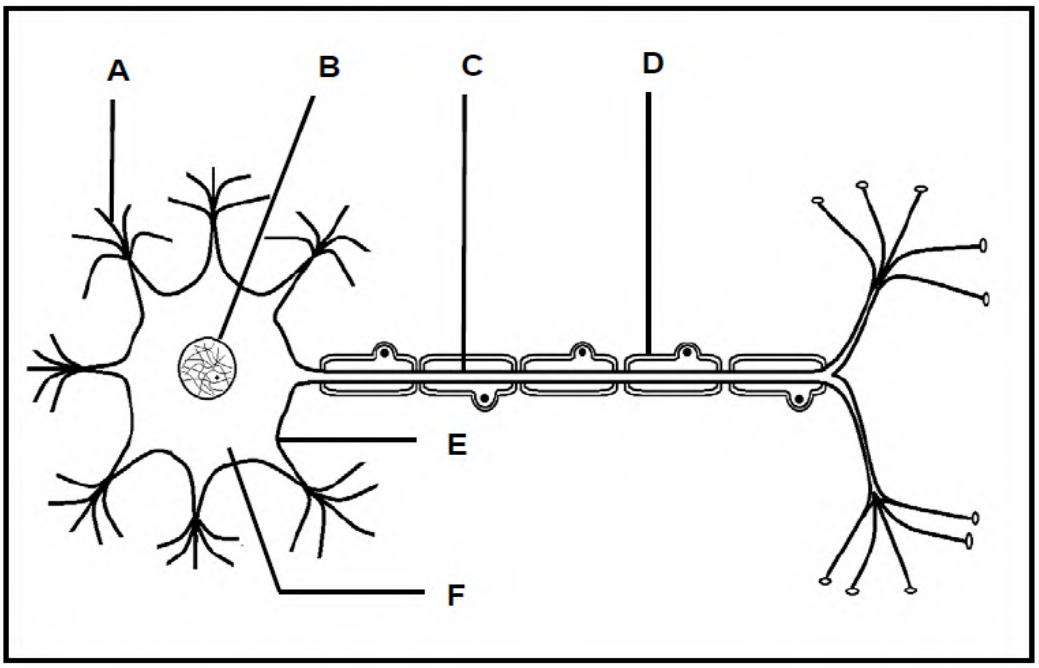
3.3 Study the diagram of the neuron below and answer the questions based on it



3.3.1 Identify the neuron above_____ 1

3.3.2 Write down the LETTER and NAME of the part that:

(a) Transmits impulses towards the cell body of the neuron
_____ 2

(b) Transmits impulses away from the cell body of the neuron
_____ 2

(c) Insulates and speeds up the transmission of impulses
_____ 2

(7)

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HINT: You are required to know the following:

- Definition of reflex action and a reflex arc
- Structure of a reflex arc and functions of each part, using a diagram: receptor, sensory neuron, dorsal ,root of spinal nerve, spinal cord, interneuron, motor neuron, ventral root of spinal nerve, effector
- Functioning of a simple reflex action, using an example
- Significance of a reflex action

Activity 4

4.1. Define the following terms in the table below.

Terms	**Definition**
(a) Reflex action	
(b) Reflex arc	

2

2

4.2 Name four different types of reflex actions.

(a) _____ 1

(b) _____ 1

(c) _____ 1

(d) _____ 1

(8)

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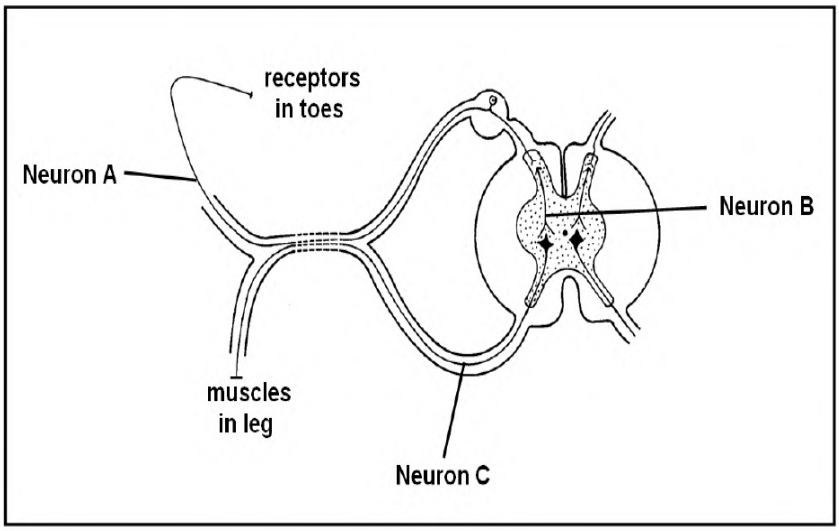
4.3 The diagram below shows what happens during a reflex action.



4.3.1 Complete the table below based on the reflex arc:

Parts on the diagram	Label of the parts	Function
Toes	Receptor	
Neuron A		
Neuron B		
Neuron C		
Muscle in leg	Effector	

8

4.3.2 The arrows in the flow chart below represent an incomplete reflex arc. Copy and fill in the missing parts of the reflex arc below:

The path of a reflex arc:

Receptor → (A) → Interneuron → (B) → (C)

A. _____
B. _____
C. _____

3

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HINT: You are required to know the following:

- Structure and functions of the parts of the human eye, using a diagram

The changes that occur in the human eye for each of the following, using diagrams:

- Accommodation
- Pupillary mechanism

Activity 5

5.1	**Use this table to complete the following terminology based on human eye.**		
		Description	**Terminology**
	5.1.1	The series of changes that take place in the shape of the lens and the eyeball in response to the distance of an object from the eye	
	5.1.2	The watery fluid that supports the cornea and the front chamber of the eye	
	5.1.3	The outermost membrane found around the embryo/foetus	
	5.1.4	The nerve that carries impulses from the retina to the brain	
	5.1.5	The membrane that transmits sound vibrations to the inner ear	
	5.1.6	Innermost membrane in the eye that contains photoreceptors	

(6)

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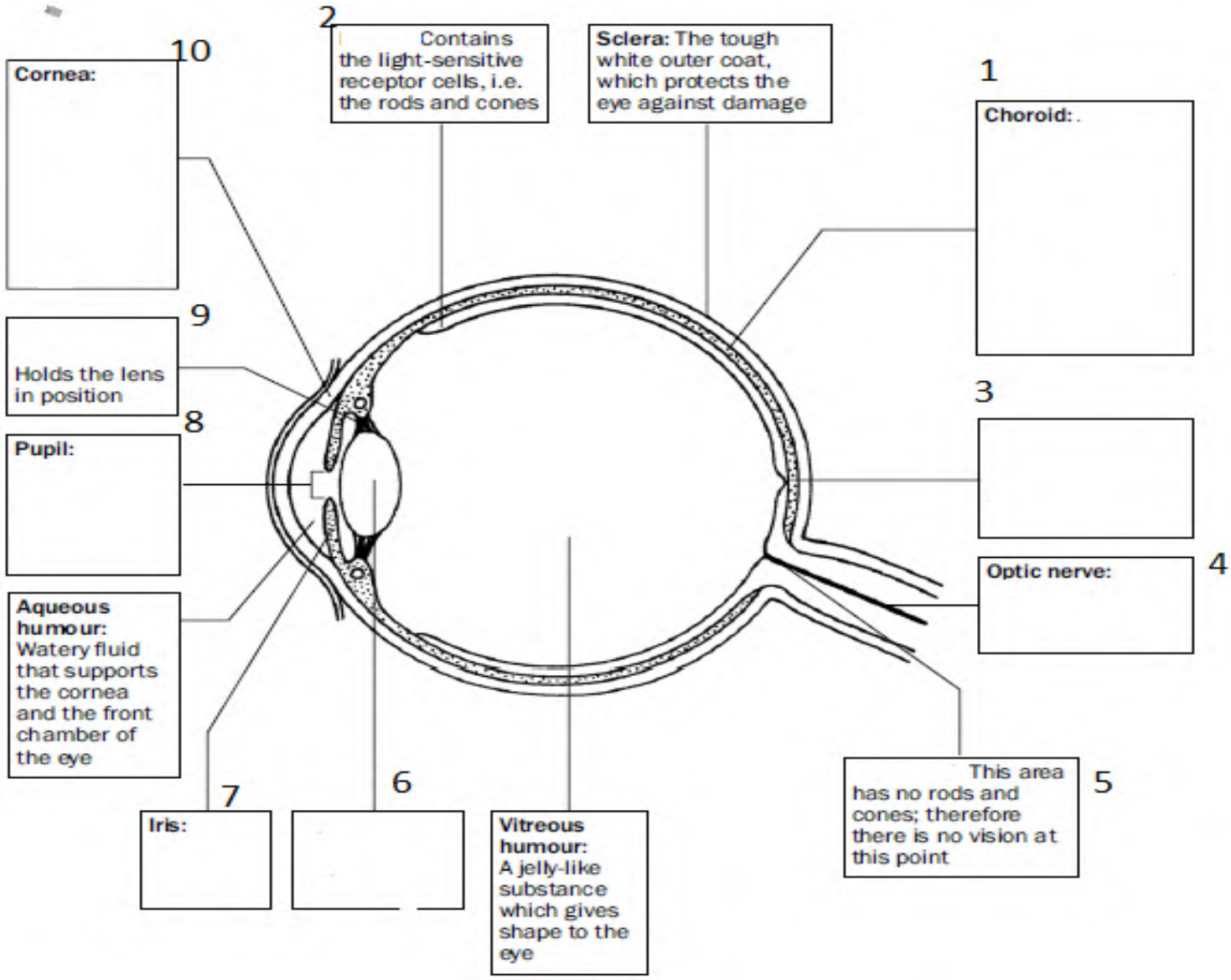
5.2	The diagram below is the structure of the eye. It has missing labels and functions. Fill in the missing information in the blocks below.



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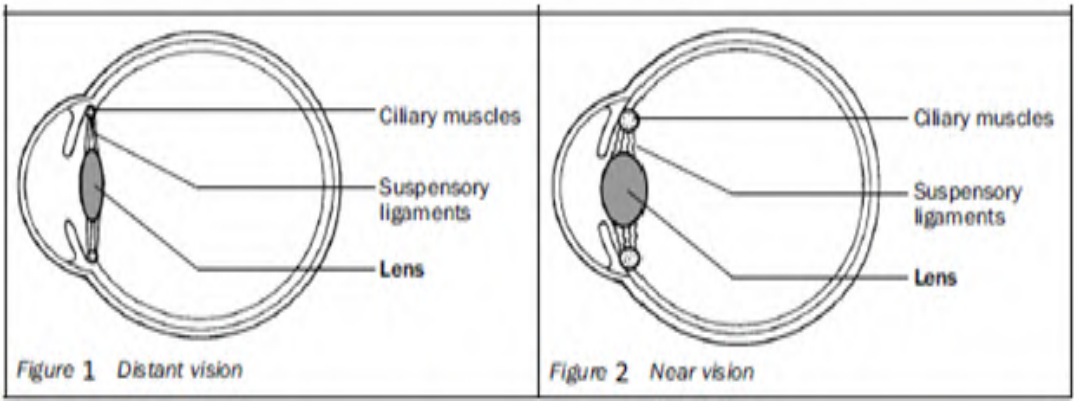
5.3 Accommodation is the adjustment of the shape of the lens to see objects clearly, whether they are far or near. The table below has an incomplete process of accommodation, with the aid of the given diagrams below.

5.3.1 Complete the process by filling in the missing parts of the process of below.

Distant vision (object further than 6 m)	**Near vision (object closer than 6 m**
A. Ciliary muscles _____	Ciliarymuscles_____
B. Suspensory ligaments_____	Suspensory ligaments_____
C.Tension on lens _____	Tension on lens _____
D.Lens is less _____	Lens becomes more _____
E. The refractive power of the lens_____	The refractive power of the lens_____
F. Light rays are focused on_____	Light rays are focused on _____

(12)

5.4 Study the diagram below and answer the questions that follow



Write down the letter and name of the part that:

(a) Relaxes and contract during accommodation

_____

(b) Alters the shape of the lens

_____

(c) Becomes more or less convex

_____ (3)

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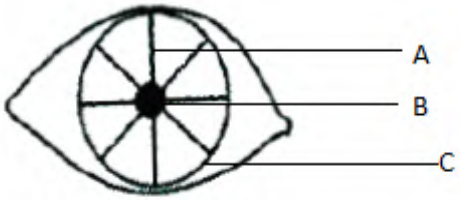
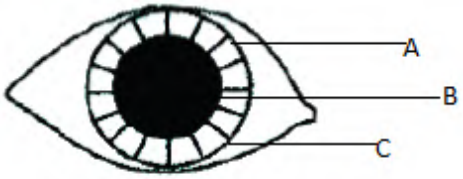
5.5 The pupillary mechanism regulates the amount of light entering the eye by adjusting the size of the pupil. Label and complete the process of pupillary mechanism shown below.

Label of the eye showing pupillary mechanism	Process of pupillary mechanism
 Diagram 1	

 Diagram 2	

Activity 6

6.1	Use this table to complete the following terminology based on human ear		
		Description	**Terminology**
	6.1.1.	The part of the ear that equalises the pressure on either side of the tympanic membrane	
	6.1.2	The receptors in the ear that detect changes in the direction and speed of any movement of the body	
	6.1.3	The part of the ear that equalises the pressure on either side of the tympanic membrane	
	6.1.4	Part of the human ear that directs sound waves into the auditory canal	

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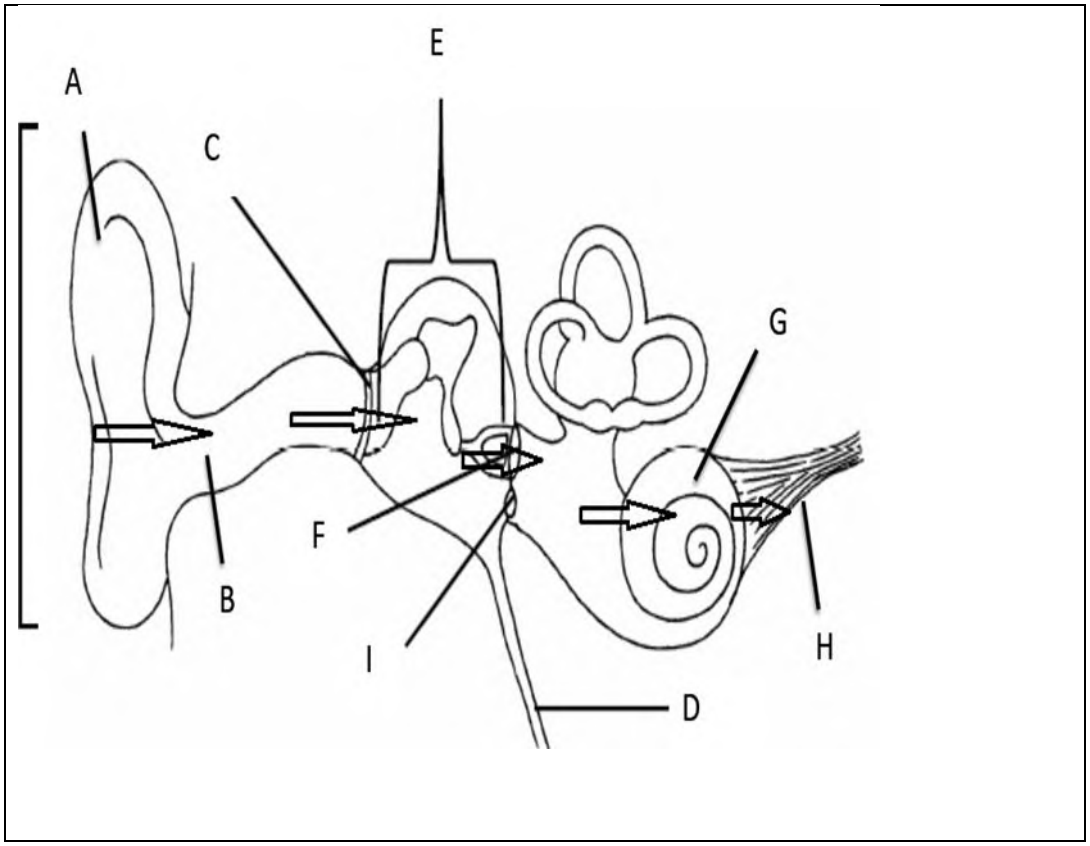
6.2 Study the diagram below and answer the questions that follow.



6.2.1 . Fill in the table below.

Part of the ear	**Function**
A-	
B-	
C-	
D-	
E-	
F-	
G-	
H-	
I-	

(9)

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6.2.2 The arrows in the diagram above show the path of the sound waves follow the direction of the arrows to describe the process of hearing until the stimulus reaches the brain.

_____
_____
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_____
_____ **(6)**

6.3 Complete the table below on balance

Type of balance	Part of the ear	Receptor	Function of receptor	Transmission of impulses	Part of brain	Action	
	Ampullae at the base of semi-circular canals			Auditory nerve transmits nerve impulses			
Change in position of the head		Maculae					

(7)

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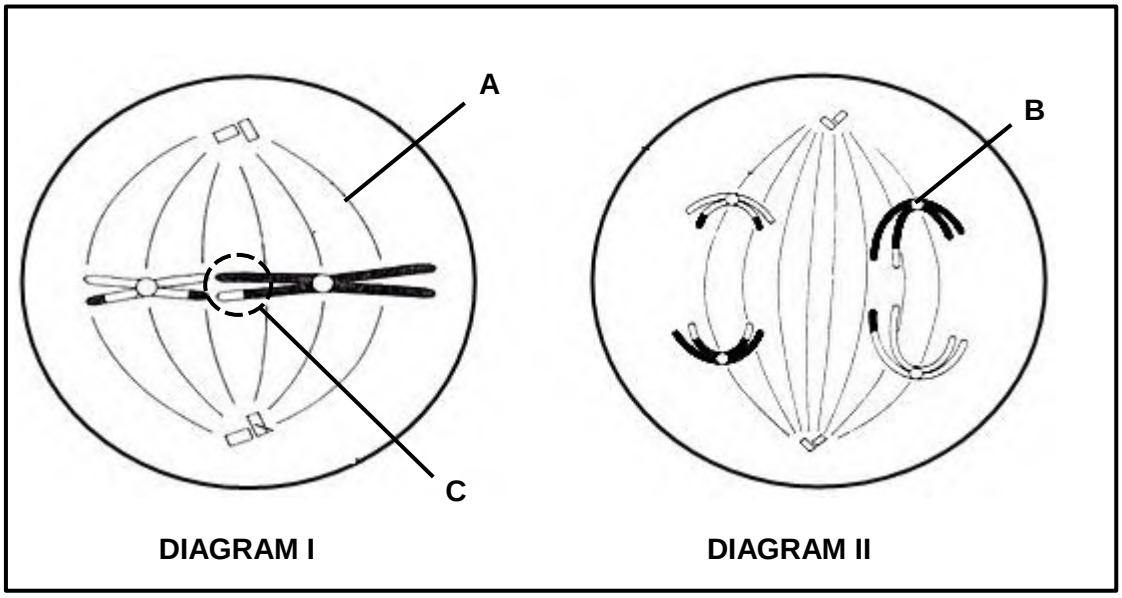
TOPIC: MEIOSIS

Activity 1

The diagrams below represent two different phases of meiosis in an organism.



1.1 Identify:

(a) A _____ (1)

(b) B _____ (1)

1.2 Identify the phases represented by:

(a) Diagram **I** _____ (1)

(b) Diagram **II** _____ (1)

1.3 State the number of chromosomes that were present in the original cell at the start of meiosis. _____ (1)

1.4 Give the name of the organ in a male where meiosis occurs. _____ (1)

1.5 Describe the process responsible for the appearance of the chromosomes as shown in region **C**.

_____
_____
_____
_____
_____
_____ (4)

1.6 Identify the phase of meiosis during which the process referred to in QUESTION 2.1.5 occurs. _____ (1)

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1.7 State TWO reasons why meiosis is important. (2)

_____
_____
_____
_____
_____
_____

ENDOCRINE SYSTEM, HOMEOSTASIS AND PLANT RESPONSE

Activity 1

A. TERMINOLOGY

The following terms should be covered in this topic:

No.	Description	Terminology
1.	A system that is responsible for chemical coordination in the body.	
2.	A gland whose secretions are transported through ducts.	
3.	A hormone that stimulates mammary gland to produce milk.	
4.	A hormone that is responsible for osmoregulation in the body.	
5.	Specialized cells in the pancreas that secretes insulin and glucagon.	
6.	A hormone responsible for secondary sexual characteristics in males	
7.	A hormone that is responsible for maintaining salt balance in the blood.	
8.	A gland that secretes FSH and LH in females.	
9.	Chemical messengers produced by endocrine glands.	
10.	A gland located in the neck that secretes thyroxin hormone.	
11.	A hormone that controls the metabolic rate in the body.	
12.	A hormone responsible for growth and development in the body.	
13.	A hormone responsible for emergencies in the body.	
14.	A mechanism that detects imbalances and restores balance in the internal environment.	
15.	A hormone that stimulates follicles development in the ovary.	
16.	Promotes the secretions of hormones produced by thyroid glands.	
17.	Process of production of milk.	

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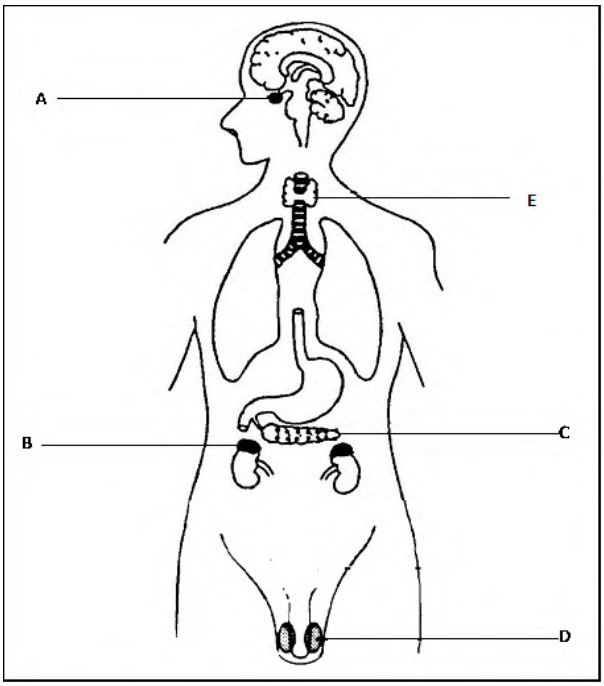
18.	A hormone that lowers the blood glucose level in the body.	
19.	A hormone the increases the blood glucose level in the body.	
20.	A hormone that maintains pregnancy.	

(20)

Activity 2

2.1 Study the diagram below and answer the questions that follow.



2.1.1 Complete the following table

Gland	Hormone(s) secreted	Function of the hormone secreted
A…… ……(1)	Growth hormone	…… …… (1)
	…… ……(1)	Stimulates the thyroid gland to secrete thyroxin.
	FSH	…… ……(1)
	…… ……(1)	Stimulates ovulation.
	Prolactin	…… ……(1)

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B…… ……(1)	…… ……(1)	Prepares the body for emergencies.
C. Pancreas (Islets of Langerhans)	Insulin	…… ……(1)
	…… ……(1)	…… ……(1)
D:…… ……(1)	Testosterone	…… ……..(1)
E:…… ……(1)	…… ……(1)	Regulates the metabolic rate.

(15)

Activity 3

3.1 Negative Feedback Mechanism

3.1.1 The diagrams below show the negative feedback mechanism involving thyroxin and TSH.

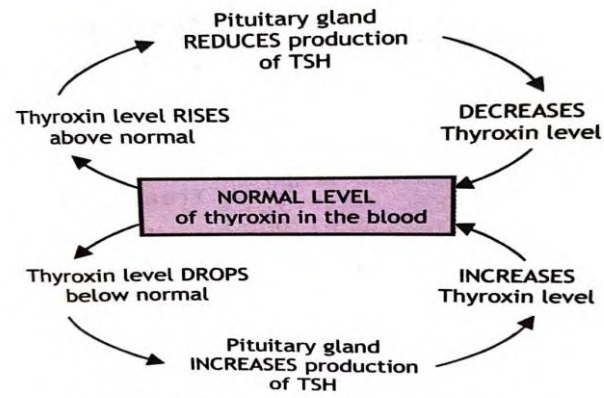

Fig. 7.18 Control of thyroxin level

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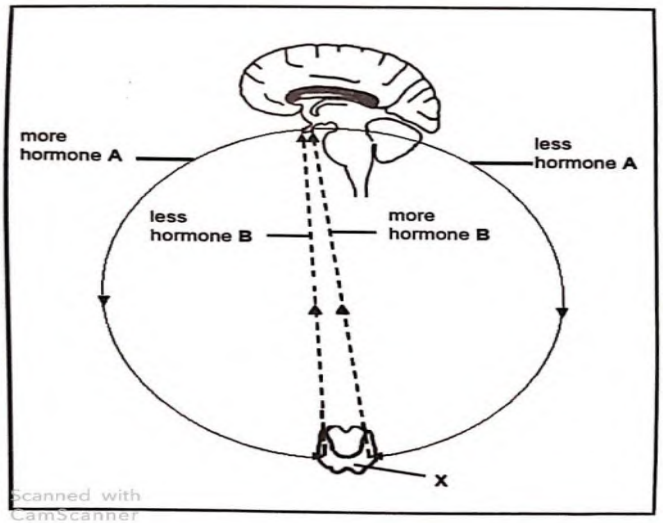

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3.1.1 Identify EACH of the following:

(a) The gland that secretes hormone A …… (1)

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(b) Hormone B……. (1)

3.1.2 Name the mechanism in the diagram that regulates the level of hormone B …… (1)

3.1.3 Give the NAME of gland X……. (1) **(4)**

Activity 4

4.1 Use the following diagram below to answer :

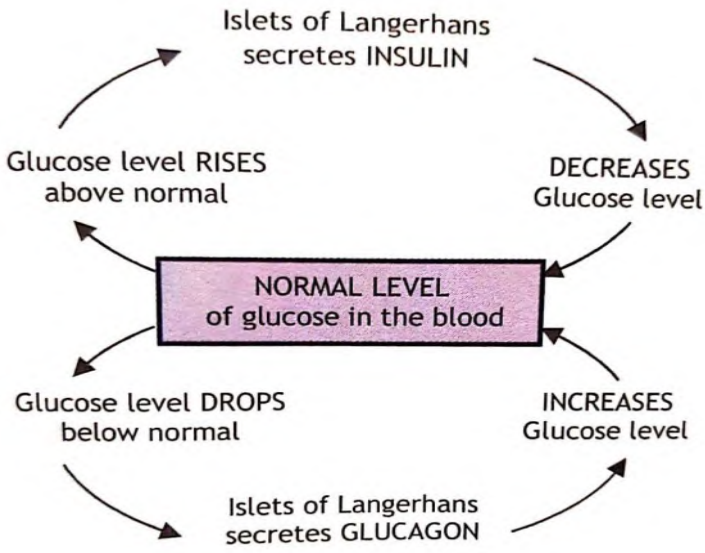

Fig. 8.1 Control of blood glucose level

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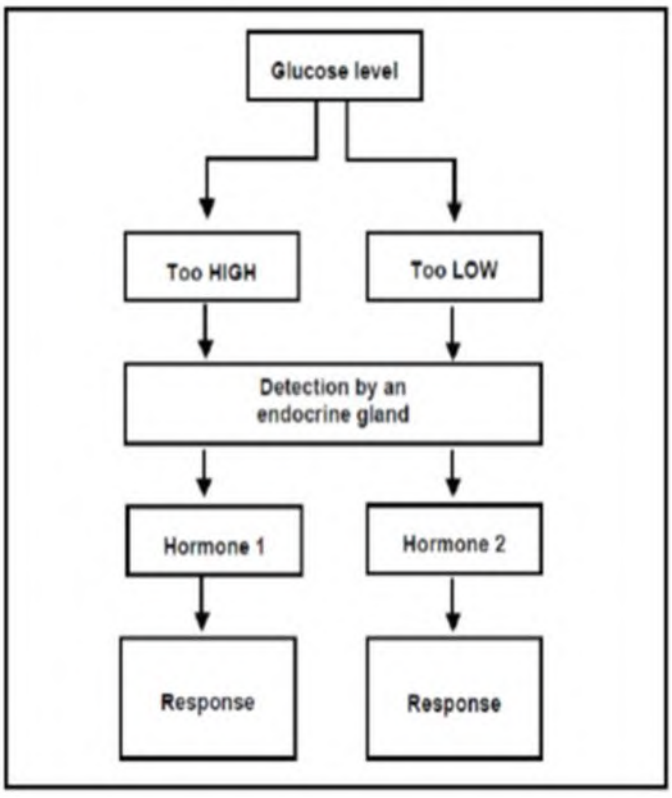

4.1.1 Identify hormone 1……. (1)

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4.1.2 Identify hormone 2…….. (1)

4.1.3 Name the gland that releases hormone 1 and 2…… (1)

4.1.4 Name the disease that will occur if hormone 1 the gland mentioned in QUESTION 4.1.3 fails to release hormone 1. (1)
…… **(4)**

TOPIC: HOMEOSTASIS

Activity 1

1.1 Study the diagram below and answer the questions that follow

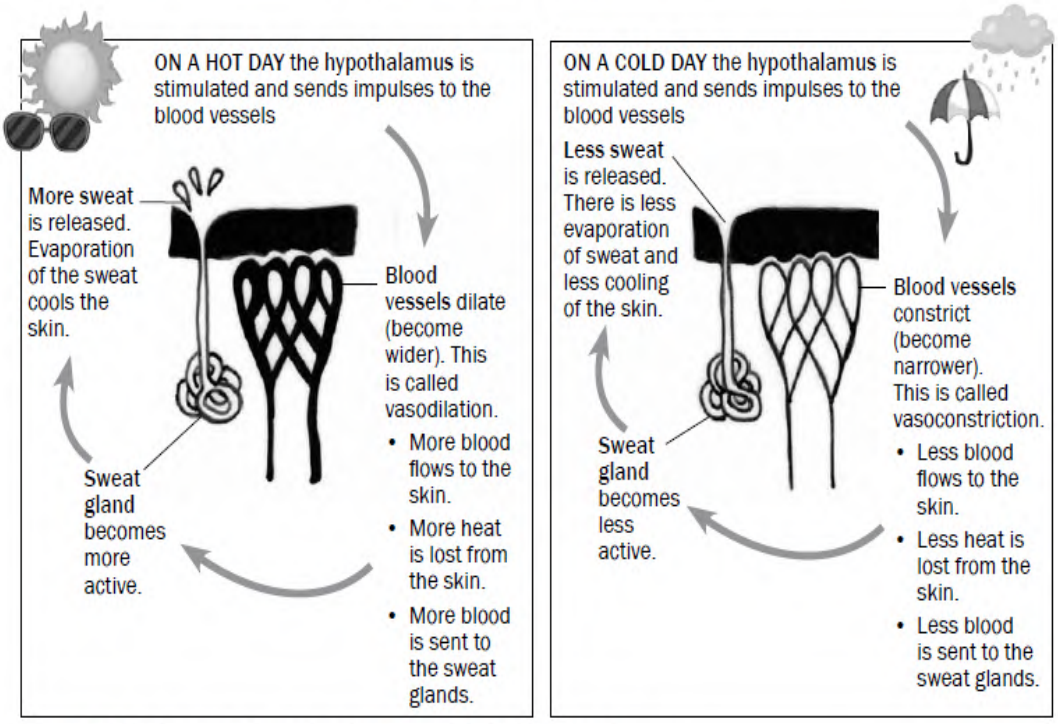
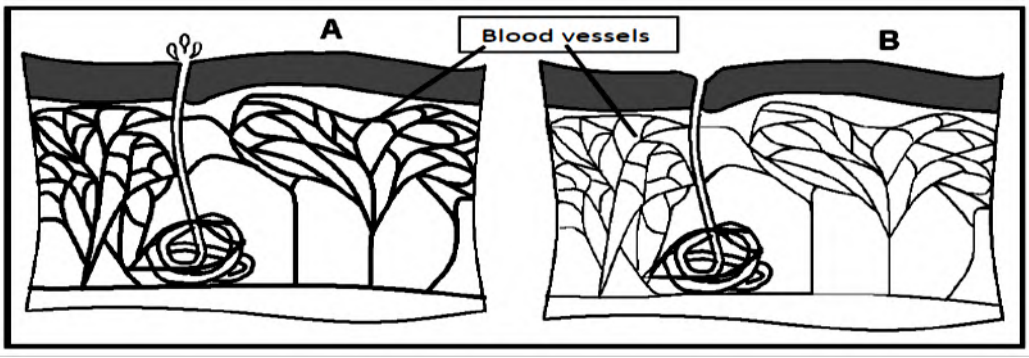


Figure 8.4 The homeostatic mechanism to regulate body temperature



1.1.1 Which diagram (A or B) is exposed to warm environmental condition? (1)
……

1.1.2 Provide TWO observable reasons for your answer in QUESTION 5 1.1.1 (2)
……
……

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……

1.1.3 Name the part of the brain that monitors the body temperature. (1)

……

……

(4)

PLANTS RESPONSE TO THE ENVIRONMENT

Activity 1

1.1 **Complete the following table**

	Description	Term
1.1.1	A plant response to an external stimulus	
1.1.2	A plant response to a light stimulus	
1.1.3	A plant response to a gravity stimulus	
1.1.4	Plant growth substance responsible for cell elongation	
1.1.5	Plant growth substance that promote fruit growth	
1.1.6	Plant growth substance that slows down seed germination	
1.1.7	Sharp structures that protect the plant against predators.	

7

1.2 Use the below diagram to answer the following questions

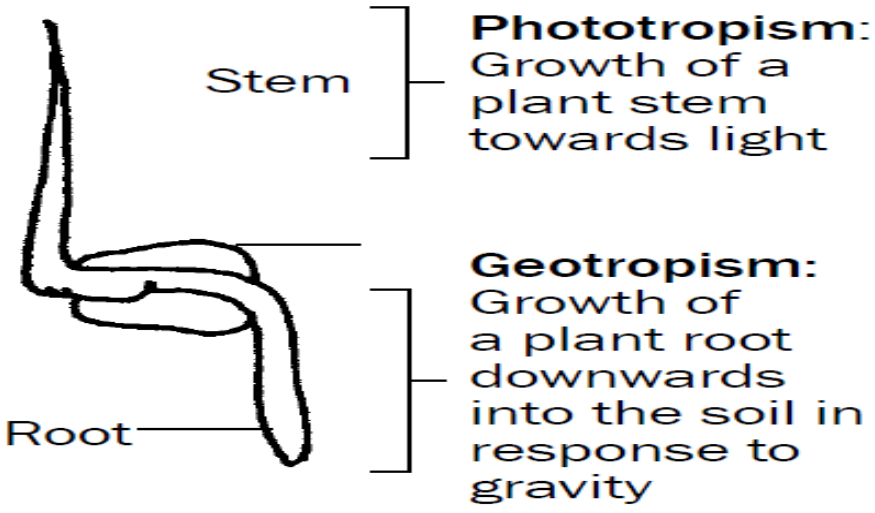

Figure 9.1 A germinating seedling

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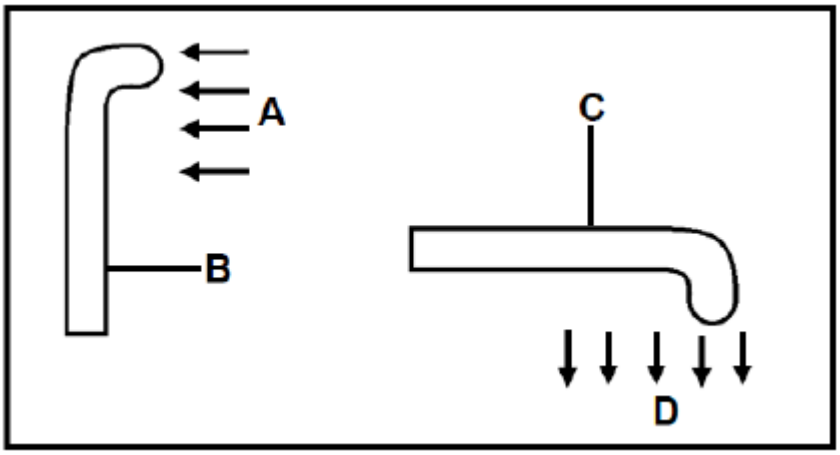

1.2.1 Name the hormone responsible for growth responses shown in the diagrams above…… (1)

1.2.2 Name the external stimulus at:

(a) **A** …….. (1)

(b) **D** ……... (1)

1.2.3 Name the growth response caused by (1)
A…….

1.2.4 Name the growth response caused by (1)
D……. **(12)**

Topic: HUMAN IMPACT ON ENVIRONMENT

Each sub-section could be approached from three aspects:

1. Human activities

Human activities are centred around our requirements for survival e.g. farming for food, dams for water supply, buildings for shelter, shops to store food and clothing, hospitals for medical attention, burning of fossil fuels for energy to power modes of transportation and electricity for light and heat. Human activities are often motivated by financial greed and the need for convenience and comfort.

2. Problems in the environment caused by the human activities

The problems in the environment are listed as the sub-sections for this topic.

- Air pollution and climate change
- Water quality and quantity
- Food security
- Loss of biodiversity
- Solid waste disposal

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3. Solutions to the problems can be discussed using the acronym S A V E ME

S	**STOP** **SLOW**	Stopping a human activity that has negative effects in the environment is an obvious solution BUT people are resistant to change so asking people to slow down and reduce their negative activities could be a more acceptable and realistic solution that could lead to a reduction in the harmful impact on the environment.
A	**Alternatives**	People are always striving for convenience and comfort. They do not take kindly to having those things removed so when one option is removed it needs to be replaced with an alternative that: • Is convenient and provides comfort • More environmentally-friendly • Cost effective • Easily accessible • Doesn't replace old problems with new problems
V	**Voting/laws**	People who want to reduce negative impact on the environment have the power to CHOOSE a government that promotes a more environmentally-friendly country. The governments need to put laws in place AND police those laws that force industries to take responsibility for their contribution to negative impact in the environment. People also have the power to CHOOSE environmentally-friendly options when in their shopping.
E	**Education**	The importance of education cannot be over-emphasised. People will only seek to fix a problem once they are aware it exists. A solution to a problem can only be found once the problem has been clearly identified. The more people know, the more contribution there will be in developing new strategies to fix environmental disasters.
ME	**Management Strategies**	Implementation of solutions requires planning. The implementation of a solution needs to be assessed so that no further problems are created.

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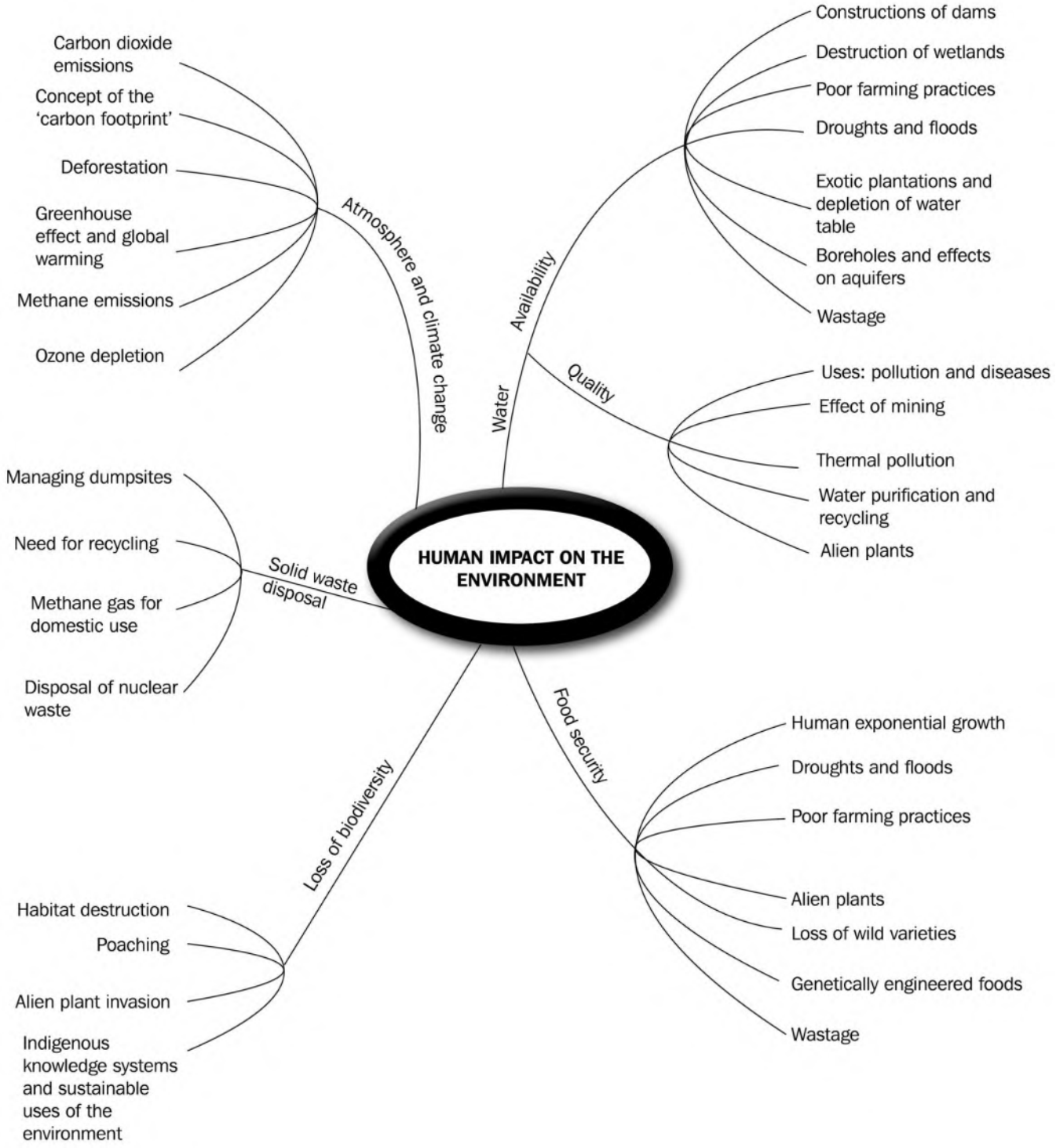
TEACHING TOOL

Adapted from FET LFSC Training Book



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B. Terminology.

Complete the table below by writing the correct biological term that matches the description provided.

No.	**Description**	**Biological term**
1.	The variety of plant and animal species on earth	
2.	The killing of pests by using their natural predators or parasites	
3.	Measurement of the total amount of carbon dioxide emissions of an individual per year	
4.	Removal of large numbers of trees from an area	
5.	The accumulation of nutrients in water bodies from the overuse of fertilisers on land, stimulating excessive plant growth	
6.	The access, by all people at all times, to adequate, safe and nutritious food	
7.	Growing the same species of crop on a farm year after year	
8.	A layer in the atmosphere that is damaged by chlorofluorocarbons (CFCs)	
9.	The illegal killing or removal of organisms from their environments	
10.	The type of pollution caused when water is released into a river after being heated in power stations or industries	
11.	Excessive production of greenhouse gases leading to more heat energy being trapped in the atmosphere	
12.	The area where an organism lives and finds the resources it needs to survive	
13.	Loss of water as liquid water changes to gaseous water vapour	
14.	Plants that have been taken from one area and introduced into another area.	
15.	The death of every organism of a species	
16.	Household water that contains detergents from bathing, showering and laundry	
17.	Excessive rainfall in an area for a long period of time leading to destruction of ecosystems.	
18.	The access to enough safe and nutritious food at all times to maintain a healthy and active life	
19	Substances that are formed over millions of years due to the decomposition and compression of organisms that died a long time ago	
20.	Increase in the average atmospheric temperature of the planet	

(20)

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Activity 1

On 9 May, 2013, the daily mean concentration of carbon dioxide in the atmosphere measured at Mauna Loa Observatory, Hawaii, surpassed 400 parts per million for the first time since measurements began in 1958.

One of the major contributors was the increase in deforestation.

[Adapted from *www.theguardian.com/environment*/2013/may]

1.1

1.1.1 Explain how afforestation(to cover with forests) will contribute to the decreased levels of carbon dioxide in the atmosphere_____ (3)

_____

_____

_____

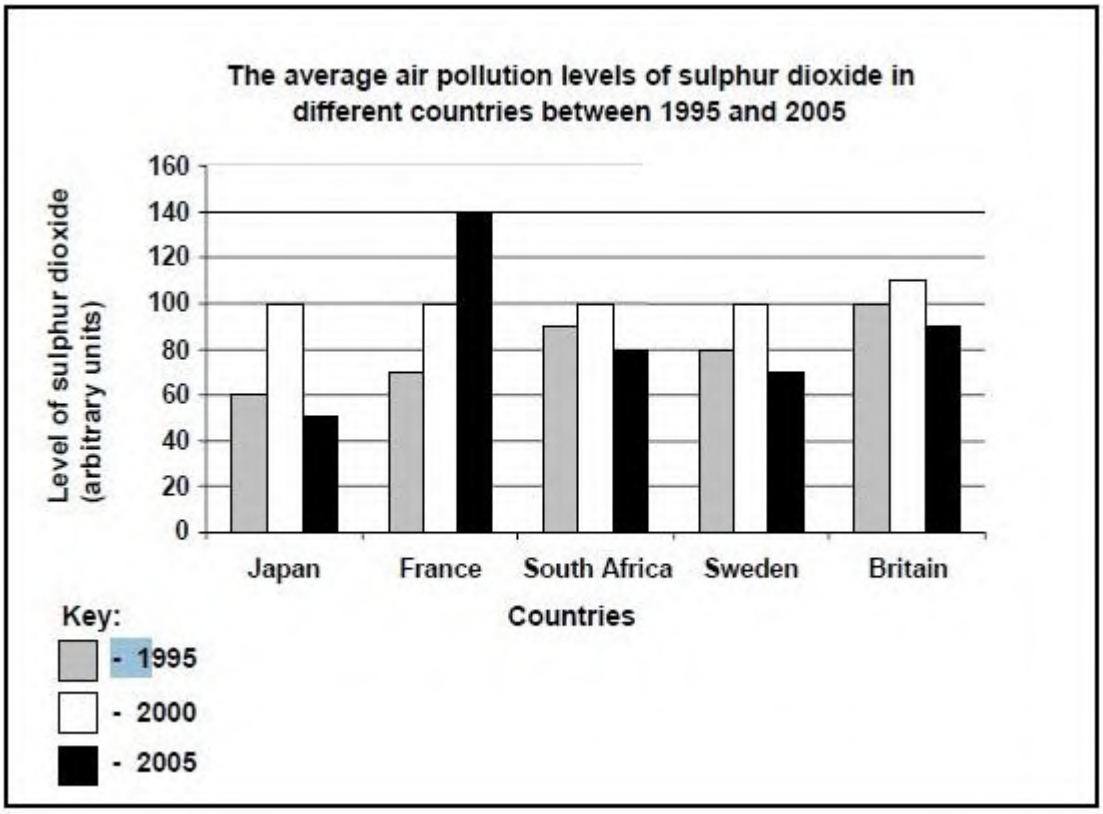
1.1.2 Describe the negative impact of the rise in the carbon dioxide concentration in the atmosphere on the green house effect._____ (3)

_____

_____

_____ **(6)**

1.2 Study the graph below.



1.2.1 By how much did the level of sulphur dioxide pollution in Sweden decrease between 2000 and 2005? _____ (1)

1.2.2 Compare the general pattern of air pollution levels of France to that of the other

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countries.

1.2.3 State the following:

(a) ONE similarity _____ (1)

(b) ONE difference _____ (2)

1.2.4 Which country had the lowest level of sulphur dioxide pollution in 2005? (1)

_____ **(5)**

HUMAN IMPACT: FOOD SECURITY

1.3 Read the extract below on food security.

FOOD SECURITY IN SOUTH AFRICA

One of the challenges in South Africa is access to food by the poor. In 2009 Statistics SA conducted a survey to determine the percentage of households in each province that had access to food.

The results are shown in the table below:

PROVINCE	HOUSEHOLDS THAT HAVE ACCESS TO FOOD (%)
Western Cape	85
Eastern Cape	79
Mpumalanga	79
Free State	67
Northern Cape	75
North West	79
KwaZulu-Natal	77
Limpopo	88
Gauteng	82

South Africa seems to have adequate food access in urban areas, but the same cannot be said of households in rural areas. In rural areas prices of staple foods (e.g. maize and rice) are usually higher than in urban areas.

Increasing agriculture is the key to food security and poverty alleviation. The majority of people living in rural areas have access to land, but more still needs to be done to make household farming (growing crops for family use only) in these areas more efficient.

[Adapted from *Food Security*, Department of Agriculture, Forestry and Fisheries, March 2011]

1.3.1 What is meant by food security? ……

……

1.3.2 Which province showed the highest percentage of households that have access to food?

……

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1.3.3 List FOUR farming practices that people in rural area may be faced with. ……

……

……

……

……

……

1.3.4 List SIX factors that negatively influence food security.

……

……

.....

.....

.....

.....

1.3.5 Identify the:

(a) Independent variable ……

(b) Dependent variable ……..

1.3.6 Draw a bar graph that shows the household access to food in KZN and Western Cape.

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ACTIVITY 2

2.1 Read the following extract and answer the questions that follow.

MANAGING INVASIVE PLANTS – METHODS OF CONTROL

Alien plant invasion is only one factor that reduces plant biodiversity. Three broad categories cover the control of invasive plants: mechanical, chemical and biological. Several techniques may be effective in controlling a single species, but there is usually one preferred method – the one that is most resource efficient with the least impact on the environment.

[Extra from an article by Christopher Mattrick]

2.1.1 Give the meaning of:

(a) Biodiversity _____ (2)

_____

_____

(b) Alien plants _____ (2)

_____

_____

2.1.2 Give TWO factors that can reduce biodiversity other than alien plant invasions. (2)

_____

_____

_____

2.1.3 Explain how biological control is applied to control alien plants. (3)

_____

_____

_____

_____

2.1.4 According to the extract list TWO criteria that should be used to control alien plants. (2)

_____

_____

_____

(11)

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ACTIVITY 3

3.1 Read the following article and study the graph and answer the questions that follow.

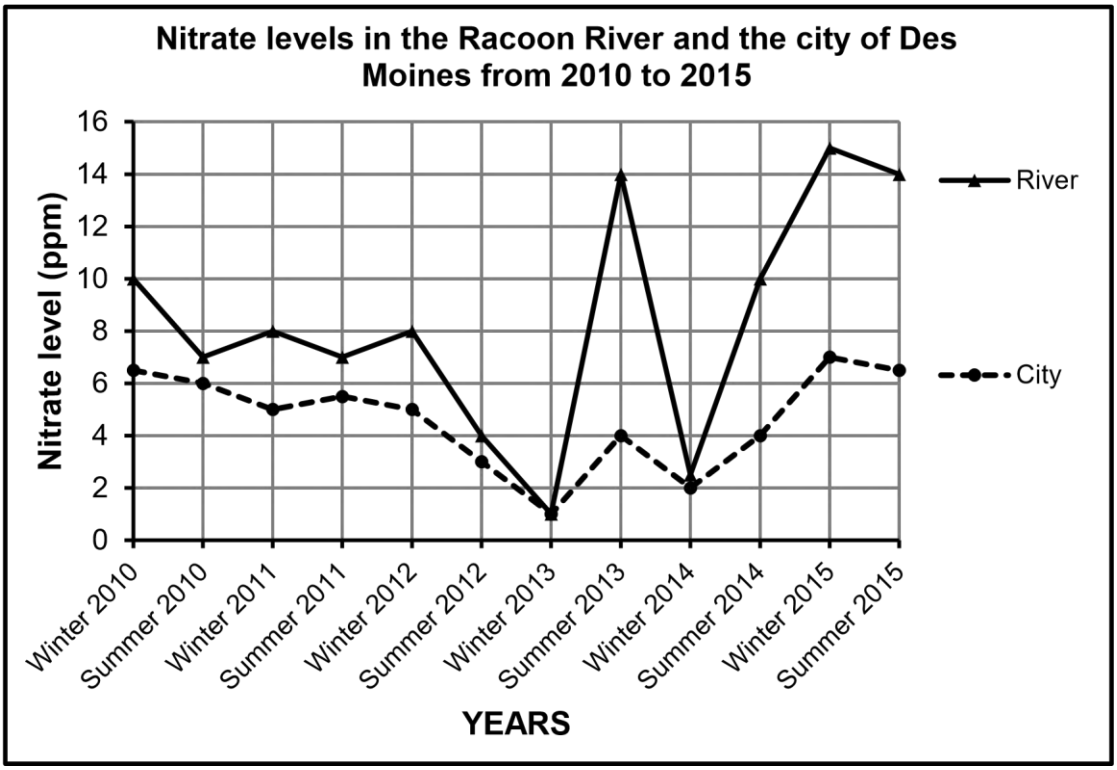
STRUGGLE TO KEEP FARM POLLUTION OUT OF TAP WATER

The Raccoon River in America runs through an intensely farmed region, covered with different crops which are regularly treated with fertilizer and other chemicals. It is also home to millions of farm animals whose manure is added to the topsoil. Commercial fertilizers and manures contain nitrates, a form of nitrogen, which gets into the river when rain washes it off fields. Polluted run-off from farms poses an acute threat to residents' tap water. It can be fatal to babies and it has also been linked to cancer in adults.

The legal limit for nitrates in drinking water is 10 parts per million (ppm) but the National Cancer Institute have found that drinking water with just 5 parts per million (ppm) of nitrate increases the risk of many cancers.

The graph below shows the nitrate readings from the river as well as treated tap water from Des Moines, a nearby city, from 2010 to 2015.

[Adapted from: *www.ewg.org/research/case-study-iowa-cities-struggle-keep- farm-pollution- out-tap-water*]



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3.1.1 Use the information in the graph to state the relationship between the seasons and nitrate levels in the river from 2010 to 2012. (2)

_____

3.1.2 State why the authorities of Des Moines cannot be fined for exceeding the legal limit of nitrate levels in drinking water. (2)

_____

_____

3.1.3 Motivate why the drinking water of the city can still be seen as unhealthy. (2)

_____

3.1.4 Name the type of water pollution caused by run-off water containing excessive nitrates. _____ (1)

3.1.5 Describe the effect of the pollution mentioned in QUESTION 3.1.4 on aquatic life. (2)

_____

_____

_____

_____

_____

_____

(9)

3.2

Complete the missing words in the statements below:

(a) Dumpsites produce a large amount of _____ gas.

(b) Radioactive waste can destroy _____ acids in organisms.

(c) _____ is necessary to reduce the amount of solid waste.

(d) Pollution at dumpsites can be prevented by using thick _____to line the base of the dump.

(e) Waste at a dumpsite should be flattened and buried with _____

(f) Vegetable waste should be used to make _____ for the garden.

(g) _____ is South Africa's only nuclear power station.

(h) The gas produced by landfill sites can be piped and used as an_____ energy source.

(8)

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3.3 Work in pairs to answer the following question.

Question adapted from DBE 2013 Grade 11 Exemplar paper II

List FOUR strategies you would use to manage solid waste if you appointed as the head of the waste disposal division of your town.

_____
_____
_____
_____
_____
_____
_____

(4)

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Paper 2 Topics:

DNA- Code of life

Activity 1

No.	Terminology	TERM
1.1	A tangled mass of threads found in a nucleus of cells that give rise to chromosomes.	
1.2	A string-like structure found in a nucleus of a dividing cell	
1.3	Natural shape of DNA	
1.4	Structural components/ building Blocks/monomers of nucleic acids.	
1.5	The weak bond between nitrogenous bases in a DNA molecule	
1.6	The process by which a DNA molecule makes identical copies of itself	
1.7	A segment of DNA/a chromosome that codes for a particular characteristic	
1.8	A sudden change in the sequence/order of nitrogenous bases of a nucleic acid	
1.9	Two chromosomes that carry the same set of genes	
1.10	The complete set of chromosomes in the cell of an organism	
1.11	The type of sugar found in a DNA molecule	
1.12	The type of sugar found in an RNA molecule	
1.13	Nitrogenous base found only in RNA molecules	
1.14	The stage of protein synthesis during which mRNA forms from DNA	
1.15	The place in the cell where transcription occurs	
1.16	Molecule that carries the coded message from the nucleus to the cytoplasm about the protein to be made	
1.17	The organelle in the cytoplasm to which mRNA attaches	
1.18	The organelle in the cytoplasm which is the site of protein synthesis	
1.19	The stage of protein synthesis that takes place in the cytoplasm	
1.20	A sequence of three consecutive bases in mRNA onto which fit three complementary bases of tRNA during protein synthesis	
1.21	A sequence of three consecutive bases on tRNA which complement the bases on the codon found on the mRNA	
1.22	The type of nucleic acid that carries a specific amino acid	
1.23	The monomers which serve as building blocks for the synthesis of proteins	
1.24	The bond between amino acids of a protein	

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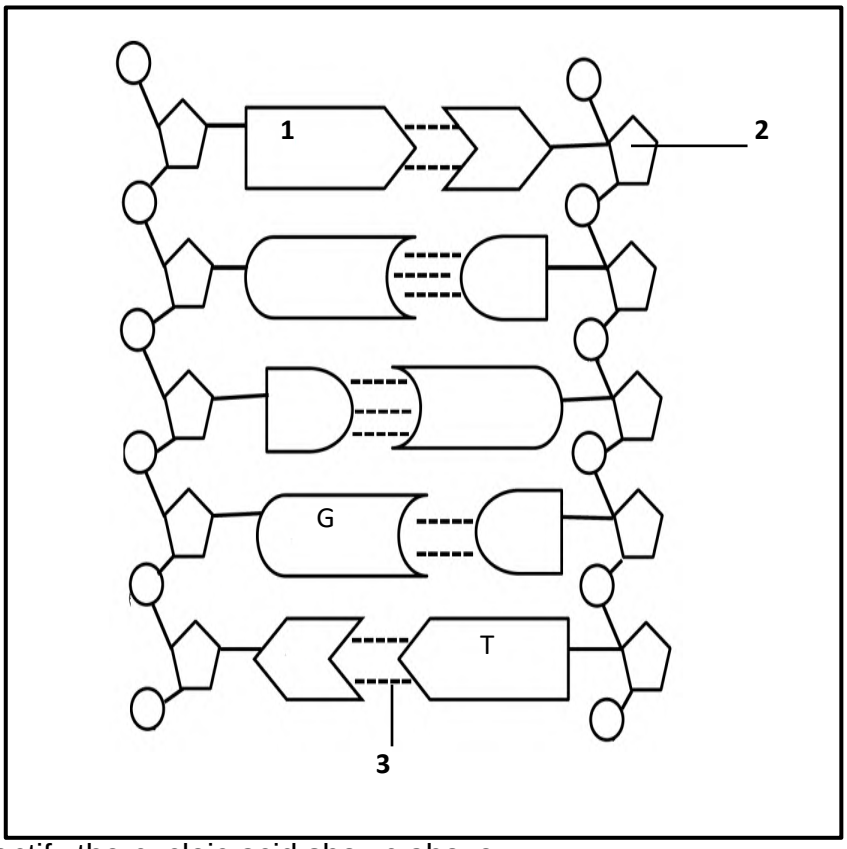
Activity 2

2.1 The diagram below shows a part of a nucleic acid molecule



2.1.1 Identify the nucleic acid shown above _____ (1)

2.1.2 How many strands make up this nucleic acid molecule? _____ (1)

2.1.3 Where is this molecule found in a cell? _____ (1)

2.1.4 Label the following parts:

a) 1 _____ (1)
b) 2 _____ (1)
c) 3 _____ (1)

2.1.5 How many nucleotides are shown in the diagram _____ (1)

2.1.6 Name the complementary base for each of the following: (1)

a) G _____

b) T _____

2.1.7 Complete the following table:

DNA	**RNA**
2.7.1.	Single stranded
Contains nitrogenous base thymine	2.7.2.
2.7.3.	Ribose sugar

(3)

(11)

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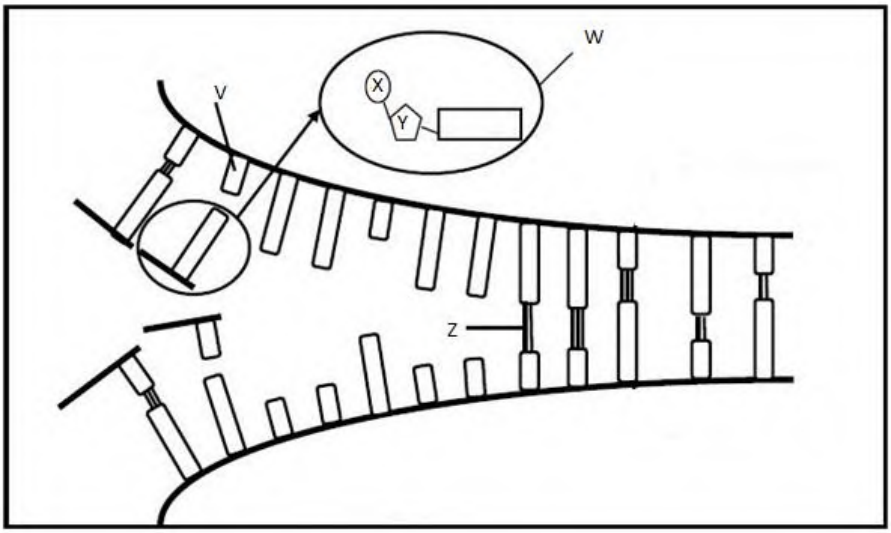
Activity 3

The diagram below represents a process taking place in the nucleus of a cell.



3.1 . Identify the:

(a) The process taking place as illustrated in the diagram

_____

(b) Parts:

W_____

X_____

Y _____ (4)

(c) Bond **Z** _____ (1)

(d) Nitrogenous base **V** _____ (1)

3.2 Name the phase of the cell cycle where this process takes place. (1)

_____

(7)

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3.3 Below is a process outlining how DNA molecule makes a copy of itself.

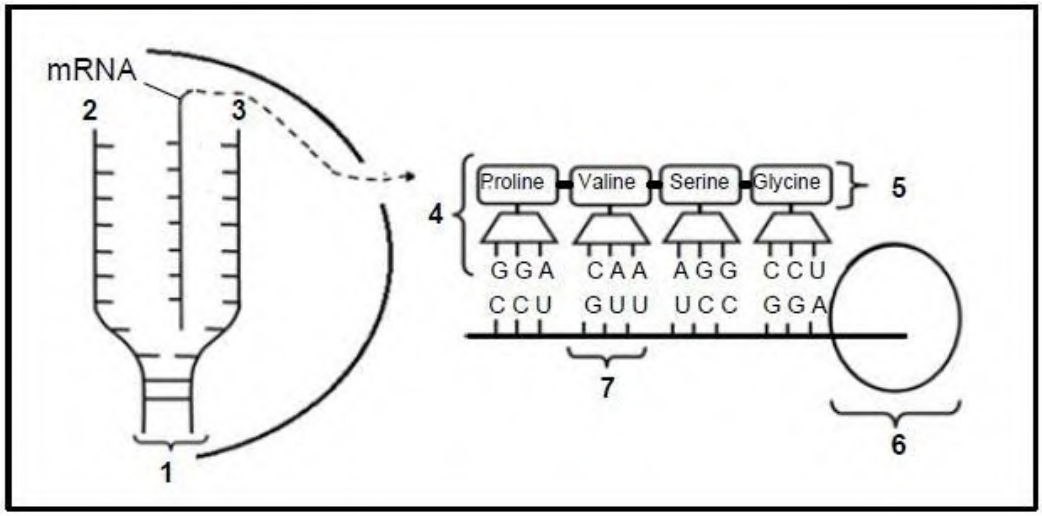
Fill in the missing words to complete the process.

The double helix DNA molecule_____ to form a ladder-like structure. _____bonds breaks. Double stranded DNA _____Two strands are formed. Each single strand of DNA acts as a _____for the formation of a new DNA molecule using free_____ of DNA from the nucleoplasm. Two _____of DNA molecules are formed. This process is controlled by _____.

(7)

Activity 3

The diagram below represents two stages of protein synthesis.



3.1 Provide labels for molecule/organelle:

(a) 1 _____ (b) 2 _____

(c) 3 _____ (d) 4 _____

(e) 5 _____ (f) 6 _____

(6)

3.2 Give only the NUMBER of the part which represents a:

(a) DNA template strand _____

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(b) Codon _____

(c) Amino acids with Anticodon _____

(d) Monomer of protein _____ (4)

3.3 Identify the processes taking place at organelle **6** and where mRNA is formed

_____ (1)

_____ (1)

3.4 Name the opening in the nuclear membrane that allows for the passage of mRNA into the cytoplasm _____ (1)

3.5 Name the amino acid for number 7_____ (1)

3.6 Provide the DNA sequence that code for glycine_____ (2)

(16)

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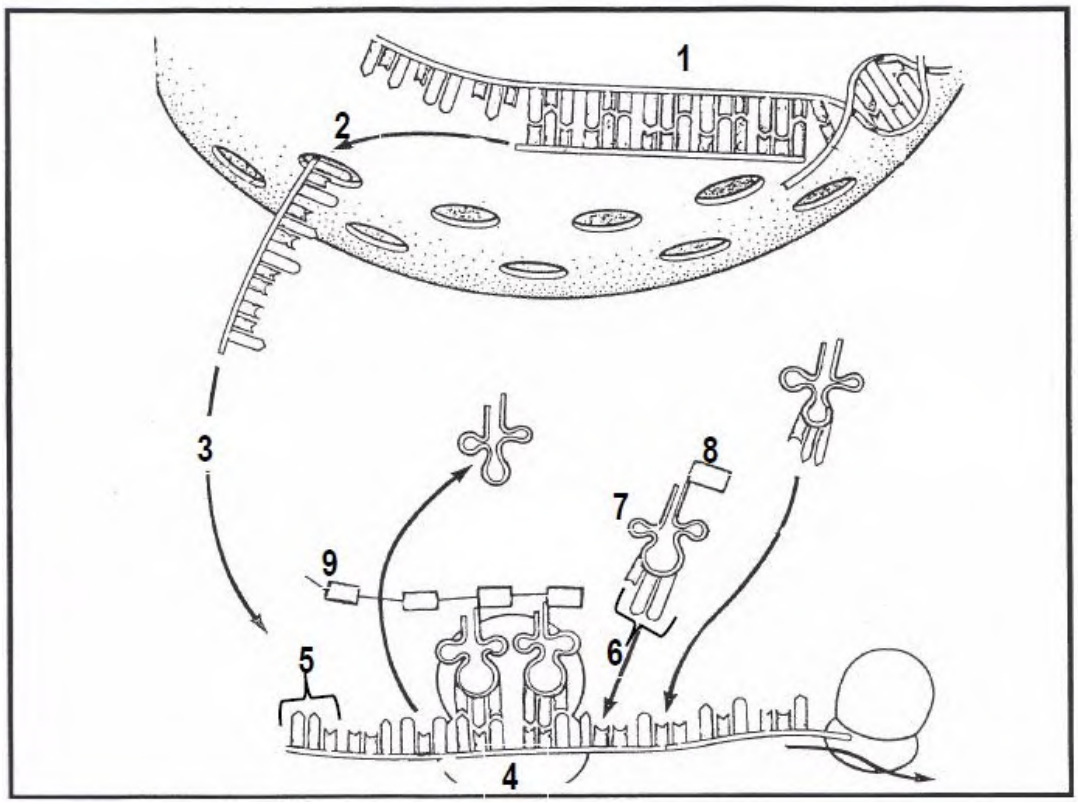
Activity 4

4.1 The diagram below represents protein synthesis



Provide labels for number 1-9.

1.
2
3
4
5
6
7
8
9

(9)

4.2 Describe what is happening in each part named in question 4.1 during protein synthesis:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____

(9)

(18)

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MEIOSIS

C. Terminology.

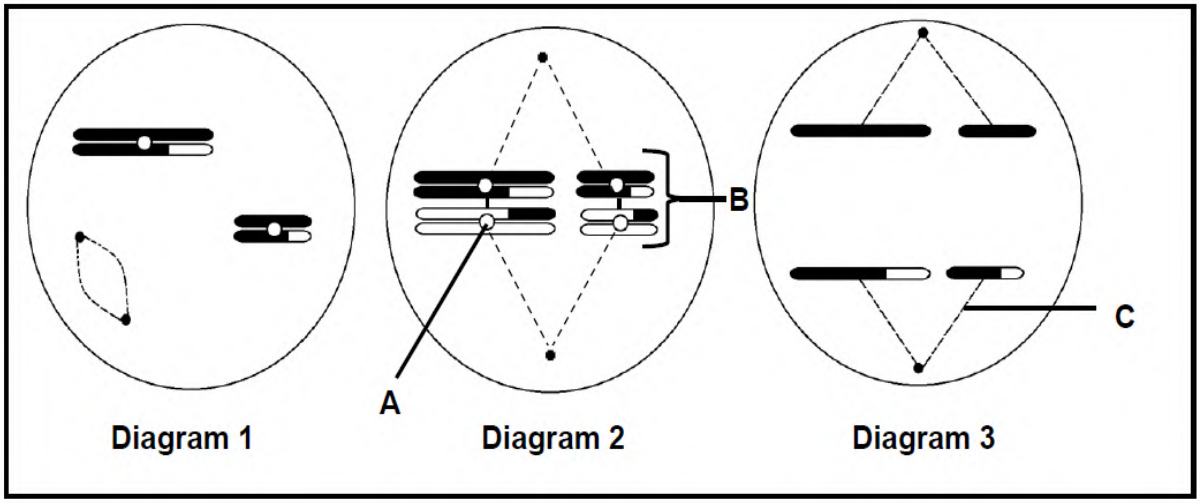
Complete the table below by writing the correct biological term that matches the description provided.

No.	Description	Biological term
1.	Organelle found only in animal cells that forms the spindle during cell division	
2.	Structures formed when the centrosome divides into two which moves to opposite poles of the cell during cell division	
3.	The point where two chromatids overlap during crossing over	
4.	The division of the cytoplasm through the constriction of the cell membrane at the end of cell division	
5.	The failure of chromosome pairs to separate during meiosis	
6.	A representation of the number, shape and arrangement of all the chromosomes in the nucleus of a somatic cell	
7.	Two arms of a chromosomes	
8.	Two set of chromosomes	
9	Pair of chromosomes that have same structural features	
10.	Phase of cell division where DNA replication occurs	

(10)

Activity 1

1.1 The diagram below represent different phases of meiosis in an organism



1.1.1 Identify :

(a) A ----------
(b) B ----------
(c) C ---------- 3

1.1.2 Name two places in humans where the above process occurs.

_____
_____ 2

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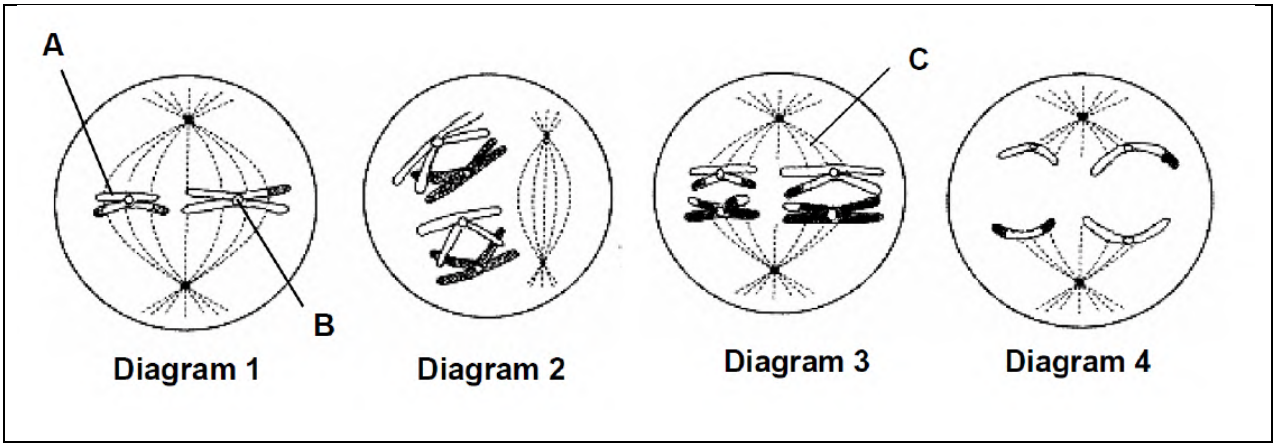
1.1.3 (a) Identify the phase represented in Diagram 3 ---------- 1

(b) Give a reason for your answer in 1.1.2 (a) . ---------- 1

1.1.4 Write down the numbers of the diagrams to show the correct sequence in which the phases occur. ----------,----------,---------- 3

1.1.5 State ONE difference between metaphase 1 and metaphase II 2

1.2 The following diagrams representing different phases of meiosis.



HINT: Use the following diagrams to :

- identify the phases of meiosis
- differentiate metaphase 1 from metaphase II and anaphase 1 from anaphase II
- describe the process of crossing over and the significance.

1.2.1 Provide labels for structures A, B and C

A ----------

B ----------

C ---------- (3)

1.2.2 Which phase is represented by :

(a) Diagram 1 ---------- (1)

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

1.2.3 How many chromosomes were present:

(a) At the start of the process of meiosis ---------- (1)

(b) At the end of the process of meiosis ---------- (1)

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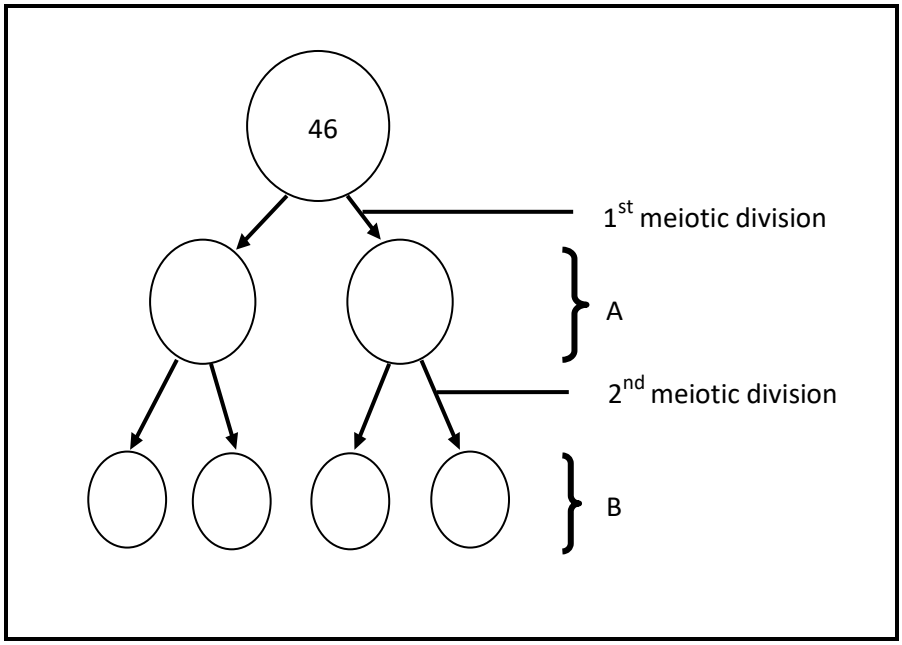
1.2.3 (a) Name the error in meiosis that may occur in the phase shown in diagram 4.

---------- (1)

(b) What term is given to the error named in 1.2.3 (a) if it occurs in chromosome pair number 21. ---------- (1)

(9)

1.3 Study the diagram below shows a process occurring in a human male. (The parent cell shown below has 46 chromosomes).



1.3.1 Is the number of chromosomes in a parent cell haploid or diploid?

---------- (1)

1.3.2 How many chromosomes will be found in each cell at: (1)

(a) A ----------

(b) B ---------- (1)

1.3.3 Name TWO processes occurring during the 1st meiotic division which contribute to the genetic variation of cells A.

---

(2)
(5)

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TERMINOLOGY

D. ACTIVITY 1

Give the correct biological term for each of the following descriptions.

No.	Description	Terminology
1.	Differences between individuals within a population.	
2.	The particular position occupied by a gene on a chromosome.	
3.	a change in the nucleotide sequence of a gene, resulting in a new allele	
4.	The genetic makeup of an individual.	
5.	The physical appearance of an individual due to the expression of genes.	
6.	An allele that is always expressed in the phenotype.	
7.	An allele that is only expressed in the phenotype if not accompanied by a dominant allele.	
8.	Both alleles influences a particular characteristic in the same way	
9.	Both alleles influences a particular characteristic in the different ways	
10.	The breeding of organisms over many generations in order to achieve a desirable phenotype	
11.	The use of biological processes, organisms or systems to improve the quality of human life	
12.	A copy of an organism that is genetically identical to the original organism	
13.	The process by which genetically identical organisms are formed using biotechnology	
14.	Undifferentiated cells that can develop into any cell type	
15.	A diagram showing the inheritance of genetic disorders over many generations	

(15)

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Activity 2

2.1

2.1.1 For each genotype, indicate whether it is heterozygous (Hh) or homozygous (HH)

hh _____ Hh _____ HH_____ Mm _____
Bb _____ ff _____ Jj _____ nn _____
(8

2.1.2 For each of the genotypes below, determine the phenotype.

(a) *Brown eyes are dominant to blue eyes*
Key s:B-brown eyes and b-blue eyes
BB _____
Bb _____
bb _____ (3)

(b) *Round **R** seeds are dominant to wrinkled **r***
RR _____
Rr _____
rr _____ (3)

(c) *Bobtails **t** are recessive (long **T** tails dominant)*
TT _____
Tt _____
tt _____ (6)

(12)

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2.2

2.2.1. For each genotype below, indicate whether it is heterozygous OR homozygous.

Bb _____ DD _____
Ff _____ tt _____ (4)

2.2.2. Which of the genotypes would be considered purebred?

_____ (1)

2.2.3. Which of the genotypes would be hybrids?

_____ (1)

2.2.4. Determine the phenotype for each genotype using the information provided

(a) Yellow body colour is dominant to blue.

YY _____ Yy _____ yy _____ (3)

(b) Square shape is dominant to round.

SS _____ Ss _____ ss _____ (3)

2.2.5. Black hair (B) is dominant to blonde(b).What would be the possible

genotype/s for a Brunette (Black hair)_____ blonde_____ (2)

(14)

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Teaching Tool 1: Steps of monohybrid cross

P_1 Phenotype: Rough hair x Smooth hair✓
Genotype: Hh x hh✓

Meiosis

G/gametes: H h x h h✓

Fertilisation

F_1 Genotype: Hh Hh hh hh ✓

Phenotypic ratio: 1 rough hair : 1 smooth hair ✓

P_1 and F_1✓
Meiosis and fertilisation✓ Any 6

OR

P_1 Phenotype: Rough hair x Smooth hair✓
Genotype: Hh x hh✓

Meiosis

Fertilisation

Gametes	H	h
h	Hh	hh
h	Hh	hh

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotypic ratio: 1 rough hair : 1 smooth hair ✓

P_1 and F_1✓
Meiosis and fertilisation✓ Any 6 **(6)**

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Activity 3

3.1. Fur colour in mice is controlled by a gene with two alleles. Black fur colour (B) is dominant over brown fur colour (b).
Use a genetic cross to show the possible genotypes and phenotypes of the offspring. if a mouse that is heterozygous for fur colour is crossed with a mouse with brown fur.

P_1 phenotype _____x _____ ✓
genotype _____ x _____ ✓

Meiosis

Gametes ___ ,___ x __, ___ ✓

Fertilization

F_1 genotype___, ___, ___, ____ ✓
phenotype _____ ✓

gametes		**OR**

max

P_1 and F_1 ✓
Meiosis and fertilization ✓ (6)

3.2. Paul and Jane both have brown eyes. Their first child has blue eyes. Explain how this is possible by using a genetic diagram

---

--- (6)
(12)

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Activity 4

4.1 **COMPLETE DOMINANCE**

4.1.1 Fur colour in mice is controlled by a gene with two alleles. A homozygous mouse with black fur was crossed with a homozygous mouse with brown fur. All the offspring had black fur.

Using the symbols B and b to represent the two alleles for fur colour, show as a Punnet square, a genetic cross between a mouse that is heterozygous for fur colour with a mouse with brown fur. Show the possible genotypes and phenotypes of the offspring.

(6)

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4.1.2 **INCOMPLETE DOMINANCE**

In a certain species of rose plants, there is incomplete dominance between the genes for red and white flower colour. This leads to the production of a third phenotype of pink flowers as an intermediate characteristic.

Determine the genotypes and phenotypes of the F1 if a red flowering rose plant is crossed with a white flowering rose plant.

.

(6)

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4.1.3 **CO-DOMINANCE**

A farmer mated a black bull with a white cow and obtained calves with a mixture of black and white coat colour (i.e. they were black with patches of white on them). This is due to co-dominance between the genes for black and white coat colour.

Use a genetic cross to explain how a calve with a mixture of black and white coat colour came about.

(6)

BLOOD GROUPS

TEACHING TOOL 4

FILL IN THE MISSING ANSWERS

GENE COMBINATION (GENOTYPE)	**BLOOD TYPE (PHENOTYPE)**
$I^A I^B$	a)_____
b)____ , c)_____	A
$I^B I^B$, I^B i	d)_____ and_____
ii	e)_____

(6)

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SEX LINKED INHERITANCE E.g Hemophilia and Colour blindness

TEACHING TOOL 6

Sex – linked disease are caused by a recessive allele found on the X-chromosome and not on the y chromosome. Males have only one X-chromosome while female have two x- chromosome – therefore males mainly suffer from the disorders than the female.

Individual	Genotype	Phenotype
M	X^BX^B	Normal female
N	X^BX^b	Carrier female. (Does not suffer from colour-blindness but can pass gene for colour-blindness to children)
O	X^bX^b	Colour-blind female
P	X^BY	Normal male
Q	X^bY	Colour-blind male

Haemophilia is a sex-linked disease caused by the presence of a recessive allele (X^h). A normal father and heterozygous mother have children. Represent a genetic cross to determine the possible genotypes and phenotypes of the children of the parents mentioned in the question above

PEDIGREE DIAGRAMS

Teaching Tool 7

Steps to follow when completing a pedigree diagram.

a. Study the opening statement in a pedigree question to identity the following when given: -
    i. dominant and recessive characteristics
    ii. the type of inheritance (e.g. sex linked or not)
b. study the keys as well for phenotypes
c. Write in the phenotype of all the individuals as given in the problem

d. Fill in the genotype of all the individuals with the recessive condition – it has to have two lower case letters
e. For every individual in the diagram that has the recessive condition, it means that each gene was obtained from each of the two parents. So, work backwards and fill in one recessive gene for each of the parents
f. If the parents showed the dominant characteristic, then fill in the second letter which has to be a capital letter
g. Any other individual showing the dominant characteristic will most likely be homozygous dominant (two capital letters)

NB! Note that examples of sex linked disoders are haemophilia and colour blindness, otherwise the question will specify in the opening statement when you must use sex chromosomes in the genetic cross.

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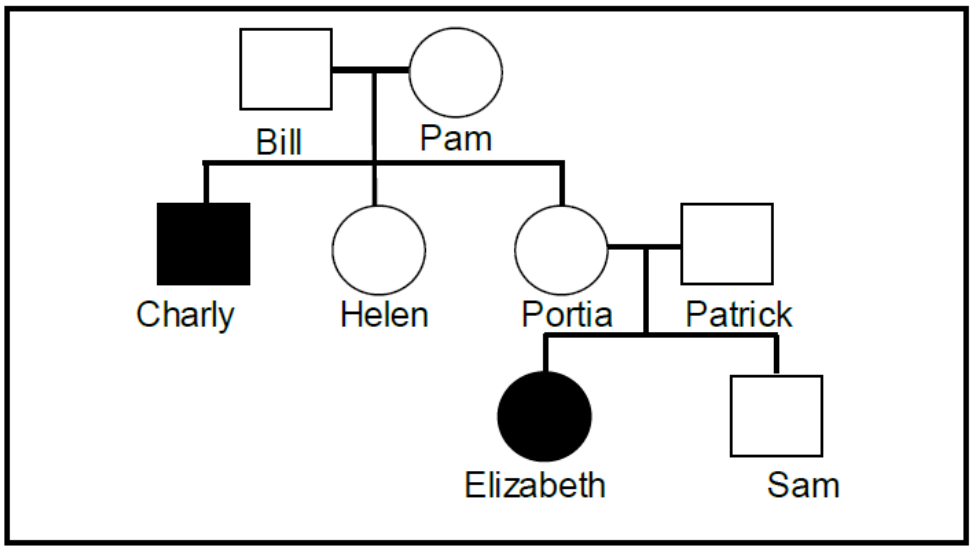
Teaching Tool 8

Tay-Sachs disease is caused by an autosomal recessive allele (**n**). Children with Tay-Sachs disease lose motor skills and mental functions. Over time, the children become blind, deaf, mentally retarded and paralysed. Tay-Sachs children die by the age of five.

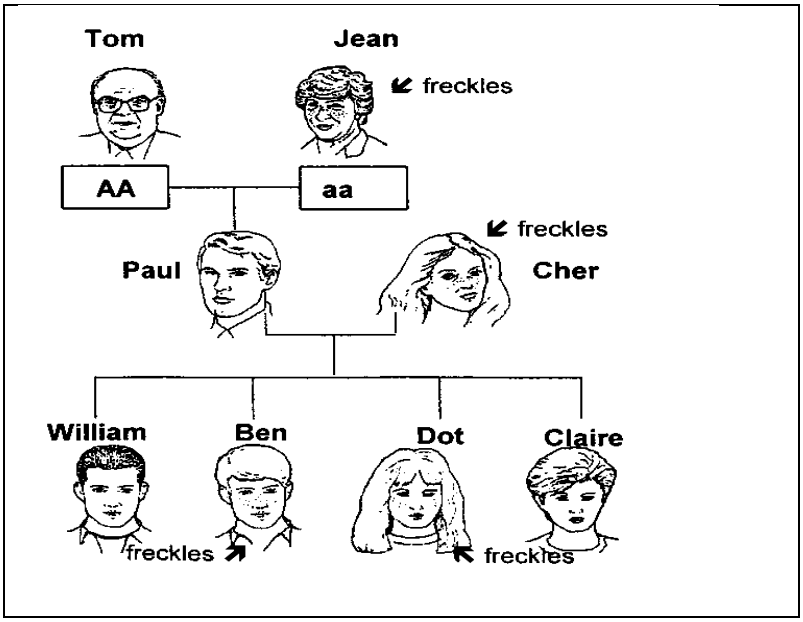
The pedigree diagram below shows the inheritance of Tay-Sachs disease in a family



[Source: www.tay-sachs.org]

5.1 **Activity 5**

Freckles are small patches of coloured skin. The allele for freckles (a) is recessive to the allele for un-freckled skin (A). The diagram below shows a family where some of the people have freckles.



5.1.1 Write down the genotypes of:

(a) William _____

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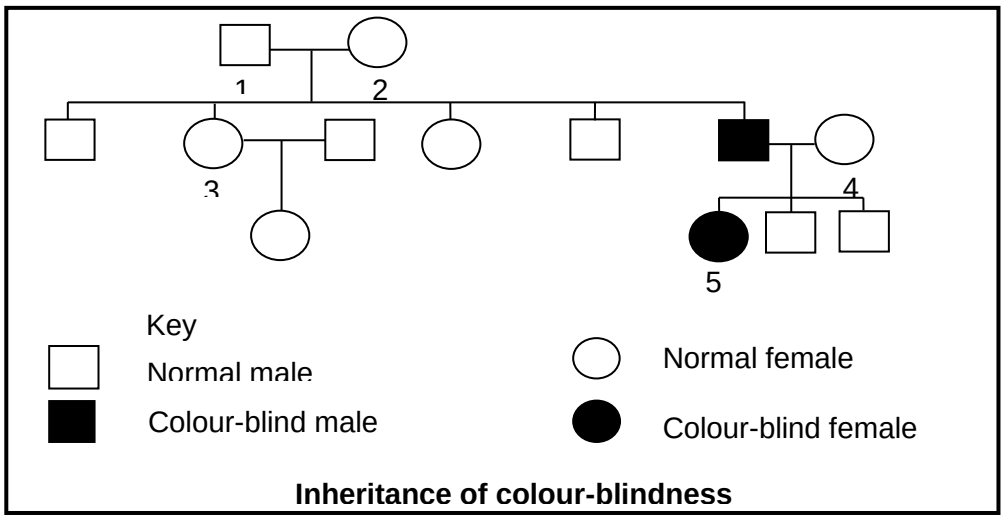
(b) Ben_____
(c) Dot _____
(d) Claire _____

Activity 6

6.1 The pedigree diagram below shows the inheritance of colour-blindness in a family. Colour-blindness is sex-linked and is caused by a recessive allele (**d**). The ability to see colour normally is caused by a dominant allele (**D**).



Inheritance of colour-blindness

6.1.3 How many of the male offspring of parents **1** and **2** were normal?
_____ (1)

6.1.4 State the genotype of:

(a) Individual **2** _____ (1)

(b) Individual **5** _____ (1) **(3)**

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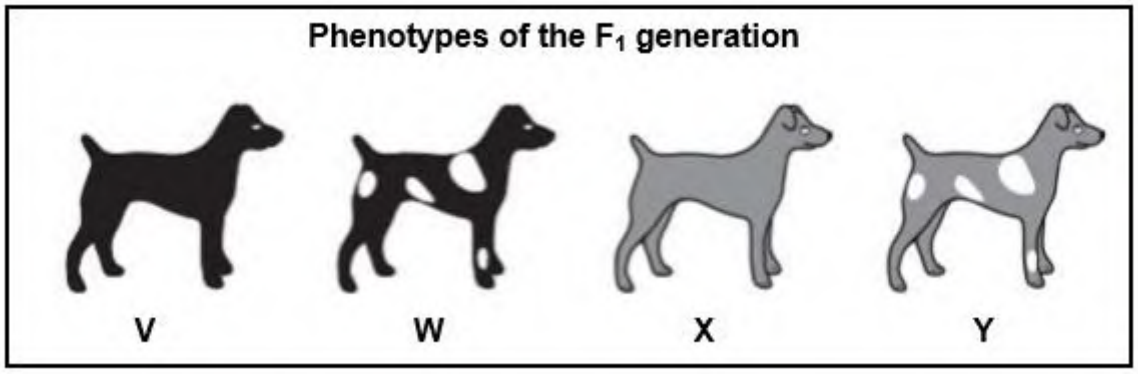
DIHYBRID

The dihybrid cross is a cross between two individuals where we are concerned with the inheritance of **TWO** characteristics at the same time

TEACHING TOOL 9

In dogs, coat appearance is controlled by two genes; one for coat colour and one for coat pattern (presence or absence of white patches).The alleles for each characteristic are shown in the table below.

CHARACTERISTIC	ALLELES	
Coat colour	Black **(B)**	Grey **(b)**
Coat pattern	Without white patches **(T)**	With white patches **(t)**



Phenotypes

V - black without white patches
W - black with white patches
X - grey without white patches
Y - grey with white patches

Genotypes

V - BBTT OR BbTt
W - BBtt or Bbtt
X - bbTT OR bbTt
Y - bbtt

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Activity 7

7.1 Study the information below.

WW = white wool ww = black wool
White wool is dominant trait
HH = horns hh = no horns
Horns is the dominant trait

7.1.1 Give the phenotype for the following genotypes:

(a) Wwhh _____

(b) wwHH _____

(c) wwhh _____

(d) WwHh _____

(e) wwHh _____ (5)

7.1.2 List the possible gametes for each of the following parents:
(Hint: use PUNNET squares)

(a) WWHH _____

(b) WwHh _____

(c) WwHH _____

(d) wwHH _____

(e) wwhh _____ (5)

7.2 In a particular type of pigeon, it was found that red eye colour (R) is dominant over black eye colour (r), while grey tail feathers (G) is dominant over white tail feathers (g).

Give the genotype of the following phenotypes:

(a) Black eye colour, Homozygous Grey tail feathers. _____

(b) Heterozygous red eye colour, heterozygous grey feather. _____

(c) Homozygous red eye colour, heterozygous grey feathers ._____

(d) Black eye colour, white tail feathers. _____

(e) Black eye colour, heterozygous grey feathers. _____
(5)

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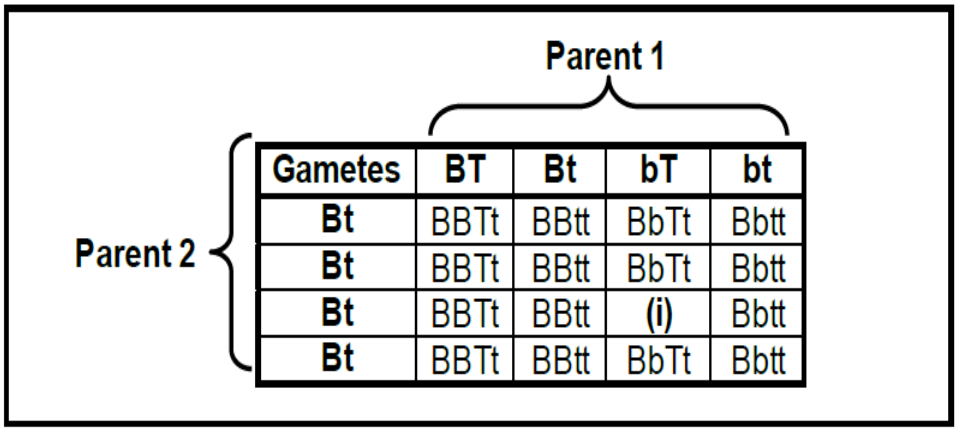
7.3 The colour in mice is controlled by two alles,black (B) and grey (b).Tail length is controlled by two alleles,long (T) and short (t).

The punnett square below shows a part of a cross between two mice. Genotype (i) has been left out.



Gametes	BT	Bt	bT	bt
Bt	BBTt	BBtt	BbTt	Bbtt
Bt	BBTt	BBtt	BbTt	Bbtt
Bt	BBTt	BBtt	(i)	Bbtt
Bt	BBTt	BBtt	BbTt	Bbtt

7.3.1 Give the:

(a) genotype of parent 1
(b) genotype of parent 2
(c) genotype of offspring (i) (3)

7.3.2 What percentage of the offspring above is grey with short tails? (1)

(4)

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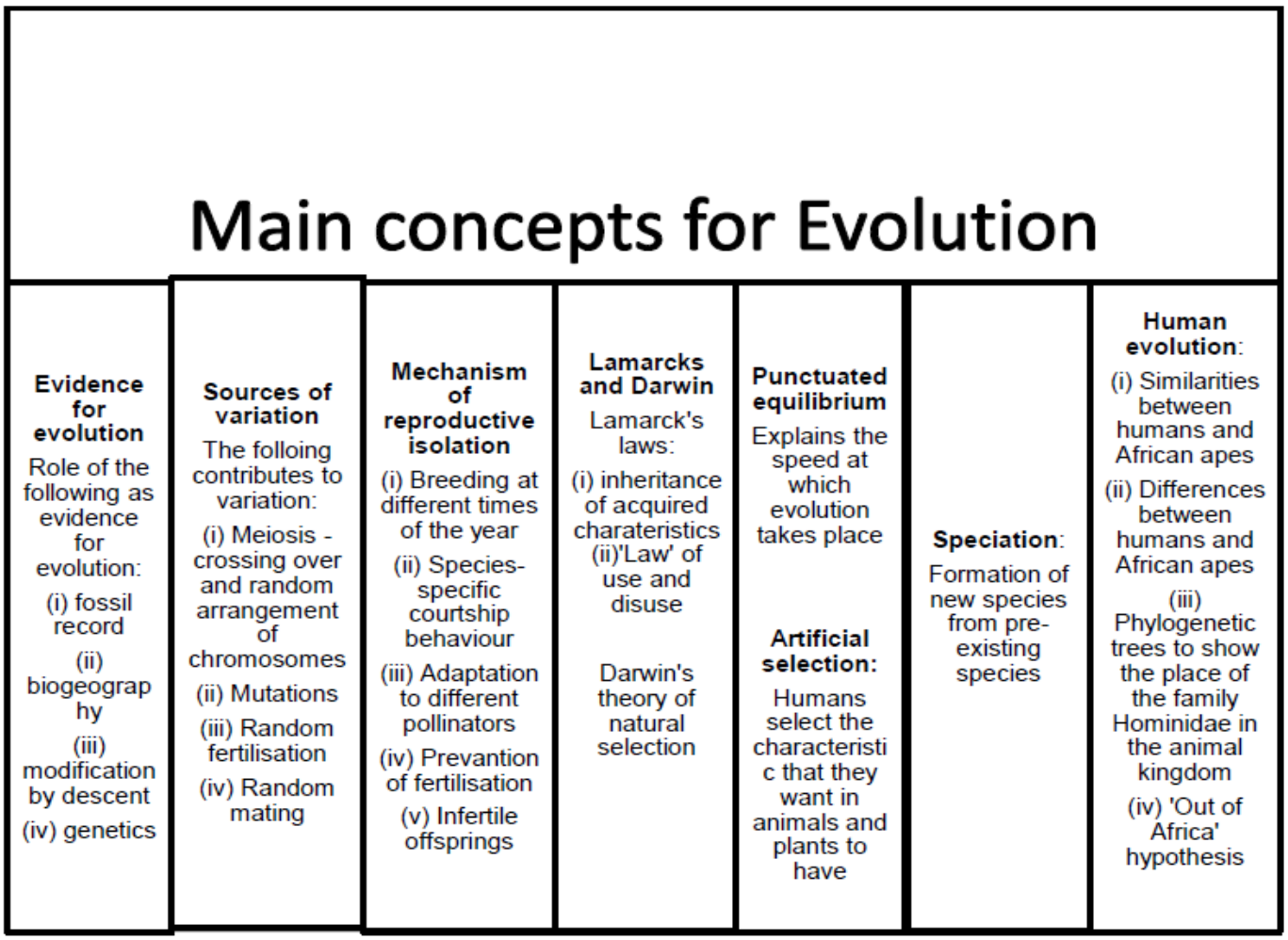
Grade: 12

Topic: Evolution

Main concepts for Evolution



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EVOLUTION

TERMINOLOGY: GENERAL EVOLUTION

Fill in the table with correct biological terms for the descriptions provided.

No.	Descriptions	Terminology
1.1.1	The distribution of species in different parts of the world	
1.1.2	A tentative explanation of a phenomenon that can be tested and may be accepted or rejected	
1.1.3	Explanation of an observation that is supported by facts, models and laws	
1.1.4	The process by which organisms best suited to survival in the environment achieve greater reproductive success	
1.1.5	The breeding of organisms over many generations in order to achieve a desirable phenotype	
1.1.6	The variety of life forms that exist on Earth	
1.1.7	Process whereby new species are formed from the original population	
1.1.8	A group of organisms which can interbreed to produce fertile offspring	
1.1.9	Type of evolution involving long periods of time when species do not change and short periods of rapid change	

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TERMINOLOGY: HUMAN EVOLUTION

Fill in the table with correct biological terms for the descriptions provided.

No.	Description	Terminology
1.1.1	The mineralised remains of organism that have lived in past	
1.1.2	The ability of an organism to walk on two limps	
1.1.3	Using two eyes with overlapping fields of view to create the single	
1.1.4	Clear sex display	
1.1.5	An organism having the pointed face	
1.1.6	The ability of an organism to walk on four limps	
1.1.7	The opening at the base of the skull through which the spinal cord enters	
1.1.8	The family to which humans belong	
1.1.9	The genus of the fossil 'Little Foot'	
1.1.10	The hypothesis that states that modern humans/*Homo sapiens* originated in Africa and migrated to other parts of the world	
1.1.11	Gap between the teeth	
1.1.12	The family to which humans belong	
1.1.13	The permanent disappearance of a species from earth	
1.1.14	A genus for humans	

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Teaching Tool 1

Introducing natural selection

Group arrangements: Groups of three

Time: 10 minutes for discussion and notes and 5 minutes for report back.

Resources: Flipchart Paper and Markers.

Instructions:

Each group will be given a different environment and they will have to come up with survival techniques.

- Group 1 – living in a forest •
- Group 2 – living in Iceland.
- Group 3 – living in the desert

Each group will concentrate on how to survive focussing on:

- Shelter
- Food
- Dress/clothing

Continuous and discontinuous variation

Group arrangements: Groups of six

Time: 15 minutes for discussion and notes, 5 minutes to answer the questions and 10 minutes for report back.

Resources: Flipchart paper and whiteboard markers.

Instructions:

Firstly list FOUR sources of genetic variation

In your groups discuss how one would approach teaching the concepts of variation to bring about clarity. Once you have completed the discussions try to answer the 2016 Prelim question that follows in a manner as if you were explaining the answer to your learners. Use the Flipchart paper to write down your answer.

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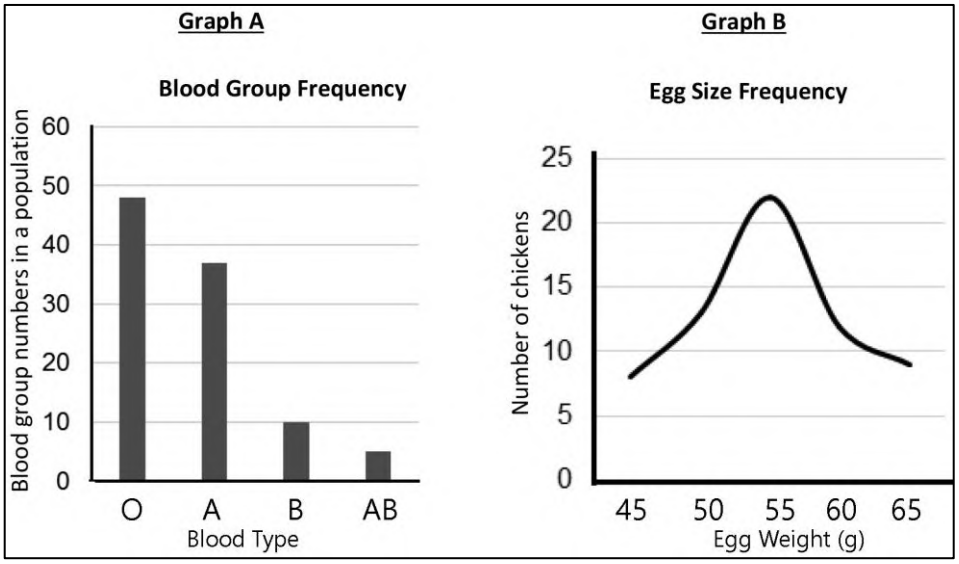
In two separate experiments, blood group frequency in humans and egg size in chickens were investigated. The following data was collected and the results graphed.



1. Identify which graph represents:

   (a) continuous variation _____ (1)

   (b) discontinuous variation _____ (1)

2. Describe the differences between the graphs, supporting your answer with a description of continuous and discontinuous variation.

   _____

   _____

   _____

   _____ (4)

Three theories of evolution:

- **Jean Baptiste de Lamarck** – evolution by acquired characteristics.
- **Charles Darwin** – natural selection.
- **Niles Eldridge & Stephen Jay Gould** - Punctuated equilibrium. Not a gradual change but a punctuated equilibrium.

Differences between Lamarck and Darwin

Lamarck	Darwin
• Ducks **walked on land** looking **for food**. • **Food** became **scarce** and they were forced to look for food in the **water**. • The duck **stretched their toes** apart to **swim**. As a result a **skin grew** between their toes. This was the beginning of **webbed feet**. • This characteristic was then **inherited** by the offspring.	• There was a **great variation** in the **appearance of the feet** of duck in a population. • Those duck who had **webbed feet** and entered the **water to obtain food** were the **successful** individuals. • Their offspring would **survive** as they could obtain food. • Those who could **not obtain food** from the water **died**.

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Punctuated equilibrium

- Evolution is not always gradual as proposed by Lamarckism and Darwinism.
- Evolution involves long periods of time where species do not change or change very little (known as equilibrium). This alternates with (is punctuated by) short periods of time where rapid changes occur.

The following was taken from the Grade 12 Ace it! Study Guide and is based on the evidence of evolution.

1.1 Ancestors of ducks did not have webbed feet. In terms of natural selection, explain how the webbed feet could have evolved.

_____

_____

_____

_____

1.2 The following questions refer to Lamarck's explanation of evolution:

1.2.1 Describe the idea proposed by Lamarck to explain evolution.

_____

_____

_____

_____

1.2.2 State why Lamarck's explanation is not accepted by most scientists today.

_____

_____

_____

_____

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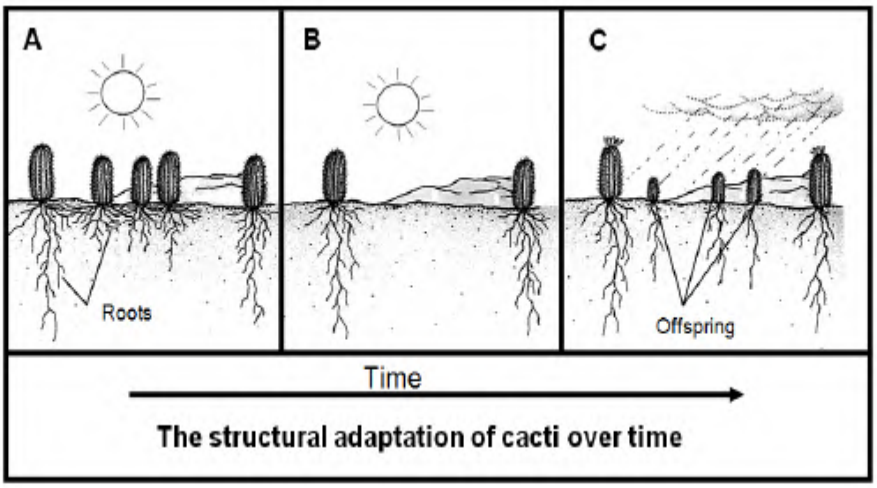
ACTIVITIES

Activity 1

1. **Natural Selection**



1.1 Describe your observation in Diagram A; B and C in relation to natural selection of cacti plants.

……

……

……

……

……

……

(6)

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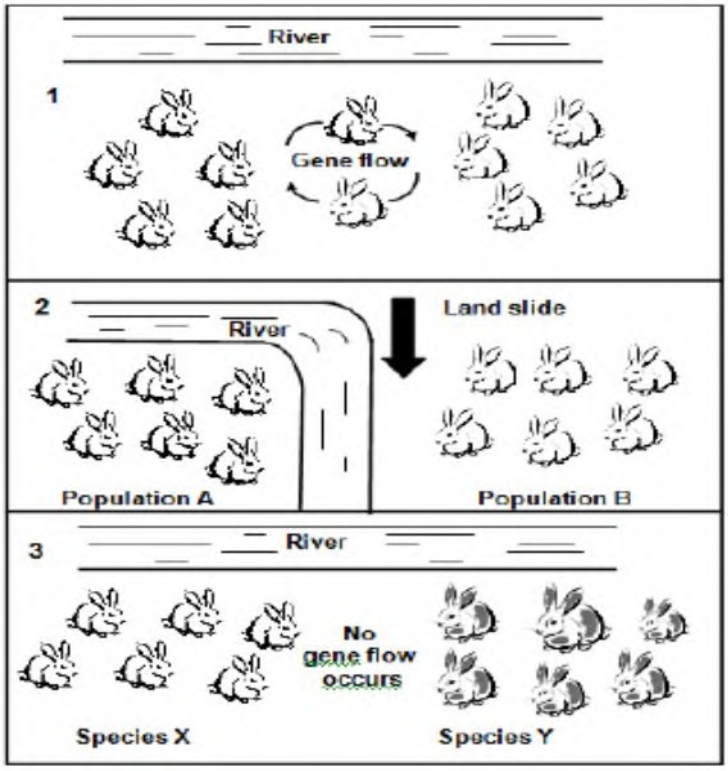
Activity 2

2. **Speciation**

2.1 Use below diagram to describe speciation



……

……

……

……

……

(6)

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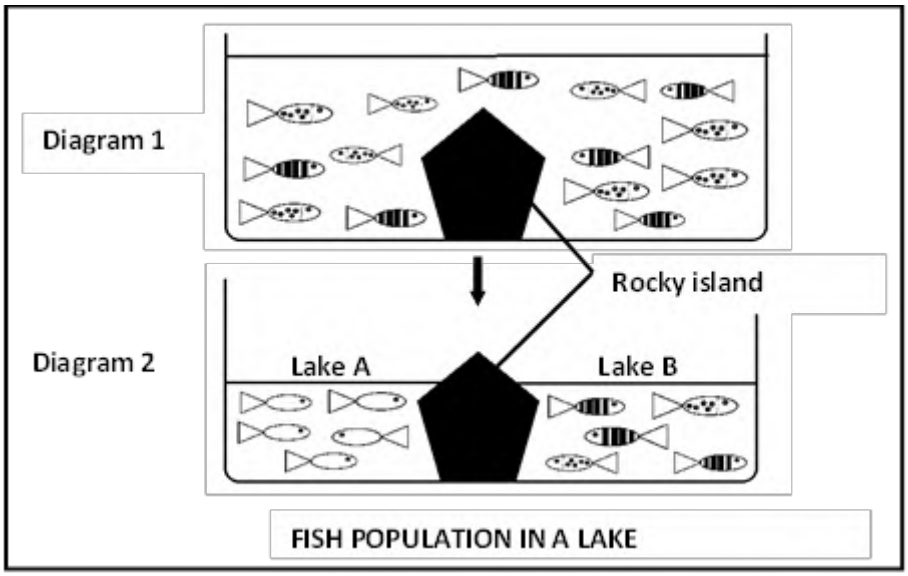
Activity 3

3.1 Diagram **1** shows variation in a species of fish living in a lake. There was a rocky island that extended across the whole length of the lake, but it was under water due to the high water level.

The fish were therefore able to move freely throughout the lake.
Diagram **2** shows the same lake many years later. A drought had caused the level of the water in the lake to drop so that the rocky island in the centre separated the lake into two smaller lakes, **A** and **B**, for a long period of time.



1.3.1 How many types of fish species do we have in diagram (1)

……

1.3.2 Which diagram **1** or **2** where there is a gene flow? (1)

……

1.3.3 State the reason for your answer in QUESTION 1.3.2. (1)

……

……

1.3.4 Define *population*. (2)

……

……

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1.3.5 State FOUR possible causes of the variation in the fish population in Diagram **1** (4)

……

……

……

……..

1.3.6 Eventually, as shown in Diagram 2, lake A and B contained two different species of fish.

(a) Name the process that resulted in the fish population becoming two different species. (1)

……

……

(b) Explain how the new species was formed using the above diagram (6)

……

……

……

……

……

……

……

……. **(16)**

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HUMAN EVOLUTION

Activity 4

4.1. There are different explanations for evolution.

4.1.1 Describe the TWO laws used by Lamarck to explain evolution. (4)

……

……

……

……

4.1.2 Describe punctuated equilibrium. (4)

……

……

……

……

4.1.3 Tabulate TWO differences between artificial selection and natural selection. (5)

……

……

……

…… **(13)**

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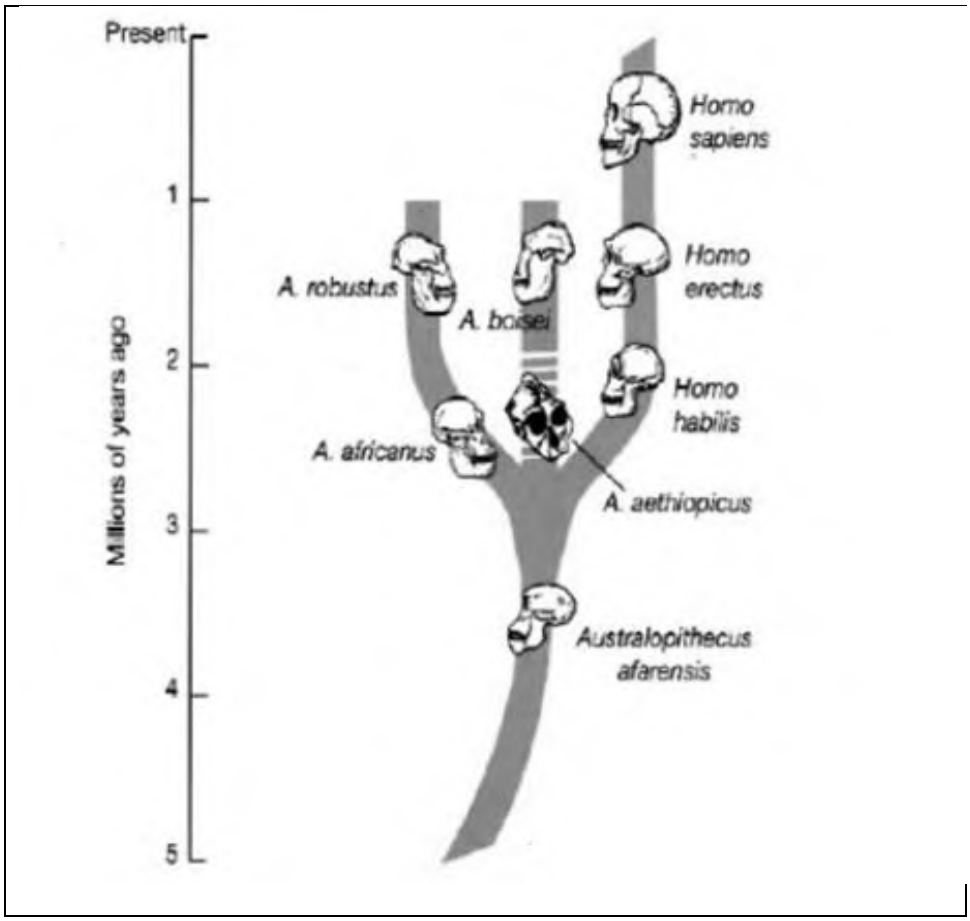
Activity 5

5.1 Study the diagram below and answer the questions below.



5.1.1 (a) What is the name given to this diagram (1)

……..

5.1.2 (a) When did Australopithecus evolved? (1)

……

(b) When did Australopithecus become extinct? (1)

……

(c) How long does *Australopithecus robustus* survived? (1)

……

(d) Which species competed with *Australopithecus boisei* for the resources? (1)

……

5.1.3 (a) Which species is more closely related to Homo sapiens? (1)

……

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(b) How many genera are involve in these diagram (1)

……

(c) How many human species are involve in this diagram (1)

……

(d) Name family for human species (1)

……

5.1.4 (a) Which of the hominids in the diagram above is considered to have been the first to use tools? (1)

……

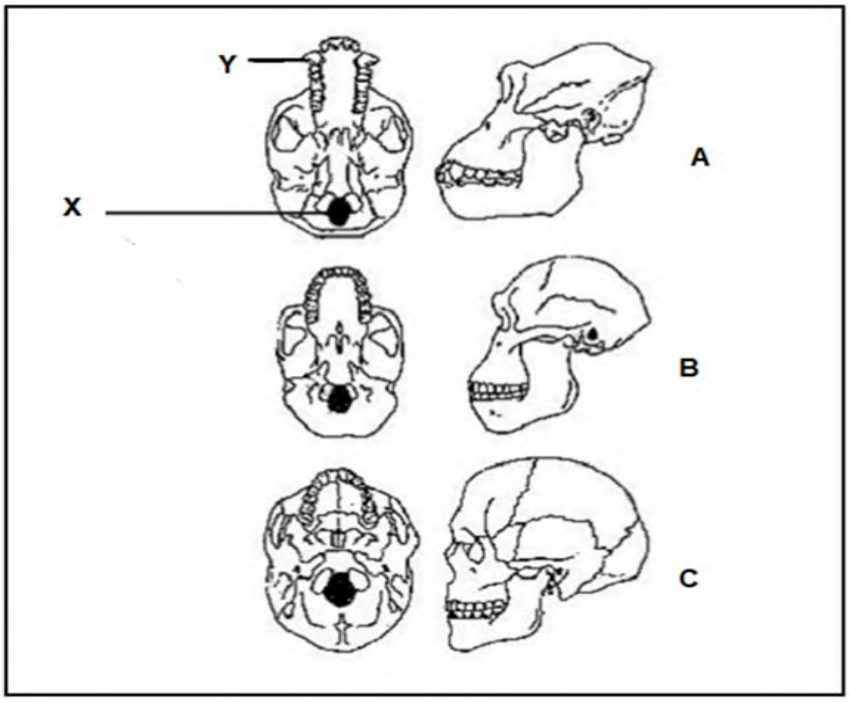
(b) Name TWO Australopithecus fossils found in South Africa.

…… (2)

(12)

Activity 6

6.1 Study the diagram below and answer the questions that follow.



6.1.1 Label part **X** and the type of teeth at **Y**. (2)

……

……

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6.1.2 Explain the significance of the location of the structure **X** in organism **C**. (3)

……

……

……

6.1.3 Which of the skulls (**A**, **B** or **C**) belongs to:

(a) An Australopithecine (1)

……

……

(b) A quadrupedal primate (1)

……

……

6.1.4 Describe the significance of the shape of each of the following as a trend in human evolution:

Shape of the spine (2)

……

……

Shape of the pelvis (3)

……

……

(12)

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ESSAY QUESTION

Activity 7

7.1

The formation of new species contributes to an increase in biodiversity.

Describe how speciation occurs through geographic isolation and describe FOUR reproductive isolating mechanisms that keep species separate by completing the missing words.

SPECIATION

7.1.1 **Speciation due to a geographical barrier**

- Speciation – population split by a_____ (river, landslide, mountains, volcanoes) – geographic isolation.
- The population will split up into two groups, cannot_____, no gene flow.
- Each group adapts to the _____factors/develops separately.
- Each group undergoes natural selection _____ as environmental conditions are different.
- Each group may become _____ and phenotypically different, which might prevent them from _____/ become reproductively isolated leading to the formation of a new _____ - speciation has occurred.

7.1.2 **Reproductive isolation**

- Reproductive isolation mechanisms isolate the gene pool of a species resulting in the formation of new species.
- Examples of reproductive isolation mechanisms_____ at different times of the year – seasonal isolation.
  - Species-specific _____ behaviour (animals) – behavioural isolation.
  - Prevention of fertilisation – gamete isolation or mechanical isolation – _____ offspring (e.g. mules, 63 – cross between a horse, 64, + a donkey, 62).
  - Cross-species hybrid, liger (cross between a lion + a tiger).
  - Adaptation to _____ _____ (plants) – no cross pollination (see diagram