



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

CURRICULUM GRADE 10-12 DIRECTORATE

NCS (CAPS)

LEARNER SUPPORT DOCUMENT

GRADE 10



LIFE SCIENCES

JUST IN TIME

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TOPIC: Chemistry of Life**Activity 1**

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

No.	Description	Biological Term
1.1	The smallest building blocks of matter	
1.2	A substance made up of only one type of atoms	
1.3	A substance made up of two or more elements chemically joined together	
1.4	The name given to a substance containing the elements Carbon, Hydrogen and Oxygen	
1.5	Substances that are protein in nature and help speed up chemical reactions in living cells.	
1.6	Condition caused by deficiency of Iodine in the diet	
1.7	Element required to form part of haemoglobin molecule in blood	
1.8	An element that is a constituent of cell membranes and ATP	
1.9	A condition in humans caused by deficiency of calcium in the diet.	
1.10	The collective name for the simplest single sugars	
1.11	Monomers or building blocks of proteins	
1.12	Made up of fatty acids and glycerol	
	(14 x 1)	(14)

Activity 2

- 2 The table below shows the nutritional value of a certain brand of breakfast cereal.

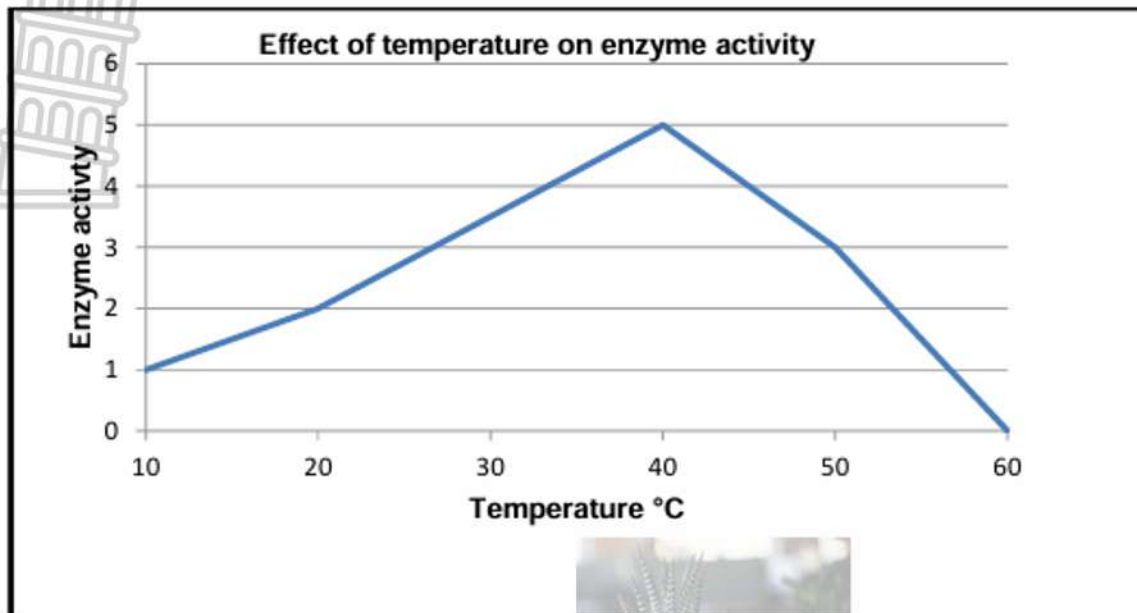
**NUTRITIONAL COMPOSITION OF CEREAL**

Ingredients	Nutritional Information (Values per 100 g)	
Whole rolled oats, roasted wheat flakes, cane syrup, brown sugar, vegetable oil, sun-dried raisins	Energy	2 000 kJ
	Protein	12,5 g
	Carbohydrates	50 g
	Fats	12,5 g
	Fibre	25 g
	Cholesterol	0 mg

- 2.1 Name the organic compound that has the most nutritional value. (1)
- 2.2 Explain ONE advantage of this cereal having no cholesterol. (2)
- 2.3 The total energy value of a 100g cereal is 2 000 kJ. The boy requires 5 500kJ of energy per day. How many grams (g) of cereal does he need to eat in order to obtain this energy (assuming that he does not eat any other foods)? Show your working. (3)
- 2.4 Draw a pie chart to illustrate the relative proportions of protein, carbohydrate, fats and fibre of this 100 g of cereal. (6)
- (12)

Activity 3

3. The graph below shows the effect of temperature on enzyme activity.

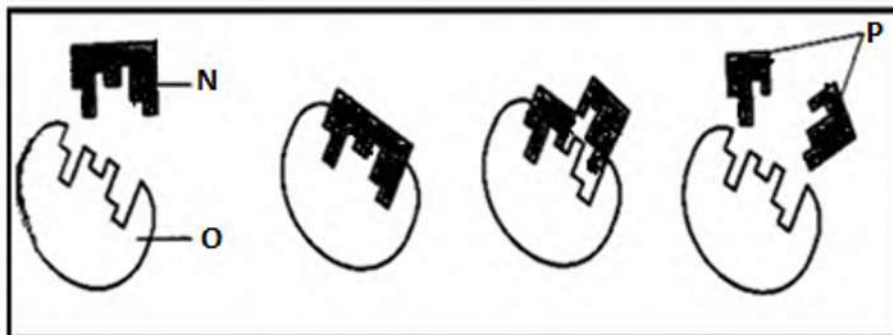


- 3.1 Identify the dependent variable in the above investigation. (1)
- 3.2 State the optimum temperature for this enzyme. (1)
- 3.3 What is the effect of exceeding the optimum temperature stated in QUESTION 3.2? (2)
- 3.4 Explain why the enzyme represented in the graph could be from a human body. (2)
- (6)

Activity 4

4

The diagrams below show the action of an enzyme



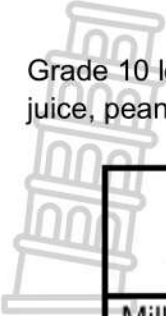
- 4.1 State the property of enzymes that is illustrated in the above diagrams. (1)
- 4.2 Identify parts labelled:
- (a) **N** (1)
 - (b) **O** (1)
 - (c) **P** (1)
- 4.3 Describe the mechanism of enzyme action as represented by the diagrams above. (4)



(8)
[14]

Activity 5

- 5 Grade 10 learners carried out three different food tests to investigate the composition of apple juice, peanuts and beans. The table below shows the results obtained from the investigation.



Chemical Reagent	Food types		
	Apple juice	Peanuts	Beans
Millon's reagent	Negative	Positive	Positive
Benedict's/ Fehling's A and B solution	Positive	Negative	Negative
Ether/ethanol solution	Negative	Positive	Positive

5.1 State the chemical reagent used to test for proteins in this investigation. (1)

5.2 State the observed colour of Benedict's / Fehling's solution A and B when the results were negative on peanuts and beans. (2)

5.3 Explain why a 100m sprinter may be advised to drink a glass of Apple juice before the race. (2)



(5)

Topic: Cell - The basic unit of life

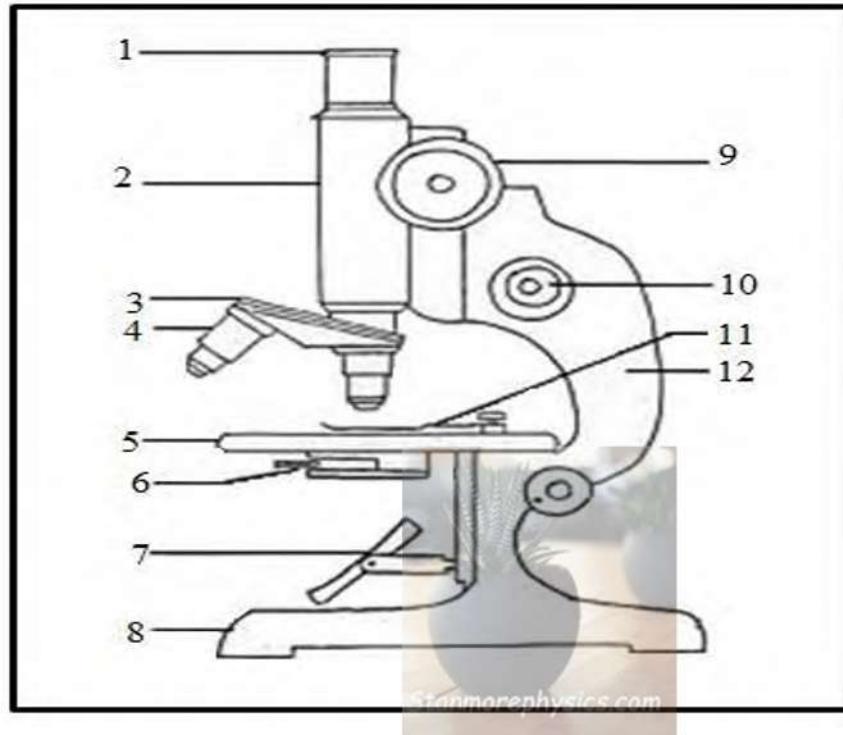
Activity 1

Give the correct **biological term** for the description given below

No.	Description	Biological Term
1.1	A basic unit of life	
1.2	An organelle in a cell that contains digestive enzymes	
1.3	The membrane around a plant vacuole	
1.4	An organelle that controls all the activities of a cell	
1.5	A structure that provides plant cells with support	
1.6	The movement of water molecules from a region of higher water potential to a region of lower water potential across a semi-permeable membrane.	
1.7	A liquid consisting of water, mineral salts, sugars and amino acids within a vacuole	
1.8	The movement of substances from a region of high concentration to that of low concentration	
1.9	A model that describes the structure of a cell membrane as a fluid structure with various protein and carbohydrate components diffusing freely across the membrane	
1.10	An organelle in a cell that releases chemical potential energy (ATP) for the cell during cellular respiration	
1.11	An organelle in a plant cell that mainly stores starch	
1.12	The transport of molecules in which energy is needed	
1.13	The state of a cell once it has developed unique characteristics and abilities to perform a specific role within the organism	
1.14	The liquid component of the nucleus	
1.15	The process by which cells become specialised in order to perform different functions	
1.16	A picture of a cell or organelle taken under a microscope	
	(16 x1)	(16)

Activity 2

- 2 The diagram below shows a diagram of a microscope.



2.1 Give the NUMBER and the NAME of the part of the microscope that:

- (a) helps to bring an object sharply into focus (2)
- (b) contains clips to prevent the slide from moving (2)

2.2 State ONE function of part 4. (1)

2.3 Name the person that came up with the cell theory which states that all cells arise from pre-existing cells. (1)

2.4 Calculate the overall magnification of a compound microscope with the magnification of 10x due to the eye piece and a magnification of 40x due to the objective lens. Show your working. (2)

(8)

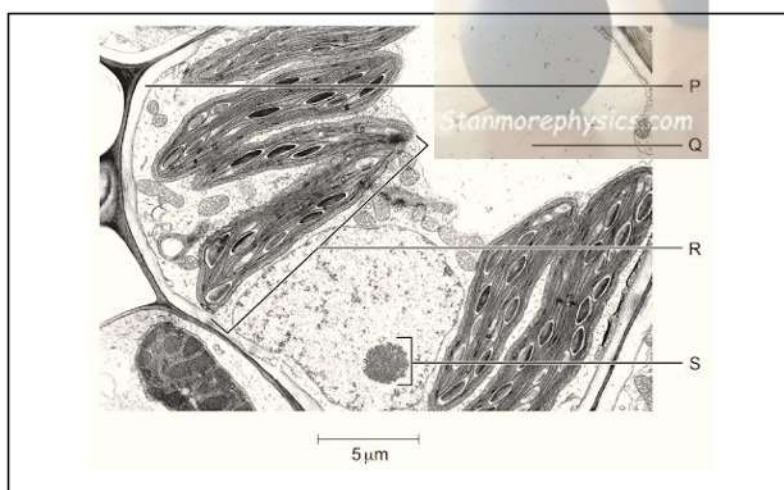
Activity 3

- 3 Complete the following table by writing down only the question numbers (3.1 to 3.7) in your ANSWER BOOK.

Cell organelle	Function	Found in plants only/animals only/both
Golgi apparatus	3.1	Both
3.2	Cellular respiration	3.3
Chloroplasts	3.4	3.5
Leucoplasts	3.6	3.7

(7)**Activity 4**

4. The diagram below shows an electron micrograph of a particular cell



- 4.1 State whether the micrograph represents a plant or an animal cell. (1)
 4.2 State TWO observable reasons for your answer. (2)
 4.3 Tabulate THREE differences between a plant and an animal cell. (7)
 4.4 Draw a fully labelled diagram of a nucleus. (4)
 4.5 Calculate the actual size of structure labelled **S** in μm , using the formula:

$$\text{Actual size} = \frac{\text{measured length of an object (mm)} \times \text{the scale line (}\mu\text{m)}}{\text{measured length of a scale line (mm)}}$$

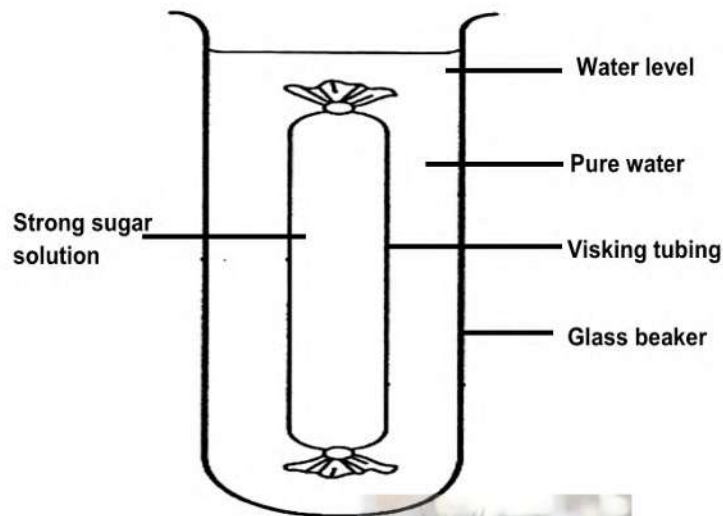
(2)

- 4.6 Explain what would happen to the above cell if it is placed in a solution with a higher concentration of salt

(4)**(20)**

Activity 5

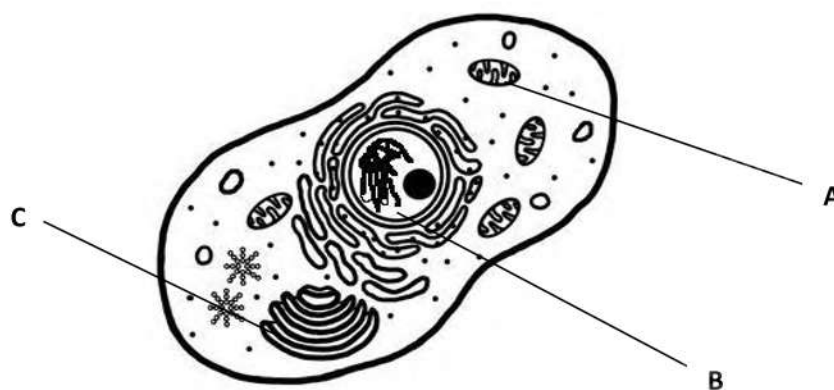
- 5 Grade 10 learners set up the apparatus as shown below to demonstrate the movement of water. Visking tubing acts as a semi-permeable membrane.



- 5.1 Name the process that is shown in the investigation above. (1)
- 5.2 Give a reason for your answer in QUESTION 5.1 (1)
- 5.3 Name the part of the cell that is represented by the visking tubing (1)
- 5.4 Describe the movement of water at the end of this investigation. (1)
- (4)**

Activity 6

- 6 The diagram below represents a cell structure



- 6.1 Identify the type of cell shown in the diagram. (1)
- 6.2 Give the LETTER and the NAME of the part that:
- (a) contains the hereditary material (2)
 - (b) secretes, packages and distributes various organic molecules around the cell (2)
- 6.3 State the function of part labelled A (1)
- (6)**

Topic: Cell Division: Mitosis

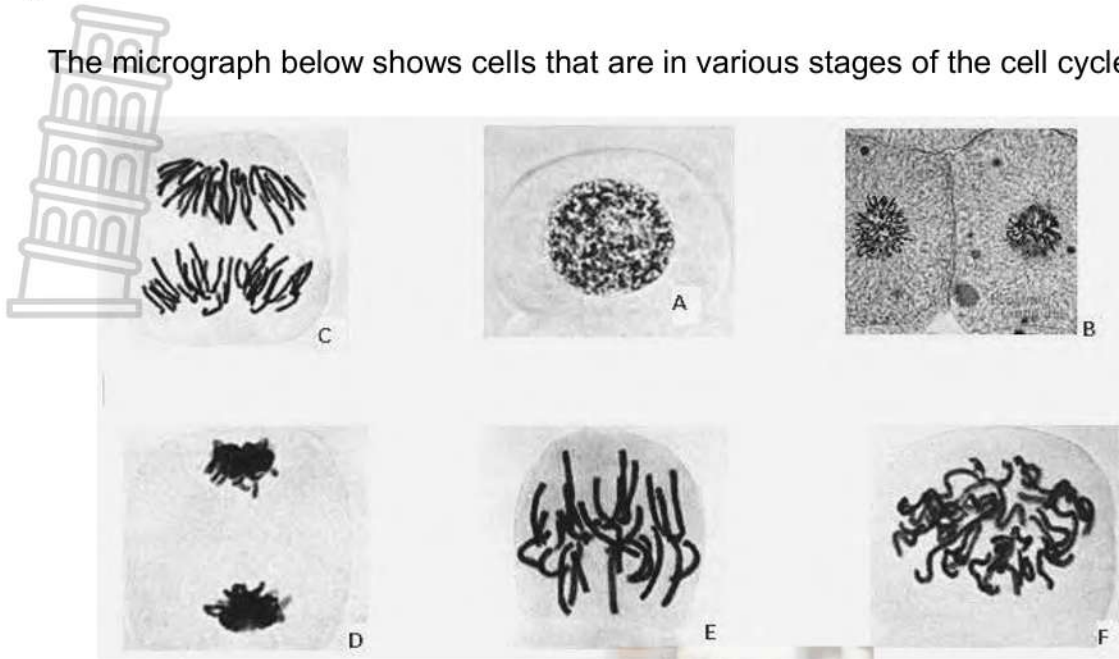
Activity 1

Give the correct **biological term** for the description given below

No.	Description	Biological Term
1.1	The phase in mitosis that results in two identical cells	
1.2	The division of the cytoplasm	
1.3	The process in which a DNA molecule forms an identical copy of itself	
1.4	Cell division that produces two identical daughter cells	
1.5	The growth or tumour that forms because of uncontrolled mitosis	
1.6	A part of a chromosome that attaches the two chromatids together	
1.7	An organelle that forms spindle fibres	
1.8	One of the two identical halves of chromosomes that are replicated in preparation for cell division	
	Stanmorephysics.com	(8X1) (8)

Activity 2

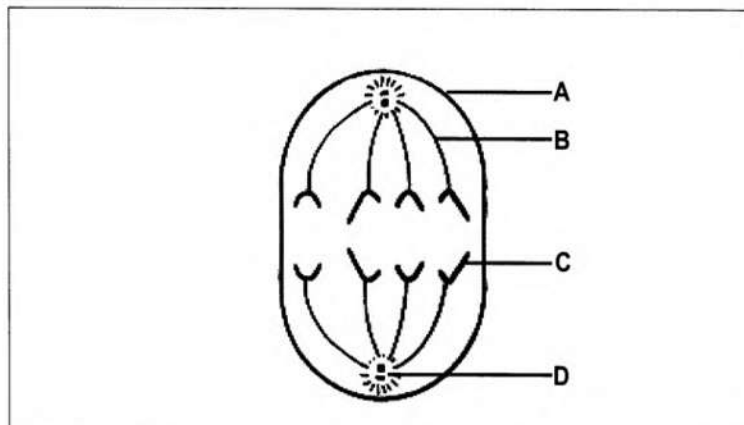
2 The micrograph below shows cells that are in various stages of the cell cycle.



- 2.1 State whether the cells above belong to an animal or plant cell. (1)
- 2.2 Give ONE observable reason for your answer to QUESTION 2.1. (1)
- 2.3 Name the phase of mitosis represented by: (1)
- (a) **B** (1)
- (b) **C** (1)
- (c) **E** (1)
- 2.4 Tabulate ONE difference on the telophase of a plant and an animal cell (3)
- 2.5 Draw a diagram of phase C if the original cell contained TWO chromosomes. (3)
- (11)**

Activity 3

- 3 The diagram below shows a phase of mitosis.



- 3.1 Name the phase shown above. (1)
- 3.2 Give TWO visible reasons for your answer in QUESTION 3.1. (2)
- 3.3 Identify part:
- (a) **A** (1)
- (b) **B** (1)
- 3.4 Give the LETTER and the NAME of the part that is not present in a plant cell. (2)
- 3.5 Describe the phase of mitosis before the one shown in the diagram. (3)
- 3.6 Describe the biological importance of mitosis (3)
- (13)**

Activity 4

- 4 The table below represents the number of chromosomes in body cells of different organisms.

Organisms	Number of chromosomes
Human	46
Chicken	78
Dog	78
Horse	64
Mosquito	6

- 4.1 Name the organism with the least number of chromosomes. (1)
- 4.2 State the number of chromosomes that will be present in each cell of a horse at the end of mitosis. (1)
- 4.3 Calculate the difference between the number of chromosomes in the cell of a dog and that of a human. (2)
- 4.4 Draw a bar graph using the information above. (6)
- (10)**

Activity 5

5 Read the extract below.

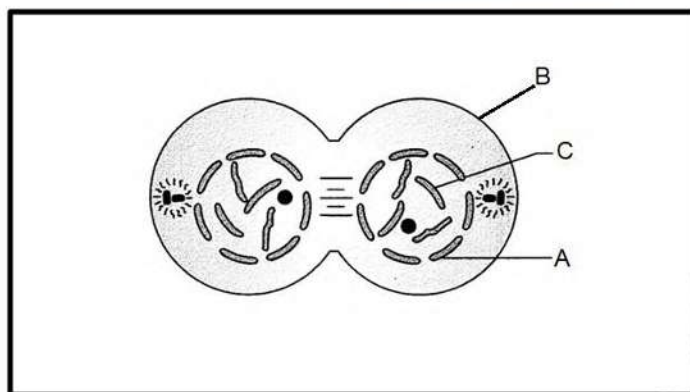
Leukemia and Bone Marrow Transplant

Leukemia, is a type of cancer which affects blood cells. This disease (as well as many others) is caused by abnormal stem cells in the bone marrow producing defective or immature blood cells. These abnormal stem cells are usually treated by chemotherapy and radiotherapy. Unfortunately, the large doses of chemotherapy required also destroy healthy bone marrow. A bone marrow transplant is necessary to replace the diseased and damaged bone marrow.

- 5.1 Define the term *cancer*. (1)
- 5.2 State: (1)
- (a) the cause of leukaemia. (1)
 - (b) the importance of bone marrow transplant. (1)
 - (c) ONE disadvantage of chemotherapy. (1)
- (4)**

Activity 6

6 The diagram below shows a phase of mitosis.



- 6.1 Identify: (1)
- (a) Part **A** (1)
 - (b) Part **C** (1)
- 6.2 State ONE function of part **B**. (1)
- 6.3 Identify the phase shown above (1)
- 6.4 Give ONE observable reason for your answer in QUESTION 6.3 (1)
- 6.5 State: (1)
- (a) The number of chromosomes that were present at the beginning of this cell division. (1)
 - (b) ONE visible feature for identifying this cell as an animal cell. (1)
- 6.6 Explain the significance of DNA replication during interphase. (2)

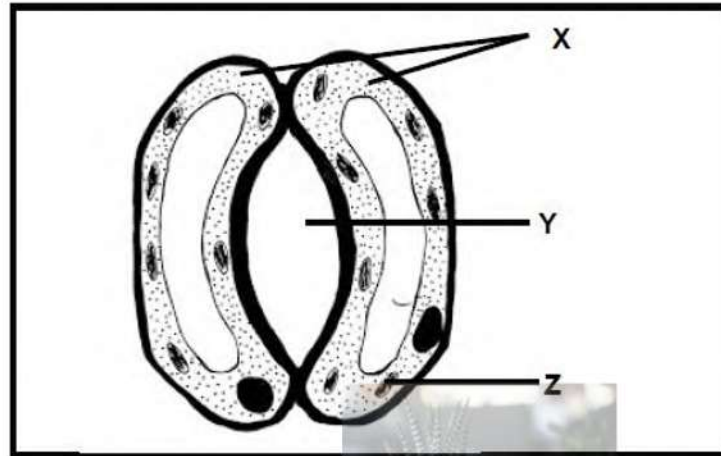
Topic: Plant tissues and Plant organs

Activity 1

No.	Description	Biological Term
1.1	Specialised cell in ciliated columnar epithelial tissue which produce mucus	
1.2	The plastids that gives red ,yellow and orange pigments to plants	
1.3	Connective tissue containing a dense network of collagen fibres	
1.4	Conducting tissue that transport manufactured food from the leaves to all part of the plant	
1.5	Plant organ that has vascular bundles arranged in a ring	
1.6	Cells formed from epidermal cells in the root to absorb water	
1.7	Transparent covering of the epidermis of the leaf	
1.8	A pore in the epidermis of the leaf surrounded by two guard cells	
1.9	Tissue in plants that conducts water and mineral salts	
1.10	A permanent tissue that lines the surfaces of the roots, stems and leaves	
	10x1	(10)

Activity 2

2 The diagram below shows a surface view of part of the epidermal tissue in a leaf



2.1 Identify the tissue

- (a) X (1)
- (b) Y (1)
- (c) Z (1)

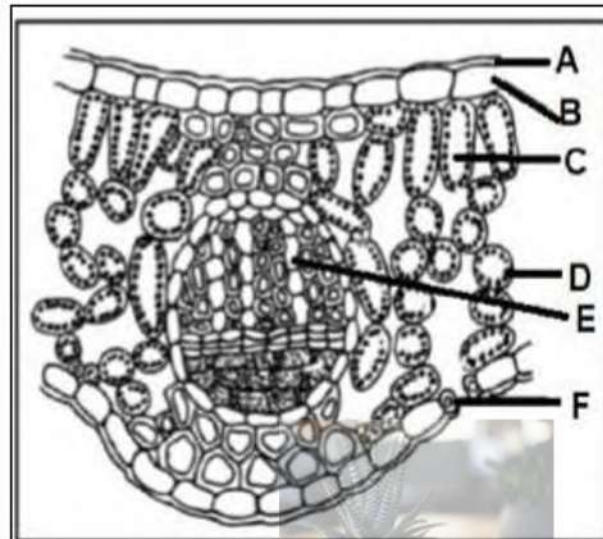
2.2 Name ONE process occurring at Z (1)

2.3 Explain ONE way in which the epidermal tissue of a leaf is suited for maximum absorption of light. (2)

(6)

Activity 3

3 The diagram below shows the cross section of dicotyledonous leaf



3.1 Give the LETTER of the part that

(a) transparent and impermeable to water

(1)

(b) transports water and mineral salts

(1)

3.2 Give the collective term for part C and D

(1)

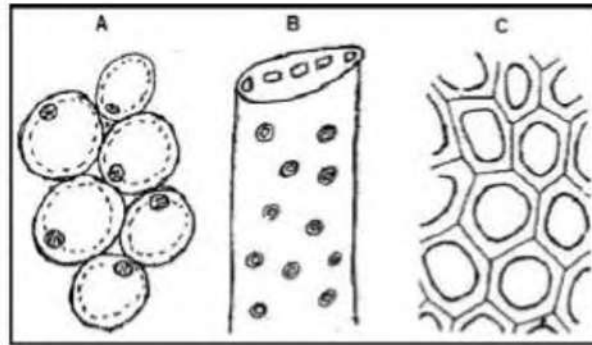
3.3 Tabulate TWO structural differences between parts B and F

(5)

(8)

Activity 4

4 The diagram below shows plant tissues:



Give the LETTER and the NAME of the tissue which:

- 4.1 (a) transports water and minerals up a plant (2)
(b) provides mechanical support to the plant (2)
- 4.2 Explain TWO ways in which tissue B is structurally suited for its function (4)
- (8)**

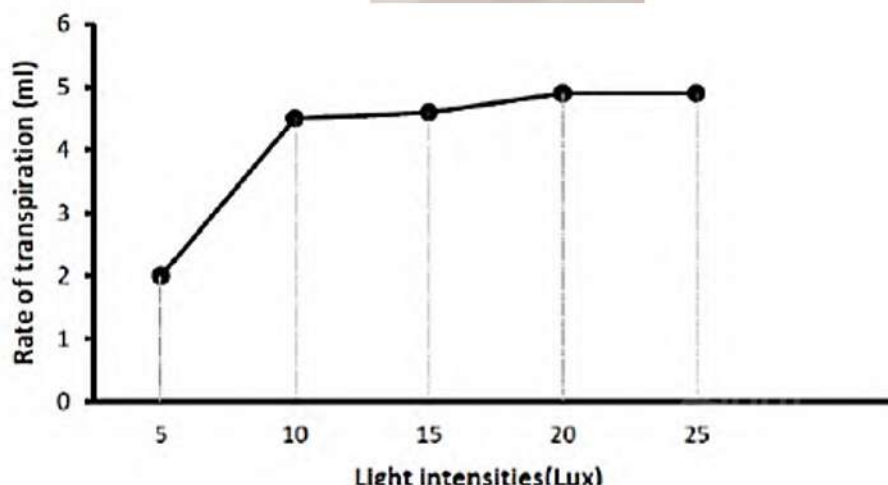
Activity 5

- 5 Grade 10 learners conducted an investigation to determine the effect of different light intensities on the rate of transpiration in leaves.

The following procedure was followed:

- 2 leafy shoot of the same plant were used
- The leafy shoots were of the same age
- The leafy shoots were then labelled leafy shoot A and leafy shoot B
- Leafy shoot A was exposed to different light intensities
- Leafy shoot B was placed in a dark area
- All others factors affecting transpiration rate were kept constant
- Potometer was used to measure the rate of transpiration in both groups
- The results of the investigation were recorded in every hour for each group

The results for leafy shoot A are shown in the graph below



5.1 Identify the:

- (a) Dependent variable (1)
- (b) Independent Variable (1)

5.2 State the effect of increasing the light intensity on transpiration rate from 0 to 5 (1)

5.3 Explain why an increase in light intensity above 10 does not increase the rate of transpiration (2)

5.4 List TWO factors affecting the rate of transpiration other than the one that was investigated (2)

5.5 Explain why group **B** was included in the investigation (2)

5.6 State the conclusion for the above investigation (2)

(11)

Activity 6

6 The extract below explains the functions of parenchyma tissue.

One of the most important functions of parenchyma cells is that of healing and repair. Parenchyma cells are unique in their meristematic nature.

Parenchyma cells, once exposed to the outside when a wound occurs, are stimulated to start dividing. The cells divide towards the wound, differentiating into the different cells. Some of the parenchyma cells on the inside of the wound remain undifferentiated and provide a source of meristematic cells in case the plant is attacked again.

6.1 Define the term meristematic tissue. (2)

From the extract above:

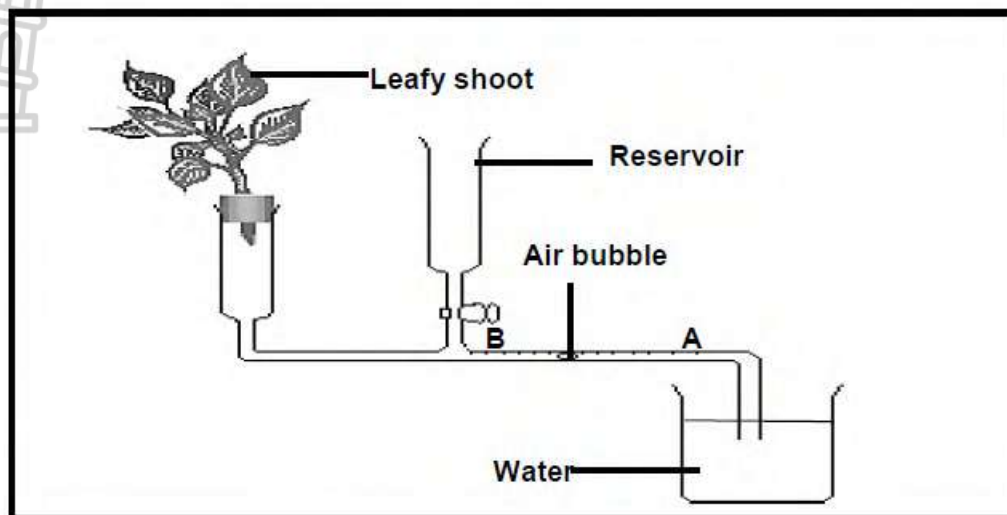
6.2 Give TWO functions of parenchyma cells. (2)

6.3 Explain why some of the parenchyma cells on the inside of the wound will remain undifferentiated. (2)

(6)

Activity 7

7 Grade 10 learners were given the set up to use as shown below.



Learners had to:

- Give the leafy shoot some time to adapt to a new environmental condition before taking readings.
- Introduce an air bubble into the capillary tubing and time how long it takes to move from point **A** to **B**.
- To repeat the procedure several times.
- Use the reservoir with the tap to move the air bubble back to point **A** before it was timed again.
- The table below shows the average results learners obtained after repeating the procedure three times.

Environmental conditions	Average time taken for air bubble to move 5 cm(seconds)
Laboratory	155
Bright light	125
Wind / fan	130
Plastic bag	160

- 7.1 State the aim of the above experiment. (2)
- 7.2 Under what condition was the rate of transpiration the lowest? (1)
- 7.3 Give ONE factor that was kept constant during the Investigation. (1)

7.4 Explain

(a) ONE precautionary measure when cutting the Leaf under water. (2)

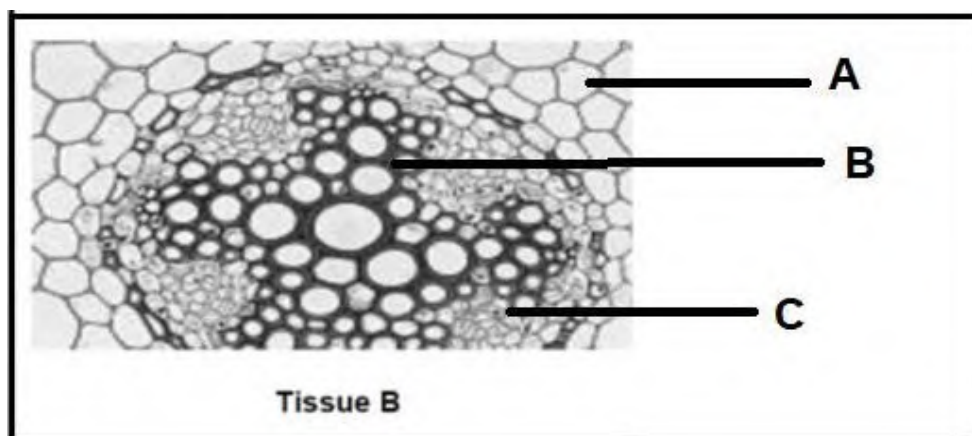
(b) What would happen when the underside of each leaf was covered with Vaseline. (3)

7.5 Draw a bar graph to represent the information on the table. (6)

(14)

Activity 8

8 The diagram below shows the structure of a transverse section through dicotyledonous root with different tissues.



Give the LETTER and the NAME of the tissue which:

8.1 (a) Transports water (2)

(b) Conducts manufactured food from the leaves to all parts of plants (2)

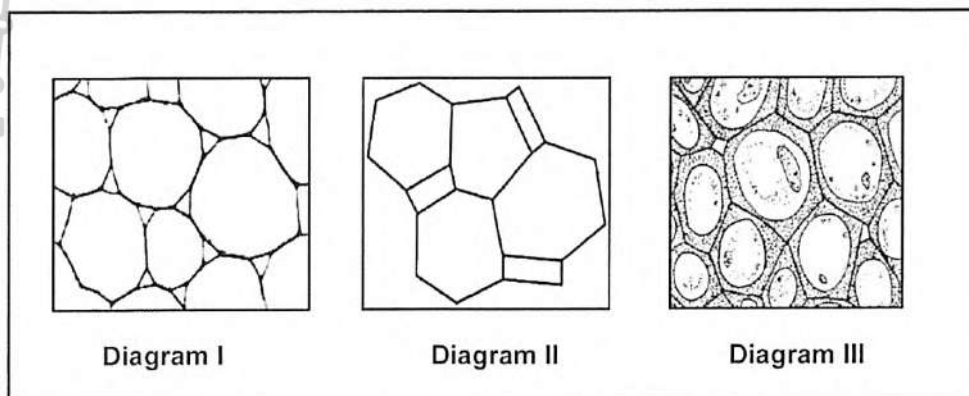
(c) Stores food in the form of starch (2)

8.2 Explain why tissue B is lignified (2)

(8)

Activity 9

9 The diagrams below represent plant tissues



9.1 Identify the tissue in:

(a) Diagram I (1)

(b) Diagram III (1)

9.2 Explain ONE consequence if the wholes of the sieve plates in the tissue in Diagram II become blocked. (2)

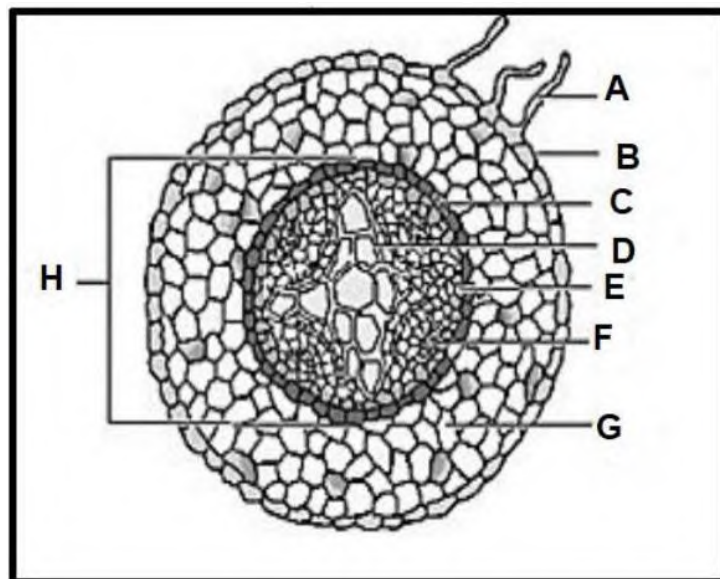
9.3 Explain TWO structural adaptations of the cells in the tissue in Diagram I (4)

9.4 Explain ONE structural adaptation of the cells in the tissue in Diagram III (2)

(10)

Activity 10

10 The diagram below shows a cross section through a dicotyledonous root.



10.1 Identify part:

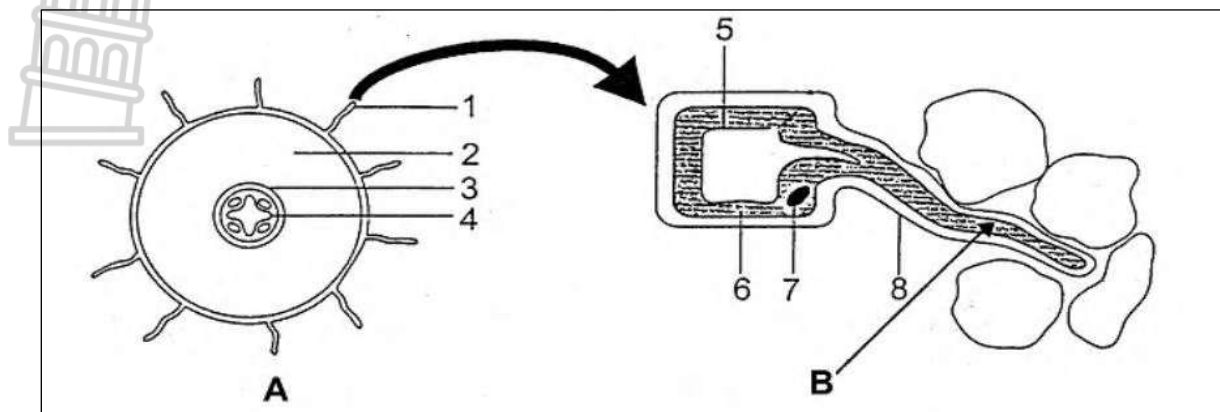
- (a) **A** (1)
- (b) **B** (1)

10.2 Give the LETTER and the NAME of the part that:

- (a) Give rise to side/lateral roots (2)
 - (b) Transports organic food in the plant (2)
 - (c) Stores starch in the root (2)
 - (d) Transport water in the plant (2)
- (10)**

Activity 11

11 The diagram below represents the plant organ



11.1 Identify organ represented by diagram A. (1)

11.2 Identify parts numbered:

(a) 2 (1)

(b) 5 (1)

(c) 8 (1)

11.3 State ONE function of parts:

(a) 3 (1)

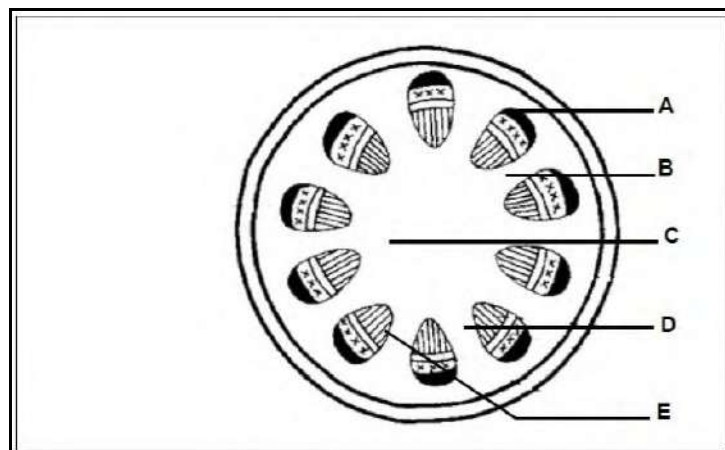
(b) 4 (1)

11.4 Explain TWO structural adaptations which enable effective functioning of part labelled 4. (4)

(10)

Activity 12

12 The following diagram represents the internal structure of the stem



12.1 Supply labels for parts **A**, **D** and **E** (3)

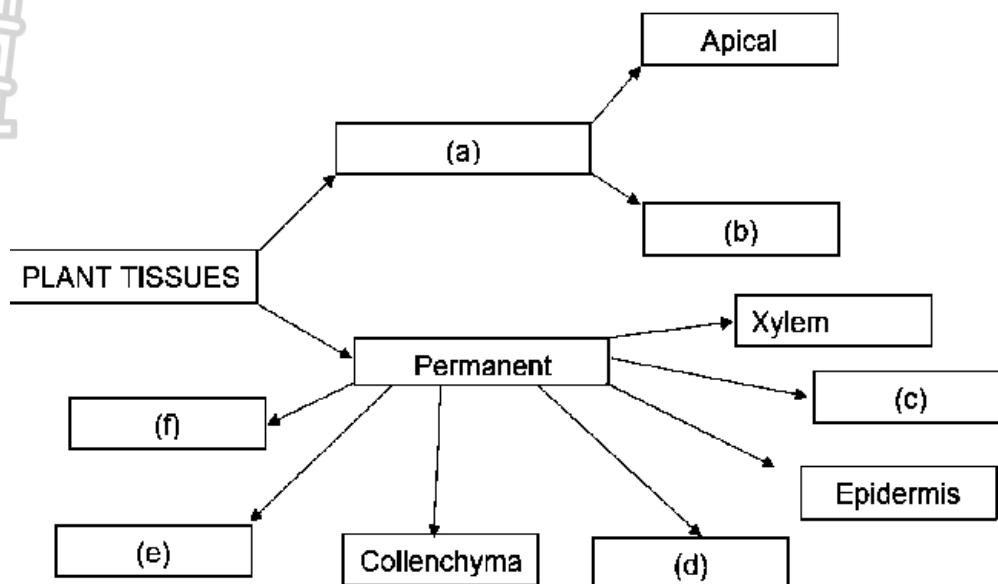
12.2 State TWO ways the above diagram represents the stem and not the root. (2)

12.3 State the function of **B** and **C** (2)

(7)

Activity 13

13 The following flow charts represents plant tissues



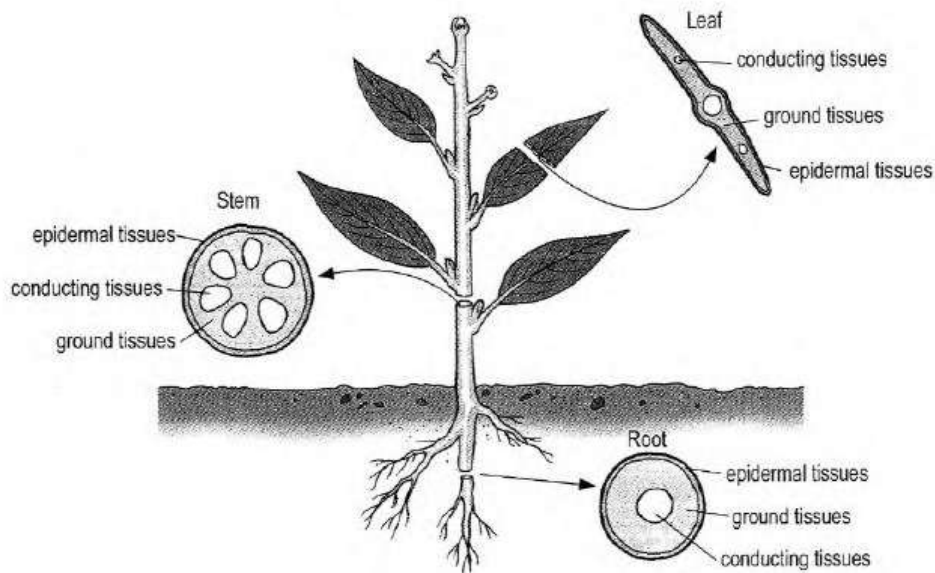
13.1 Write down letters (a) to (f) and next to each letter the correct term. (6)

13.2 Tabulate the TWO differences between apical and lateral meristematic tissues (5)

(11)

Activity 14

14 The diagram below shows the cross section of the leaf, stem and root of a plant



14.1 State.

- a) two functions of the root (2)
- b) two functions of the stem (2)

14.3 Name the TWO conducting tissues found in the plant. (2)

(6)

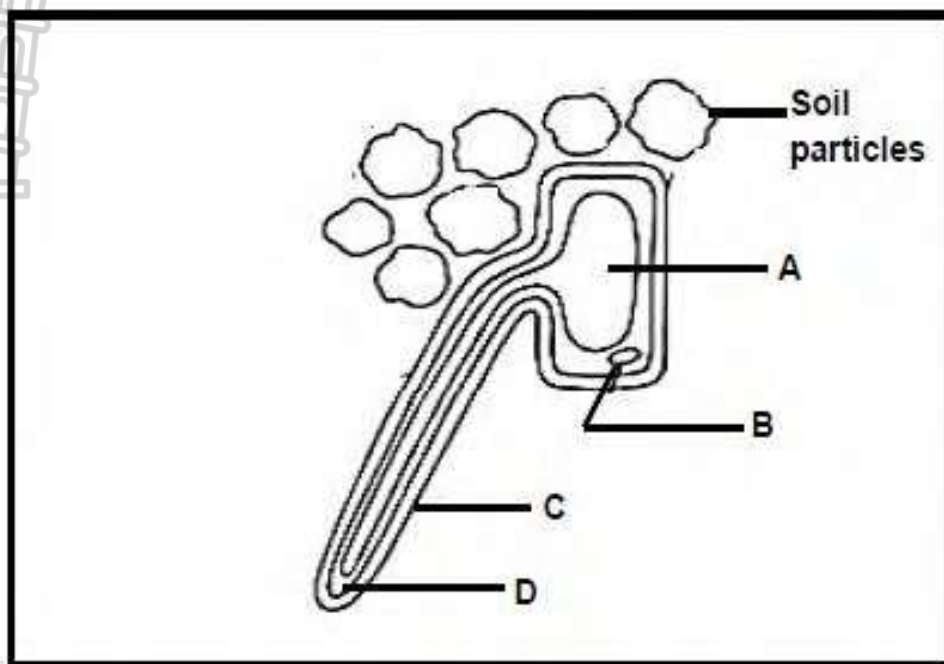
Topic: Transport and support system

Activity 1

No.	Description	Biological Term
1.1	A group of similar cells adapted for a particular function	
1.2	Movement of particles from a high to a low concentration	
1.3	Tissue in plants that conduct water and mineral salts	
1.4	Movement of water from a high concentration to a low concentration across a differentially permeable membrane until dynamic equilibrium is reached	
1.5	Apparatus used to measure the rate of transpiration	
1.6	The force that moves water into the leaf cells from the xylem vessels to replace the water lost due to transpiration	
1.7	Conducting tissue that transport manufactured food from the leaves to all parts of the plant	
1.8	Cells formed from epidermal cells in the root to absorb water	
1.9	A factor that is manipulated in an investigation	
1.10	A waterproof band found in the cell walls of the endodermis that direct water into the xylem	
	10x1	(10)

Activity 2

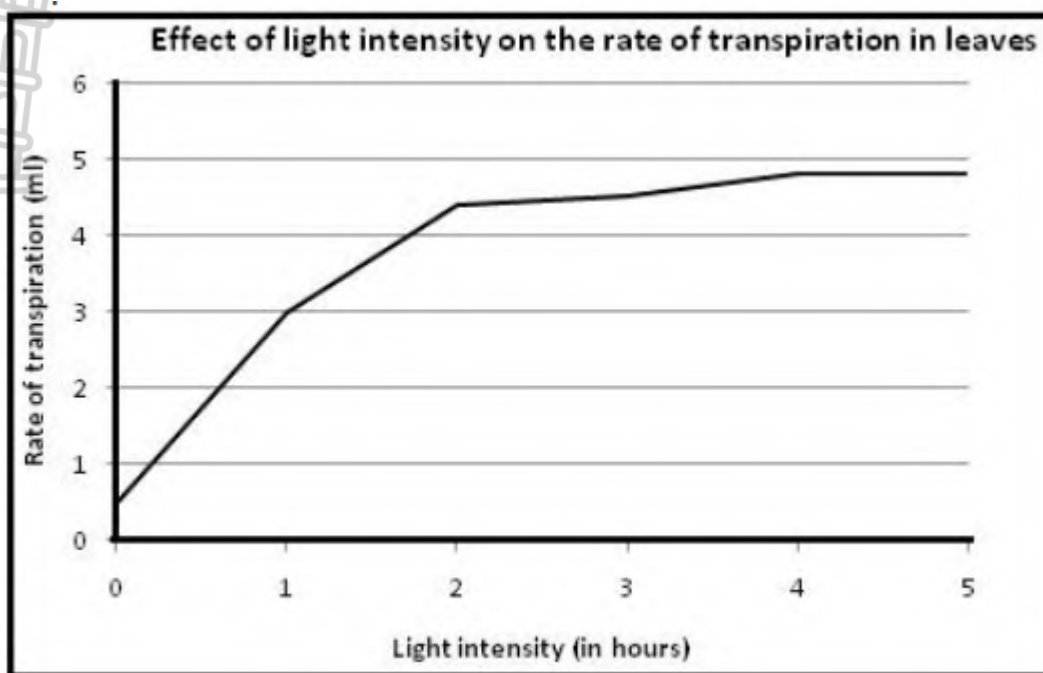
2 The diagram below shows a root hair.



- 2.1 Identify part **A** (1)
- 2.2 Give ONE function of part **B** (1)
- 2.3 Name the plant organ where the root hair is found. (1)
- 2.4 Name THREE forces that are responsible for the upward movement of water from the roots to the leaves. (3)
- 2.5 Explain: (4)
- (a) ONE difference related to permeability of part C and D. (4)
- (b) TWO ways in which the root hair cell is structurally suitable to perform its function. (4)
- (14)

Activity 3

- 3 The line graph below shows the effect of light intensity on the rate of transpiration in leaves

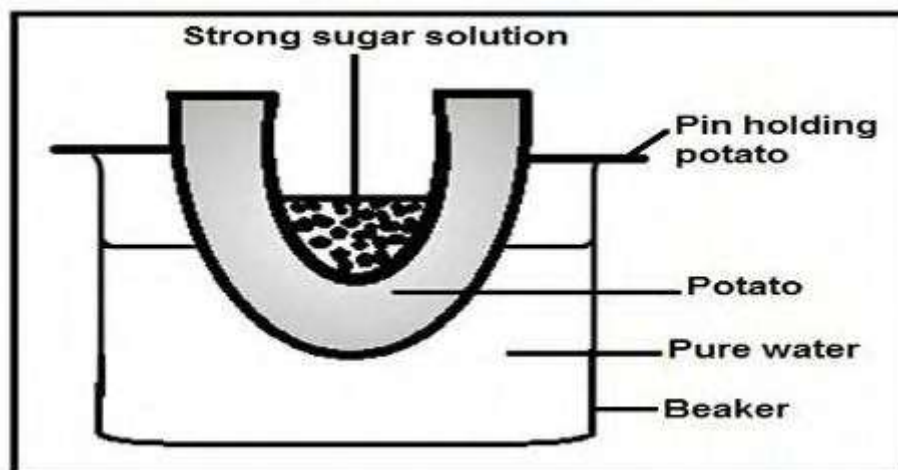


- 3.1 Identify the dependent variable in the above investigation. (1)
- 3.2 State the effect of increasing the light intensity from **0** to **2**. (1)
- 3.3 Explain why an increase in light intensity above 2 does not increase the rate of transpiration much further. (3)
- 3.4 List TWO factors that should be kept constant in the above investigation. (2)
- 3.5 Why should the factors mentioned in QUESTION 3.4. be kept constant when conducting the investigation? (1)

(8)

Activity 5

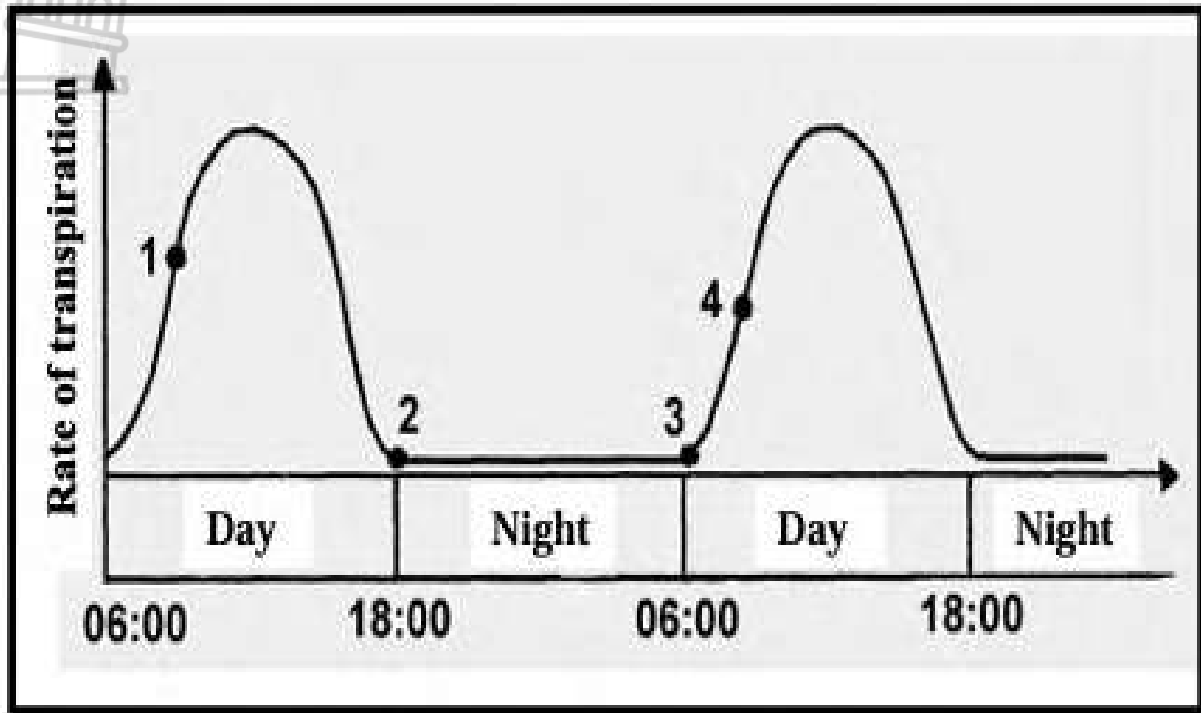
5 The diagram below shows an investigation on osmosis.



- 5.1 State ONE planning step that should be considered before undertaking such an investigation. (1)
 - 5.2 Explain the importance of the potato in this investigation. (2)
 - 5.3 List TWO observations that you would make in this investigation. (2)
 - 5.4 State TWO differences between the process investigated in the diagram above and diffusion. (4)
- (9)**

Activity 6

- 6 The graph below illustrates the rate of transpiration in a plant under conditions of light and darkness.



- 6.1 Give the numbers which will indicate:

- (a) open stomata (2)
(b) closed stomata (2)

- 6.2 Mention any ONE environmental condition in the guard cells responsible for the change at:

- (a) 4 (1)
(b) 2 (1)
(6)



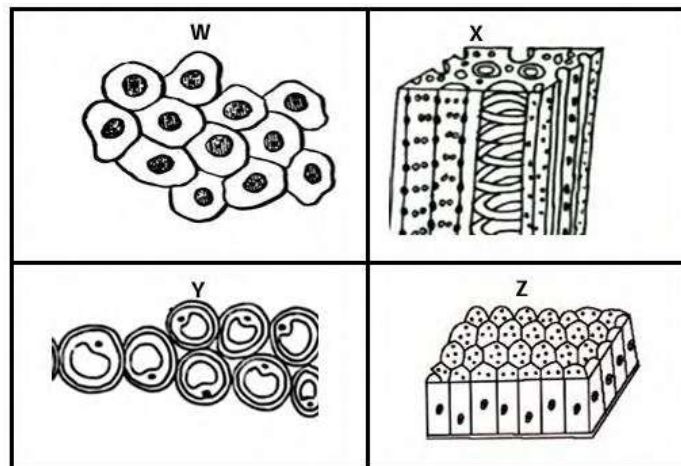
Topic: Animal tissue and support systems: Animals**Activity 1**

No.	Description	Biological Term
1.1	A neuron that transports impulses towards the central nervous system	
1.2	Undifferentiated animal cells that can become any cell in the body.	
1.3	Structure that connects a bone and muscle.	
1.4	Flattened animal cells that line the oral cavity.	
1.5	The nerve fibre that transports impulses towards the cell body.	
1.6	Finger bones.	
1.7	Protein found in the exoskeleton.	
1.8	Skeletal structure that protects the brain.	
1.9	Specialized internal, living skeleton.	
1.10	Large opening at the base of the skull through which the spinal cord emerges.	
	10x1	(10)



Activity 2

2 The diagrams below show animal and plant tissues.



2.1 Identify tissue:

(a) Y

(1)

(b) Z

(1)

2.2 Describe the structure and location of tissue

(a) W

(2)

(b) Z

(2)

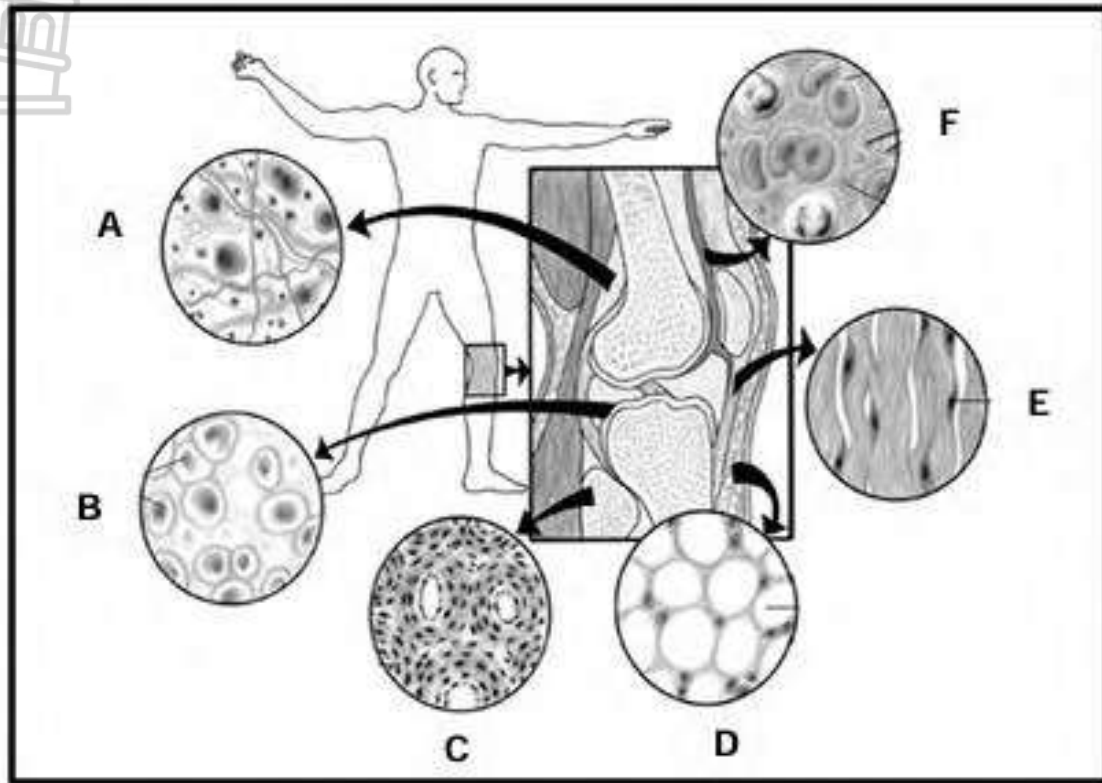
2.3 State ONE function of tissue Y.

(1)

(7)

Activity 3

- 3 The diagram below displays different types of connective tissues found in humans:



3.1 Differentiate between ligaments and tendons. (2)

3.2 Provide the LETTER of connective tissue that:

(a) Is found under the skin (1)

(b) Makes up the endoskeleton of mammals (1)

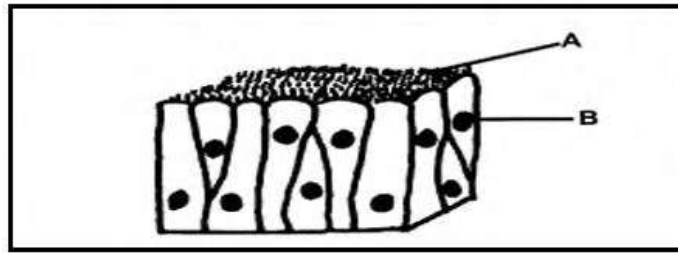
(c) Is a liquid (1)

(d) Is affected by osteomalacia (1)

(6)

Activity 4

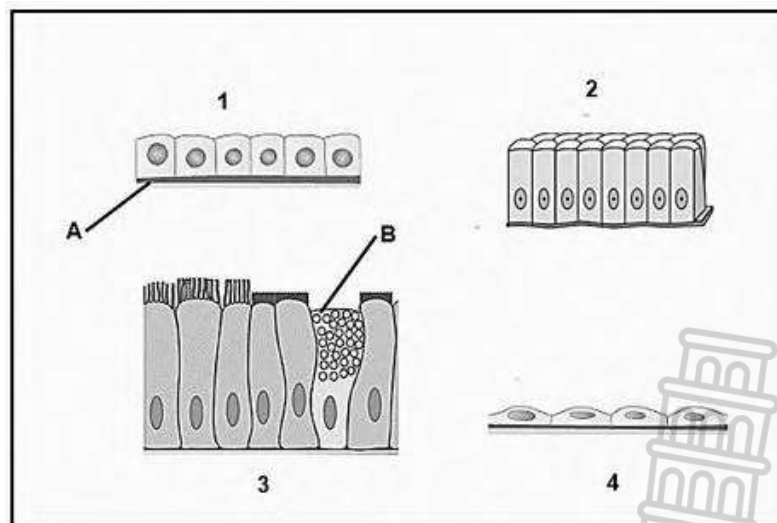
4 The diagram below shows an animal tissue



- 4.1 Identify the above tissue, (1)
 - 4.2 Label part A and B (2)
 - 4.3 Name TWO areas in the human body where the tissue is found (2)
 - 4.4 Give TWO functions of the tissue identified in QUESTION 4.1 (2)
 - 4.5 Describe ONE way in which the tissue is structurally suited for its function (2)
- (9)**

Question 5

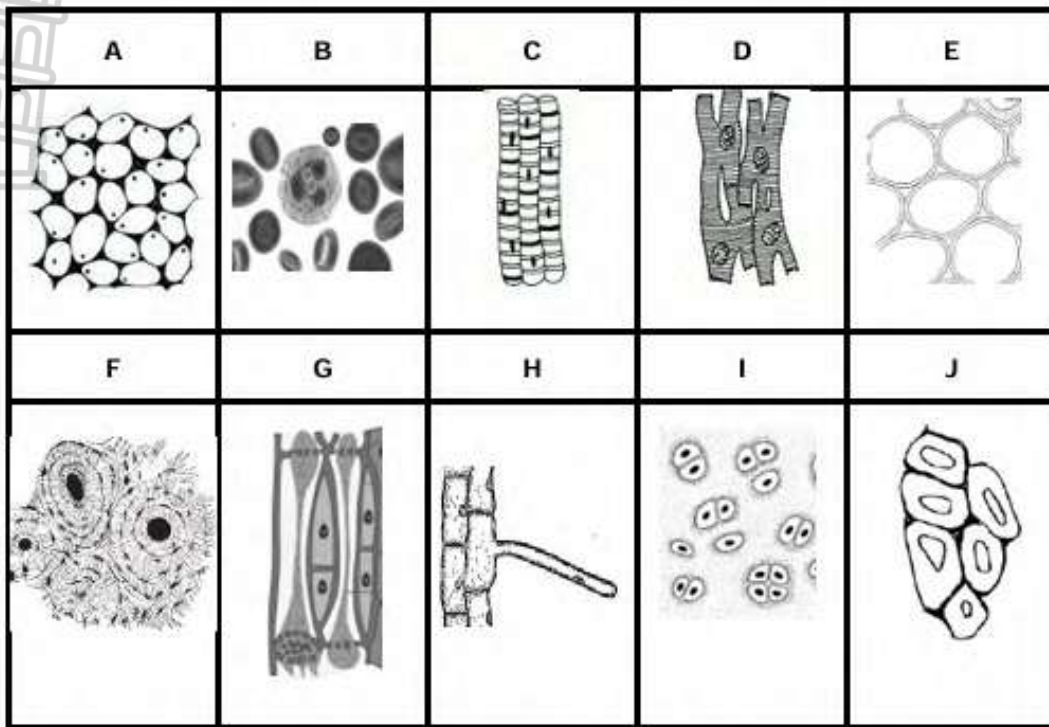
5 The diagrams below represent different epithelial tissues.



- 5.1 Identify:
 - (a) Part A (1)
 - (b) Epithelial tissue 2 (1)
 - (c) Epithelial tissue 4 (1)
 - 5.2 Give the NUMBER of the tissue that is found lining the respiratory tract. (1)
 - 5.3 Identify cell B that secretes mucus. (1)
 - 5.4 Explain the consequence if cilia in the epithelium lining respiratory passages become damaged. (2)
- (7)**

Activity 6

6 The table below contains diagrams of animal tissues and plant tissues.



6.1 Give ALL the LETTERS that represent animal tissues. (2)

6.2 Write down the LETTER of the tissue that... (1)

(a) is a fluid connective tissue. (1)

(b) forms the skeleton of mammals. (1)

(c) allows the heart to contract and relax (1)

(d) allows voluntary movement. (1)

6.3 Name the THREE types of cells that tissue **B** consists of. (3)

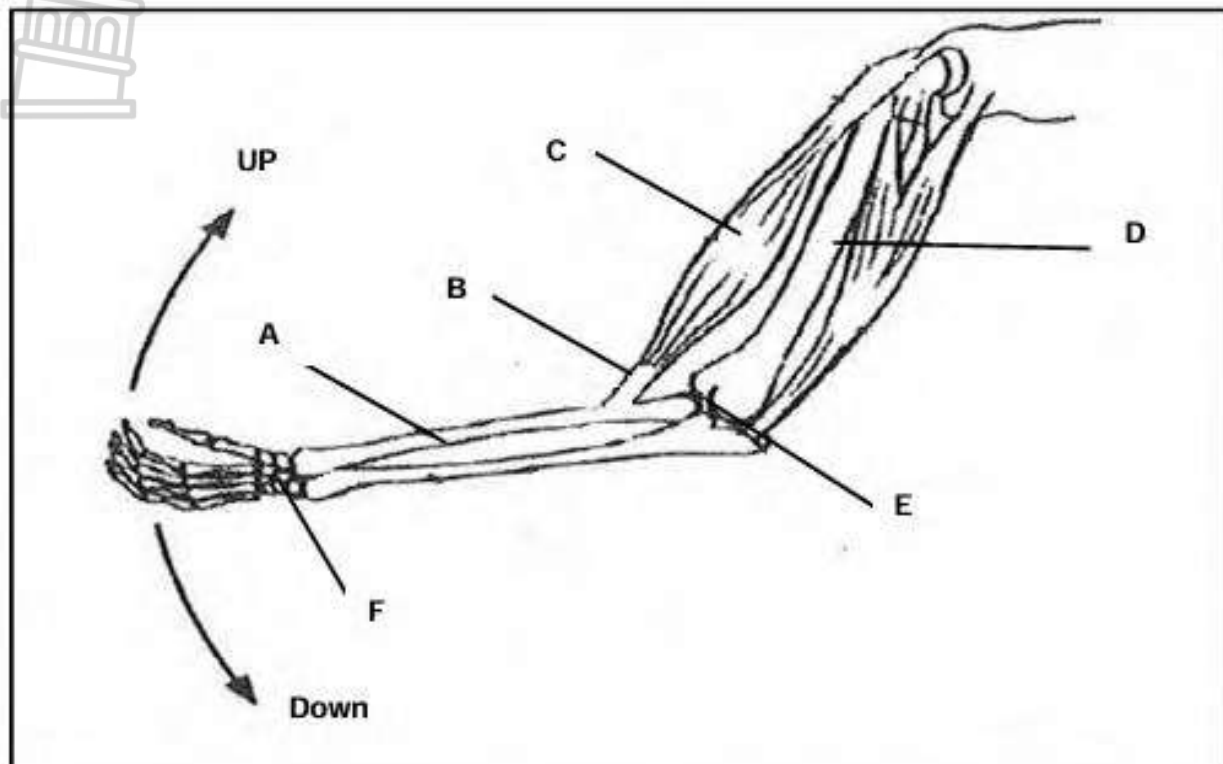
6.4 Give ONE function of:

(a) Tissue **I**. (1)

(10)

Activity 7

7 The diagram below is an illustration of the upper arm of the human body.



7.1 Identify:

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

7.2 Give the name of bones, similar to F, in the foot of the human body. (1)

7.3 Identify the tissue that:

- (a) attaches the bones at part **E.** (1)
 (b) forms part **C.** (1)

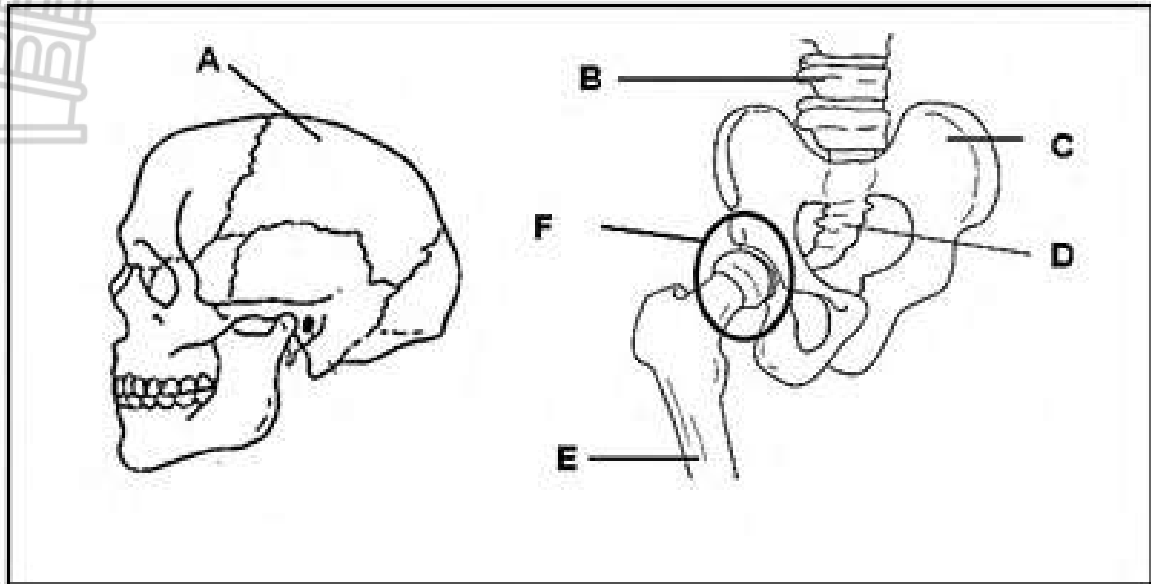
7.4 Give the function of part **B** (1)

7.5 Give FOUR functions of the skeleton. (4)

(10)

Activity 8

8 The diagram below represents the skull and pelvis.



8.1 Identify parts:

(a) **B**(vertebrae)

(1)

(b) **C**

(1)

(c) **D**

(1)

8.2. Name the bone that encloses the brain

(1)

8.3 Give TWO letters of the parts that are classified as part of the axial skeleton.

(2)

8.4 Name the opening at the base of the skull.

(1)

8.5 State the function of the part mentioned in QUESTION 8.4

(1)

(8)

Activity 9

- 9 Osteoporosis is a disorder whereby bones develop small pores and can easily break.

An investigation was conducted to determine the frequency of Osteoporosis amongst different age groups of men and women.

The investigators carried out a survey amongst 500 men and 500 women of different age groups in a certain country.

The results of the survey are shown in the table below.

AGE GROUP (years)	FREQUENCY OF OSTEOPOROSIS (%)	
	Men	Women
20-35	0	2
36-50	2	5
51-65	8	25
65-80	26	35

- 9.1 Identify the: (1)
- (a) Dependent variable (1)
- (b) The age group with the lowest frequency of Osteoporosis (1)
- 9.2 Which gender shows the higher frequency of Osteoporosis? (1)
- 9.3 Draw a bar graph to show the results of the survey. (6)
- (9)



Activity 10

- 10 A learner did an investigation in his community to determine the number of back injuries found in different age groups.

The following steps were followed during the investigation:

- 200 people were interviewed
- People of all trades were chosen
- People's results were sorted into different age groups
- The data was summarized in the table below

Age of person	Number of back injuries
Under 30	12
30 to 40	18
40 to 50	25
Over 50	45

- 10.1 Identify the: (1)
- (a) Dependent variable. (1)
- (b) Independent variable. (1)
- 10.2 Why was the data of 200 people used for the investigation? (1)
- 10.3 Describe the relationship between the age of a person and the percentage of back injuries. (2)
- 10.4 The student interviewed 200 people. How many people under 30 years of age have had a back injury? Show all your calculations. (3)
- 10.5 Draw a pie chart to illustrate the percentage of back injuries. (6)
- (14)**



Activity 11

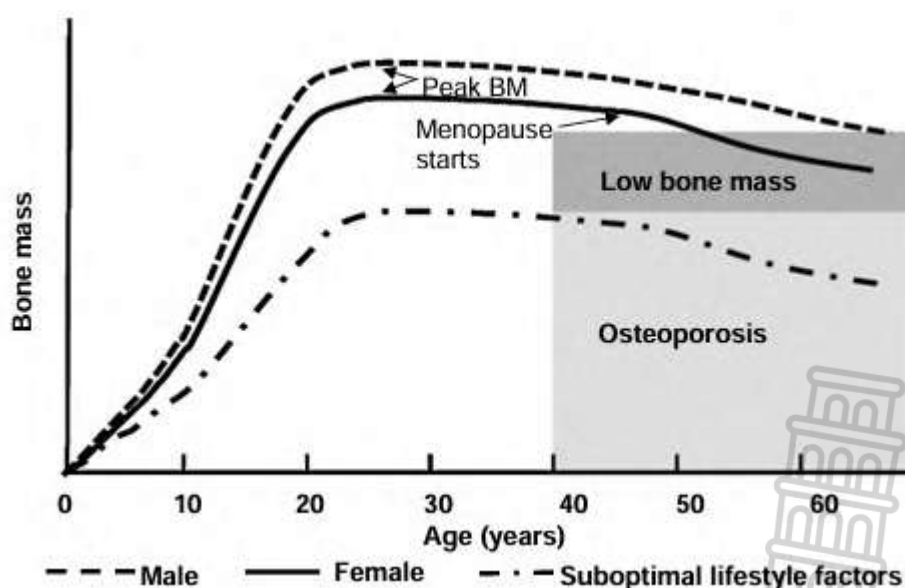
Read the following passage and answer the questions that follow.

Osteoporosis is a bone disease that results in the thinning and weakening of bones resulting in the reduction on bone mass (BM). Bones become porous and crack due to aging but can also occur due to lifestyle factors such as poor nutrition and absorption as well as lack of exercise, increasing the risk of fractures.

Other factors such as pregnancy, breastfeeding and menopause in woman can also play a role. Oestrogen is required for the formation and maintenance of bone, the excretion thereof peaks in woman of reproductive age and reduces after menopause.

The graph below illustrates bone mass acquisition to reach peak bone mass in men and woman. The impact of suboptimal lifestyle factors is also shown

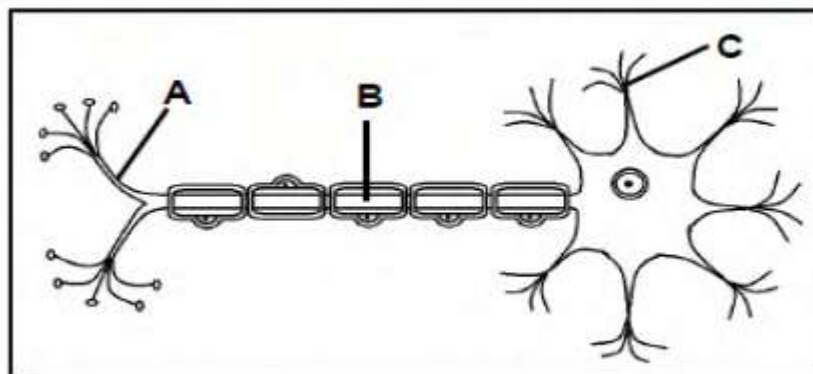
The graph below shows the relationship between age and bone mass.



- 11.1 Write down the age that: (1)
- (a) Bone mass reaches its peak (1)
- (b) Menopause starts (2)
- 11.2 From the extract define what is osteoporosis (2)
- 11.3 Give the factors listed in the extract play a role in osteoporosis. (2)
- 11.4 State the role of oestrogen according to the extract. (2)
- (8)**

Activity 12

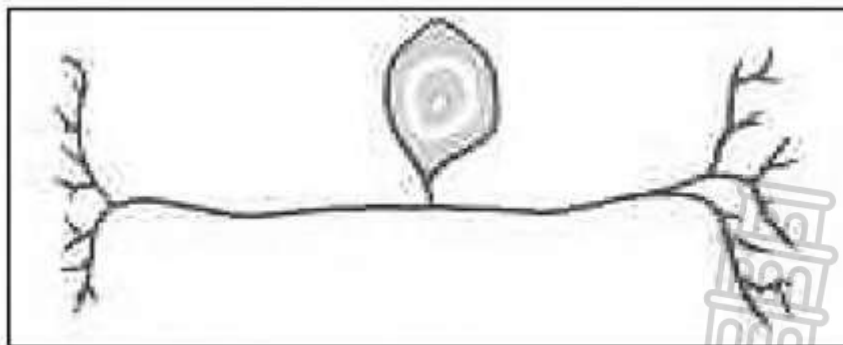
12 The diagram below represents a nerve cell.



- | | | |
|------|---|------------|
| 12.1 | Name the type of the nerve cell illustrated in the diagram. | (1) |
| 12.2 | Identify B . | (1) |
| 12.3 | Describe the function of this neuron. | (2) |
| 12.4 | Give ONE way in which part B is protected. | (1) |
| 12.5 | Explain the effect if the above nerve cell was damaged | (2) |
| | | (7) |

Activity 13

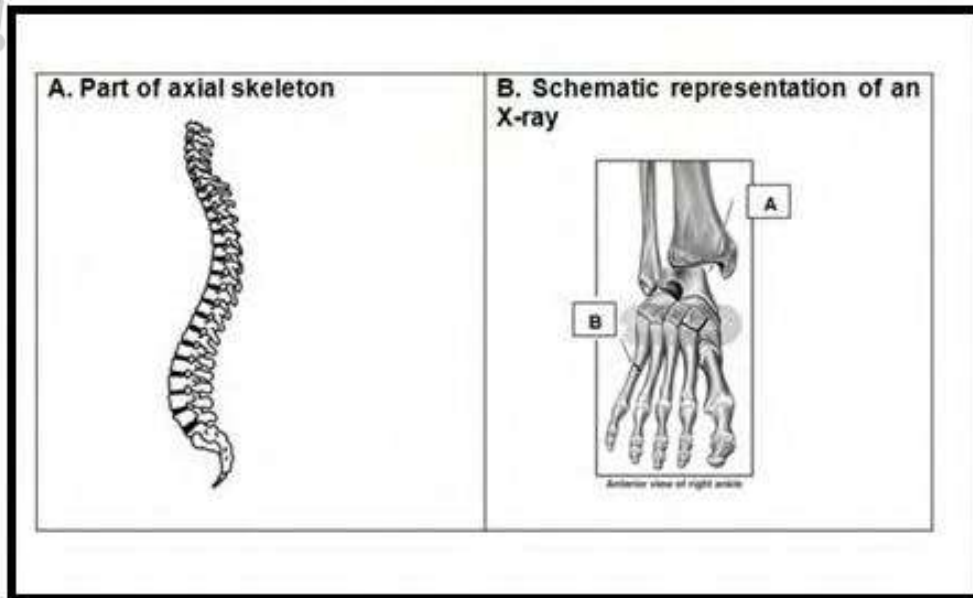
13 The diagram below represents an animal tissue.



- | | | |
|-------|---|------------|
| 13.1. | Name the type of the nerve cell illustrated above. | (1) |
| 13.2 | From the diagram above name the structure with the following function: | |
| (a) | receives and transmits impulses to the cell body | (1) |
| (b) | transmits impulses away from the cell body | (1) |
| (c) | controls and nourishes the cell | (1) |
| 13.3 | Name a part that is not shown on the above diagram that provides insulation. | (1) |
| 13.4 | Tabulate ONE functional difference between a motor neuron and a sensory neuron. | (3) |
| | | (8) |

Activity 14

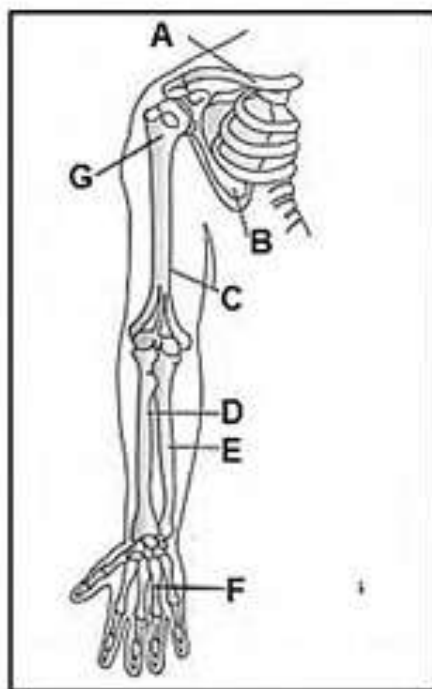
- 14 Study the diagrams below A (x-ray) and B (part of axial skeleton) and answer the questions that follow.



- 14.1 Refer to diagram B (x-ray). Name the bone that is:
- (a) broken (1)
 - (b) dislocated (1)
- 14.2 Identify the part of the axial skeleton shown in diagram **A** above. (1)
- 14.3 State the main function of the part of the skeleton identified in QUESTION 14.2. (2)
- 14.4 Name FOUR advantages of an exoskeleton. (4)
- (9)**

Activity 15

15 The diagram below shows a part of a human skeleton.



15.1 Label parts:

(a) **D**

(1)

(b) **E**

(1)

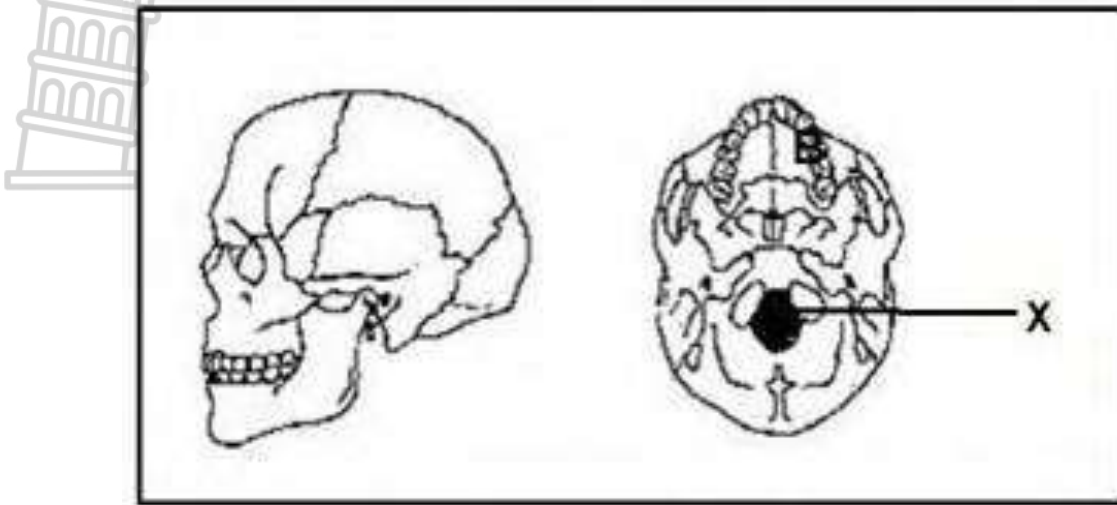
15.2 Give the LETTER/S of the part/s making up the pectoral girdle

(2)

(4)

Activity 16

16 The diagram below represents the side and ventral views of the human skull.



- 16.1 To which one of the two main sections of the skeleton do these structures belong? (1)
- 16.2 Identify the opening marked X. (1)
- 16.3 Which vertebra does this part of the skeleton articulate with? (1)
- 16.4 What is the name of the top part of the skull that houses and protects the brain? (1)
- (4)

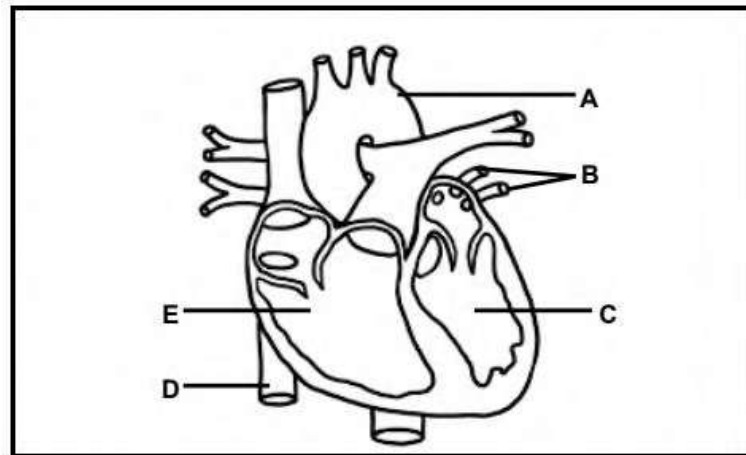
Topic: Transport in Animals

Activity 1

No.	Description	Biological Term
1.1	The upper chambers of the heart that receives blood	
1.2	The largest artery in the body, which leaves the left ventricle	
1.3	The organ in the body into which deoxygenated blood flows from the right ventricle	
1.4	The type of blood cell that transports carbon dioxide	
1.5	The double walled membrane that surrounds the heart	
1.6	The blood vessel that supplies the heart tissue with oxygen	
1.7	Relaxation of the heart muscles during the cardiac cycle	
1.8	Lower chambers of the heart	
1.9	Part of the heart that separates oxygenated and deoxygenated blood	
1.10	Chamber of the heart that pumps blood to all parts of the body	
	10x1	(10)

Activity 2

2 The diagram below shows the human heart.



2.1 Provide the LETTER and NAME of the part that:

- (a) transports oxygenated blood to the entire body (2)
- (b) has a thick wall to pump blood with increased pressure to the body (2)
- (c) carries blood from the lower part of the body to the heart (2)

2.2 Describe the difference in the type of blood found in part **E** and part **C** (2)

2.3 Part **B** enters into the right atrium of the heart.

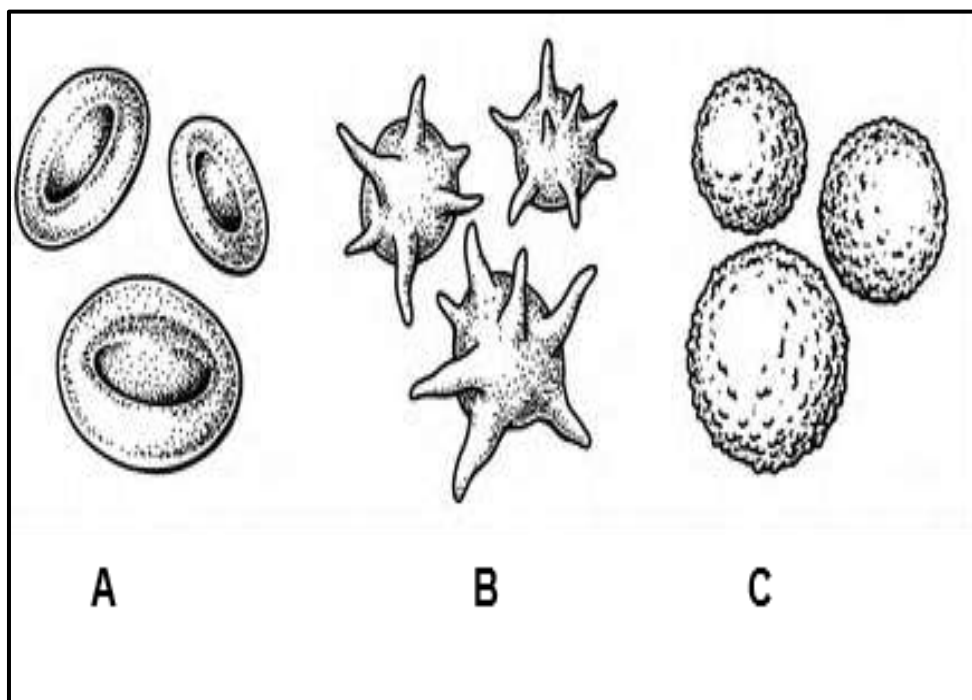
- (a) Where does part B come from? (1)
- (b) What type of blood does part B contain? (1)

2.4 Explain what would happen if the tissue in part **C** were to die. (2)

(12)

Question 3

- 3 The diagrams **A**, **B** and **C** represent blood cells. Diagram **A** represents red blood cells, Diagram **B** represents platelets and Diagram **C** represents white blood cells.



3.1 What is the function of:

- (a) Blood cell **A** (1)
- (b) Blood cell **B** (1)
- (c) Blood cell **C** (1)

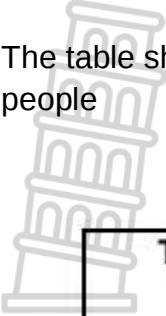
3.2 Name the pigment found in blood cell **A**. (1)

3.3 Explain what would happen if blood cell **A** were irregularly shaped. (3)

(8)

Activity 4

- 4 The table shows the composition of the types of blood cells per mm^3 of blood in three people



Types of blood cells	Number of blood cells per mm^3 blood in three people		
	Nceba	Zhandalee	Vastheek
Erythrocytes (red blood cells)	8 350 000	2 200 500	6 000 500
Leucocytes (white blood cells)	580	6 950	5 300
Thrombocytes (blood platelets)	247 500	258 000	175

4.1 Identify the person:

- (a) who is most immune to infections (1)
- (b) who is mostly likely to lose a lot of blood from an injury (1)
- (c) who is most easily infected, having a low immune system (1)

4.2 Calculate:

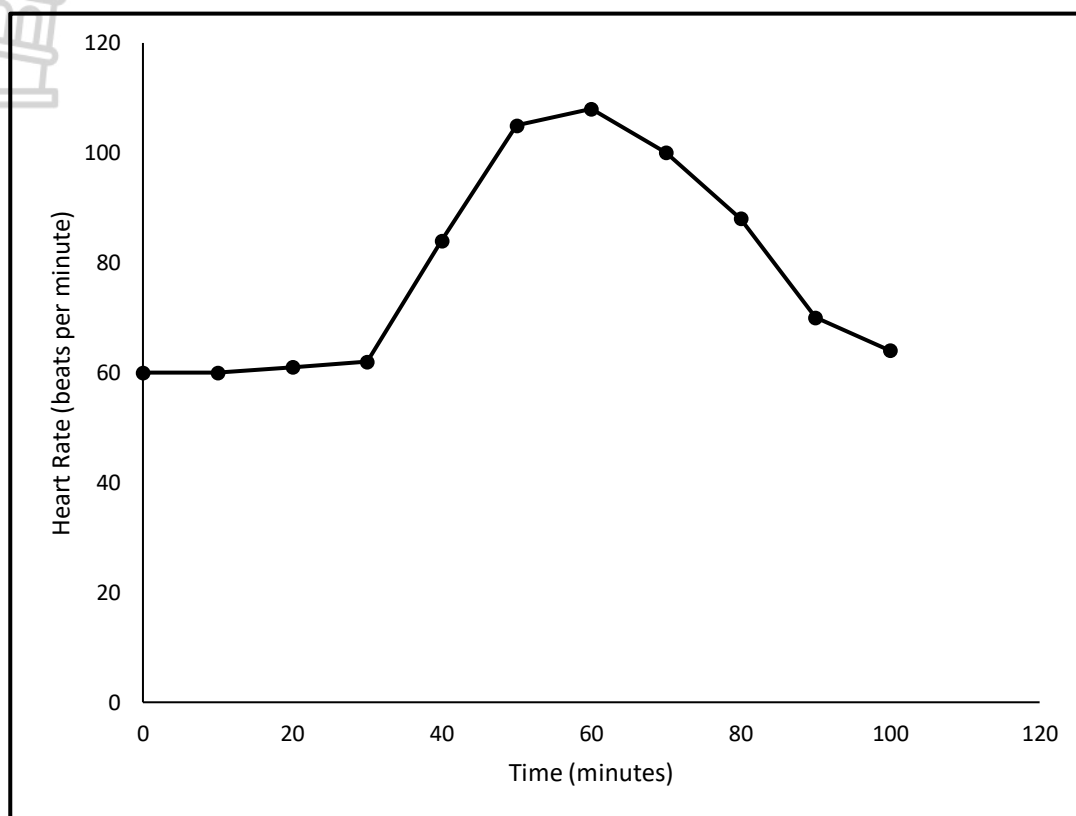
- (a) how many more times erythrocytes does Nceba have compared to Zhandalee. Show all working (2)
- (b) what is the percentage increase in the number of leucocytes from Vastheek to Zhandalee. Show all working. (3)

(8)



Activity 5

- 5 The graph below shows the recorded heart rate of an athlete before, during and after training for a period of 100 minutes.



- 5.1 State the resting heart rate. (1)
- 5.2 After how many minutes did the athlete stop training? (1)
- 5.3 Explain your answer to QUESTION 5.2 (2)
- 5.4 Heart rate indicates how fast the heart beats in a minute. (3)
- Name the phases of the cardiac cycle that make up the heart-beat. (7)

Activity 6

- 6 An investigation was carried out to determine the effect of caffeine on the heart rate.

The resting heart rate of 10 healthy males were recorded. They were given 250ml of the same brand caffeine drink. Their heart rates were monitored using a pulse meter for 30 minutes,

The table below shows the average heart rate of the males during the investigation.

Time (minutes)	Average Recorded Heart Rate (beats per minute)
5	65
10	70
15	75
20	85
25	90
30	95

- 6.1 Identify:

- (a) the independent variable (1)
(b) dependent variable (1)

- 6.2 State TWO planning steps for this investigation. (2)

- 6.3 State ONE way in which reliability could have been maintained (1)

- 6.4 State TWO ways that validity was maintained. (2)

- 6.5 Draw a line graph to represent the results in the table. (6)

(13)

Activity 7

- 7 Read the passage below and answer the questions.

In South Africa, cardiovascular diseases remain a major public health challenge. According to the Heart and Stroke Foundation's 2025 report, heart disease and stroke together account for almost one in five deaths nationally. This makes them the second leading cause of death after HIV/AIDS. The burden is particularly high in urban areas, where lifestyle changes have led to increased rates of obesity, diabetes, and hypertension.

Statistics South Africa's 2024/25 annual report highlights that over 215,000 new cases of heart-related illnesses were recorded in the past year, with hospital admissions for heart failure and coronary artery disease rising steadily. Alarming, more than 30% of adults in South Africa have high blood pressure, a key risk factor for heart disease. Smoking and alcohol consumption also remain widespread, contributing to the growing problem.

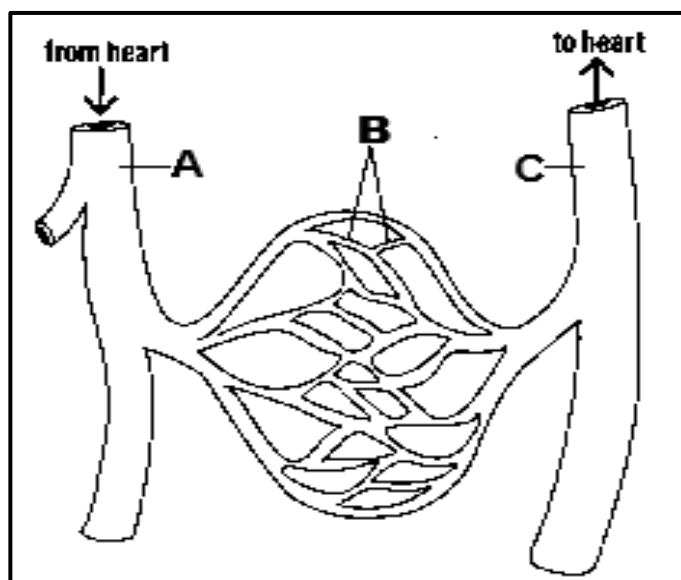
The impact is not only medical but also economic. Cardiovascular illnesses cost the healthcare system billions of rand annually, while reducing productivity due to premature deaths and disability.

https://heartfoundation.co.za/annual_reports/annual-report-2025/

- 7.1 Name the TWO diseases that are the second leading causes of deaths in South Africa. (2)
- 7.2 State TWO socially related habitats that contribute to the key risk factor for heart disease. (2)
- 7.3 Explain the impact of heart related illnesses on the South Africa economy (2)
- 7.4 State TWO ways to create awareness to the growing problem of heart related diseases. (2)
- 7.5 Name TWO other health related diseases that impact on the heart. (2)
- (10)**

Activity 8

8 The diagram below shows blood vessels in the body



8.1 Identify blood vessels labelled:

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

8.2 Describe the difference in the contents of the blood in blood vessel **A** and blood vessel **C**. (4)

8.3 Make a labelled drawing of a cross section through blood vessel **B** (5)

(12)

Activity 9

- 9 The table below shows the percentage incidence of high level of cholesterol in different population groups in KZN. High cholesterol levels lend itself to cardiovascular diseases.



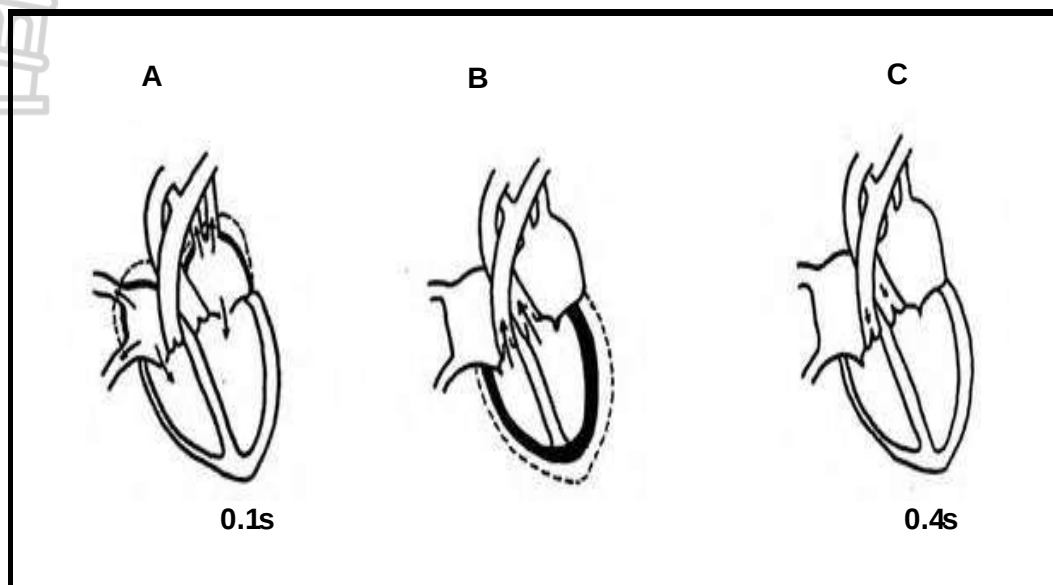
Population Group	Percentage of individuals having high levels of cholesterol
A	30%
B	65%
C	10%
D	25%

- 9.1 According to the table which population group is least affected by high cholesterol? (1)
- 9.2 Explain how high levels of cholesterol lead to cardiovascular diseases. (2)
- 9.3 Give ONE possible reason why the population group mentioned in QUESTION 9.1 is low. (1)
- 9.4 Draw a bar graph to represent the data in the table. (6)
- (10)**



Activity 10

- 10 The diagram below shows the three phases of cardiac cycle and how long each phase lasts. Each cycle last 0.8 seconds



- 10.1 Identify phase **A** (1)
- 10.2 State how long does phase **B** last according to the data given. (1)
- 10.3 Use the diagram to describe how the cardiac cycle works in: (2)
- (a) **A** (2)
- (b) **B** (3)
- (c) **C** (3)
- (10)



Activity 11

- 11 Grade 10 learners conducted an investigation to determine the effect of exercise on the heart rate. The heart rate also indicates fitness level of a person.

The following procedure was followed:

- Three learners of the same age and gender were chosen
- Their heart rate was taken and recorded before the investigation starts
- They were all allowed to jump for a minute and their pulse rates were recorded
- The time for jumping was increased by a minute up to five minutes per individual
- The average of their results was calculated and recorded

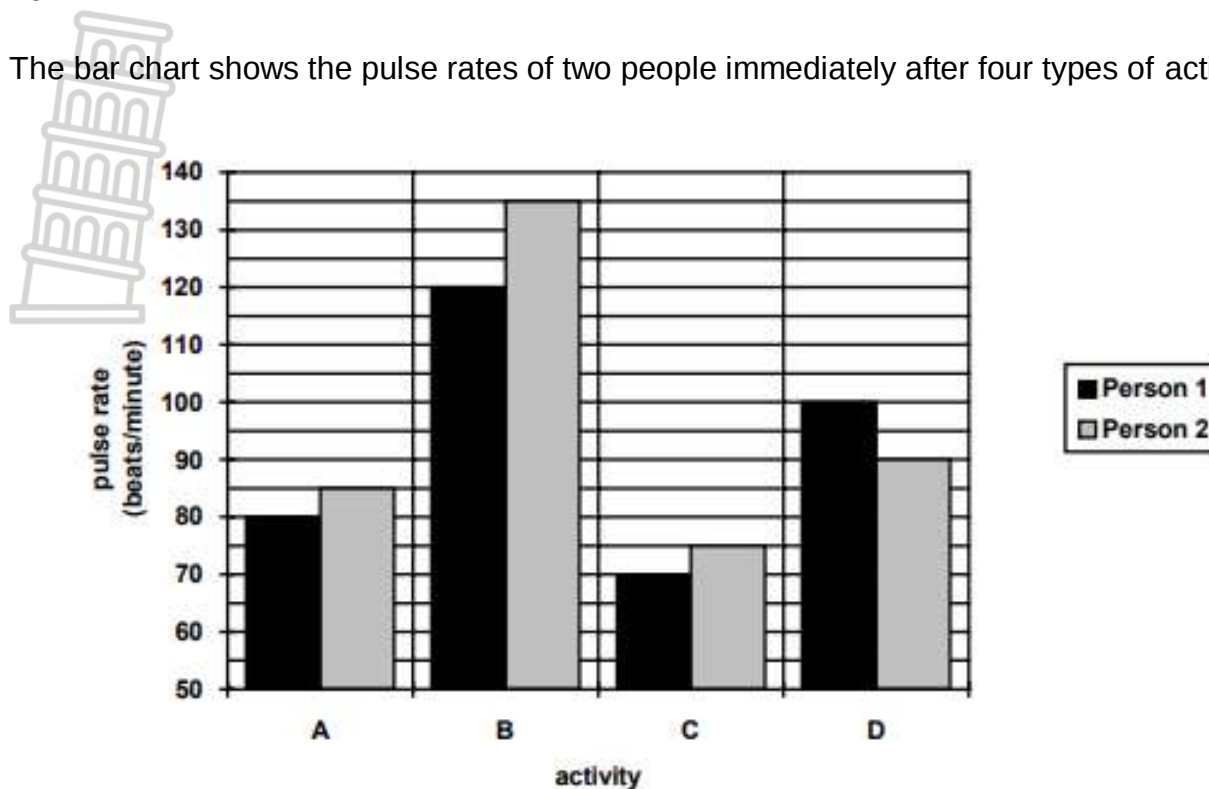
The table showing their results is shown below

Beats per minute bpm	Learner A	78	78	76	76	78	78
	Learner B	68	68	72	78	84	84
	Learner C	90	115	117	120	122	122
Time of exercise (min)		0	1	2	3	4	5

- 11.1 Identify the dependent variable. (1)
- 11.2 List TWO planning steps for the above investigation. (2)
- 11.3 State ONE factor that was kept constant during the above Investigation. (1)
- 11.4 Identify which learner is unfit. Explain your answer. (2)
- 11.5 State how the learners increased reliability of this investigation. (1)
- (7)

Activity 12

12 The bar chart shows the pulse rates of two people immediately after four types of activity



- 12.1 What is the pulse rate of Person 1 after activity1? (1)
- 12.2 What is the resting pulse rate of all individuals? (1)
- 12.3 During which activity was there the greatest difference between the two people? (1)
- 12.4 The four activities were walking, standing, running and sitting. Which label on the chart represent each activity. (4)
- 12.5 Explain why does the pulse rate increase during strenuous activity. (3)
- (10)**

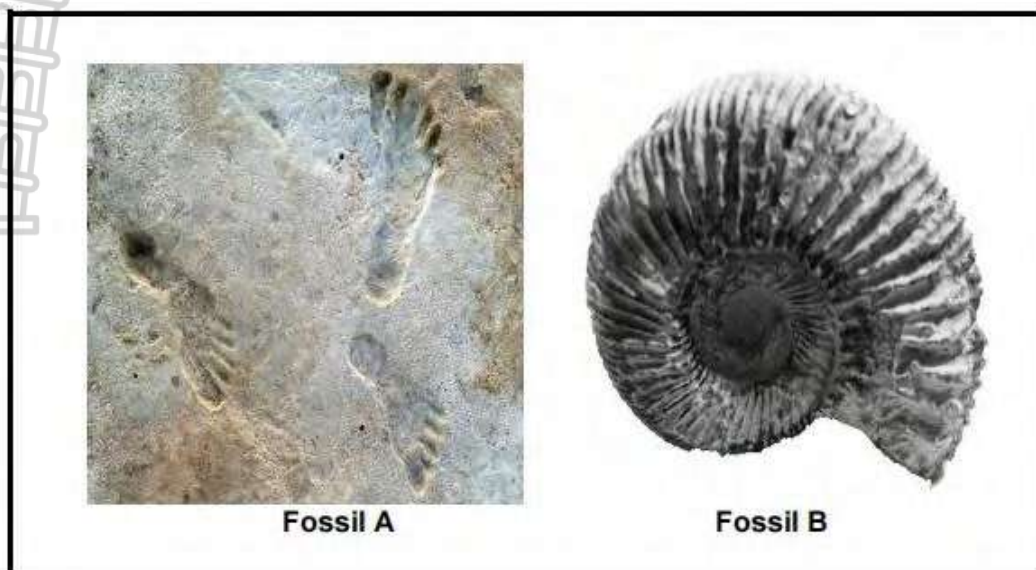
Topic: History of Life on earth

Activity 1

No.	Description	Biological Term
1.1	The study of plant and animal fossils	
1.2	Complete organisms or the remains, imprints or traces of organisms preserved in rocks	
1.3	A scientist who studies fossils	
1.4	A timeline that represents the geological time units of the history of life on earth	
1.5	A living fossil that was originally caught near the mouth of the Chalumna River near East London	
1.6	The complete disappearance of many different species over a short period	
1.7	Indirect method to determine the age of a fossil by studying sedimentary layers above and below the fossil	
1.8	An act of walking on two legs	
1.9	A transitional fossil between reptiles and birds	
1.10	The gradual change in structure or characteristics of organisms over time	
1.11	The act of walking on four legs	
1.12	The breakup of Pangea into the continents we know at present	
1.13	Bipedal primates with both Ape-like and human-like characteristics	
1.14	Indirect method to determine the age of a fossil by studying sedimentary layers above and below the fossils	
1.15	The period when dinosaurs were last seen on earth	
	15x1	(15)

Activity 2

2 The diagram below two types of fossils.



2.1 Identify the fossil as (**trace** or **ammonite**):

(a) **A** (1)

(b) **B** (1)

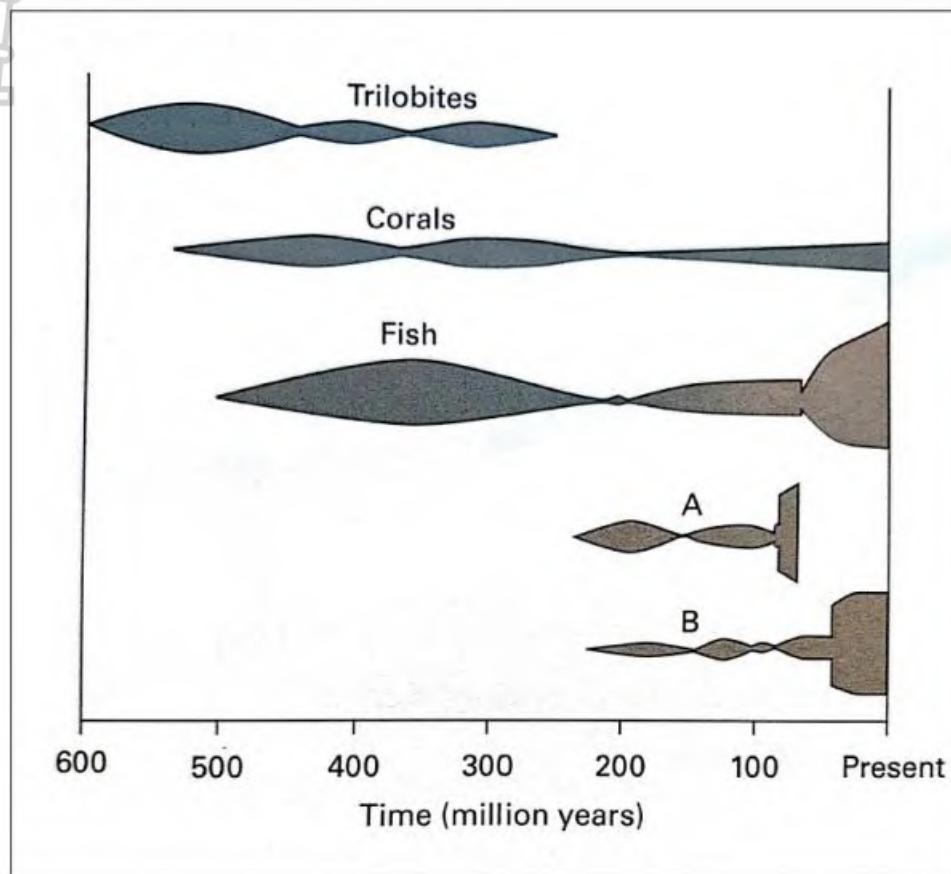
2.2 Describe how fossil **B** may have formed in sedimentary rock. (4)

2.3 Scientists use radioactive isotopes such as carbon-**14** or potassium- **40** to date fossils.

Give the name of this method of dating fossils (1)
(7)

Activity 3

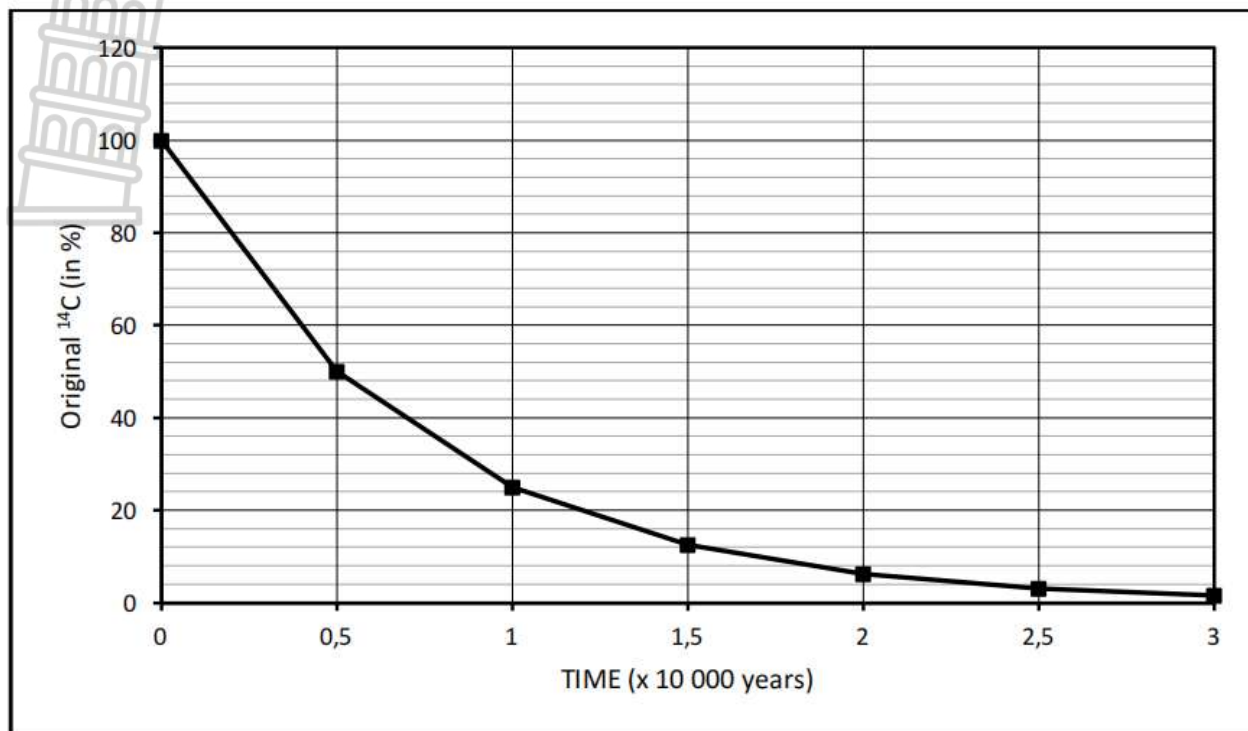
- 3 The chart below shows the abundance of different groups of organisms during the last 600 million years. The width of the shape indicates abundance.



- 3.1 According to the chart, which organisms existed 300 million years ago? (3)
 - 3.2 Which group (**A** or **B**) is more likely to represent the dinosaurs? (1)
 - 3.3 Give a reason for your answer to QUESTION 3.2. (1)
 - 3.4 Which group of organisms was the most successful in the period 300 to 400 million years ago? (1)
 - 3.5 State how you arrived at your answer to QUESTION 3.4. (1)
 - 3.6 According to the chart, which group of animals became extinct about 250 million years ago? (1)
 - 3.7 A scientist estimates a piece of rock containing a trilobite fossil to be 200 million years old. Provide one possible explanation for the above. (2)
 - 3.8 Suggest TWO reasons why there are gaps in the fossil record. (2)
- (12)**

Activity 4

- 4 Study the following graph showing the decay of Carbon-14 (^{14}C).

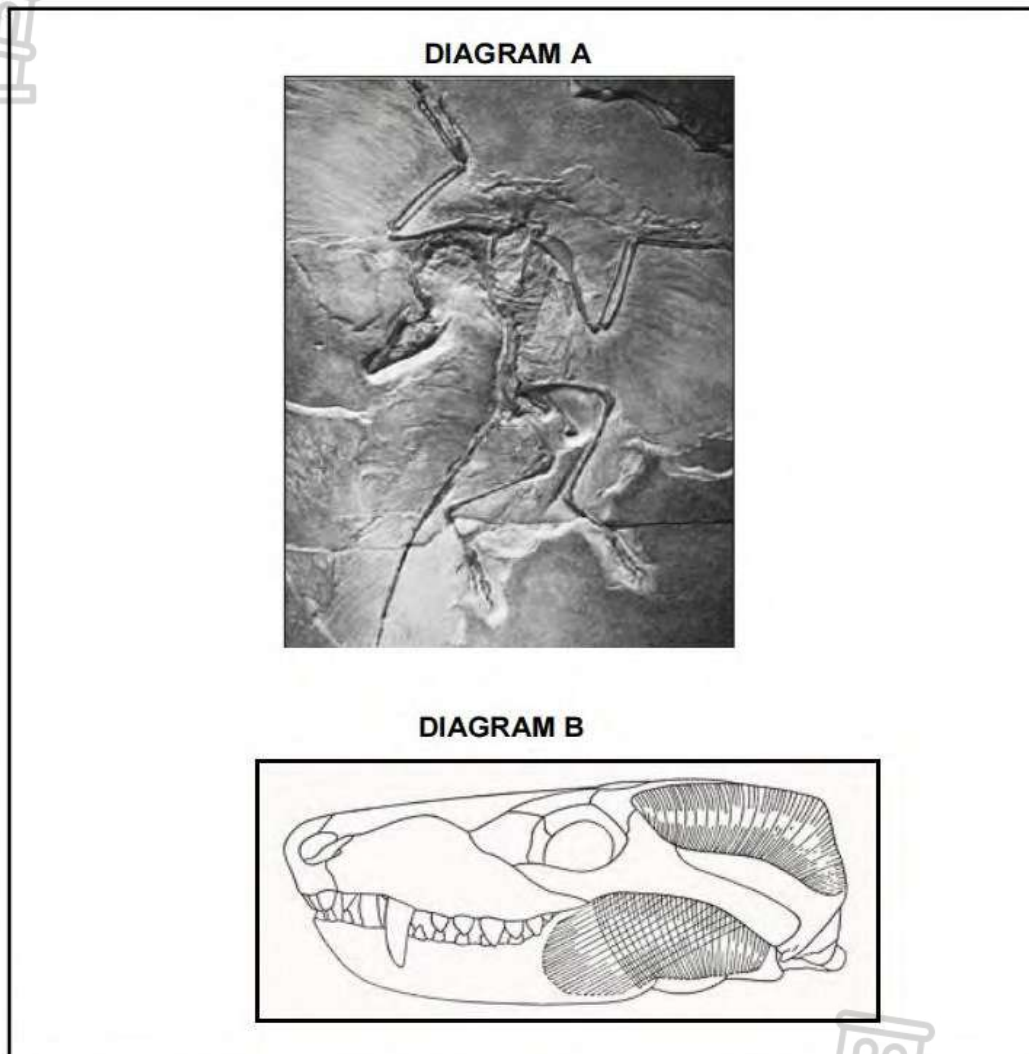


- 4.1 What is the half-life of ^{14}C according to the graph? (2)
- 4.2 4% of the original ^{14}C was found in a fossilised snail shell.
Using the information in the graph, determine the age of the fossil. (1)
- 4.3 Explain why a scientist cannot use ^{14}C to determine the age of a dinosaur fossil. (3)
- 4.4 What is the advantage of radiometric dating over relative dating? (2)
- (8)**



Activity 5

- 5 Study the two fossils (Diagram A and Diagram B) which were discovered and classified as transitional fossils.



- 5.1 What is the scientific name of the prehistoric bird in Diagram A? (2)
- 5.2 Explain why scientists concluded that this prehistoric bird is a transitional fossil. (4)
- 5.3 Describe how this fossil could have been formed. (2)
- 5.4 Name the organism illustrated by Diagram B and state where it was found in South Africa. (2)
- (10)

Activity 6

- 6 Study the table below that shows the decay of carbon-14 over time and then answer the questions that follow.

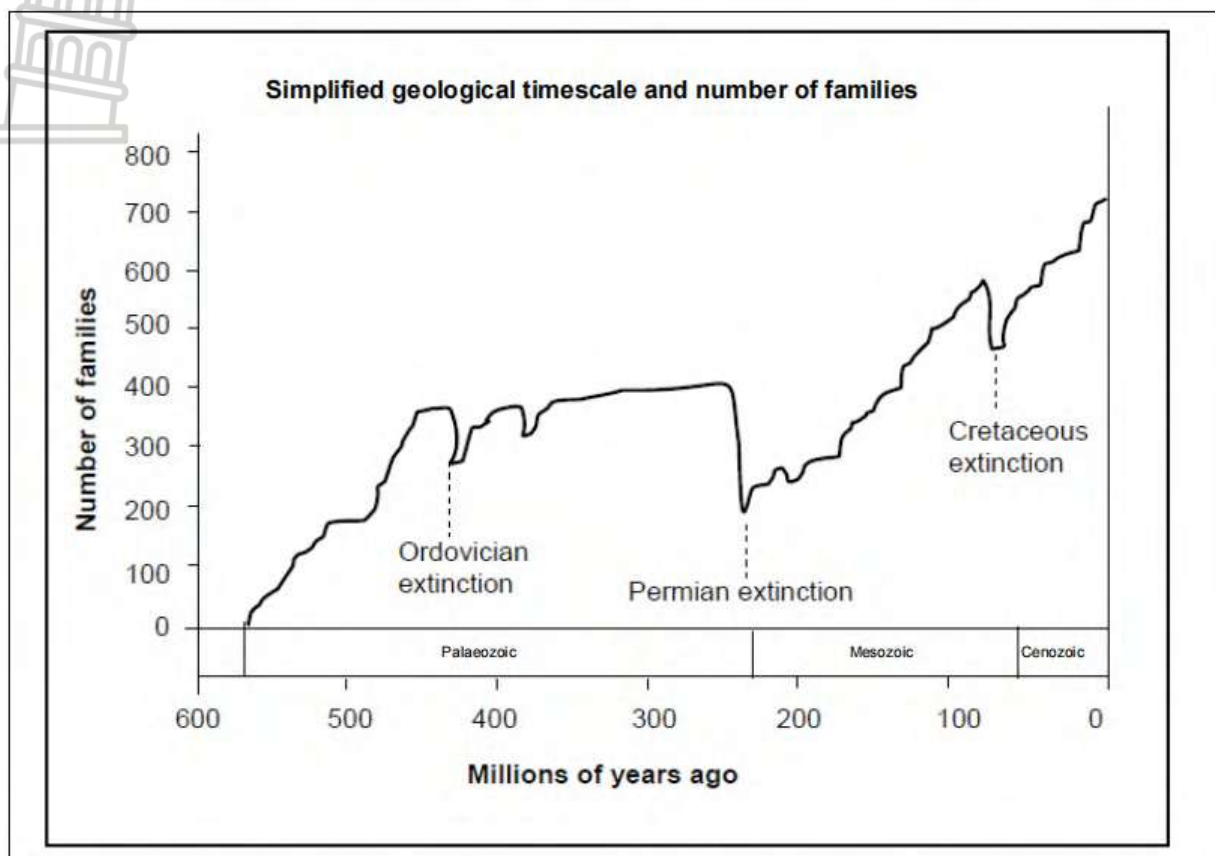
DECAY OF CARBON-14								
Years from the present	0	5 730	11 460	17 190	22 920	X	34 380	40 110
Number of half-lives elapsed	0	1	2	3	4	5	6	7
Percentage of original carbon-14 remaining	100	50	25	12,5	6,25	Z	1,56	0,78

- 6.1 Name TWO types of methods used to determine the age of fossils. (2)
- 6.2 Calculate the value of:
- (a) X (2)
- (b) Z (2)
- 6.3 Explain why it would not be possible to date a fossil which existed 80 million years ago using the decay of carbon-14. (2)
- 6.4 Give TWO reasons why there are gaps in the fossil records. (2)
- (10)**



Activity 7

- 7 Study the graph below which shows the major extinction events and answer the questions that follow.



- 7.1 When did the Cenozoic era begin? (2)
- 7.2 Which mass extinction took place towards the end of the Palaeozoic era? (1)
- 7.3 Approximately how many families of species died out at the end of the Palaeozoic era? Show ALL working. (3)
- 7.4 Explain why the number of families of organisms rapidly increased after each mass extinction. (3)
- (9)**

Activity 8**8 Read the extract below**

In 1938, a Coelacanth was caught at the mouth of the Chalumna River on the east coast of South Africa. This 'living fossil' comes from a lineage of fishes that was thought to have been extinct since the time of the dinosaurs.

Before 1938 they were believed to have become extinct approximately 80 million years ago, when they disappeared from the fossil record.

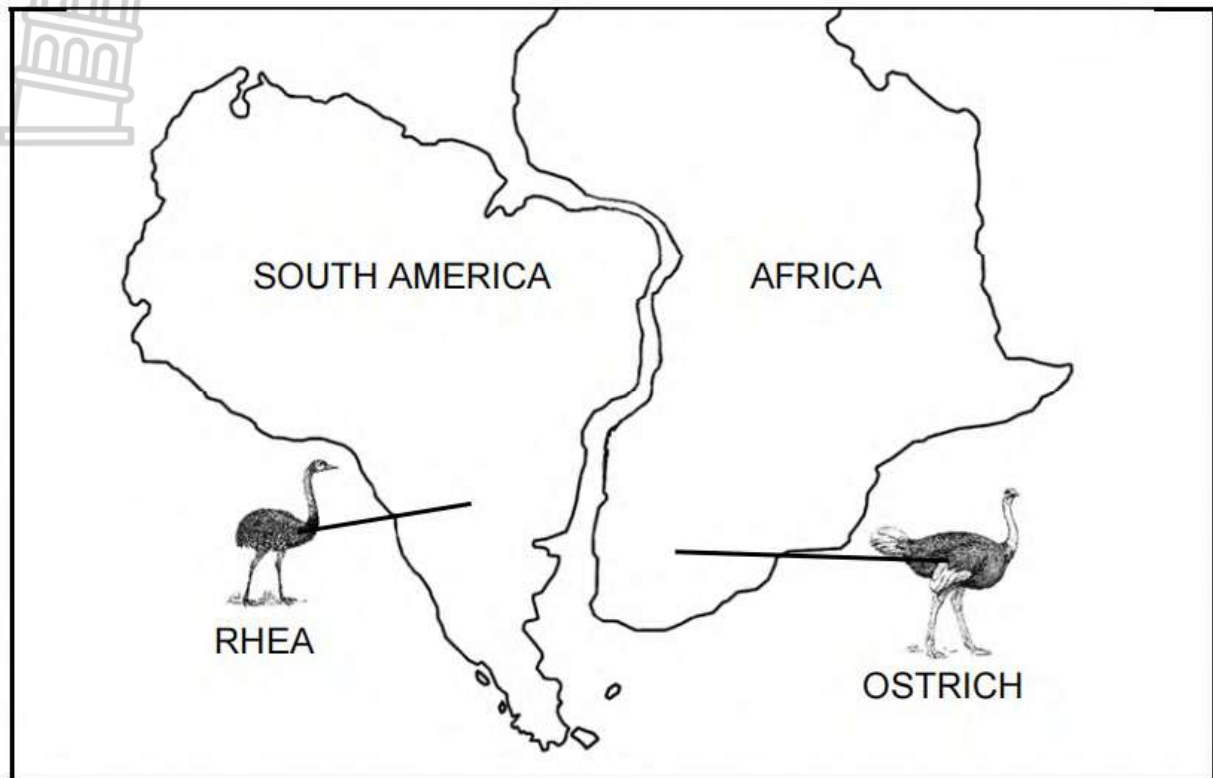
How could Coelacanths disappear for over 80 million years and then turn up alive and unchanged well in the twentieth century? The answer seems to be that the Coelacanths from the fossil record lived in environments favouring fossilisation. Modern Coelacanths, both in the Comoros and Sulawesi were found in environments that do not favour fossil formation. They inhabit caves and overhangs in near vertical marine reefs, at about 200 m depth, off newly formed volcanic islands.

- 8.1 Define the term *extinction*. (2)
- 8.2 Name the place where the first coelacanth was caught. (1)
- 8.3 Explain why coelacanths are thought to be living fossils. (3)
- 8.4 According to the extract, give TWO reasons why Coelacanths disappeared for over million years and returned alive. (2)
- (8)**



Activity 9

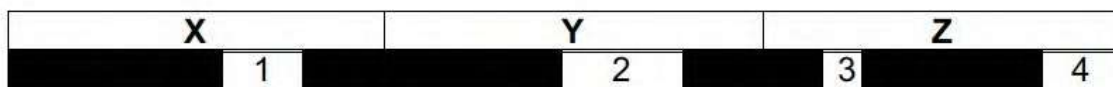
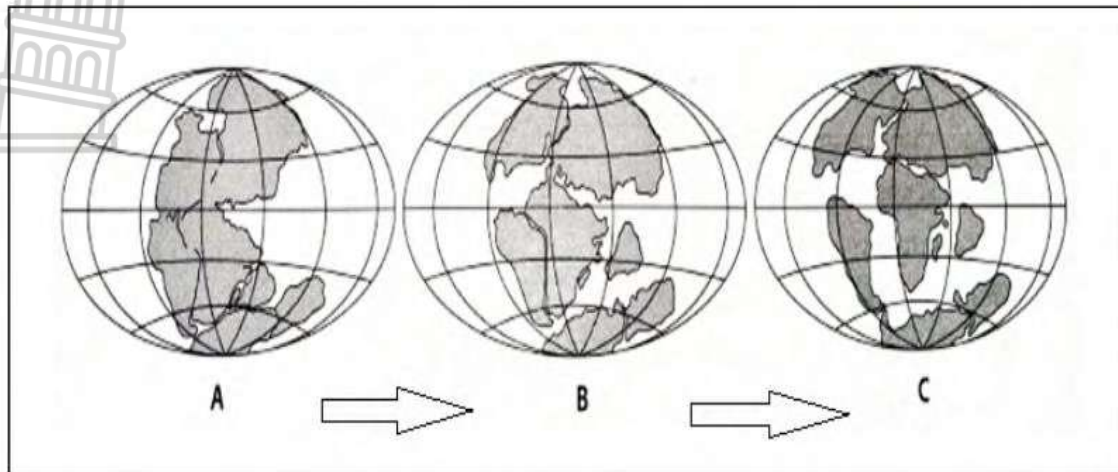
- 9 The diagram below shows how South America and Africa were once joined in the past.



- 9.1 Which of the two major super continents did South America and Africa belong to? (1)
- 9.2 What do we call the study of the distribution of existing and extinct organisms in different geographical areas? (1)
- 9.3 Flightless birds like the rhea and ostrich are different species, yet they share many similar characteristics. Explain how such similar birds that cannot fly ended up on continents separated by a vast ocean. (3)
- 9.4 Polar bears live in the North Pole, the Arctic, while penguins live in the South Pole, the Antarctic, both of which are very similar climates. Suggest a reason why penguins and polar bears do not live at both poles. (4)
- (9)

Activity 10

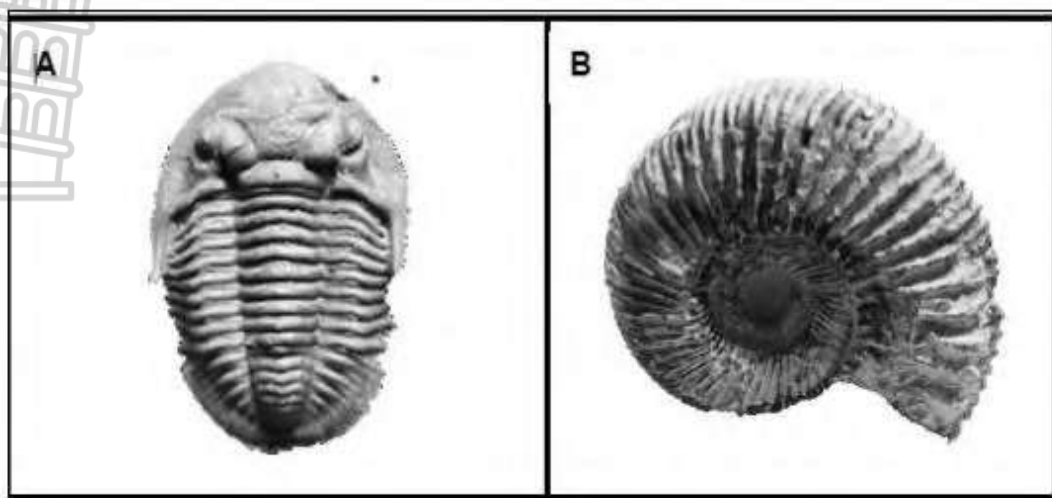
- 10 Study the maps below showing the changes that took place during a geological event.



- 10.1 Name the giant continent labelled **A**. (1)
- 10.2 Identify the geological event that is represented in the diagrams above. (1)
- 10.3 Name the TWO super-continents formed from the continent in Diagram **A**. (2)
- 10.4 Identify the eras, corresponding to different stages in the geological event, labelled:
- (a) **X** (1)
 - (b) **Y** (1)
 - (c) **Z** (1)
- 10.5 The black bands below the map indicate warm periods and the white bands show periods of ice ages.
- (a) How many warm periods occurred during this geological event? (1)
 - (b) Which ice age (**1**, **2**, **3** or **4**) was of the longest duration? (1)
 - (c) State ONE possible consequence that these ice ages may have had on the diversity of life on earth. (1)
- (10)**

Activity 11

11 The images below are two different fossils:



11.1 Identify:

(a) Fossil **A**

(1)

(b) Fossil **B**

(1)

11.2 Describe how these fossils may have formed in sedimentary rock.

(4)

11.3 Name TWO other ways that fossils are formed, other than in sedimentary rock

(2)

11.4 Scientists use radioactive isotopes such as carbon-14 or potassium-40 to date fossils. What is this method of dating fossils called?

(1)

(9)



Activity 12

The table below shows the timescale of a part of Earth's history.

MYA	Era	Period	Fossils
298–251	Paleozoic	Permian	Trilobites, Ammonites, Fish, Animals with shells, Sponges, Jellyfish, Land plants, Corals, Amphibians, Insects, many more reptiles, Cone bearing plants
323–298		Pensylvanian	Trilobites, Ammonites, Fish, Animals with shells, Sponges, Jellyfish, Land plants, Corals, Amphibians, Insects, Reptiles
358–323		Mississippian	Trilobites, Ammonites, Fish, Animals with shells, Sponges, Jellyfish, Land plants, Corals, Amphibians, First insects, First reptiles
419–358		Devonian	Trilobites, Ammonites, Fish, Animals with shells, Sponges, Jellyfish, Land plants, Corals, Insects, First amphibians
443–419		Silurian	Trilobites, Ammonites, Fish, Animals with shells, Sponges, Jellyfish, Land plants, Corals
485–443		Ordovician	Trilobites, Ammonites, Fish, Animals with shells, Sponges, Jellyfish, First land plants
541–485		Cambrian	Trilobites, First fish, First animals with shells, Sponges, Jellyfish

12.1 State the:

- (a) Period in which the first land plants appeared (1)
- (b) Group of animals that survived the longest in this era (1)

12.2 What do we call a time scale like the one above? (1)

12.3 In which period above did an explosion (a large increase) in the number and diversity of fossils in the fossil record occur? (1)

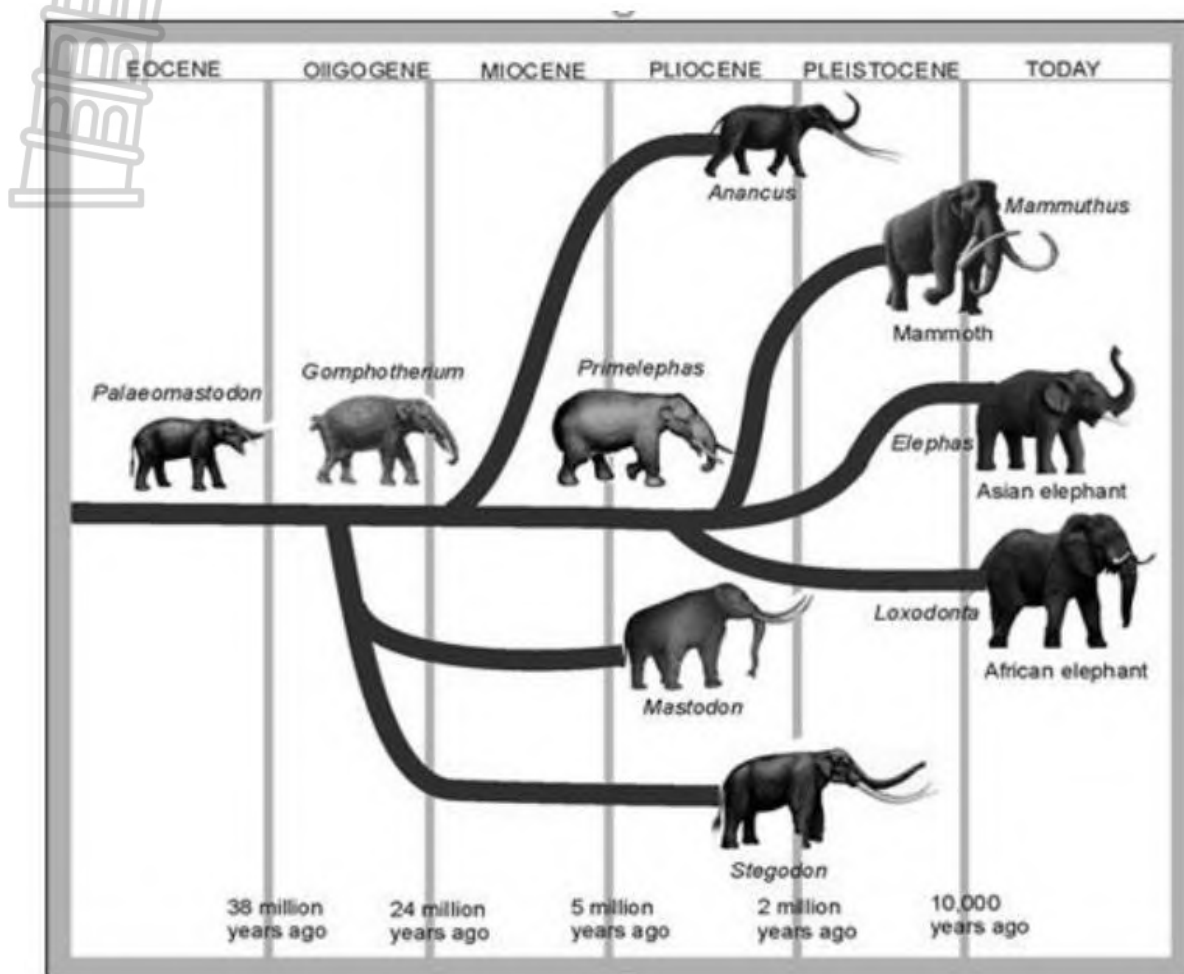
12.4 Scientists may use different layers of rock to work out if a new fossil was formed before or after a particular geological event. What do we call this method of dating fossils? (1)

12.5 Scientists may use fossils like Ammonites to help them date other fossils found in the same layer. What do we call fossils like the Ammonites and others that help scientists to do this? (1)

(6)

Activity 13

13 The flow chart below shows the evolution of the modern day elephant

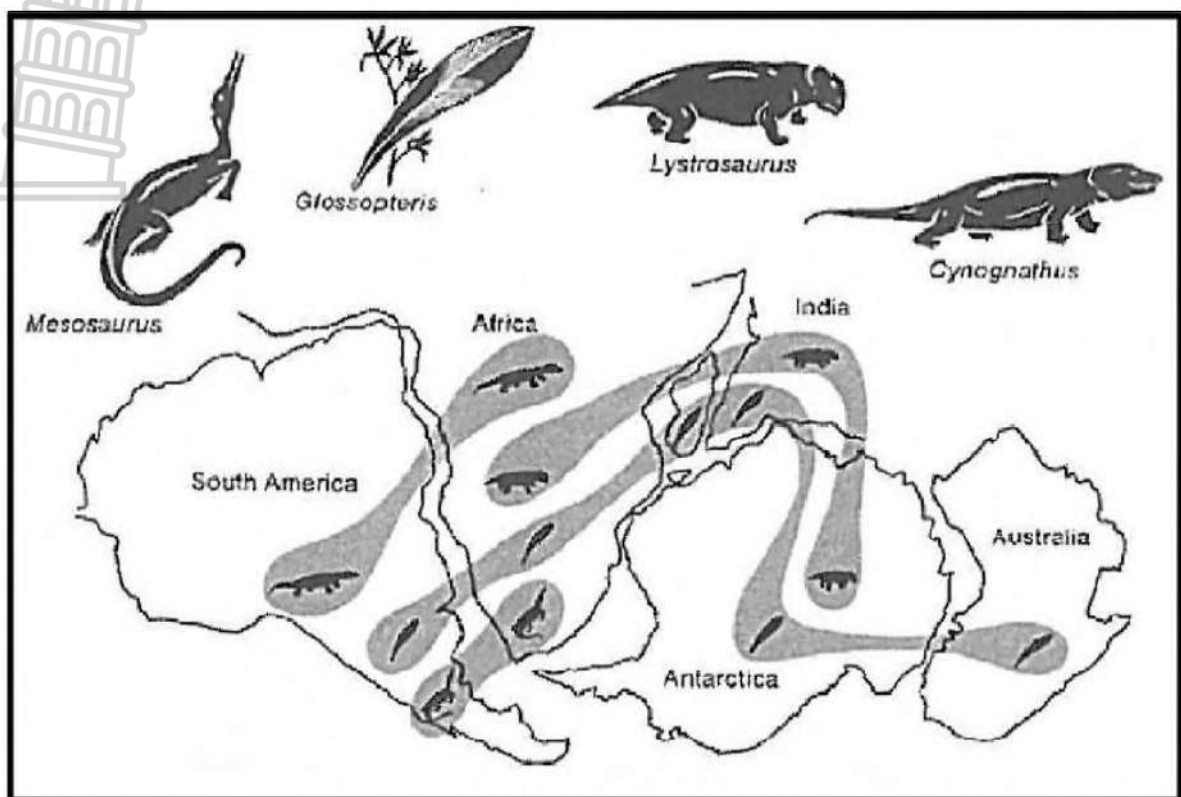


- 13.1 Name the earliest ancestor of the elephants. (1)
- 13.2 When did the ancestor of the elephant first appear on Earth? (1)
- 13.3 How does the ancestor differ from modern-day elephant? (3)
- 13.4 Give the scientific name of the African elephant. (1)
- 13.5 According to the flow chart, which evolved first- the African elephant or the mammoth? (1)
- 13.6 When did the mammoth extinct? (1)
- 13.7 Is the African elephant under threat of becoming extinct? Give ONE reason for your answer . (2)

(10)

Activity 14

14 The diagram below shows the continents and different species



- 14.1 What do we call the study of the distribution of individual species? (1)
- 14.2 Name the supercontinent evident in the diagram. (1)
- 14.3 Using the diagram above, explain how fossil evidence supports the fact that Africa and South America may have once been joined as part of the same continent. (2)
- 14.4 Which organism's fossil remains are found on all the land masses shown above? (1)
- (5)

Topic: BIOSPHERE AND ECOSYSTEM

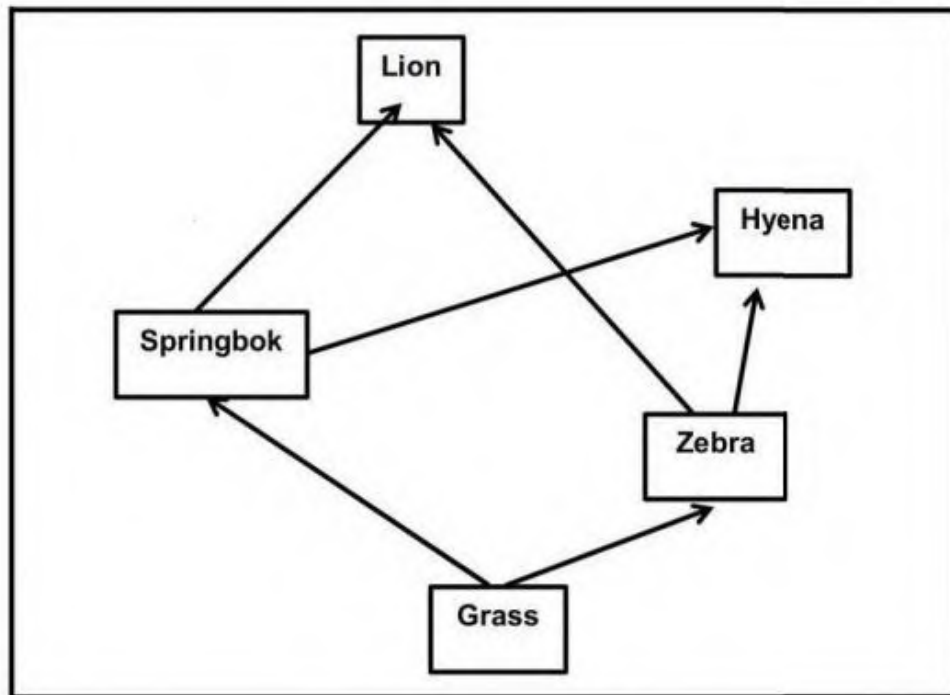
Activity 1

No.	Description	Biological Term
1.1	The region that is classified by species that live in it, having a certain climate and soil type	
1.2	Organisms in an ecosystem that break down the dead organic matter	
1.3	Non – living things in an ecosystem	
1.4	Exotic species of plant or animal that do not naturally live in a particular habitat and can cause harm to the ecosystem	
1.5	Species that are indigenous, found only in one specific area and nowhere else in the world	
1.6	A state of inactivity and reduced metabolism when temperatures drop and food become scarce	
1.7	The part of the earth and its atmosphere where living organisms are found	
1.8	The path taken by the energy as it passes from one organism to the other in an ecosystem	
1.9	Plants adapted to live in very dry conditions	
1.10	Height above sea level	
	(10 x 1)	(10)



Activity 2

2 The diagram below represents a food web.



2.1 Use the food web above to identify:

- (a) Herbivore (1)
- (b) Secondary consumer (1)

2.2 State what would happen to the population of zebra if the hyena dies? (1)

2.3 Draw a food pyramid to show the three trophic levels amongst the grass, lion and springbok (3)

(6)



Activity 3

- 3 The extract explains about the human impact on the environment.

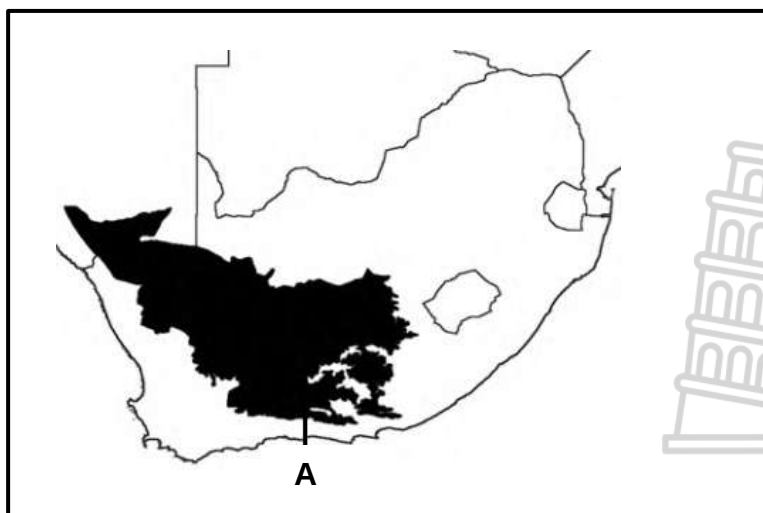
Humans impact the physical environment in many ways: overpopulation, pollution, burning fossil fuels and deforestation. Changes like these have triggered climate change, soil erosion, poor air quality and undrinkable water.

These negative impacts can affect human behaviour and can prompt mass migrations or battles over clean water

- 3.1 State TWO ways in which humans impact the environment, as stated in the above extract. (2)
- 3.2 Explain the reason for deforestation due to overpopulation. (3)
- 3.3 Suggest ONE way that the government can assist to reduce the air pollution in factories and industries (1)
- (6)

Activity 4

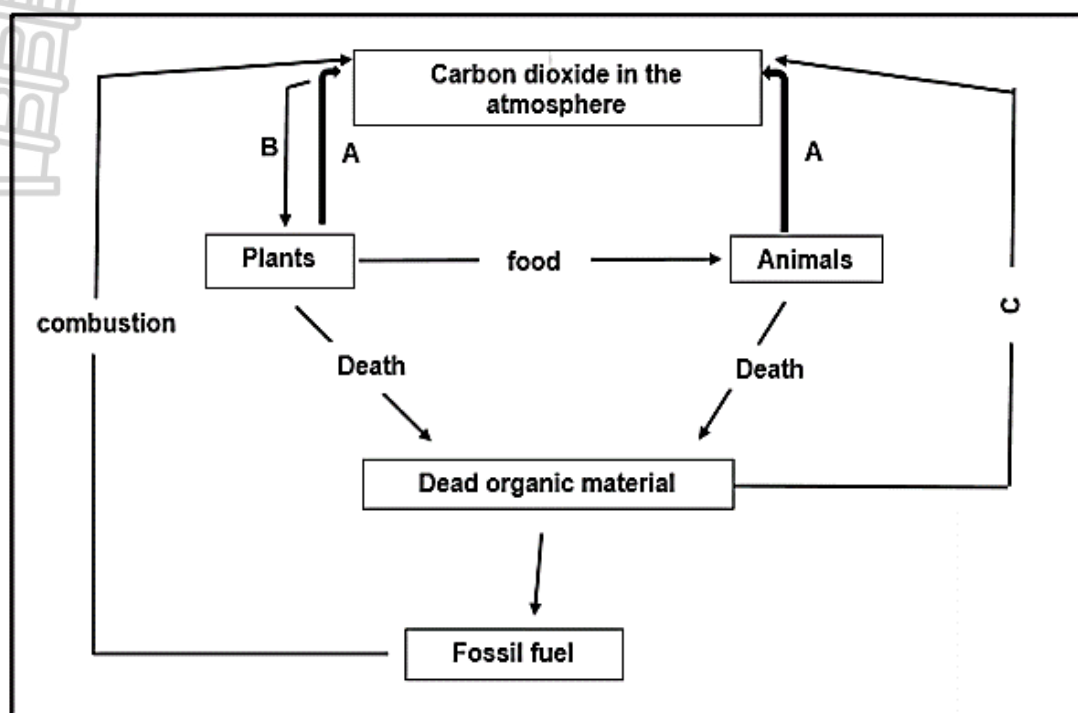
- 4 The map below shows one of South Africa's biomes where a species of Karoo Dwarf Chameleon live.



- 4.1 Identify the biome on the map shown by the highlighted by labelled A (1)
- 4.2 Describe the climate of this biome (3)
- 4.3 What general type of vegetation might you expect to find in this biome? (2)
- (6)

Activity 5

5 The diagram below shows the flow chart of a particular cycle.



- 5.1 Identify the environmental cycle represented by the flow chart above. (1)
 - 5.2 Identify processes labelled:
 - (a) C (1)
 - (b) A (1)
 - (c) B (1)
 - 5.3 Briefly describe the environmental cycle identified in QUESTION 5.1 (4)
 - 5.4 Explain how each of the following process affect levels of carbon dioxide in the atmosphere:
 - (a) Respiration (2)
 - (b) Photosynthesis (2)
 - (c) Decomposition (2)
 - 5.5 Describe oxygen cycle (3)
- (17)**

Activity 6

- 6 The following information shows an investigation based on the absorption of carbon dioxide by different plants.

Nathan and Nqaba heard that the Spekboom plant is very good at storing carbon dioxide from the atmosphere which helps prevent the extreme increase in the Earth's temperature called global warming. This carbon dioxide is used by plants for photosynthesis.

They decide to investigate how quickly different plants absorb CO₂.

They got three different types of plants from their local nursery: a Spekboom, an Aloe and a Prickly Pear. They make sure that the plants are the same height. They plant them in equal sized pots with the same type and amount of soil. All three plants are placed in the same location and get equal amounts of water.

They take the weight/mass of their plants in the pots at the start of the investigation. They then leave the plants to grow for one month and measure their weight/mass again.

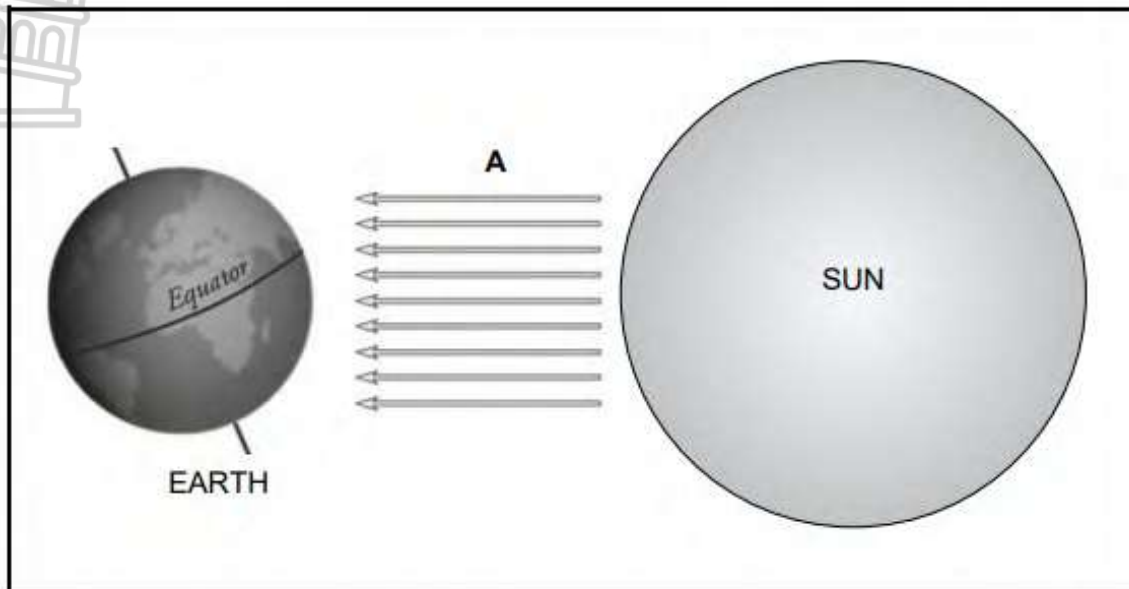
The results are shown in the table below.

Plant	Weight/Mass (g)		
	Start	End	Increase
Aloe	800	832	32
Prickly Pear	800	843	43
Spekboom	800	871	71

- 6.1 Identify the independent variable (1)
- 6.2 Plot a bar graph of weight/mass increase of the three plants (6)
- 6.3 What was the purpose of measuring the starting weight/mass of the plants? (1)
- 6.4 Identify TWO ways in which validity was ensure during this investigation. (2)
- 6.5 How could they improve the reliability of their investigation? (1)
- 6.6 Calculate the percentage increase in mass from the start to the end of the investigation of the spekboom plant. (3)
- 6.7 Explain how using the weight gain of the plants will give Nathan and Nqaba an idea of how much CO₂ the plants are absorbing (2)
- (15)**

Activity 7

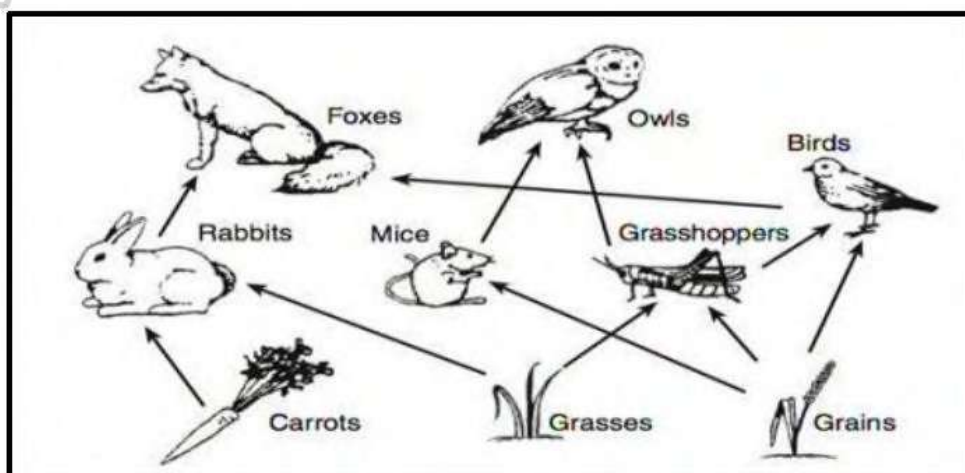
7 The diagram below shows the sun's rays hitting the earth.



- 7.1 Which abiotic factor is represented by **A** in the diagram above? (1)
- 7.2 Explain how the tilt of the Earth's axis causes seasonal changes. (3)
- 7.3 Changes in the length of the day can affect seasonal temperatures.
- (a) What do we call the number of hours of light a plant or animal receives every day? (1)
- (b) What is migration? (2)
- (c) Give ONE reason why an animal migrates. (1)
- (8)**

Activity 8

8 The diagram below shows feeding relationships in an ecosystem.



- 8.1 Name the type of diagram shown. (1)
- 8.2 Define the term ecosystem. (2)
- 8.3 Explain the changes that may result in the ecosystem if the carrots, grasses, and grains are removed from the area. (2)
- 8.4 Make a simple schematic diagram to show a possible food chain which includes a producer and any two consumers from the diagram. (3)
- (8)**

Activity 9

- 9 The following extract provides information on the Cape Floral Kingdom.

The Cape floral kingdom is the smallest of the world's floral kingdoms. It is home to more endemic (species that occur in one region and nowhere else in the world) and indigenous plants than in any other region in South Africa. Approximately 70% of the 9 000 plant species in this area are found nowhere else in the world. The vegetation of this biome, which is mostly small bushes, grows in nutrient poor soil. They also survive the long dry summer conditions, as well as frequent fires.

The flora of the Cape is threatened, amongst others, by habitat destruction by humans. Already numerous species are extinct from this biome. Hence, its conservation is a national conservation priority. In a bid to save this biome, there are several projects aiming at encouraging responsible travel to natural areas to conserve the environment, as well as improving the well-being of local communities

- 9.1 What does endemic species mean? (1)
- 9.2 Which biome is discussed by the extract above? (1)
- 9.3 What did the conservation group do to save this biome? (2)
- 9.4 Calculate the total number of species that are endemic to this biome. Show your working. (3)
- 9.5 Describe the type of climate and vegetation found at this biome. (3)
- (10)**



Activity 10

The following investigation is based on the effect of light intensity on flower buds.

- 10 Bob decided to see how light intensity affects flower buds opening in a species of plant known as Watsonias.

He built four outside enclosures for the Watsonias. The first one was covered with one layer of green shade cloth. The second one was covered with two layers, the third one with three layers and the fourth one with four layers.

Watsonias flower in spring to early summer so Bob did his experiment in October with flowers that he bought from the nursery.

In each enclosure Bob put five identical pots of Watsonias. Each pot had a single Watsonia plant which was 20 cm high and had no open flowers. Each enclosure was placed on his lawn in full sun. At the end of each week he counted the total number of flowers open in each enclosure and recorded his results.

His results are shown in the table below.

Number of flower buds opening on Watsonia plants in four different enclosures over four weeks in October				
Enclosure No.	Week 1	Week 2	Week 3	Week 4
(25% shade)	4	7	17	29
(50% shade)	2	5	9	15
(75% shade)	0	3	4	7
(100% shade)	0	0	0	3

- 10.1 Identify the:

(a) dependent variable

(1)

(b) independent variable

(1)

- 10.2 Name ONE thing that Bob could do to ensure the validity of his experiment.

(1)

- 10.3 How could Bob have set up a control for his experiment?

(2)

- 10.4 Calculate the percentage increase in numbers of open flowers for enclosure 2 from week 2 to week 3.

(3)

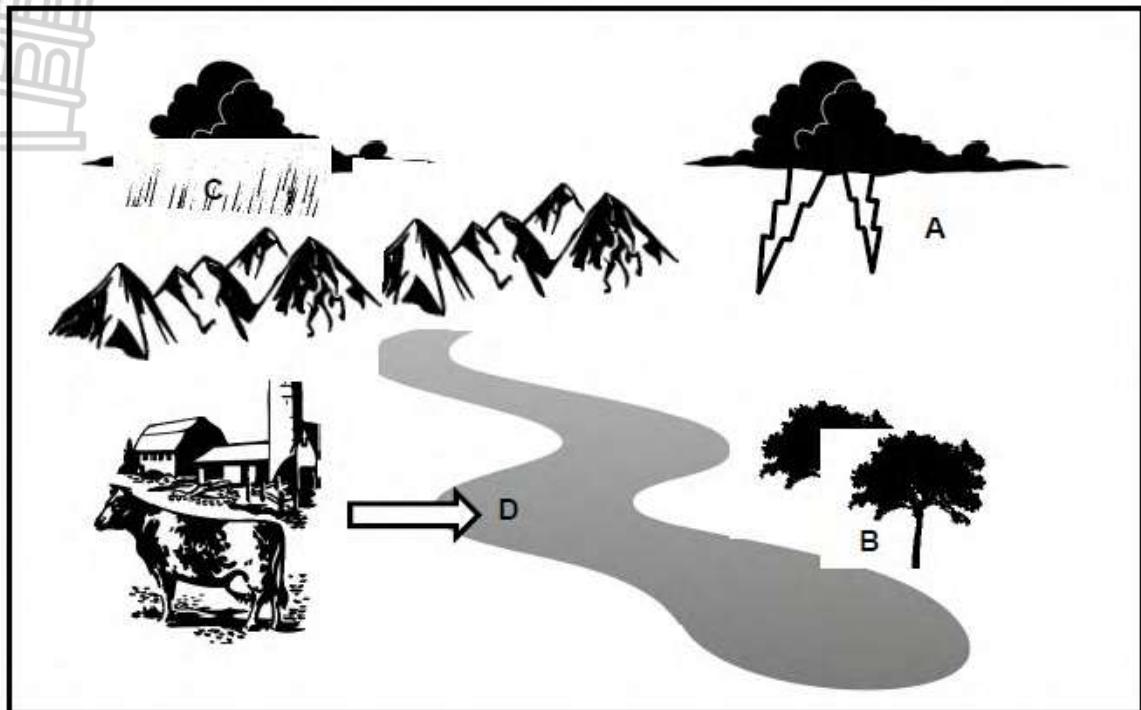
- 10.5 State a conclusion for this investigation

(2)

(10)

Activity 11

11 The diagram below shows part of the nitrogen cycle and the water cycle.



- 11.1 Name the process of removing nitrogen from the atmosphere at **A**. (1)
- 11.2 In which form is nitrogen absorbed by plants out of the ground at **B**? (1)
- 11.3 Which part of the water cycle is represented by **C**. (1)
- 11.4 Runoff water from the farm into the river at **D** can cause excess nutrients to flow into the water. What is this called? (1)
- 11.5 Explain how the process mentioned in QUESTION 11.4 above might cause organisms to die in the river. (3)
- (7)

Activity 12

- 12 Grade 10 learners did an investigation to determine the soil pH, humus content and permeability to water of three different soil samples

The following procedure was followed:

- Three soil samples were taken from the garden
- The three-soil sample were analyzed according to the level of pH using the litmus paper, humus content and permeability to water
- The results were collected and recorded

The table below show the results of the investigation.

	pH level in 100g of soil sample	% Of humus content in 100g of soil sample	Permeability to water (ml of water passing through 100g of soil per minute in %)
Sample A	5.8	5	75
Sample B	9	10	5
Sample C	7.6	25	20

- 12.1 Identify TWO factors that were being investigated in the soil samples. (2)
- 12.2 Identify the soil Sample (**A**, **B** or **C**) that will have low water holding capacity. (1)
- 12.3 Give a reason for your answer in QUESTION 12.2 (2)
- 12.4 Explain the disadvantage of soil Sample **A** having low humus content. (2)
- 12.5 State TWO ways in which the reliability of the result could be increased. (2)
- (9)**



Activity 13

- 13 An investigation was carried out to investigate the effect of alkaline pH on the growth of roots of young Austrian pine plants.

The table below show the results of the investigation.

Plant type	Length
A	30
B	10
C	45
D	20

- 13.1 List TWO planning steps that were taken during the investigation. (2)
 13.2 Identify the independent variable in this investigation. (1)
 13.3 Which plant grows better in alkaline soil according to these results? (1)
 13.4 State TWO ways in which the reliability of the result could be increased. (2)
(6)

Activity 14

- 14 The table below shows the different amounts of CO₂ entering the atmosphere (▲) and being removed from the atmosphere (▼). The numbers represent billions of tons of CO₂ per year.

ATMOSPHERE					
120	60	60	1.1	8.4	90
▼	▲	▲	▲	▲	▼
					
Vegetation	A	B	C	Oceans	
LITHOSPHERE			HYDROSPHERE		

- 14.1 Identify the sources of CO₂ in the atmosphere represented by:
 (a) **A** (1)
 (b) **B** (1)
 (c) **C** (1)
 14.2 Vegetation contributes 60 billion tons of CO₂ to the atmosphere annually. Which biological process is responsible for this? (1)
 14.3 According to the table, what is the net amount of CO₂ that enters the atmosphere each year? (3)
 13.4 Name the world-wide phenomenon of increasing temperatures that is being caused by excess CO₂ in the atmosphere. (1)
(8)

Topic: Biodiversity and Classification

Activity 1

No.	Description	Biological Term
1.1	The variety of species in an area, or the entire earth	
1.2	Organisms that do not have a true nucleus	
1.3	The group name given to the first life forms, such as bacteria, which developed on Earth about 3,8 billion years ago.	
1.4	Complete disappearance of a species from Earth	
1.5	Grouping of organisms according to their similarities	
1.6	Organisms not able to produce their own food but rely on other organisms for food	
1.7	A species that occurs in a local region, but nowhere else in the world	
1.8	A list of paired descriptive statements as a guide to identify organisms	
1.9	Organism with cell/s that have true nuclei, and true organelles occur in the cytoplasm	
1.10	Organisms live together, and one benefits and the other is harmed.	
	10x1	(10)

Activity 2

- 2 Read the extract below and answer the questions that follow.

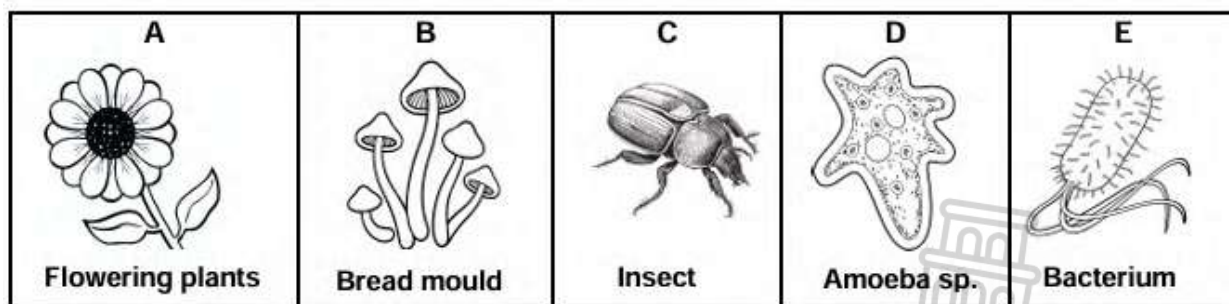
Carolus Linnaeus established a hierarchical classification system of grouping similar organisms together. He grouped from broad groups called Kingdoms down to the smallest group called species.

Using his system, a lion is fully classified as follows: Animalia, Chordata, Mammalia, Carnivores, Felidae, panthera leo.

- 2.1 According to Linnaeus' system, which class does the lion belong to? (1)
- 2.2 The lion's scientific or binomial name, panthera leo, has been written incorrectly. Rewrite it correctly. (2)
- 2.3 Why is it necessary for organisms to have scientific names? (2)
- (5)**

Activity 3

- 3 The diagram below shows organisms belonging to different kingdoms according to the Five-Kingdom system of classification.



- 3.1 Give The LETTER and KINGDOM of the organisms with the flowing characteristics:
- (a) Autotrophic feeding method (2)
- (b) Unicellular and prokaryotic (2)
- (c) Have cell walls composed of chitin (2)
- (d) Invertebrates and have no cell wall (2)
- 3.2 Tabulate TWO differences between prokaryotic and eukaryotic organisms. (5)

Activity 4

- 4 The table below shows how living organisms are classified according to the Five Kingdom classification system.

Kingdom	Body Structure	Nutrition
Monera	Unicellular, prokaryotic	Autotrophic / heterotrophic
(a)	Unicellular, eukaryotic	Autotrophic / heterotrophic
Fungi	Multicellular, eukaryotic, cell walls containing (b)	Heterotrophic
Plantae	Multicellular, eukaryotic, cell walls containing (c)	(d)
Animalia	Multicellular, eukaryotic, no cell walls	Heterotrophic

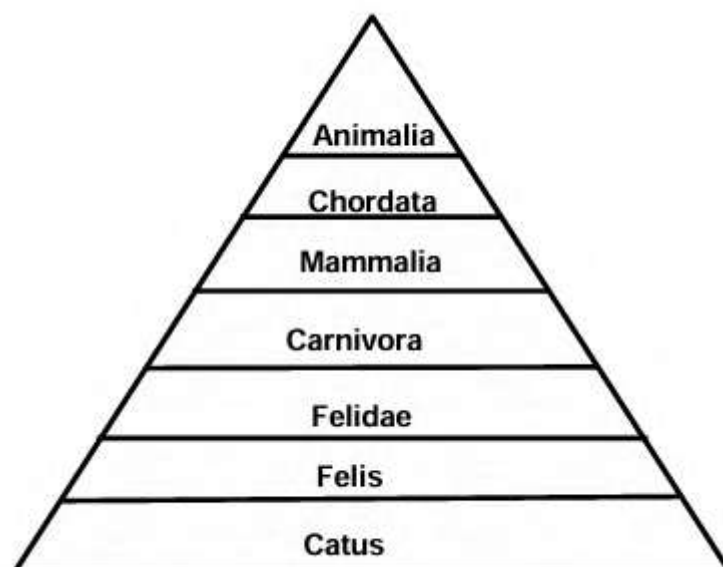
- 4.1 Fill in the missing pieces of information from the table labelled (a) to (d). (4)
- 4.2 What does eukaryotic mean? (1)
- (5)



Activity 5

- 5 Carolus Linnaeus established a hierarchical classification system of grouping similar organisms together.

He classified a cat as follows:



5.1 According to Linnaeus' system state the:

- (a) class to which the cat belongs (1)
- (b) species to which the cat belongs (1)

5.2 Write down the correct scientific name of the cat. (1)

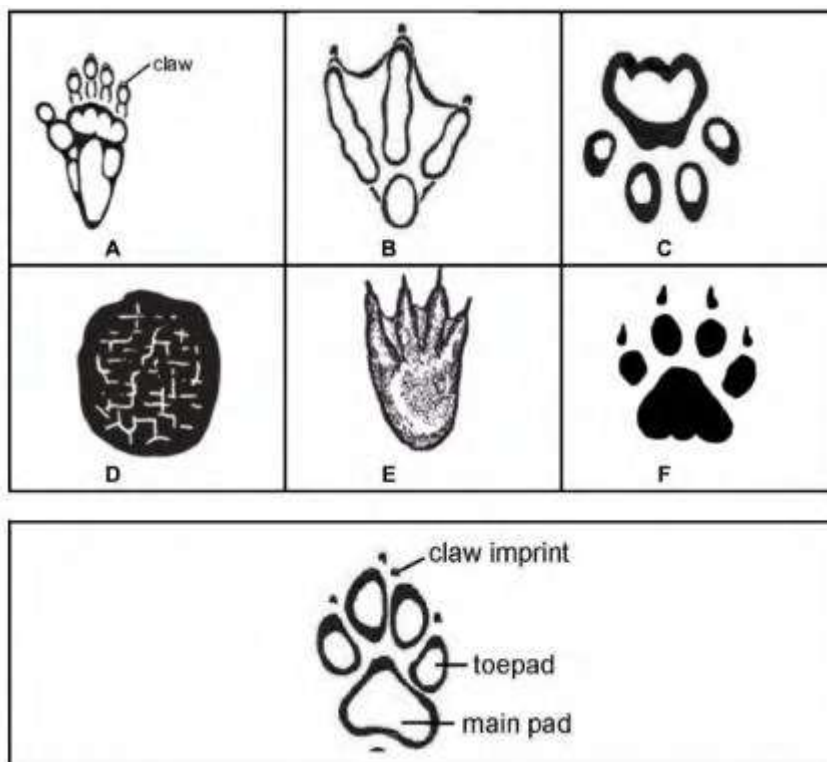
5.3 State the genus to which humans belong. (1)

(4)

Activity 6

- 6 Kuhle and Bongile found the animal tracks shown below while walking with their class in a nearby field.

Their teacher gave them the key below to help them identify the footprints.



1	Track has distinct claw imprints	Go to 2
	Track does not have claw imprints	Go to 5
2	Track has four toepads	Go to 3
	Track has three or five toepads	Go to 4
3	Webbed foot	Crocodile
	Foot not webbed	Cheetah
4	Three toepads	African Penguin
	Five toepads	Baboon
5	Toepad imprints visible	Go to 6
	Toepad imprints are not visible	Elephant
6	Four toepad imprints	Leopard
	Three toepad imprints	Dassie

Use the key above to identify footprints **A**, **B**, **C** and **D**. Write down only the letter (**A**, **B**, **C** or **D**) and the name of the animal.

(4)

(4)

Activity 7

7 The snow leopard is classified as follows:

Animalia, Chordata, Mammalia, Carnivora, Felidae, Panthera, Uncia



- 7.1 To which Order and Family does the snow leopard belong? (2)
 - 7.2 Correct the errors in the snow leopard's binomial (scientific) name. (2)
 - 7.3 How many kingdoms of living organisms are there? (1)
 - 7.4 The snow leopard is eukaryotic. What does this mean? (1)
 - 7.5 Suggest which mode of nutrition and method of reproduction is common in snow leopards. (2)
 - 7.6 Tigers, jaguars, lions and leopards belong to the same genus as snow leopards.
Name the type of two-step key that may be used to identify these cats. (1)
- (9)**

Activity 8

8 A plant commonly known as a Pine tree is classified as follows:

Plantae, Pteridophyta, Gymnospermae, Corniferales, Pinaceae, Pinus, ponderosa



8.1 Give the name of the scientist and the type of system he used to name organisms using the genus and the species. (2)

8.2 To which Kingdom, Order and Family does the Pine tree belong? (3)

8.3 Write the scientific name of the Pine tree. (2)

8.4 The five-kingdom system is the most common classification system that was proposed by Robert Whitaker in 1969.

In light with the above statement give 5 kingdoms that were proposed by Robert Whitaker. (5)

(12)

Activity 9

- 9 Tabulate TWO differences between organisms grouped under kingdom animalia and plantae (5)

(5)**Activity 10**

- 10 Study the information regarding the number of animal species in South Africa and the world below and answer the question that follow

Vertebrates	Number of species in SA	Number of species in the world
Mammals	227	3913
Birds	718	8975
Reptiles	286	6217
Amphibians	84	4000
Fish	112	8615

- 10.1 How many vertebrate animals' species occur in South Africa? (2)
- 10.2 Identify:
- (a) Independent variable (1)
- (b) Dependent variable (1)
- 10.3 Plot the bar graph in which numbers of species of five vertebrates is compared in South Africa. (6)
- 10.4 Kingdom Protista is distinguished into three groups as protozoa, algae and moulds, discuss general characteristics. (5)
- (15)**



Activity 11

- 11 According to the Five-Kingdom system of classification, each of the organisms shown below belongs to a different Kingdom. Complete the table by filling in the missing words. Write down only the question number (1.4.1–1.4.10) and the answer, for example 1.4.11 Animalia.

Organism					
Kingdom	11.1	Protista	Fungi	11.2	Animalia
Genus		Paramecium	Agaricus	Protea	Bos
Species		caudatum	Bisporus	Cynaroides	Taurus
Prokaryote or Eukaryote	11.3	11.4	Eukaryote	Eukaryote	11.5
Unicellular or Multicellular	11.6	Unicellular or Multicellular	Multicellular	11.7	Multicellular
Method of Feeding	Autotrophic and heterotrophic	Autotrophic, Heterotrophic and Saprophytic	11.8	11.9	
Scientific name		11.10			



(10 x 1) (10)

(10)

Activity 12

10 The extract shows classification

Carolus Linnaeus established a hierarchical classification system of grouping similar organisms together. He grouped them from broad groups called Kingdoms down to the smallest groups called species.

Using his system a chimpanzee is fully classified as follows:

Animalia, Chordata, Mammalia, Primates, Hominidae, Pan, Troglodyes

- 12.1 According to Linnaeus' system, to which class does the chimpanzee belong? (1)
- 12.2 Write correctly the scientific name of the chimpanzee. (2)
- 12.3 Identify the genus to which the chimpanzee belongs. (1)
- 12.4 State TWO reasons why organisms are given scientific names. (2)
- (6)



General Suggestions (P1 and P2)

- Emphasize **practical work** and high-quality tasks in Grades 10 and 11 to prepare learners for scientific investigation questions.
- Encourage learners to **design their own investigations** by being given an observation and an aim.
- Scientific investigation skills are assessed in both **Paper 1** and **Paper 2**, making this practice essential.

Variables

Learners should avoid common errors when identifying variables:

- Writing the independent variable incorrectly (e.g., “*effect of temperature*” instead of simply “*temperature*”).
- Confusing dependent and independent variables (e.g., “effect of” refers to the dependent variable).
- Using “result” instead of “aim” to extract variables, this can lead to incorrect identification.

Example: Aim: To determine the effect of temperature on enzyme activity.

- Independent variable: Temperature
- Dependent variable: Mass of starch (not “average mass of starch”)

Clues for Identifying Variables

1. Relationship (‘and’)

- Variables are separated by “and”.
- Example: *Light intensity and rate of transpiration*
 - Independent: Light intensity
 - Dependent: Rate of transpiration

2. Effect/Influence (‘of’ and ‘on’)

- Independent variable follows “of”; dependent variable follows “on”.
- Example: *Effect of salt concentration on osmosis*
 - Independent: Salt concentration
 - Dependent: Rate of osmosis

3. Affect

- “Affect” separates variables.
- Example: *Potato thickness affects osmosis*
 - Independent: Potato thickness
 - Dependent: Rate of osmosis

4. Lead/Result

- “Lead to” or “result in” separates variables.
- Example: *High temperature leads to increased transpiration*
 - Independent: Temperature
 - Dependent: Rate of transpiration
 -

5. Use of

- “Use of” separates variables.
- Example: *Effect of light intensity on transpiration using a potometer*
 - Independent: Light intensity
 - Dependent: Rate of transpiration
 -

6. Caused

- “Caused” separates variables.
- Example: *Eutrophication causes fish mortality*
 - Independent: Eutrophication
 - Dependent: Fish mortality
 -

Conclusions

- A conclusion must be derived from the **aim**, showing the relationship between variables.
- Results guide learners in writing accurate conclusions.
- Learners must understand that different data types (continuous vs. discontinuous) require different conclusion formats.
- Avoid vague terms like “*directly proportional*” or “*inversely proportional*”—be explicit.

Validity vs. Reliability

Validity

- All factors influencing results must be kept constant.
- Validity improves when only the independent variable changes.
- Learners should use the term *validity* instead of *fairness*.

Reliability

- Reliability improves when investigations are repeated, sample sizes are increased, or measurements are repeated over time.
- The key question: *Will the same results be achieved if repeated?*

Control vs. Baseline

Control

- A group that does not receive the independent variable treatment.
- Example: Testing starch in potato solution.
 - Experiment: Beaker with potato solution.
 - Control: Beaker with distilled water.
 - Purpose: To prove iodine colour change is due to starch only.

Baseline

- Measurement taken before treatment of the independent variable.
- Example: Investigating exercise effect on pulse rate.
 - Baseline: Initial pulse rate measured before exercise.
 - Comparison: Pulse rate after exercise.
 - Purpose: To confirm changes are caused by the independent variable.

Graphs

- Learners must be taught graph-drawing skills from Grade 10.
- Headings must be explicit, including both variables (avoid “vs/versus”).
- Example: Line graph showing *temperature and enzyme activity*.

Calculations

Learners must master simple calculations for data analysis:

- **Difference:** Larger value – smaller value (or final – initial).
-
- **Percentage:** $\frac{\text{value given}}{\text{Total}} \times 100$.
-
- **Percentage increase:** $\frac{\text{larger value} - \text{smaller value}}{\text{Smaller value}} \times 100$.
-
-
- **Percentage decrease:** $\frac{\text{larger value} - \text{smaller}}{\text{Larger value}} \times 100$.
-
-
- **By how many times:** Larger value $\div$ smaller value.
-
- **Average:** Sum of values $\div$ Total number of values given.

Note: Answers should be rounded to **two decimal places**, unless otherwise instructed

