



education

Department:
Education
PROVINCE OF KWAZULU-NATAL

LEARNER

SUPPORT DOCUMENT

TERM 2

GRADE 11

LIFE SCIENCES

2020

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Topic: PHOTOSYNTHESIS

A. TOPIC PLAN

Lesson	Aspect	Classwork	Homework
1	Introduction <ul style="list-style-type: none"> • Overview of plant organs Structure of a leaf and chloroplast*	Activity 1.1 Teaching tool 1 Teaching tool 2	Activity 1.2
2	Requirement and product <p style="text-align: center;">Process:</p> <ul style="list-style-type: none"> • Light phase • Dark phase 	Activity 2.1 Teaching tool 3	Activity 2.2
3	Investigation if starch and light is produced for photosynthesis	Activity 8.3	Activity 5.2
4	Investigation if CO ₂ , oxygen and Chlorophyll is necessary for photosynthesis	Activity 5.1 Teaching tool 4	Activity 7.1
5	Factors affecting photosynthesis <ul style="list-style-type: none"> • Light • Carbon dioxide • Temperature Importance of photosynthesis	Activity 4.2	Activity 8.1
6	Greenhouse system & food production The role of ATP	Activity 6 Activity 9	Activity 3
7	Topic test		
8	Remedial		

Try to include as many of the following as possible as classwork/homework:

Extracts

Graph to interpret

Graph to draw

Tables

Diagrams to label

Diagrams to draw

Paragraph questions

Calculations

Investigations

Extracts

B. TERMINOLOGY

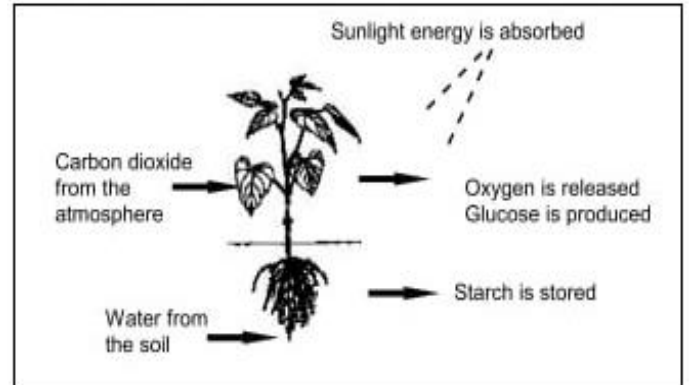
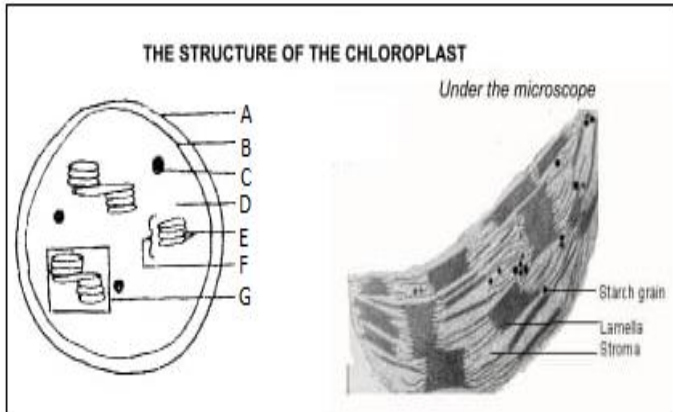
The following terms should be covered in this topic:

Photosynthesis	ATP	Variegated	Starch
Chloroplast	Iodine solution	Greenhouse	Limiting factor
Chlorophyll	Autotrophs	Destarch	Photolysis
Light phase	Experiment	Control	Anabolic
Dark phase	Glucose	Heterotrophs	Enzymes
Stroma	Thylakoids	Lamella	Xylem
Phloem	Cuticle	Spongy mesophyll	Stomata

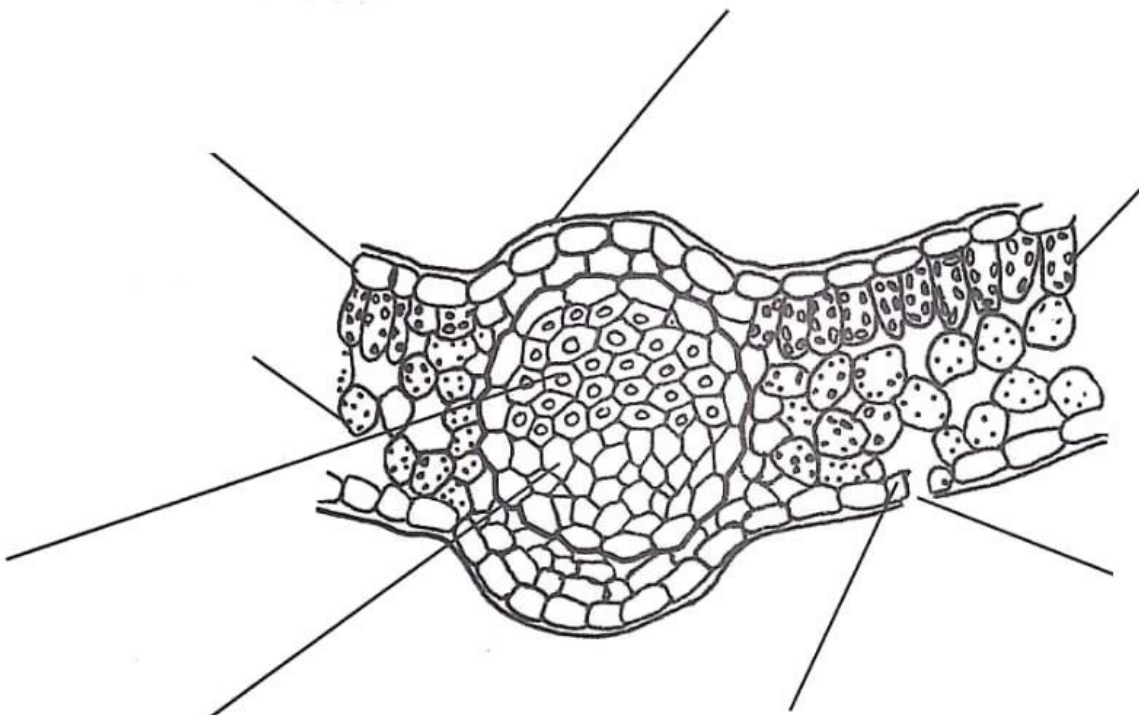
Term	Description
Photosynthesis	A process whereby green plants manufacture their own food using radiant energy
Chloroplast	Organelle in a plant cell where photosynthesis occur
Chlorophyll	Green pigment that trap light for photosynthesis
Light phase	Occurs in the grana of the chloroplast
Dark phase	Occurs in the stroma of the chloroplast
ATP	Energy carrier in the living things used for various activities
Iodine solution	Used to test for the presence of starch
Autotrophs	Organisms that use light energy to manufacture its own food
Experiment	A scientific procedure undertaken to make a discovery, test a hypothesis or demonstrate a known fact.
Glucose	Sugar that is the product of photosynthesis
Variegated	Leaf that has more than one colour
Greenhouse	Special building that is used for growing plants in an area where they would not normally grow that well.
Destarch	Process of eliminating starch reserves in a plant for experiments concerning photosynthesis
Control	A variable that is not changed throughout an experiment
Heterotrophs	Organisms that are unable to manufacture their own food (consumers & decomposers)
Starch	A carbohydrate that store energy in plants
Limiting factor	Factor that limits the rate at which photosynthesis takes place

C. TEACHING TOOLS

Teaching Tool 1



Teaching Tool 2

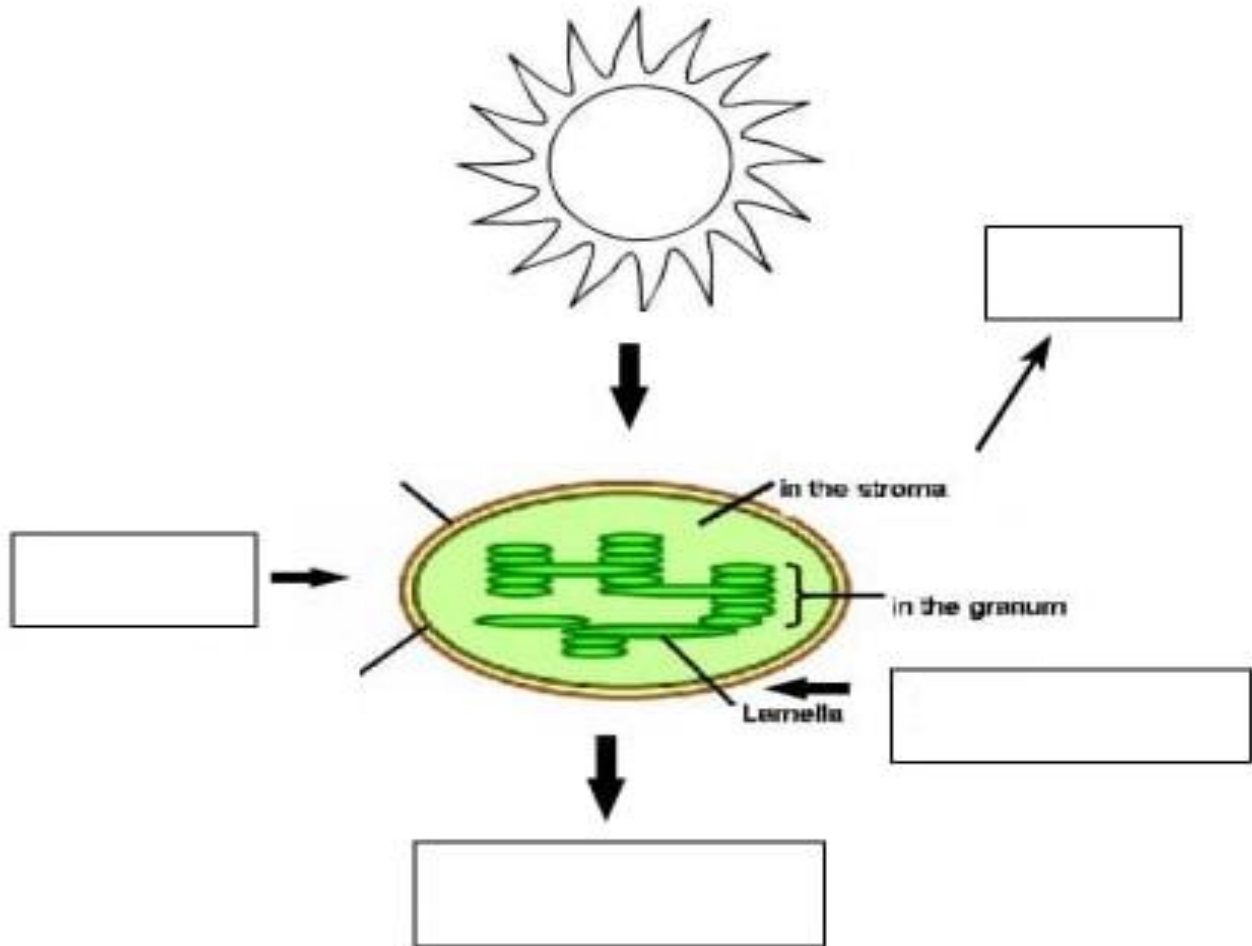


Transverse section through a leaf

Teaching Tool 3

PHOTOSYNTHESIS

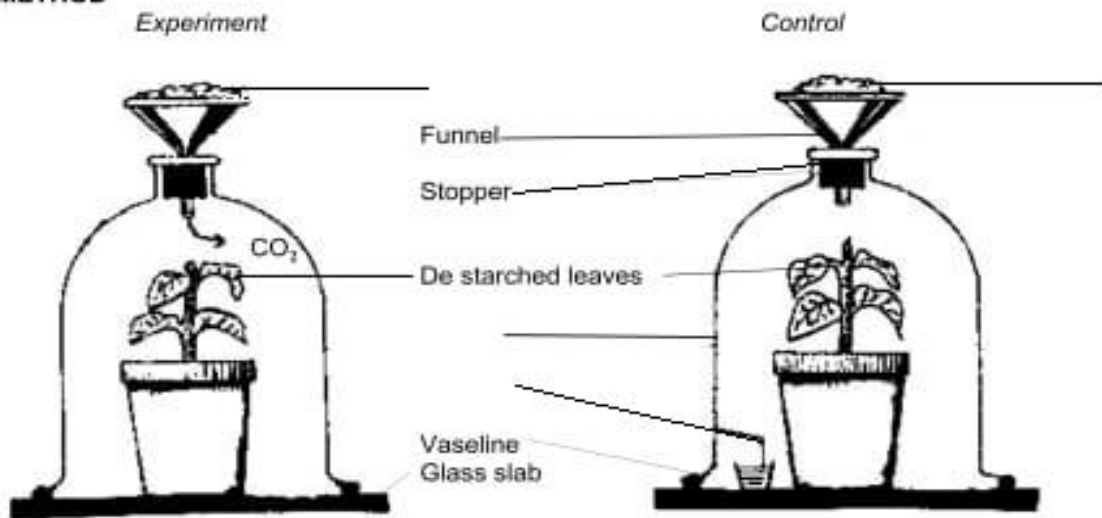
Photosynthesis consists of two stages a)
b)



Teaching Tool 4

AIM : _____

METHOD



A. CLASSWORK/HOMEWORK

Activity 1

1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter A to D) next to the question number in the answer book.

1.1.1 The characteristics listed below are all applicable to chloroplasts.

- (i) Contain a double membrane
- (ii) Contain a fluid matrix with enzymes
- (iii) Contain parallel sacs called lamellae
- (iv) Contain a green pigment called chlorophyll
- (v) Contain starch granules

Which combination of characteristics make the chloroplast suitable to perform its function?

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

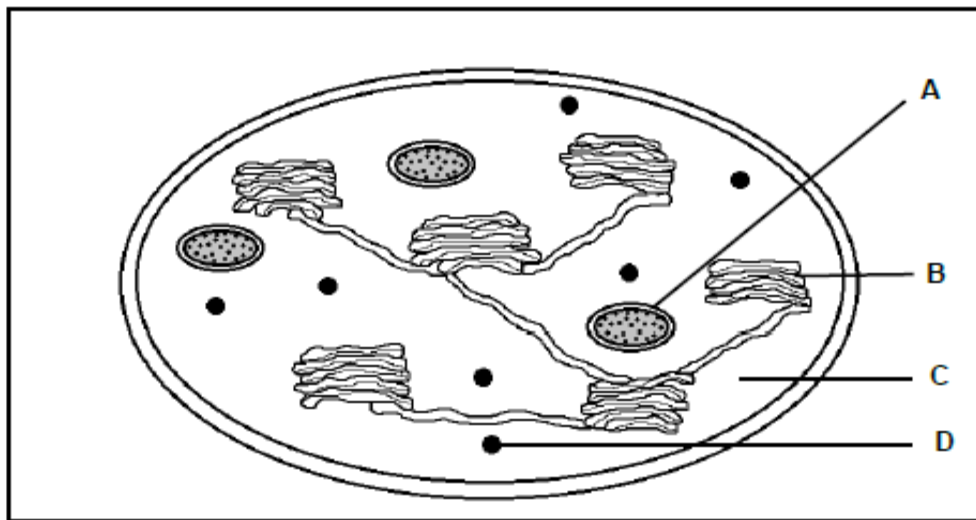
(2)

1.1.2 Which ONE of the following characteristics make the leaf suitable for photosynthesis to take place?

- A The spongy mesophyll is elongated
- B The leaf has many stoma for gaseous exchange in the lower epidermis
- C The upper epidermis has a white cuticle
- D Xylem is present to the products of photosynthesis

(2)

1.2 The diagram below represents the structure of a chloroplast.



1.2.1 Identify:

(a) Part C (1)

(b) Structure D (1)

1.2.2 Give the function of the part labelled A. (1)

1.2.3 Name the part that will be active in light only. (1)

Activity 2

2.1 Give the correct **biological term** for each of the following descriptions. Write only the term next to the question numbers in the answer book.

2.1.1 The simple sugar formed during photosynthesis in green plants (1)

2.1.2 The type of plastid that absorbs radiant energy during photosynthesis (1)

2.1.3 The splitting of water molecules into hydrogen and oxygen in the presence of light (1)

2.1.4 Site of reactions of the dark phase in the chloroplast (1)

2.1.5 The form in which excess glucose is stored in a plant (1)

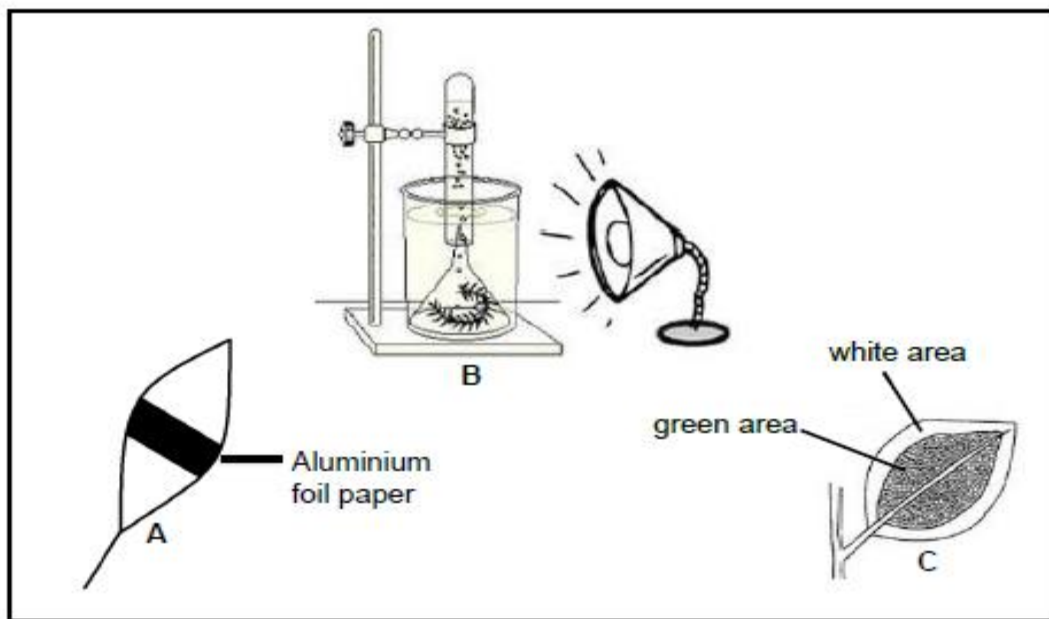
2.1.6 The green, light-trapping pigment in photosynthesis found in plant leaves (1)

2.1.7 The type of energy absorbed by chlorophyll (1)

- 2.2 Indicate whether each of the descriptions in COLUMN I apply to **A ONLY**, **B ONLY**, **BOTH A AND B** or **NONE** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question numbers (1.3.1 to 1.3.3) in the answer book.

2.2.1	The type of energy stored in food molecules during photosynthesis	A: Chemical energy B: Potential energy	(2)
2.2.2	Raw material(s) essential for photosynthesis	A: Oxygen B: Carbon dioxide	(2)

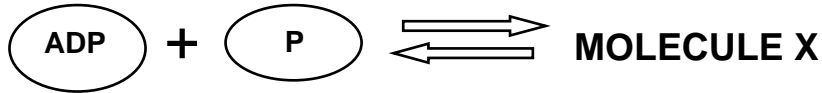
- 2.3 The following diagrams represent investigations involved in a process which takes place in green plants. The plant/leaves represented as A and C were exposed to sunlight for 4-5 hours.



- 2.3.1 Which investigation (A, B or C) is designed to test for the following? (1)
- Chlorophyll is necessary for photosynthesis (1)
 - Light is required for photosynthesis (1)
 - Oxygen is produced during photosynthesis (1)
- 2.3.2 Give the LETTER of the investigation that does not show a control. (1)
- 2.3.3 Which investigation(s) need(s) a chemical to test for whether photosynthesis took place? (2)

Activity 3

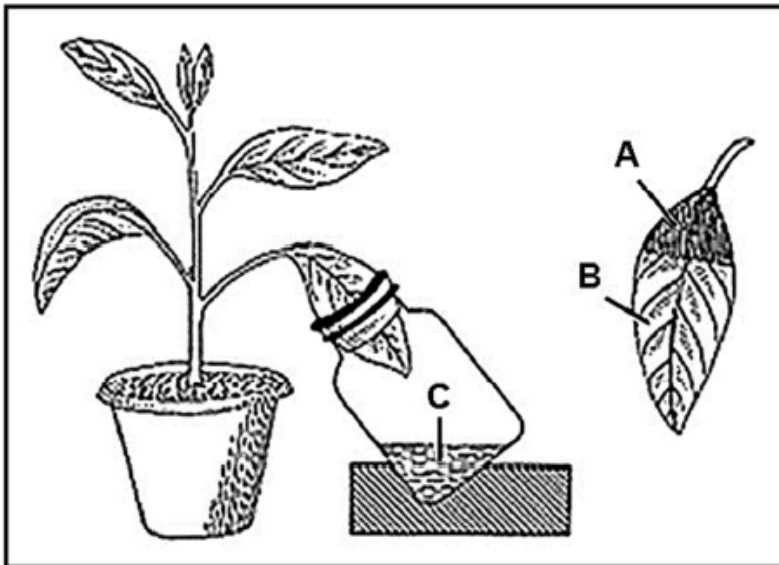
3.1 Study the equation below showing the formation of the energy carrier molecule X



- 3.1.1 Give the full name of ADP (1)
- 3.1.2 Name molecule X (1)
- 3.1.3 Give one reason why molecule is biologically important. (1)

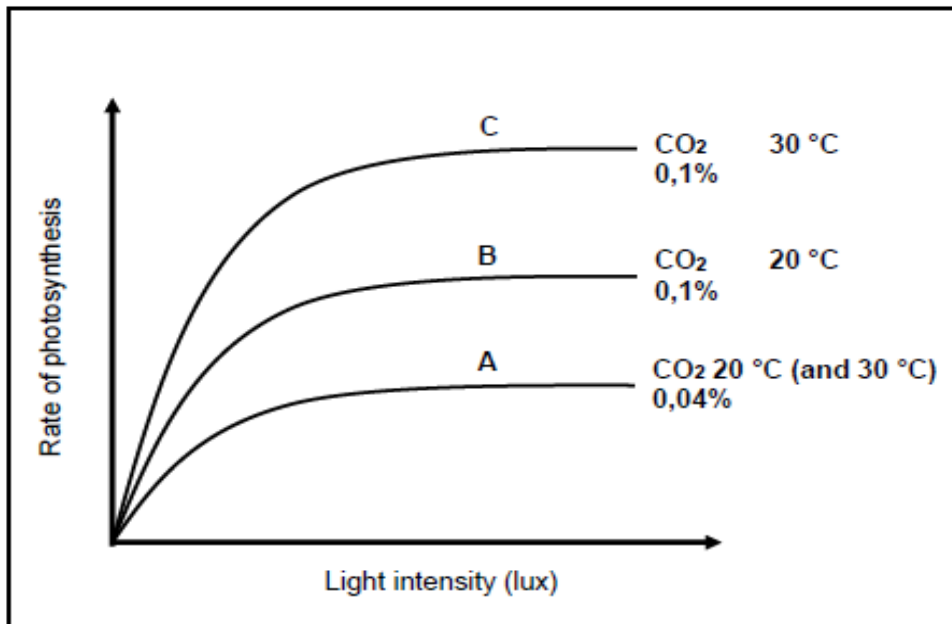
Activity 4

4.1 The diagram below shows the set-up of an experiment to investigate whether carbon dioxide is necessary for photosynthesis to take place. The plant was destarched before the apparatus was set up as in the diagram and placed in a sunny room.



- 4.1.1 Name liquid C. (1)
- 4.1.2 Give the function of liquid C. (1)
- 4.1.3 What result can be seen at A? (1)
- 4.1.4 Explain ONE reason for the result at B. (2)
- 4.1.5 In which phase of photosynthesis will carbon dioxide be used? (1)
- 4.1.6 Where in the cell will the phase named in Question 4.1.5 take place? (1)
- 4.1.7 Why was the plant destarched before the experiment was conducted? (1)

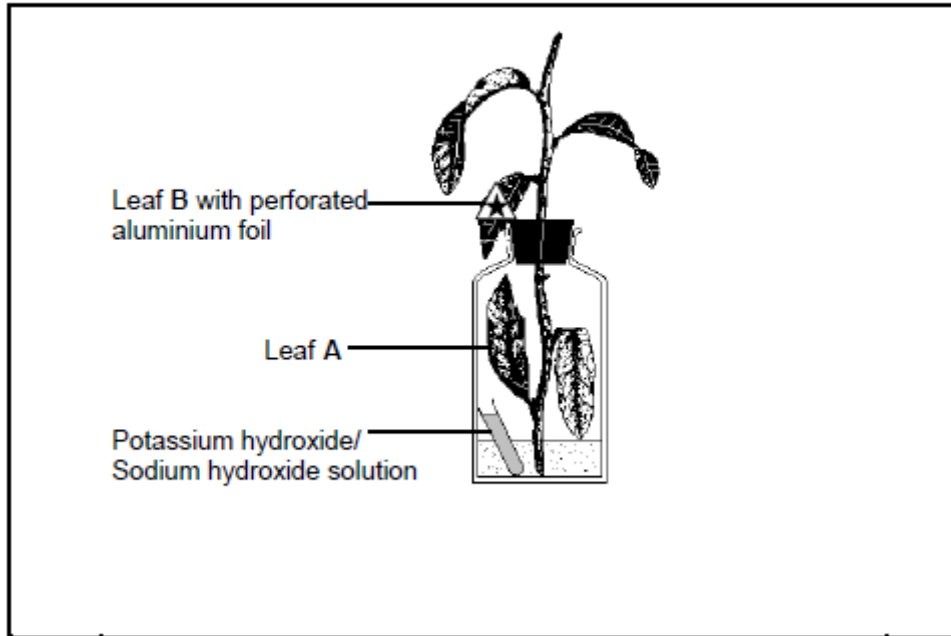
- 4.2 The graph below shows the rate of photosynthesis under different environmental conditions. Study the graphs and answer the questions that follow.



- 4.2.1 Which of the graphs shows the highest production of glucose? (1)
- 4.2.2 Why is the production of glucose in graph A, low? (1)
- 4.2.3 What factor in graph B and C limits the rate of photosynthesis? (1)
- 4.2.4 Predict what the graphs would look like if the temperature were increased first to 40 °C and then to 60 °C. (2)
- 4.2.5 Give a reason for your answer in QUESTION 4.2.4 (1)

Activity 5

5.1 Study the diagram and then answer the questions.

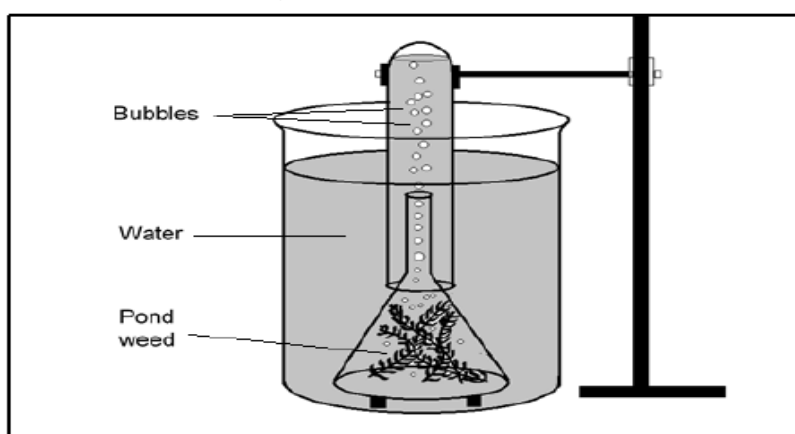


- 5.1.1 Why was the plant kept in a dark place for 48 hours before it was placed in sunlight? (1)
- 5.1.2 Looking at the diagrams given, which leaf (A or B) would be used: (1)
- (a) To show that CO_2 is necessary for photosynthesis? (1)
- (b) To show that light is necessary for photosynthesis? (1)
- 5.1.3 What is the role of the potassium hydroxide / sodium hydroxide in this experiment? (1)
- 5.1.4 With which chemical will you test to see if photosynthesis takes place? (1)

- 5.2 When light shines on pondweed, *Elodea sp*, bubbles of gas are released. The rate at which bubbles of gas are produced can be used to measure the rate of photosynthesis. An investigation was carried out to study the effect of different colours of light on the rate of photosynthesis in the pondweed.

The apparatus was set up as shown in the diagram below.

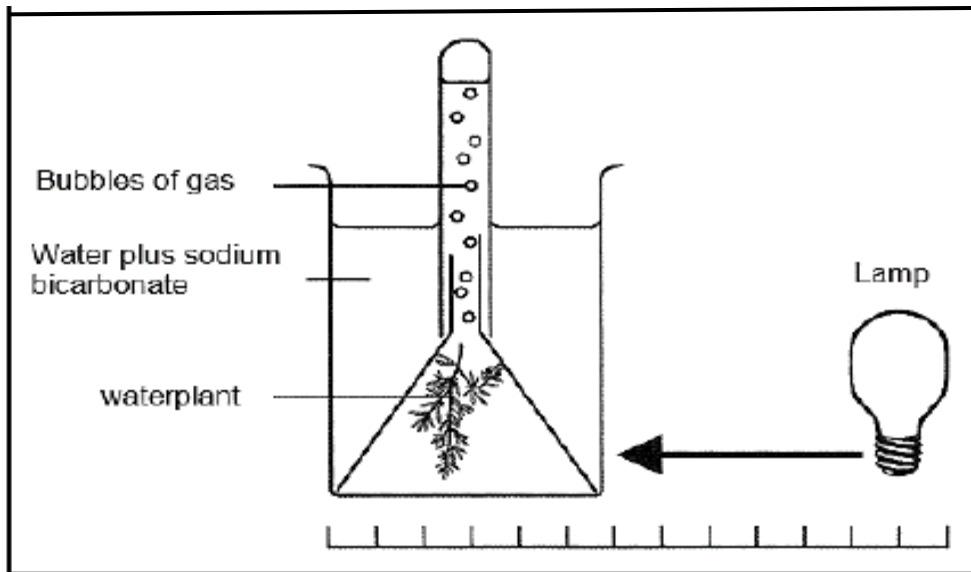
- The pondweed was exposed to one colour of light and left for 5 minutes before measurements were taken.
- The time taken for the release of 20 bubbles was recorded.
- The procedure was repeated using light of different colours but of equal intensity.
- The results are given in the table below.



Colour of light	Time (in seconds) for 20 bubbles to form
Violet	80
Green	40
Blue	160
Red	140
Yellow	70

- 5.2.1 Which colour light is the best for photosynthesis? (1)
- 5.2.2 Name the:
- Independent variable (1)
 - Dependent variable (1)
 - Two fixed variables (2)
- 5.2.3 Calculate the average time taken to release 20 bubbles for all the colours together. Show all your calculations. (2)
- 5.2.4 Draw a bar graph of the results shown in the table. (6)

- 5.3 An experiment was conducted to investigate the effect of light intensity and the rate of photosynthesis. The apparatus was set up as shown in the diagram below. Study the diagram and answer the questions.



- 5.3.1 State a reason:

- (a) for choosing a water plant instead of a terrestrial plant in this particular experiment. (1)
- (b) for the addition of sodium bicarbonate (baking powder) to the water. (1)

- 5.3.2 How was the rate of photosynthesis measured using this experiment? (1)

- 5.3.3 The data in the table below was recorded during the experiment:

A	B	C
Distance between the water plant and light source (metres)	100 W bulb Light intensity = power/Area Light intensity = W/m ²	Number of bubbles given off in one minute.
1,0	7,96	8
0,5	31,85	28
0,25	127,39	105
0,125	510,20	105

- 5.3.4 With reference to the results given above, what deduction can be made with regard to the relationship between the intensity of light and rate of photosynthesis? (3)

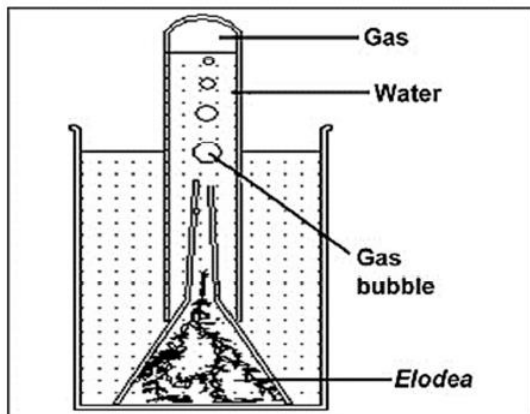
Activity 6

6.1 Complete the missing words in the statements below:

- 6.1.1 As the light intensity increases, the rate of (1)
photosynthesis_____
- 6.1.2 Structures in which crops are grown in a protected and controlled (1)
environment are called _____
- 6.1.3 ATP stands for _____ (1)
- 6.1.4 _____ energy is found between phosphates. (1)
- 6.1.5 Photosynthesis helps maintain a healthy level of carbon dioxide in the (1)

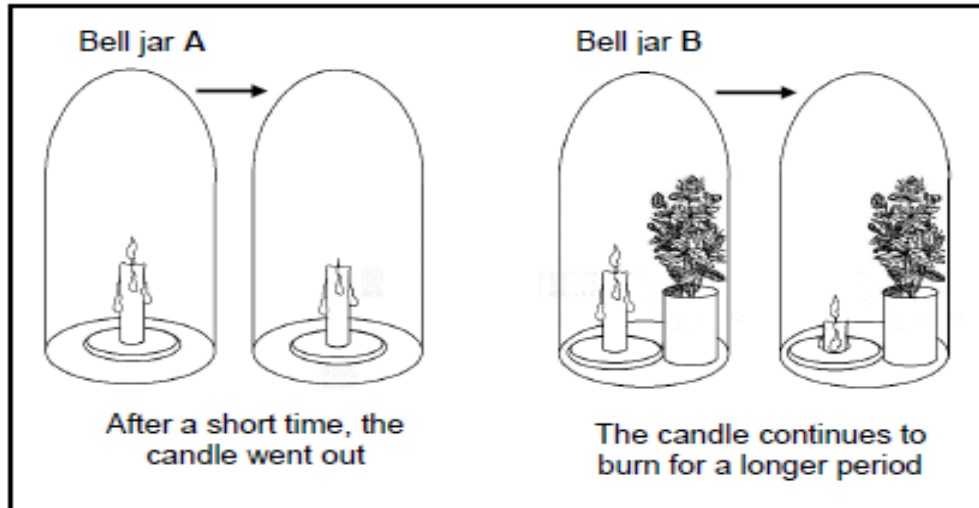
Activity 7

7.1 The diagram below shows a photosynthesis experiment done to investigate if a gas is produced during the process. A small amount of sodium carbonate was added to the water before the experiment was started.



- 7.1.1 Name the gas produced by the plant. (1)
- 7.1.2 Describe a test for the gas mentioned in QUESTION 2.4.1. (2)
- 7.1.3 Explain why sodium carbonate was added to the water. (2)
- 7.1.4 Why was this experiment done under water? (1)
- 7.1.5 Explain TWO ways in which the rate of this experiment could be increased. (4)

- 7.2 An experiment was set up to investigate whether oxygen is released during photosynthesis. The result of the experiment is represented in the following diagram.



The following deductions were made before arriving at the final conclusion.

- (i) Photosynthesis reduces the amount of CO_2 inside bell jar B
- (ii) The oxygen in bell jar A was completely used up and the burning is not supported
- (iii) The photosynthesis increases the amount of oxygen inside bell jar B
- (iv) The vapour produced inside bell jar A due to combustion extinguished the burning candle

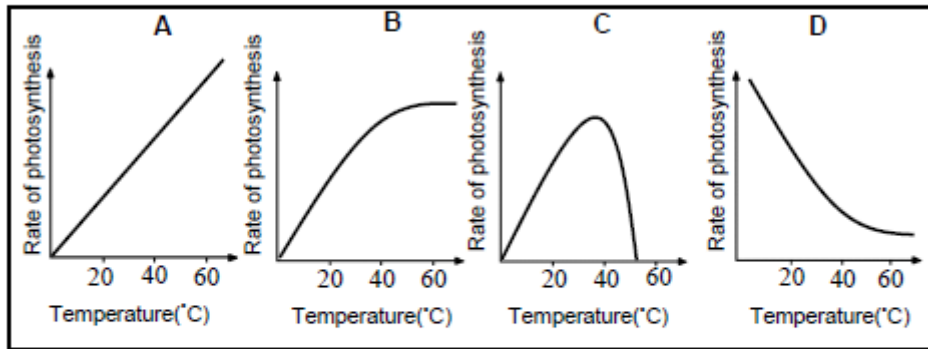
Which ONE of the following set of deductions is correct?

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

(2)

Activity 8

8.1 The graphs below (A, B, C and D) represent the relationship between the rate of photosynthesis and temperature.



Which ONE of the graphs (A, B, C or D) represent the correct relationship between the temperature and the rate of photosynthesis?

- A D
B A
C B
D C

(2)

8.2 An experiment was carried out to calculate the rate of photosynthesis in a group of plants at different concentrations of carbon dioxide. This was repeated at two different light intensities. The results are given below.

CO ₂ concentration (%)	Rate of photosynthesis (Arbitrary units)	
	Low light intensity	High light intensity
0,00	0	0
0,02	20	20
0,04	29	35
0,06	35	47
0,08	39	68
0,10	42	84
0,12	45	89
0,14	46	90
0,16	46	90
0,18	46	90

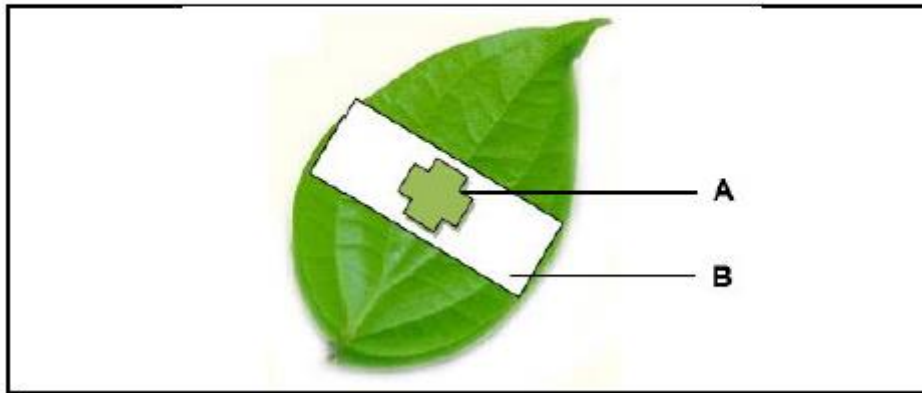
8.2.1 Identify the dependent factor in the above graph. (1)

8.2.2 Up to what values does CO₂ concentration act as a limiting factor at high light intensities? (1)

8.2.3 Name TWO limiting factors of photosynthesis other than the ones mentioned in QUESTION 8.2.2 (2)

8.2.4 Draw a line graph to represent the rate of photosynthesis under various concentrations of CO₂ at low light intensity. (7)

- 8.3 The diagram below shows how the leaf in a destarched plant was set up by a learner to perform an experiment on photosynthesis. Study the diagram and answer the questions below.



- 8.3.1 What was the aim of this experiment? (2)
- 8.3.2 What was the dependent variable in this experiment? (1)
- 8.3.3 What chemical was used to test for the presence of starch in the leaf? (1)
- 8.3.4 What was the colour change observed in areas of the leaf that were:
- (a) Not exposed to sunlight (1)
- (b) Exposed to sunlight (1)
- 8.3.5 State the:
- (a) Human enzyme responsible for the digestion of the stored product of photosynthesis (1)
- (b) Glands that secrete the enzyme mentioned in QUESTION 1.4.5(a) into the mouth cavity (1)
- 8.3.6 There are two gases involved in the process of photosynthesis. (1)
- (a) Which gas would not be produced, if the plant is placed in a dark box? (1)
- (b) Which of the gases mentioned above is required by living organisms to generate energy for body processes? (1)

Activity 9

9.1 Which ONE of the following factors will cause optimal growth in greenhouses?

- A Carbon dioxide enrichment
- B Temperatures between 10 °C and 15 °C
- C Dim lighting in the greenhouse
- D Only irrigating once a week

(2)

Topic: Animal nutrition

A. TOPIC PLAN

Lesson	Aspect	Classwork	Homework
1	Introduction to human nutrition <ul style="list-style-type: none"> • Importance of inorganic and organic compounds • Energy flow • Define autotrophs and heterotrophs 		
2	Nutrition in animals <ul style="list-style-type: none"> • Importance of food • Define dentition • Differences in dentition of herbivores, carnivores, omnivores and human Definition of the following terms <ul style="list-style-type: none"> • Ingestion • Digestion • Absorption • Assimilation • Egestion 	Teaching tool 1	1.1
3	Human alimentary canal <ul style="list-style-type: none"> • Structure and functions of various parts • Associated organs 	Teaching tool 2	Activity2
4	Digestion <ul style="list-style-type: none"> • Mechanical and chemical digestion • The process of mechanical and chemical digestion Role of the following in chemical digestion <ul style="list-style-type: none"> • water • Enzymes • Bile 	Activity 3	
5	Absorption <ul style="list-style-type: none"> • Structural suitability of small intestines • Structure of villi • Importance of hepatic portal system 	Activity 4	
6	Process of absorption <ul style="list-style-type: none"> • Absorption of glucose and amino acid by villi • Absorption of glycerol and fatty acids • Absorption of water 	Activity 5	
	Assimilation <ul style="list-style-type: none"> • Definition of assimilation • Role of the liver 	Activity 6	

Lesson	Aspect	Classwork	Homework
7	Homeostatic control <ul style="list-style-type: none"> • Review role of liver and pancreas • Definition of homeostasis • Negative feedback mechanism involving glucagon and insulin • Diabetes 	Activity 7	
8	Importance of balanced diet <ul style="list-style-type: none"> • Causes and effects of malnutrition • Tooth decay • Effect of alcohol and drug abuse • Different types of diets 	Activity 8	Activity 9
9	Test		

B. TERMINOLOGY

The following terms should be covered in this topic:

Ingestion	Egestion	Deamination	Kwashiorkor
Digestion	Mechanical digestion	Homeostasis	Marasmus
Absorption	Chemical digestion	Diabetes	Anorexia
Assimilation	Villi	Malnutrition	Obesity
Bulimia	Chyme	Osmosis	Lymph vessels
Dentition	Goblet cells	Hepatic portal vein	Negative feedback
Peristalsis	Capillaries		

C. TEACHING TOOLS

Teaching Tool 1: Fox skull: from a typical carnivore (meat-eater)



Carnivores generally have long, sharp front teeth which help them catch and tear into their prey. The back teeth are narrow and sharply serrated, much like the blade of a knife. They are used to cut meat into smaller chunks. Insectivores (like moles) eat insects almost exclusively, and have fine, needle-like teeth.



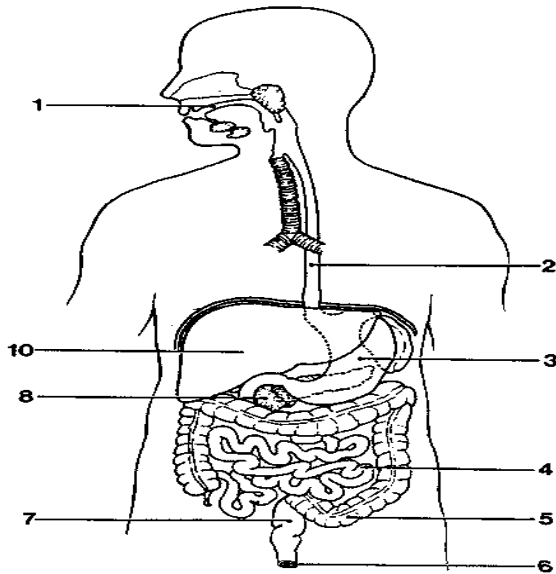
Herbivores have broad, flat molars (back teeth) with rough surfaces, which are used for grinding up tough plant tissues. Many herbivores (like squirrels) have chisel-like front teeth used for gnawing through wood or hard seeds. These teeth grow continually to avoid being worn down with use. Herbivores often have a gap between the front and back teeth to allow space for repositioning plant tissue as it's chewed, since much chewing is required to break it up.



Omnivores (such as humans) eat both plants and animals, and have broad, flat molars for grinding up a variety of foods. The front teeth are wide, narrow at the tips, and somewhat chisel-shaped, making them useful for biting off chunks of meat or plant material.

Teaching Tool 2

The following diagram shows human alimentary canal.



Complete the following table:

PART NUMBER	FUNCTION
1	
2	
3	
4	
5	
6	
7	
8	
10	

D. CLASSWORK/HOMEWORK

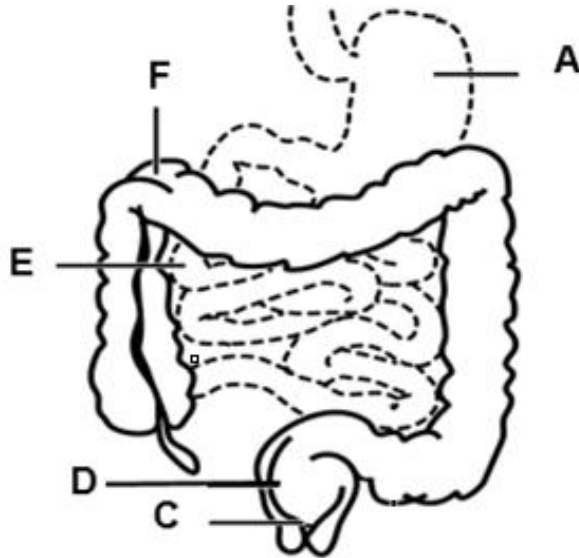
Activity 1

1.1 Provide the correct **biological term** for each of the following terms

- 1.1.1 Ejection of solid waste from the body (1)
- 1.1.2 The breakdown of large insoluble food molecules into smaller water soluble molecules so that they can be absorbed into blood plasma (1)
- 1.1.3 The products of digestion become part of the protoplasm of the body cells (1)
- 1.1.4 The process of taking soluble food substances into blood stream (1) **(4)**

Activity 2

2.1 Study the following diagram about a part of human alimentary canal.



2.1.1 Give labels for the following parts:

- | | |
|-------|-----|
| (a) A | (1) |
| (b) B | (1) |
| (c) C | (1) |
| (d) E | (1) |

2.1.2 Give the LETTER of the part with the following function or characteristics

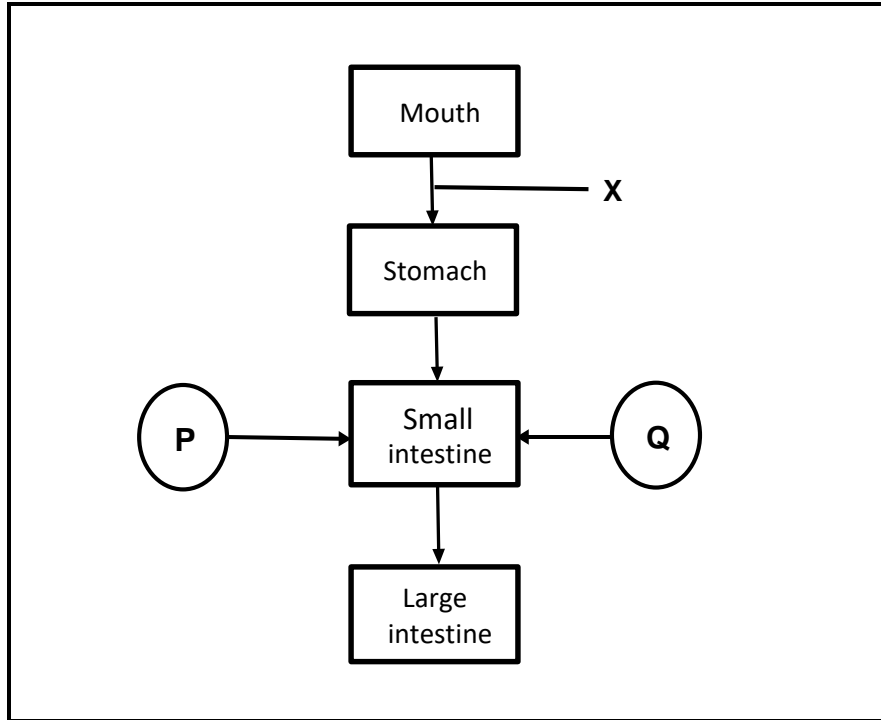
- | | |
|--|-----|
| (a) Responsible for the absorption of most water | (1) |
| (b) Responsible for breaking down of food molecules by mechanical and chemical digestion | (1) |
| (c) Contains the sphincter muscle responsible for controlling defecation | (1) |

2.1.3 State TWO functions of the liver associated with nutrition

(2) **(9)**

Activity 3

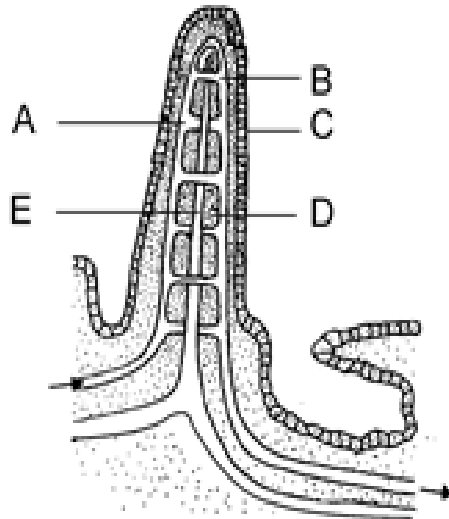
- 3.1 The diagram below shows a diagrammatic representation of the digestive system.



- 3.1.1 Name the part of the alimentary canal represented by **X**. (1)
- 3.1.2 By which process is food moved through structure **X**? (1)
- 3.1.3 Name the glands P and Q that release their secretions into the small intestine. (2)
- 3.1.4 Name the part of the alimentary canal where the digestion of proteins begins. (1) **(5)**

Activity 4

- 4.1 Study the following diagram and then answer the questions by filling in the missing words. Write the numbers 4.1.1 to 4.1.10 in your answer book and next to each the missing word.

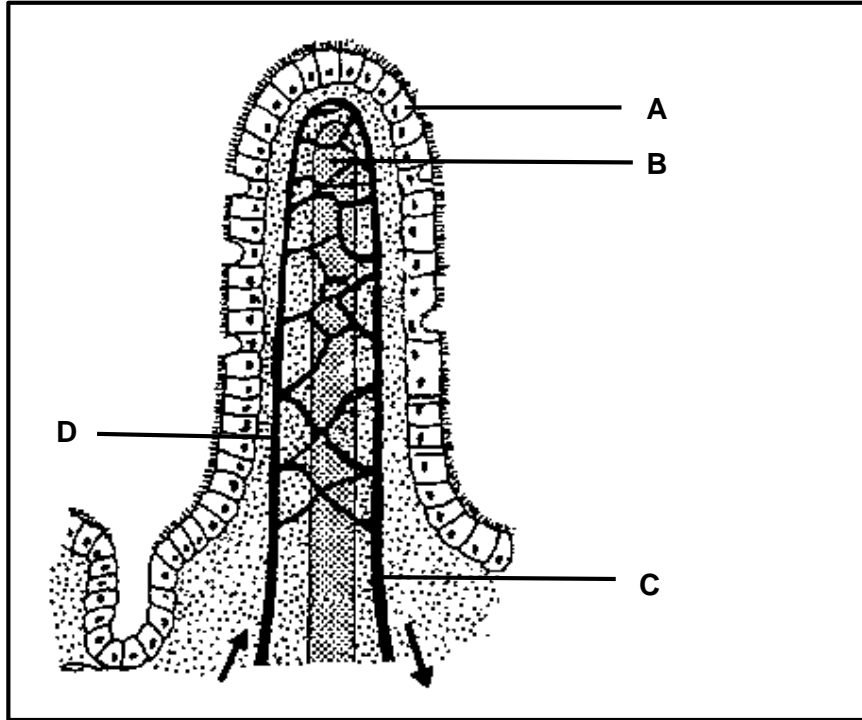


The diagram shows the structure of a 4.1.1 which is found lining the 4.1.2. The layer C consists of 4.1.3 cells. The part labeled D is 4.1.4 tissue. Parts A and B represent 4.1.5 into which the products of digestion, 4.1.6 and 4.1.7, pass so that they can be transported away. Vessel E represents the 4.1.8 into which diffuses products of digestion such as 4.1.9 and 4.1.10.

(10)

Activity 5

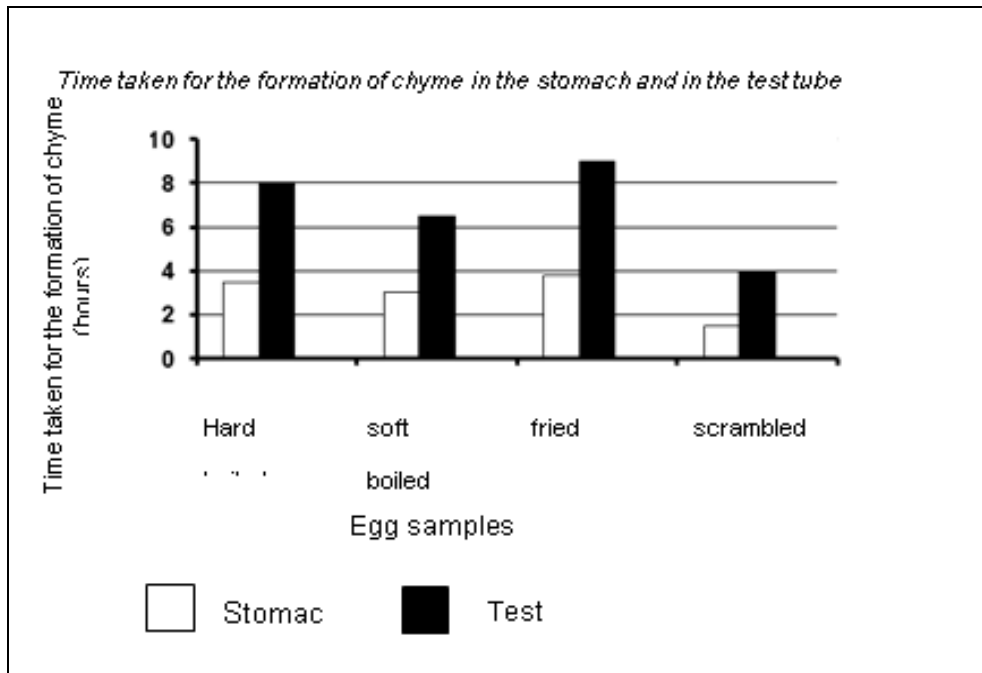
5.1 The diagram below shows a structure associated with the digestive system.



- 5.1.1 Identify the structure shown in the diagram. (1)
- 5.1.2 Name the following parts:
- (a) A (1)
- (b) B (1)
- 5.1.3 In which part of the digestive tract would this structure be found? (1)
- 5.1.4 Explain TWO structural adaptations of the part mentioned in QUESTION 5.1.3 that enables it to perform its functions (4)
- 5.1.5 In which part (C or D) would you expect to find more nutrients? (1)
- 5.1.6 Explain your answer in QUESTION 5.1.5 (4) **(13)**

Activity 6

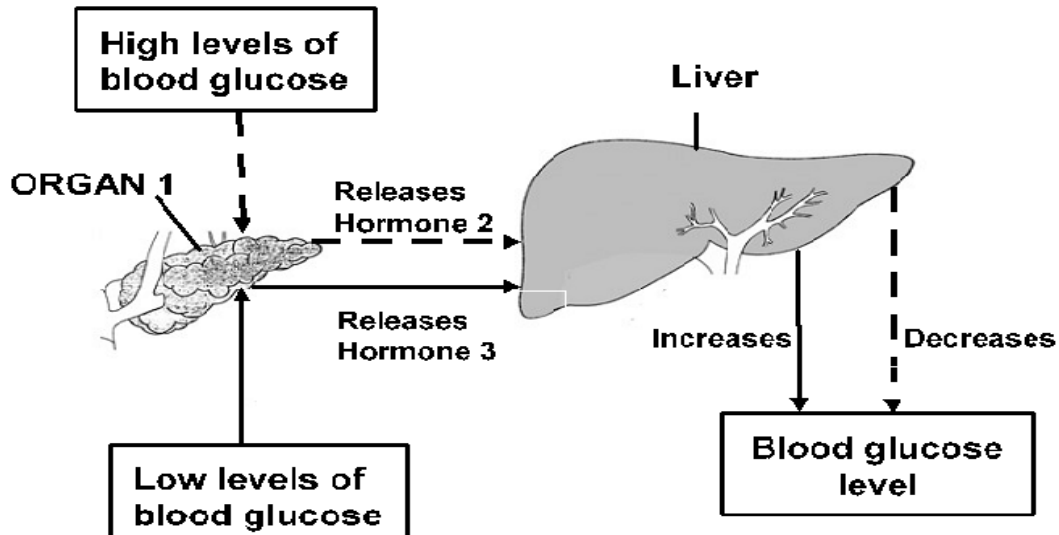
- 6.1 A scientist conducted an investigation on digestion, involving gastric juice. She compared the time taken for 50 g of different cooked egg samples to form chyme in the stomach, with the time taken for the same sample to form chyme in a test tube containing gastric juice. The test tube was maintained at 37°C. The results are indicated in the graph below.



- 6.1.1 Why was the temperature of the test tube maintained at 37°C? (1)
- 6.1.2 Name ONE factor other than temperature which was kept constant during the investigation (1)
- 6.1.3 Determine the following from the graph:
- The sample which took the longest time to form chyme in the stomach (2)
 - The sample which took the shortest time to form chyme in the test tube. (2)
- 6.1.4 Describe the absorption and transportation of end product of food that contains only carbohydrates. (8) **(14)**

Activity 7

7.1 Study the flow diagram below.



7.1.1 Identify: -

- (a) Organ 1 (1)
- (b) Hormone 2 (1)
- (c) Hormone 3 (1)

7.1.2 The disorder caused when organ 1 fails to release amounts of hormone 2 (1)

7.1.3 The mechanism that controls the levels of glucose in the body (1) **(5)**

Activity 8

8.1 Read the extract below and answer the questions that follow.

TOO MUCH CARBOHYDRATES AND TOO LITTLE PROTEINS

The World Health Organisation (WHO) defines malnutrition as “the cellular imbalance between the supply of nutrients and energy and the body’s demand for them to ensure growth, maintenance, and specific functions.” The term protein-energy malnutrition (PEM) applies to a group of related disorders. This involves inadequate intake of protein and calories and is characterised by emaciation (extreme thinness). The term was first used in 1933, and it refers to an inadequate protein intake with reasonable caloric (energy) intake.

*[Adapted from
<http://emedicine.medscape.com>]*

- 8.1.1 State the World Health Organisation’s definition of malnutrition. (2)
- 8.1.2 What condition can children suffer from if they get enough energy foods like bread, rice and porridge but not enough proteins? (1)
- 8.1.3 Describe the chemical digestion of proteins in the stomach. (5) **(8)**

Activity 9

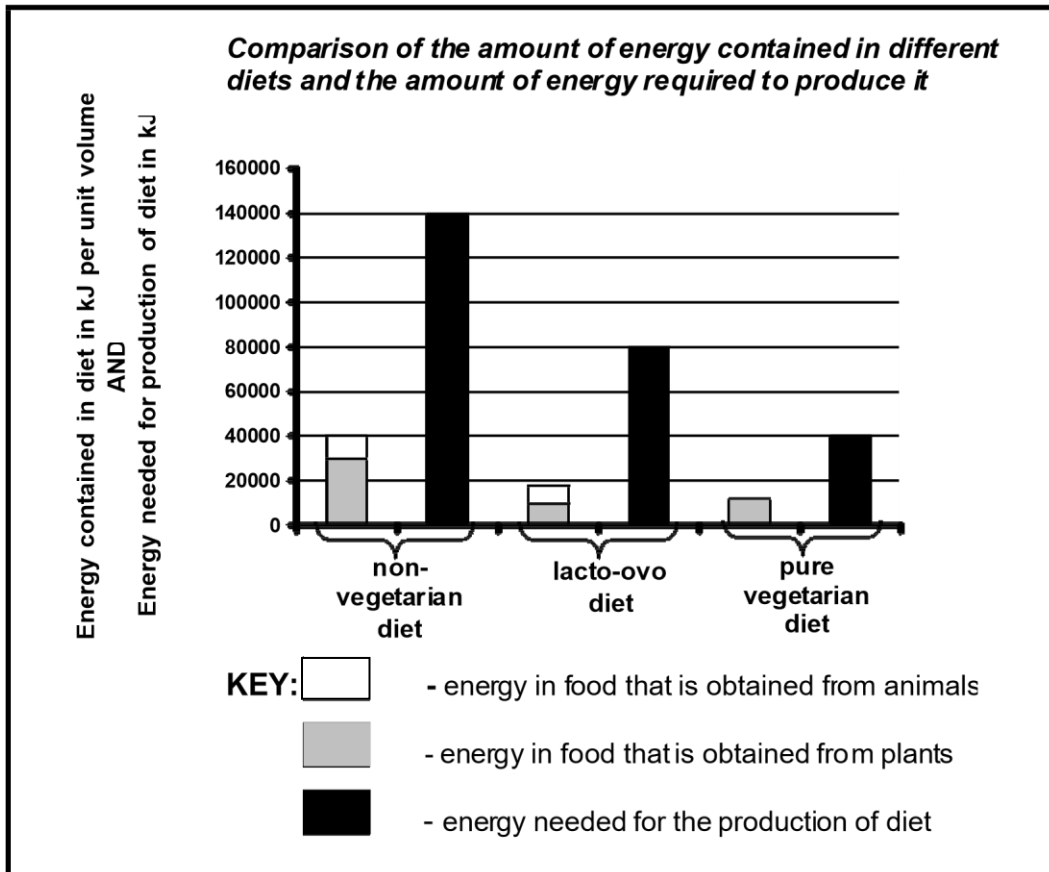
9.1 In general, people’s eating patterns can be divided into three basic kinds of diet based on the type of protein eaten.

(a) *Non-vegetarian diet*: where people eat / drink all types of food

(b) *Lacto-ovo diet*: where people do not eat meat but do eat eggs milk, and milk products

(c) *Pure vegetarian diet*: where people do not eat/ drink any animal-based food

The bar graphs below show the amount of energy contained in each of these three types of diets per unit volume as well as the amount of energy needed to produce each type of diet.



- 9.1.1 Which of the above three diets requires the greatest volume of food to be eaten? Give a reason for the answer. (3)
- 9.1.2 Suggest a reason why this diet named in QUESTION 2.2.1 might cause problems for very young children. (2)
- 9.1.3 What is the main source of proteins for pure vegetarians? (1)
- 9.1.4 Calculate the food energy intake that is provided by animals in the non-vegetarian diet, as a percentage. (3) **(9)**

TOPIC: Cellular Respiration

A: TOPIC PLAN

Lesson	Aspect	Classwork	Homework
1	Terminology	Teaching Tool 1	Activity 1
2	<ul style="list-style-type: none"> • Define what cellular respiration is. • Where does cellular respiration take place? • List TWO types of cellular respiration AND describe conditions required for each to take place. • Give requirements and products of cellular respiration. • Illustrate equation of cellular respiration. • Why cellular respiration is important? 	Activity 2	
3	Aerobic Respiration <ul style="list-style-type: none"> • Definition of aerobic respiration. • Raw materials needed for cellular respiration. • Structure of mitochondrion • Structural adaptations of mitochondrion to facilitate process of cellular respiration • Phases of aerobic respiration. • Products of aerobic respiration. 	Activity 3 Activity 4	
4	Practical Investigation on aerobic cellular respiration 4.1 - O ₂ is used by living organisms during cellular respiration 4.2 - CO ₂ is given off during cellular respiration	Tool 2	
5	Anaerobic Respiration <ul style="list-style-type: none"> • Definition of anaerobic respiration. • Process of anaerobic respiration. • Comparison of Aerobic and Anaerobic respiration. • Role of anaerobic respiration in industry 	Tool 3 Activity 5	
6	Topic Test		

B. TERMINOLOGY

Cellular respiration	Kreb's Cycle	Oxygen
Aerobic respiration	Ethanol	Glycolysis
Anaerobic respiration	Lactic acid	Mitochondrion
Co-enzyme	Carbon dioxide	ATP

C: Teaching Tools

Tool 1

Give the correct **biological term** for each of the following descriptions.
Write only the term next to the question numbers in the answer book.

1.1 Breaking down of glucose (organic compounds) so as to gradually release energy to all cells (1)

1.2 Process of cellular respiration that takes place in the presence of O_2 (1)

1.3 Process of cellular respiration that takes place in the absence of O_2

OR

1.4 Biochemical pathway taken by the process of cellular respiration in the absence O_2 (1)

The non-protein partner that are carriers of high energy Hydrogen atoms in the oxidative phosphorylation stage of respiration.

OR

1.5 Organic compounds that act as Hydrogen acceptors / carriers during cellular respiration (1)

1.6 An energy carrier (1)

1.6 The gas needed/ required for the process of cellular respiration

OR

1.7 The final acceptor of Hydrogen atoms (1)

1.7 Stage of cellular respiration that takes place in the cytoplasm/ cytosol

OR

1.8 Anaerobic phase of respiration that occurs in the cytosol (1)

1.8 The organelle in a cell at which Kreb's cycle occurs (1)

1.9 Cyclic series of reactions that takes place in the mitochondrion

OR

Phase of cellular respiration in which CO_2 is evolved

OR

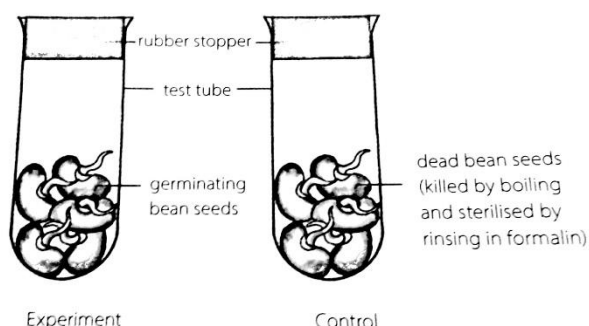
Phase of respiration which releases a large amount of energized

- hydrogen atoms. (1)
- 1.10 Product, other than CO₂ of alcoholic fermentation in plants (1)
- OR**
- 1.11 Organic product of anaerobic respiration in plants. (1)
- 1.11 Organic acid builds up in the muscle cells due to anaerobic respiration (1)
- 1.12 Is a gas given off as a by-product during the process of cellular respiration? (1)
- OR**
- Gas evolved during process of cellular respiration (1) (12)

Tool 2

Practical Investigation 1

- 2.1 To investigate that oxygen is used by living organisms during cellular respiration



Methods and precautions

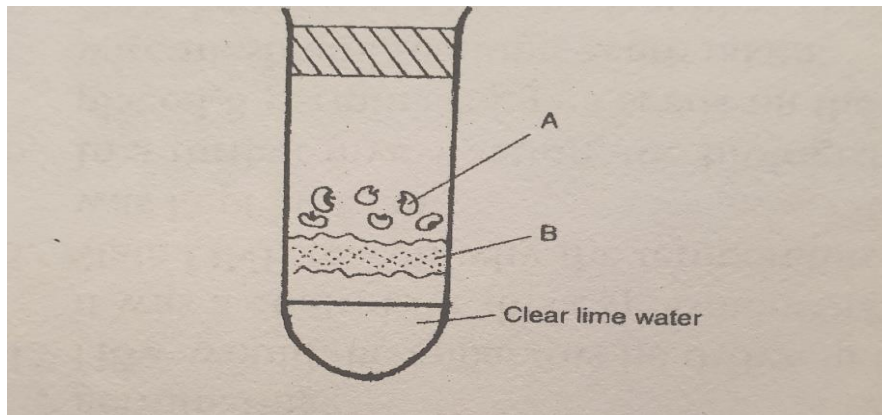
- Sterilise all seeds and apparatus with 10% formalin solution, to kill and prevent the regrowth of micro-organisms. This prevents them from being able to use oxygen and thereby influencing the result of the investigation.
- Boil the seeds that you use in the Control to kill them, so that they cannot undergo cellular respiration.
- The high respiration rate in germinating bean seeds leads to rapid use O₂ so ensure that all contact points between the rubber stoppers and the test tubes are sealed with petroleum jelly.
- Ensure that the investigation is kept in a warm place, between 25^o C and 30^o C. This will ensure that cellular respiration will occur at an optimal rate.
- Allow the investigation to run for sufficient time (at least overnight) for all the available oxygen to be used, to produce a positive result.
- Insert a glowing splinter into each of the test tubes. It will ignite or glow more brightly only in the presence of oxygen. In the absence of oxygen, glowing splinter will die.

Results

The experiment will give a positive result, that is, the splinter will go out, indicating that oxygen has been used. This indicates that cellular respiration has occurred.

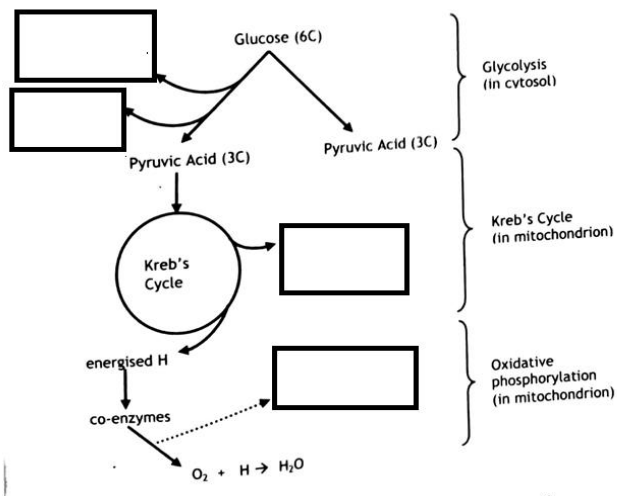
Practical Investigation 2

2.2 Study the experimental design and answer the questions that follow:



TOOL 3

Study the diagram below that illustrates aerobic respiration



Use the cuttings provided below and paste them on the appropriate spaces/ blocks to complete the phases of aerobic

(4)

respiration.

ATP	ENERGISED H	CO ₂	ATP
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D: ACTIVITIES (CLASSWORK/HOMEWORK)

Activity 1

1. Define the following terms:
 - 1.1 Cellular respiration
 - 1.2 Aerobic respiration
 - 1.3 Anaerobic
 - 1.4 Co-enzymes
 - 1.5 ATP
 - 1.6 Oxygen
 - 1.7 Glycolysis
 - 1.8 Mitochondrion
 - 1.9 Krebs's Cycle
 - 1.10 Ethanol
 - 1.11 Lactic acid
 - 1.12 Carbon dioxide(CO₂)
- (12)**

Activity 2

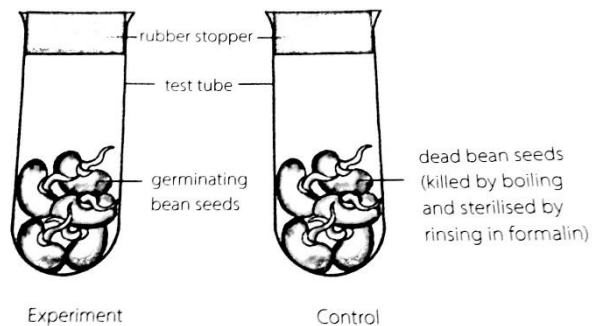
2. Answer the following questions on cellular respiration.
 - 2.1 Describe the process of cellular respiration (7)
 - 2.2 Where in the cell does cellular respiration take place? (2)
 - 2.3 Name the types of cellular respiration and describe the conditions required for each to occur. (4)
 - 2.4 List all the:
 - (a) requirements of cellular respiration (3)
 - (b) the product of cellular respiration (3)
 - 2.5 Give the equation of aerobic cellular respiration (6)
 - 2.6 Discuss the reasons why cellular respiration is important for life on earth (8) **(33)**

Activity 3

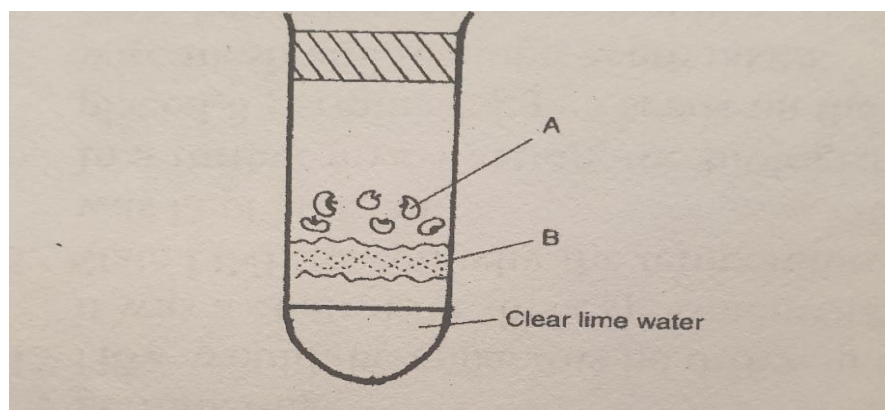
3. Answer the following questions on aerobic respiration.
- 3.1 Define aerobic respiration. (2)
 - 3.2 List all the raw materials needed / required for cellular respiration. (3)
 - 3.3 Draw a labelled structure of an organelle responsible for cellular respiration. (6)
 - 3.4 Discuss FOUR structural adaptations of mitochondrion to facilitate the process of cellular respiration. (8)
 - 3.5 Describe the process of aerobic respiration. (10)
 - 3.6 Name the products of aerobic respiration. (3) **(32)**

ACTIVITY 4

- 4.1 Study the investigation showing that oxygen is used by living organisms during cellular respiration and answer the questions.



- 4.1.1 What is the role of the control in this investigation? (2)
 - 4.1.2 In which set up (experiment or control) would oxygen be still present after 12 - 24 hours? (1)
 - 4.1.3 Give the reason to support the answer in question number 2. (2) **(5)**
- 4.2 Study the experimental design and answer the questions that follow.



- 4.2.1 State the aim of the experiment. (2)
- 4.2.2 Name the parts labelled A and B. (2)
- 4.2.3 State TWO precautions you would take in setting up this experiment.
Give a reason in each case. (4)
- 4.2.4 Explain the purpose of lime water? (3)
- 4.2.5 Explain how you would set up a control for this experiment. (2) **(13)**

ACTIVITY 5

5. Answer the following questions on anaerobic respiration.
- 5.1 Define what anaerobic respiration means. (2)
- 5.2 Describe how anaerobic cellular respiration occurs. (5)
- 5.3 State the significance of anaerobic respiration in industries. (3)
- 5.4 Tabulate differences between aerobic and anaerobic cellular respiration, using the following criteria:
• relative to amount of energy
• raw materials and products (5) **(15)**