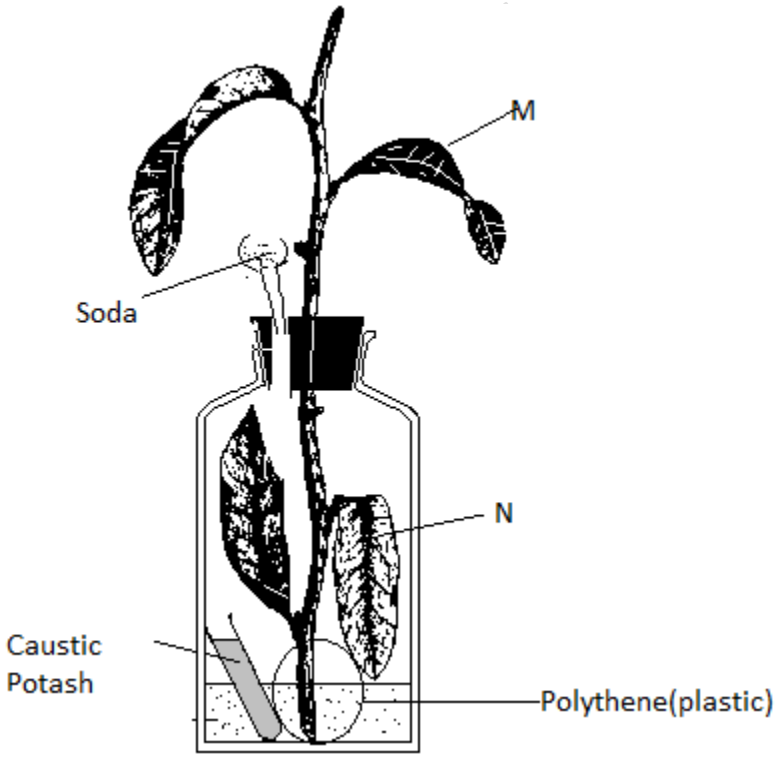
BIOLOGY SAMPLE PRACTICAL SOLUTIONS - IV

COMMON PRACTICALS:

1. **FOOD TEST**
2. **CLASSIFICATION**
3. **RESPIRATION**
4. **TRANSPORTATION**
5. **PHOTOSYNTHESIS**
6. **COORDINATION**



SUBJECT HANDOUT

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Introduction to Biology Practical's

Format

Until 2008, NECTA biology practicals contained three questions. Question 1 was required, and was a food test. Students then chose to answer either question 2 or question 3. One of these questions was usually classification.
The format changed in 2008. Now, the practical contains two questions, and both are required. Food test and classification remain the most common questions, but sometimes only one of these two topics is on a given exam. The second question may cover one of a variety of topics, including respiration, transport, coordination, photosynthesis, and movement.
Each question is worth 25 marks.

Common Practicals

_ **Food test:** students must test a solution for starch, sugars, fats, and protein
_ **Classification:** students must name and classify specimens, then answer questions about their characteristics
_ **Respiration:** students use lime water to test air from the lungs for carbon dioxide
_ **Transport:** students investigate osmosis by placing leaf petioles or pieces of raw potato in solutions of different solute concentrations
_ **Photosynthesis:** students test a variegated leaf for starch to prove that chlorophyll is necessary for photosynthesis
_ **Coordination:** students look at themselves in the mirror and answer questions about the sense organs they see

Note: These are the most common practicals, but they are not necessarily the only practicals that can occur on the national exam. Biology practicals frequently change, and it is possible that a given exam will contain a new kind of question. Look through past NECTA practicals yourself to get an idea of the kind of questions that can occur

(A) Food Tests

In this practical, students test a solution of unknown food substances for starch, protein, reducing sugars, non-reducing sugars, and fats/oils. They record their procedure, observation, and conclusions, then answer questions about nutrition and the digestive system.

This section contains the following:

_ How to carry out food tests
_ How to write a report
_ Sample practical with solutions

(1) How to Carry Out Food Tests

- **Starch**

Add a few drops of iodine to the solution and shake well. A blue-black color forms if starch is present

- **Lipids**

Add a few drops of iodine to the solution and shake well. A red ring will form at the top of the test tube is lipids are present.
You can also have your students do the grease spot test { rub a drop of solution onto a piece of paper, and let dry. A translucent spot forms if fat is present. This test is great for its simplicity, but is not used on national exams.

- **Protein (Biuret test)**

Add a few drops of 1 M NaOH to the solution and shake well. Then add a few drops of 1% $CuSO_4$ solution and shake. A violet color forms if protein is present. Sometimes the color takes a minute or two to appear.
Some textbooks may recommend using Millon's reagent to test for protein.
This reagent contains mercury, which is extremely poisonous and should never be handled by students.
The purple colour from a positive test is the result of a complex between four nitrogen atoms and the copper (II) ion. Specifically, these nitrogen atoms are all part of peptide bonds. These peptide bonds are adjacent on a protein, either two from one protein and two from another, or two from one part of a protein and two from another part of the same protein.

- **Reducing sugar**

Place some food solution in a test tube, and add an equal volume of Benedict's solution. Heat to boiling, then let cool. A brick red or orange precipitate forms if a reducing sugar is present.

Benedict's solution contains aqueous copper (II) sulphate, sodium carbonate, and sodium citrate. The citrate ions in Benedict's solution complex the copper (II) ions to prevent the formation of insoluble copper (II) carbonate.
In the presence of a reducing sugar, however, the copper (II) ions are reduced to copper (I) ions which form a brick red precipitate of copper (I) oxide. The oxygen in the copper (I) oxide come from hydroxide; the purpose of the sodium carbonate is to provide this hydroxide by creating an alkaline environment.
Normally, sugar molecules form five or six member rings and have no reducing properties. In water, however, the rings of some sugar molecules can open to form a linear structure, often with an aldehyde group at one end. These aldehyde groups react with copper (II) to reduce it to copper
(I). Sugars that do not have an aldehyde group in the linear structure or that are not able to open are not able to reduce copper (II) ions and are thus called non-reducing sugars. Students do not need to understand this chemistry for their exam, but they may ask about what is happening in the reaction.

- **Non-reducing sugar**

Do the test for a reducing sugar using Benedict's solution. Notice that no reaction occurs. Add a few drops of citric acid solution to the solution, then heat to boiling. Let solution cool. Add a few drops of 1 M NaOH, and shake well. Then, add some Benedict's solution (equal in volume to the liquid in the test tube). Boil the solution, and let it cool. A brick red or orange precipitate forms if a non-reducing sugar is present.
This experiment will also test positive for all reducing sugars. Therefore it is important to first perform the test for reducing sugars before considering this test. If the test for reducing sugars is positive, there is no reason to perform the test for non-reducing sugars - the conclusion will be invalid.
Non-reducing sugars are a misnomer, that is, their name is incorrect. This test does not test for any sugar that is not reducing. Rather, this is a test for any molecule made of multiple reducing sugars bound together, such as sucrose or starch. When these polysaccharides are heated in the presence of acid, they hydrolyse and release monosaccharides. The presence of these monosaccharides is then identified with Benedict's solution.
The purpose of the sodium hydroxide is to neutralize the citric acid added for hydrolysis. If the citric acid is not hydrolysed, it will react with the sodium carbonate in Benedict's solution, possibly making the solution ineffective.

(2) How to Write a Report

Food test data is reported in a table containing four columns: test for, procedure, observation, and inference. With the exception of the `test for' column, data should be reported in full sentences written in past tense.
The procedure should also be in passive voice. No, this is not the way professional scientists write. However, students here must use passive voice to get marks on the national exam.
Note that every column is worth marks on the exam. Even if students fail to do the food tests correctly, they can still get marks for writing what they are testing for and what the procedure should be.
See the sample practical below for an example of a report.

(3) Sample Food Test Practical Solutions

Practical 01

You have been provided with Solution K. Carry out food test experiments to identify the food substances present in the solution.
1. Record your experimental work as shown in the table below.

Test for	Procedure	Observations	Inferences
Protein			
Starch			
Lipids			
Reducing sugars			
Non-reducing sugars			

2. Suggest two natural food substances from which solution K might have been prepared.
3. What is the function of each of the food substances in solution K to human beings?
4. For each food substance identified, name the enzyme and end product of digestion taking place in the:
4.1. Stomach
4.2. Duodenum
5. What deficiency diseases are caused by a lack of the identified food substances?

Solution

(Assume Solution K contains protein and starch.)

1) The results were as follows

Test for	Procedure	Observations	Inferences
Protein	A few drops of NaOH solution were added to Solution K. The solution was shaken. Then a few drops of $CuSO_4$ solution were added to Solution K, and the solution was shaken again.	A violet color was observed.	Protein was present.
Starch	A few drops of iodine solution were added to Solution K, and the solution was shaken.	A blue-black color was observed.	Starch was present.
Lipids	A few drops of Sudan III solution (or iodine solution) were added to Solution K. The solution was shaken and then allowed to stand.	A red ring did not form at the surface.	Fats/oils were absent.
Reducing sugars	A small amount of Benedict's solution was added to Solution K. The solution was boiled and allowed to cool.	There was no precipitate	Reducing sugars were absent.
Non-reducing sugars	A small amount of dilute acid was added to Solution K. The solution was boiled and allowed to cool. Then a small amount of NaOH solution was added, and the solution was shaken. Finally, a small amount of Benedict's solution was added. The solution was boiled and let cool.	There was no precipitate.	Non-reducing sugars were absent.

2) Solution K could have been prepared from egg and maize. (Note: Any non-processed food containing protein or starch is correct here.)

3) Starch provides energy to the body. Proteins are used in growth and tissue repair.

4)

Food Substance	Location	Enzyme	End Product of Digestion
Protein	Stomach	*Pepsin*	Polypeptides
Protein	Duodenum	*Trypsin*	Amino acids
Starch	Duodenum	*Pancreatic amylase*	Maltose

5) A deficiency of protein causes kwashiorkor. A deficiency of starch causes marasmus.

Practical 02

You are provided with food sample A. By using scientific procedures, taste what sample A contained.

TABLE OF RESULTS

FOOD TASTED	PROCEDURES	OBSERVATION	INFERENCE
STARCH	A small portion of food solution A was kept in a test tube then a few drops of iodine solution were added and was shaken.		
REDUCING SUGAR	A small portion of food solution A was kept in a test tube then an equal amount of Benedict's solution was added and the mixture was heated to boil.		
PROTEIN	A small portion of food solution A was kept in a test tube then a few drops of $NaOH$ and $CuSO_4$ solution was added and shaken.		
NON-REDUCING SUGAR	A small portion of food solution A was kept in a test tube then a few drops of dill HCl was added heated and then cooled then a few drops of $NaOH$ was added and equal amount of Benedicts solution was added and the mixture was heated to boil.		
FATSTOLS	A small portion of food solution A was kept in a test tube then few drops of sudden III solution were added and were shaken strongly and leave it to settle.		

Solution

By using the table below

TABLE OF RESULTS

FOOD TASTED	PROCEDURES	OBSERVATION	INFERENCE
STARCH	A small portion of food solution A was kept in a test tube then a few drops of iodine solution were added and was shaken.	The colour of solution A changed from white to black	Starch is present
REDUCING SUGAR	A small portion of food solution A was kept in a test tube then an equal amount of Benedict's solution was added and the mixture was heated to boil.	Series of colour change from blue to green to yellow to Orange PPts	Food solution A contained reducing sugar
PROTEIN	A small portion of food solution A was kept in a test tube then a few drops of $NaOH$ and $CuSO_4$ solution was added and shaken.	Food sample A retained light blue colour of $CuS0_4$	Protein is absent
NON-REDUCING SUGAR	A small portion of food solution A was kept in a test tube then a few drops of dill HCl was added heated and then cooled then a few drops of $NaOH$ was added and equal amount of Benedicts solution was added and the mixture was heated to boil.	Food solution A retained blue colour of Benedict's solution	Non-reducing sugar is absent
FATS/OILS	A small portion of food solution A was kept in a test tube then few drops of sudden III solution were added and were shaken strongly and leave it to settle.	Food solution A retained red colour of Sudan III solution	Fats. Oils is absent

Hence

The food solution A contained

i) Reducing sugar

ii) Starch

Practical 03

From the samples

- Sample A…….
- Sample B…….

TABLE OF RESULTS

FOOD TEST	PROCEDURES	OBSERVATION	INFERENCE
Starch	A small portion of food solution A and B were kept in two different test tubes then few drops of iodine solution were added to each test tube and were shaken		
Reducing sugar	A small portion of food solution A and B were kept in two different test tubes then on equal amount of Benedicts solution was added in each test tube and the mixture of each was heated to boil.		
Non-reducing sugar	A small portion of food solution A and B were kept in two different test tubes then a few drops of dill *HCl* were added; heated and then cooled; then a few drops of *NaOH* were added and equal amount of benedicts solution were addled and the mixture were heated to boil for all solution A and B.		
Protein	A small portion of food solution A and B were kept in two different test tubes then a few drops of *NaOH* and $CuS0_4$ solution were added to both solution and shaken		
Lipids (Fat and Oil)	A small protein of food solution A and B were kept in two different test tubes then a few drops of Sudan III solution were added and were shaken. strongly and leave to settle to both two test tubes		

Solution

From the samples

- Sample A – Tomato
- Sample B - Onion

TABLE OF RESULTS

FOOD TEST	PROCEDURES	OBSERVATION	INFERENCE
Starch	A small portion of food solution A and B were kept in two different test tubes then few drops of iodine solution were added to each test tube and were shaken	Food sample A and B solutions rationed brownish yellow color of iodine	Starch was absent in both sample A and B
Reducing sugar	A small portion of food solution A and B were kept in two different test tubes then on equal amount of Benedicts solution was added in each test tube and the mixture of each was heated to boil.	Series of colors change from blue to green to yellow to change PPts (Brick red PPts) to both food solution A and B	Reducing sugar is present to both food samples
Non-reducing sugar	A small portion of food solution A and B were kept in two different test tubes then a few drops of dill *HCl* were added; heated and then cooled; then a few drops of *NaOH* were added and equal amount of benedicts solution were addled and the mixture were heated to boil for all solution A and B.	Both solution A and B rationed black color of Benedict its solution	Non-reducing sugar to both sample food A and B
Protein	A small portion of food solution A and B were kept in two different test tubes then a few drops of *NaOH* and $CuS0_4$ solution were added to both solution and shaken	Food solution A and B rationed; light blue color of $CuS0_4$	Protein is absent in all food sample A and B
Lipids (Fat and Oil)	A small protein of food solution A and B were kept in two different test tubes then a few drops of Sudan III solution were added and were shaken. strongly and leave to settle to both two test tubes	Food solution A and B rationed red color of Sudan III solution	Lipids is absent in all food sample A and B

Practical 04

You are provided with solution S

(a) Carry out experiments to identify the food substances present in solution S

(i) Record your experimental work as shown in table 1 below

Table 1

Test for	Procedure	Observations	Inference

(ii) Solution S contains**…….**

(b) Suggest one storage organ in a plant from which solution S might have been prepared.

(c) For each food substance identified in (a) (ii) above, name its end product(s) of digestion.

(d) Which of the identified food substance is mostly needed by small children?

Solution

(a) i) Experimental work to identify food substance(s) present in solution S.

TEST FOR	**PROCEDURE**	**OBSERVATION**	**INFERENCE**
• Starch	• To 2 cm^3 of a sample solution S, few drops of iodine solution was added.	• Yellow- brown color was observed i.e. iodine color was retained.	• Starch was absent.
• Reducing sugar	• To 2 cm^3 of a sample solution S, equal volume of Benedict's solution was added and boiled for few minutes.	• The blue color of Benedict's retained (observed).	• Reducing sugar was not present
• Non reducing sugar	• To 2 cm^3 of a sample solution S, few drops of Hcl solution was added and heated followed by cooling. After cooling few drops of NaoH/$NaHC0_3$ were added, followed by Benedicts solution + boiling	• The blue - color of Benedict's solution was retained (observed.)	No reducing sugar was not present
• Protein	• To 2 cm^3 a sample solutions, few drops of sodium hydroxide solution was added followed by addition 1% copper II sulphate solution drop vise white shaking	• Purple color was formed	• Protein was present.
• Lipids (Fats and oil)	To 2 cm^3 a sample solution s, few drops of Sudan III dye solution was added followed by addition of few mills of distilled water and then the mixture was shaken Vigorously and left to stand for about 5min.	• Red stained food droplets were found at the upper layer of the test tube	• Lipid (oil) was present

(ii) Solution S contains protein and lipid (oil).

(b) Storage organ in a plant from which solution S might have been prepared might be root tuber (bulb - like tuber (which is ground nut

(c) Protein end product of digestion was amino acid(s)

Lipid (Fat and) oil end product of digestion was Fatty acids and glycerol.

(d) Food substance in solution S identified which is mostly needed by small children is protein.

Practical 05

In a practical lesson, a candidates has been provided with a sweet potato and a ginger

(a) Explain how the candidates should prepare these organs for investigation of stored foods and suggest the experiment (s) he/she would carry out and his her observations

(b) Record the information as shown in the table below

Test for	Producer	Observation	Inference

(c) (i) State the nature of the stored food substances identified in each storage organ.

(ii) Name the plant from which each storage organ develops.

Solution

a) Preparation for sweet

(i) Clean your sweet potatoes under normal tap running water

(ii) Peel off your sweet potatoes using normal kitchen knife

(iii) Cut it into small slices or pieces using kitchen knife

(iv) Grind it either by using mortar and pestle or blender machine.

(v) Slurry or porridge of sweet potato is now read for laboratory food test - procedures.

Preparation for a ginger

(i) Clean your ginger preferably under normal running tap water.

(ii) Peel off your ginger using normal kitchen knife.

(iii) Cut into small slices or pieces using kitchen knife

(iv) Grind it by using either mortar and pestle or blender machine

(v) Slurry or porridge of ginger is now ready for laboratory food test procedures.

b)

TEST FOR	PROCEDURE	OBSERVATION	INFERENCE
• Starch	• To 2mls of a sample (potato slurry), a few drop of iodine solution was added.	• Blue - black coloration was observed	• Indicates that starch was present in the sample.
• Reducing sugar	• To 2cm^3 of a sample in a test tube, equal volume of Benedict's solution was added and the mixture was shaken. The mixture was then boiled for about 2-5 min.	• The series of color changes was then observed from blue to green, yellow, orange and finally - brick -red coloration	• This shows that reducing sugar was present in the food sample (sweet potato)
• Non reducing sugar	• To 2 cm^3 of a food sample in a test tube, 1 cm^3 of HCl was added to the sample and the mixture was then boiled for about one minute. After cooling the mixture, sodium hydrogen carbonate solution was then added to the mixture. Equal volume of Benedict's solution was added into the mixture and boiled again.	• The series of color changes was observed from blue to green, yellow, orange and finally brick – red coloration.	• Non reducing sugar was present
• Protein	• To 2 cm^3 of potato sample in a test tube, a little solution of NaOH was added, followed by solution of Copper II Sulphate drop wise	• Purple color was observed	• Protein was present
• Lipids (fats & oil)	• To 2 cm^3 of sweet potato sample, a little amount of water was placed, followed by addition of few drops of Sudan III dye solution and then, the mixture was shaken. After five (5 min) the observation was done.	There was no any food droplets trapped by the Sudan III solution at the upper part (top) of the test tube.	• Lipids was absent

c) (i) The nature of the stored food substances identified in each storage organ.

In sweet potato: (as storage organ)

- Starch found in sweet potato remain as it is i.e. is stored as starch.

- Both reducing sugar and non reducing sugar found in potato are stored in from of starch since the storage of glucose in plants is starch.
- Protein found in sweet potato are stored in form of amino acids

In ginger (as a storage organ

- Starch found in sweet potato is stored as starch (it remains as it was).
- Reducing sugar and non reducing sugar are both stored as starch since the storage of glucose is plants is starch.
- Protein however small is it; it is stored in form of amino acids.

(ii) The plant part from which each storage organ develops

- For sweet potato was root tuber
- For ginger is a rhizome (modified plant stem.)

Practical 06

From two students of Moivoro secondary school were asked to carry out an - experiment by their biology teacher the experiment was conducted as follows

(i) Three test tubes labeled A, B and C were set as shown in figure 4 below. Each of the three test tubes contained 1 ml saliva and 1 ml water. The three test tubes wee heated in water bath at different temperature for 30 minutes.

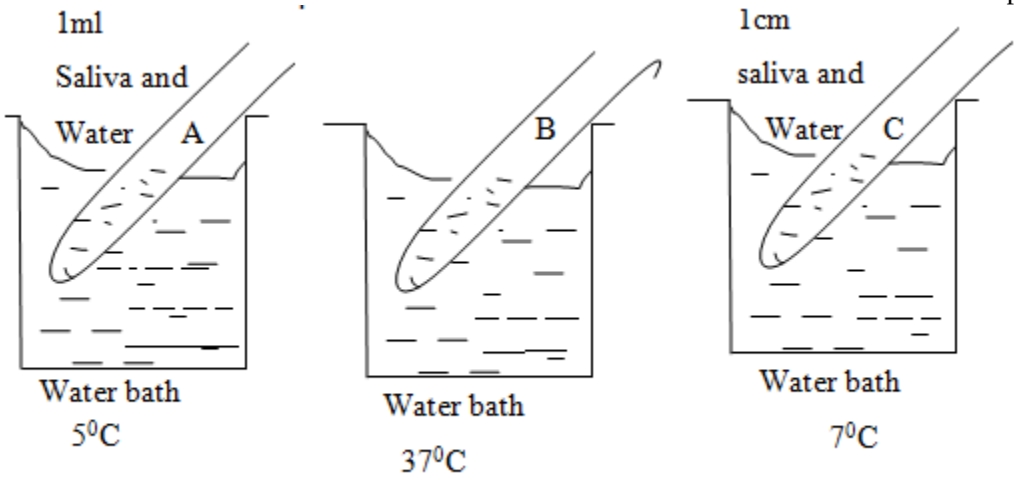


Fig 4.

(ii) Another set of three test tubes also labeled A, B, and C each containing 1 mil starch solution was heated for the same duration in water bath as shown in figure 5 below.

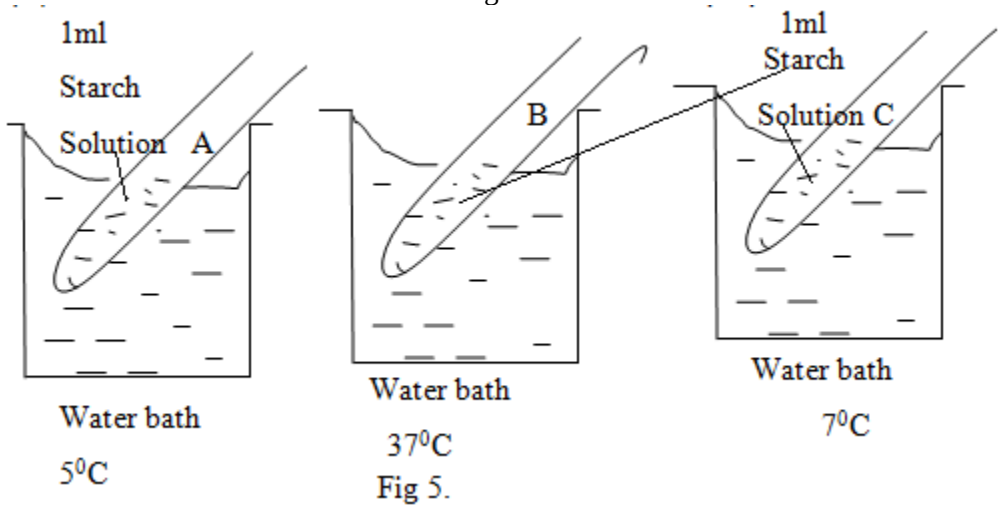


Fig 5.

(iii) The contents of the test tubes in the corresponding water bath of figure 4 and figure 5 was mixed and heated further for 30 minutes.

(iv) The contents of each test tube was then tested for starch using iodine solution

Study the above procedures carefully and then answer the following questions

(a) What was the aim of the experiment?

(b) Why was it necessary to heat the tubes for 30 minutes before mixing their contents?

(c) State the colour change you would expect in each test tube after adding iodine solution
(d) Account for the expected observations

Solution

(a) The aim of the experiment was to find out the effect of temperature on salivary amylases or to study the effect of temperature on enzyme salivary amylase) activity
(b) It was necessary to heat the tubes for 30 minutes before mixing their content in order to obtain optimal temperature for enzymes (salivary amylase) to work properly.
(c) After adding iodine solution, the following color change were observed
Test tube labeled A: in this case, blue- black colouration was observed
Test tube labeled B: in this case, yellowish -brown colouration was observed
Test tube labeled C: blue - black colouration was observed as well.
(d) Accounting for the expected observations.

- For the test tube labeled A blue- black colouration was observed to indicate that starch is still present because the temperature 5 is not suitable temperature for the enzyme to act on substrate (starch)
- For the test tube labeled B, the colour of iodine (yellowish - brown) was retained because all the substrate (starch) has been reduced into simple sugar by the action of enzymes (salivary amylase) due to the availability of favourable or suitable temperature for such enzyme to act on the substrate
- For test tube labeled C, blue - black colouration was observed to indicate; substrate (starch) was still present because the temperature 7 is not optimal temperature for the enzymes (salivary- amylase) to act on substrate (starch).

(B) Classification

The classification practical requires students to identify specimens of animals, plants, and fungi. The students must write the common name, kingdom, phylum, and sometimes class of each specimen. They also answer questions about the characteristics and uses of the specimens.

This section contains the following:

- Common specimens
- Sample classification practical with solutions

(1) Common Specimens

Fungi: Mushroom, yeast, bread mold
Plants: Fern, moss, bean plant, bean seed, maize plant, maize seed, pine tree, cactus, sugar cane, Irish potato1, cypress tree, acacia tree, hibiscus leaf and cassava
Animals: Millipede, centipede, grasshopper, lizard, tilapia (fish)3, scorpion, frog, tapeworm, liver fluke, cockroach and spider

Practical 07

Study the diagram below.

Fig 1

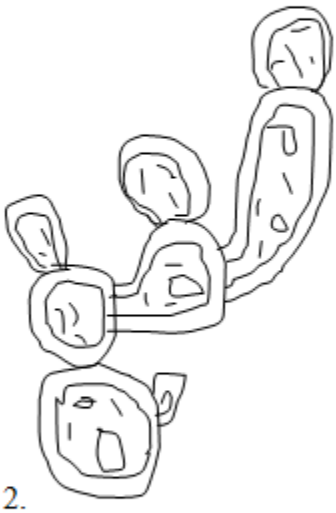


Fig 2.

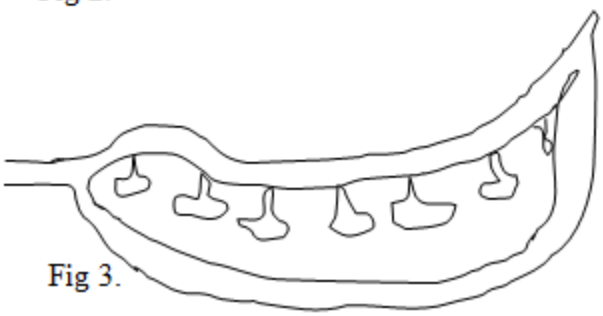
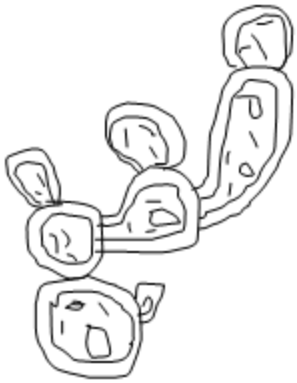
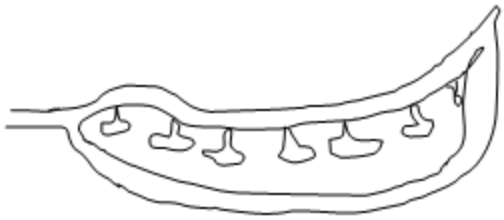


Fig 3.

a) (i) Identify specimens represented in figures. 1, 2 and 3
ii) Explain how each of the organisms part of the organism represented by figures 1, 2 and 3 reproduce.
iii) Mention the type of reproduction exhibited by the organisms/ part of organism represented by figures 1,2 and 3
b) Write down the advantages and disadvantages of mode of reproduction represented by figure 1.

Solution

(a) (i)

ORGANISIM (SPECIMEN)	COMMON NAME
 Fig 1	Potato tuber
 Fig 2	Yeast cell
 Fig 3.	Pea seedpod

(ii) Potato tuber (fig1) reproduces asexually

- Yeast (fig 2.) produce by budding or binary fission
- Pea plant reproduce sexually since it has both male and female parts

(iii) Type of reproduction exhibited by organism represented above (i)

Fig 1 (potato tuber): exhibit asexual mode of reproduction

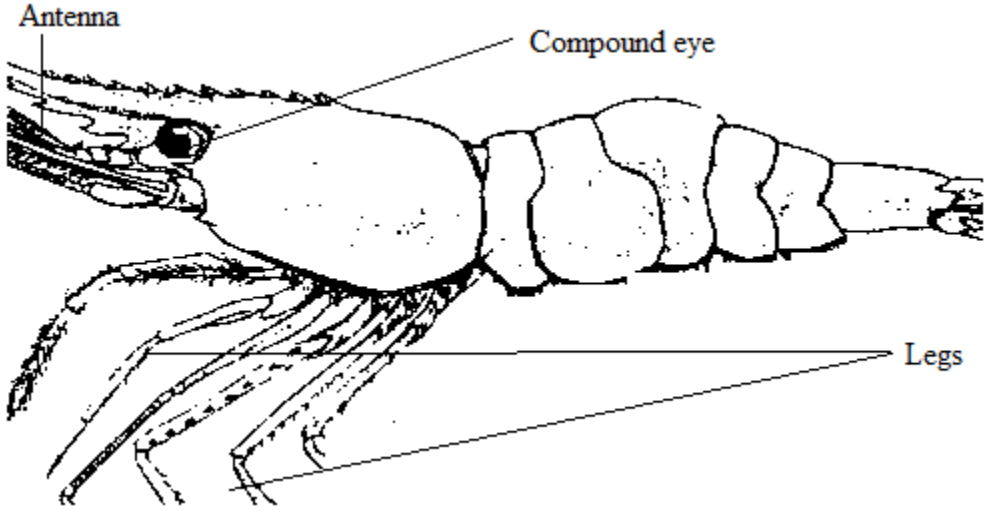
Fig 2. (Yeast): Exhibit budding mode of reproduction

Fig 3. (Pea seedpod): Exhibit sexual mode of reproduction.

Advantages of asexual reproduction	Disadvantages of asexual reproduction
- Gives the ability to produce large quantities of offspring - It requires less energy as compared to sexual reproduction - It has a better chance of survival even at adverse condition etc.	- All offspring are exactly identical, so no diversity - Since all the offspring are genetically cloned, it is mo-likely for mutation to spread more rapidly - It is impossible for asexual reproduction to adapt to any environmental changes etc.

Practical 08

In an ecological study a student caught an organism represented by figure 6 below



(a) (i) Name the kingdom and phylum to which the organism belong
(ii) Name the class to which the organism belongs, give reason (s) for your answer
(iii) Suggest its feeding habits.
(iv) Suggest its mode of locomotion.
(b) Suggest how the organism is adapted to its habitat (any 2)

Solution

(a) (i) Organism	Kingdom	Phylum
Fig. 6	Animalia	Arthropod
(Lobster)		
(ii) Organism	class	
Fig. 6 (lobster)	crustacean	

Reason:
- They have hard exoskeleton made of calcium
- They have had with two compound eyes
- They have two pairs of antennae.

(iii) Feeding habits of organism (fig 6) is mainly on scraps and dead bodies (scavengers)
(iv) Its mode of locomotion: organism uses appendages for locomotion
(b) Adaptation for the organism fig. 6 (lobster) to its habitat.

- Has ability to lose and re-grow an appendage designed to help organism escape predators.
- Its compound eyes are adapted to low light environment.
- Organisms antennae are revered in small hairs that pick up chemicals from potential predators or prey, these hairs are so sensitive
- Organism also developed a pair of claws that are distinct to another, one claw is large with very small teeth on it that the organism uses to grab, hold and crush its prey.

Practical 09

Study the specimens J, K, L, M and N provided.
(a) Identify specimens J, K, L, M and N by their common names.
(b) Name the kingdoms for each of specimens J, K, L, M and N.
(c) Suggest the possible habitats for specimens J and K.
(d) Draw and label specimen N.
(e) List four (4) observable differences between specimens J and K.

Solution

Specimen	Common name
j	Grasshopper
K	Earth worm
L	Centipede
M	Cocoyam (sweet potatoes)
N	Leaf (simple leaf).

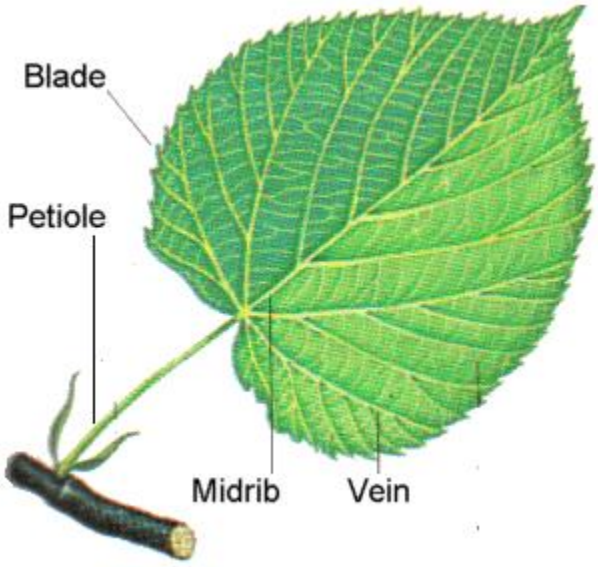
a.

Specimen	j	K	L	M	N
Kingdom	Animalia	animalia	Animalia	Plant ae	Plant ae

b) Possible habitat(s) for specimen J (Grasshopper) are dry and open habitat with plenty of grass and other low plants, some live in forest or jungles A

Possible habitat(s) for specimen K (Earthworm) are in moist soil and in dead plant material; they are available in rainy forest areas as well as in fresh water.

c) Well labeled diagram of specimen N (leaf)



d. Four (4) observable differences between specimens J and K are: -

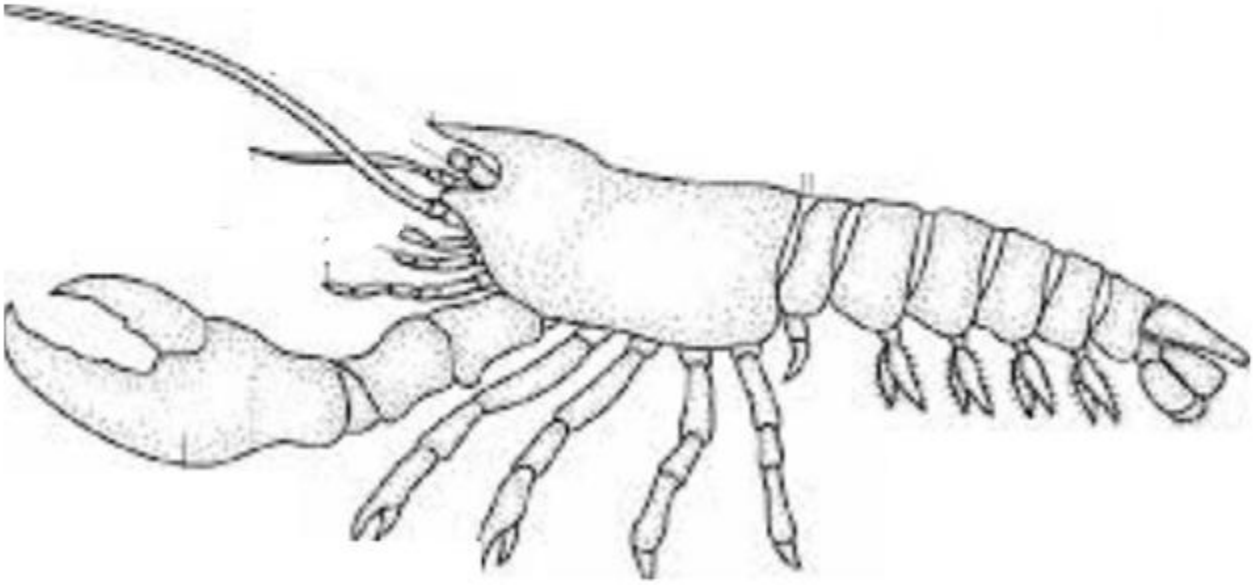
Specimen J (Grasshopper)	Specimen K (Earthworm)
• They have legs • Specimen J are able to jump • They have wings specially adult • Habitat for specimen J is dry and open place with plenty of grass. • Specimen J possesses antennae. Etc.	• They do not have legs • They are not able to jump • They do not have wings • Habitat for specimen K is mostly in moistly in moist soil and in dead organic water. • Specimen K does not have antennae. Etc.

Practical 10

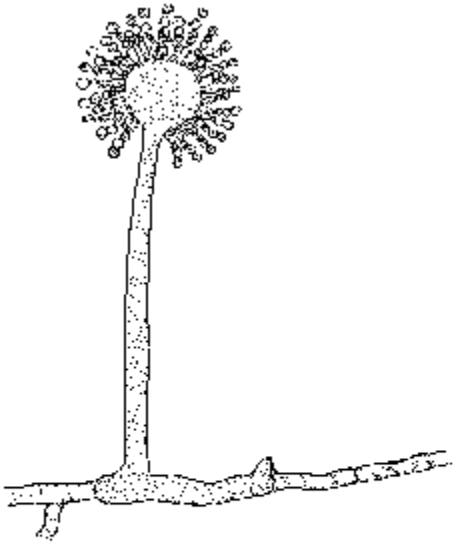
Carefully observe the organisms represented by diagrams A, B, C and D shown below

A.

B.



C.



D.

(a) **(i)** Identify the organisms represented by diagrams A, B, C and D by their common names.

(ii) Name the kingdom to which each of the organism in (a) (i) above belongs

(iii) Which two (2) features have you used to group each organisms represented by diagrams B and D in their representative kingdom?

(b) Name the mode of reproduction and movement for the organism represented by diagram D

(c) **(i)** Where does the organism in diagram A live?

(ii) What is the economic importance of the organism in diagram C?

Solution

a. i).

Organism (s)	**Common name(s)**
A.	Hydra
B	Lobster
C.	Filamentous fungi
D	Protozoa

ii)

Organism	**Kingdom**
A	Animalia
B	Animalia
C	Fungi
D	Protozoa

iii) Features (2) that were used to group organism B in kingdom animalia are:-

- Invertebrates, it lack back bones
- It has external skeletons (exoskeleton)
- It has jointed appendages and segmented body
- Most of them are unicellular
- They take eukaryotic organism
- They take in their food through osmotrophy or phagocytosis.
- Others have flagella for locomotion
- They cause diseases. E.g. Amoeba (Amoebiasis, etc.

b) The mode of reproduction and movement for the organism represented by diagram D

- The mode of reproduction for the organism represented by diagram D is either exhibit sexual reproduction or a sexual reproduction by binary' fission
- The mode of movement for the organism represented by the diagram D is through flagellum, since it has single flagellum.

c) (i) The organism in diagram A live in aquatic environment.

(ii) Economic importance of the organism in diagram C:

- Organism is used by industry for manufacture of useful products such as enzymes; metabolites; food. (e.g. baking; brewing cheese - making)
- Manufacture of some antibiotics etc.

Practical 11

You are provided with specimens. **A, B, C, D, E and F.** Study them careful and then answer questions below

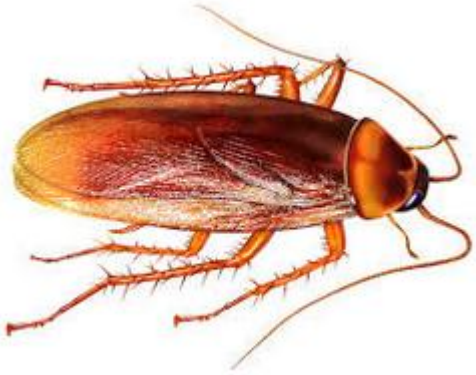
A.

B.

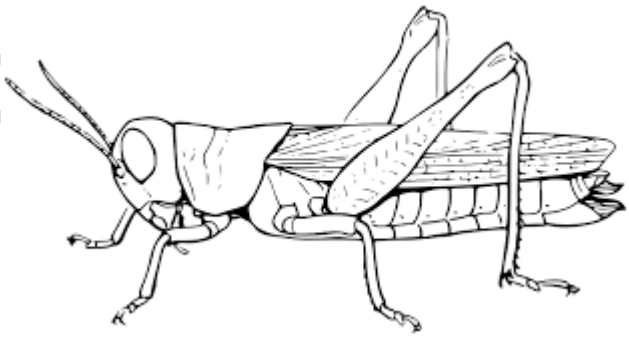
C.

D.

E.



F.



(i) Identify Specimen A to F by their common names
(ii) Classify specimen A to F to class level
(iii) What are the observable features of specimen A and B**?**
(iv) What are the modes of nutrition of specimen A and B**?**
(v) What are habitats for specimens A and B**?**

Solution

(i) Specimen are A - Giant Millipede B - Centipede C - Lizard D- Beetle E- Cockroach F - Grasshopper

(ii)

SPECIMEN	KINGDOM	PHYLUM	CLASS
A – Millipede	Animalia	Arthropoda	Diplopod a
B – Centipede	Animalia	Arthropoda	Chiropody
C – Lizard	Animalia	Chlorate	Reptilian
D – Beetle	Animalia	Arthropoda	Insect a
E – Cock roach	Animalia	Arthropoda	Insect a
F – Grasshopper	Animalia	Arthropoda	Insect a

iii) Observable features of A and B
(a) They have hard exoskeleton
(b) They have one pair of intimae
(c) Their bodies are divided into segments
iv) Mode of Nutrition
The mode of nutrition is Heterotrophic nutrition
A - Herbivorous
B - Carnivorous
(a) Habitat of specimen A and B
A - Moist shed places
B - Moist shed places (dark)

COMMOON NAME	**KINGDOM**	**PHYLUM**	**CLASS**
Fern plant	Plantae	Filicinophyta	Hepatica
Bean plant	Plantae	Angiospemae	Dicotyledone
Maize plant	Plantae	Angiospemae	Monocotyledon
Grasshopper	Animalia	Arthropoda	Insert
Crab	Animalia	Arthropoda	Crusla
Cactus	Plantae		
Moss plant	Plantae	Bryophyte	Music
Butterfly	Animalia	Arthropoda	Insect
House fly	Animalia	Arthropoda	Arachinida
Spider	Animalia	Arthropoda	Reptilian
Chameleon	Animalia	Chordate	Aves
Quail feathers	Animalia	Chordate	

Practical 12

Your are provided with specimen D1, D2, D3, D4 and D5 grown on bread. Study them carefully and answer the questions that follow
(i) Give the common name of each specimen provided
(ii) Classify specimen D1 to D5 to Phylum Division level
(iii) Specimen D3 is a vector of much human disease. Identify any two disease transmitted by specimen D3.
(iv) Give three (3) adaptive feature of specimen D2 to its survival in its habitat
(v) Draw a large diagram of specimen D1 and label the part involved in photosynthesis.
(vi) Write two (2**)** economic importance of the Kingdom from which specimen **D**5 is obtained

Solution

i. Specimen
- Hibiscus leaf

D2 – Tilapia fish
D3 - House fly
D4 - Millipede
D5 - Bread mould/ Rhizopus

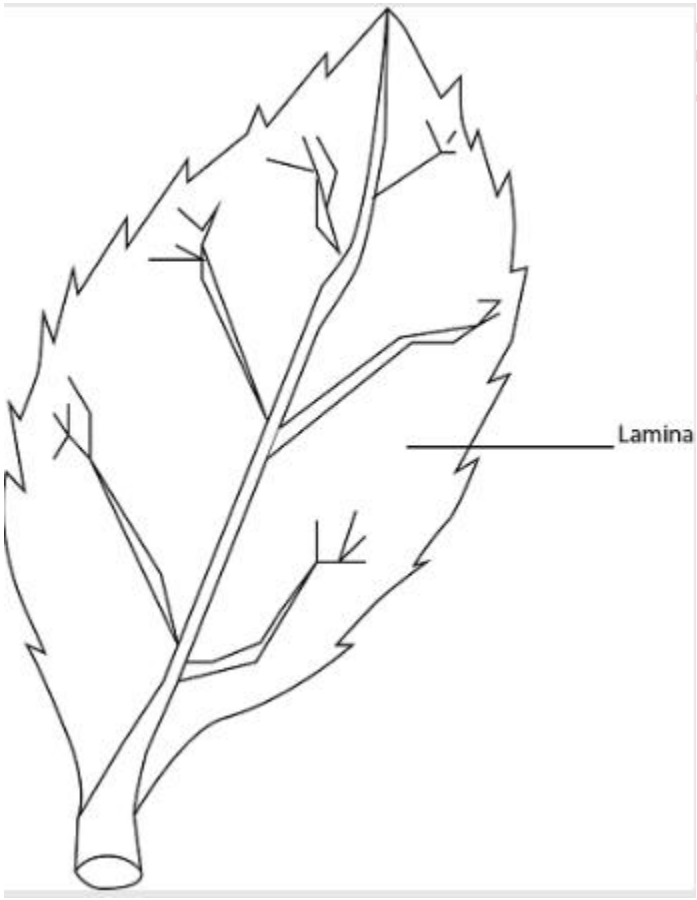
ii.

(II) SPECIMEN	KINGDOM	PHYLUM/ DIVISION
D_1	Plantae	Angios permaphyta
D_2	Animalia	Chordate
D_3	Animalia	Arthropoda
D_4	Animalia	Arthropoda
D_5	Fungi	Zygomycota

iii) - Cholera, Trachoma
- Typhoid

iv) They have gills for gaseous exchange
- They have (paired pelvic and pectoral) fins for swimming
- They have cycloid scales which point backwards to avoid friction when moving in water.
- They have streamlined body
- They have lateral line for detection
- They have swim bladder that is filled with air to regulate buoyancy.

v)



Structure of a specimen D1 showing apart involved in photosynthesis

vi. - Cause diseases
- Spoil food substances
- Used as food e.g. edible mushroom
- Used in production of alcohol e.g yeast
- Used in production of medicine e.g penicilcum.

Practical 13

A class of twelve groups of students carried out a survey of uncultivated land measuring 20 x 15 metres, with twelve 5 x 5m quadrates labeled A - L. Each group counted the number of black ants, grasshoppers, spiders, beetles in each quadrate as shown in the table below.

Animals	**Number of animals in each quadrate**											
	A	B	c	D	E	F	G	H	I	J	K	L
Black ants	30	25	6	7	20	26	10	4	27	11	30	20
Red ants	25	2	17	5	0	4	4	23	4	61	45	25
Grasshoppers	8	3	2	9	2	7	3	6	1	8	12	5
Spiders	1	1	2	1	1	1	2	6	1	3	12	4
Beetles	0	0	0	2	2	0	0	2	0	0	0	1

a. Calculate the
   i) Area of the land surveyed
   ii) Density of grasshopper population in the whole plot
b. Which group of animals is most abundant/plentiful?
c. Calculate the density of the most abundant group of animals
d. Give three (3) reasons to explain why the population density of the area studied will have changed after six months

Solution

a.

i) Area of the land surved:

$= 5 \times 5m^2$ (quadrats) x 12 groups of students

$= 25 \times 12$

$= 300m^2$

ii) Density of grasshopper population in the whole plot

$$\frac{\text{Total population of grasshopper}}{\text{Total number (Area) of land surveled.}}$$

$$= \frac{8+3+2+9+2+7+3+6+1+8+12+5}{300}$$

$$= \frac{66}{300}$$

$= 0.22$ per m^2 or

$= 0.22/m^2$

b. Group of animals which are most abundant/plentiful are Red ants

c. Density of the most abundant group of animals

$$= \frac{235 \text{ animals}}{300 \text{ total area surveyed}}$$

$= 0.78$ per m^2

$= 0.78/m^2$

d.

i. Migration of the animals
ii. Birth rate (whether increases or decreases)
iii. Death rate
iv. Competition among animals.

(C) Respiration

The purpose of this practical is to investigate the properties of air exhaled from the lungs. This section contains the following:

_ Limewater
_ Apparatus
_ Sample respiration practical with solutions

(1) Limewater

Limewater is a saturated solution of calcium hydroxide. It is used to test for carbon dioxide. When carbon dioxide is bubbled through limewater, the solution becomes cloudy. This is due to the precipitation of calcium carbonate by the reaction:

$CO2(g) + Ca(OH)2(aq) \rightarrow CaCO3(s)$

Limewater can be prepared from either calcium hydroxide or calcium oxide.

Calcium oxide reacts with water to form calcium hydroxide, so either way you end up with a calcium hydroxide solution. Calcium oxide is the primary component in cement. Calcium hydroxide is available from building supply shops as chokaa.

(2) Apparatus

Many books call for delivery tubes, test tubes, and stoppers. These are totally unnecessary. Add the limewater to any small clear container and blow into it with a straw.

Practical 14

You are given limewater in a test tube and Rubber tube Blow some air through a rubber tube and at the same times observe the changes that take place. Then answer questions that follows

(i) What changes did you observe?
(ii) What was the cause of those changes?
(iii) Represent chemical equations reactions
(iv) What physiological process was being investigated in this experiment?
(v) What was the aim of the experiment?
(vi) Define the process
(vii) Differentiate between exhaled and inhaled air

Solution

(i) The color of Limewater changed from coloures to milky [white PPts]
(ii) The cause of those changes is CARBONDIOXIDE GAS $(CO_{2(g)})$
(iii) The chemical equation is

$$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$$

(iv) Physical process is Respiration
(v) The aim of the experiment is to demonstrate that Exchange air contains $CO_{2(g)}$
(vi) Respiration
Is the process of breaking down food substances in living cells to release energy.
(vii) The following are the difference between inhaled air and exhaled air.

INHALED AIR	EXHALED AIR
i) Contains more Oxygen	i. Contains more Carbon dioxide
ii) Have the temperature of the surrounding	ii. Have the temperature of the body
iii) Dry air	iii. Moist air

(D) Transport

The purpose of this practical is to investigate osmosis by observing the changes in a leaf petiole placed in a hypotonic solution (water) and a hypertonic solution (water containing salt or sugar).

This section contains the following:

_ Materials
_ Sample practical with solutions

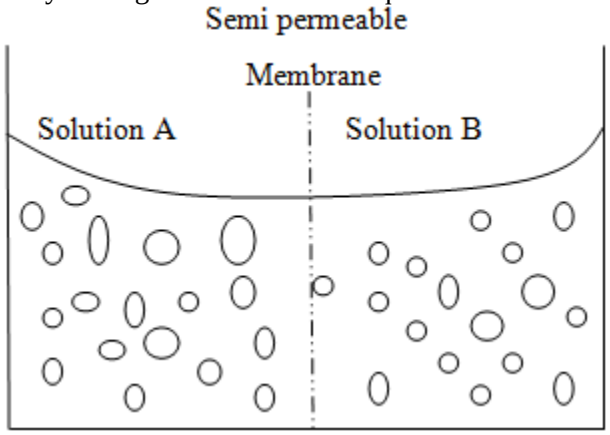
1. Materials

The petiole is the stalk which attaches a leaf to a branch. The papaya leaf petioles in this practical should be soft petioles from young leaves, not stiff petioles from older leaves. Cut the petioles into pieces, and give each student two pieces of about 6 cm in length. Cylinders cut from a raw potato may be used instead of petioles.
The hypertonic solution may be made with by mixing either salt or sugar with water. The hypotonic solution is tap water.

Practical 15

A form four student was interested to investigate osmosis phenomenon and decided to set the experiment as shown in figure 7 below

Study this figure and answer the questions that follow.



(a) Which solution has a higher concentration of free water molecules?
(b) Which solution has high solute concentration
(c) In which direction will osmosis occur?
(d) What does the semi - permeable membrane corresponds to within an animal cell?
(e) (i) What is osmosis?
(iv) Name five (5) processed in living things that depend on osmosis

Solution

(a) Solution which as a higher concentration of free water molecules is solution B.
(b) Solution which has high solute concentration is solution A
(c) Osmosis will occur in this way; water molecules will move from solution B through semi permeable membrane towards solution A
(d) The semi-permeable membrane correspond to plasma membrane within an animal cell
(e) (i) Osmosis refers to the movement of solvent (water) from the region of its low concentration to the region of its high concentration through semi - permeable membrane.
OR
Osmosis is the movement of a solvent across semi- permeable membrane toward a higher concentration of solute.
(v) Five (5) process in living things that depends on osmosis are:-
(b) Active transport
(c) Passive transport
(d) Plasmolysis
(e) Osmotic pressure
(f) Endocytosis
(g) Osmotic gradient
(h) Oxocytosis

Practical 16

You are provided with a beaker, tea bag and hot water. Carry out the following experiment.
Pour about $100cm^3$ off hot water into the beaker.
Put the tea bag into the beaker containing hot water.
Observe carefully the experiment for a few minutes.
a.(i) What happened to the tea bag when it was put in hot water?
(ii) Explain why the changes you observed occurred?
b.(i) What do you think was the aim of the experiment?
(ii) Draw a conclusion from the experiment
c.(i) Name the physiological process investigated in this experiment
(ii) Define the process named in (c) (i) above

(iii) What is the importance of this process in nature?

Solution

(a) (i) When tea bag was put in hot water, water rushed (entered) the tea bag through Osmosis process, after attaining equilibrium water soluble ingredients (chemicals) from the tea bad started to go out (diffuses) slowly into the beaker containing hot water and changes the color of hot water slowly from clear (colorless) to brown color through diffusion process.

(ii) The above change a (i) occurred due to occurrence of both diffusion and osmosis. Osmosis process is when hot water molecules entered (moved) into a tea bag through selectively permeable membrane (tea bag material), and the diffusion process is when aqueous solutes (soluble chemical ingredients) moved out (diffuses) from the tea bag into the beaker containing hot water and finally becomes brown in color.

(b) (i) Aim of the experiment was demonstrate both Osmosis and diffusion processes.

(ii) In conclusion, tea bag acted like a cell membrane because it controlled what went in and out just like a cell osmosis and diffusion occurred when tea color left the bag and water entered the bag.

It also acted like a cell membrane by keeping some things in likes the tea leaves.

(c) (i) The physiological process investigated in this was either Diffusion or Osmosis.

(ii) Diffusion is the movement of substance from area of higher concentration to area of lower concentration.

Osmosis is the movement of water molecules through or across semi permeable membrane from where they are in high concentration to where they are in low concentration in order to reach equilibrium.

(iii) Importance of diffusion in nature

Diffusion is a process in which material spreads throughout a liquid or gas, it is important to living things as it explains how useful materials and waste products can move into and out of cells. Digested food molecules (amino acids, glucose) move down a concentration gradient from the intestine to the blood.

Diffusion allows the exchange of substances; the entry of oxygen, proteins etc. into the cell and the removal of waste substances.

(iv) Importance of Osmosis in nature

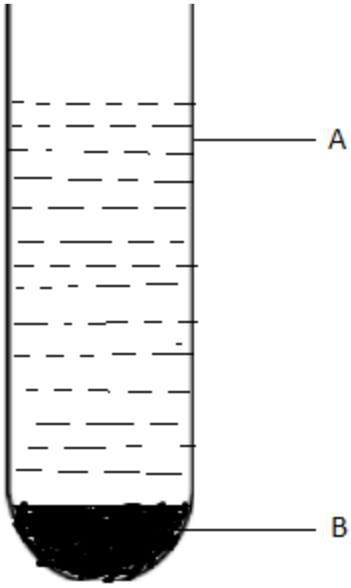
Osmosis is a natural physical process in which water molecules moves across a selectively permeable membrane from area of high concentration to an area of low concentration so as to maintain equilibrium.

Plants need osmosis because, through osmosis they their water. So plant cells maintain their water content despite the loss of water to the air that is constantly occurring.

Osmosis provides turgidity to the softer tissues and is therefore, essential for their mechanical support. It also controls the absorption of water by root hairs from the soil etc.

Practical 17

In an experiment to find the composition of blood, 5cm3 of fresh blood from a rabbit was centrifuged and the result was as shown below



a) i) Label A and B

ii) Identify four (4) substances present in A

iii) Identify three (3) Substances present in B and state the function(s) of each substance

b) Name the substance that is

i) Most plentiful in B

ii) Least plentiful in B

c) Arrange in increasing order the substances present in B

Solution

a) i)

A: Blood plasma

B: Blood

ii) Four (4) substances present in A

i. Carbon dioxide
ii. Protein
iii. Glucose
iv. Hormones

iii) Three (3) Substances present in B and state the function(s) of each substance

i. Red blood cells: Transportation of oxygen gas
ii. White blood cells: Involve in protecting body against both infections disease and foreign invaders
iii. Platelets: It prevents bleeding.

b)

i) The substance which is most plentiful in B was Red blood cells

ii) The substance which is least plentiful in B was white blood cells.

c) White blood cells, platelets and red blood cells.

Practical 18

You are provided with solid sample C and distilled water. Fill the beaker with distilled water using a spatula slowly put a small portion of the solid sample C in a beaker of water and observe the changes in the mixture for 5mn then answer the question that follows.

(a) Explain what you have observed

(b) Draw a conclusion from your Observation

(c) Name the physiological process that is investigated in your experiment

(d) Outline two (2) significance of the process named in (c) above to both animals and plants

(e) Write down two organs found in human that perform their work by the process mentioned in (c) above.

Solution

(a) The purple colour spread throughout the distilled water after 5mn

(b) The conclusion is solid sample C ($KMno_4$) has high concentration compare to distilled water hence ($KMno_4$) solid diffuse to distilled water throughout.

(c) The physiological process is Diffusion

(d) Significance of Diffusion

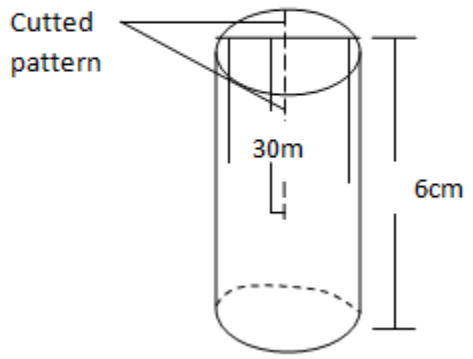
i. Absorption of minerals
ii. Transportation of food
iii. Excretion of Nitrogenous wastes
iv. Gaseous exchange

(e) Organs which are formed in the body of human being are

i. Lungs
ii. Small intestine

Practical 19

You are provided with a pawpaw leaf petiole, Solution S1 and S2. Cut a petiole as shown in the diagram



(a) Dip it in a solution S1 leave it for 30min then observe the change

(b) What happen to a petiole?

(c) Feed for the softness or hardness to a petiole give reasons

Dip a petiole in a solution S2 and leave for 30min then observes the changes

(a) What happen to a petiole?

(b) Feed for the softness or hardness of a petiole give reasons

(c) Draw and label a petiole

(d) What physiological process is being investigated, in the experiment

(e) What are the importances of process to plants?

(f) What is the nature of solution S1 and S2 in term of their concentration?

Solution

- (b) The cut strips of a petiole open wide
  (c) The petiole became hard

Reason

The cells of the petiole absorb water by Osmosis, the petiole expand and become turgid

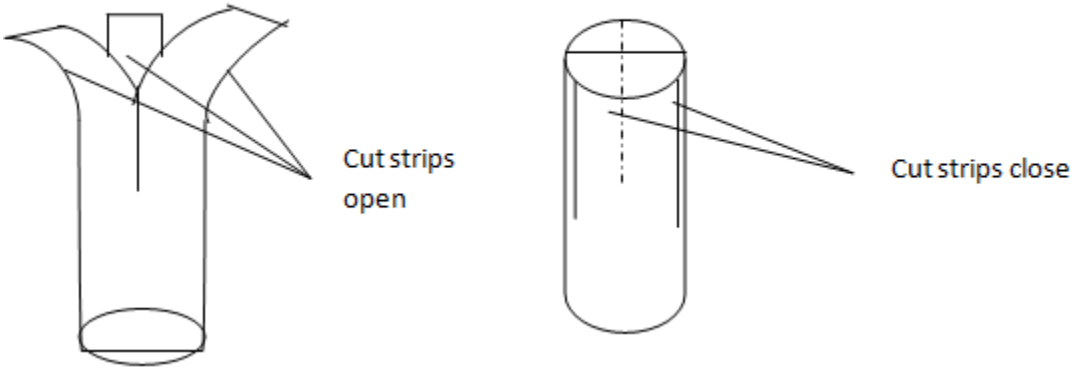
- (a) The cut strips of petiole close
  (b) The petiole strips will be soft

Reason

The leaf petiole loss water by Ex – Osmosis hence shrink and become flawed

(c) Drawings

In soln S_1 *In soln* S_2



(d) Physiological process is **Osmosis**

(e) Importance of Osmosis

i) Absorption of water from the soil
ii) Make the plants to be firm and supportive
iii) Closing and opening of stomata
iv) Transportation of food in plants

(f) Solution S1 is hypotonic {low concentrated solution}

Osmosis

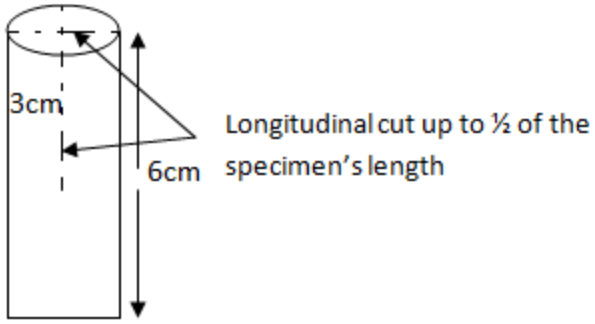
Is the movement of water molecules from high concentration of water molecules to low concentration of water molecules.

Practical 20

You have been provided with specimen X and two solutions SI and S2. Using razor blade or scalpel, cut 6cm long petiole from Specimen X. Use this same piece of petiole in all 3 stages of the experiment described below.

Stage I:

Using razor blade or scalpel, spirit the piece of petiole from Specimen X longitudinally up to its length so as to produce 4 strips on one end of the specimen, while the other end remains intact as shown in the diagram.



Stage II

Dip the piece of petiole in solution S2 for about 10 minutes. Remove it from the solution, observe and touch it gently to feel it's hardness or softness.

Stage III

Dip the petiole in S3 for about 10 minutes. Remove it from the solution, observe and touch it gently to feel its hardness or softness.

(a) Record your observations and explanations for Stage II and stage III of the experiment as shown in the table.

Stage of Experiment	**Observation**	**Explanation**
Stage II		
Stage III		

(b) What was the aim of the experiment

(c) Give brief comments on the concentrated of solution S2 and S3

(d) Why is the biological process demonstrated by the above experiment important to plant?

(e) Define the process demonstrated by the above experiment

(f) Explain what happen to the cells of the petioles in Stage II and Stage III. Illustrate your answer.

Solution

a.

Stage of Experiment	**Observation**	**Explanation**
Stage II	The piece of petiole becomes soft	It shrinks due to loss of water
Stage III	The piece of petiole becomes hard and strong	It absorbs water and become turgid

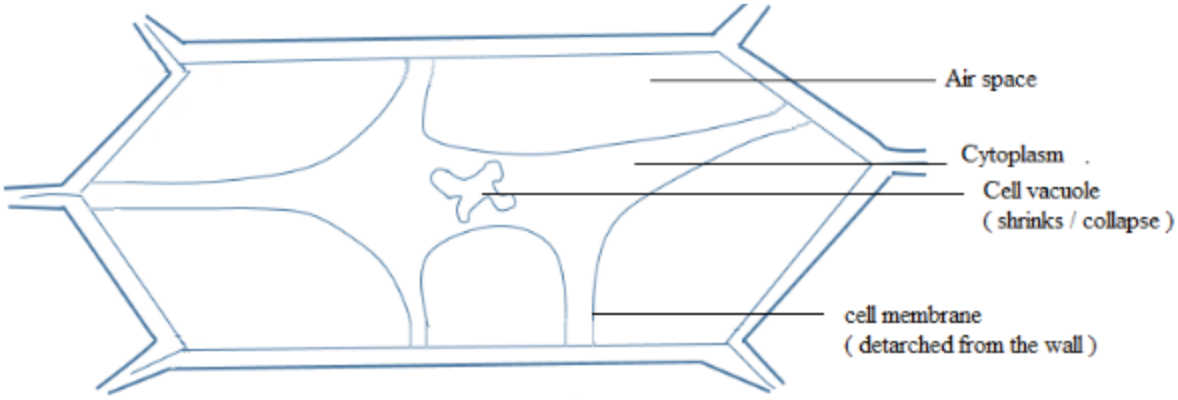
b) To demonstrate the process of Osmosis

c) - The solution of S2 is hypertonic (too concentrated) compound to cell sap of the leaf petiole that is why the petioles lose water and become plasmelysed.
- The solution S3 is hypotonic (less concentrated) compared to the cell sap of the leaf petiole that is why the petiole absorbs water and become turgid.

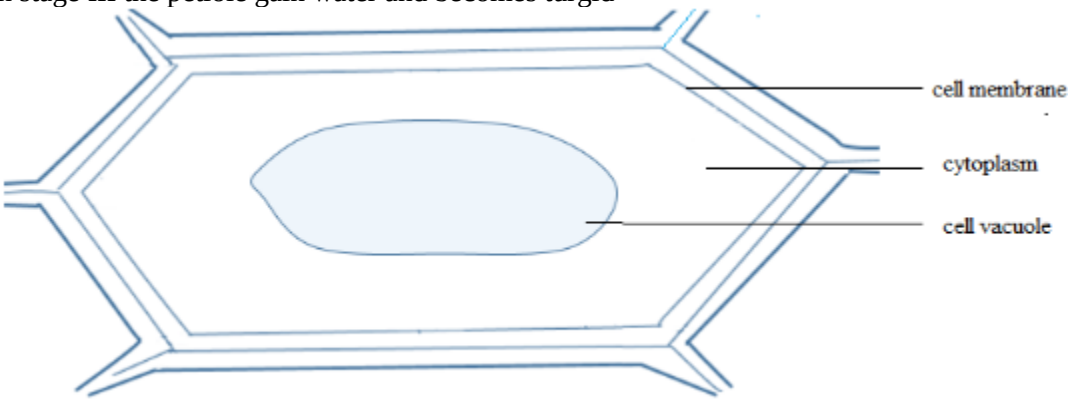
d) **i.** It is important as it enables plant roots to absorb water and dissolved mineral salt from the soil also give strength to the offers support plant
ii. Allows opening of stomata hence facilitate gaseous exchange.

e) Osmosis is the movement of water Transpiration molecules from lowly concentrated solution to highly concentrated solution through semi- permeable membrane.

f) In stage IT the petiole loses water, shrinks and become plasmolysed



In stage III the petiole gain water and becomes turgid



(E) Photosynthesis

The purpose of this practical is to prove that chlorophyll is required for photosynthesis.
This is done by using iodine to test a variegated leaf for starch. The parts of the leaf containing chlorophyll are expected to contain starch, while the parts lacking chlorophyll are expected to lack starch.

This section contains the following:

_ Procedure
_ Materials
_ Sample photosynthesis practical with solutions

1. Procedure

1. Use iodine tincture from the pharmacy without dilution.
2. Prepare hot water bathes. The water should be boiling.
3. While the water gets hot, send the students to gather small leaves. The best have no waxy coating and are varigated (have sections without green).
4. The leaves should be boiled in the hot water bath for one minute.
5. Each group should then move its leaf into their test tube and cover it with methylated spirit.
6. Each group should then heat their test tube in a water bath. Over time, the leaf should decolorize and the methylated spirit will turn bight green.
The chlorophyll has been extracted and moved to the spirit. A well chosen leaf should turn completely white, although this does not always happen.
7. After decolorization, dips the leaves briefly in the hot water.
8. For leaves that turn white, students should test them for starch with drops of iodine solution.

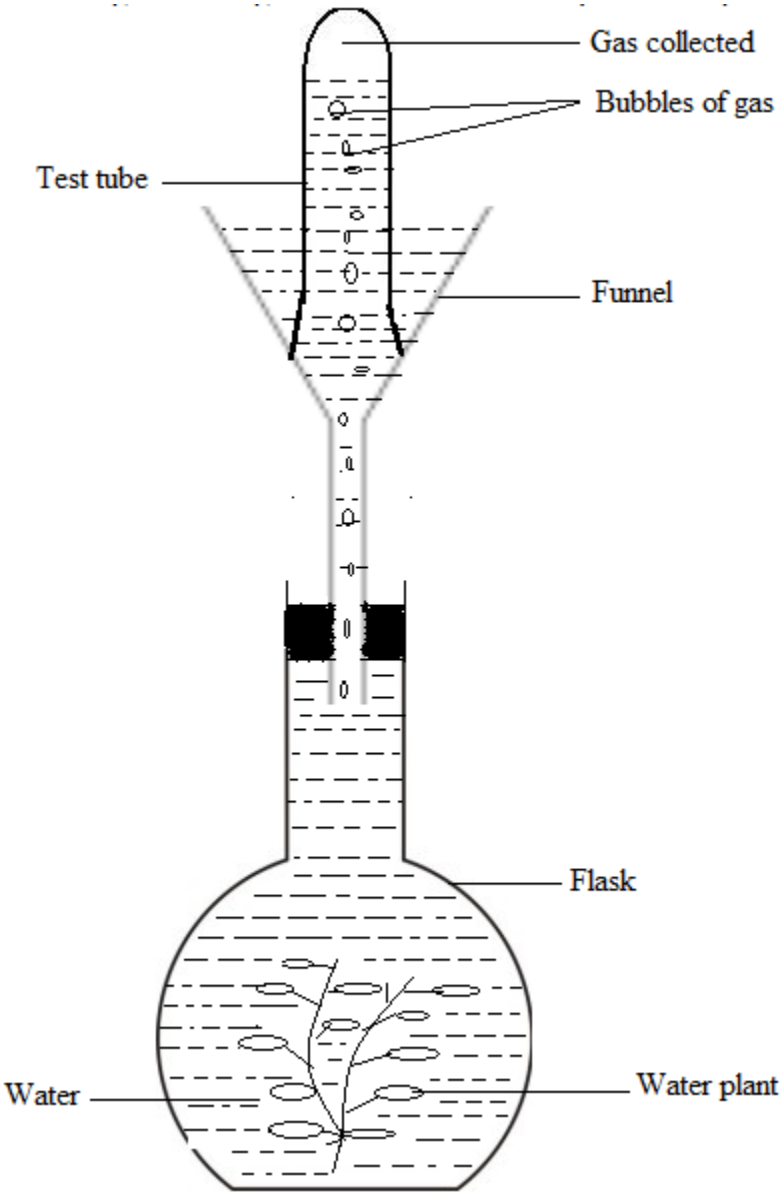
(2) Materials

- ***Variegated leaf:*** this is a leaf that contains chlorophyll in some parts, but not in others. Often variegated leaves are green and white or green and red. Look at the flower beds around the school and at the teachers' houses - they often contain variegated leaves.
- ***Source of heat:*** anything that boils water - Motopoa is best, followed by kerosene and charcoal

- ***Ethanol:*** use the least expensive strong ethanol available; this is probably methylated spirits unless your village specializes in high proof gongo.

Practical 21

The diagram in figure 8 shown the set up of an experiment to investigate a certain physical process in a plant, follows: -



Study the apparatus set up and then answer the question that

(a) (i) Which gas is collected in the test tube?
(ii) Where does it come from?
(iii) During which process is this gas produced?
(iv) Write conditions necessary for the process to take place
(v) Suggest a test for this gas and experiment results.
(b) What will happen if the apparatus is kept in a dark place?
(c) What was the aim of the experiment?
(d) There was a mistake in assembling the apparatus. With a reason, point out that mistake.
(e) Why is water held up in the test tube without running on the funnel?

Solution

(a) (i) Gas which is collected in the test tube is oxygen gas (O_2)

(ii) Gas collected come from water plant (elodea) i.e. this is a green water ; when exposed to sunlight it produces oxygen gas

(iii) This gas is produced during the process called photosynthesis.

(iv) Conditions necessary' for the process (photosynthesis) to take place are

- Sunlight
- Chlorophyll
- Carbon dioxide gas
- Water.

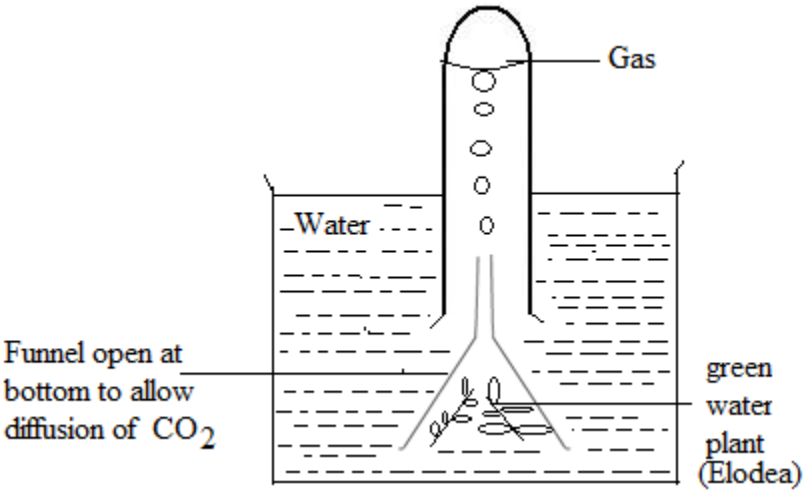
(v) A test for this gas (oxygen) is re- lighting glowing splint (piece of wood)

(b) If the apparatus was kept in the dark place there will be no gas produced by the water plant (elodea) due to the absence of sunlight.

(c) The aim of the experiment was to show that water plant produces oxygen gas during photosynthesis process.

(d) Mistake in assembling the apparatus.

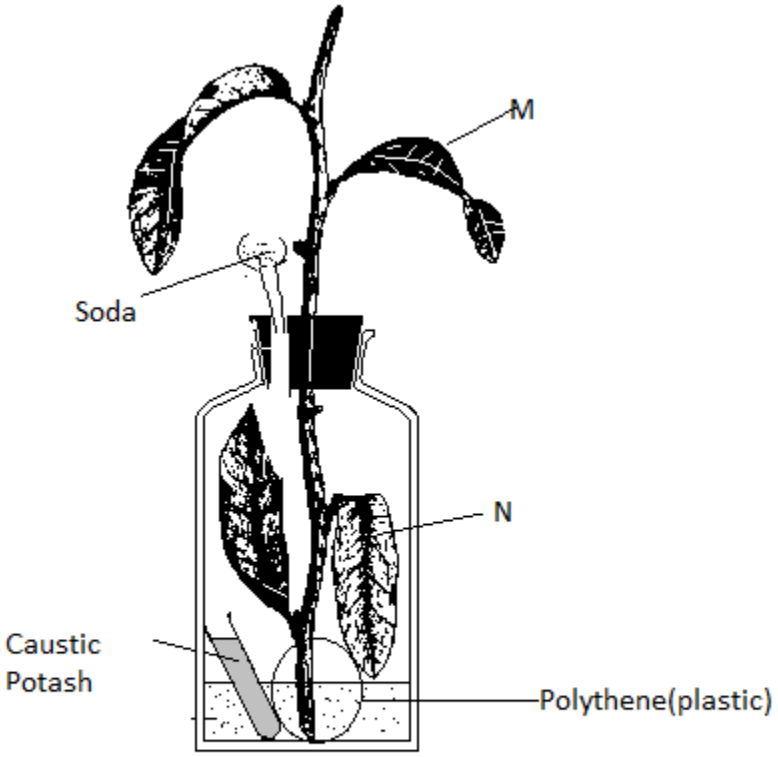
• Funnel was not inverted in such a way that test would be inserted to fit so as trap the gas properly as shown in the figure below



(e) Water was help up in the test tube without running on the funnel because water is denser than air or gas collected, must be collected in upward delivery replacing water in the test tube.

Practical 22

The diagram below- shows an experiment set up for a biological investigation. The potted plant was kept in darkness for 48 hours before the experiment. It was then kept in sunlight for several hours. Observe the set up and answer the questions



a. Suggest the purpose of the
   i) Caustic soda/potash
   ii) Soda lime.
   iii) Polythene (plastic) bag.

b) Why was the potted plant kept in darkness?

c) **(i)** What will be observed if iodine solution is added to leaves M and N after their chlorophyll is removed?

(ii) Which of the leaves M and N served as a control experiment?

d) **(i)** Name the biological process investigated in the experiment

ii) Suggest the aim of the experiment

iii) State the importance of the experiment

Solution

a.

i) The purpose of the caustic soda/potash in this experiment was to absorb carbon dioxide CO_2 gas.

ii) The purpose of the soda lime in this experiment was to absorb any water vapour as well as carbon dioxide CO_2 gas.

iii) The purpose of the polythene (plastic) bag in this experiment was to prevent the release of carbon dioxide by the soli microorganisms.

b. The potted plant was kept in darkness in order to de-starch the plant.

c. i) The following will happen;

- If iodine solution was added to leaves M after the removal of chlorophyll will color or show blue-black coloration (positive to iodine test).
- If iodine solution was added to leaves N after the removal of chlorophyll it will retain iodine color (yellowish-brown) color to indicate negative respond to iodine test due to the absence of carbon dioxide.

ii) Among the leaves M and N the one that served as a control experiment was leave M

d. i) Biological process being investigated in the experiment was photosynthesis process.

ii) The aim of the experiment was to determine whether carbon dioxide is necessary for photosynthesis to take place.

iii) Importance of the experiment

- Generally photosynthesis help in maintaining a balance level of oxygen and carbon dioxide in the atmosphere.
- During photosynthesis, the plants take carbon dioxide (which is present throughout the air) and water.
- Light is used by plants, algae, bacteria etc. in a process called photosynthesis, to convert atmospheric carbon CO_2 into carbohydrate.
- During photosynthesis, plants make sugars such as glucose which can be quickly changed into starch.
- Energy from light, in the presence of chlorophyll promotes a reaction between carbon dioxide and water vapour that leads to the production of glucose.

Practical 23

You have been provided with specimen K_4

(a) Identify specimen K_4

(b) What is the main function of K_4 in the Organism in which, it is found

(c) Hold Specimen K_4 by its stack (petiole) and incase in a beaker containing boiling water. Becarefull without moving K_4 in beaker. Observe the upper and lower surface of K_4 as it is still in immersed in boiling water

(i) Record your observation

(ii) What inference can you draw from the above observation?

(d) Remove the specimen K_4 from boiling water and dip it in mentholated alcohol (spirit) containing in test tube. Roll a clean white paper in a ball and use it to plug the mouth of the test tube (containing K_4 submerged in alcohol) into a beaker containing boiling water and allow remain in it for about 7 – 10 minutes. Remove the leaf from alcohol at the end of this period and dip it in warm water from about 1 minute spread K_4 on a white tile and apply iodine solution on the specimen. Record your observation

(i) What was the aim of this experiment?

(ii) What was the importance of

1. Dipping the specimen K_4 in warm alcohol
2. Dipping the specimen in warm water after removing it from mentholated spirit

(iii) What physiological process was being investigated in this experiment?
(iv) Mention two importance of the process named in d (iii) above

Solution

(a) Leaf {Variegated leaf}
(b) The main function of leaf is containing green pigment known as chlorophyll which taps solar energy from the sun which is used in photosynthesis. Other functions are

- Used in transpiration
- Used in gaseous exchange

(c) (i) Air bubbles will be observed in both sides
(ii) In the upper part there is a lower concentration of stomata while the lower past there is high concentration of stomata
(d) (i) To demonstrate the necessary. Chlorophyll in the leaf
(ii) 1. To remove the chlorophyll pigment from the leaf
2. To increase the surface area for iodine penetrations

(F) Coordination

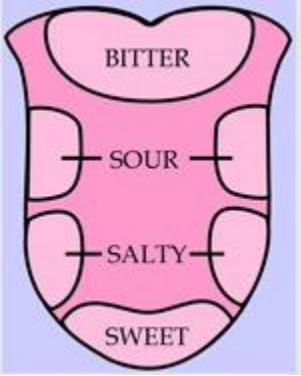
Practical 24

You are predicted with a looking mirror open your mouth widely and look at your mouth on the mirror then answer the following questions

(a) What sense organ did you observe?
(b) What sense is it perceived
(c) Draw and label the sense organ showing different regions of state

Solution

a) The sense Organ is TONGUE
b) The fumet ion is used for TASTING
c) The diagram



Practical 25

Look at your image of right eye and then answer the following questions i) What structures responsible with

i) Protection from physical injury
a) Protection from dust particles
b) Control amount of light entering the eye
c) Draw and label your right eye as you see it on a looking mirror.

Solution

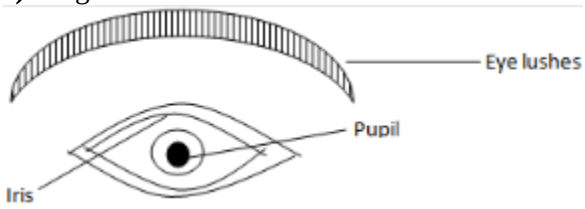
i) Structures are

a) Upper eyelid

b) Eye lushes

c) Iris

ii) Diagram



Practical 26

You have been provided with cotton wool soaked, in methylated spirit. Rub it at the back of the palm of your hand.

(i) What sensation do you feel on the rubbed part?

(ii) Explain what happened to the superficial blood vessels miler the rubbed part in response to the sensation experienced

(iii) In nature what process brings about the same sensation as that experienced in (i) above in human being

(iv) What biological significance of the process in (iii) above

(v) State two ways by which an animal is capable of regulation body temperature when it is above normal

Solution

i) Coldness sensation

ii) Blood needs contrast (This is due to prevent more heat loss)

iii) Sweating

iv) To regulate the body temperature

v) **(a)** Sweating

(b) Vasodilatation

Practical 27

Look at your body observe the structure you can see on your body

(a) Name the sense organ that occurs through the whole body

(b) What are the functions of the sense organ you have named in (a) above

Solution

a) The sense Organ is SKIN

b) The functions of skin

i) Used to cover the body' prevention from pathogen

ii) Used in excretion

iii) Used in sensation