BIOLOGY PRACTICAL REVISION 2025

SUKUMA WIKI

QUESTION ONE

You are provided with the specimen labelled H.`Study it and answer the questions that follow.

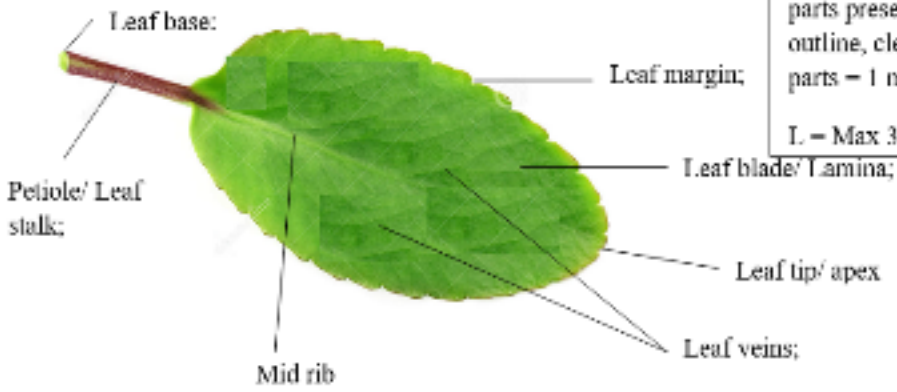
A. (i) Using external features only, identify the part of the plant. (1 mark) Give 3 reasons. (4 marks)

- **Leaf;**

Reasons:

- **Leaf blade/ Lamina;**
- **Presence of petiole/ mid-rib/ leaf stalk;**
- **Presence of leaf veins/ venation;**

B. Draw a well-labeled diagram to illustrate the external features of the leaf. (4 marks)



D Correct, proportional, all parts present, continuous outline, clear partition of parts – 1 mark

L – Max 3 marks

C. State the morphological differences between specimen H and *Lantana camara*/Bean leaf. (4 marks)

Lantana camara	Bean Leaf
Simple leaf	**Compound leaf: Trifoliate**
Hairy leaf surface	**Smooth surface**

Lantana camara	Sukuma wiki
Rough/Hairy leaf surface	**Smooth surface**
Thinner	**Thicker**
Smaller in size	**Larger in size**

Sukuma wiki	Bean
Simple leaf	**Compound leaf: Trifoliate**
Thicker	**Thinner**
Larger in size	**Smaller in size**

D. Giving reasons in each case, classify the specimen into the following taxonomic units:

(i) Kingdom

Plantae;
Reasons
•
•
(ii) Division
Spermatophyta
Reasons
•
•
(iii) Subdivision
Angiosperphyta
Reasons
• .
(iv) Class
Dicotyledonae
Reasons
- **The leaf has network venaition**
- **Broad leaf**
- **Has leaf petiole**

E. Using observable features only, identify the habitat of the plant. Give 3 reasons. (4 marks)
- **Terrestrial habitat with moderate conditions**

Reasons
- **Broad leaves to increase the surface area for maximum photosynthesis in open air.**
- **Have leaves with thick waxy cuticle that is waterproof to reduce water loss.**
- **Glossy/shiny leaf surface to reflect away excess light hence reduce transpiration rate.**

F. Using observable features only, state the adaptation of the specimen to its habitat. (3 marks)
- **Broad leaves to increase the surface area for maximum photosynthesis in open air.**
- **Broad leaves to increase the surface area for trapping light to allow maximum photosynthesis.**
- **Broad leaves with numerous stomata to increase the surface area for absorption of carbon (IV) oxide to allow maximum photosynthesis.**
- **The leaf has thin lamina/epidermis to shorten the distance for penetration of light and diffusion of gases (CO_2 and O_2).**
- **The leaf is green with numerous chloroplasts for maximum trapping of light**
- **Have leaves with thick waxy cuticle that are waterproof to reduce water loss.**
- **Glossy/shiny leaf surface to reflect away excess light hence reduce transpiration rate.**

G. Using observable features only, state the adaptation of the specimen to photosysnthesis.(3 marks)
- **Broad leaves to increase the surface area for trapping light to allow maximum photosynthesis.**
- **Broad leaves with numerous stomata to increase the surface area for absorption of carbon (IV) oxide to allow maximum photosynthesis.**
- **The leaf has thin lamina/epidermis to shorten the distance for penetration of light and diffusion of gases (CO_2 and O_2).**
- **The leaf has is green with numerous chloroplasts for maximum trapping of light**

H. Using observable features only, state the adaptation of the specimen to enhance gaseous exchange. (3 marks)

- **Broad leaves with numerous stomata to increase the surface area for absorption of carbon (I V) oxide to allow maximum photosynthesis.**
- **The leaf has thin lamina/epidermis to shorten the distance for diffusion of gases (CO_2 and O_2).**

I. Using observable features only, state the adaptation of the specimen to reduce transpration. (3 marks)

- **Have leaves with thick waxy cuticle that are waterproof to reduce water loss.**
- **Glossy/shiny leaf surface to reflect away excess light hence reduce transpiration rate.**

J. State the role of the specimen to the environment/ habitat/ ecosystem. (3 marks)

- **Producer/Photosynthesize to produce food for herbivores**
- **Habitat for small animals**
- **Purifies air/Reduce CO_2 in the atmosphere**
- **Ground cover**

K. You are provided with a microscope, slides and cover slips and iodine solution/methylene blue/ eosin solutions. Peel the epidermis of the lower and upper surfaces. Observe under low, medium an d high power magnification.

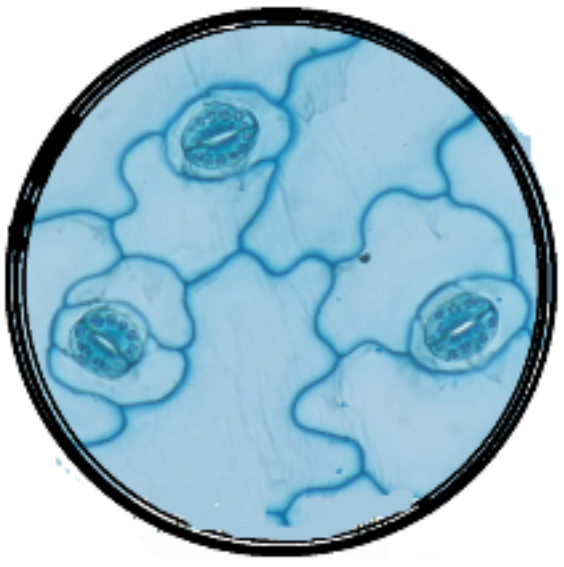
(i) Count the number of stomata on the two surfaces and record in the table below.

	Lower epidermis	Upper epidermis
Number	**12**	**3**

(ii) Account for the distribution/number of stomata on the lower and upper epidermis.

- **The lower epidermis has more stomata than the upper epidermis; to reduce direct exposure t o light hence reduce transpiration rate;**

(iii) Draw a well labelled diagram showing the distribution of the stomata as observed across the fi eld of view.



L. Estimate the size/diameter of the one cell in micrometres.

- **Place the transparent ruler on the stage of the microscope;**
- **Focus so that the mm marks are seen as dark line;**
- **Count the 1mm marks between the first mark and last mark across the field of view;**
- **Estimate the field of view in mm;**
- **Convert the mm to micrometres where 1mm = 1000 micrometres**

M. Give reasons for each of the following procedures during microscopy, when preparing a tempor ary slide.

(i) Cutting thin sections

- **To make the specimen transparent hence allow light tom pass through;**

(ii) Using a sharp scalpel blade

- **To avoid distortion of tissues**

(iii) Staining using iodine solution/eosin/methylene blue solution.

- **To make certain parts more distinct/more distinguishable/clearer**

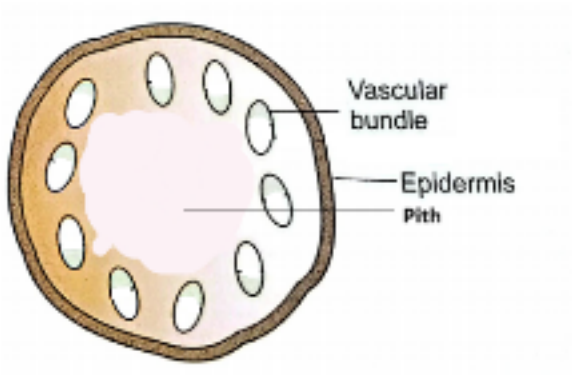
(iv) Mounting on a drop of water

- **To make the cells turgid/prevent dehydration of the specimen;**

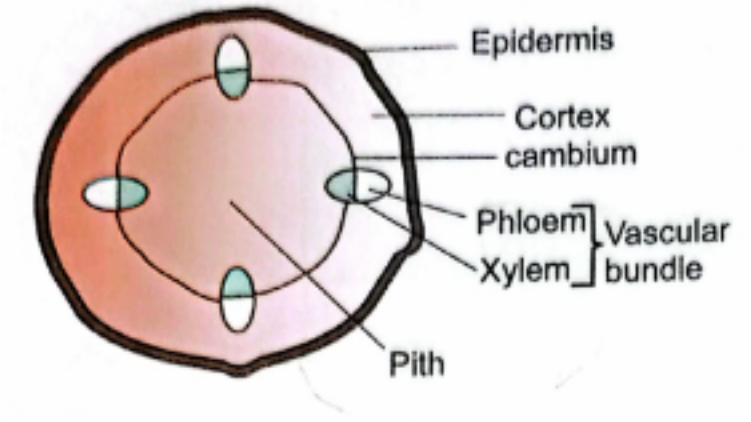
(v) Using a cover slip

- **To protect the specimen/objective lens**
- **To spread the specimen**

N. Cut the transverse/cross-section of the leaf petiole and observe using a hand lense and then usi ng a light microscope. Draw a well labelled diagram as observed using the hand lens and then usin g the microscope.



Hand lens



Light microscope

O. Using a scalpel blade, cut a **slit** halfway through the middle of the petiole. Place one piece in liq uid L1 (distilled water) and liquid L2 (concentrated salt solution). Allow it to stand for 30 minutes.

(i) Feel the texture of the pieces by pressing between your fingers.

Record and account for the observations. (6 marks)

L1 (Distilled water - Hypotonic solution)

- **Firm/Hard/Stiff/Rigid**

Account

- **Liquid L1 is hypotonic to the cell sap of the plant cells. The cells draw in water by osmosis an d become turgid making the petiole firm;**

L2 (Salt solution - Hypertonic solution)

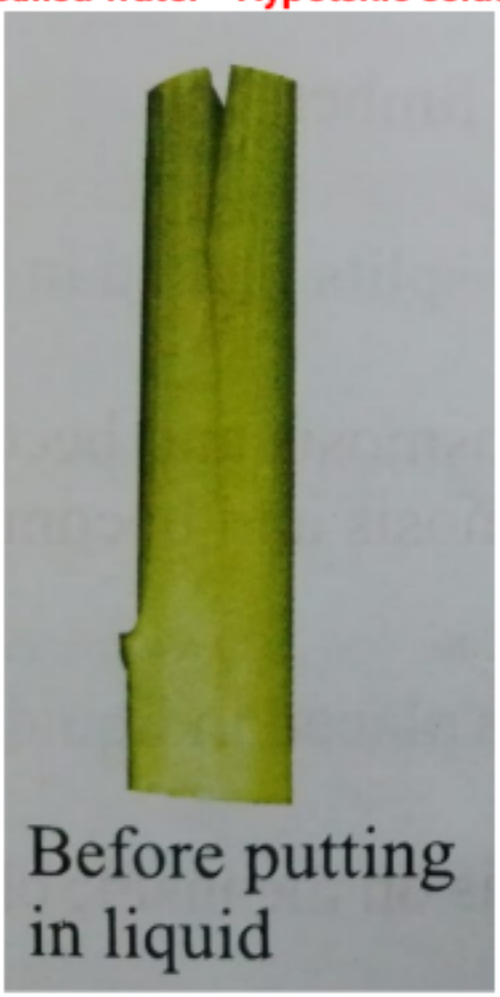
- **Flexible/Soft/Flabby**

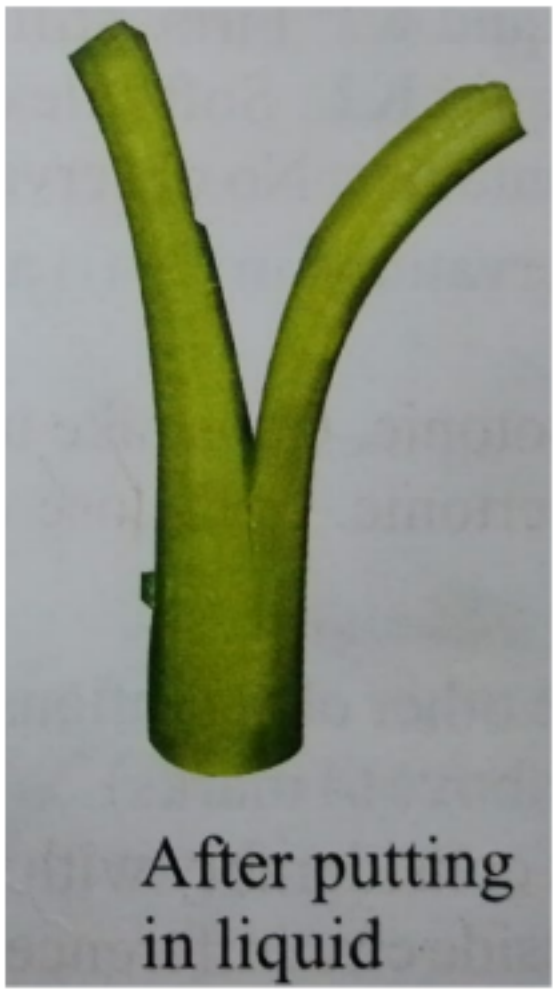
Account

- **Liquid L1 is hypertonic to the cell sap of the plant cells. The cells lose water by osmosis and become flaccid making the petiole soft;**

(ii) Examine the shape of the pieces. Record and account for the observations . (6 marks)

L1 (Distilled water - Hypotonic solution)



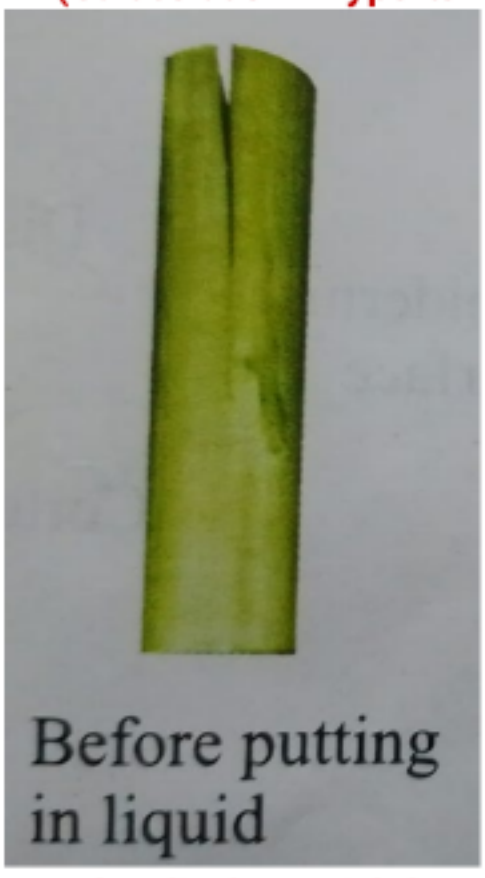


- **The slit widens;**

Account

- **The epidermis is waterproof. Liquid L1 is hypotonic to the cell sap of the inner cells/cortex cells. The inner cells/cortex cells draw in water molecules by osmosis and become turgid, increasing in length than the epidermis. Hence the slit widens.**

L2 (Salt solution - Hypertonic solution)



- **The slit closes tightly**

Account

- **The epidermis is waterproof. Liquid L2 is hypertonic to the cell sap of the inner cells/cortex c ells. The inner cells/cortex cells lose water molecules by osmosis and become flaccid, reduci ng in length than the epidermis. Hence the slit closes tightly.**

P. Using a scalpel blade, **split/strip** the piece lengthwise through the middle of the petiole into two halves. Place one piece in liquid L1 (distilled water) and liquid L2 (concentrated salt solution). Allo w it to stand for 30 minutes.

(i) Feel the texture of the pieces by pressing between your fingers. Record and account for the obs ervations. (6 marks)

L1 (Distilled water - Hypotonic solution)

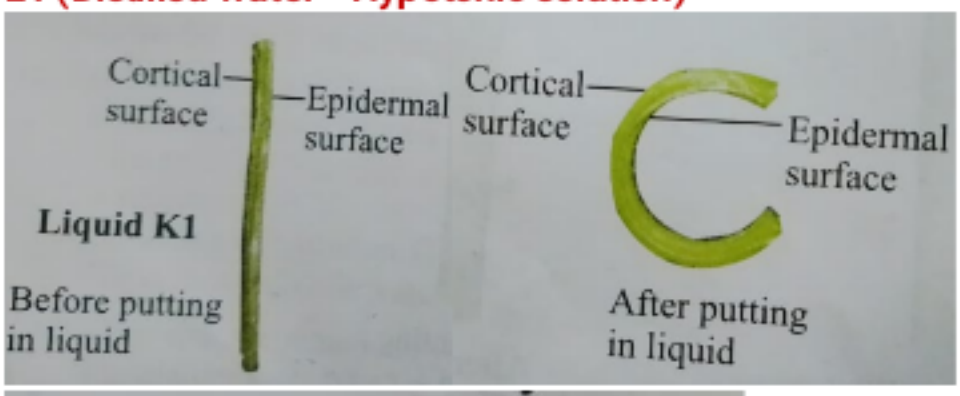
- **Firm/stiff/hard/rigid;**

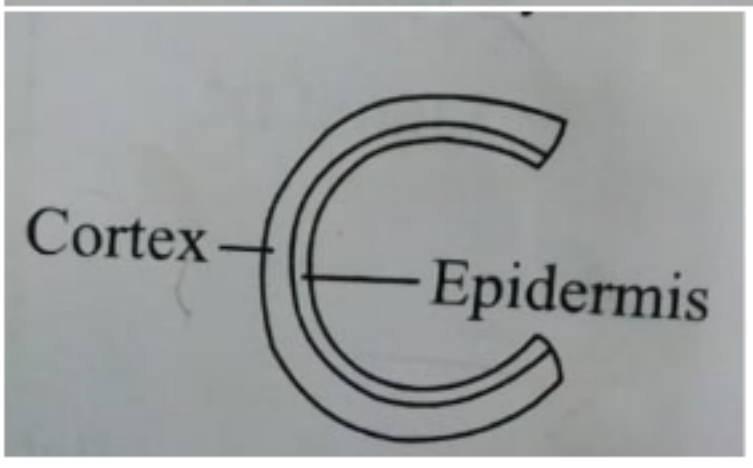
L2 (Salt solution - Hypertonic solution)

- **Soft/flexible/flabby**

(ii) Examine the shape of the pieces. Record and account for the observations . (6 marks)

L1 (Distilled water - Hypotonic solution)

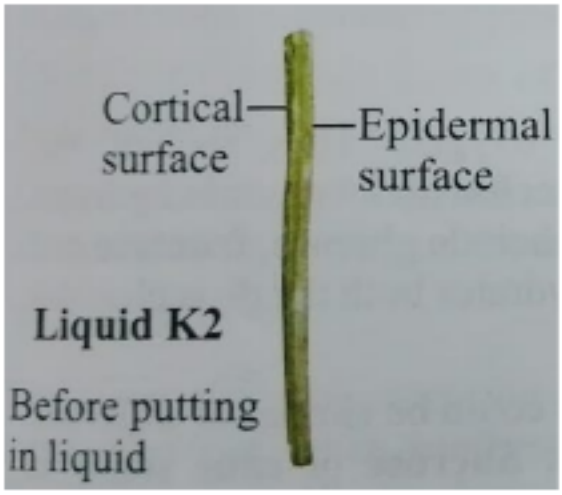


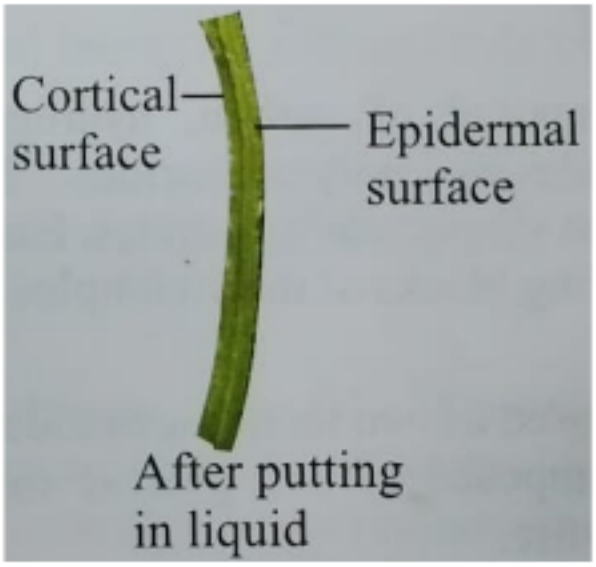


Account

- **The epidermis is waterproof. Liquid L1 is hypotonic to the cell sap of the inner cells/cortex ce lls. The inner cells/cortex cells draw in water molecules by osmosis and become turgid, incre asing in length than the epidermis. Hence the spilt/strip curves outwards.**

L2 (Salt solution - Hypertonic solution)





Account

- **The epidermis is waterproof. Liquid L2 is hypertonic to the cell sap of the inner cells/cortex c ells. The inner cells/cortex cells lose water molecules by osmosis and become flaccid, reduci ng in length than the epidermis. Hence the split/strip curves outwards.**

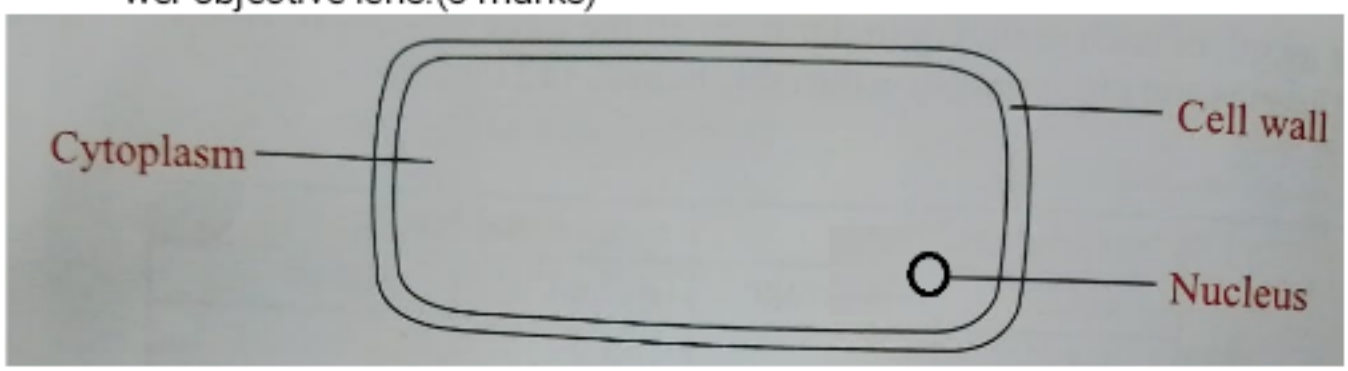
Q. .....

QUESTION TWO

1. You are provided with an Sukuma wiki plant, 30 cm ruler transparent ruler, clean microsc ope slides cover slips, razor blade, distilled water, iodine solution, pair of forceps dropper and mounting needle;

(i) Carefully peel out a piece of epidermis from this leaf using forceps
(ii) Trim down the epidermis to about 1 cm long
(iii) Place a drop of water on a clean microscope slide and quickly spread the piece of epider mis on the drop of water
(iv) Place a cover slip on the epidermis strip
(v) Examine the slide under low and medium power
(vi) Repeat the above procedure with another epidermal strip using a drop of dilute iodine so lution instead of distilled water

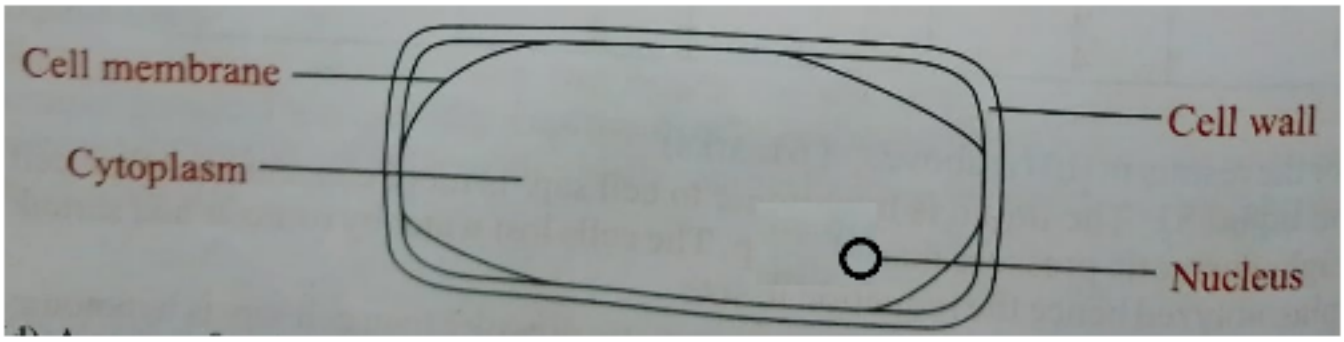
(a) (i) Make a large neat well labelled diagram of one cell as observed under the medium po wer objective lens.(5 marks)



(ii) State one difference observed when viewing the stained cells compared to when viewing the unstained cells. (1 mark)

- **Parts become more distinct and clearer when stained;**

(b) On the same specimen of the epidermis that you wer examining above, place several drops of Li quid L2 (salt solution - hypertonic solution). Draw the liquid under the cover slip and across the specimen using adsorbent paper placed on the opposite side of cover slip. What for 5 minutes a nd then observe the specimen. Draw and label one of the cells. (5 marks)



Account for the results in (c) above

- **Liquid K2 is hypertonic to the cell sap. The cell lose water by osmosis and become flaccid (ce ll membrane is pulled away from the cell wall;**

(c) i) With the low power objective lens estimate the diameter of the field of view you are usi ng to view the cells write down the step by step working (4 marks)

- **Place the transparent ruler on the stage of the microscope;**
- **Focus so that the mm marks are seen as dark line;**
- **Count the 1mm marks between the first mark and last mark across the field of view;**
- **Estimate the field of view in mm;**
- **Convert the mm to micrometres where 1mm = 1000 micrometres**

(ii) State one disadvantage of the above method of cell size estimation. (1 mark)

- **Cell vary in shape and size and so counting the total number of cells across the field of view may not give the accurate size of cell;**

BEAN SEEDLING

You are provided with specimens H . specimen H is a complete plant. Observe the specimens and u se it to answer the questions that follow.

a) Explain how the stem of specimen H adapts the plants to photosynthesis (2mks)

- **Firm/ upright to expose the leaves to light for photosynthesis**
- **Green to trap sunlight for photosynthesis**

b) State the ecological importance of specimen H (1mk)

- **Producer/ food for herbivores**
- **Habitat for small animals**
- **Purifies air/Reduce CO2 in the atmosphere**
- **Ground cover**

d) Explain the consequences of adding concentrated salt solution to the soil in which specimen H i s growing. (2mks)

- **The common salt will make the surrounding soil solution hypertonic to cell sap; the plant lose water to soil by osmosis hence become dehydrated/ wilt/dry/die.**

2. Observe the three photographs carefully and answer the questions that follow.

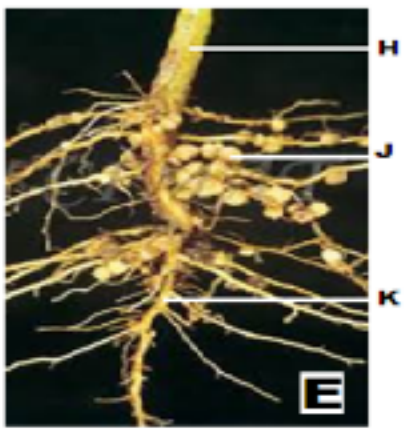
(a) To which class does the plant belong. Give reasons for your answer. (4 marks)

- **Dicotyledonae;**

Reasons

- **The leaves have network venation**
- **Tap root system**

(b) Study the diagram below



Identify the structures labeled H, J, and K(3mks)

H

- **Stem;**

J

- **Root nodule;**

K

- **Tap root;**

(c) Suggest the group of plant from which the root is obtained (1 mark)

- **Legume;**

(d) Explain the relationship found at point J (4 marks)

- **Symbiosis; Rhizobium bacteria fix nitrogen to nitrates; which are used by the legume to mak e plant protein; the legume shares manufactured food with Rhizobium;**

(e) Explain how the relationship benefits a farmer. (2 marks)

- **The nitrates formed reduce the need for the farmer to use fertilizers; hence saves;**

IRISH POTATO

You are provided with Irish potato tuber and dilute Hydrogen peroxide solution. Cut 2 cubes each of sides 1 cm. Crush one cube into a paste and put both both crushed and uncrushed piece in separat e test-tubes and add hydrogen peroxide in each testtube.

A. (i) State the observations that was made when hydrogen peroxide was added to the to the irish potato

- **Effervescence/Foaming occurs**

(iii) Explain the observations above.

- **The catalase enzyme in irish potato tissues catalyzed the breakdown of the toxic hydrogen p eroxide to water and oxygen;**

(iv) Write a word equation for the reaction producing the gas.

(v) Describe the test for the gas produced.

- **The gas relights a glowing splint;**

(vi) Where does the process above occur in humans?

- **Liver**

B. Name and state the importance of the process observed above.

- **Detoxification**
- **Conversion of toxic compounds to non-toxic compounds**

C. State and explain the observations made in each of the test-tubes

Test tube A (crushed/marcerated)

- **More vigorous effervescence/fizzing;**
- **Crushing increases the surface area for enzyme action hence more vigourous effervescence /fizzing**

Test tube A (uncrushed)

- **Slight effervescence/fizzing; Less surface area is eposed hence less effervescence/fizzing**

D. Boil another piece of Irish potato, cool and then place in a test tube. Add hydrogen peroxide. Sta te and explain the observations made.

- **Boiling denatured the enzyme catalase; hence there was no breakdown of hydrogen peroxid e;**

GRASSHOPPER/LOCUST

You are provided with an actual specimen of an animal labeled T (Locust) whose photograph is sh own below. Examine it.

A. Giving reasons, state the Phylum of animals to which the specimen belongs. (3 marks)

- **Phylum Arthropoda**

Reasons

- **Have jointed appendages;**
- **Have segmented bodies**
- **Body covered by exoskeleton**

B. Giving reasons, state the class of animals to which the specimen belongs. (3 marks)

- **Class Insecta**

Reasons

- **Body is divided into three parts: head, abdomen and thorax**
- **Has 3 pairs of legs**
- **Has wings for flight**

C. Based on external features, suggest the habitat of the animal and state your reasons. (3 marks)

- **Terrestrial grassland habitat**

Reasons

- **Long, powerful hind legs adapted for jumping on land.**
- **Camouflaged body colour (brown) to blend with grass and avoid predators.**
- **Wings for short-distance flight in open grassland.**
- **Hard exoskeleton to prevent water loss and provide protection on land.**

D. Using observable features only, state the adaptations of the grasshopper to its habitat

- **Long, powerful hind legs adapted for jumping on land.**
- **Camouflaged body colour (brown) to blend with grass and avoid predators.**
- **Wings for short-distance flight in open grassland.**
- **Hard exoskeleton to prevent water loss and provide protection on land.**
- **Has compound eyes and antennae that are well-developed for detecting movement and sens ing the environment.**
- **Has strong mouth parts (mandibles) for biting and chewing plant material.**

E. Examine the legs of the animal.

(i) With reference to size, state how the hind legs differ from the fore legs.

- **The hind legs are larger than fore legs**

(ii) Suggest the significance of the difference in the sizes of legs.

- **The hind legs provide a greater forward force/thrust that enable the animal to hop;**

F. State the importance of the organism to the ecosystem

- **Serves as food for other organisms**
- **Source of carbon (IV) oxide used by plants for photosynthesis**
- **Nutrient recycling – their waste and decomposing bodies return nutrients to the soil.**
- **Controls plant population**

G. List the observable differences between the Fore wings (outer) and Hind wings (inner).

Fore wings (outer)	Hind wings (inner).
Hard	**Soft**
Opaque	**Translucent**
Non-membranous	**Membranous**
Less prominent network of veins	**Have a prominent network of veins**

H. List the observable differences between the Fore legs and Hind legs.

Fore legs	Hind legs
Smaller sized	**Large sized**
Lack spikes	**Has spikes**

I. ..

DICHOTOMOUS KEY

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