



231/3

BIOLOGY (Practical)

Nov. 2023 – 1¼ hours



Name:

Index Number:

Candidate's signature:

Date:

Instructions to candidates

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer **all** the questions in the spaces provided.
- (d) You are required to spend the first 15 minutes of the 1¼ hours allowed for this paper reading the whole paper carefully before commencing your work.
- (e) Additional pages must **not** be inserted.
- (f) **This paper consists of 6 printed pages.**
- (g) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (h) **Candidates should answer all the questions in English.**

For Examiner's Use Only

Question	Maximum Score	Candidate's Score
1	11	
2	15	
3	14	
Total Score	40	



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Nyanday P.O
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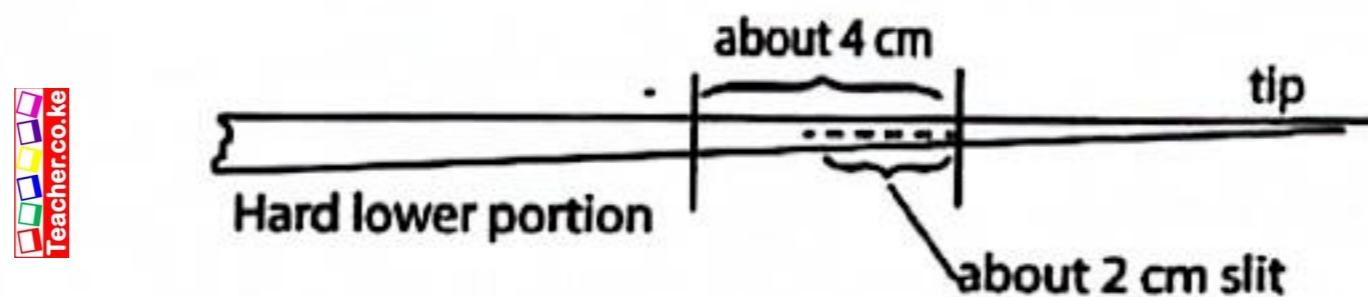
1 You are provided with the following materials:

- Two similar leaves of *Brassica oleraceae* (Sukuma wiki)
- A scalpel
- 5 cm³ of liquid K₁ in a test tube
- 5 cm³ of liquid K₂ in a test tube
- (Access) to means of timing

K₂ - hypertonic soln.

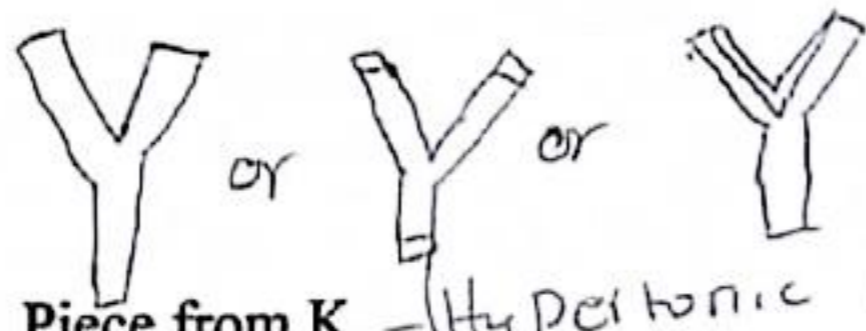
Procedure

- Remove the entire leafy parts along the midribs of both leaves
- Retain the two midribs still attached to their petioles.
- Discard the hard lower petiole.
- Measure about 4 cm of the remaining midrib towards the tip. Cut and discard the tip. The process is illustrated as follows:



- Make a 2 cm slit from the tip end of each of the 4 cm portions as shown in the diagram above.
 - Place one piece into the test tube with liquid K₁ and the other into liquid K₂ and leave them for 20 minutes. Remove the two pieces and make observations.
- (a) Draw the appearance of each piece.

(i) Piece from K₁ (*Distilled water*)



(ii) Piece from K₂ (*Hypertonic soln*)



(1 mark)

- Rej. shaded diagram (1 mark)

- Acc. any orientation of the diagram e.g.



Reject

- If student uses ruler to draw - 3D diagram



- Wrongly labelled diagram if student commits himself to label

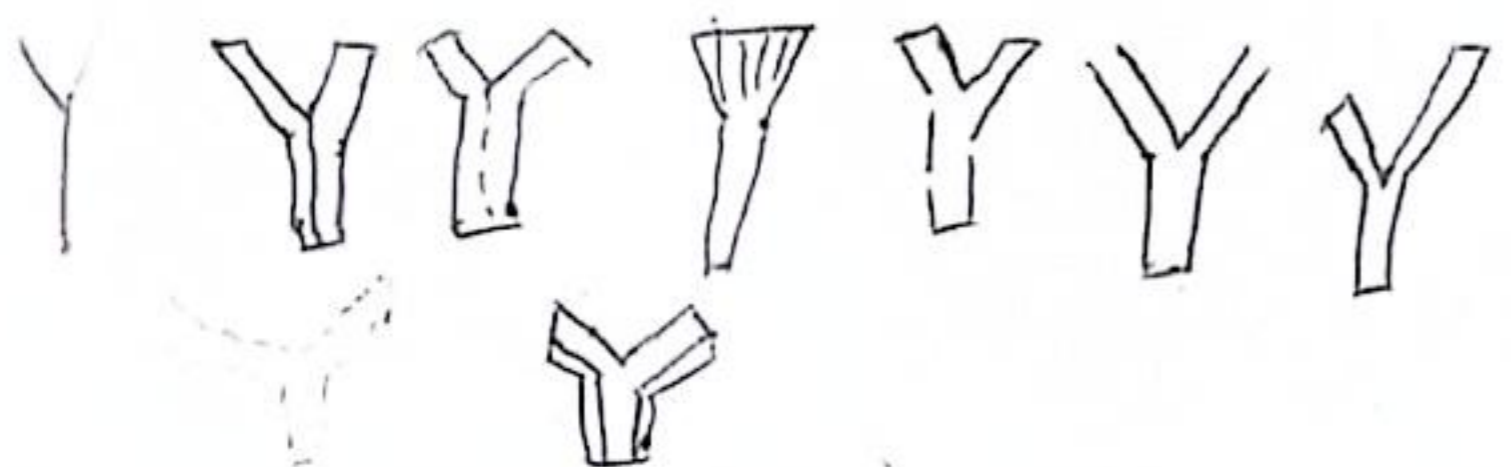
- Dotted line

- Multiple slits

- One arm straight & another bending

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Reject



Observed that the solution
 Gain more by osmosis
 3
 Curvature expanded more
 Test the observation Nature of sln Marked Independently

(b) Account for the observations made on the piece from each liquid.

(i) Piece from K_1

(3 marks)

Acc. converse of cell sap K_1 & cell sap
 Acc. hypotonic
 hypotonic
 hypertonic

Piece from sln K_1 was firm/hard/stiff/rigid because sln K_1 was hypotonic/lowly concentrated; hence the (inner/cortical) cells gained water by osmosis and became turgid;

OR
 Piece in K_1 curved outward/slit opens/slit widens/slit expands (more); because K_1 was hypotonic/lowly concentrated to the cell sap; Hence inner/cortical cells gained water by osmosis & elongated more/faster/expanded more;

(ii) Piece from K_2

(3 marks)

Reji
 hypertonic
 hypotonic

Piece from sln K_2 was soft/flabby/limber/flexible; because K_2 was hypertonic/highly concentrated to the cell sap; Hence inner/cortical cells lost water by osmosis & became flaccid;

OR
 Piece in K_2 curved inward/slit closed/slit slightly opens; because K_2 was hypertonic/highly concentrated to the cell sap; Hence inner/cortical cells lost water by osmosis and shrunken/reduced in size;

(c) State how the experiment would be modified to obtain the same results within a shorter period of time.

(2 marks)

Student must be specific K_1 or K_2

- For K_1 , use more dilute/less concentrated sln/more (distilled) water/more hypotonic
 - For K_2 , use a saturated sln/add more solute in K_2 /more concentrated sln/hypertonic solution

Accept Increase length of slices (number of slices) } in both K_1 & K_2
 Reduce thickness of inner tissue/cortex } 5 marks on c
 Increase temperature upto optimum/warm

(d) Explain why the petiole and the lower parts of the midribs were not suitable for use in this experiment.

(1 mark)

- The ~~cells are~~ Hard/Not easy to bend/not flexible/less flexible/rigid/tough/not flexible/inflexible.

2

You are provided with three plant specimens labelled E, F and G obtained from different plants belonging to different Families.

(a) Use the specimens provided together with the photographs below to construct a dichotomous key that can be used to identify them. Use the features below in the order given to construct the key: (10 marks)

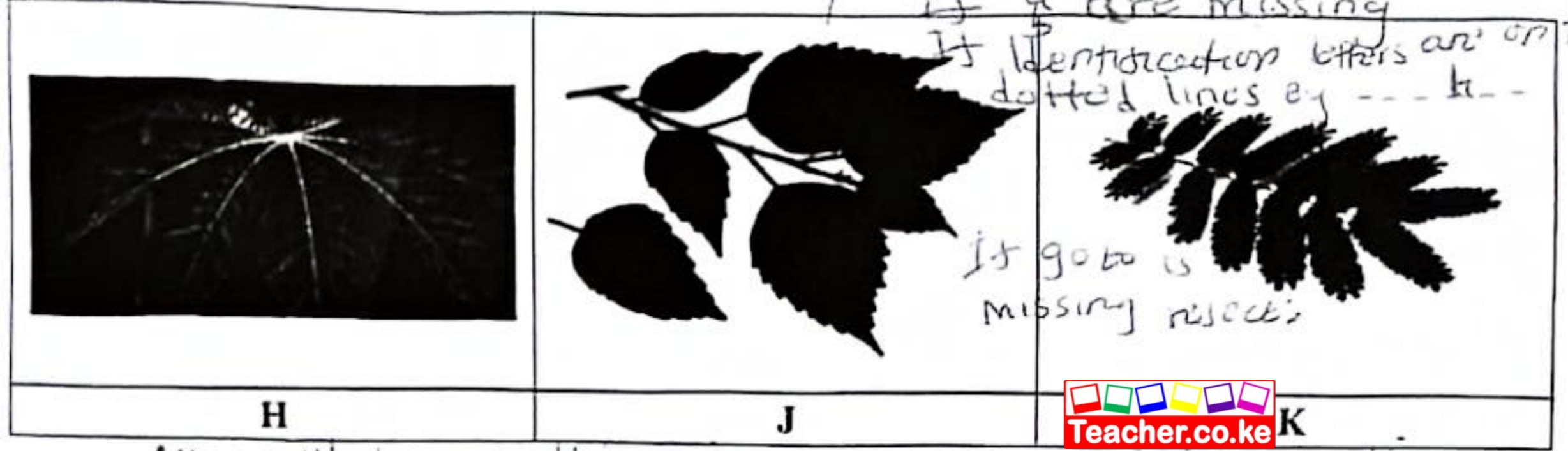
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- Simple or compound leaves
- Leaf venation
- Type of compound leaf
- Leaf margin
- Nature of leaf lamina

11

Let student...
 leaf - go to
 leaf - go to
 leaf - go to
 leaf - go to
 2 (marks divided by 2)

1a 1b 1c 1d
 1e 1f 1g 1h
 4 Rej. If word leaf is missing more so in step one
 If a are missing



Key with bean seedling simple

- 1a) Leaf simple ----- go to 2
- 1b) Leaf compound ----- go to 3
- 2a) Leaf network veined / reticulate / branched ----- go to 4
- 2b) Leaf parallel veined ----- F
- 3a) Leaflets emerging from one stalk like fingers / digitate / digit like / palmate ----- H
- 3b) Leaflets emerging from several stalks / Bipinnate ----- K
- 4a) (leaf) (margin) smooth / entire ----- go to 5
- 4b) (leaf) (margin) serrated / dentate / teeth like ----- J
- 5a) Leaf lamina hairy / rough ----- E
- 5b) Leaf lamina smooth ----- G

Key with bean seedling cpd

- 1a) leaf cpd ----- go to 3
- 1b) Leaf simple ----- go to 2
- 2a) Leaf parallel veined ----- F
- 2b) Leaf ret. veined ----- go to 4
- 3a) Leaflets emerging from several stalks attached to main stalk / Bipinnate ----- K
- 3b) Leaflets emerging from one stalk like fingers ----- go to 5
- 4a) Leaf margin serrated ----- J
- 4b) Leaf margin smooth ----- G
- 5a) Leaf lamina rough / hairy ----- E
- 5b) Leaf lamina smooth ----- H

E - bean
 F - Marne
 G - Bo. g. n. l. a. w.
 When in step 4 J is chosen then bean is treated as simple when in step 4 J is with G then bean is cpd

Conditions

----- go to (must be given)
 Accept small letters (g or h)

(b) Fill the following table indicating the steps followed to identify specimens E, F and G. (3 marks)

Specimen	Bean simple	Bean cpd
E	1a, 2a, 4a, 5a	1a, 3b, 5a
F	1a, 2a, 4a, 5a	1b, 2a
G	1a, 2a, 4a, 5b	1b, 2b, 4b



If student omits a or b
 Whole key

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 omits leaf c)

Deny marks in step one & continue marking (put omission sign)

(c) (i) State **one** feature in the root and **one** in the stem of specimen **G** that places the plant in its Class.

(2 marks) *rej: diagram an explanation system with phloem*

Root - *star shaped xylem*
 - *Tap root system*
 - *Vascular bundles located in the middle/centrally/star shaped xylem with phloem alternating with arms of xylem*

Stem - *woody/spongy/hyaline/hard/has a cambium/rigid*
 - *Vascular bundle arranged in a ring/presence of pith/cortex*



3 You are provided with the following materials:



- 3 test tubes and means of labelling them
- Solutions L₁, L₂ and L₃,
- 10 cm³ measuring cylinder,
- Iodine solution.

Procedure

- Label the three test tubes **A, B** and **C**.
- To test tube **A**, add 1cm³ of L₁, add one drop iodine solution. Record the observations in the table below.
- Add 1cm³ each of L₁ and L₂ into tube **B**. Place it on the test tube rack and leave it undisturbed for ten minutes. Add a drop of iodine solution and record the observations in the table below.
- To the third test tube, **C**, add 1cm³ of L₂, add two drops of dilute hydrochloric acid. Leave the contents undisturbed for ten minutes. Add 1cm³ of L₁, shake the contents and again place the contents on the test tube rack for about five minutes, add a drop of iodine solution.
- Record the observations and inferences in the table below.

L1 - starch soln
L2 - Enzyme
L3 - HCl

A - L1 + iodine
B - L1 + L2 + iodine
C - L2 + L3 + HCl + iodine

Test tube	Observations after adding iodine solution	Conclusion
A	<i>Blue-black / blue black / blue black All: black.</i>	<i>starch present</i>
B	<i>light blue black / pale blue black / less blue black / faded blue black</i>	<i>Traces / small amount of starch present / starch broken down</i>
C	<i>Brown / yellow colour of iodine retained / colour of iodine retained / no colour change</i>	<i>starch absent / starch broken down / starch hydrolysed</i>

}}}

(a) (i) Suggest the likely identity of solution L₂.

Diastase / enzyme / starch-digesting enzyme / amylase / salivary amylase / pancreatic amylase / ptyalin (underline wrong spellings)

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OR

Observation	Conclusion
<i>- Brown colour / yellow colour of iodine remained / NO colour change</i>	<i>- starch absent / broken down / hydrolysed</i>
<i>- Blue-black</i>	<i>- starch present</i>
<i>- light blue black</i>	<i>- Traces / small amount of starch present</i>

Turn over

OR

Tied to (a) i

(ii) Explain your answer in 3(a)(i). (2 marks)

BROKE down/digest/hydrolyse starch; (in test tube B into simple sugars resulting in negative result for starch test) Its effect/activity is affected by change in pH/temperature/denatured ~~that~~ by acid/HCl/low pH;



(b) Suggest with a reason where the process being investigated in this experiment would take place in the human alimentary canal. (1 mark)

(i) Part of alimentary canal: mouth/duodenum/ileum/small intestine/Buccal cavity/oral cavity

(ii) Reason (2 marks)

① The medium is basic/alkaline; Favours the action of the enzyme/providing optimum/favourable pH/Its effect is impeded when pH is altered by acidic pH;

OR
② Digestion of starch takes place in this regions

(i) State two other modifications one would make in test tube C to obtain similar observations (2 marks)

① Increase temperature beyond optimum/Boiling/Heating above optimum temperature/Reducing temperature below optimum/freezing

② Reduce enzyme concentration/introduce enzyme inhibitors/metabolic poisons ACCEPT: specific inhibitor - mercury, cyanide

THIS IS THE LAST PRINTED PAGE.

③ Increase substrate concentration

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