

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education

231/3

BIOLOGY (Practical)

Nov. 2023 – 1¼ hours



Paper 3

Name:

Index Number:

Candidate's signature:

Date:

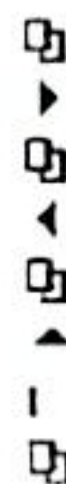
Instructions to candidates

- (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	



Turn over

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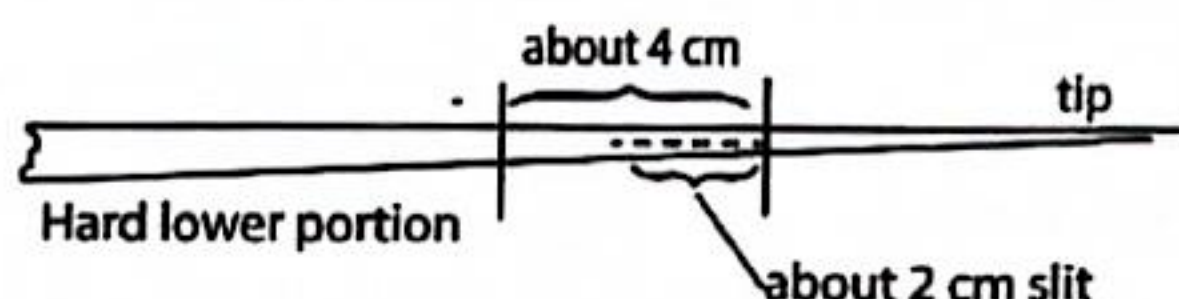
1 You are provided with the following materials:

- 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

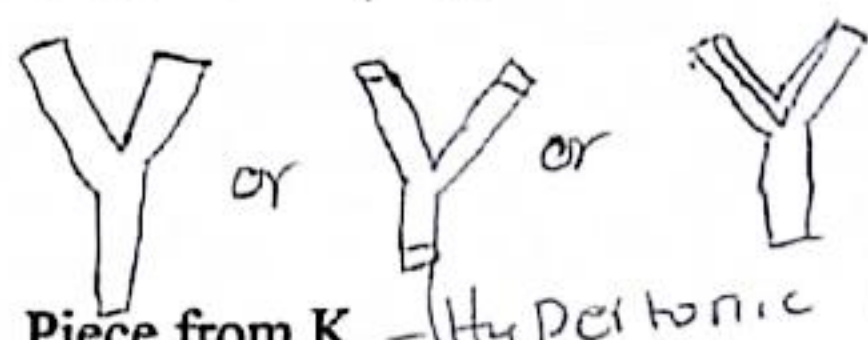
- Remove the entire leafy parts along the midribs of both leaves.
- Retain the two midribs still attached to their petioles.
- Discard the hard lower petiole.
- Measure about 4 cm of the remaining midrib towards the tip. Cut and discard the tip. The process is illustrated as follows:



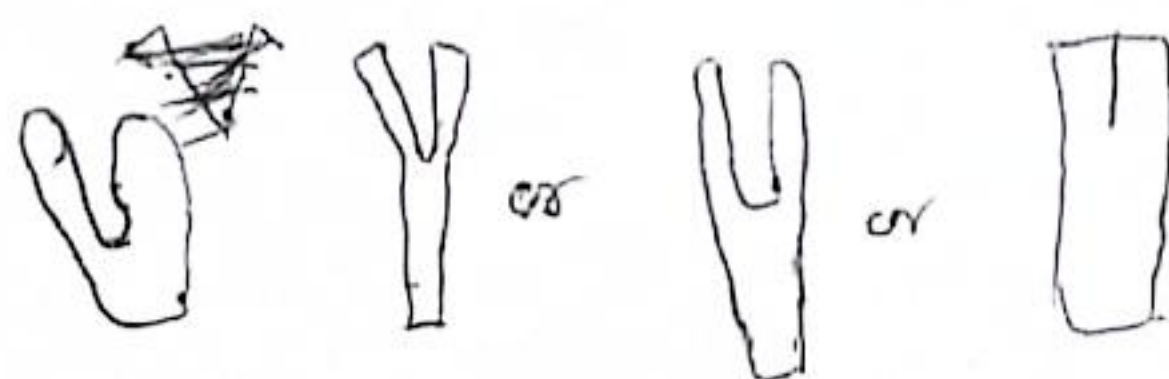
- Make a 2 cm slit from the tip end of each of the 4 cm portions as shown in the diagram above.
 - Place one piece into the test tube with liquid K₁ and the other into liquid K₂ and leave them for 20 minutes. Remove the two pieces and make observations.
- (a) Draw the appearance of each piece.

- Piece from K₁ (*Distilled water*)

(1 mark)



- Piece from K₂ (*Hypertonic soln*)



- 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 is student commits himself to label

- Dotted line

- Multiple slits

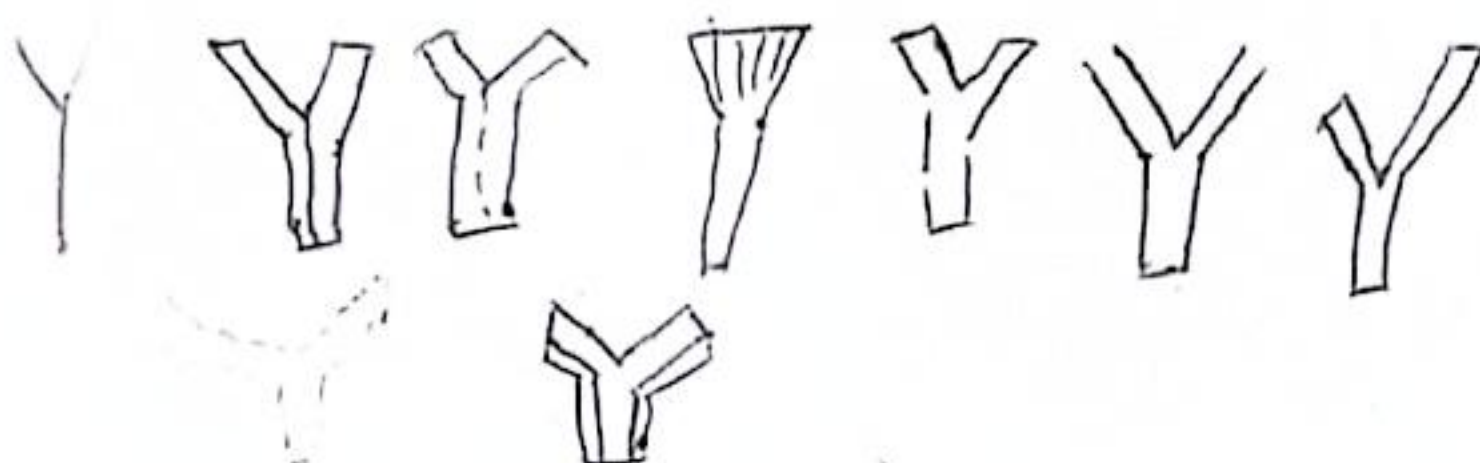
- One arm straight & another bending

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Reject



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

(i) Piece from K_1

(3 marks)

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 (compared to the cell sap); Hence inner/cortical cells gained water by osmosis & elongated more/faster/expanded more;

(ii) Piece from K_2

(3 marks)

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 inwards/slit closes/slit slightly opens; because K_2 was hypertonic/highly concentrated to the cell sap; Hence inner/cortical cells lost water by osmosis and shrank/reduced in size;

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

(2 marks)

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 } but marked 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

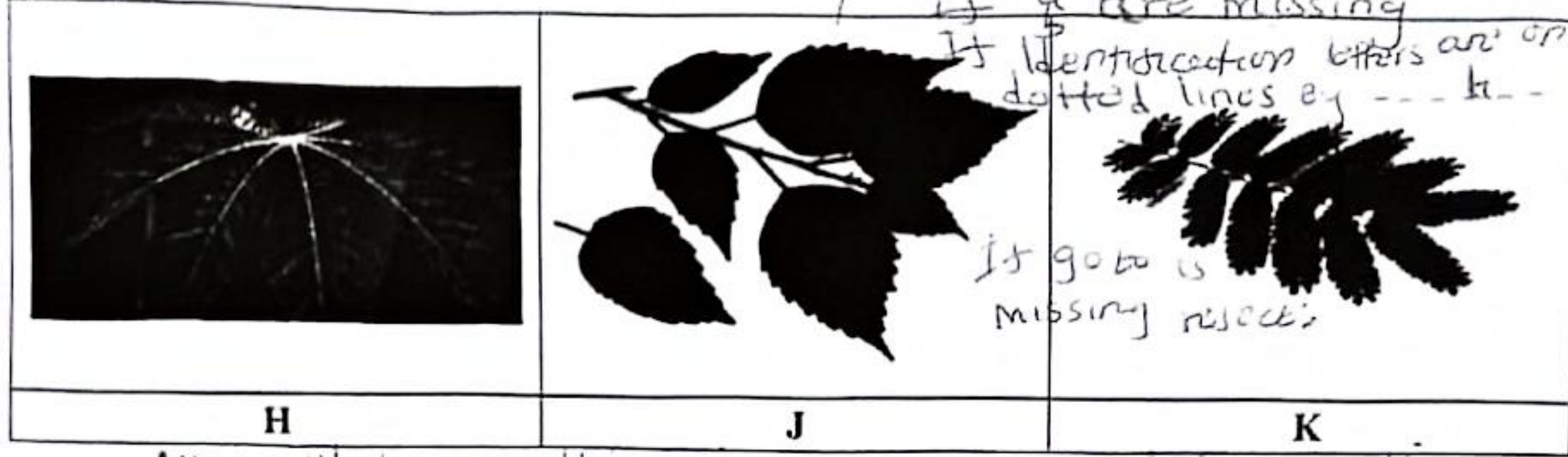
You are provided with three plant specimens labelled E, F and G obtained from different plants belonging to different Families.

(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)

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

1st student
 leaf - go to
 leaf - go to
 leaf - go to
 leaf - go to

Key: 18 word leaf is missing more so in step one
 It is missing
 Identification letters are on the dotted lines e.g. - - - k - -



Key with bean seedling simple

Key with bean seedling cpd

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

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

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



Leaf - go to
 leaf - go to
 If students omits a

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omits leaf c)

compound - - - - go to
 simple - - - - go to
 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)

Ans: diagram
an explanation
xylem with
phloem

Root

- star shaped xylem

Stem

- Tap root system

- Vascular bundles located in the middle/centrally/star shaped

- xylem with phloem alternating with arms of xylem

- woody/stomper/hygnated/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 L_1 , L_2 and L_3 ,
- 10 cm³ measuring cylinder,
- Iodine solution.

Procedure

- Label the three test tubes **A**, **B** and **C**.
- To test tube **A**, add 1 cm³ of L_1 , add one drop iodine solution. Record the observations in the table below.
- Add 1 cm³ of each of L_1 and L_2 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 1 cm³ of L_2 , add two drops of dilute hydrochloric acid. Leave the contents undisturbed for ten minutes. Add 1 cm³ of L_1 , 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.

L_1 - starch soln
 L_2 - Enzyme
 L_3 - HCl

A - L_1 + iodineB - L_1 + L_2 + iodineC - L_2 + L_3 + HCl + iodine

Test tube	Observations after adding iodine solution	Conclusion
A	Blue-black/blue black/blue black All black	Starch present
B	Light blue black/pale blue black Less blue black/Faded blue black	Traces/small amount of starch present/starch broken down
C	Brown/yellow colour of iodine retained/colour of iodine retained No colour change	Starch absent/starch broken down/starch hydrolysed Reject: hydrolysed by L_2

- (a) (i) Suggest the likely identity of solution L_2 .

Diastase/Enzyme/starch digesting enzyme/amylase/salivary amylase/
Pancreatic amylase/ptyalin (underline wrong spellings)

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OR

Observation

- Brown colour/yellow colour of iodine remained/No colour change

Conclusion

- Starch absent/broken down/hydrolysed

Turn over

- Blue-black

- Starch present

- Light blue black

- Traces of starch present
small amount

70R

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

Added to (a) i
Broke down / digest / hydrolyse starch; (in test tube B into simple sugars resulting in negative result for starch test) Its effect / action is affected by change in pH / denatured / destroyed ~~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

- (c) 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 - meaning, cyanide

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③ Increase substrate concentration