Candidate's Name: .....

Signature: .....

Random No.					Personal No.		

(Do not write your School/Centre Name or Number anywhere on this booklet)

P530/3
BIOLOGY
(Practical)
Paper 3
Nov. / Dec. 2019
3¼ hours

UGANDA NATIOAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
(PRACTICAL)

Paper 3

3 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists of **three** *questions.*

Answer **all** *questions.*

Write the answers in the spaces provided. **No** *additional sheets of paper must be inserted in this booklet.*

You are **not** *allowed to start working within the first* **15 minutes**. *You are advised to use this time to read through the paper and ensure that you have all the apparatus, chemicals and specimens you may require.*

For Examiners' Use Only		
Question	**Marks**	**Examiner's Signature and No.**
1	40	
2	30	
3	30	
Total	100	

Turn Over

1. You are provided with specimen **R** which is freshly killed.

(a) Observe the head of the specimen from the dorsal side and describe **three** external features on the head. *(7½ marks)*

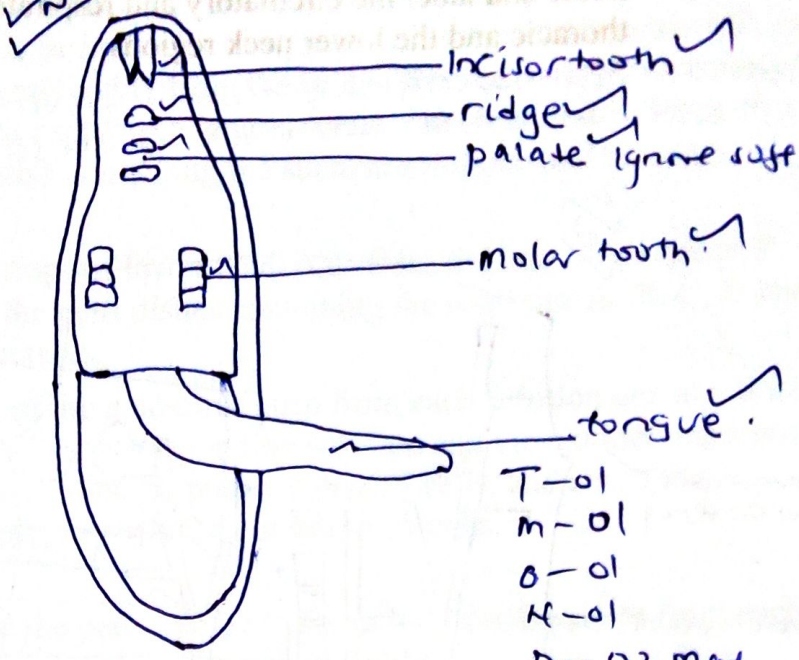
- Eyes, a pair, two, large, small, protruding, bulging, oval, curved, convex shaped, round, spherical, brightly coloured, pink, red, dull coloured, black, 2½
- pinnae, external ears, external earlobes, outer ear, large, funnel shaped, curved at the base, narrow at the base, tapers at the base, covered by, with few, scanty, short, hair. 2½
- vibrissae, whiskers, numerous, many short, long, of variable length, stiff, erect, straight, thin, slender, tapering, pointed, sharp. 02½ (any 2 feature)
- fur, hair, Numerous, many, thick, short, long, of variable length, thin, slender, dull coloured, brightly coloured, white, grey, yellow, black, pointed, sharp, tapering. 07½

(b) Pin specimen **R** ventral side uppermost. Cut the masseter muscles and open the mouth wide. Pull the tongue forward and displace it to the left side of the specimen.

(i) Draw and label structures in the buccal cavity which are used for physical break down of food into smaller particles.

(7½ marks)

A drawing showing structures in the mouth/buccal cavity that are used for the physical digestion/breakdown of food of specimen R.



NAD – If any external structure drawn & labelled but award L

Ignore pharynx/oesophagus/glottis/epiglottis, diastema lower & upper jaw.

T – 01
m – 01
o – 01
N – 01
D – 02 max
L – 02 max
08

×1 – 5

(ii) State how any **three** features observed in the mouth are suited for the diet of the animal. (*04 marks*)

- long tongue for easy rolling of the food during chewing/for easy swallowing/to increase S.A for rolling food.
- Broad/large tongue to the S.A to expose taste buds.
- Sharp/pointed incisors for easy cutting of food.
- large/broad molars to the S.A for chewing/grinding of food.
- Ridged molars for easy chewing/grinding of food.

any 3

- Hard palate for manipulation of hard/coarse food. 03
- wide/Broad diastema for easy movement of the tongue.
- Thick tongue for easy manipulation/chewing/rolling of food.

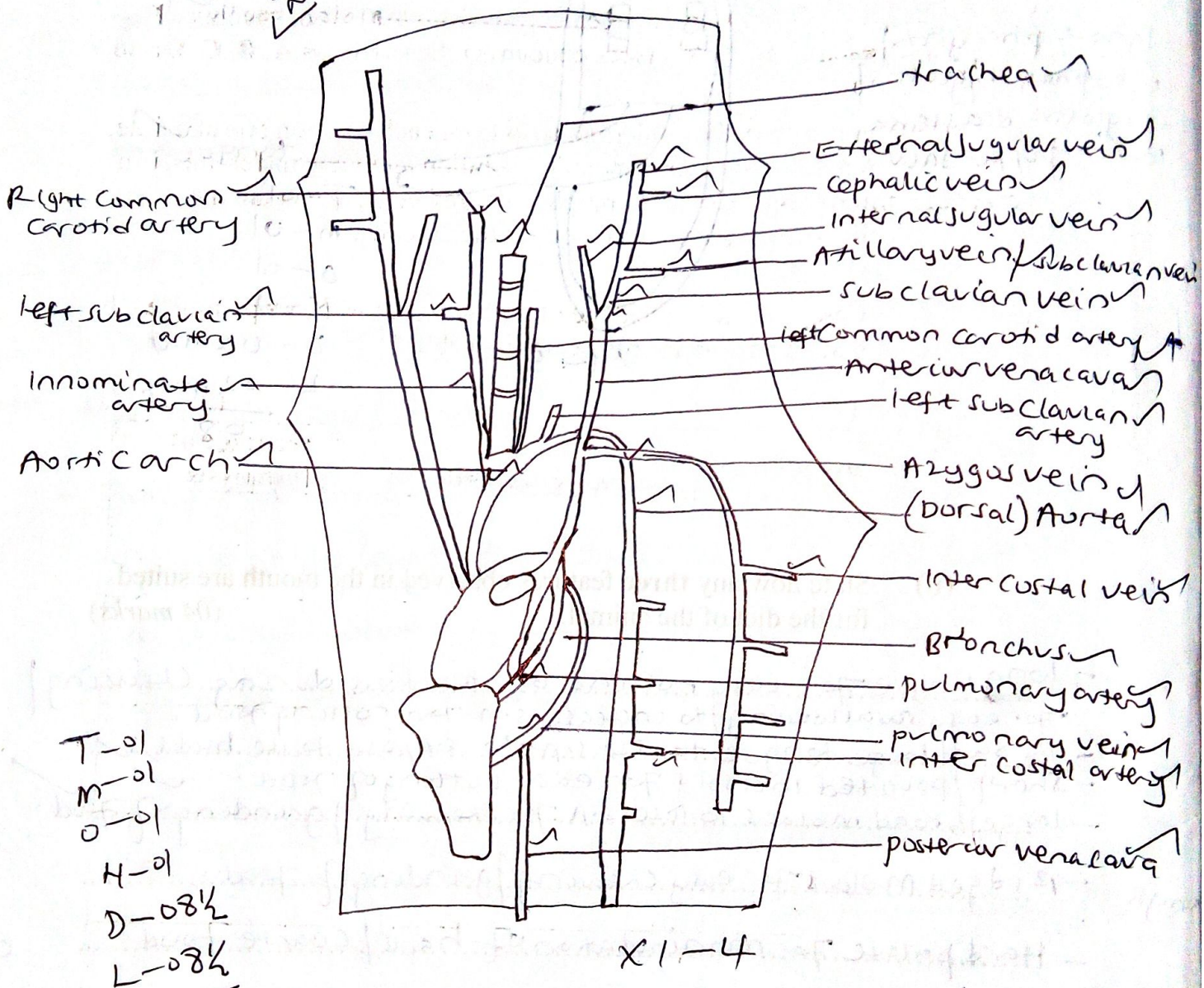
(iii) Observe the mouth of the specimen and write down its dental formula. (*01 mark*)

$I\frac{1}{1}, C\frac{0}{0}, pm\frac{0}{0}, M\frac{3}{3}$ 01

(c) **Dissect specimen R further by cutting the rib cage to expose structures in the thorax and base of the neck. Clear away the thymus gland and deflect the heart and left lung to the right of the specimen.**

Draw and label the circulatory and respiratory systems within the thoracic and the lower neck regions. *(20 marks)*

A drawing showing the circulatory and respiratory systems within the thoracic and lower neck of specimen R.



T-01
M-01
O-01
H-01
D-08½
L-08½
21

X1-4

40

2. You are provided with specimen **P** and sucrose solutions of different concentrations labelled **A, B, C, D** and **E**. You are to carry out tests on the specimen using the solutions.

Label 5 petri dishes as **A, B, C, D** and **E** and put 10 cm^3 of the corresponding solution in each. Cut two pieces of stem from specimen **P**, each measuring 3 cm long preferably from the same internode or from internodes next to each other. Cut each piece longitudinally into four equal pieces. Put a piece into each petri dish containing the sucrose solutions and leave for 40 minutes.

Meanwhile, peel off strips of lower epidermis from the leaf of specimen **P**. Put a strip in each of the petri dishes containing the solutions **A, B, C, D** and **E**, and leave for 10 minutes.

After 10 minutes mount the epidermal strip from each solution one at a time, onto a slide in a drop of its corresponding solution and view under medium power of a microscope. Count 20 purple coloured cells, and count the number of cells that are plasmolysed out of the 20 cells.

(a) (i) Compute the percentage of plasmolysis for the strips from each solution and enter the results in Table **1**.

(7½ marks)

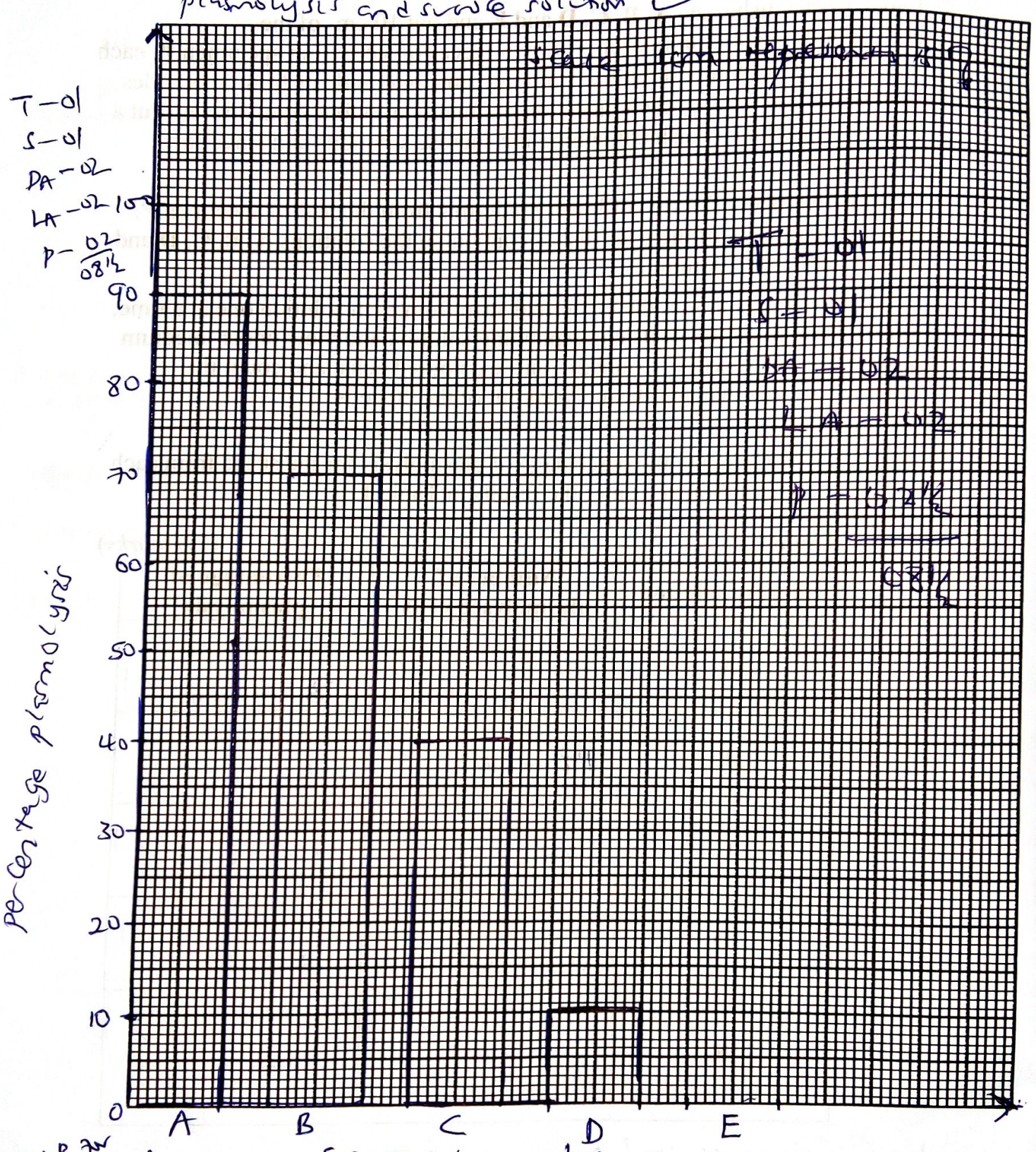
Table 1

Sucrose solution	Number of plasmolysed cells	Percentage of plasmoysis
A	17 – 20 ✓	85–100 ✓1
B	~~14~~ –17 ✓	70–85 ✓1
C	08–12 ✓	40–60 ✓1
D	02–05 ✓	10 – 25 ✓1
E	0–02 ✓	0 – 10 ✓1

Deny wrong results / results out of range but mark graph with CE. 07½

(ii) Plot a graph to show the relationship between percentage plasmolysis with sucrose solutions. (*7½ marks*)

A graph / Bar graph showing the relationship between % plasmolysis and sucrose solution ✓

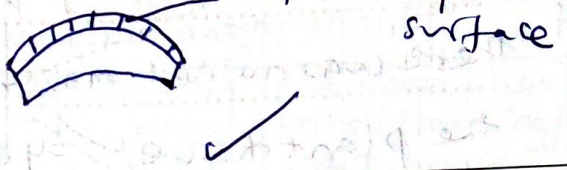
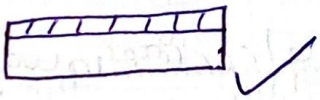
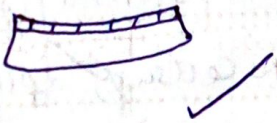


(iii) On your graph mark point ***X*** to show the solution with the concentration that would have 50% plasmolysis. (*01 mark*)

(b) After 40 minutes observe the pieces of stem of **P** from the solutions in the petri dishes. Draw the shape of each piece in Table **2** and on each drawing, label the outer surface of the piece.

(05 marks)

Table 2

Piece of stem from Solution	Shape of stem after 40 minutes
A	
B	
C	
D	
E	

- put emphasis on direction of bending / curvature but ignore the extent.
- Award marks if epidermis is labelled at least once.
- Award if cortex / inner surface is labelled.

(c) From your results;

(i) suggest the solution with the concentration nearest to that of the cell sap of specimen P. Explain your answer. (3½ marks)

Solution C, causes 50% plasmolysis / has a value close to 50% plasmolysis / piece of stem that was placed in it remained straight / almost straight / curved slightly implying that there was no net movement of water into / out of the plant tissue, by osmosis ✓ of

(ii) arrange the sucrose solutions starting with the most concentrated. Explain your answer. (5½ marks)

A, B, C, D, E / A > B > C > D > E ✓ - solution A has the highest % of plasmolysed tissue curved more with the cut surface / cortex inwards, ✓ implying that the solution was the most hypertonic / most concentrated / had lowest osmotic / solute potential / lowest / least water potential compared to cellsap, cells tissue lost most, water to the solution by osmosis ✓ solution E had the least / lowest number of plasmolysed cells / no cells plasmolysed / stem curved most with the cortex / cut surface outwards ✓ implying solution was the least concentrated / hypotonic / very dilute / had highest osmotic potential / highest water potential compared to the cellsap, ✓ cells absorbed most, water by osmosis from the solution causing most cells to become turgid. ✓ 05

30

- Biders commelina - lantana - Bougainvillea - Hibiscus

3. You are provided with specimens **K, L, M, N** and **O** which are plant organs.

(a) State the phylum of the plants from which the specimens were obtained. Angiospermophyta *(01 mark)*

Tracheophyta / Angiospermatophyta / spermatophyta / ✓

(b) (i) Examine the flowers or florets of each specimen, and state **three** structural descriptive features as indicated in Table 3.

Table 3 *(7½ marks)*

Flowers or florets of specimen	Symmetry	Corolla – Have projections at open end	Calyx	
K	Radial / many lines / regular / Actinomorphic / zygomorphic / bilateral / irregular / one line	small, fused, net veined, tubular / open at apex, broad at apex, smooth	free, slender / thin pointed / tapering / sharp, smooth	01½
L	one line / bilateral / irregular / zygomorphic	3, free, net veined small, broad at apex narrow at base, variable size, smooth	3, free, small net veined	01½
M	Many lines / radial / regular / Actinomorphic	5, fused, small, broad at apex, tubular, smooth	fused, small, short	01½
N	many lines / radial / regular / Actinomorphic	-5, fused, small net veined, smooth	Absent	01½
O	many lines / radial / regular / Actinomorphic	5, free / seperate net veined, broad at apex, narrow at base,	five, fused, small tapering / pointed / hairy	01½

07½

(ii) For each specimen, name the outermost part of the flower or floret and give **one** descriptive feature of it. *(05 marks)*

K Sepal, free, slender, tapering, dull colored ... 01

L Sepal, 3, free, small dull colored ... 01

reject corolla, calyx

M Sepal, fused, small, short, dull colored ... 01

N petal, five, fused, net veined, small, brightly Colored ... 01

O Epicalyx, 5/6/7, free, slender, tapering / pointed / sharp, narrow, hairy, dull colored ... 01

05

(c) Using the features in (b), construct a dichotomous key to identify the specimens **K, L, M, N** and **O**. *(06 marks)*

A dichotomous key to identify specimens K, L, M, N and O

1 a) specimen with free petals - - - - - - - - - - - - 2
b) specimen with fused petals - - - - - - - - - - - - 3

2 a) specimen with one line of symmetry - - - - - - - L ✓
b) specimen with many lines of symmetry - - - - - - O ✓

3 a) specimen with sepals - - - - - - - - - - - - 4
b) specimen without sepals - - - - - - - - - - - - N ✓

4 a) specimen with free sepals - - - - - - - - - - - K ✓
b) specimen with fused sepals - - - - - - - - - - - M ✓

D ✓

Accept any other correct key I — 05
Deny I if real names used 01
06

Dichotomous key must flow

Features mentioned / used in key should have appeared in b (i) whether marked or not

(d) (i) What is the structural limitation for the mode of pollination for florets of specimens **K, L, M** and **N**? *(1½ marks)*

Have small petals ✓ making them inconspicuous ✓ and can't easily attract insects for pollination ✓

(ii) What is the structural advantage of specimen **O** to its mode of pollination? *(01 mark)*

Has large petals ✓ hence can easily attract pollinating insects ✓

(iii) How has specimen **N** overcome the limitation in (d)(i)?

(01 mark)

Has large/broad brightly colored bract ✓
to make it conspicuous ✓ 01

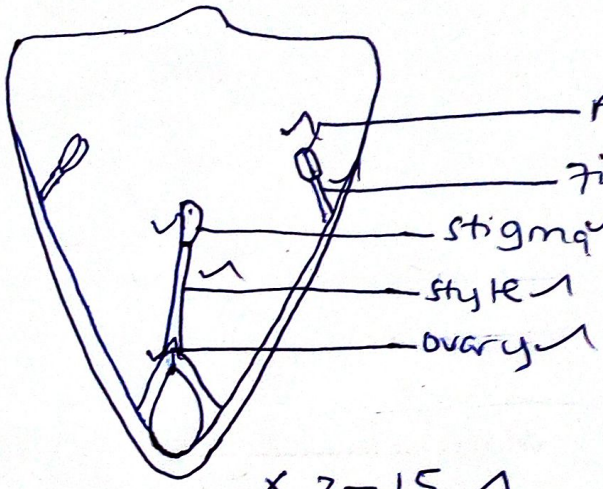
(e) Obtain a floret from specimen **M** and cut it longitudinally.

(i) Draw **one** half of the floret and label the essential parts.

(06 marks)

A drawing of longitudinal section / one half of floret of specimen M showing the essential reproductive parts.

9½



T – 01½
M – 01½
O – 01½
H – 01½
D – 02½
L – 02½

07

NAD
If essential/non essential parts drawn & labelled
If IR – H only
non essential parts drawn & labelled / floret not cut.

× 3 – 15 ✓

(ii) How is the floret of specimen **M** adapted to its type of pollination?

(01 mark)

- Has both the stamens and pistil in the same flower to ease self pollination ✓ or
- Anthers are above / higher than stigma for self pollination (pollination) ✓
reject anthers taller / stigma shorter.

31 not 30

END