

288

2001 - 2017

2001 - 2013

Candidate's Name:

KYANGA M. KAZIYA

Random No.

Personal No.

Signature:

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

P530/3

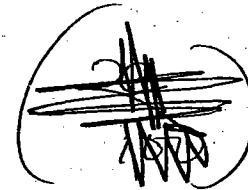
**BIOLOGY
PRACTICAL**

Paper 3

Nov./Dec. 2017

3 hours

2017



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

**BIOLOGY
PRACTICAL**

Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

This paper consists of three questions.

Answer all questions.

Write answers in the spaces provided. Additional sheets of paper must not be inserted in this booklet.

For Examiners' Use Only

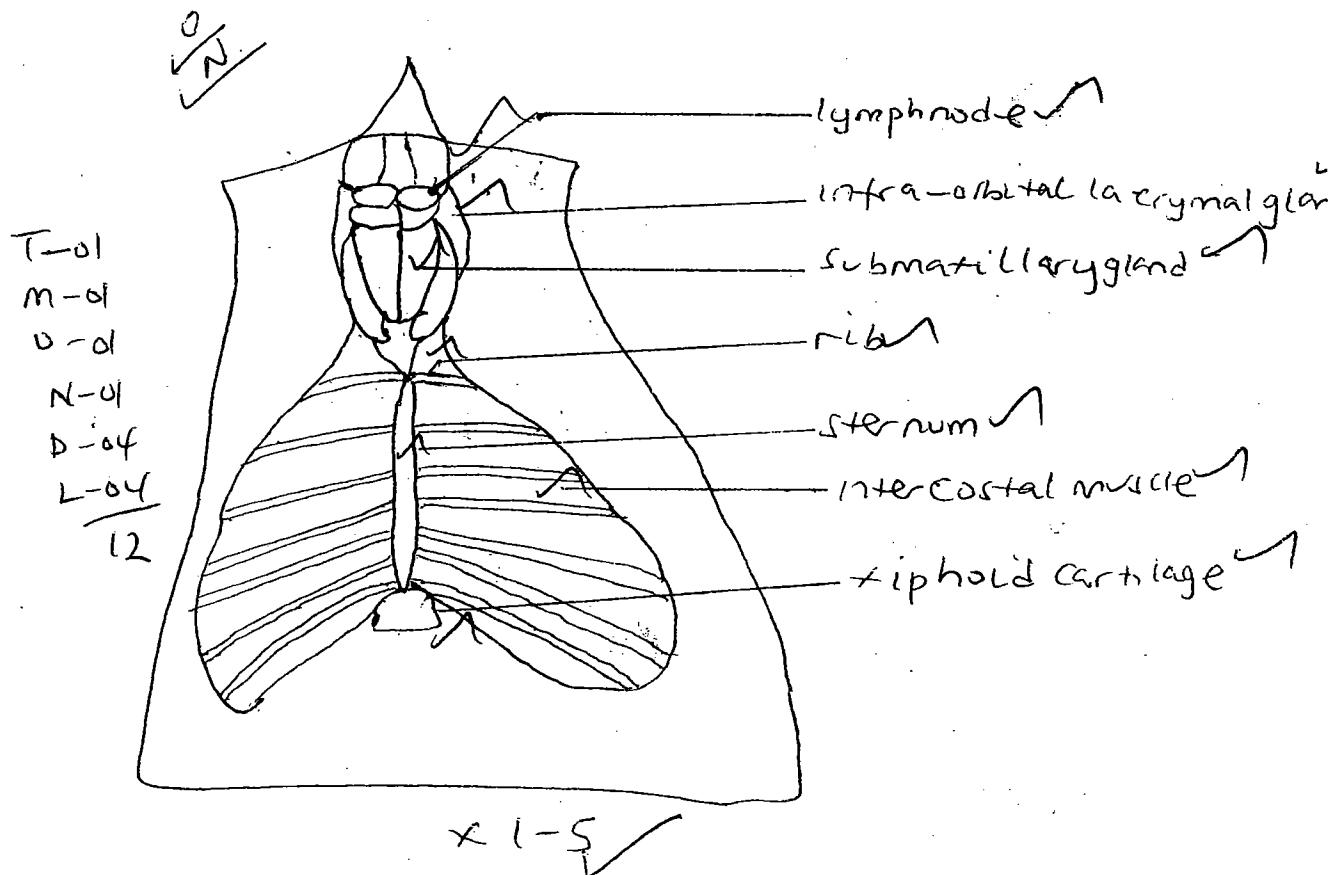
| Question | Marks | Examiner's Signature & No. |
|----------|-------|----------------------------|
| 1 | | |
| 2 | | |
| 3 | | |
| Total | | |

1. You are provided with specimen M which is freshly killed.
- (a) (i) Name the class to which the specimen belongs. (01 mark)
- Mammalia / re) mammal, wrong spelling 01
- (ii) Examine the specimen and give **five** characteristics of the class named in (a)(i) which can be observed on the specimen. (05 marks)
- Fur / hair
 - pinnae / external ear, reg. ear 03
 - External genitalia / external reproductive pores / scrotal sac / penis / clitoris & vulva
 - Vaginal opening
 - Nipple / teat

- (b) Open up the specimen, clear the pectoral muscles of the thorax to expose the rib cage and structures in the neck region.

Draw and label the rib cage and structures located in the neck region of the specimen. (12 marks)

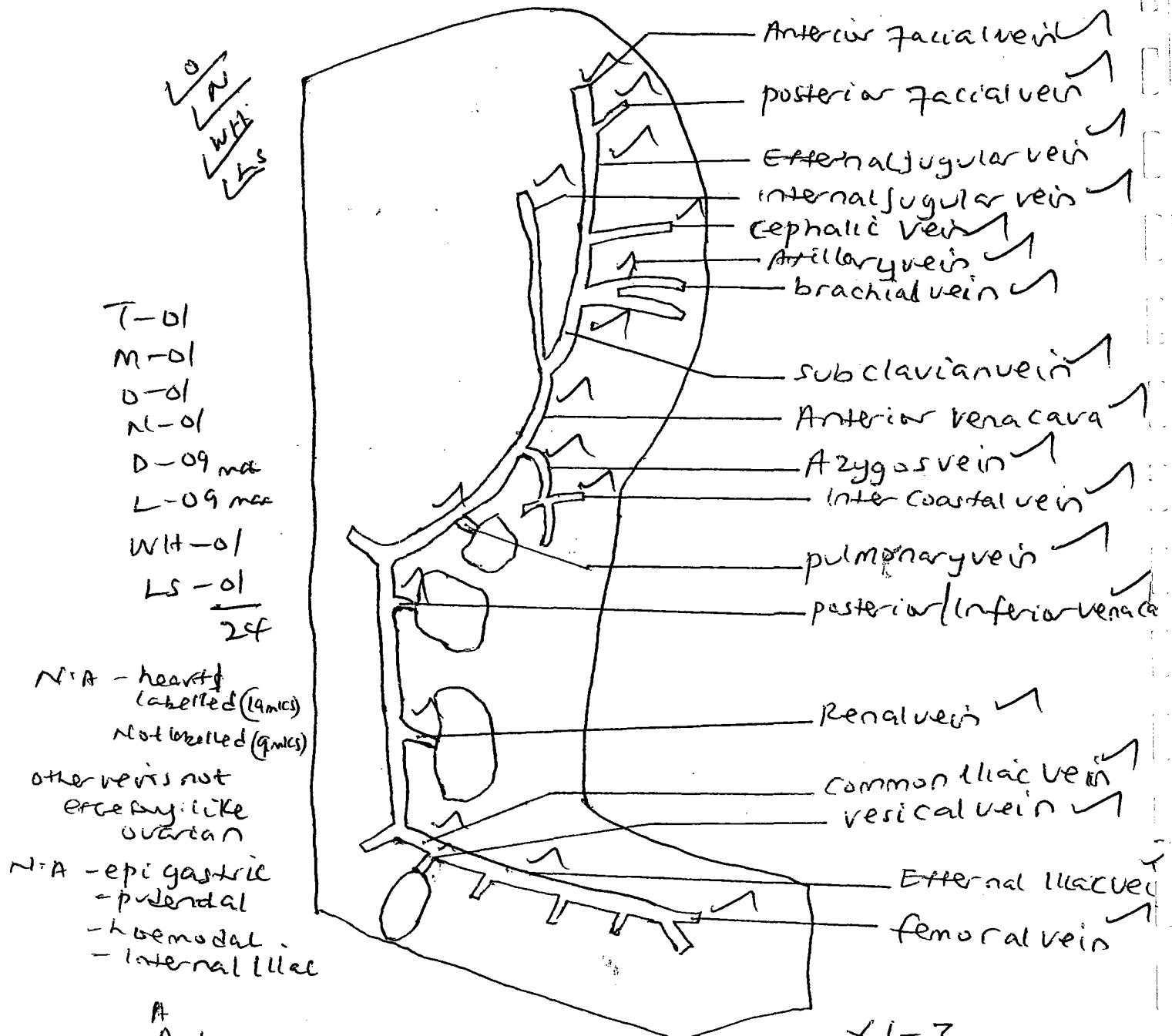
A drawing showing the rib cage and structures in the neck region of specimen m / rats.



(c) (i) Cut out the alimentary canal and dissect the posterior part of the specimen to expose blood vessels which drain blood from structures used for excretion and the left hind limb, back to the heart.

(ii) Continue to dissect the anterior parts of the specimen to expose blood vessels which take away blood from the left head region, left thoracic region and left fore limb back to the heart.

Draw and label what is displayed in (c)(i) and (c)(ii) excluding the heart, in one drawing. (22 marks)



*1-3

2. You are provided with solutions P, Q, R, S, T and specimen U. You are required to carry out tests on the solutions using specimen U, following the procedure provided.

Procedure

- (i) Label five test tubes as P, Q, R, S and T and add 10 cm³ of the corresponding solution to each test tube.
- (ii) Using a cork borer cut out 10 pieces from specimen U, each measuring 4 cm long.
- (iii) Put two pieces of U, made in (a)(ii) into each test tube and leave the set-up for one hour.
- (iv) After one hour, carefully pour out all the liquid from test tube P into a measuring cylinder leaving behind the pieces of U in the test tube.
- (v) Record the final volume of the liquid from test tube P in Table 1.
- (vi) Repeat steps (iv) and (v) for the remaining test tubes to obtain the final volume of the liquids from test tubes Q, R, S and T. Record each of them in Table 1. (05 marks)

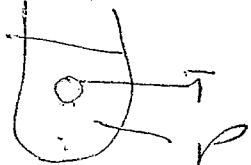
Table 1

| Test tube | Final volume (cm ³) | Change in volume (Final volume – Initial volume(cm ³)) |
|-----------|---------------------------------|---|
| P 0.3m | 9.5 - 10 ✓ | -0.5 - 0.0 ✓ |
| Q 0.5m | 10.1 - 10.3 ✓ | 0.1 - 0.3 ✓ |
| R 0.0m | 9.0 - 9.5 ✓ | -0.1 - -0.5 ✓ |
| S 1.0m | 10.3 - 10.7 ✓ | 0.3 - 0.7 ✓ |
| T 0.7m | 10.2 - 10.60 ✓ | 0.2 - 0.6 ✓ |

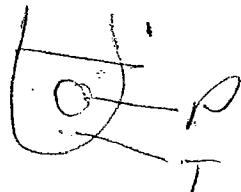
- (b) Work out the change in volume in each test tube and complete Table 1 above. (05 marks)

rej. wrong values in table but award
Histogram with CE for correct transfer
(Indicate CE on the first correct histogram)

① T carbon



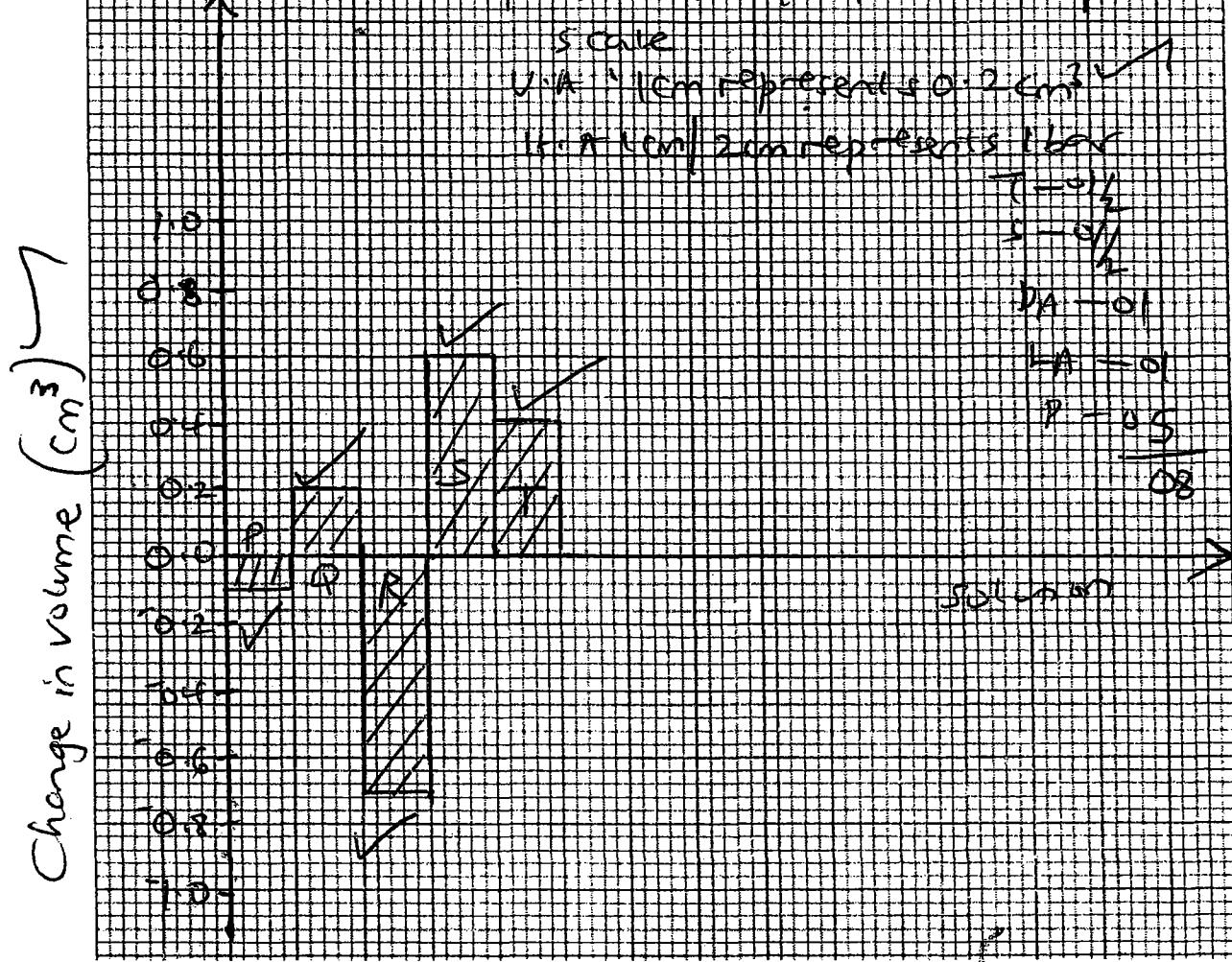
② P carbon



| size | number | Class |
|------|--------|-------|
| P | 1 | |

- (c) In the space provide draw a histogram of change in volume against solutions P, Q, R, S and T. (07 marks)

A histogram showing change in volume with different solutes and osmotic variations vs relationship



- (d) Using your histogram explain the changes in volume of each solution.

- change in volume is slightly negative / (10 marks)

- 03 M P water to pieces of U by osmosis since the water potential of cells sap of U was slightly lower than that of solution P
No change in volume b/c there was no net movement of water by osmosis b/c water potential of cells sap of U was equal to that of (0.5) Q solution P is isotonic

change in volume of solution is slightly +ve. cell sap of pieces of U has slightly higher water potential than solution so little water lost by cylinders/pieces of U to the surroundings by osmosis

R (distilled water)

Change in volume most -ve / greatest decrease in volume

- 04 Solution lost most water to pieces of U by osmosis; b/c U had the lower water potential / lower osmotic potential compared to solution. 5 Turn Over

- S(1.0) Highest turgor change in volume/highest increase in volume. Solution had the least water potential/most concentrated/least or more potential compared to cells sap of pieces of U. So much water gained by the solutions by osmosis from pieces of U.
- T(0.7M) Moderate turgor change in volume/moderate increase in volume. It's solution gained moderate amount of water from pieces of U by osmosis; this solution had a low water potential compared to cells sap of pieces of U.

- (c) From your results, estimate the water potential of the cell sap of specimen U. Give a reason for your answer. (02 marks)

~~p/Q registered the least change/no change in volume of the solution~~ 02

3. You are provided with specimens W, X, Y and Z. — Soldier termite

- (a) Using a hand lens, examine specimen Z and state how the features of its head are suited for its role in the community it lives. (02 marks)

- pointed/long/curved/sharp edged mandibles for defence/protection/cutting/hard mandibles for defence
- Big sized head to scare off enemies/hard head for defence
- Thin/segmented antennae for easy swing/flexibility
- segmented palps for flexibility/sensing/manipulating food needed for defence

- (b) Examine the wings of specimens W and Y using a hand lens and state three structural differences between them in Table 1. (03 marks)

Table 1

| Wings of specimen W cockroach | Wings of specimen Y Wasp |
|--|--|
| - outer fore wing/tegmina narrower than inner wing | - outer wing broader than inner/hind wing. |
| - only inner/hindwings/elytra membranous thin | - All wings membranous or thin |
| - inner wing folded | - inner wing not folded |
| - inner wing notched | - inner wings not notched, |
| - more veined wings | - less veined wings |

(c) (i) Observe the tibia and tarsus of each specimen using the low power of a microscope. State **two** descriptive features on the tibia and tarsus of each specimen in Table 2.

(ii) Observe the abdominal appendages on each of the specimens and state your observation in Table 2.

(12 marks)

Table 2

| Specimen | Descriptive features on | | |
|-------------------------------|--|--|--|
| | Tibia | Tarsus | Abdominal appendages |
| 03 Cuckoo hawk W | - very many pointed tapering thick very long bristles / spines - many pointed thin short hair | - Many pointed thick short spines - pointed thick tapering curved claw hairy thick swollen rounded arculum insect round planula | segmented hairy cerci slender tapering pointed long short style |
| 03 bee fly X | - few pointed tapering thick long bristled spines - very many pointed thin short hair | - long pointed tapering thick many spines bristles - thin pointed many numerous short hair - pointed thick curved claw bilobed hairy rounded thick arculum | lacks no abdominal appendages |
| 03 Wasp Y | - Many thin pointed tapering short spines bristles - very many numerous short thin pointed tapering | - few thin pointed tapering short spines - numerous short thin pointed hair - rounded arculum curved pointed thick claw | short slender thin pointed |
| 03 soldier termite Z | - few pointed short tapering hair | - few thin pointed hair - long curved pointed tapering thick claw - Rounded arculum glandular fluid | lacks |

(d) Using the features on the tibia alone, construct a dichotomous key to identify the specimens. (06 marks)

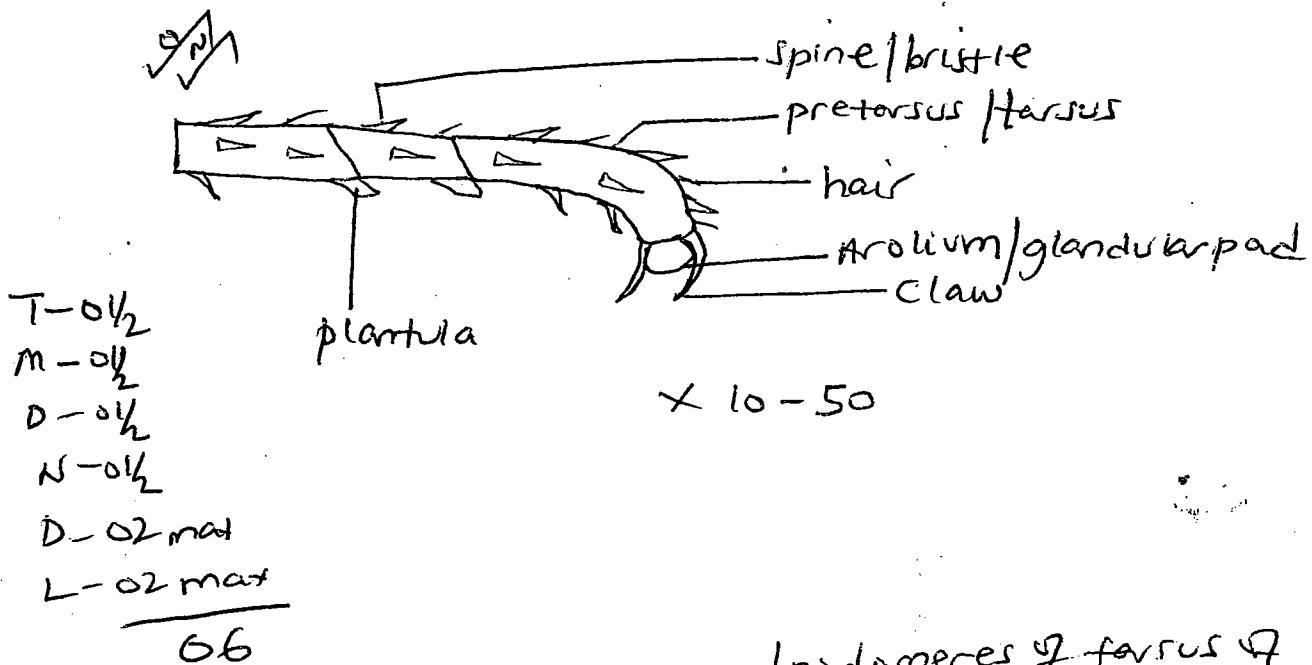
a) Tibia with spines | Tibia with hair & spines - 2
 b) Tibia without spines | with only hair - 1 Z

2^a Tibia with few spines - - - - - X
 2^b Tibia with many spines - - - - - 3
 3^a Tibia with thick spines - - - - - W
 3^b Tibia with thin spines - - - - - Y

D
 + 03
 + 01
 - 04

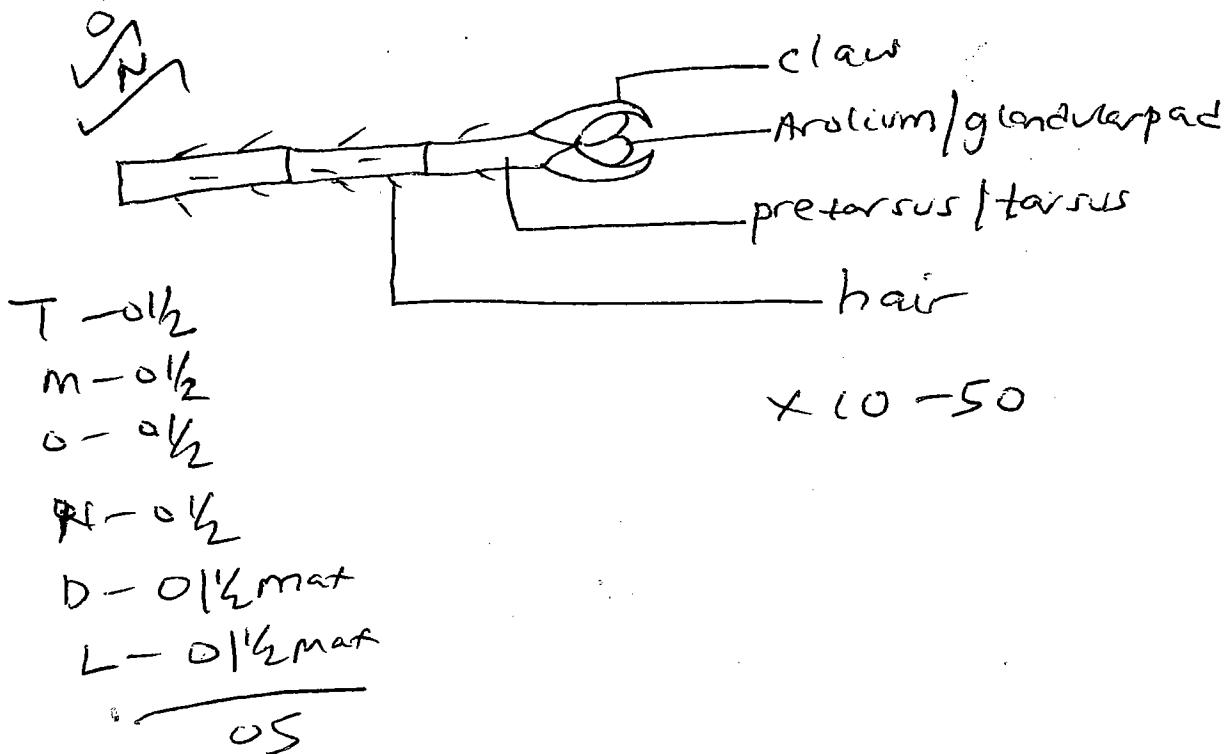
- (e) In the space below, draw and label the last three segments of the tarsus of the hind limbs of specimens W and X, when viewed under low power of a microscope. (08 marks)

Drawing of the last three segments (podomeres) of the tarsus of specimen W / cockroach viewed under low power.



× 10 - 50

Drawing of the last three segments (podomeres) of tarsus of specimen X / blowfly viewed under low power.



× 10 - 50

| | |
|------------------------|----------------------------|
| Cell | Solute |
| $\psi_s = -1240$ | $\psi_w = 530 \text{ kPa}$ |
| $\psi_p = +350$ | $\psi_w = \psi_s + \psi_p$ |
| $\psi_w = -1240 + 350$ | -330 |
| -890 | |

1
1240

-890 - 330

H

-890
-330
-330
0

G
N

1240
350
890

F = Frde, H = burg, G = Cassi
K = purple L = Canth, M = latice

Candidate's Name:
Signature:
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P530/3
BIOLOGY
PRACTICAL
Paper 3
Nov./Dec. 2016
3 hours



PG
100

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
PRACTICAL

Paper 3
3 hours

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| Question | Marks | Examiner's Signature & No. |
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| 1 | | |
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| Total | | |

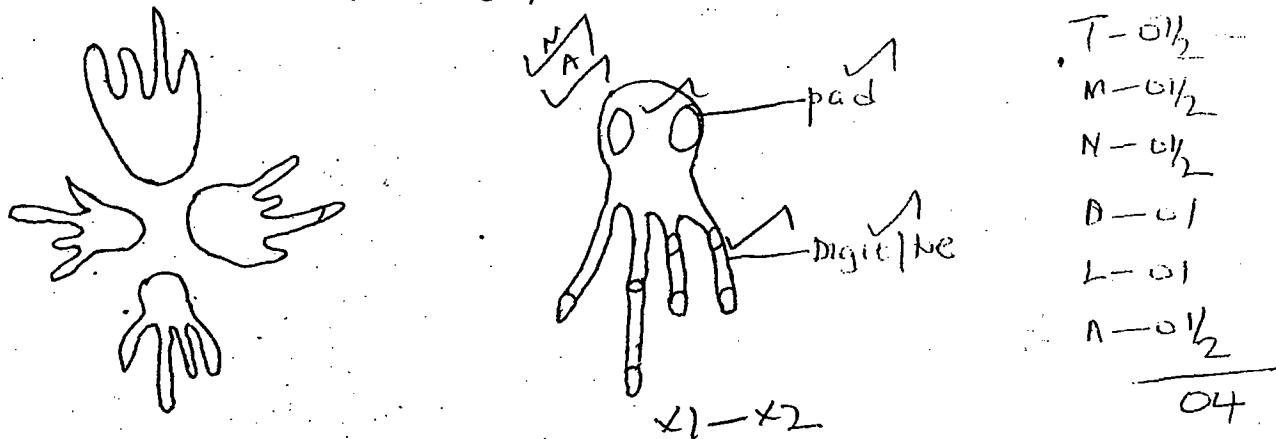
72 Minutes

1. You are provided with specimen R which is freshly killed. Examine the fore and hind feet of the specimen.

- (a) Draw and label the ventral side of the left fore foot and left hind foot of the specimen. Both drawings should be at the same magnification. (07 marks)

(i) Fore foot

A drawing showing the ventral side of the left fore foot of specimen R.



(ii) Hind foot

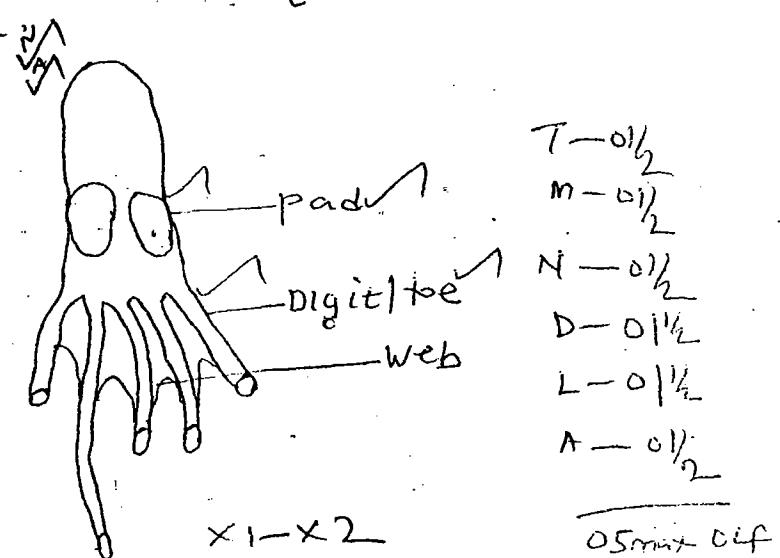
A drawing showing ventral side of the left hind foot of specimen R.

Accuracy mark

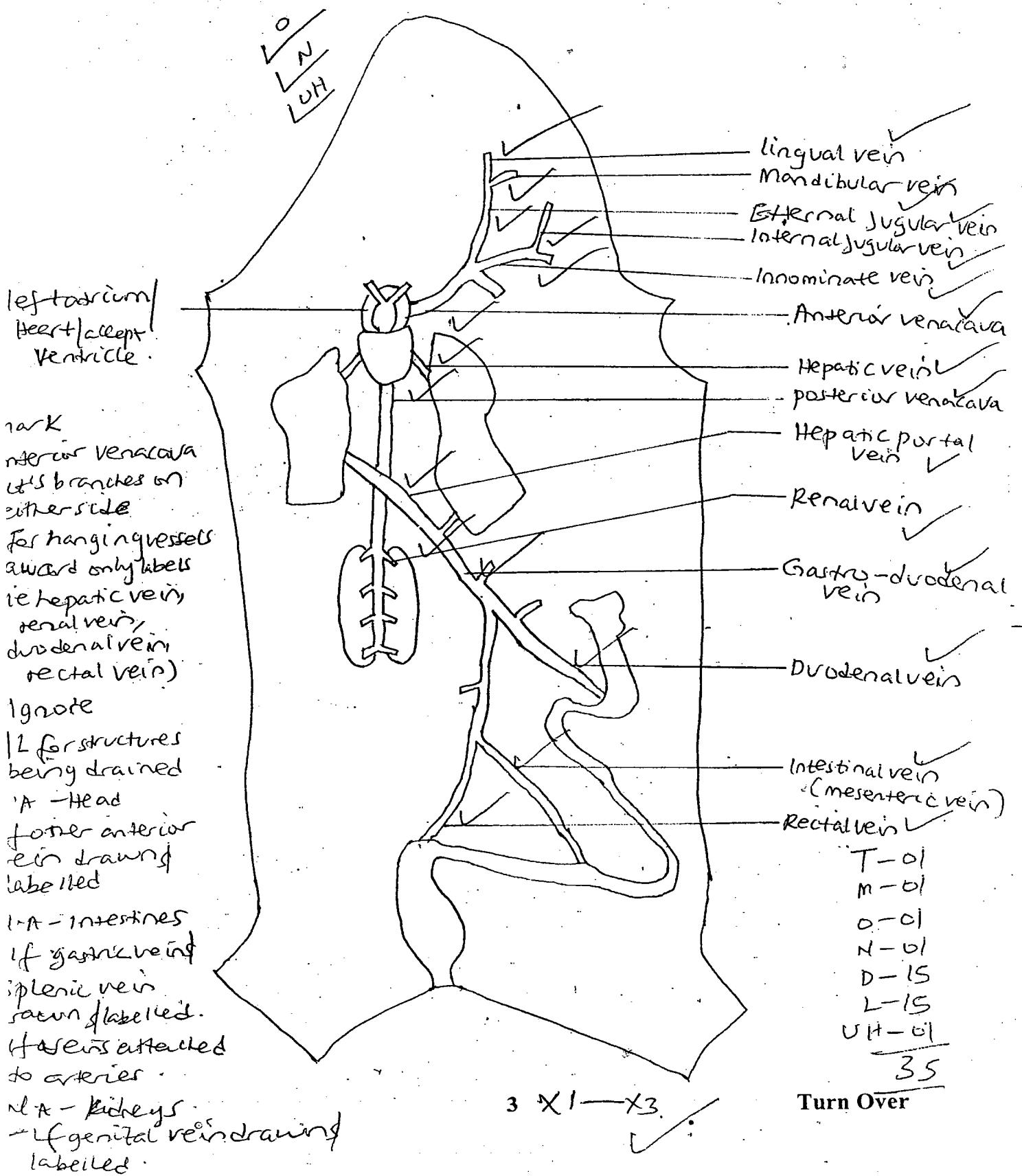
Awarded when the ventral view is drawn

N + A for A & D if whole leg drawn & labelled.

A + D if whole leg drawn but only foot labelled.



- (b) Dissect the specimen to display the heart and the blood vessels that carry blood from the head region, intestines and kidneys and back to the heart. Without displacing the heart, draw and label your dissection. (36 marks)



49 Minutes

2. You are provided with specimen K and sucrose solutions of different concentrations as shown in Table 1. Carry out tests on the specimen using the solutions, according to the following instructions.

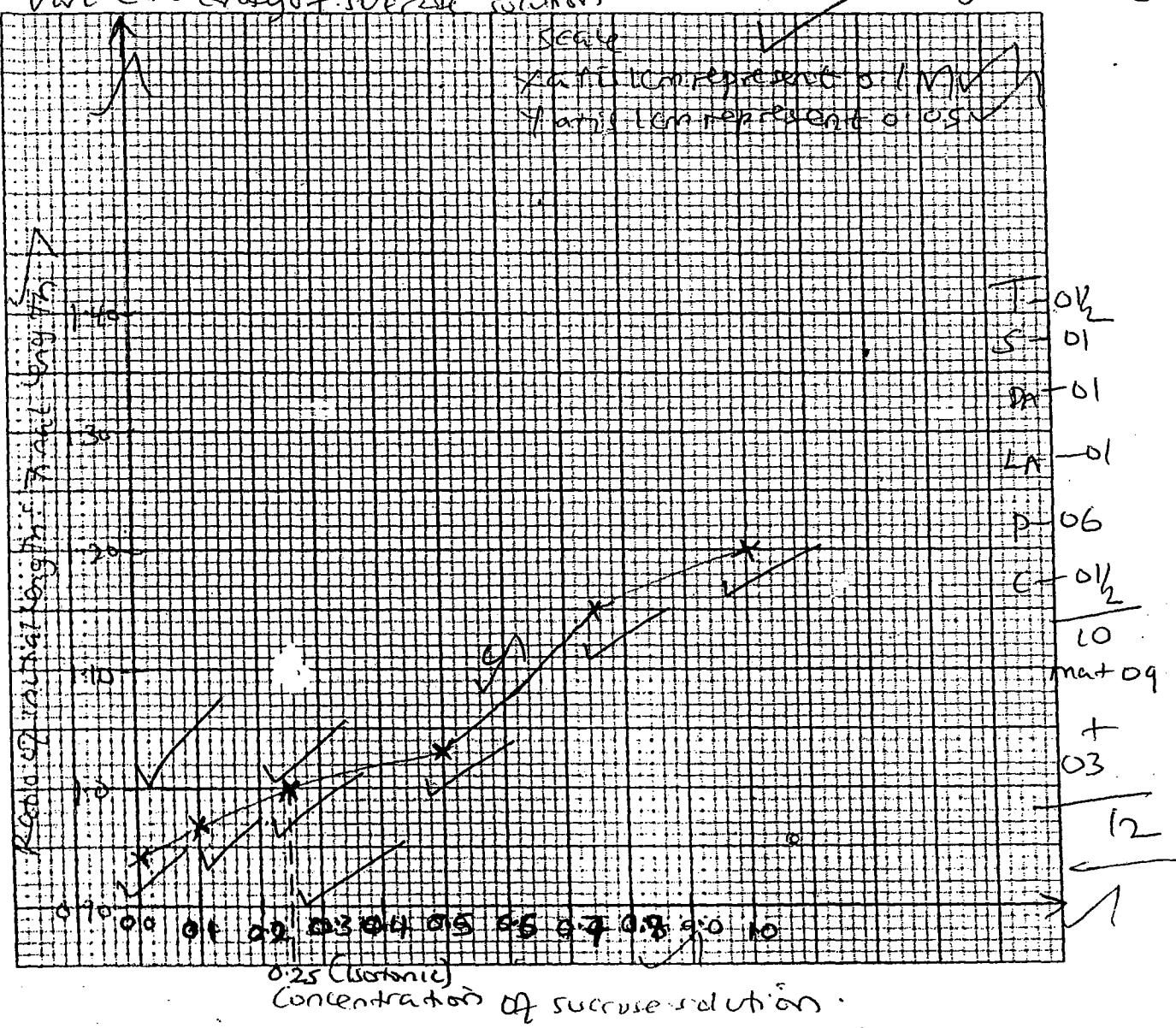
1. Cut long strips out of K using a cork borer of 0.5 cm in diameter. All strips must be cut along the same axis.
 2. From the long strips, cut out six strips each measuring 3 cm in length.
 3. Place one strip in each of the sucrose solutions ensuring that the strip is immersed.
 4. Leave the set-up for 1 hour (*You may proceed with other work in the meantime*).
 5. After 1 hour, remove one strip at a time and measure its final length.
- (a) Record the measurements appropriately in Table 1. (03 marks)
- (b) Complete the table by working out the initial length: final length ratio for each piece. (06 marks)

Table 1

| Molarity of sucrose solution | Initial length (cm) | Final length (cm) | Initial length: final length ratio |
|------------------------------|---------------------|---------------------|------------------------------------|
| 0.0M (Distilled water) | 3.0 ✓ | 3.2 (> 3.0) ✓ | 0.94 ✓ 1:0.97 |
| 0.1M | 3.0 ✓ | 3.1 (> 3.0) ✓ | 0.97 ✓ 1:0.97 |
| 0.25M | 3.0 ✓ | 3.0 (\geq 3.0) ✓ | 1.00 ✓ 1:1.00 |
| 0.50M | 3.0 ✓ | 2.9 (< 3.0) ✓ | 1.03 ✓ 1:1.03 |
| 0.75M | 3.0 ✓ | 2.6 (< 3.0) ✓ | 1.15 ✓ |
| 1.0M | 3.0 ✓ | 2.5 (< 3.0) ✓ | 1.20 ✓ |

- (c) In the space provided, plot a graph of the initial length : final length ratio against the molarity of the sucrose solution. (09 marks)

A graph showing relationship between the initial length : final length ratio and varied molarities of sucrose solution.



- (d) From your graph,

- (i) deduce how turgor pressure and osmotic pressure of the tissue of K varied, in the different sucrose solutions. (06 marks)

Turgor pressure was highest at 0.0M & reduced

with increasing molarity. Increasing sucrose concentration

base highest increase in length / lowest ratio at 0.0M

implies highest turgor base of much water intake by

- Turgor pressure (increase / decrease)
- results (length / ratio)
- process (normal)
- state (plasmolysed)

Osmosis / Endosmosis ✓ Osmotic pressure was lowest at 0.0M.

at 0.0M, increased with increasing molarity /.....

Increasing sugar concentration, b'le highest decrease.

(length / highest ratio) at 1.0M, implying cell most plasmolysed, due to excess water loss by osmosis / exosmosis

and hence highest concentration

(extremities 0.0M / 1.0M, turgor pressure increase / decrease, results length / ratio, process osmotic, state of cell (e.g. plasmolysed))

- (ii) determine the molarity of sucrose solution that is isotonic to that of the cell sap of K. Show your working on the graph. (03 marks)

54 Minutes

3. You are provided with specimens P and Q.

- (a) Mount a small portion of specimen P in a drop of water and observe under the low power of a microscope. Classify P into kingdom and phylum, giving two reasons in each case.

- (i) Kingdom. (03 marks)

Protostista or Plantae ✓

Reasons

protostista - unicellular / single celled, numerous identical cells.

Plantae → Has cell wall, chloroplast / chlorophyll / green

pigment

- (ii) Phylum (03 marks)

Chlorophyta ✓

Reasons

Spiral chloroplasts / chloroplasts reject chlorophyll

- Filamentous thallus / filaments, septate / cells joined end to end

- (b) Similarly mount a small portion of specimen Q in a drop of water and observe under the low power of a microscope. Describe the structure of the main parts of the specimen. (08 marks)

- Sporangium - is spherical / round, smooth / rough, large
- Sporangio-phore / vertical hyphae - long, elongated,
 - slender / thin / thread-like
- Rhizoids / rooting hyphae - thin / thread-like
 - branched ✓
- Stolon / linking hyphae - thin / thread-like
 - slender ✓
 - branched

08

- (c) From the structures of specimens P and Q, suggest how each of them is adapted to its habitat.

- (i) P - septate / segmented for easy fragmentation and propagation (02 marks)
 - filamentous for easy filtration
 - spiral chloroplast increase S/A for photosynthesis? any 2
 - Many pyrenoids for food storage
 - Thick cell wall for protection / prevent bursting
 - Filamentous for easy diffusion of nutrients / materials.

- (ii) Q (04 marks)

- Large / swollen sporangium to store many spores..... any 4
- Many spores increase chances of propagation / reproduction
- Small pores makes them light for easy dispersal
- long sporangiophore to expose sporangium for spore dispersal
..... for flexibility to increase chances of spore dispersal
- Thin / slender sporangiophore to expose sporangium for spore dispersal
- Numerous rhizoids for anchorage / increase S/A for food absorption
- Thin / pointed tips of rhizoids to easy penetration into substratum
- Many stolons for faster colonisation / propagation

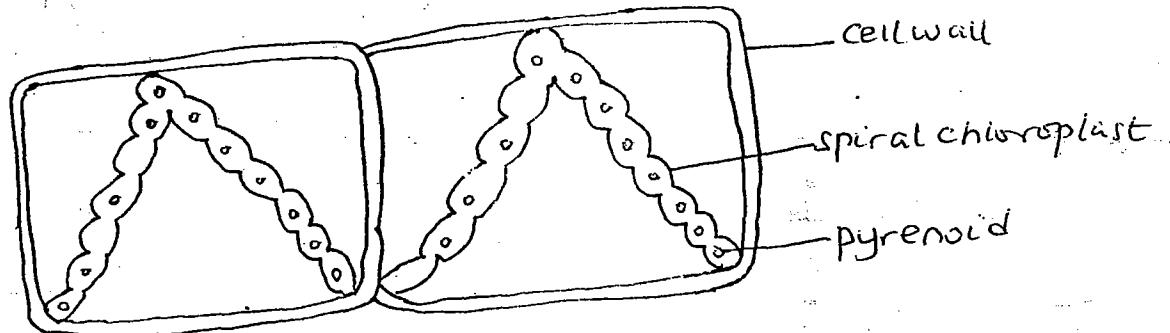
Turn Over

- (d) From your observation of specimen Q, suggest the limitations that the specimen faces in a terrestrial environment. (02 marks)

- Thin and soluble to desiccation due to fast evaporation of water
- Lacks protective structures leading to loss of water

- (e) Draw and label two adjacent cells of specimen P which can be seen clearly under the medium power of a microscope. (08 marks)

A drawing of two adjacent cells of Specimen P under medium power.



T - 01

m - 01

O - 01

N - 01

D - 01½

L - 01½

A - 01

08

X 100 - 400

Candidate's Name:

~~KAMBA ALFRED~~

| Random No. | Personal No. |
|------------|--------------|
| | |

Signature:

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P530/3
BIOLOGY
PRACTICAL
Paper 3
Nov./Dec. 2015
3½ hours



UGANDA NATIONAL 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. Additional sheets of paper must not 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 | 38+12=39 | |
| 2 | 29 | |
| 3 | 32 | |
| Total | 105 | |

(68 minutes)

1. You are provided with specimen K which is freshly killed.
 - (a) (i) Measure the length of the fore and hind limbs and record the results in Table 1. Express the results as a ratio of length of fore limb : length of hind limb. (02 marks)
- Table 1**
- | Length (mm) | Fore limb | Hind limb | |
|-------------|-----------|------------|----|
| | 20 - 55 ✓ | 40 - 130 ✓ | |
| Ratio | 1. | 2 ✓ | 02 |
- (ii) State the significance of the ratio. (01 mark)

hind limb is twice as long / longer than the fore limb
to generate propulsive force for swimming / hopping / locomotion; / fore limb is shorter / half the length of the hind limb to absorb shock on landing / during locomotion
 - (b) Examine the hind limb and state three ways it is adapted for the survival of the specimen in its habitat. (03 marks)
 - long / muscular to generate propulsive force for swimming / hopping / locomotion.
 - numerous / many muscle glands / swelling to secrete mucus to moisten skin for gas exchange / moisten skin for gas exchange.
 - numerous / many poison glands / swelling to secrete mucus to moisten skin for gas exchange / moisten skin for gas exchange?
 - numerous poison gland to secrete poison for defence.
 - dark colour / brown patches for camouflage.
 - webbed toes for swimming.
 - long digits / digits of varying lengths to the grip.
 - Toes & claws / digits for抓握力 (grasping power).

2001 - 2014

Candidate's Name:

HAMIS ALI

Random No.

Personal No.

Signature:

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P530/3
BIOLOGY
PRACTICAL
Paper 3
Nov./Dec. 2014
3 hours



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY PRACTICAL

Paper 3

3 hours

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| 1 | | |
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| 3 | | |
| Total | | |

(63 minutes)

1. You are provided with specimen G which is freshly killed.

(a) Using a hand lens examine the antennae and hind limbs of the specimen and state how they are adapted to the habitat of the specimen.

(i) Antennae.

(02 marks)

- Long to feel / sense at long distance; long to increase surface area for sensitivity
- Segmented / jointed for flexibility / ease movement
- Tapering to reduce weight to ease movement
- Thin / slender to ease movement;
adaptation tied to the function of adaptation

(ii) Hind limbs.

(02 marks)

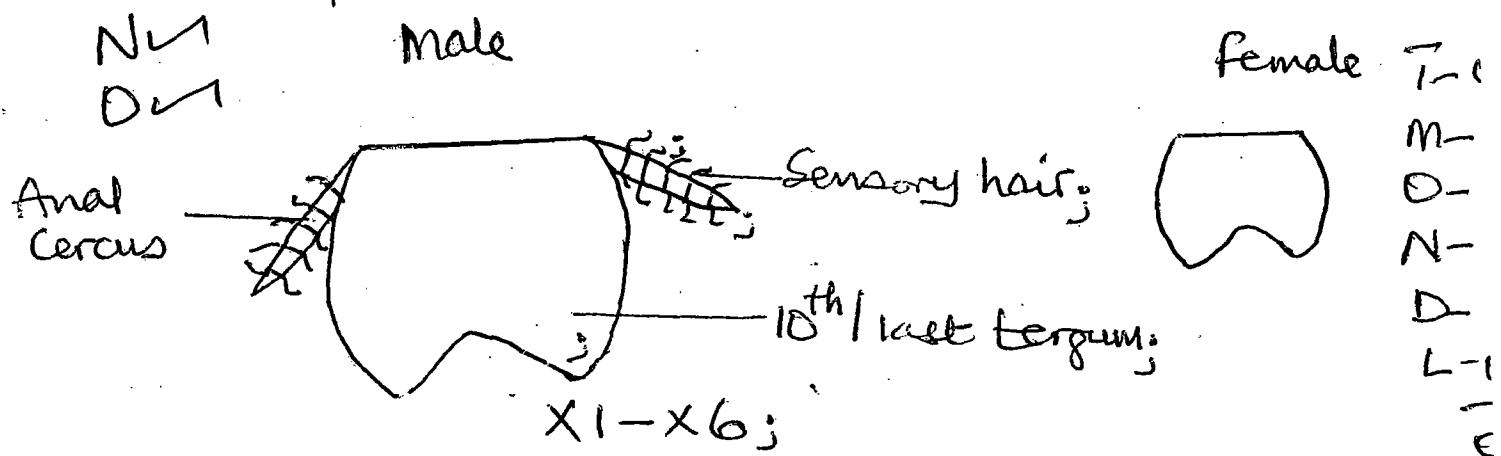
- Jointed for flexibility; pointed spines for defense / protection against enemies; pointed spines to increase grip; pointed claws for grip on rough surfaces; plantulae / arolium / glandular pad for secretion of adhesive / sticky substance for grip on slippery / smooth surfaces;
- Dull Coloured for Camouflage; broad coxae for generation of propulsive force during locomotion.
- long femur / tibia to generate propulsive force for locomotion / movement

(b) Examine the last tergum of the specimen from the ventral view.

(i) Draw and label.

(06 marks)

A drawing of the structures on the ventral side of the last tergum of Specimen G | cockroach



NA

- If anapophyses, amus are drawn on tergum
- Structures on sternum eg Podical plates and anal styles are drawn
- If notch is absent deny O
- IR
- If whole cockroach is drawn / sternum drawn

(ii) Giving reasons, state the sex of the specimen. (01 mark)

Male; bse has anal style; pointed gonadopophys
narrow abdomen; or O₁
Female; bse has blunt / round ended gonadopophy
yes; broad abdomen; has podical plates /
Ovipositor / oothecal Chambers;

- (c) With the dorsal side uppermost, dissect the specimen to display the structures used for the removal of undigested and excretory materials from the specimens body. Draw and label. (10 marks)

A drawing showing the structures for the removal of undigested and Excretory materials from the body of specimen G | cockroach;

O ✓

N ✓

more

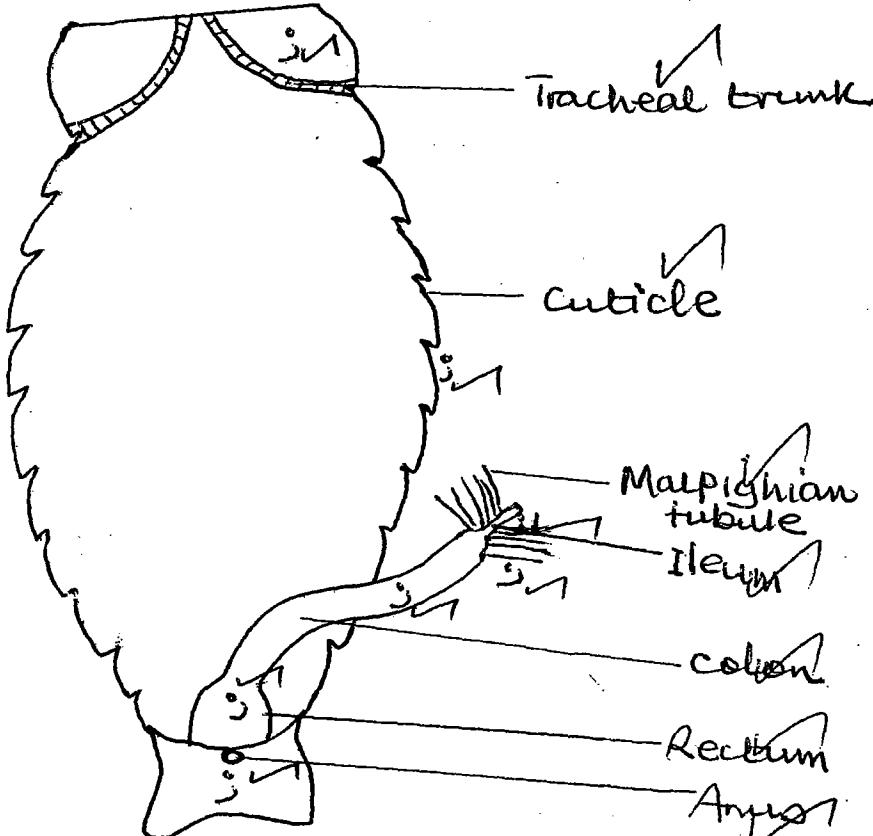
- Structures on dorsal tergum
are drawn but not labelled
f Structures On the head
are drawn & not labelled

A

my structures of the gut/
Salivary gland / salivary
cepfacte drawn & labelled

- Structures On dorsal
Cuticle / tergum drawn and
labelled; but accept if
the dorsal Cuticle alone
is labelled.

- Structures On the head
drawn and labelled

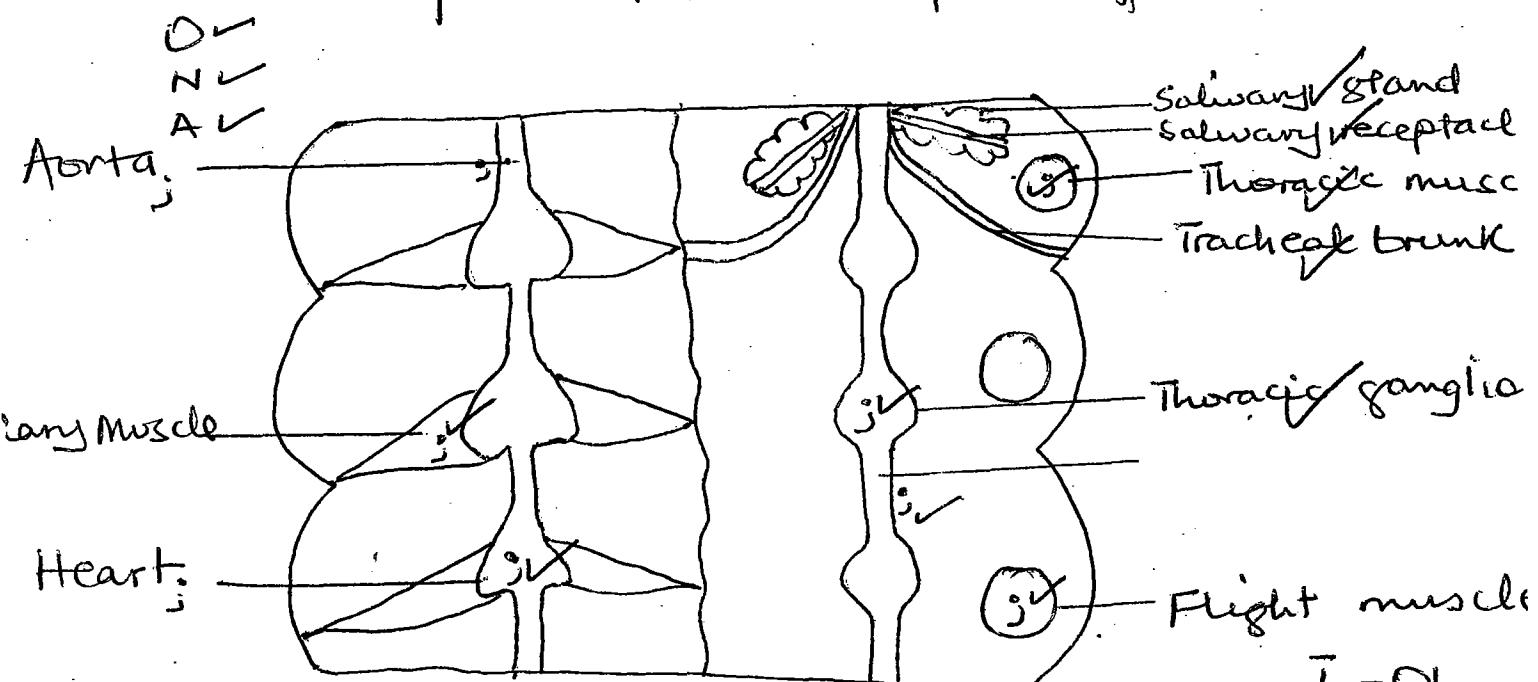


X1 - X6 ✓

T - D₂
M - D₂
O - D₂
N - D₂
D - D₂
L - D₃
5

- (d) Cut out the gut and remove unnecessary tissue to display the structures in the thoracic region. Deflect the dorsal cuticle to the left. Draw and label. (14 marks)

A drawing showing structures on the thoracic tergum and sternum | dorsal & ventral cuticles | thoracic cuticle of specimen G with the gut | Alimentary Canal removed | cut off |



- NA - reproductive structures drawn & labelled $\times 1 - \times 5$

- outline segmented to earn 0;

- NA if gut or any part of gut drawn even without labels. Any structures on head drawn and labelled.

(68 minutes)

| |
|-----------|
| T-OI |
| M-OI |
| O-OI |
| N-OI |
| D-5 |
| L-5 |
| A-OI |
| <hr/> |
| <u>15</u> |

2. You are provided with solution C and extract D from a plant organ.

- (a) Carry out tests on the solutions as indicated in Table 1. Record your tests, observations and deductions in the Table. (20 marks)

Table 1

| Tests | Solution | Observations | Deductions |
|---|----------|---|--|
| Iodine test: To 1cm ³ of Solutn extract C D; add 1 to 2 drops of iodine solution. | C | Turbid milky ; Soln Suspension; turns to black blue-black Soln; | Much moderate Starch present ; |
| | D | Turbid Yellow Pale yellow; Soln suspension turns to Pale Brown intense Yellow Soln. | Starch absent ; |
| Benedict's test: To 1cm ³ of Solutn Extract C D add 1cm ³ of Benedict's Solutn and boil; | C | Turbid soln turns to pale blue purple green Pale green purple Solution ; | Much Reducing sugar absent ; |
| | D | Yellow soln turns to pale blue; soln to green; soln to Yellow Orange precipitate; | Moderate Much reducing sugar present ; |
| Biuret test: To 1cm ³ of Solutn Extract C D; add 1cm ³ of NaOH Solutn followed by 3/4 drops dropwise of Copper II Sulphate Solutn; | C | Turbid; Solutn turns to pale blue Soln to deep intense purple Soln ; | Much moderate protein present ; |
| | D | Yellow; Solutn turns pale blue Soln to pale faint light purple; Soln ; | Little trace proteins present ; |
| DCPIP test: To 1cm ³ of DCPIP Solutn add extract C D dropwise Until in excess | C | Deep blue; Solutn turns to pale faint light blue; Solutn ; | Vitamin C absent |
| | D | Deep blue; Solutn turns to pink; Solutn then to Colourless Solutn | Much moderate Vitamin C present ; |

(b) Label four test tubes as 1,2,3 and 4 and put contents in each test tube as indicated in Table 2.

Table 2

| Test tube | Contents |
|-----------|--|
| 1 | 2 cm ³ of C and 2 cm ³ of D |
| 2 | 2 cm ³ of C and 1 cm ³ of D and 1 cm ³ of dil HCl |
| 3 | 2 cm ³ of C, 1 cm ³ of D and 1 cm ³ of dil NaOH |
| 4 | 2 cm ³ of C and 2 cm ³ of boiled and cooled D |

Incubate the test tubes in a water bath maintained at 37°C – 40°C for 1½ hours. (You may continue with other work in the meantime)

After, 1½ hours, carry out tests in Table 3 and record your observations and deductions in the Table. (12 marks)

Table 3

| Tests | Observations | Deductions |
|--|--|---|
| (i) Divide contents in test tube 1 into four portions. On the 1 st portion, carry out an iodine test. | Turbid soln turns to black blue-black Pale blue-black purple Soln; | much moderate starch present ; |
| (ii) On the 2 nd portion carry out a Benedict's test. | Turbid Soln turns to pale blue soln to green soln to yellow precipitate Orange brown ppt | much moderate reducing sugar Present ; |
| (iii) On the 3 rd portion carry out a Biuret test. | Turbid soln turns to pale very pale light faint purple purple Soln | little protein present ; |
| (iv) On the 4 th portion, carry out DCPIP test | Turbid Soln turns to pink Colourless turbid Solution Suspension | Vitamin C present ; |
| (v) Carry out a Biuret test on contents of test tube 2. | Turbid Soln turns to pale very light faint blue Soln | very little protein present ; |
| (vi) Repeat test (v) using contents of test tube 3. | Turbid Soln turns to pale blue Soln to very pale very light faint purple purple Soln | very very little little Protein present ; |
| (vii) Divide contents of test tube 4 into 2 portions. Carry out a Biuret test on the 1 st portion. | Turbid Soln turns to pale blue Soln to deep intense purple purple Soln | much moderate Proteins present ; |
| (viii) Carry out a DCPIP test on the 2 nd portion. | Turbid Soln turns to deep blue Soln turns to pink colourless | Vitamin C present ; |

7, Dowtton

Turn Over

is stopped / slowed down / inhibited by boiling because high temperature denatures the active substance in Solution D;

(c) Explain your results in Table 3. (04 marks)

- Active substance / Enzyme / Chemical substance

Organic / biological catalyst in Solution D breaks down hydrolyses protein and does not hydrolyse Starch;

- Active substance in D is more active in acidic pH & alkaline / high pH / NaOH & less active in neutral medium;

- Boiling breaks down / decomposes vitamin C in Solution D;

(ii) From your results, state the nature of extract D. (02 marks)

Extract D is a biological catalyst / Enzyme / protein digesting Enzyme / pepsin; D contains reducing sugar and vitamin C;

(49 minutes)

3. You are provided with specimens B₁, B₂, B₃, B₄ and B₅

(a) Cut specimen B₂ longitudinally and using a hand lens where necessary, examine specimens B₂ and B₅.

Using structural features, state the kingdoms of specimen B₂ and B₅. Give a reason for your answer in each case.

(i) Kingdom of specimen B₂. (02 marks)

Fungi

Reason

- Body made up of fine filaments / hyphae;

hyphae / filaments form a mycelium / individually
sporangia and; others like rhizoids / rhizalike
with rhizoids / small vesicles / large
sclerites / sporangia on thick hyph.

(ii) Kingdom of specimen B₅.

(02 marks)

Plantae

Reason

- Body differentiated into roots | stem | rhizom
rhizoid and leaf-like structures

(b) (i) Using a hand lens, observe specimen B₁ and describe its structure. (02 marks)

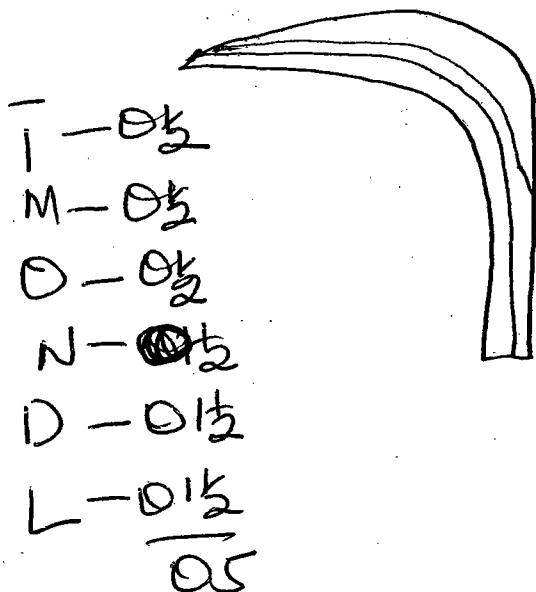
- Body made up of meshwork | network of fine | thin | slender | long | elongated filaments | hypha | fibres; some upright | vertical | sporangiophore; at horizontal | stolon; many sporangiophore have swollen | large structures | sporangia at the tip

(ii) From its structure explain how specimen B₁ is adapted to its mode of life in its habitat. (02 marks)

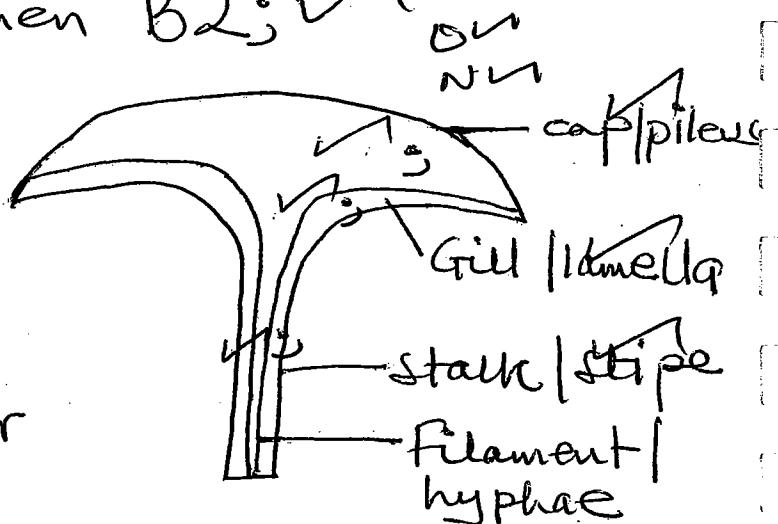
- Long sporangiophore | vertical hyphae to expose sporangia for easy dispersal of spores;
- Swollen | large sporangia to produce | store a lot of | large quantities of spores;
- Numerous sporangia to produce large amounts of spores;
- many horizontal filaments | hyphae | Stolons to spread out for easy colonisation | nutrition;
- many horizontal filaments | hyphae to spread out for easy colonisation | nutrition;

- (c) Using a hand lens, observe the cut surface of specimen B₂.
 Draw and label. (05 marks)

Drawing ~~on~~ showing the longitudinal section of specimen B₂; ✓

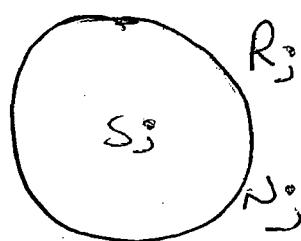


Or



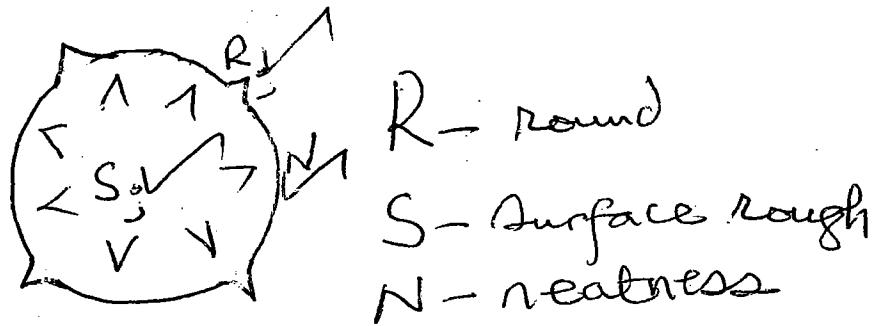
$\times \frac{1}{4}$ — $\times 5cm$

- (d) (i) Dust some spores from specimen B₁ on a microscope slide.
 Observe under high power of a microscope.
 Draw one spore but do not label. (1½ marks)



R → Round
 S → Surface
 A → Readiness

- (ii) Dust some spores from the lower surface of the leaf front of specimen B_5 on a microscope slide. Observe under the high power of a microscope. Draw one spore but do not label. (1½ marks)



- (iii) State two differences between the spores of B_1 and B_5 . (02 marks)

| | B_1 | B_5 |
|---|-------------------------------------|-----------------------|
| - | Smaller | Larger Bigger |
| - | Smooth surface | Rough surface Spiky |
| - | Dull brightly Color eq | - Brightly coloured |

- (e) State one advantage which specimen B_3 has over B_1 for survival. (01 mark)

B_3 has green colour | green patches | Chlorophyll to absorb sunlight for photosynthesis;

- (f) (i) In Table 4, write the major structural distinguishing features of specimens B₁, B₂, B₃, B₄ and B₅. (05 marks)

Table 4

| Specimen | Distinguishing features |
|-------------------------------|---|
| B ₁ Bread mould | - mesh work network of fine filaments hyphae vertical & upright hyphae Sporangiophore with spherical bodies |
| B ₂ mushroom | - Has large cap pileus with numerous gills; Has stalk stipe body made up of fine filaments hyphae with rooting hyphae |
| B ₃ Lichen | - Crustose crust-like flattened body - leaf like body; irregularly shaped lobed; has hyphae filaments rhizoids |
| B ₄ moss | - Differentiated into roots; stems & leaves - long stalk seta; bearing sporangia Capsule at the end; numerous slender root-like structures rhizoids; leaves spirally arranged; |
| B ₅ fern | - Differentiated into roots; stem & rhizome leaves front; lamina divided into leaflets pinnules; sori on lower leaf surface |

- (ii) Using the features in Table 4, construct a dichotomous key to identify the specimens. (04 marks)

- 1 (a) Body differentiated into stems, roots, leaves. -- 2
 (b) Body not differentiated into stems, roots, leaves. -- 3
- 2 (a) Lamina divided into leaflets. - - - - 4
 (b) Lamina not divided. - - + - Pf
- 3 (a) Body crust-like | flattened. - - - - b
 (b) Body not crust-like | not flattened. - - - - 1
- 4 (a) Has large cap | pileus at the top. - - - B2
 (b) Has sporangia at the tip. - - - ✓ - E.
-

(reject repeated structures)

(Acc any key with features from table)

Candidate's Name:

KIRKESAT

| | | |
|-------|------------|--------------|
| | Random No. | Personal No. |
| | | |

Signature:

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

P530/3
BIOLOGY
PRACTICAL
Paper 3
Nov./Dec. 2013
3 hours



2C
100

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
PRACTICAL

Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

This paper consists of three questions.

Answer all questions.

Write answers in the spaces provided. Additional sheets of paper must not be inserted in this booklet.

For Examiners' Use Only

| Question | Marks | Examiner's Signature & No. |
|----------|-------|----------------------------|
| 1 | | |
| 2 | | |
| 3 | | |
| Total | | |

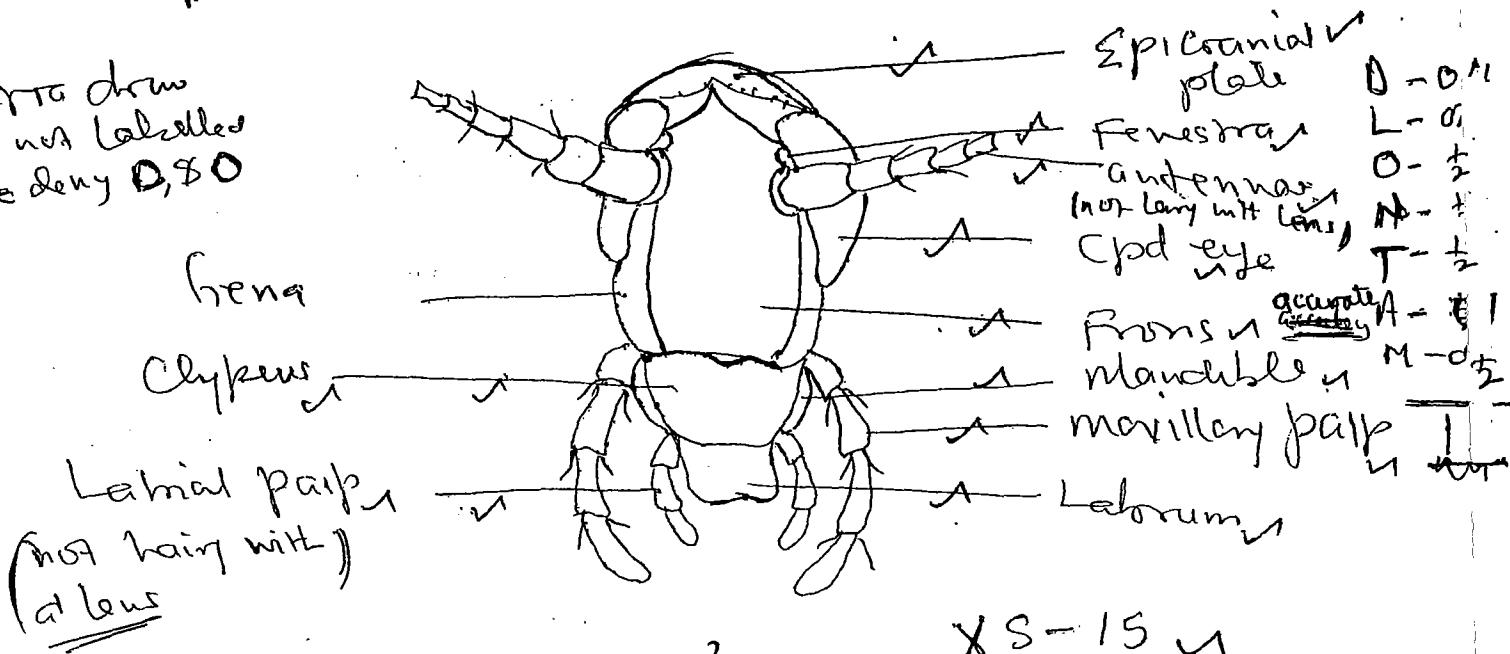
1. You are provided with specimen K.

- (a) (i) With the help of a hand lens, examine the head of the specimen. Using any four observable features on the head, explain how each of them enables the animal to survive in its habitat.

- Labrum curved to prevent food from falling into mouth (04 marks)
 - Long antennae to feel at a distance
 - Antennae segmented/jointed for flexibility/easy swinging/move in all direction
 - Fapillary antennae to easily swing in all direction
 - Serrated tooth edge to increase surface area for crushing food
 - Cpd eyes which are large/protruding curved outwards for a wide field of view
 - Hairy maxillary palp (hairy with a lens) for sensitivity
 - Long palps to reach food at a distance
 - Segmented palps for flexibility/to push food into the mouth
- (ii) View the anterior part of the head using a hand lens. Draw and label. (11 marks)

The drawing of the anterior view of the head of Specimen K

certo draw
but not labelled
will deny 0,80



- (b) Cut off the head of the specimen then cut out one eye with as little tissue under it as possible. Place the eye on the slide with the cut side facing downwards. View under the low power of a microscope.

(i) Describe the arrangement of the eye units. (05 marks)

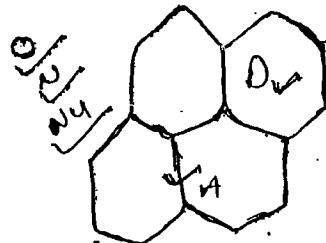
It consists of hexagonal/polygonal; large; numerous;
closely packed; ommatidia which are adjacent to
each other regularly (parallel); arranged

05

(ii) Draw four adjacent eye units. Do not label. (06 marks)

The drawing of four adjacent eye units
of Specimen K

T - 01
O - 01
N - 01
D - 01
units - 01
Attached - 01
- polygonal
- no gaps
- attached
units



T - 01
O - 01
N - 01
D - 01
adjacent A - 01
Nu - 01
No of units

06

(iii) What is the significance of the arrangement of the units?

Numerous ommatidia (units); compact (02 marks)

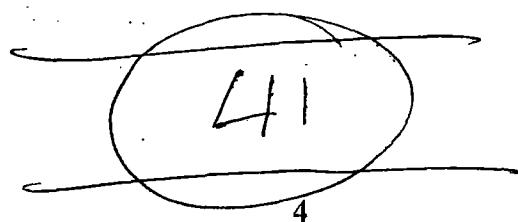
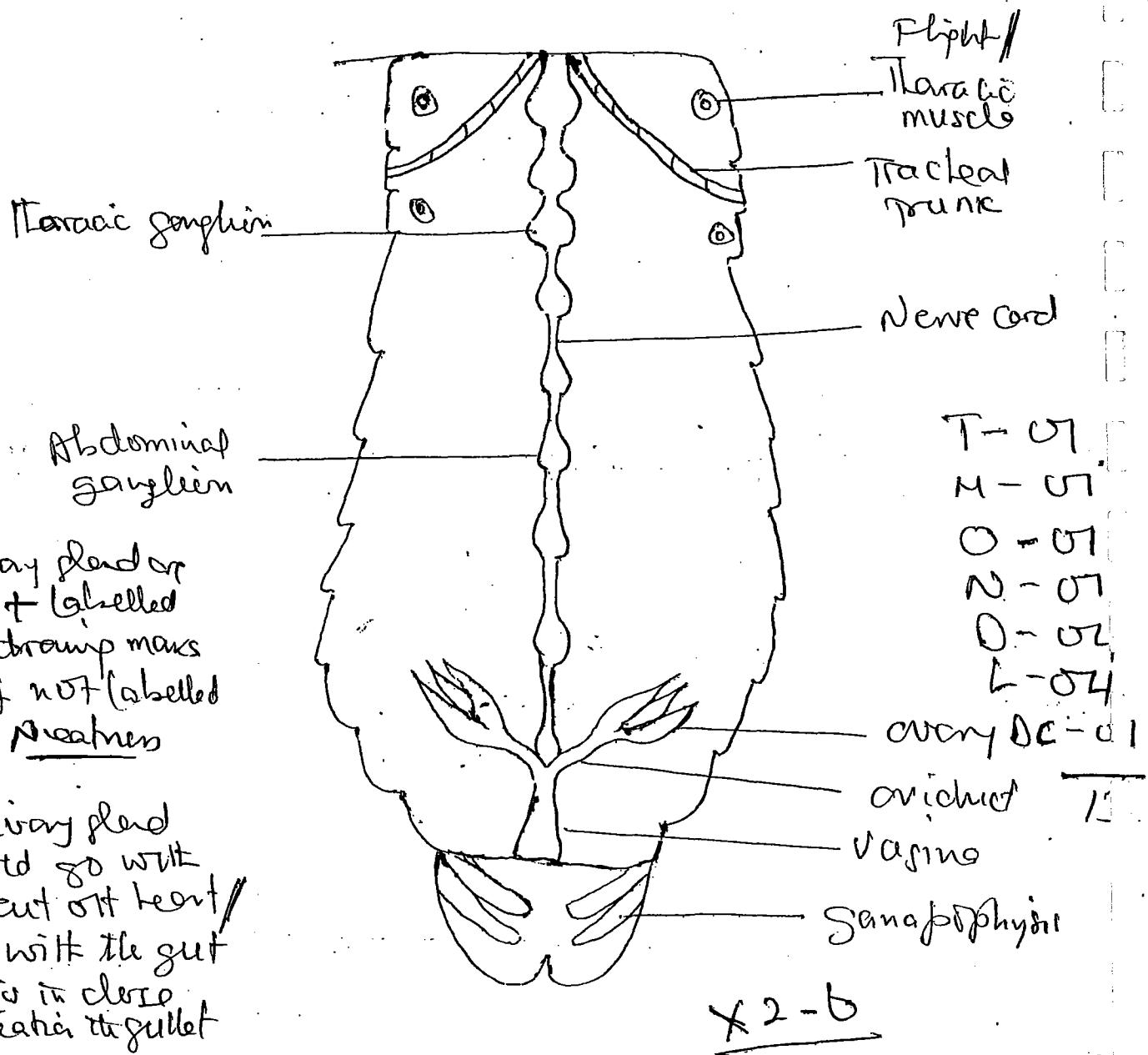
regularly arranged to increase field of
view; and sensitivity;

02

13

- (c) With the dorsal side upper most, dissect the specimen to remove the digestive system. Display the structures remaining on the ventral cuticle. Draw and label. (12 marks)

The drawing of the structure on the ventral cuticle of specimen K with digestive system removed.



T3

2. You are provided with solutions A, B, C, D, E, F and G which are sucrose solutions of different concentrations, and specimen T.

(a) Carry out tests on T and the solutions using the procedure provided.

(i) Label 14 test tubes in two sets, A_1A_2 , B_1B_2 , C_1C_2 , D_1D_2 , E_1E_2 , F_1F_2 and G_1G_2 . Put the solutions into their corresponding sets of test tubes in the quantities shown in Table 1.

Table 1

| Test tube | Solution added |
|-----------|------------------------|
| A_1 | 3 cm ³ of A |
| A_2 | 2 cm ³ of A |
| B_1 | 3 cm ³ of B |
| B_2 | 2 cm ³ of B |
| C_1 | 3 cm ³ of C |
| C_2 | 2 cm ³ of C |
| D_1 | 3 cm ³ of D |
| D_2 | 2 cm ³ of D |
| E_1 | 3 cm ³ of E |
| E_2 | 2 cm ³ of E |
| F_1 | 3 cm ³ of F |
| F_2 | 2 cm ³ of F |
| G_1 | 3 cm ³ of G |
| G_2 | 2 cm ³ of G |

- (ii) Arrange test tubes A_1 , B_1 , C_1 , D_1 , E_1 , F_1 and G_1 in a front row and A_2 , B_2 , C_2 , D_2 , E_2 , F_2 and G_2 in a back row in a test tube rack.
- (iii) Now add a small drop of methylene blue to each of the test tubes in the back row, using a dropper just to colour the solutions.
- (iv) Using a cork borer, prepare seven uniform cylinders from specimen T measuring between 6 - 8 mm in diameter and 5 - 6 cm in length.
- (v) Add one cylinder to each of the test tubes in the front row (uncoloured solutions) and leave for 20 minutes.

(vi) After 20 minutes, decant the liquid in test tube A₁ into another test tube.

- (vii) Using a dropper, obtain a coloured solution from test tube A₂ and carefully, lower the tip of the dropper into the centre of the decanted liquid, about 5 mm from the surface, and release one drop of the coloured solution as shown in fig 1.

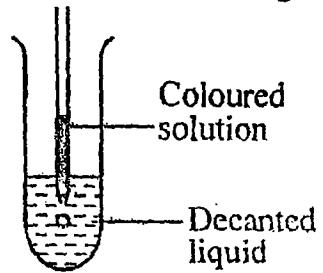


Fig. 1

- (viii) Observe the behaviour of the coloured drop and record your observation in Table 2. Clean the dropper and the test tube and repeat procedures (vi) – (viii) using the liquids in the remaining sets of test tubes by decanting solutions from test tubes with potato cylinders and adding a drop of coloured solution from corresponding test tubes in the back row. (14 marks)

Table 2

| Test tube from which liquid is decanted | Behaviour of the coloured drop |
|---|--------------------------------|
| A ₁ | Spreads horizontally |
| B ₁ | Rises slowly |
| C ₁ | Sinks slowly |
| D ₁ | Sinks moderately |
| E ₁ | Rises moderately |
| F ₁ | Rises fast |
| G ₁ | Sinks fast |

014

- (b) Explain the behaviour of the coloured drop in each decanted liquid.

(14 marks)

A₁ The solⁿ and cell sap of the cylinder are isotonic no net osmotic movement of H₂O hence the E/T remains and density remains unchanged.

B₁ This is slightly less concentrated than cell sap of cylinder hence absorbs little H₂O from the solⁿ slightly rise E/T of 1 molⁿ of the solⁿ and hence slightly rises the density of the solⁿ. 02

C₁ solⁿ slightly more E/T than the cylinder, so it absorbs little H₂O becoming slightly dilute with slight decrease in density. 02

D₁ solⁿ moderately more conc'd than cylinder, so it absorbs moderate amount of H₂O becoming moderately dilute with moderate decrease in density. 02

E₁ solⁿ moderately less conc'd than cell sap of cylinder moderate amount of H₂O absorbed by ~~the~~ cylinder solⁿ becomes slightly E/T leading to moderate rise in density. 02

F₁ solⁿ is much less conc'd than cell sap of cylinder; it loses much water to cylinder, and becomes much ~~conc'd~~ with such high rise in density. 02

G₁ solⁿ much conc'd than cell sap of cylinder, much water absorbed by solⁿ; becoming much dilute, with greatly decreased density. 02

- (c) From your results, estimate the water potential of the cells of specimen T. Give a reason for your answer. (02 marks)

water potential of cells of cylinder is equivalent to that of solⁿ A₁ with no net gain or loss of H₂O; causing no change in density; and E/T. 02

2. Specimens P, Q, R, S and T are flowers and inflorescences.

(a) Describe the androecium and gynoecium of each of specimens P, Q and R and of one flower from each of specimens S and T. (15 marks)

Table 3

| Specimen | Characteristics of androecium | Characteristics of gynoecium |
|--|---|--|
| P <i>Hibiscus</i> Anthers free, bilobed, round, curved, brightly colored | numerous; filaments fused into stamen tubes which long; end of them are free and attach each on a stamen tube | 5 Cepel; and fused; 5 separate style, broad hairy sticky stigma 2 lobes style long, flexible, free, on a superior ovary broad base |
| Q <i>Crotonia</i> calotropis Anthers bilobed, round, elegantly, brightly colored | 10 stamen (few); 9 fused one one into stamen tube which grooved, curved and long with free filament ends | one Cepel, Style long, flat & hairy; short style superior long curved, smooth ovary |
| R <i>Sweet potato</i> Anthers, bilobed, at apex | 5 stamen, filament long, free & slender thin & attached to petal base hairy at base. | 23 Cepel, fused, & name bilimblased, round, hairy Style long, thin superior ovary, round ad smooth |
| S <i>Guinea grass</i> Flower of S | 3 free stamen, filaments long & thin Anthers pendulous dull colored, bilobed, large long loosely attached to filament | 2 style, brightly colored long feathery stigma style is short, superior ovary ad round. |
| T <i>maize</i> | 3 free stamen, free filaments, anthers free, long, slender pendulous smooth long, bilobed | No gynoecium |

brightly colored and loosely attached to filament

@ box 1b
three + 1 his

14. b

- (b) Using the characteristics of the androecium and gynoecium, construct a dichotomous key to identify the specimens. (04 marks)

| (a) Has stamens | Pilament | anthers only - - - T;

| (b) Has both stamens | F | anthers and pistil - - - P 2;

2 (a) Pilaments are free - - - - - 3;

2 (b) Pilaments are fused or partly fused - - - 4;

3 (a) Has long style - - - - - R;

3 (b) Has short style - - - - - S;

4 (a) Has one stigma leaf - - - Q;

4 (b) Has five stigmatic surface - - - P;

ST 7 groups now of staminate, Androecium, bisexual, unisexual,
gynoecium like are the ones used in key 04

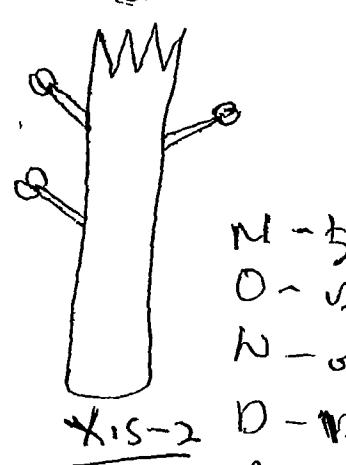
- (c) In the space below, draw the androecium of specimens P and Q.

(06 marks)

Androecium of specimen P

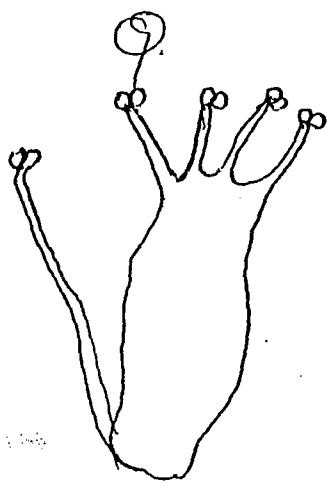
Androecium of specimen Q

Drawing of androecium of specimen P/Q



M - 5
O - 2
N - 2
D - 12
A - 5

X15-2



M - 5
O - 2
N - 2
D - 12

X2-10

N - 5
D - 12

X3-2

but for other
plant 3-7

O3-2

07

- (d) State whether specimen P is more likely to be self or cross pollinated.
Explain your answer. (03 marks)

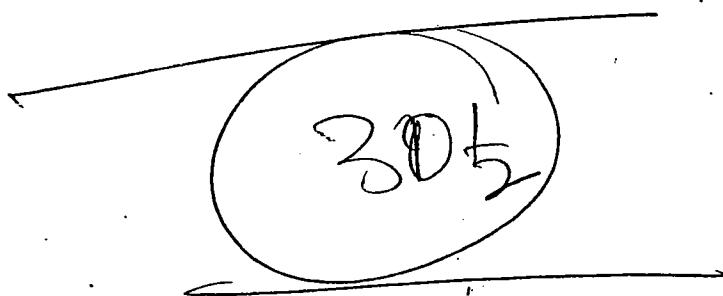
Cross pollinated; b/c the stigmas heads
are above the anther head; such that
the pollinator/insect from other flowers
will pollen reach stigma before anthers.

03

- (e) Explain how pollination is facilitated by the androecium of specimen T. (02 marks)

- Long Filament to expose anther heads with pollen grain to wind;
- Large anther heads to produce much pollen grains to enhance pollination;
- Filaments are flexible/pendulous for easy swinging to release the pollen easily;
- Anthers are loosely attached to the filament to easily scatter the pollen;

any two, $4 \times 2 = 02$



0.5

Candidate's Name:

2012

MARKING GUIDE

Random No.

Personal No.

Signature:

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

P530/3
BIOLOGY
PRACTICAL
Paper 3
Nov./Dec. 2012
3 hours



161

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
PRACTICAL

Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

This paper consists of three questions.

Answer all the questions.

Answers must be written in the spaces provided. Additional sheets of paper must not be inserted in this booklet.

For Examiners' Use Only

| Question | Marks | Examiner's Signature & No. |
|----------|-------|----------------------------|
| 1 | 39 | |
| 2 | 36 | |
| 3 | 25 | |
| Total | 100 | |

(70 minutes)

Rat

1 hour

1½ hours

Final examination

QUESTION PAPER

1. You are provided with specimen K which is freshly killed.

(a) (i) Identify the sex of the specimen.

(01 mark)

Female / Male

01

(ii) Describe the structures you used to determine the sex of the specimen.

(02 marks) 03

for female: Clitoris; small projection / swelling / bulge / protrusion;
cylindrical; solid with small opening at tip; &
short scanty hair.
Nipple; small projection / pointed; short / elongated;
cylindrical; smooth; rej... hairless.....

Vulva/genital opening / vaginal opening / aperture; wide/
slit-like / round; opening.

(b) Dissect the specimen to display the contents of the abdominal cavity.

Cut out the stomach without breaking much of the mesentery.

Displace the duodenum loop to the right of the specimen, then turn the bulk of the ileum to the left of the specimen. Displace the colon and the caecum downwards to the right of the specimen to display the vessels that carry blood from the alimentary canal to the liver which is displaced anteriorly.

Draw and label structures visible in the abdominal region in the space provided on the next page. (23 marks)

OR

Male:

Scrotum / Scrotal sac; 1/2 mk.

Swollen / Bulge; Sac / Sac-like; elongated /
long; with short / long; scanty hairs;

two protrusions / swellings with a depression
in the middle; 2 descriptions that are correct = 01mk

Penis; long / elongated; covered by retractable

1/2 mk / loose sheath / prepuce which is
cylindrical; solid; with short; scanty
hairs; slit-like aperture at tip;

any 2 correct descriptions = 01mk.

• Award (ii), if part (i) not answered ² = 01mk.

• If Δ or \square entry is given for any question, then award (i) 1 mark.

Rej.
drawings.
If both descriptions
given (male & female)
given all mks.
Giving all mks.

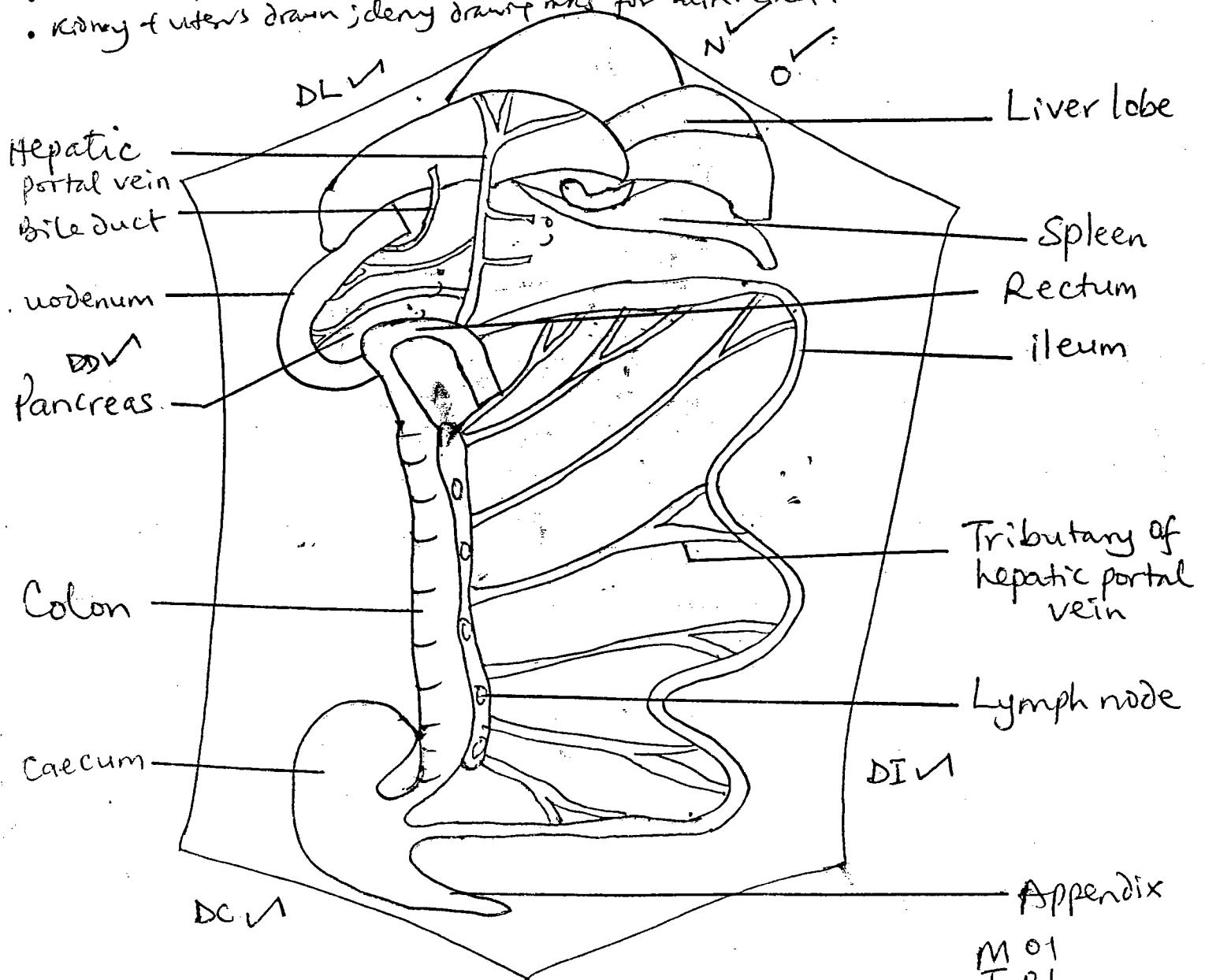
A drawing showing the structures in the abdominal region of specimen K without the stomach, with the duodenum displaced to the right of the specimen, ileum to the left, colon and caecum downwards to the right and the liver anteriorly.

- If whole alimentary canal has been cut off, deny all marks.

If structures displaced wrongly; award labels for those structures.

Without displacements award labels. MTO, but deny drawing marks.

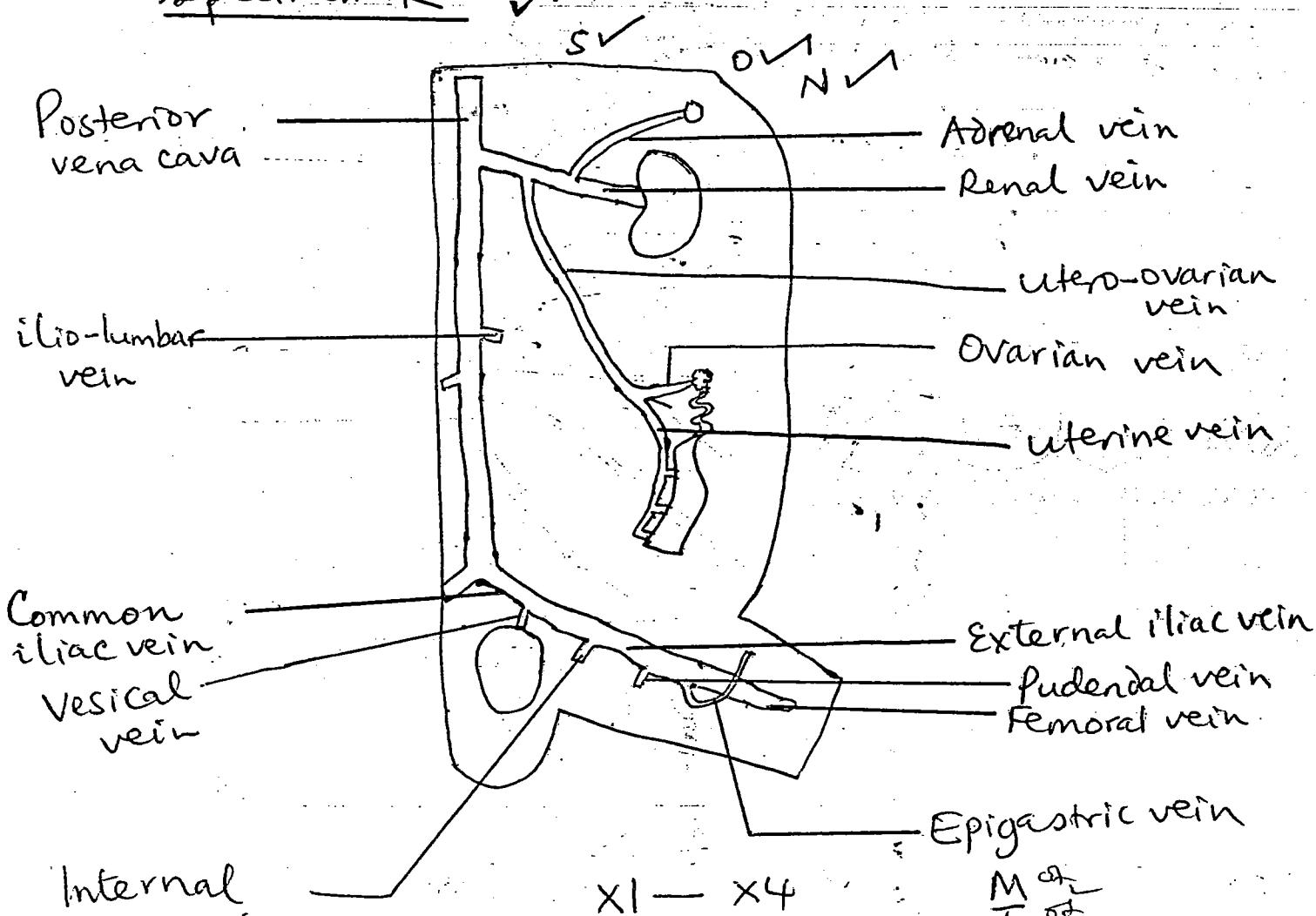
Kidney & uterus drawn; deny drawing marks for alimentary canal.



- If stomach not cut off, or structures in chest drawn, deny drawing & labelling marks but award MTO & displacements.

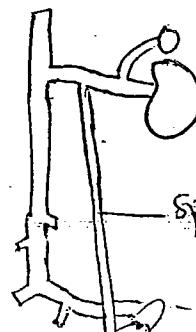
- (c) Cut out the alimentary canal then continue to dissect to display the vessels that drain blood from the upper parts of the hind limbs and abdominal region back to the heart. Draw and label the vessels on the left hand side of the specimen excluding the heart. (13 marks)

Drawing of blood vessels that drain blood from the upper parts of the hind limb and abdominal region back to the heart on the left side of specimen K ✓



Internal
iliac vein
or hypogastric

OR
male:



Correct → S 01

side
of limb. 15

M 01
T 02
N 03
O 04 ← limb with
D 05 max
L 06 max
there.

- m/s ovary vein once.
- If alimentary canal still present deny D&L m/s.
- if additional bld vessels (imaginary) included award labels but deny drawing m/s.
- Ignore H/P/V.

if right side
drawn b/w legs (sic)
award labels only.

if both sides drawn but
only labelled mark normally
denied all drawn

(65 minutes)

*2% yeast
1% starch
1% sucrose
1% glucose*

2. You are provided with solutions W, X, Y and Z. Solutions X, Y and Z contain food nutrients. You are required to carry out tests to determine the food nutrients contained in the solutions and investigate the action of solution W on solutions X, Y and Z following the instructions provided.

- (a) Carry out the iodine and Benedict's tests on solutions X, Y and Z and record your tests, observations and deductions in Table 1.

(14 marks)

Table 1

| Test | Solution | Observations | Deductions |
|--|----------|---|--------------------------------|
| (i) Iodine test <i>To 1cm³ of test solution add 1/2/3 drops of iodine solution;</i> | X | Milky / Cloudy / Colourless / turbid; solution / suspension turns blue-black; soln acc. black. | Much; Starch present; |
| | Y | Colourless; solution; turns pale brown / yellow ; acc. pale yellow / brown. | Starch absent; |
| | Z | Colourless; solution; turns pale brown / pale yellow / yellow ; | Starch absent; |
| (ii) Benedict's test <i>To 1cm³ of test solution add 1cm³ of Benedict's solution; and boil;</i> | X | Turbid suspension turns pale blue; 1/2 which persists | Reducing sugars absent; |
| | Y | Colourless solution turns pale blue; 1/2 which persists | Reducing sugars absent; |
| | Z | Colourless solution turns to pale blue; to green; solution to yellow; ppt; to orange/brown; ppt | Much; Reducing sugars present; |

08

07½

• 5 award ppt once.

Turn Over

• If no procedure deny obs. & deductive mks.

Max: 15

- (b) Label 3 test tubes as X, Y and Z and add into each of them 2 cm³ of the corresponding solution followed by 2 cm³ of solution W. Incubate the mixtures at a temperature of 37°C-40°C for 1 hour. (You may proceed with other work in the meantime). After 1 hour, carry out the iodine and Benedict's tests and record your observations and deductions in the following Table 2. (12 marks)

Table 2

| Test | Solutions | Observations | Deductions |
|-----------------|-----------|---|---|
| Iodine test | X + W | Cloudy/turbid solution turns to black specks / pale blue-black soln / purple soln | Little starch present; ✓ |
| | Y + W | Cloudy/turbid solution turns to pale brown / yellow / pale yellow; ✓ | Starch absent; ✓ |
| | Z + W | Cloudy/turbid solution turns to pale brown / yellow / pale yellow; ✓ | Starch absent; ✓ |
| Benedict's test | X + W | Cloudy solution turns to pale blue to green / yellow; ppt | Little/moderate; reducing sugars present; ✓ |
| | Y + W | Cloudy solution turns to yellow/orange; ppt occ. brown ✓ | moderate/much; reducing sugars present; ✓ |
| | Z + W | Cloudy solution turns to green / greenish-yellow occ. yellow ppt ✓ | little/moderate; reducing sugars present; ✓ |

(c) Suggest

- (i) explanations for your results in (b). (07 marks)

X The amt. of starch reduced; since W contains enzyme / active substance; which hydrolyses / breaks down starch; to reducing sugars; ✓ 04

Y was broken down to reducing sugars; by active substance / enzyme in W ✓ 01

Z There was reduction in the amt of reducing sugar; 02 because the R/S were broken down / decomposed; by active substance in W. (eg. hydrolysed in Z)

- award enzyme / active substance once.
- Explanation must tally with observations in

(ii) the nature of W.

(03 marks)

Solutions W contains enzymes / active substances which break down starch; solution Y; and reducing sugars;

03

36

(45 minutes)

Commoning leaf for open habitat
shade habitat max.

3. You are provided with specimens S and T and solutions A, B and C. Specimens S and T are from plants of the same species but grown under different habitats. Solutions A, B and C are sucrose solutions of different concentrations.

- (a) Examine specimens S and T using a hand lens where necessary and state one difference between the specimens. (01 mark)

| S | T |
|---|--|
| - More hairy | - Less hairy |
| - Pale green / less green | - Dark / intense (deep green) / more green |
| - narrower (faster) <small>smaller</small> | - broader (wider) / larger SA |

- (b) Label four microscope slides at their edges as S-upper epidermis, S-lower epidermis, T-upper epidermis and T-lower epidermis. From each specimen peel a small piece of the upper epidermis and lower epidermis one at a time and mount in a drop of water on the corresponding microscope slide. Cover the mountings with cover slips and view them one at a time, under the low power of a microscope. For each piece of epidermis viewed, count the number of stomata visible in the field of view and record your results in Table 3.

(04 marks)

Table 3

| Specimen | No. of stomata | No. of stomata |
|----------|-----------------|-----------------|
| | Upper epidermis | Lower epidermis |
| S | 20 - 70 | 80 - 500 |
| T | 40 - 150 | 60 - 350 |

Q4

- (c) From your results in (a) and (b) suggest the type of habitat from which each specimen was obtained giving two reasons. (02 marks)

S. open / sunny / lit / terrestrial ; Km

- i) Pale green so has less chlorophyll since it is exposed to much sunlight ;
- ii) Much hair to reduce transpiration / H_2O loss
- iii) Narrow lamina reduces S.A to minimise H_2O loss.
- iv) Much more stomata on lower surface & few on upper to reduce H_2O loss
- v) More no. of stomata than T to increase H_2O loss hence rapid cooling.

AND

T. of shade / dimly lit / terrestrial .

- i) Dark green has much chlorophyll to maximise absorption of light .
- ii) less Hair because less need to conserve H_2O / to enhance transpiration .
- iii) Broad lamina to increase S.A for light absorption .
- iv) fewer no. of stomata as compared to S for it receives less direct sunlight so less H_2O loss .

- (d) Label three microscope slides at their edges as A, B and C and on each slide, add a drop of the corresponding solution. Peel three small pieces of the lower epidermis from specimen S and mount a piece with the outer-side uppermost, in each solution on the slides. Leave the set up for 20 minutes. After 20 minutes cover each mounted piece with a cover slip and observe under the low power of a microscope. Draw one stoma with its adjacent cells from each slide, in the space provided. (09 marks)

(A) largest
for light absorption.
B more stomata
on lower than upper
to minimise H_2O loss.

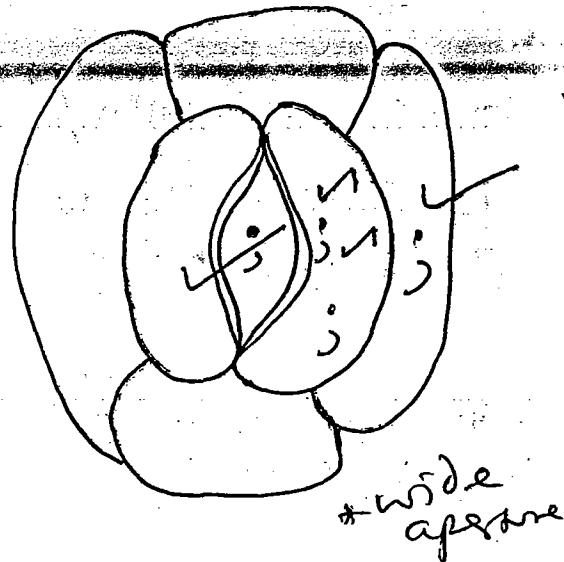
Terrestrial habit ✓

S. (A) more hairy to conserve H_2O

- Narrow lamina to conserve H_2O

B more stomata on lower surface than upper

(i) From slide A.



Ignore other structures
epidermoplast, nucleus etc.

Turn Over (ii)

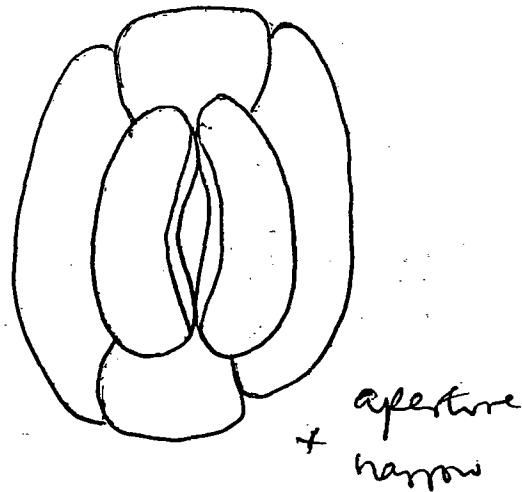
- aperture (stoma); ✓

- guard cell wall
thickness; ✓
shape ✓

- presence of
adjacent cells ✓

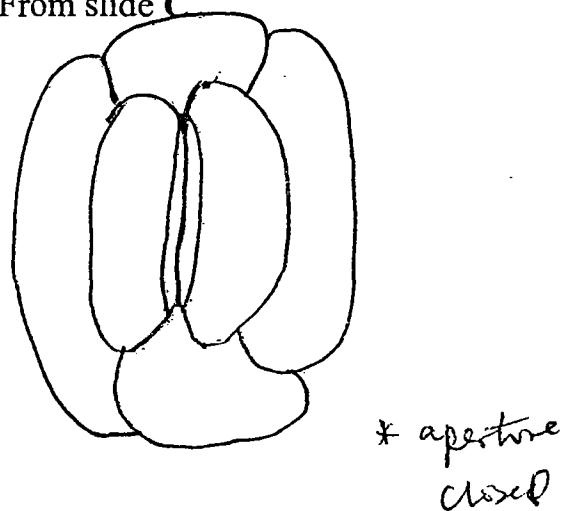
03

(ii) From slide B.



03

(iii) From slide C



03

(e) Explain what is observed from each slide. (09 marks)

(i) From slide A.

Solution A has lowest concentration / is Dilute ;

Compared to cell sap ; much water moves in ; by Osmosis ; causing (high) turgidity ; stoma opens wide ;

Acc. low concn / high ψ_w / high osmotic potential / high solute potential / hypotonic soln .

Q3

(ii) From slide B.

Soln B is slightly less concentrated / higher concn than cell sap ; some water moves in/out ; making guard cells turgid/shrink ; & stoma slightly open/closes.

OR

Almost of same concn / isotonic ; as cell sap ; no net movement in & out of water ; stoma slightly open ;

O2%

(iii) From slide C.

Soln C has highest concn ; than cell sap ; much water moves out ; making guard cells shrink (flaccid plasmolyzed) ; stoma closes.

Acc. opposite of

awan Osmosis once

25

1. (69 minutes) **36**

You are provided with specimen K. Cockroach.

Few Legs

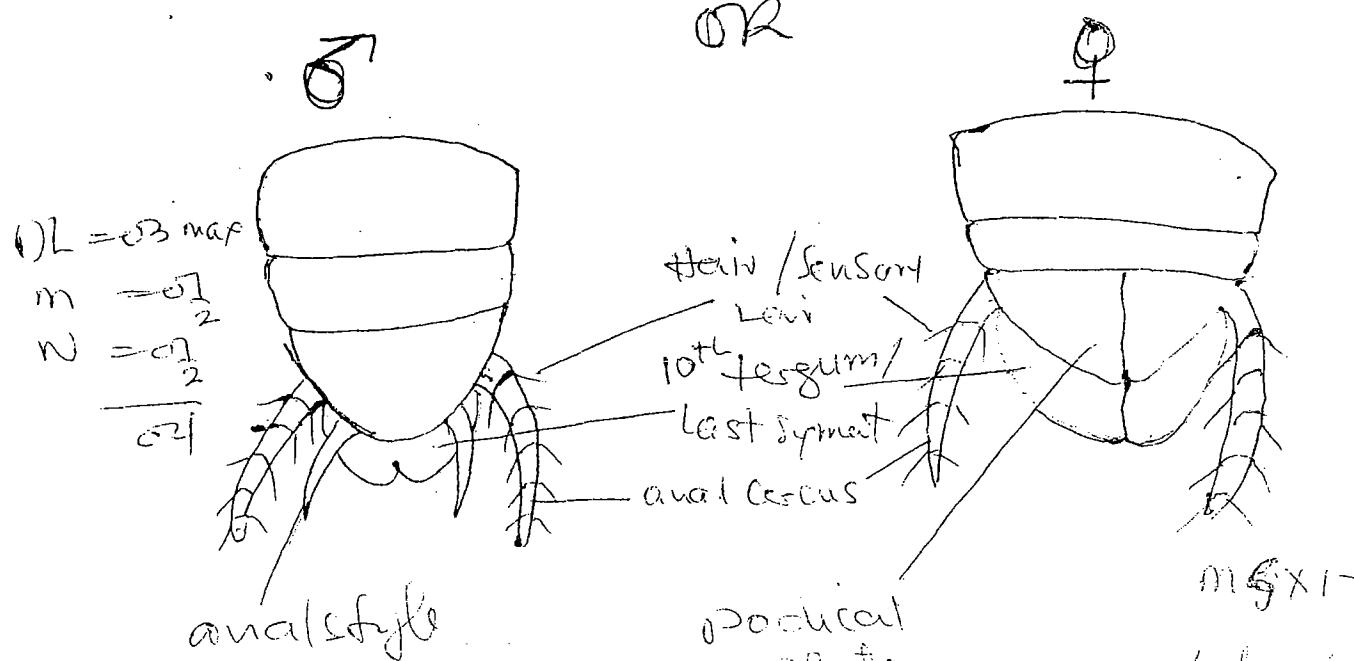
- (a) Examine the specimen and name the external features which are characteristic of the class to which the specimen belongs. (03 marks)

Rejo other ^{several} - Three pairs of Limbs (legs) | Six legs
 fles & ^{thighs} - Three (distinct) body parts / Las head, thorax &
 abdomen. - Has a pair of antennae (feeler);
 antenae, ^{posterior} Thorax divided into three distinct segments /
 Post. ^{ext.} (P.D., meso. and meta. Abdomen) (03) ^{0 = 0.5 m}

- (b) From your observation of the external features, state with reasons the sex of the specimen. ^{reg wide} (02 marks)

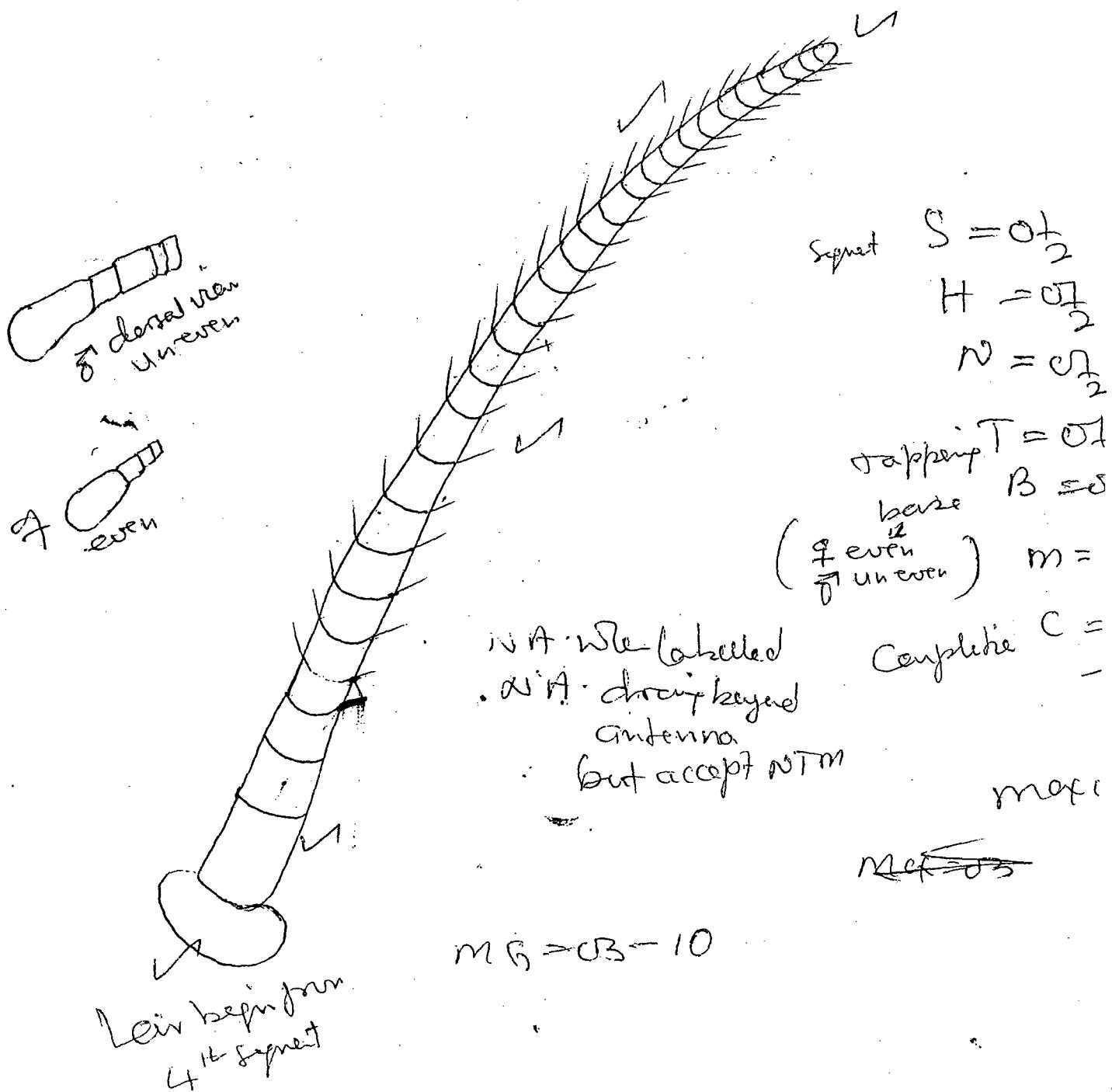
^{reg} ^{camopophyses} ♀ Podical plates; broad abdomen;
^{distig. internal} even segments of antennae;
^{reg} ^{asym.} OR: ♂ styles / anal styles; narrow abdomen;
^{reg} ^{structures} uneven segments of antennae at the base;
^{up no style} ^{for ♀}

- (c) Place the specimen ventral side uppermost. Draw and label the end of the abdomen. (05 marks)



1. If whole specimen shown / 2. In 1/2 diagram shown / draw / draw

- (d) Using a hand lens examine one antenna and draw. Do not label.
(02 marks)



- (e) Place the specimen dorsal side uppermost and dissect to expose the structures within the abdominal cavity.
- (i) Displace the structures to display the salivary glands on the left of the specimen.

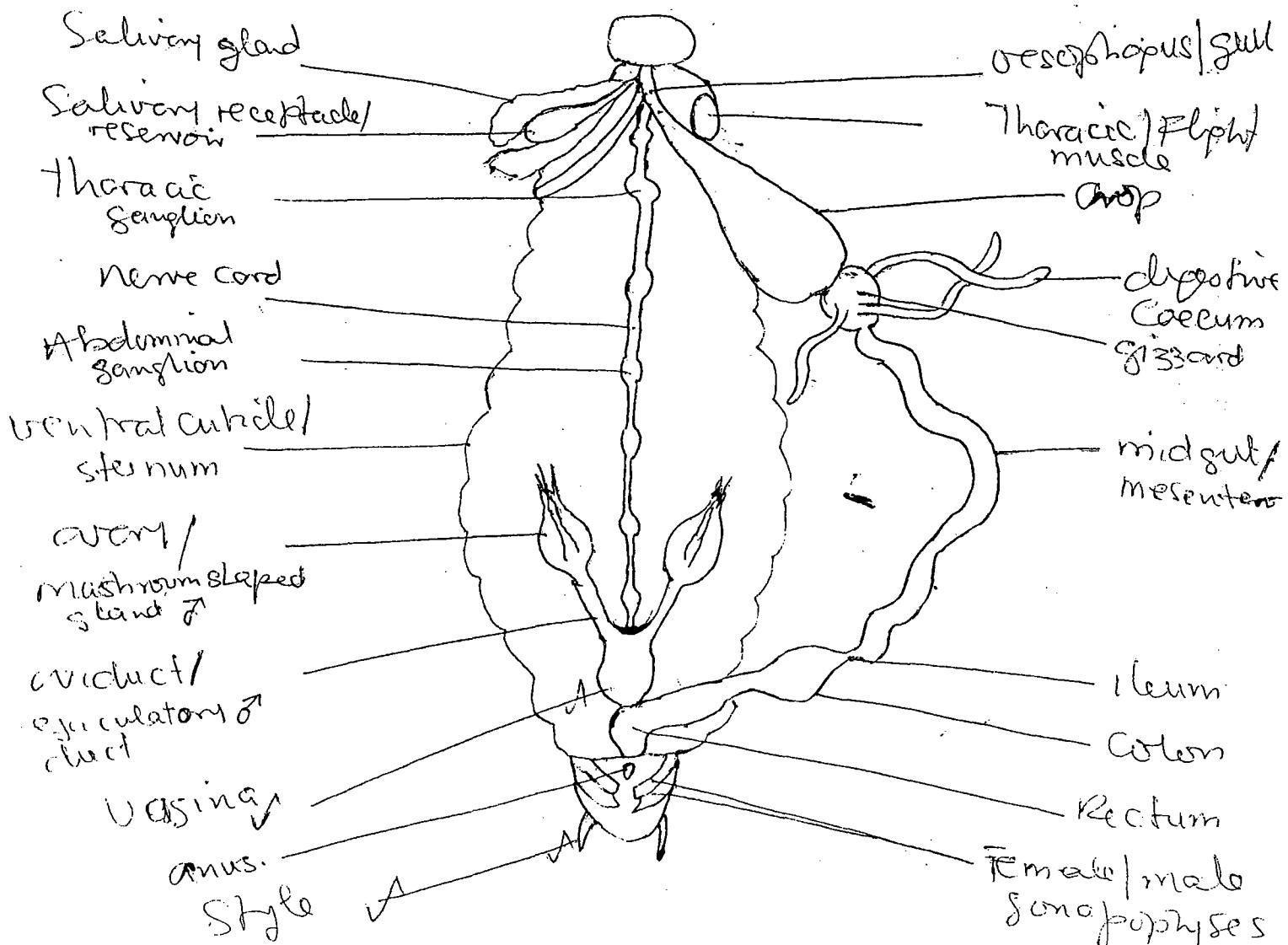
- (ii) Displace the alimentary canal to the right of the specimen. Remove all unnecessary tissue to display all the parts of the alimentary canal and the structures on the ventral cuticle.

No label with
the draw

Draw and label.

(24 marks)

Drawing of Specimen K showing alimentary Canal and structures on the ventral cuticle;



N.H. Alimentary Canal is
with the lead parts are labelled. Of blunt ♂ pointe
or if malpighian tubes shown
can be labelled.

N.H. If ventral cuticle (if any)
structure of dorsal cuticle is
shown too can be labelled.

N.H. If it is plain front + middle part

$$DIL = 48$$

$$n = 07$$

$$T = 07$$

$$N = 01$$

$$G = 01$$

$$Gut = 01$$

2. (72 minutes)

You are provided with specimen B. ~~1 m² potato~~

- (a) Using a scalpel, peel the specimen then cut out two cubes from it. Cube B1 measuring, 1cm x 1cm x 1cm and cube B2 measuring, 2cm x 2cm x 2cm.
- (i) Calculate the surface area, the volume and the surface area to volume ratio of each cube in Table I. Show your working.

Table I

| | Surface area | Volume | Surface : Volume ratio |
|--------------------------------------|---|---|-------------------------------------|
| Formula B1 substitution answer | $2(1+1)+2(1+1)+2(1+1)$ $2(1+1)+2(1+1)+2(1+1)$ $2 + 2 + 2$ $6 \text{ cm}^2 \checkmark$ | $1+1+1 \checkmark$ $1 \text{ cm}^3 \checkmark$ | $6:1 \checkmark$ 0.33 |
| calculation | | | |
| B2 | $2(L+b)+2(L+b)+2(L+b)$ $2(2+2)+2(2+2)+2(2+2)$ $2(4)+2(4)+2(4)$ $8+8+8$ $24 \text{ cm}^3 \checkmark$ | $L+b+L \checkmark$ $2+2+2 \checkmark$ $8 \text{ cm}^3 \checkmark$ | $28:8$ $3.5 \checkmark$ 0.3 |

(03 marks)

any ans. if working
is wrong.

MAX 0.5

- (ii) Immerse each cube completely in a beaker containing potassium permanganate solution and leave for 15 minutes. After 15 minutes remove the cubes from the solution and wipe them using a blotting paper.

Using a razor blade, cut each cube into two halves. Using one half of each cube, measure the distance in mm, across the uncoloured portion as indicated in fig.1.

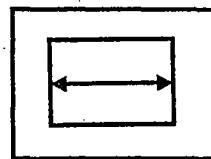


Fig.1

Record your results

B1 $5 \leq 9$ ✓ mm. 02

B2 $16 \leq 19$ ✓ mm.

(02 marks)

- (iii) What physiological process is observed in (ii)? (01 mark)

Diffusion ✓

01

- (iv) How do the results in (ii) relate to the physiological process named in (c)(i), in living organisms? (04 marks)

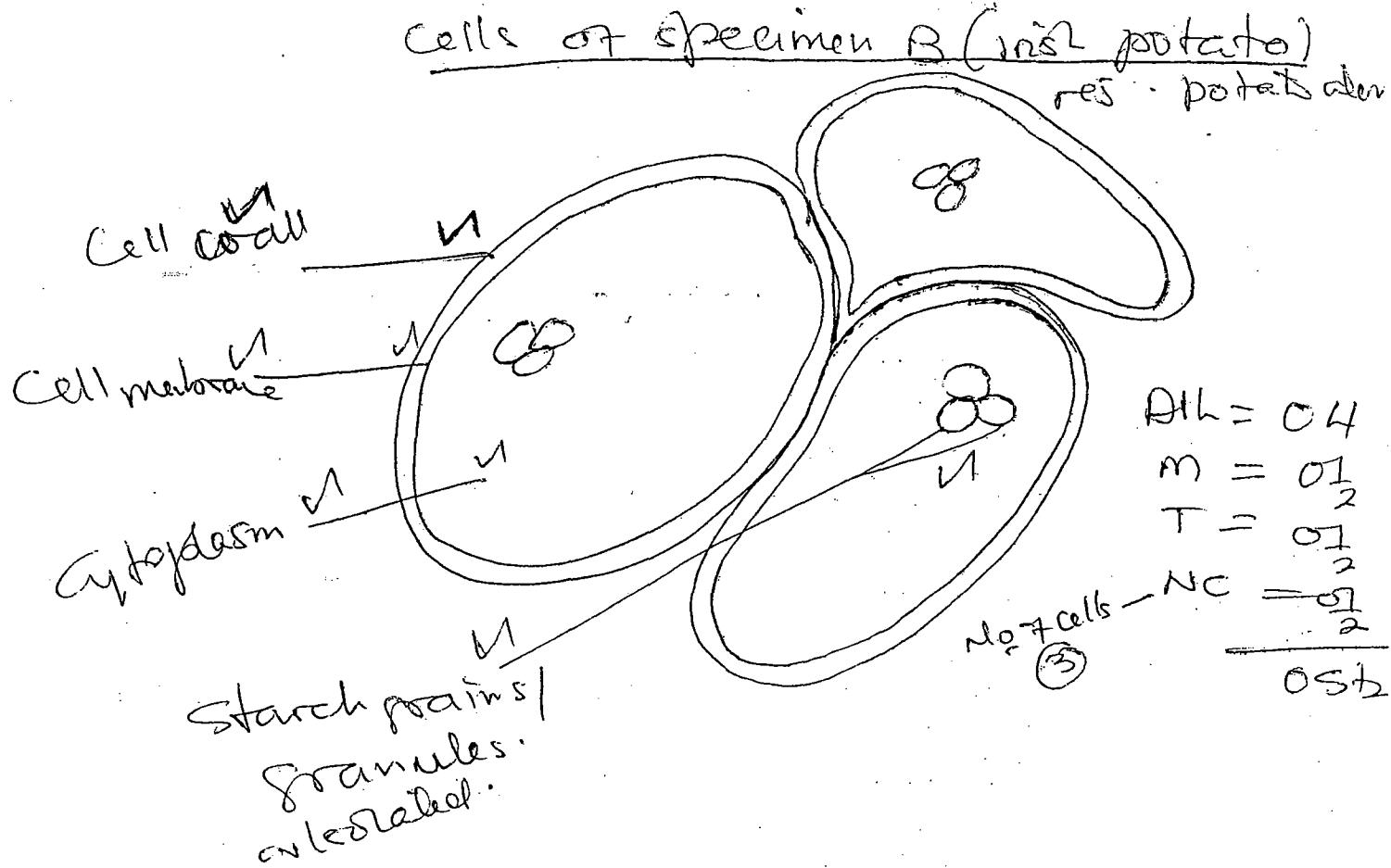
Wrong. The Smaller the organism; the Larger the surface area: volume ratio; the faster / greater the rate of diffusion; The bigger / larger the organism the Smaller the surface area: volume ratio; the lower / slower the rate of diffusion.

05

- (b) Cut a very thin slice of specimen B using a sharp razor blade. Place the slice on a slide in a drop of water and irrigate with iodine solution. Observe the slice under the medium power of a microscope.

Draw 3 adjacent cells and label.

- (i) Draw and label three adjacent cells observed. (06 marks)



- (ii) Giving a reason, suggest the name of the tissue observed. (02 marks)

If it is parenchyma tissue ✓ 6
 char: Thin-walled | Compact cell | presence of starch
 granules | grains

- (iii) From your observation, state the function of the tissue observed. (02 marks)

For storage of starch

(c) Using a mortar and pestle, crush the remaining piece of specimen B. Add 10cm³ of water to it, stir then decant the liquid part into a test tube.

(i) Carry out tests for proteins, starch and reducing sugar on the solution, using the reagents provided.

Record your tests, observations and conclusions in Table II.

Table II

| | Test | Observations | Conclusion |
|----------------|--|--|--|
| Protein | 10.1 cm ³ of B + 3 drops of m. l. h. n's + heat | Red/purple Coagulation | protein present |
| | Lee of B + 1cc of NaOH + 3/4 drops of CuSO ₄ | purple solution | protein present |
| Starch | 10.1 cm ³ of B + 2 drops of iodine solution + 2 or 3 drops of iodine | black/blue/black dark blue/deep blue purple deep blue/dark blue | Much starch present |
| | | | moderate starch |
| Reducing Sugar | 10.1 cm ³ of B + 1cc of Benedict solution (schups) + Fehling solution and heat / boil | Green/yellow solution/ppt beyond yellow OK Blue solution | little/moderate reducing sugar present |
| | | | Reducing sugar absent |

(10 marks)

Amylase

- (ii) To 5cm^3 of solution B, add 2cm^3 of solution Y provided.
 Incubate in a water bath at $35 - 40^\circ\text{C}$ for 5 minutes. Repeat
 the tests in Table II above using the incubated mixture.
 Record your observations and conclusions in Table III.

Table III

| Test | Observations | Conclusion |
|-------------------------|--|---|
| Test for protein | <p>It turns purple</p> <p>It turns Red/pink</p> <p>Coagulation</p> | <p>protein present</p> <p>62</p> |
| | <p>It turns purple</p> <p>Water solution</p> | protein present |
| Test for starch | <p>Brown / yellow color</p> <p>Cloudy ✓</p> <p>or</p> <p>pale blue (faint) / specks of black</p> <p>Red blue alone</p> | <p>Starch absent /</p> <p>Starch hydrolyzed</p> <p>trace of starch</p> <p>present</p> <p>62</p> |
| Test for reducing sugar | <p>Yellow (orange)</p> <p>brown precipitate</p> <p>Accept green solution if was blue in table II</p> <p>Yellow</p> | <p>Increased /</p> <p>much reduced</p> <p>sugar present</p> <p>traces of reduced sugar present</p> <p>moderate reducing sugar</p> <p>02</p> |

Observation and Conclusion of amylase test (06 marks)

In Table III, the results are not yet written.

- (iii) From the results in (c)(ii) suggest the nature of solution Y.

Starch hydrolysis / digest / break
agent / enzyme / catalyst / Carbohydrates
/ less enzymatic property / in nature. 5

Re^s Amylase / salivary amylase / deactivator for enzyme der
all 2 marks / reject active substance / rest action / work or
Q7 (as a ^(iv) State one property of solution Y shown by the results in (c)(ii).
~~other~~ or state

It is specific in action. Since at hydrolysis
Starch only but not protein / hydrolysis
Ferul only. 5.

(02 marks)

3. (39 minutes)

Banana
Carica
nivea
Linn

40

You are provided with specimens C, D, E and F which are inflorescences.

- (a) Observe each specimen and describe the pattern of arrangement of florets. (04 marks)

Banana

C Arranged / crowded / clustered / grouped in
two rows; attached at base / one
point of spathe or bract / covered in it
spathe / on inner surface \Rightarrow Spathe /
bract. Attached directly / serrated / unft
ked on peduncle. any the

D

Messia

Alternately arranged / spirally, at
different part by a pedicel / stalk /
stuccoed / reddish / pedicel of
middle length. any the

1 1/2

3

Maize

E Florets paired; alternately arranged on peduncle; one short stam/~~pedicel~~ /~~pedicell~~ pedicellate / stamens smooth sessile; $1\frac{1}{2}$ enclosed in bract / spicule

Bougainvillea

F Attached on inner upper surface of bract; each floret attached on its bract along midrib / midrib veined in three's into the peduncle / at or 8 stink / pedicel fused with midrib

(b) Remove a single floret from specimens C, D and E.
Examine the florets using a hand lens where necessary.

(i) Give two descriptive features on each of the following floral parts of each floret.

| Floral part | Banana Floret of Specimen C | Cassia Floret of Specimen D | Mango Floret of Specimen E | |
|--|--|--|---|------------|
| Pistil any Pis-1 two per lmp. | Labeled Stigma; 3-fused stigmatic surfaces; Inferior ovary; elevated rounded style; brightly Colored stigma; elevated happen ovary; green base | elevated ovary; dull colored ovary; Curved ovary; superior ovary; monoecious ovary; short style; | absent/ none | OB |
| Anthers per lmp. per | Plattened; elongated; flat; pointed; bulked; dull Colored; brightly Colored; Curved An. Tuber | bulked; elongated Thick; curved; variable size Orifice | Elongated, bulked; green; dull colored perpendicularly porous; tan | OB |
| Petals one t/2 | None/ absent | Curved; Free polyhedral; only holly Colored; long; variegated size & prominently varied; papery/tan | None | OB |
| Bracts | prominently veined; large shovel (boat shaped); Curved; thick; spongy; fleshy; dull Colored | thin bracts thin bracts; thin webbed; semi-ovate; semi-oval Dull dull Colored; prominently variegated (perpetual flowering) | OB | (11 marks) |

- (ii) With reference to the information in the table in b(i), state how the florets from specimens D and E are adapted to their modes of pollination. (02 marks)

Florets from D Thick, conspicuous / brightly Coloured petals to attract pollinators. Insect \ominus
re^y brightly coloured only.

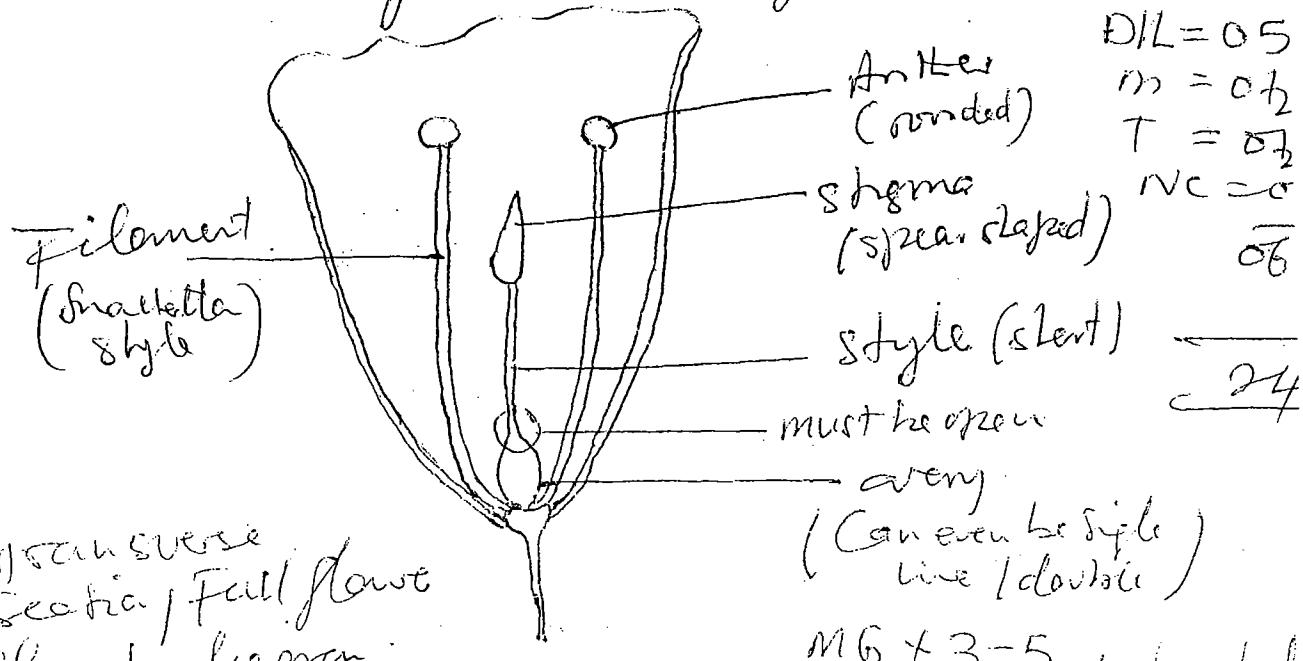
Florets from E elongated anthers for carrying large quantities of pollen to be dropped and blown by wind \oplus

N.B features must be stated in table iii

- (c) Remove one floret from specimen F. Cut it symmetrically into two halves. Observe the internal structures using a hand lens.

Draw one half of the floret and label only the essential reproductive floral structures. (07 marks)

L.S./one half of Specimen F in L.S showing essential reproductive floral structures.



F.S. (transverse
Section) Fall flower
Floral diagram

N.B. If non-essential floral structures labelled in only essential reproductive floral structures drawn and labelled but ~~not~~ M.G. + L.G. only

(72 minutes)

1. You are provided with specimen T which is freshly killed.

- (a) Pin the specimen with the ventral side uppermost. Dissect and remove the skin, taking note of how it is attached to the underlying body wall.

- (i) Describe the attachment of the skin to the body wall. (03 marks)

Skin firmly attached to the body wall, at pectoral forelimbs; pelvic/hind limbs; and throat region; while loosely attached, within the abdomen;

- (ii) Suggest the significance of the way the skin is attached to the body wall as described in (a)(i) above. (03 marks)

Loose attachment has fluid filled spaces to facilitate gaseous exchange, while firm attachment helps to support / hold skin onto the body of the animal;

- (b) Observe the main blood circulation on the skin.

- (i) Describe the pattern of blood circulation on the skin. (04 marks)

One main blood vessel / musculocutaneous vein, from attachment of forelimbs; big sized branches to form into many smaller blood vessels spread all over the skin;

- (ii) Give the significance of the pattern of blood circulation described in (b)(i). (03 marks)

Blood vessels attach to the skin to reduce loss of heat and diffusion of gases. Blood vessels are small and are loosely attached to the skin to reduce damage in case of injury.

(c) Dissect the specimen further to display:

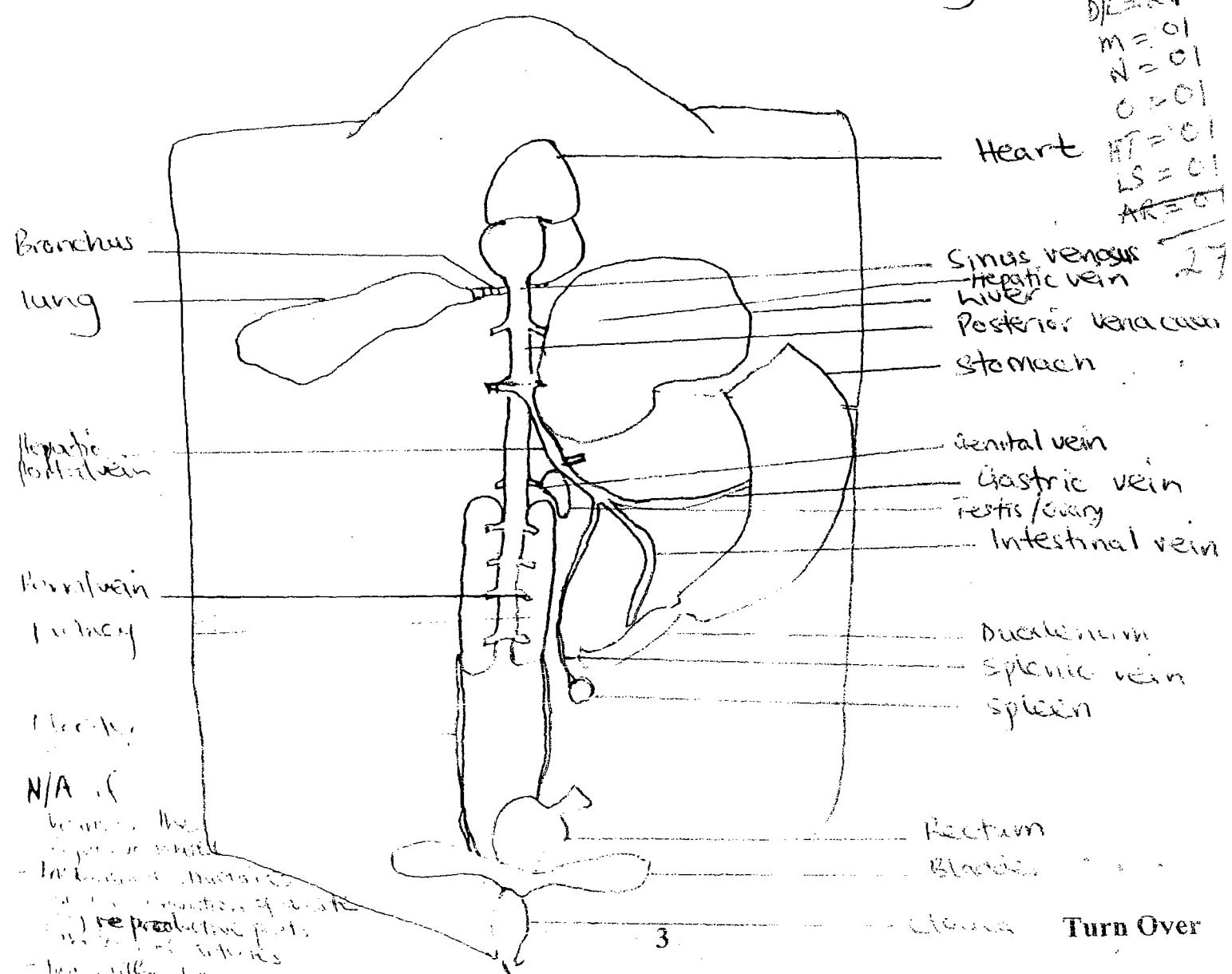
- (i) blood vessels carrying blood from organs located on the left half of the abdominal cavity back to the heart.
- (ii) structures used for the elimination of unwanted materials from the body.

With the heart displaced anteriorly, draw and label the blood vessels and structures displayed in (c)(i) and (ii) on one diagram.

(27 marks)

A drawing of Blood vessels carrying blood from organs located on the left half of the abdominal cavity back to the heart, and structures used for the elimination of unwanted materials from the body of specimen T | Toad | frog, with the heart displaced anteriorly.

$T = 0.1$
 $D/L = 2.0 \text{ mc}$
 $m = 0.1$
 $n = 0.1$
 $O = 0.1$
 $HT = 0.1$
 $LS = 0.1$
 $AR = 0.1$



(69 minutes)

2. You are provided with specimens P and Q and solutions X, Y and Z. Using the solutions, you are to carry out tests on the specimens. Peel specimen Q, then cut from it four cubes of measurements and label as indicated below.

0.5 cm x 0.5 cm x 0.5 cm, label K.

1.0 cm x 1.0 cm x 1.0 cm, label L.

1.5 cm x 1.5 cm x 1.5 cm, label M.

2.0 cm x 2.0 cm x 2.0 cm, label N.

Prepare an extract from each cube as follows:

Grind the cube in a mortar into a paste then add 10 cm³ of distilled water, stir, leave to settle and decant. Label each extract correspondingly.

- (a) Label four test tubes as 1, 2, 3 and 4 and add contents to each as shown in Table 1. Record your observation and deductions in the table. (06 marks)

Table 1

| Test tube | Contents | Observations | Deductions |
|-----------|---|---------------------------------------|---------------------------------|
| 1 | 2 cm ³ of Z and 2 cm ³ of K | few bubbles; No/little foam/froth | Z broken down slowly |
| 2 | 2 cm ³ of Z and 2 cm ³ of L | Moderate; bubbles; little foam/froth | Z broken down moderately |
| 3 | 2 cm ³ of Z and 2 cm ³ of M | many bubbles; effervescent foam/froth | Z broken down fast |
| 4 | 2 cm ³ of Z and 2 cm ³ of N | very many bubbles; lots of foam/froth | Z broken down very fast/rapidly |

- (b) Use extract N to carry out further tests in Table 2. Record your observations and deductions in the table. (4½ marks)

Table 2

| Tests | Observations | Deductions |
|---|---------------------|-------------------|
| (i) To 2 cm ³ of Z add 2 cm ³ of N that has been boiled for 5 minutes and cooled. | No bubbles formed | Z not broken down |
| (ii) To 2 cm ³ of Z add 2 cm ³ of N followed by 2 cm ³ of X. | many bubbles formed | Z broken down |
| (iii) To 2 cm ³ of Z add 2 cm ³ of N followed by 2 cm ³ of Y. | no bubbles formed | Z not broken down |

(c) Explain your results

(i) in Table 1

(06 marks)

Solution K was obtained from the smallest cube, so had the lowest concentration of the active substance enzyme; hence it showed lowest enzyme activity. The concentration of enzyme increased with increasing cube size, with the highest concentration being in N, which was obtained from the largest cube, and showed the greatest activity.

(ii) in Table 2

(02 marks)

Substance X*

Boiling denatures the active substance, so no activity.

Substance X provides a suitable medium for the enzyme ~~act~~ activity.

Substance Y inhibits enzyme activity.

(iii) From the tests in Tables 1 and 2, state the factors that were being investigated.

(03 marks)

- the effect of enzyme concentration on enzyme activity

- the effect of excess heat (boiling temperature) on enzyme activity

- the effect of an inhibitor on enzyme activity

pH

- (d) Peel specimen P and from it cut out a cube of 1.0 cm x 1.0 cm x 1.0 cm and make an extract from it in the same way you prepared earlier extracts. Label the extract P.
- (i) Carry out the following tests to determine the relative abundance of starch, reducing sugar and proteins in extracts P and L prepared in 2(a).

Record your tests, observations and deductions for each extract in Table 3. (12 marks)

Table 3

| Tests | Observations | Deductions |
|---|--|--|
| Starch: 10 cm ³ of the solution in a test-tube add 3 drops of iodine solution | P Brown/yellow colour of iodine retained / specks of blue black | No/little starch present |
| | L Blue black colour observed | Much starch present |
| | P _____ | _____ |
| Reducing Sugar: 10 cm ³ of the solution in a test-tube add 1 cm ³ of Benedict's sol. and boil | P A colour change from blue to green/yellow observed | little/moderate/much reducing sugar present |
| | L Solution remains blue | No reducing sugar |
| | P _____ | _____ |
| Proteins: 10 cm ³ of solution in a test tube, add 1 cm ³ of sodium hydroxide sol. followed by 4 drops of copper sulphate | P A pale purple/violet colour observed | less; protein present |
| | L A colour change from blue to purple/violet observed | Much; protein present |
| | P _____ | _____ |

- (ii) Explain any differences between the contents of P and L observed in Table 3. (05 marks)

..... spreading occurs in P, less substances.....
hypocellulose broken down to cellulose for growth &
development. More is less abundant protein

P. Then in I reducing sugar from the hydrolysis of starch from starch in sprouting tuber. P. Then Q.

(39 minutes)

3. You are provided with specimen S. Cut three thin cross-sections from it and immediately transfer them into a petri dish of water.

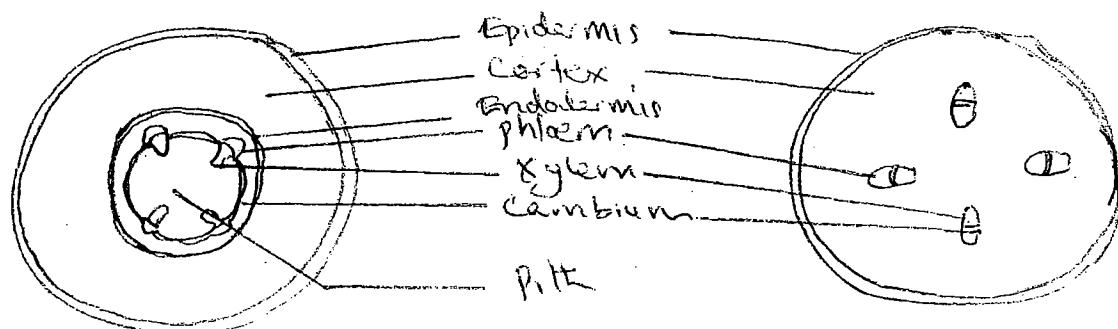
Mount one section in a drop of acidified phloroglucinol on a slide and cover with a cover slip. Observe under the low power of a microscope.

- (a) (i) Draw and label the tissue plan of the section of specimen S.

Drawing of the tissue plan of the section of specimen S (10½ marks)

N/A if detailed cell structure is drawn

$$\begin{aligned} D/L &= 0.1 \\ m &= 0.1 \\ N &= 0.1 \\ T &= 0.1 \\ &\hline C/F \end{aligned}$$



$$MG = K10 - 30$$

- (ii) Draw the structure of one cell from each tissue type found in the section.

(05 marks)

Any 4 cells

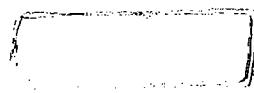
in each cell

T. 0.4
C. 0.4
L. 0.4

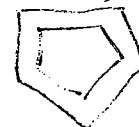
2. 0.4

2. 6

Epidermal cell



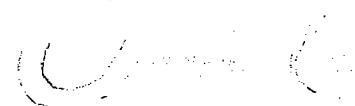
Sclerenchyma cell



Parichyma/cell



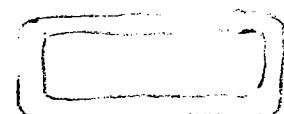
Xylem cell



Phloem cell



Collenchyma cell



(b) Identify the stained tissue in the section of specimen S. (01 mark)

Kylem

01

(i) Giving reasons, state the major group of plants to which specimen S belongs. (03 marks)

Dicotyledon,

- Vascular bundles arranged in a circular pattern in the stem.

Ans

- Central pith

- Presence of cambium; endodermis;

- Clear cortex layer beneath the epidermis;

(ii) Give structural adaptations of the coloured tissue for its function. (02 marks)

- Thick walled for support / mechanical strength.

- Empty lumen for passage of materials.

02

W.M.A

Mar 20

1. (77 minutes)

You are provided with specimen P which is freshly killed.

- (a) Examine the specimen and give five observable adaptive features that enable the specimen to survive in its habitat. (05 marks)

(i) Dorsal-laterally positioned / large bulging /

protruding eyes for wide vision ✓

(ii) Long / muscular hind limbs for propulsive force / forward thrust when jumping / swimming / locomotion ✓

(iii) Short / stout / well built fore limbs to serve / act as shock absorbers when landing / support at rest ✓

(iv) Pointed / triangular / streamlined head or body to ease swimming (OWTIE) ✓

(v) Webbed hind feet / toes / digits for swimming regulation ✓

- Dull / Dark skin (upper / dorsal part) / pale ventral or lower side for camouflage

- Wide gape opening of buccal cavity for consuming prey of large size

- Nostrils / external nares for breathing / passage for gases or air when submerged in water

- (Large / numerous) poison glands for defence / protection (to be unpalatable)

- Nictating membrane to protect / moisten the eye

- Jointed limbs for flexibility (during movement / locomotion) stretch and fold

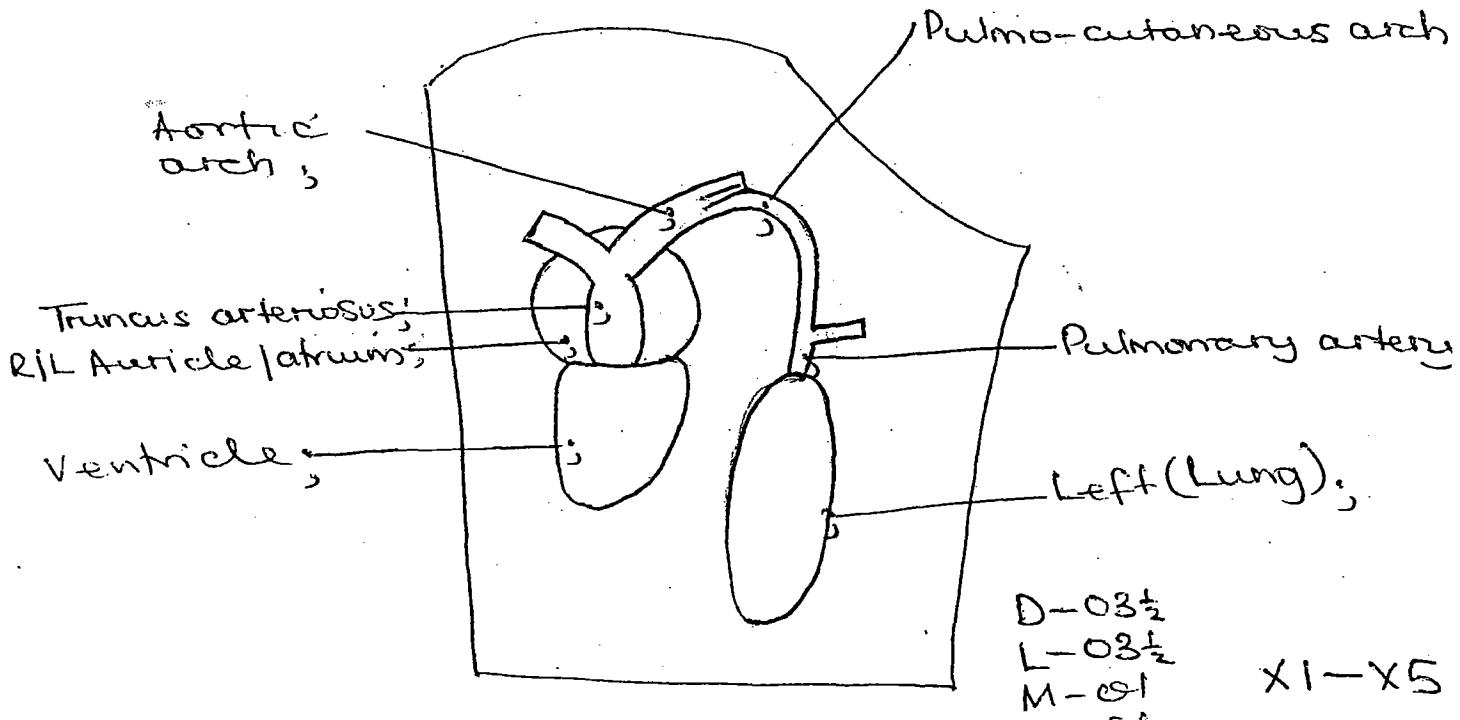
- External ear drum / tympanic membrane for hearing

- Mucus glands for secretion of mucus to moisten skin for gaseous exchange / temperature regulation

(b) Dissect the specimen to display the :

- (i) blood vessels taking blood to the left lung of the animal. Draw and label. (16 marks)

DRAWING OF SPECIMEN P|TOAD|FROG SHOWING
BLOOD VESSELS|ARTERIES TAKING BLOOD TO
THE LEFT LUNG



NA: 1- Any artery not associated with blood flow to left lung drawn and labelled.

2- Any vein is included

3- Both sides drawn and labelled

D-03½

L-03½

M-01

N-01

O-01

T-01

S-01

X1-X5

12

relevant to position of or closed.

NB: - Rej - wrong spelling

- If labelling is within drawing, deny label mark where error has been committed

- Award drawing only if label lines cross

- Deny mark for drawing right side but mark labels

- If heart labelled award drawing independently depending on label lines drawn but award ½ mark for heart.

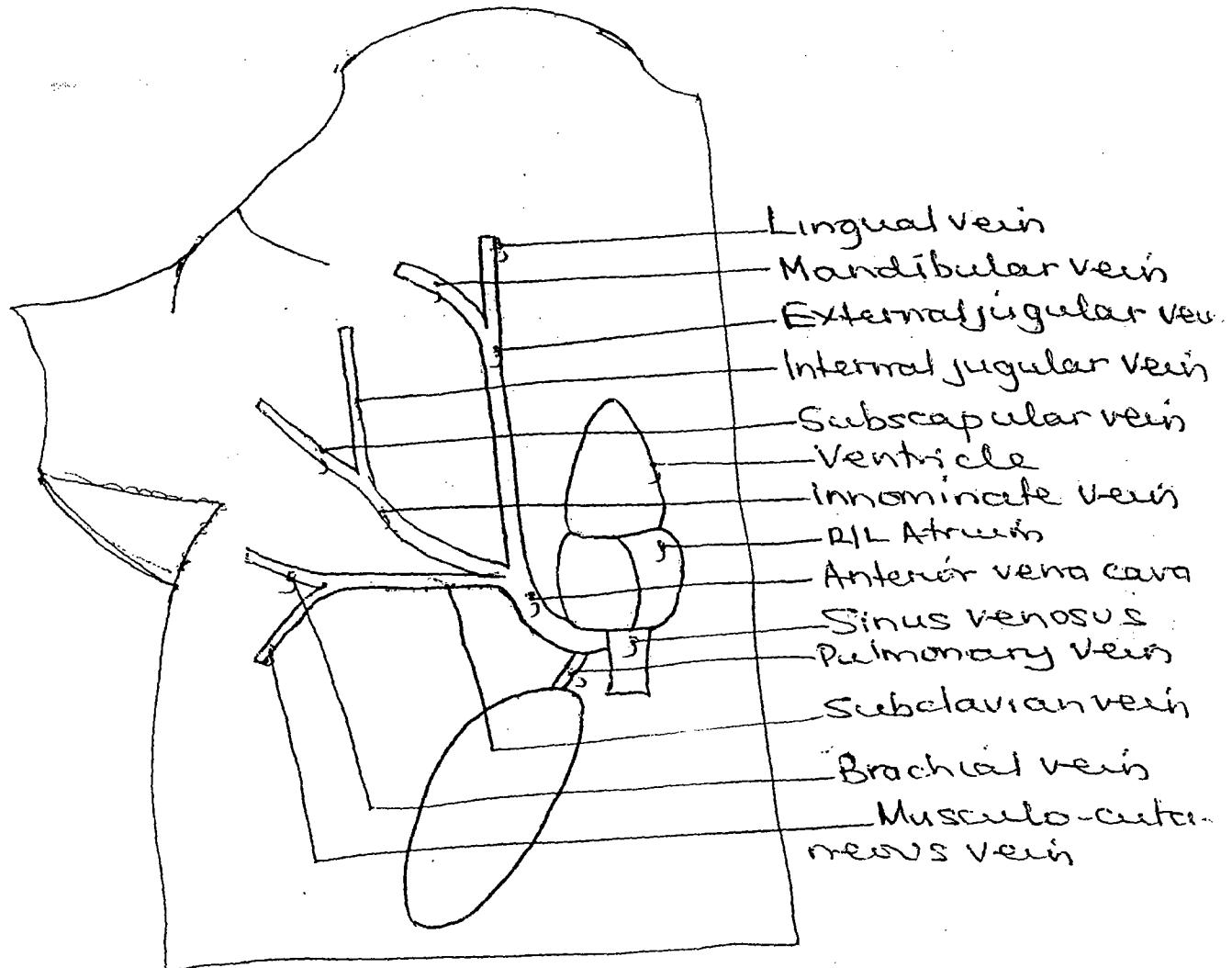
Deny tithe - Specimen not mentioned

- Blood vessels not specified

- Side not specified

- (ii) blood vessels returning blood from the right side of the head and chest region of the animal to the heart. (22 marks)

Drawing of specimen P/Toad/Frog showing blood vessels (veins) returning blood from the right side of head and chest region back to the heart



W.W. Any artery unlabelled

Any vein not associated with head and chest region except posterior vena cava and hepatic vein where if drawn and labelled deny drawing unless best mark labels.

All hepatic vein is drawn and labelled.

All other comments in (b) (i) apply in b (ii) as well.

Ignore if lung drawn and labelled.

Consider proportionality to award drawing mark

19

2. (54 minutes)

You are provided with solutions A, B, C and D which are extracts from seedlings of same type of seed at different stages of germination.

- (a) Carry out an iodine test on each solution. Record your tests observations and deductions in Table 1. (05 marks)

Table 1

(Must show ~~less~~ increasing trend in amount of starch)

(Emphasis on presence of starch)

| Solution | Iodine Test | Observations | Deductions |
|------------------------|---|---|----------------------------|
| A | To 1cm^3 of Sol. A add $1/2/3$ drops of Iodine Solution. | Black / blue-black solution | Much starch present; ✓ |
| B | , | Blue-black / deep blue / trace of blue-black Solution | Moderate starch present; ✓ |
| C | , | Deep blue / trace blue-black Solution | Trace of starch present; ✓ |
| D Ignore | | | |

0.15

0.3

0.3 = 0.75

- (b) Carry out a Benedict's test on each of solutions A, B, C and D. Record your tests, observations and deductions in Table 2. (05 marks)

Table 2

Must show >ing trend
of reducing Sugars

| Solution | Benedict's test | Observations | Deductions |
|--------------|---|---|--|
| A | To 1 cm ³ of Sol. A, add 1 cm ³ of Benedict's sol; and heat/boil. | Blue/green Solution ✓ | Blue - reducing Sugars absent; Green - little ✓ reducing Sugars present; ✓✓ |
| B | | Green/greenish yellow Sol. / yellow ppt ✓ | Green - little/trace ✓ of reducing Sugars ✓ Yellow - moderate reducing sugars present. |
| C | | Greenish-yellow Solution ✓ yellow/orange ppt ✓ | Yellow - moderate ✓ reducing sugars ✓ Orange - much ✓ reducing sugars present. ✓✓ |
| D Ignore. | | Rej.: - brown. | |

02

03

03

= 08.

- (c) Solutions E and F are extracts of seedlings of same type of seed, but different from seed type from which extracts A, B, C and D were obtained. Solution E is from seedlings of the same age as those from which extract A was obtained, while extract F is from seedlings of same age as of those from which extract C was obtained.
- Carry out the following tests on solutions, A, C, E and F.

Record your tests, observations and deductions in table 3.

Table 3

| Solution | Buiret Test | Observations | Deductions |
|----------|---|------------------------------|--------------------------------|
| A | To 1cm ³ of Sol. A add 1cm ³ of NaOH sol. followed by 1/2/3 drops of CuSO ₄ sol. | Solution remains blue ✓ | Proteins absent ✓ |
| C | | Solution remains blue ✓ | Proteins absent ✓ |
| E | | Solution turns purple/violet | Moderately protein present ✓ |
| F | | Solution turns pale purple | trace/little protein present ✓ |

$$02\frac{1}{2} \quad 04 \quad 04 = 10\frac{1}{2}$$

Table 3 continued...

| Solution | Benedict's Test | Observations | Deductions |
|----------|-------------------------------|--|---|
| E | Benedict's test (marked once) | Solution remains blue ✓ | Reducing sugars absent ✓ |
| F | | Solution remains blue/turns pale green | Reducing sugars absent/ very little reducing sugars present |

- (d) (i) From your results in Table 1 and Table 2, arrange the solutions A, B, C and D in order, starting with the solution from the youngest seedlings and ending with that from the oldest seedlings. (01 mark)

A, B, C, ✓ (trend must be correct,
refer to table 1+2)

N.B: Ignore Solution D

- (ii) Give reasons for your answer in (d) (i). Refer to ~~Q4 marks~~

Because amount of starch decreases
from solution A-C, while reducing sugars
increases; since starch is being broken
down/hydrolysed into reducing sugars;
i.e.: changed/converted/digested/acted etc.

Must be tied to table 3 results.

- (e) (i) From your results in Table 3 compare the contents in solutions A and E and contents in solutions C and F. (02 marks)

A has no proteins, E has proteins;
C has no proteins, F has proteins,

OR

A and C - no proteins, ✓

E and F - (little/moderate) proteins, ✓

02

- (ii) Explain your results in Table 3.

(Both must be indicated)

Seedlings from which extracts A and C were obtained do not store proteins, while

Seedlings from which E and F were obtained store mainly proteins, ✓ and some
(if no carbohydrates) but no carbohydrates, ✓

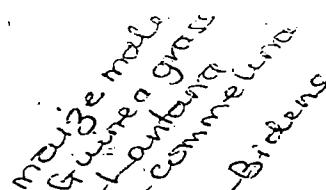
(if no carbohydrates)
As germination proceeds some of the stored carbohydrates is broken down,

hydrolysed into reducing sugars (F.) and the stored protein is broken down/hydrolysed used up as germination progresses.

right

4

3. (49 minutes)



Specimens Q, R, S, T and U are reproductive parts of different plants.

- (a) Remove one of the outer most flowers and one flower from the middle part of specimen U. Using a hand lens examine the two flowers and state two differences between them. (02 marks)

Outer Ray | Irregular

| | | | |
|-----------------------------------|-----------|--|--------------------|
| Mark 1st two; Ignore the rest. | base only | (i) - Open corolla towards apex tubular corolla; ✓ | Tubular corolla; ✓ |
| | | - zygomorphic; ✓ | |
| | | (ii) - Corolla white in colour Corolla yellow in colour | Hermomorphic; ✓ |
| | | - Style/stigma/ovary Anthers style/stigma/ovary anthers absent present; ✓ | |

02

- (b) (i) Using a hand lens examine a flower from each of specimens Q and R. Describe the structure of each flower.

Flower from Q.

(04 marks)

Bracts present which are large, dull coloured, boat shaped | curved; pointed | tapering; outer bracts - rough | hairy, thick, hard | tough | stiff; inner bracts - smooth, thin | papery | membranous, semi-transparent | translucent

Mark any
8 @ f

at tip | paired
enclosing stamens; parallel veined; paired
Unisexual | only stamens present, with thin, flexible; elongated | long filaments and beige, bilobed
anthers which hang outside | are pendulous | loose
attached; free stamens; alternating florets from pedicel
florets paired

Flower from R.

(04 marks)

Bracts present which are variable in size | short and long | dull coloured; smooth, boat shaped | curved; hard | tough | stiff; parallel veined; paired; pointed | tapering; Unisexual | Bisexual (pistil and anthers present); stamens with thin, flexible, long | elongated filaments; and long anthers; which hang outside | are pendulous | loose attached; some enclosed; free stamens; Stigma feathery, with two stigma heads; Superior ovary | stalked; florets alternating from peduncle

04

- (ii) State one advantage of specimen R over specimen Q in reproduction. (02 marks)

R is bisexual/hermaphrodite and therefore capable of self-pollination/seed formation/fertilization, while Q is unisexual/staminate and therefore requires another flower of opposite sex for reproduction to occur ✓ 02

- (iii) How is specimen R adapted for pollination? (04 marks)

- Has both stamens and pistil/carpel therefore pollen produced by stamen and deposited easily on stigma ✓
acc. any 3 - Elongated/long/flexible filaments to expose anthers ✓
@ 1mk - 2 stigma heads/feathery stigma to capture trap/avail large surface area for pollen
- Pendulous/flexible/loose attached anthers to easily shake off pollen ✓
- Exposed stigma to capture trap/receive pollen
large anthers to produce large quantity of pollen to increase chances of pollination

0:

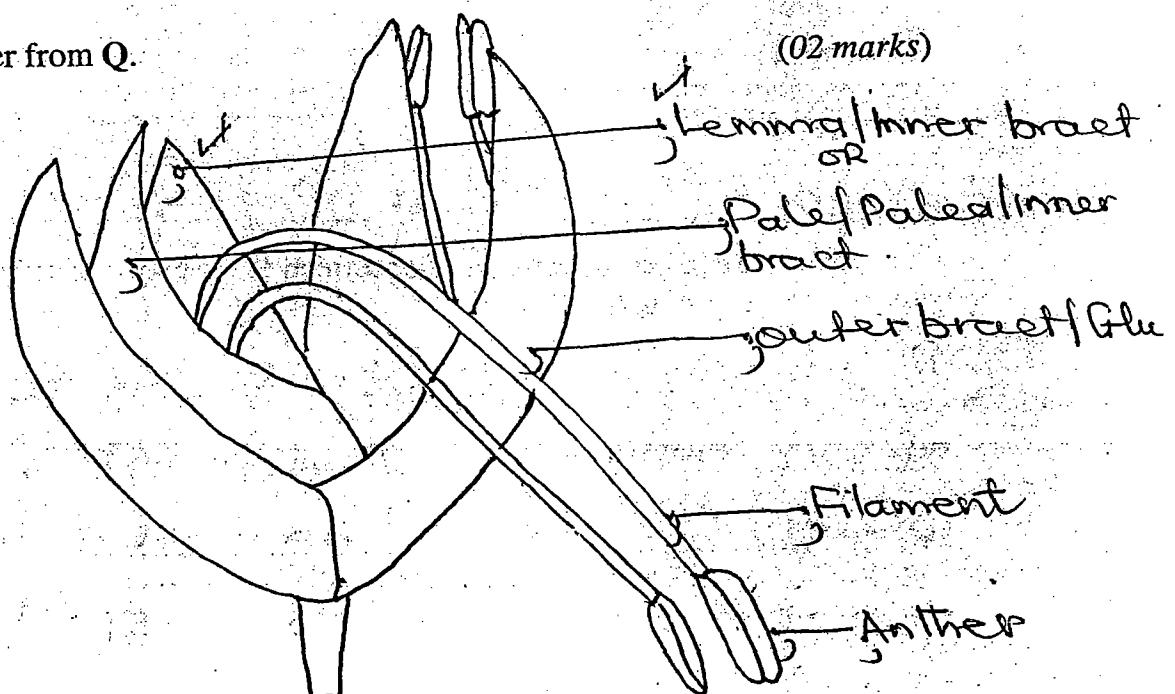
09

(c) Open up one flower from each of specimens Q and R. Draw and label each flower in the space provided.

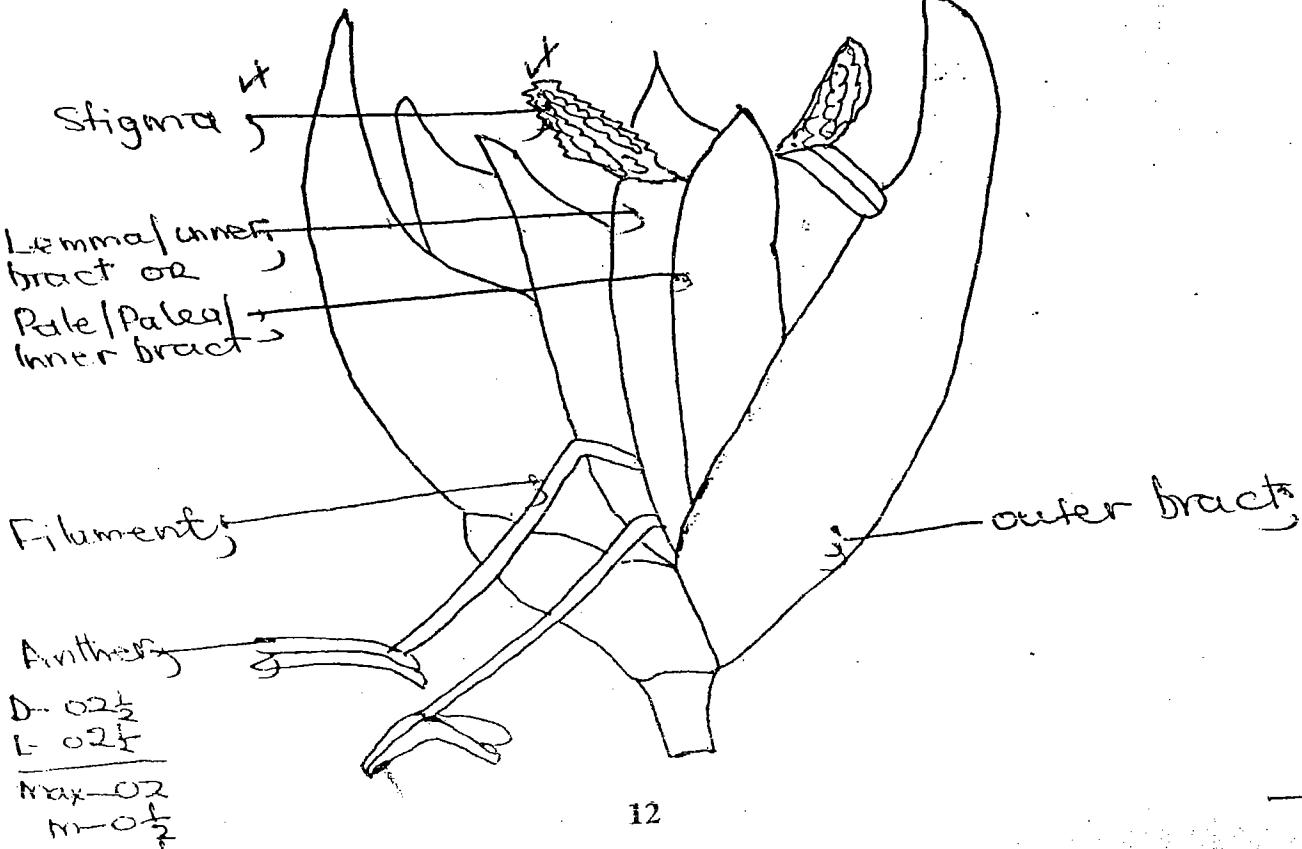
Flower from Q.

$$\begin{array}{r}
 D-02 \\
 L-02 \\
 Max-02 \\
 M-0\frac{1}{2} \\
 N-0\frac{1}{2} \\
 \hline
 03
 \end{array}$$

(02 marks)



Flower from R.



(d) Construct a dichotomous key to identify specimens Q, R, S, T and U. (08 marks)

CHARACTERISTICS OF SPECIMEN TO BE USED IN
CONSTRUCTING THE KEY:

Q - Zea mays

- Florets sessile, numerous; spiral arrangement of spikelets along peduncle; paired; irregular/ zygomorphic
 - Unisexual / staminate / Has only stamens - free
 - Anthers - bilobed, elongated, pendulous, dull coloured, large
 - Filaments - flexible, long, elongated
 - Perianth
 - Bracts - enclose two florets; dull coloured
- KEY:
DICH=01
ID = 05
—
06
- Curved, boat shaped parallel veined; outer bracts - hairy, tough, thick, hard; inner bracts thin, membranous, semi-transparent, smooth

Q - Panicum maximum

variable lengths

- Florets / spikelets - sessile / stalked; numerous; alternate; spiral arrangement along peduncle;
- Di sexual and some staminate; irregular / zygomorphic
- Stamens - refer to Q.
- Pistil - stigma feathery, 2 stigma heads; super ovary
- Bracts - variable size, dull coloured, curved, hard, enclose stamens and pistil

S - Lantana Camara

Florets - sessile, numerous, crowded at apex of peduncle / same levels, in 2 colour all tubular, brightly coloured; outer older inner younger; regular / radial / actinomorph / bisexual

- Pistil and stamen enclosed in petals; super ovary
- Has involucre of bracts which are dull col.
- Sepals
- Apex of peduncle flabbed
- Free stamens

T - Commelinidae spp

Florets - Bisexual

- Brightly coloured petals and sepals
- Stalked
- Free petals / polypetalous
- Irregular / zygomorphic / Bilateral symmetry
- Single / solitary / few.
- Anthers brightly coloured
- Long, thin and flexible filaments
- Superior ovary
- Spathe / bract present - curved, parallel veined, hairy / rough

U - Bidens pilosa

Florets - 2 types (Ray / ligulate and tubular / disc)

- Brightly coloured petals
- Dull coloured sepals
- Dull coloured involucle of bracts
- Inner tubular regular / actinomorphic
- Outer Ray - irregular / zygomorphic
- Ovary inferior
- Sessile
- Tubular - bisexual with stigma at tip of corolla
- Outer - sterile
- Numerous
- Radially arranged
- Crowded at the cup-shaped apex of peduncle
- Sessile
- At different levels / heights (inner taller / longer)

N.B.- Key: use of groups to describe specimen eg Capitulum, inflorescence etc.

- Do not proceed if key does not flow
- Accept any of the given descriptions

Name: Centre/index No. /.....

Signature: *[Handwritten signature]*

P530/3
BIOLOGY
PRACTICAL
Paper 3
Nov./Dec. 2008
3 hours

L 3



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
PRACTICAL
Paper 3
3 hours

INSTRUCTIONS TO CANDIDATES:

Answer all questions.

Answers must be written in the spaces provided. Additional sheets of paper must not be inserted.

| For Examiners' Use Only | | |
|-------------------------|-------|------------------------------|
| Question | Marks | Examiner's No. and signature |
| 1 | | |
| 2 | | |
| 3 | | |
| Total | | |

(69 minutes)

1. You are provided with specimens Q which are freshly killed.

(a) Examine one of the specimens and state two external features in each case, used to classify the specimen into its phylum and class.

(i) Features for phylum. (02 marks)

(1) ~~Exo skeleton / cuticle; Reg - chitin~~

(2) Segmented ~~l~~^{Jointed} body / parts; Reg - division

(3) Jointed appendages / Limbs or legs. Reg - symmetrical

(ii) Features for class. (02 marks)

(i) Three main body division / parts OR Three body division

The first two parts namely, thorax, head and abdomen. 02

(ii) 3 pairs of limbs / 6 legs ✓

(iii) A pair of two antennae ✓

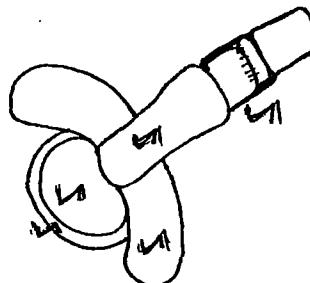
(iv) Thorax divided into 3 parts / segments (ie pro meso & metathorax)

(b) Using a hand lens, examine the left compound eye of the specimen including the first three segments of one antenna, from the base.

Draw the structures observed. Do not label.

(05 marks)

Adrawing of Left Compound eye and first three segments at the base of the antenna of specimen Q



$$\text{no. of segs / NS} = \frac{07}{0} = 2\frac{1}{2}$$

$$n = \frac{07}{2}$$

$$T = 0\frac{1}{2}$$

$$N = \frac{07}{2}$$

$$\underline{05}$$

$$mg + 10 = 40$$

= Hair no marks to 1st and 2nd eye.
= Accept drawing from any side

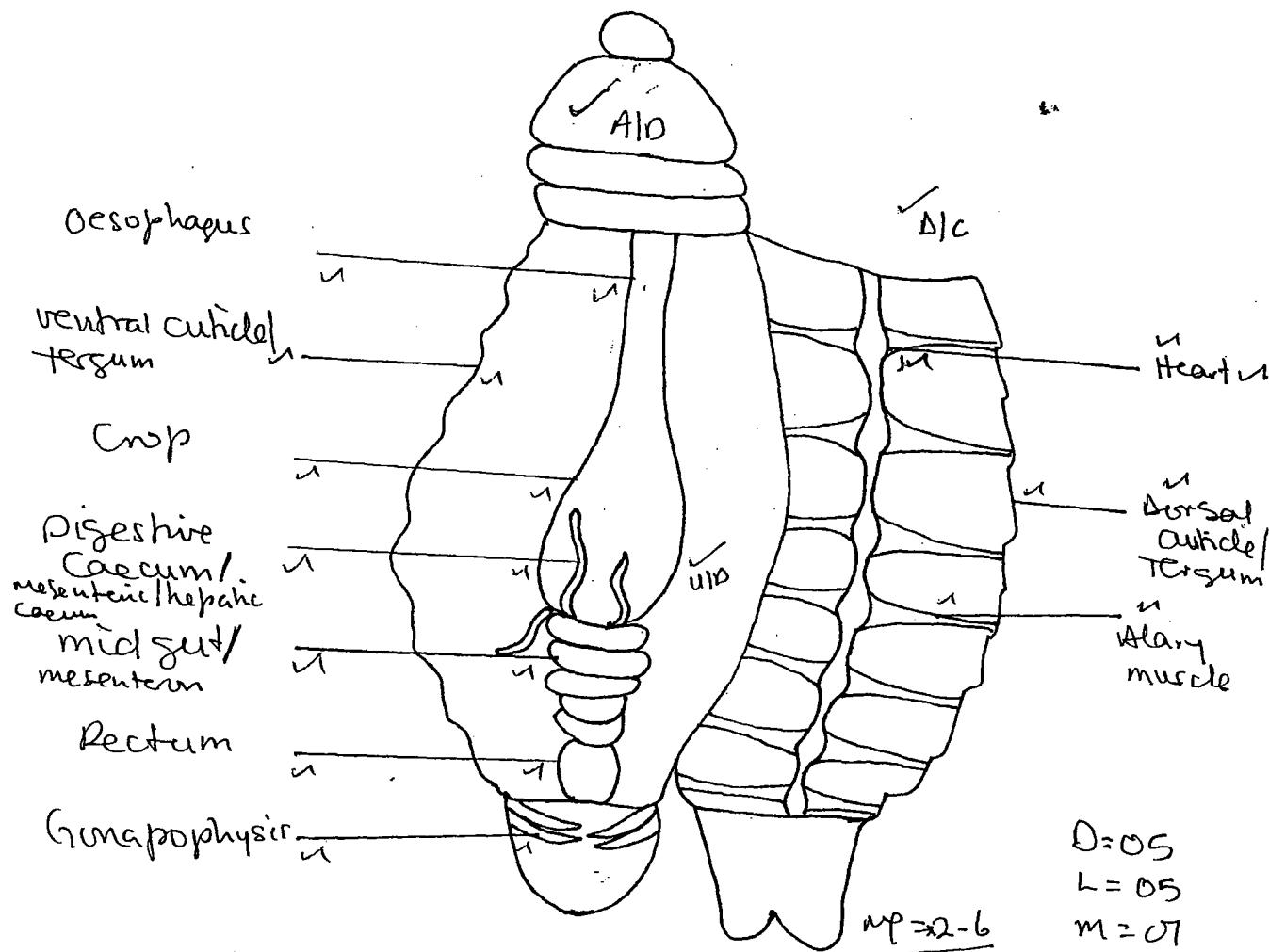
= IR = If whole or part of
" head & draw

= MA = if more or less than
3 segments drawn

MA = if labelled.

- (c) (i) Pin one specimen Q with the dorsal side uppermost. Dissect along the left lateral line of the abdomen. Displace the dorsal cuticle and clear any fat tissue. Without displacing any other structures, draw and label your dissection. (16 marks)

A drawing of structures exposed on ventral and dorsal abdominal cuticles of specimen Q1 without displacing any structures.



Ignore: any external structures drawn
and labelled, colon, and anus, gizzard
malpighian tubules and ileum.

N.B. If any structures in thorax drawn
and labelled.

- if gut is displaced before
drawn & labelled nervous system
- If gut displaced by ventral cuticle

$$\begin{aligned} D &= 05 \\ L &= 05 \\ M &= 07 \\ N &= 07 \\ T &= 07 \\ O &= 07 \end{aligned}$$

$$\begin{aligned} AID &= 07 \\ DIC &= 07 \\ undispaced VIB &= 07 \end{aligned}$$

17

- (ii) By further dissection, cut and remove the whole alimentary canal to clearly display the structures on the ventral cuticle (*keep the alimentary canal for Q2*). Draw and label the structures associated with the ventral cuticle, anterior to the last abdominal segment. (13 marks)

~~Adrawing of structures on the ventral cuticle
of specimen Q anterior to the last abdominal
segment without the alimentary canal.~~

~~skip~~

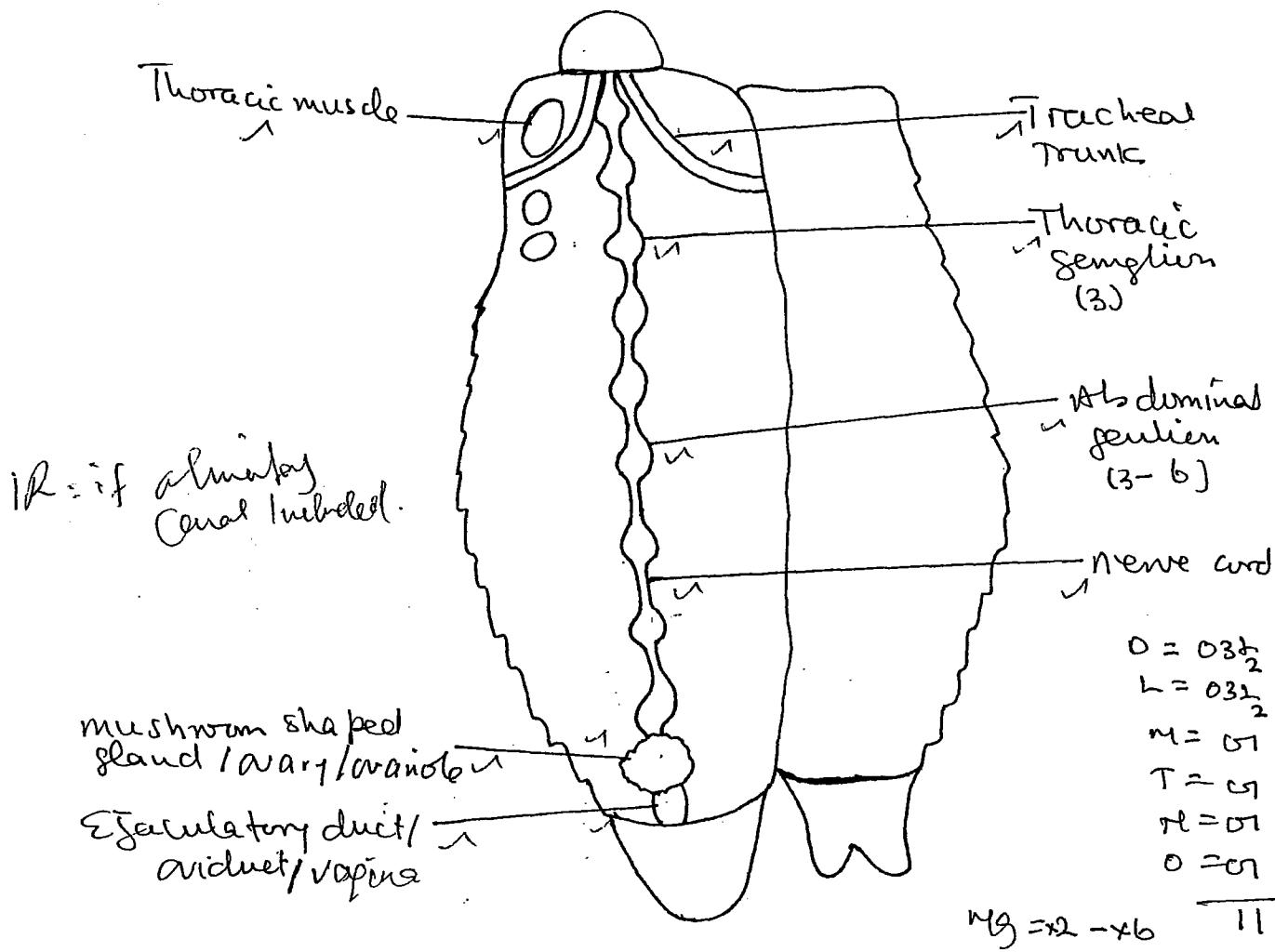


FIGURE Whole salivary apparatus, testes, vas deferens

1. R = If any structure on the last abdominal cuticle drawn and labelled.

= Head or any of its parts drawn & labelled

1. R Relevant
 (if) - if alimentary Canal included .

(59 minutes)

2. Solutions P_1 , P_2 and P_3 are extracts of different plant organs. Carry out the following tests in tables 1, 2, 3 and 4 to determine the nutrient content of each solution. Record your tests and observations in the tables.

(i) Benedict's test

P_1 = Beans P_3 = newly ripe
orange
 P_2 = Potato

Table 1

| Test | Observations |
|---|---|
| To $1/2 \text{ cm}^3$ of soln was added $1/2 \text{ cm}^3$ of Benedict's reagent / soln and acid. | P_1 Blue soln / colour ✓ P_2 Green soln / yellow ppt / yellowish-green soln / greenish yellow ppt ✓ P_3 yellow / orange / Brown precipitate ✓ |
| If leaf = more absent ^{absent} after with <u>Cu²⁺</u> | |
| | 02 |

01 $\frac{1}{2}$ (04 marks) = 03 $\frac{1}{2}$

(ii) Biuret test

Table 2

| Test | Observations |
|--|--|
| To $1/2 \text{ cm}^3$ of soln was added $1/2 \text{ cm}^3$ of Biuret soln followed by $1/2$ to 3 drops (for 1 cm^3 of soln) or 2-6 drops (for 2 cm^3 of soln) of CuSO ₄ soln. | P_1 (intense) purple soln (deep) violet purple soln / color P_2 pale purple / blue / violet soln ✓ P_3 Blue solution ✓ |
| accept if colored purple used for no. 1 is used for no. 2 | Biuret = blue - turn - from In 10°C the me these above tests are to |
| | 04 |

02 $\frac{1}{2}$

07 $\frac{1}{2}$

(04 marks)

(iii) Iodine test

Table 3

Ref - deep blue / Faint

| Test | Observations |
|--|--|
| To $1/2 \text{ cm}^3$ of SO_2 was added $1/2/3$ (or 1cm^3) or 2-6 (or 2cm^3) drops of iodine (solution) | P ₁ pale / specks of blue-black / black SO_2 ✓ P ₂ blue black / black SO_2 ✓ P ₃ brown / yellow SO_2 ✓ |

01 $\frac{1}{2}$

01 $\frac{1}{2}$ (04 marks)

03

(iv) DCPIP test.

Table 4

| Test | Observations |
|--|---|
| To $1/2 \text{ cm}^3$ of DCPIP SO_2 was added surprise of food solns. ✓ | P ₁ Blue colour remains ✓ P ₂ Blue colour remains ✓ P ₃ Blue colour decolorised / clear / fun: colourless blue color clear ✓ |

01 $\frac{1}{2}$

01 $\frac{1}{2}$ (04 marks)

03

any class

P₁ = orange
P₂ = sweet potato
P₃ = rice seed.

- (b) From your results suggest the plant parts that the solutions were obtained from. Explain your answer. (02 marks)

P₁ Seed has stores (much) protein and little starch.

P₂ Root tube/tube/stem tube has/stores (much) starch and little protein.

P₃ Fruit has/stores (much) Acetic acid/vitamin C and much ~~sugars~~ R-sugars.

04

- (c) Dissect the second specimen Q, remove the alimentary canal and cut out the foregut and midgut. Cut out the foregut and midgut from the alimentary canal of the previous dissection for question 1 as well. Put all the foreguts and midguts in a mortar, grind into a fine paste and add 3 cm³ of water. Stir, leave to settle and decant to obtain extract C. Divide the extract equally into three test tubes labelled as P₁, P₂ and P₃.

To test tube P₁ add 3 cm³ of solution P₁, to test tube P₂ add 3 cm³ of solution P₂ and to test tube P₃ add 3 cm³ of solution P₃. Incubate the test tubes at 35 – 40°C for 20 minutes. After 20 minutes, carry out the tests in Table 5 on the contents of each test tube to establish the effect of extract C on solutions P₁, P₂ and P₃.

- (i) Record your observations in the table.

Table 5

Refer to (correct procedure
of Table 1, 2, 3)

| Contents (near) Intense of test tube P ₁ | Observations after 20 minutes. | | |
|--|--|--|---|
| | Biuret test | Iodine test | DCPIP test |
| purple/blue SOL ^b ✓ blue SOL ^b | pale (pale) purple/blue SOL ^b ✓ | pale blue SOL ^b ✓ v. few specks of blue black/black brown/yellow SOL ^b | It remains blue (It turns pale blue) |
| Of test tube P ₂ | pale purple/ blue/violet SOL ^b ✓ blue SOL ^b | moderately blue black/pale blue/black/ black SOL ^b / brown/yellow | It remains blue It turns pale blue ✓ |
| Of test tube P ₃ | Solution remains blue ✓ | SOL ^b remains brown/yellow ✓ | blue color is deeper ideal ✓ |

03 03

7

03

(09 marks)

03

Turn Over

13h 12m

(ii) Explain your results of the tests with the contents of

(04 marks)

test tube P₁

Amount of starch greatly reduced with little reduction of protein content. Extract ^{partially} has enzymes that break down starch but ^{completely} breaks down protein. ⁰²
test tube P₂ or does not break down protein (if protein content remains the same in table 2 + 5 the same.)

Amount of starch greatly used (absent). Amount of protein reduced even less remains the same. Extract C has enzymes that break down starch but not protein. ⁰²
or has little protein - if table 2 - no protein but 5 - has protein. ⁰²

test tube P₃

Vitamin C in table 4 and 5 remain the same in amount. ^{still} Since there is no breakdown of Vitamin C ⁰¹
(C by enzymes in C)

(iii) From your results in (c) (i), state two properties of the active substances in extract C. ^(02 marks)

- (i) It is specific in action. ^(breaks starch but not protein) ⁰²
- (ii) Catalyses breakdown of starch and protein ⁰²
- (iii) If it is active / breaks down protein and starch in a temperature range of 35-40°C ⁰²
0.8h

TOT 35L met 34

(52 minutes)

3. Specimens R, S and T are inflorescences. Examine the specimens using a hand lens where necessary.

(a) Describe the structure of the inflorescence and flowers of each specimen.

(i) Specimen R. Panicum maximum ^{2.2} ^{0.4} ^(08 marks)

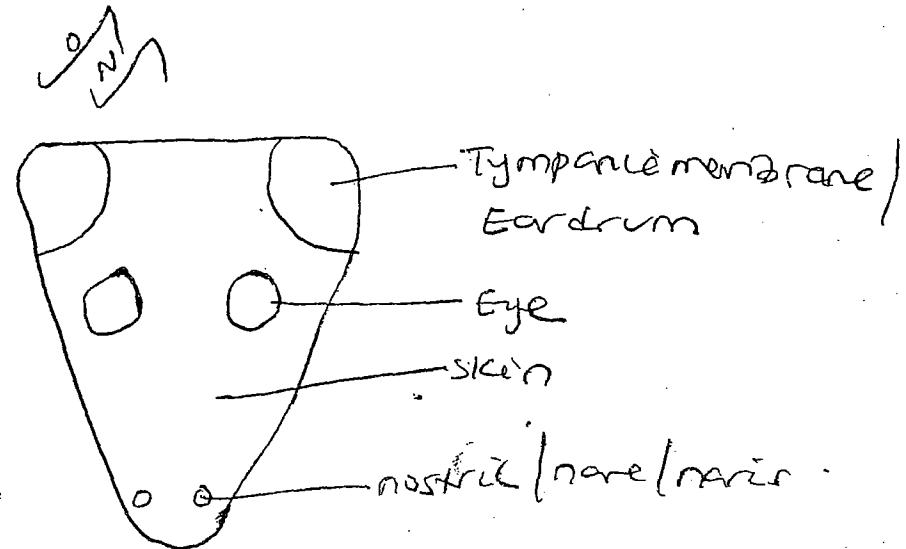
Structure of inflorescence.
Centrifugal

Has main axis peduncle Rachis with lateral branches of variable length reducing up wards apex, attached opposite whorly / alternately having numerous glomerules / flowers ⁰⁷

- (c) Examine the head of the specimen and draw and label the dorsal view of the anterior part of the head to show the structures for sensitivity.

(05 marks)

A drawing of the dorsal view of the anterior part of the head to show the structures for sensitivity of specimen K.



$\times 1-10$

T - $\frac{0}{1}$
m - $\frac{0}{1}$
o - $\frac{0}{1}$
n - $\frac{0}{1}$

b - $\frac{0}{2}$

L - $\underline{\underline{02}}$

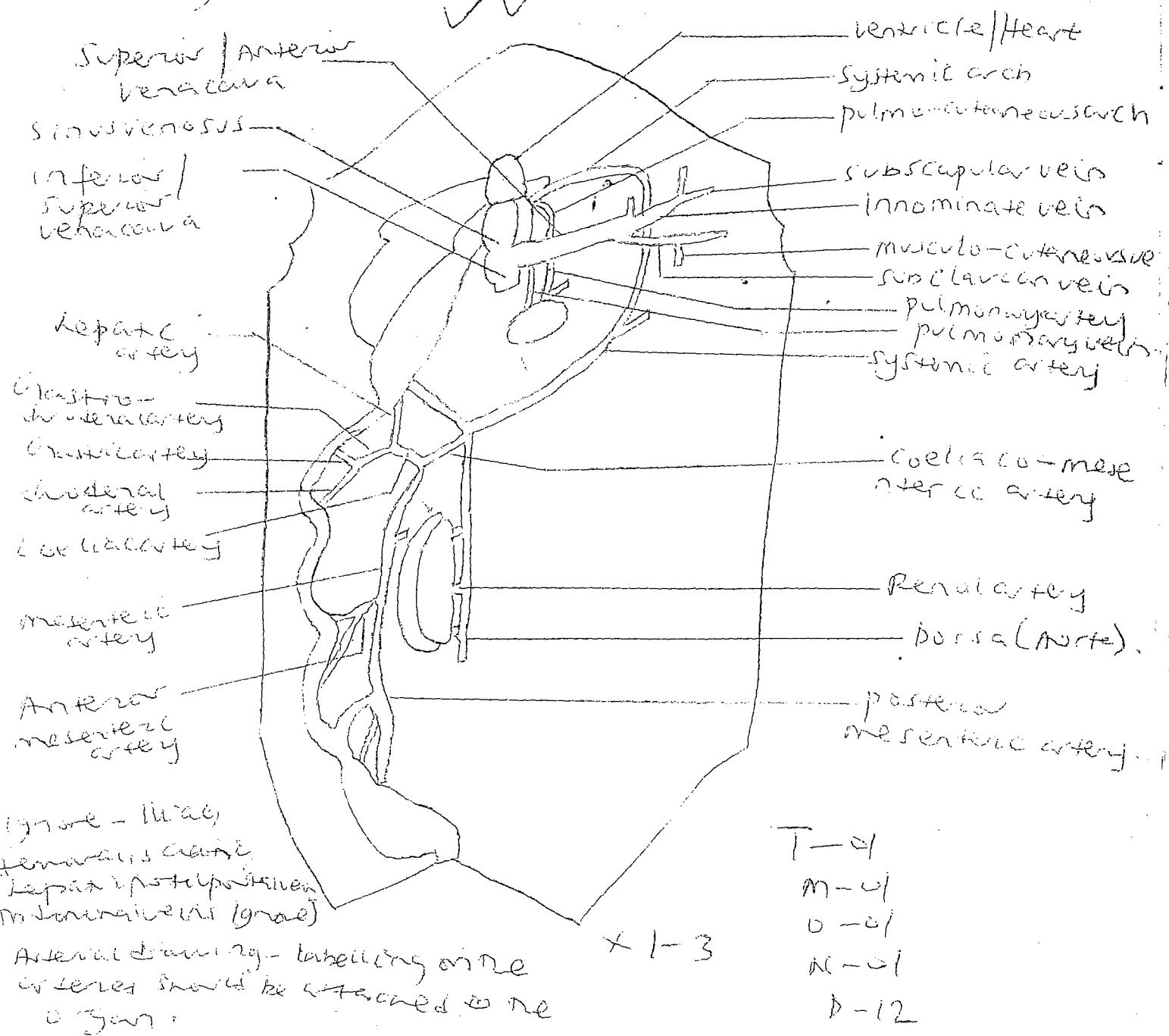
05

(d) Dissect the specimen to expose the heart. Turn the heart over to display the main blood vessels

- (i) returning blood from the trunk region to the heart.
- (ii) supplying the structures for absorption of nutrients and excretory organs.

Draw and label,

~~returning of blood vessels returning blood from the trunk region to the heart & supplying structures for absorption of nutrients and excretory organs when the body is turned over of specimen k.~~



T-1
M-1
D-1
N-1

P-12

L-12

28

A-A Arteria carotis, subclavian, lingual
anterior tibial artery

N-n - venae - venae, lingual,
anterior tibial vein

Arteries should be directed to your left for venae should

(56 minutes)

2. You are provided with solutions D, E and X. You are to carry out tests on solutions D and E and investigate the action of X on the solutions.
- (a) Carry out tests in Table 2 to determine the food nutrients in D and E. Record your tests, observations and deductions in the table. (12 marks)

Table 2

| Tests | Solutions | Observations | Deductions |
|---|-----------|--|--|
| Benedict's test To 1/2 cm ³ of solution D/E addition here 27. | D | Colourless solution turns to pale / faint / light blue solution / pale green / green solution | R is absent w trace R is present P present |
| Benedict's solution on soil | E | Milky / cloudy / turbid solution / suspension, turns pale blue | trace / little R is present |
| Iodine test To 1/2 cm ³ of solution D/E add 2/3 drops of iodine solution | D | Colourless solution turns to yellow / pale yellow / pale brown solution | Iodine is absent |
| | E | Milky solution turns blue-black / black solution | much starch present |

12

- (b) Label four test tubes as 1, 2, 3 and 4 and add contents to each test tube as shown in Table 3

Table 3

| | |
|-------------|--|
| Test tube 1 | 1cm ³ of X + 3cm ³ of D. |
| Test tube 2 | 1cm ³ of X + 3cm ³ of E. |
| Test tube 3 | 1cm ³ of X + 5cm ³ of D + 1cm ³ of Y. |
| Test tube 4 | 1cm ³ of X + 3cm ³ of E + 1cm ³ of Y. |

Incubate the test tubes for 30 minutes in a water bath maintained at (37 – 40)^oC.

After 30 minutes, divide the contents of each test tube into two and carry out the iodine and Benedict's tests as shown in Table 4. Record your observations and deductions in the Table. (16 marks)

Table 4

| Tests tube | Test | Observations | Deductions |
|------------|-----------------|--|---|
| 1 | Iodine test | milky colorless turbid, solution turns to pale yellow pale brown yellow solution | starch absent. |
| | Benedict's test | milky cloudy turbid solution turns to pale blue solution to green solution, yellow precipitate, + orange precipitate. | much R.S. present. |
| 2 | Iodine test | deep blue pale blue - black purple pale black solution Sooty + black precipitate. | - little/ moderate starch present. |
| | Benedict's test | pale blue solution green solution pale green solution | - R.S absent + little R.S present. |
| 3 | Iodine test | pale yellow yellow pale brown solution | - starch absent. |
| | Benedict's test | - green solution yellow precipitate greenish/yellow precipitate | little R.S / or moderate R.S present. |
| 4 | Iodine test | blue - black / black deep blue / deep purple or pale black solution | - much / moderate starch present. |
| | Benedict's test | - pale blue solution | R.S absent. |

not makes
topFinal
answer

(c) From your results, state the nature of solutions X and Y giving reasons for your answer.

(i) X (03 marks)

Contains active substance (enzyme that break

down/hydrolyse) digests solution D (starch)

- It breaks down solution D to reducing sugars

Starch is reduced in quantity / it is specific

in that it hydrolyses / breaks down solution D

but not starch

- It's inhibited by solution Y as their less
hydrolysis / activity in presence of solution

(ii) Y (01 mark)

It is an inhibitor because it

reduces the ~~negative~~ activity of solution

X in titres

(56 minutes)

3. You are provided with specimens P, Q, R, and S.

- (a) Examine them and state the phylum of each specimen giving a reason in each case. (08 marks)

| Specimen | Phylum | Reason |
|----------|--|--|
| P | Chlorophyta | - spiral chloroplast / filaments with green pigment. - Septate filament. |
| Q | Zygomycota / Zygomycetes | - sporangiophore / stalk with sporangium / branched hyphae / vertical hyphae / mycelium / non septate hyphae / a septate - sporangium / rhizoids |
| R | Bryophyta | - Body differentiated into simple leaves / stem - spirally arranged leaf like structure - Gametophyte anchored by rhizoids / sporophyte attached to gametophyte / sporangium / capsule / spores, in extent of stalk / stalk / sporangiosphere - false leaves or simple leaves / leaf like structure |
| S | Angiospermophyta / Tracheophyta / Angiospermophytina / Spermatophytina | - Body / sporophyte differentiated into true roots, stems and leaves - presence of flowers / seeds - presence of vascular bundles - Accept root / stem / leaves |

- (b) Obtain a unit of P, mount it in water on a slide and observe under medium power of a microscope.

State how the specimen is adapted for nutrition.

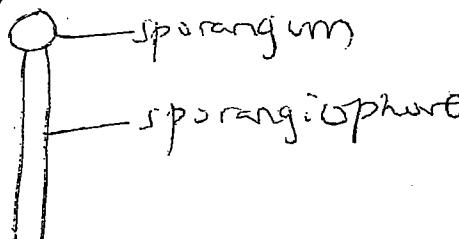
(01 mark)

- Chloroplasts for trapping light for photosynthesis
- spiral chloroplast to use SA for sunlight for photosynthesis or more surface of cell / anisotropic conditions
- Green pigment to absorb sunlight for photosynthesis
- cytosol for food storage

- (c) (i) Isolate one functional unit of specimen Q growing vertically.
 Put it on a slide and observe under medium power of a microscope.
 Draw and label. (04 marks)

A drawing of one functional vertically growing unit
 of Specimen Q.

✓



reject outline if
 other structures not
 required are drawn) ($\times 30-100$)
 N.B - If drawings (if any) are drawn

| | |
|-----------|--|
| T - 0½ | |
| M - 0½ | |
| B - 0½ | |
| N - 0½ | |
| D - 0½ | |
| L - 0½ | |
| <hr/> | |
| <u>0½</u> | |

- (ii) Dust particles of Q from tips of vertically growing structures onto a slide. Observe under medium power of a microscope.
 From the structures of Q explain how it is adapted for propagation. (03 marks)

- produces many spores \rightarrow increase of propagation.
- colonization | dispersal.
- slender sporangiophore to store large no. of spores to increase chances of propagation.
- long sporangiophore to expose sporangium to ease spore dispersal.
- small spores which are light to be easily blown by wind.
- Numerous sporangium to store many spores for propagation.

- (d) (i) Examine specimen R and suggest its habitat. (01 mark)

moist/damp place | Damp shaded terrestrial soil |
 tree trunks | walls of houses | buildings ✓

- (ii) Isolate one unit of R and examine it. State how the specimen is adapted for survival in the habitat stated in (d) (i). (04 marks)

- long seta/stalk / sporangiophore to expose sporangium /
spore capsule for easy spore dispersal

- Numerous rhizoids/rhizoids for anchorage / absorption of nutrients

- Green leaves for trapping light for photosynthesis / more surface

- Spirally arranged leaves to increase SA / of exposure to sunlight

- Erect / upright sporangiophore to expose spores for dispersal

- Numerous leaves to increase SA for light absorption

- Thin rhizoids to ease absorption of nutrient
of nutrients

- Large / swollen sporangium / capsule to store many spores.

- (e) (i) Examine specimen S and state the class of plants it belongs to. (01 mark)

Dicotyledonae / Angiospermae

- (ii) Give three descriptive features of specimen S which qualify it to be in the class stated in e (i). (03 marks)

- One main root with numerous lateral branching / long /
tapering main root

- leaves attached to stem by short / ground / long / short /
smooth stalk

- leaves with network of veins / venation / mesh network of
veins

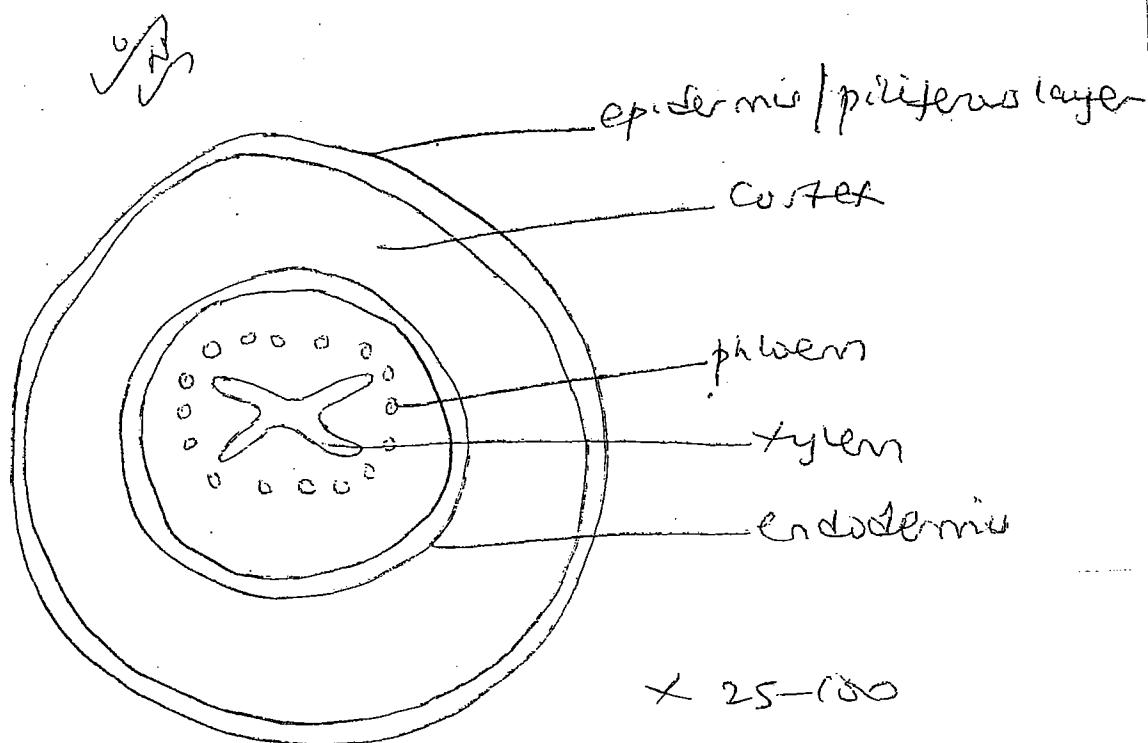
- leaves with broad laminae

reject - system is network system

Ans 3

- (f) Cut a thin traverse section of the main root of specimen S. Place it onto a slide and observe under low power of a microscope. Draw and label a plan to show the arrangement of tissues. (05 marks)

Drawing of transverse section of root of Specimen S showing arrangement of tissue plan.



T - O_2
M - O_2

O - K

D - O₂

L - O₂

OB

K - toad
P - sponge
Q - Broad mural
R - Moss plat
S - Amaranthus
D - Senna 28 Ar
E - Stark 19 Ar
X - yeast 16 Ar
Y - 22 Ar
24 Hcl

Nopawa Hellene

Beech's
flat
no 2-3

Noboro Coalbed

1. Spiculeh some single / in groups of 2/3 all having
Stalks which are varying in length attached alternately
The lateral and main axes have terminal spiculet.
Max = 04

Structure of flowers.

Stalked covered by / enclosed by bracts outer being thick /
hard / tough smooth parallel veined curved boat shaped
 tapering towards apex and inner thin membranous / papery
Bisexual, stamen with long slender filament and
large, long, elongated whitish anthers
Pistil with two feathery stigma heads and superior
away Zygomatic / irregular flower Max = 04

(ii) Specimen S Bidens pilosa

(10 marks)

Structure of inflorescence.

Numerous crowded sessile florets / flowers
Attached onto the a flattened / cup-shaped / expanded
slightly curved apex of main receptacle with
a concentric / radial / circular pattern of floret
arrangement / tubular / disc floret at the
Centre surrounded by ray / ligulate floret on
The outermost side covered by / surrounded
by involucre of bracts. Max = 04

Structure of flowers.

Two types of flowers both sessile with fused Corolla/petals
 Inner/Ray ligule hairy flattened broad open corolla
 at apex which is tubular at the base Zygomatic
 irregular free ~~sharp~~ spiny Sepals
 Inner/tubular/disk flower being bisexual with tubular
 Coroll Corolla free spiny Petals /sepals /calyx
 pistil with long elongated inferior ovary and forked
 stigma zygomorphic regular
 stamens with fused bilobed elongated long anthers
 and short filaments with regular symmetry $Mop = \frac{5}{2}$

(iii) Specimen T n/a 130

(04 marks)

Structure of inflorescence.

^{Central axis}
 Has a main axis/rachis/raceme in which numerous/
 many/paired one stalked off perite, flowers are attached
 spirally/alternately with lateral branches each with rows of spikelets
 $Mop = 0.2$

Stalked/sessile covered bracts auto being hard/tough
 thick hairy parallel veined curved/boat shaped
 tiping towards apex. One being thin/membranous/papery
 smooth. Unisexual with only stamen/staminate filament
 being long slender ad anthers large bilobed long $Mop 0.2$
 zygomorphic symmetry

(b) State one advantage and one disadvantage of the structural arrangement of the flowers of specimens R and T.

(i) R

(02 marks)

Adv.

- Alternate arrangement exposes flower to pollination
- crowded/packed results in production of large quantities of pollen grain/increases chance of pollination

Dis

- " crowded/packed for easy/fast spread & disease/pests
- (i) crowded/packed/close to each other makes it conspicuous and (ii) T increases chance of being eaten

(02 marks)

Adv. - Packed/crowded results in production of large quantities of pollen grain/increases chance of pollination

- packed/crowded for support

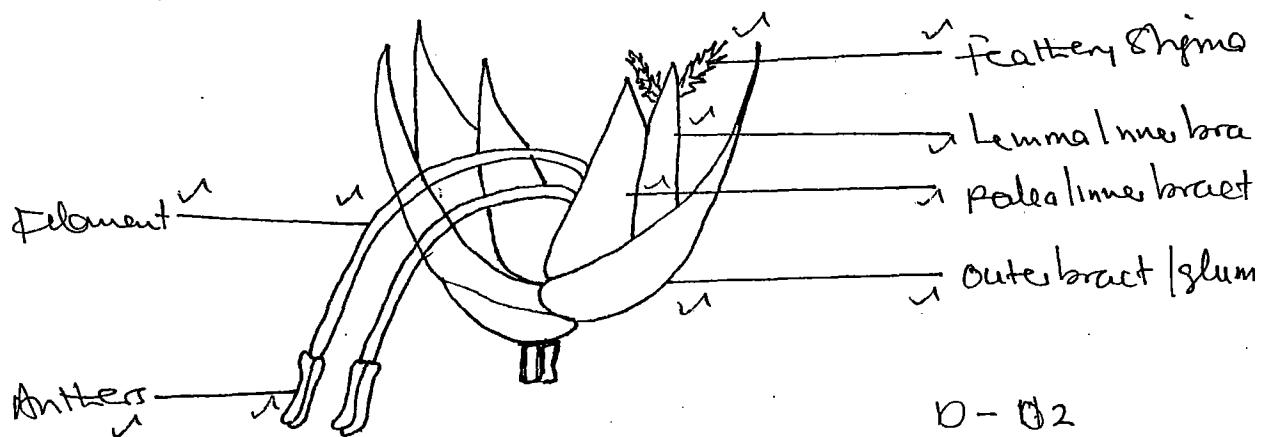
Dis

- packed makes it conspicuous for easy predation
- packed makes spread of disease/infection easy

(c) Using a hand lens, examine one flower of specimen R displacing some structures where necessary to expose all parts.

Draw and label it.

(03 marks)



$$D = 02$$

$$L = 02$$

$$H = \frac{01}{2}$$

$$\frac{01}{2} + 04 = 05$$

MOP D

Conside only for D/L

bract (01)

filament

anther

stigma

$$IR = \underline{\underline{Zero}}$$

29

Name Centre/Index No. /

Signature

P530/3

BIOLOGY
PRACTICAL

Paper 3

Nov. / Dec. 2007

3 hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY

PRACTICAL

Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

Answer all questions.

Answers must be written in the spaces provided. Additional sheets of paper must not be inserted.

| For Examiners' Use Only | | |
|-------------------------|-------|---------------------------------|
| Question | Marks | Examiner's Number and Signature |
| 1 | | |
| 2 | | |
| 3 | | |
| Total | | |

(72 minutes)

1. You are provided with specimen T which is freshly killed.

- (a) Pin the specimen with the ventral side uppermost. Dissect and remove the skin, taking note of how it is attached to the underlying body wall.

- (i) Describe the attachment of the skin to the body wall. (03 marks)

Skin firmly attached to the body wall; at pectoral fore limbs, pelvic/hind limbs, and throat region; while loosely attached within the abdomen; 03

- (ii) Suggest the significance of the way the skin is attached to the body wall as described in (a)(i) above. (03 marks)

Loose attachment has fluid filled spaces to facilitate gaseous exchange; while firm attachment helps to support / hold skin onto the body of the animal; 02

- (b) Observe the main blood circulation on the skin.

- (i) Describe the pattern of blood circulation on the skin. (04 marks)

One main blood vessel / musculo-cutaneous vein; from attachment of fore limbs; big sized branches; form a network into many smaller blood vessels; spread all over the skin; 04

- (ii) Give the significance of the pattern of blood circulation described in (b)(i). (03 marks)

Blood vessels attached to skin to reduce distance; for diffusion of gases. Blood vessels form a network to increase surface area; and are closely attached to the skin to reduce distance; 03 for diffusion of gases;

(c) Dissect the specimen further to display:

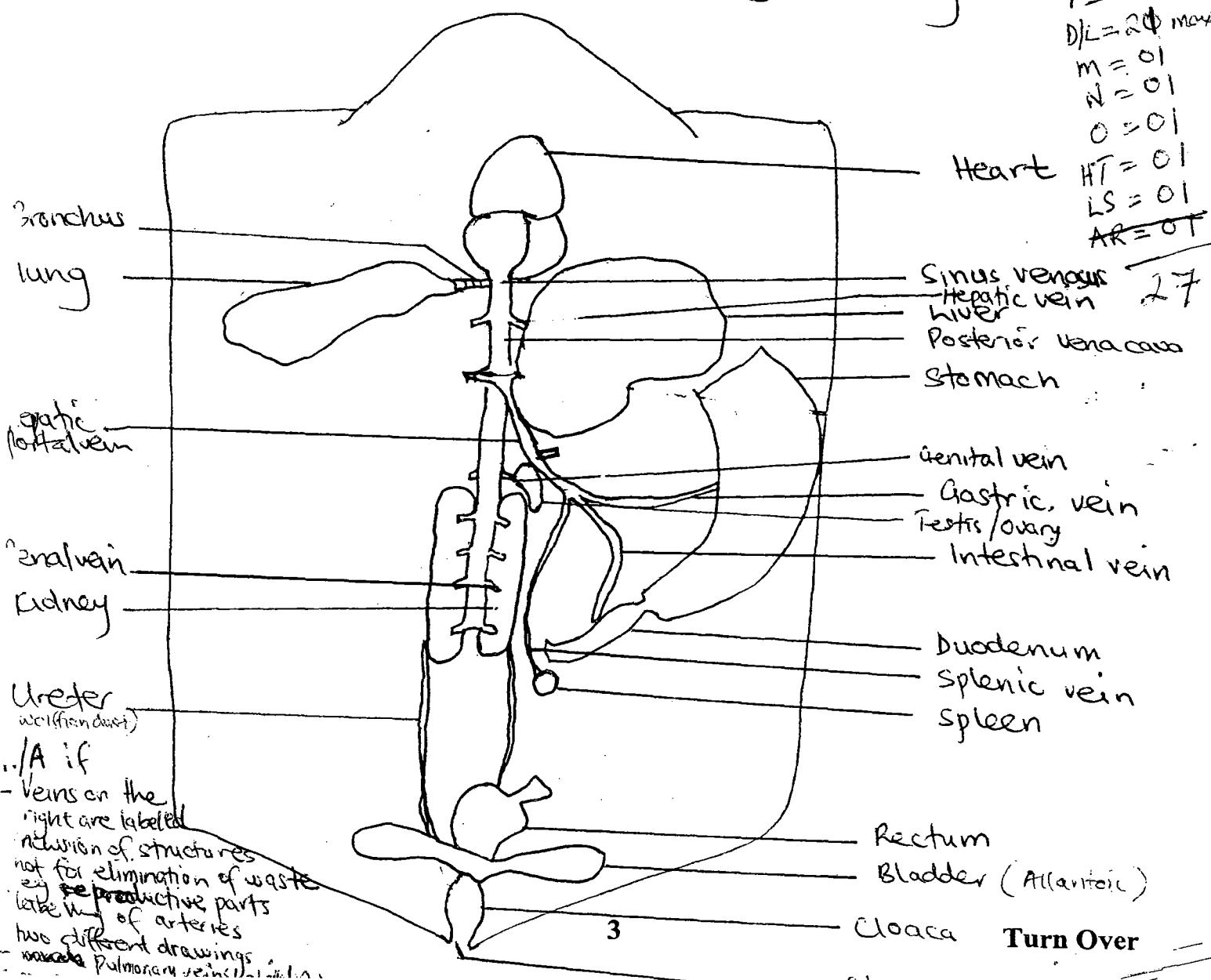
- blood vessels carrying blood from organs located on the left half of the abdominal cavity back to the heart.
- structures used for the elimination of unwanted materials from the body.

With the heart displaced anteriorly, draw and label the blood vessels and structures displayed in (c)(i) and (ii) on one diagram.

(27 marks)

A drawing of Blood vessels carrying blood from Organs located on the left half of the abdominal cavity back to the heart, and structure used for the elimination of unwanted materials from the body of specimen T | Toad | frog, with the heart displaced anteriorly.

$T = 01$
 $D/L = 20 \text{ max}$
 $m = 01$
 $N = 01$
 $O = 01$
 $HT = 01$
 $LS = 01$
~~AR = 0T~~



(69 minutes)

2. You are provided with specimens P and Q and solutions X, Y and Z. Using the solutions, you are to carry out tests on the specimens. Peel specimen Q, then cut from it four cubes of measurements and label as indicated below.

0.5 cm x 0.5 cm x 0.5 cm, label K.

1.0 cm x 1.0 cm x 1.0 cm, label L.

1.5 cm x 1.5 cm x 1.5 cm, label M.

2.0 cm x 2.0 cm x 2.0 cm, label N.

Prepare an extract from each cube as follows:

Grind the cube in a mortar into a paste then add 10 cm³ of distilled water, stir, leave to settle and decant. Label each extract correspondingly.

- (a) Label four test tubes as 1, 2, 3 and 4 and add contents to each as shown in Table 1. Record your observation and deductions in the table. (06 marks)

Table 1

| Test tube | Contents | Observations | Deductions |
|-----------|---|---|----------------------------------|
| 1 | 2 cm ³ of Z and 2 cm ³ of K | few bubbles; No/ little foam/froth | Z broken down slowly |
| 2 | 2 cm ³ of Z and 2 cm ³ of L | Moderate bubbles, effervescent; little foam/froth | Z broken down moderately |
| 3 | 2 cm ³ of Z and 2 cm ³ of M | many bubbles, effervescent; more foam/froth | Z broken down fast |
| 4 | 2 cm ³ of Z and 2 cm ³ of N | Very many bubbles, effervescent; much foam/froth | Z broken down very fast/ rapidly |

- (b) Use extract N to carry out further tests in Table 2. Record your observations and deductions in the table. (4½ marks)

Table 2

| Tests | Observations | Deductions |
|---|---------------------|-------------------|
| (i) To 2 cm ³ of Z add 2 cm ³ of N that has been boiled for 5 minutes and cooled. | No bubbles formed | Z not broken down |
| (ii) To 2 cm ³ of Z add 2 cm ³ of N followed by 2 cm ³ of X. | many bubbles formed | Z broken down |
| (iii) To 2 cm ³ of Z add 2 cm ³ of N followed by 2 cm ³ of Y. | No bubbles formed | Z not broken down |

(c) Explain your results

(i) in Table 1

(06 marks)

Solution K was obtained from the smallest cube, so had the lowest concentration of the active substance enzyme; hence it showed lowest enzyme activity. The concentration of enzyme increased with increasing cube size, with the highest concentration being in N, which was obtained from the largest cube, and showed the greatest activity.

(ii) in Table 2

(02 marks)

Substance X

Boiling denatures the active substance, so no activity.

Substance X provides a suitable medium for the enzyme ~~no~~ activity;

Substance Y inhibits enzyme activity;

(iii) From the tests in Tables 1 and 2, state the factors that were being investigated.

(03 marks)

- The effect of enzyme concentration on enzyme activity;
- The effect of excessive heat / boiling / temperature on enzyme activity;
- The effect of an inhibitor on enzyme activity, i.e. pH.

- (d) Peel specimen P and from it cut out a cube of 1.0 cm x 1.0 cm x 1.0 cm and make an extract from it in the same way you prepared earlier extracts. Label the extract P.
- (i) Carry out the following tests to determine the relative abundance of starch, reducing sugar and proteins in extracts P and L prepared in 2(a).

Record your tests, observations and deductions for each extract in Table 3. (12 marks)

Table 3

| Tests | Observations | Deductions |
|---|---|---|
| Starch: 10 cm ³ of the solution in a test-tube add 3 drops of iodine solution | P Brown/yellow colour of iodine retained / specks of blue black | No/little starch present |
| | L Blue black colour observed | Much starch present |
| | P _____ | _____ |
| Reducing Sugar: 10 cm ³ of the solution in a test-tube add 1 cm ³ of Benedict's sol. and boil. | P A colour change from blue to green/yellow/observed | little/moderate/much reducing sugar present |
| | L Solution remains blue | No reducing sugar. |
| | P _____ | _____ |
| Proteins: 10 cm ³ of solution in a test-tube, add 1 cm ³ of sodium hydroxide sol/ followed by drops of copper sulphate CR 10 cm ³ of the sol. in a test-tube add 2 drops of milkton's reagent and boil. | P A pale purple/violet colour observed | less protein present |
| | L A colour change from blue to purple/violet observed | much protein present |
| | P _____ | _____ |

- (ii) Explain any differences between the contents of P and L observed in Table 3. (05 marks)

A ~~s~~ sprouting germination occurs in P; food substances are hydrolysed/broken down to release materials for growth & development; so there is less starch and protein;

~~P than in I while there is more reducing sugar from the hydrolysis of starch from starch in sprouting tuber P than Q.~~

(39 minutes)

3. You are provided with specimen S. Cut three thin cross-sections from it and immediately transfer them into a petri dish of water.

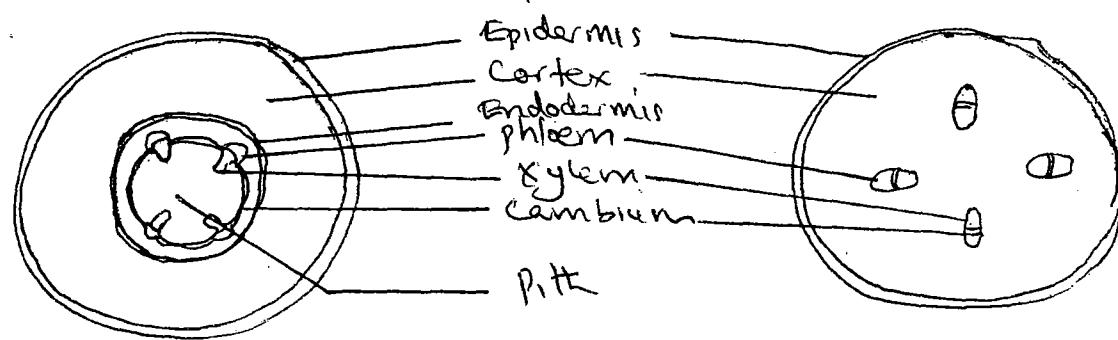
Mount one section in a drop of acidified phloroglucinol on a slide and cover with a cover slip. Observe under the low power of a microscope.

- (a) (i) Draw and label the tissue plan of the section of specimen S.

Drawing of the tissue plan of the section of specimen S (10½ marks)

N/A if detailed cell structure is drawn

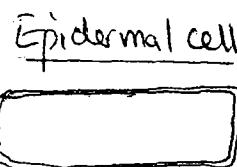
$$\begin{array}{l} D/L = 0.4 \\ m = 0.1 \\ N = 0.1 \\ T = 0.1 \\ \hline MG = X 10 - 30 \end{array}$$



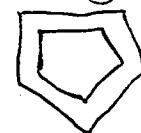
- (ii) Draw the structure of one cell from each tissue type found in the section. (05 marks)

Any 4 cells

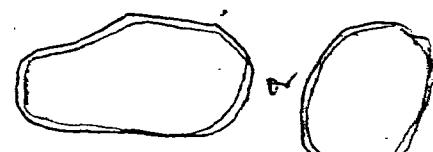
$$\begin{array}{l} T = 0.1 \\ S = 0.1 \\ CW = 0.1 \\ \hline 0.1 \end{array}$$



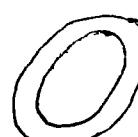
Sclerenchyma cell



Parichyma/cork cell



Xylem cell



phloem cell



Collenchyma cell



06

N.B.
size
wall thickness

(b) Identify the stained tissue in the section of specimen S. (01 mark)

Xylem ;

01

(i) Giving reasons, state the major group of plants to which specimen S belongs. (03 marks)

Dicotyledon;

- Vascular bundles arranged in a circular pattern in the stem. 4 max
- Central pith.
- Presence of cambium; endodermis;
- Clear cortex layer beneath the epidermis;

(ii) Give structural adaptations of the coloured tissue for its function.

(02 marks)

- Thick walled for support / mechanical strength.
- Empty lumen for passage of materials.

02 m

~~07~~

DAAC

May 20

**BIOLOGY
PRACTICAL
INSTRUCTIONS
Nov./Dec. 2006**

DEPT

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

PRACTICAL BIOLOGY INSTRUCTIONS

P530/3/Inst. Sch.

Nov./Dec. 2006

This information is given only to facilitate the preparation of the examination.

CONFIDENTIAL

Great care should be taken that the information given below does not reach the candidates either directly or indirectly.

Each candidate must be provided with:

A freshly killed frog / toad, labelled R.

Irish potato tuber, labelled P.

Several filaments of *Spirogyra* in a petri dish of water, labelled S.

Small portion of a common mould (*Rhizopus*) freshly detached from its substratum and kept moist in a petri dish, labelled T.

Sucrose solutions of different concentrations and labelled as follows:

1.0 M, labelled A

3 H 2

0.8 M, labelled B

0.5 M, labelled C

0.3 M, labelled D

0.1 M, labelled E

0.0 M (*distilled water*), labelled F.

(15 cm^3 of each solution should be provided).

Measuring cylinder (100 cm^3)

7 test tubes

Cork borer

Microscope, slides and cover slips.

Name Centre/Index No. /

Signature

P530/3
BIOLOGY
PRACTICAL
Paper 3
Nov./Dec. 2006
3 hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
PRACTICAL
Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

Answer all questions

Answers must be written in the spaces provided. Additional sheets of paper must not be inserted.

| For Examiner's Use Only | |
|-------------------------|-------|
| Question | Marks |
| 1 | 40 |
| 2 | 35 |
| 3 | 25 |
| Total | |

(72 minutes)

Toad/Frog

1. (a) You are provided with specimen R. Classify it into the following groups:

(1½ marks)

Kingdom ... Animalia; ✓

Phylum ... Chordata; ✓ 0½

Class ... Amphibia; ✓
Reject: wrong spellings eg Animal, chordate, amphibian

- (b) Observe the head of the specimen and state how it is adapted to its habitat.

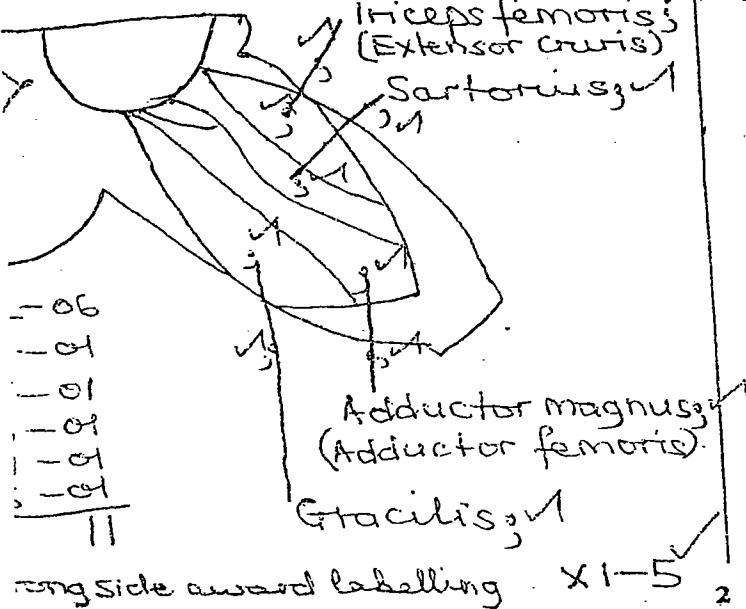
- Head is triangular shaped (streamlined) (3½ marks)
tapers anteriorly | dorso-ventrally flattened to
(ease) swimming/burrowing; ✓
- Large protruding | dorso-laterally located eyes, for wide field of view | better view/clear seeing; (quantify seeing)
- Large mouth to provide wide gape for capturing prey; ✓
- Apart of nostrils/noses/smell holes/nasihils located at the tip of head/snout to ease breathing on land | when submerged in water; (eg. gas exchange; help breathing)
- Patched/grey/green/brown/dull coloured skin for camouflage; (eg - black); acc. poison glands - protection
- Nictitating membrane for protection of the eye from mechanical injury during swimming/burrowing;
- Flat ear-drum/tympanic membrane for to allow for streamlined shape; ✓

- (c) Dissect specimen R to display the main superficial muscles of the left 03½

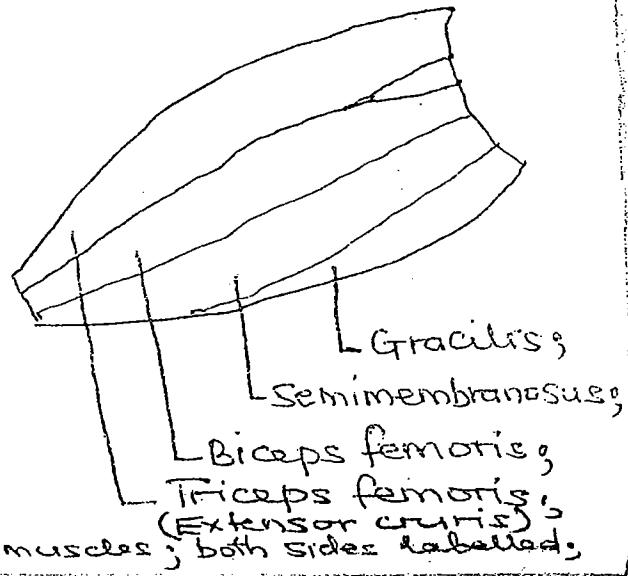
thigh of the specimen. Draw and label the muscles. (09 marks)

Drawing of superficial muscles of the left thigh of specimen R;

entral



Dorsal



TG

(d) Continue to dissect the specimen to display,

- the blood vessels that drain blood from the alimentary canal and its associated organs back to the heart, with the alimentary canal displaced to your right and the heart turned upwards and pinned through the ventricle.
- the blood vessels that take blood from the heart to the thoracic region of the animal.

Draw and label your dissection showing (i) and (ii) on one diagram.

Drawing of blood vessels that drain the alimentary canal and its associated organs and the blood vessels that take blood from the heart to the thoracic region of specimen R; ✓

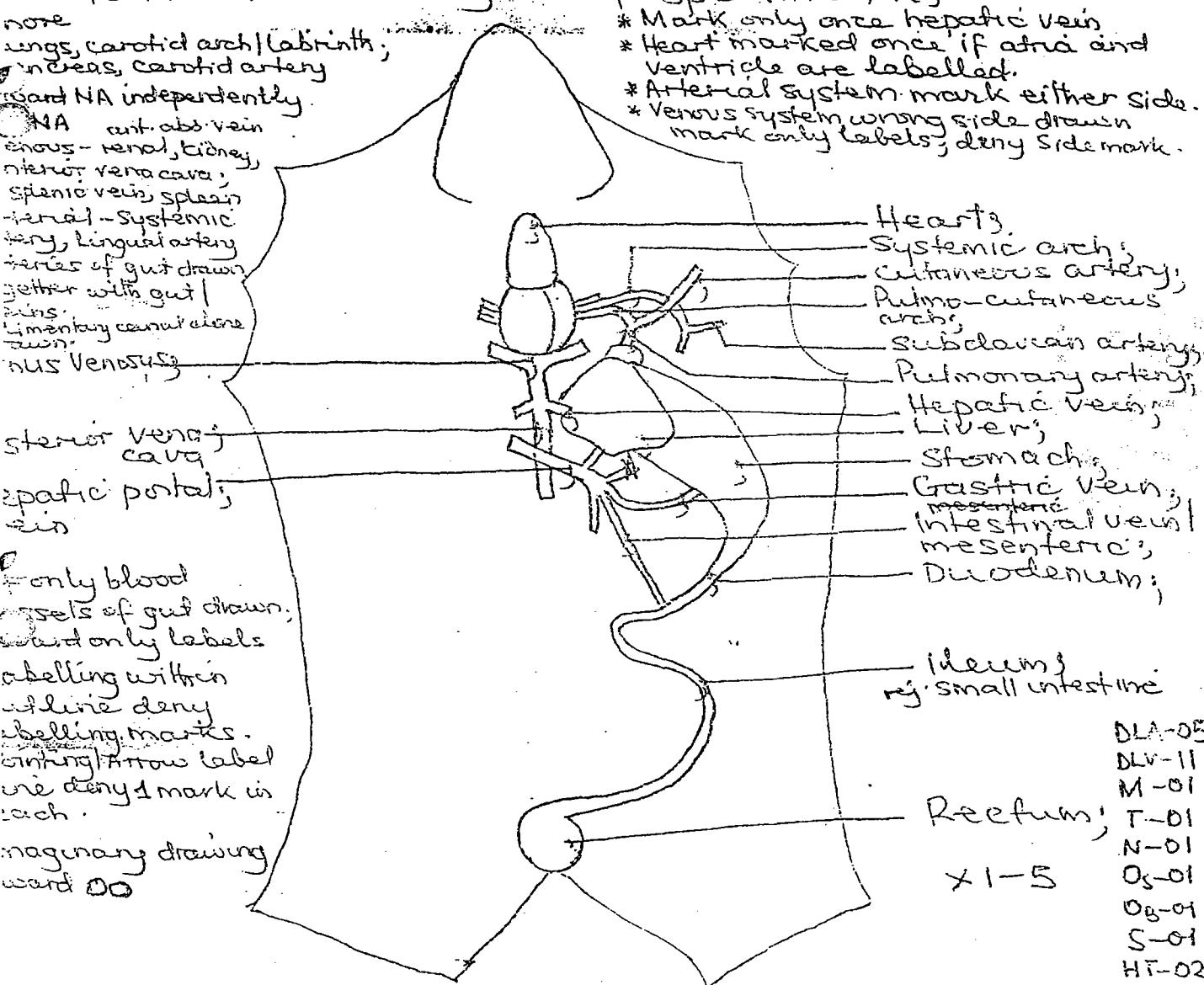
Note
ungs, carotid arch / labyrinth;
nerves, carotid artery
ward NA independently.

NA ant. a. vein
eaus - renal, kidney,
terior vena cava;
splenic vein, spleen
renal - Systemic
tery, Lingual artery
series of gut drawn
gether with gut /
ins.
limentary canal alone
seen.
nus Vena

sterior Vena
cava
spatic portal;
ein

only blood
sets of gut drawn,
ward only labels
abelling within
utline deny
abelling marks.
straight arrow label
one deny 1 mark in
each.

imaginary drawing
ward 00



(03 minutes)

2. You are provided with specimen P and sugar solutions of varying concentrations labelled A, B, C, D, E and F.

(a) Measure 8.0 cm³ of each solution and transfer the solutions into test tubes labelled correspondingly. Using a cork borer, obtain six equal sized cylinders of at least 1cm diameter, from specimen P and trim the cylinders to a uniform length of 6.0 cm. Immerse a cylinder into each of the solutions in the test tubes and leave for 1½ hours.

(You may proceed with other work)

- (i) After 1½ hours, transfer solution A into a measuring cylinder and record the final volume in Table 1.

Repeat the procedure for the remaining solutions. (06 marks)

Table 1
N.B.: Imaginary Values in table - no marks for b and c

| Solutions | A | B | C | D | E | F |
|--|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Final volume | 9.0-8.5 | 8.8-8.4 | 8.6-8.1 | 8.3-7.8 | 7.9-7.4 | 7.6-7.0 |
| Initial volume: final volume ratio | $\frac{8.0}{\infty}$ | $\frac{8.0}{\infty}$ | $\frac{8.0}{\infty}$ | $\frac{8.0}{\infty}$ | $\frac{8.0}{\infty}$ | $\frac{8.0}{\infty}$ |

- (ii) Calculate the initial volume to final volume ratio, of the solutions, in the spaces provided in Table 1. (06 marks)

- (b) From the table,

- (i) suggest the solution with the concentration nearest to that of the cell sap of specimen P. Explain your answer. (03 marks)

Solution D (C, D, E in relation to results)

The initial and final volumes of the

solution remains the same / closest to

the original volume; giving a ratio of
1:1 nearest to 1:1 meaning no net

movement of water into or out of the
plant tissue; 03

- (ii) arrange solutions A to F in order of decreasing osmotic potential.
Explain your answer. (06 marks)

F, E, D, C, B, A ($F > E > D > C > B > A$). F has highest tendency of water to move out, thus loses most water to the cylinder. Greatest decrease in volume is most dilute & followed by E in that order. A has the lowest tendency to loose water/gains most water/greatest increase in volume is the most concentrated.

(F highest op, A lowest op) QWTE 06

- (c) Explain the results obtained in test tubes A, D and E. (09 marks)

Test tube A

Solution A is hypertonic/more concentrated to the cell sap of the cylinder, water is lost from the cylinder by osmosis/exosmosis, and gained by the solution causing the volume of the solution to increase. (acc use of water/osmotic potential if correctly used) in whole 03

Test tube D

Solution D is isotonic/same concentration to the cell sap of the cylinder, net water gain is equal to water loss in the cylinder/no net cylinder size movement of water, causing no change in volume of solution. 03

Test tube E

Solution E is hypotonic/less concentrated to the cell sap of the cylinder, water is gained by the cylinder by osmosis/endosmosis, and lost by the solution causing the volume of solution to decrease. 03

B: Osmosis must be mentioned once in any of the three explanations to get the marks for each.

- If isotonic Solution is correct explanation of band E Turn Over
- Change accordingly.
- Though the words hypertonic, isotonic and hypotonic are not applicable to plant tissues, accept their use. 15

(d) Examine the cylinders placed in solutions B and F.

- (i) Compare the physical condition of the cylinders from the two solutions. (04 marks)

rank comparison B → F

| | |
|--|--|
| 1 - Shorter/narrower/decreased in length | Longer/wider/increased in length, bigger |
| 2 - Shrunken/decreased in Volume | Swollen/increased in Volume |
| 3 - Flabby/soft/limp | Turgid/hard/firm/rigid/stiff |
| 4 - Smooth texture | Doughy/coarse texture, |
| 5 - flexible, flaccid, spongy, fine | |

04

Defer to (d) (ii) Suggest the ecological significance of your observations in (d)(i)

(i) above in the life cycle of specimen P.

(01 mark) max 5 A

- Turgidity gives support to herbaceous plants / causes them to be upright for photosynthesis
- Turgidity enables the plant to store water. ✓
Stomatal opening for gaseous exchange ✓✓
- Flabby tissues lead to dormancy of the stem tips
lead to drooping/wilting which reduces surface area for water loss/reduction of photosynthetic area
- active growth of meristems for turgidity.

(45 minutes)

06

3. You are provided with specimens S and T Alirepus (mucor/mould)
Sporogonium Total. 36 (max 35)

- (a) Observe the specimens and state the type of nutrition that occurs in each, giving a reason. (02 marks)

S - Autotrophic / photosynthetic / holophytic / photoautotrophic
because it has chlorophyll / green in colour,
(ie: chloroplasts alone)

T - Heterotrophic / because it lacks chlorophyll
green colour, ie: saprophytic, ✓

02

(i) Give two structural characteristics of the specimen. (02 marks)

- Spiral chloroplasts of cells joined end to end
(lengthwise) \Rightarrow septate to make a filament
prominent continuous cell wall; pyrenoid's within
chloroplasts; peripheral cytoplasm / thin cytoplasm;
large vacuoles ✓✓ 02
(mark first two only)

(ii) State three structural features which enable specimen S to survive in its habitat. (03 marks)

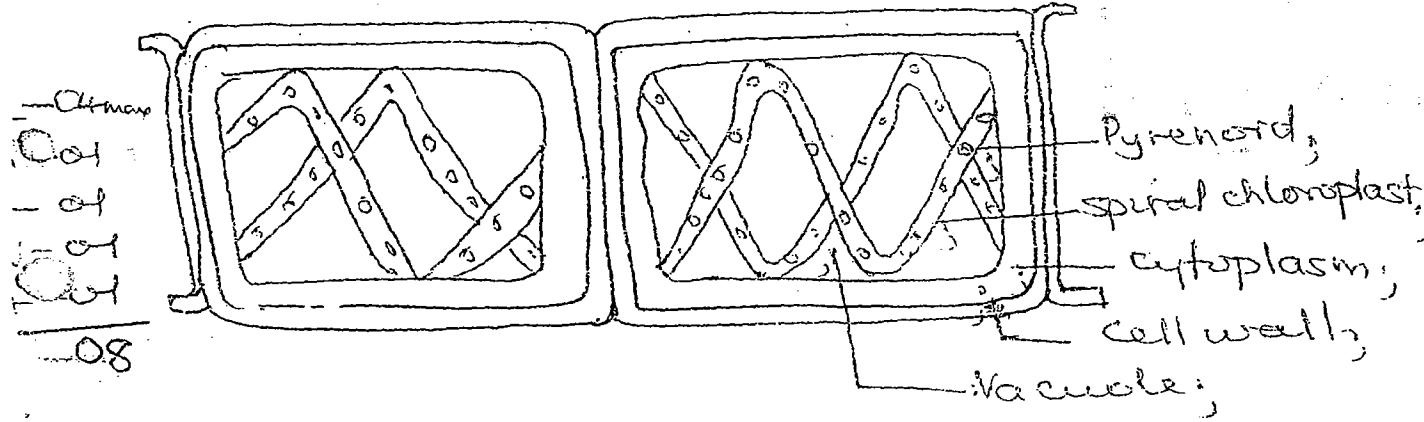
- chloroplasts for photosynthesis; filaments for floating on water / to increase surface area to absorb sunlight; photosynthesis; pyrenoids for food storage; Septate for flexibility; spiral chloroplasts to increase surface area for trapping sunlight;

(mark first three only)

03

(iii) Draw and label two cells of S that you can see clearly. (06 marks)

Drawing showing 2 cells of specimen S. ✓
(magnifying power used must be mentioned to get
titles marks)



Note: + mucilage
clearly - Cell membrane
is in Nucleus
escape Cytoplasmic strands

~~Forward accuracy mark only
when the above structures
are not drawn.~~

Take note of spellings

24: Not 2 cells drawn

Calculation of magnification
 → Measure size of drawing; in cm
 Convert to microns; divide by
 300 microns; add $\frac{1}{2}$ to value obtained
 by drawing; 6 cm $\rightarrow \frac{6000 \text{ microns}}{300}$
 $= 200 + 100 = \times 300$

(c) Remove a small portion of specimen T and examine it under a microscope.

(i) Name and describe four major vegetative parts of specimen T in Table 2. (06 marks)

Table 2

| Part | Description |
|-----------------------------------|---|
| - Sporangium; ✓ (spore capsule) | - Round swollen spherical Diell black head; ✓ |
| - Root system | - Thin slender long; ✓ |
| - Rhizoids; ✓ (rooting hyphae); ✓ | - Numerous thin slender; ✓ |
| - Stolon (branching hyphae); ✓ | - Thin threadlike slender forms network extensively branched; ✓ |

06

Q has to be
told to (i)

(ii) From the descriptive features in Table 2, state how any two parts are adapted to their functions. (02 marks)

- Sporangiospore - Spore dispersal (for asexual reproduction)
- Rhizoids - penetrate into substratum to absorb nutrients | for anchorage | large s. A for absorption of nutrients;
- Sporangium - Storage of spores;
- Stolon - network for support | transport of nutrients | wide coverage

(d) For survival in its habitat, state one advantage

(any two) 02

(i) specimen S has over T. (01 mark)

- S has chloroplasts / chlorophyll for photosynthesis | Septate for fragmentation | asexual reproduction | Pyrenoid for food storage | filaments for large surface area to absorb sunlight; (any one) of

(ii) specimen T has over S. (01 mark)

Support - rhizoids

T has rooting hyphae to absorb ready made nutrients | Bear's spreading cap containing spores which are easily dispersed by wind

- Long sporangiophores for carrying sporangia high to eat

(e) From the structural characteristics of S and T, classify the specimens according to the groups in Table 3. (02 marks) 04

Table 3

| Specimen | Phylum | Class | |
|----------|-------------|------------------------|----------------------|
| S | Chlorophyta | Chlorophyceae | ✓ |
| T | Zygomycota | Zygomycetes | ✓ |
| | Zygomycetes | Zygomycetales | ✓ |
| | Eumycophyta | Phycomycetes | ✓ |
| | Mycophyta | Mycetes Phycomycetes | END. |
| | Eu mycete | Phycomycetes | Total 27 max (25) |

Name Centre/Index No. 916
Signature

P530/3
BIOLOGY
Paper 3
Nov./Dec. 2005
3 hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY

PRACTICAL PAPER

Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

Answer all questions.

Answers must be written in the spaces provided. Additional pages must not be inserted.

| (DO NOT WRITE HERE) | |
|----------------------------|--|
| 1 | |
| 2 | |
| 3 | |
| Total | |

1. (77 minutes)

You are provided with specimen P which is freshly killed. (Roar)

- (a) Examine the specimen and give five observable adaptive features that enable the specimen to survive in its habitat. (05 marks)

- (i) Dorsal laterally positioned large |
bulging | protruding eyes for wide vision
(ii) pointed / triangular / streamlined head or body
any five for swimming
Ignore the rest @ 1mk.

(iii) Long / muscular hind limbs for propulsive force / forward thrust when jumping
(iv) Short stout / well built fore limbs to serve as shock absorber when landing
(v) Webbed hind feet / toes / digits for swimming

- moist skin for gas exchange / breathing
- dull / dark skin (upper / dorsal part) pale ventral / lower side + Concolor
- wide gape / opening of buccal cavity for consuming prey of large size
- Nostrils / external nares for breathing / passage of gases / air / ventilation
- Large / numerous poison glands for defense / protection (toxic in palatals).
- Nictitating membrane to protect / moisten the eye
- Jointed limbs for flexibility during movement / locomotion
- External eardrum / tympanic membrane for hearing

(b) Dissect the specimen to display the :

(i) blood vessels taking blood to the left lung of the animal. Draw and label. (16 marks)

Diagram of specimen p) Toad, frog showing blood vessels arteries taking blood to the left lung.

Aortic arch ✓

Truncus arteriosus ✓

RT. Auricle/
atrium
(left) ✓

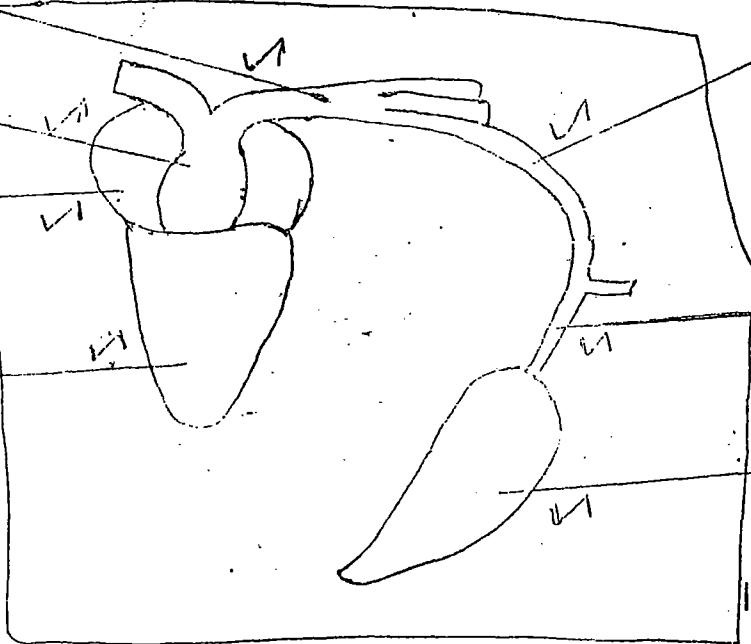
Ventricle ✓

Pulmonary
sinuous
arch ✓

pulmonary
artery

(left)
lung ✓

$$N_6 = X_1 - X_5$$



NB if i) any artery not associated with blood flow

- to left lung drawn & labelled

ii) Any vein is included.

iii) both sides drawn and labelled

NB

= wrong ~~bad~~ spelling.

- if Labelling is within drawing, draw label

mark where error has been committed

struck through only if label lines cross

- Only mark for left side if right side drawn,
but mark ^{crossed} if right side drawn
except for lung if labelled left lung

- if heart labelled around drawing indept don't
depend on label lines drawn, but around
for heart if → specimen not mentioned

$$M_{\text{O}} = 7$$

$$N_1 \rightarrow 0$$

$$N_2 \rightarrow 0$$

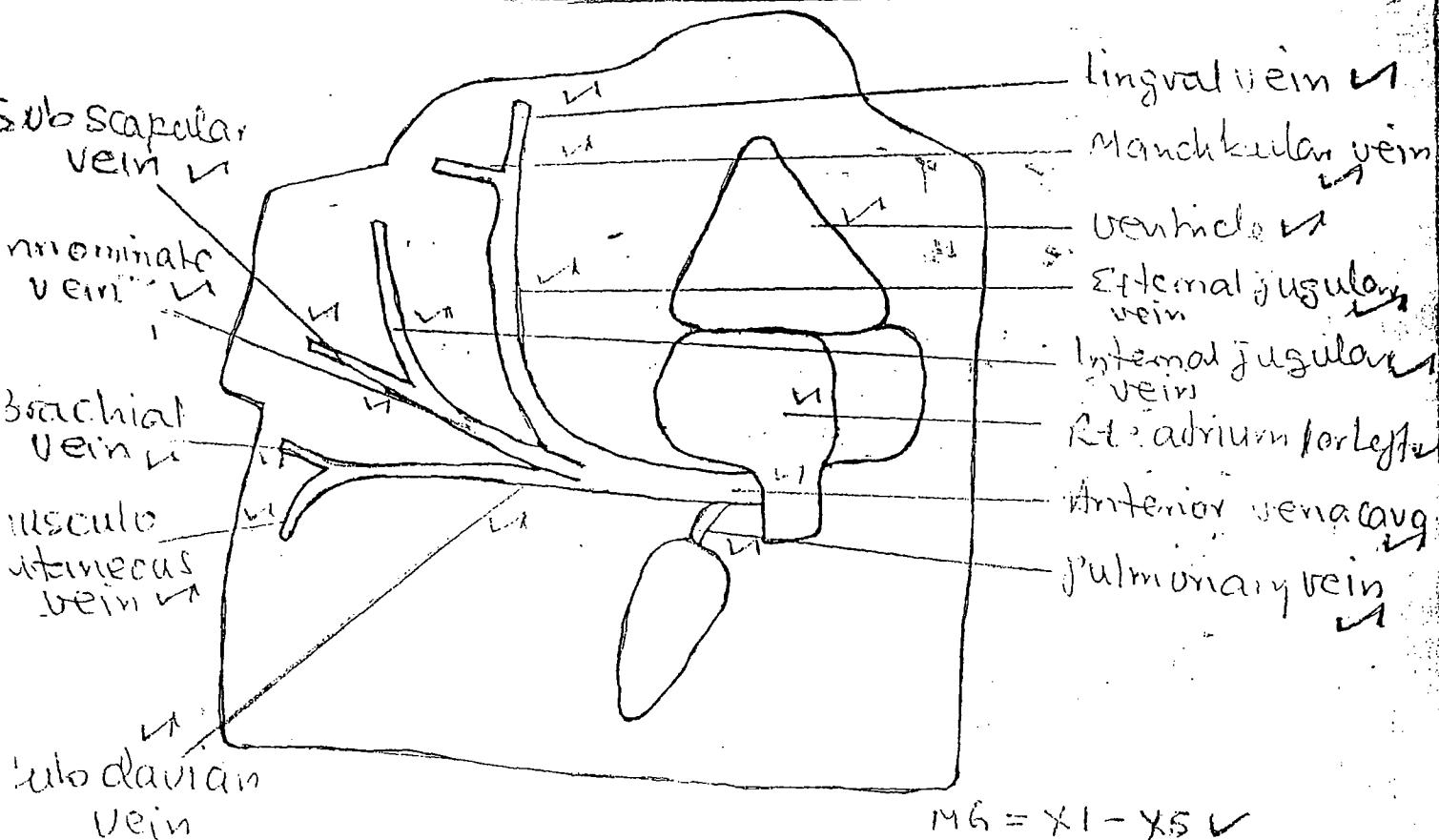
$$S \rightarrow 0$$

$$T \rightarrow 0$$

$$12$$

- (ii) blood vessels returning blood from the right side of the head and chest region of the animal to the heart. (22 marks)

Diagram of specimen of a dog showing blood vessels veins returning blood from the right side of head and chest region to the heart.



$$M6 = \times 1 - \times 5 \checkmark$$

N.A if ii) any vein not associated with head and chest region included e.g. posterior vena cava, etc.

(2) any artery included.

N.B - All other comments in b) apply in b) as well.

- Ignore if lung drawn and labelled.

N.B veins attached

to Truncus arteriosus

* Omission in labelling, give drawing only and re-drawing marks

| | |
|---|---|
| M | = |
| N | = |
| O | = |
| S | = |
| T | = |

2. (54 minutes)

You are provided with solutions A, B, C and D which are extracts from seedlings of same type of seed at different stages of germination.

- (a) Carry out an iodine test on each solution. Record your tests observations and deductions in Table 1.

(05 marks)

Table 1

Must show decreasing trend

One day
germinated
Sorghum

3 days

5 days

Ignore 7
So 2 to 12 days

| Solution | Iodine Test | Observations | Deductions |
|----------|--|--|---------------------------------|
| A | To 1cc, 0.7 for 1 cc add 2 drops of iodine solution | black/✓ blue black Solution is black | Much starch present ✓ |
| B | " | blue black solution ✓ deep blue or trate blue black | Moderate starch present ✓ |
| C | " | Deep black trate blue black solution faint blue black | Trace of starch ✓ present |
| D | " | | |

01 $\frac{1}{2}$

03

03 = 07

7 days Thursday A 0.41 m

5 days Saturday B 0.15 m 5

3 days Wednesday C 0.2 m
the day - 0

- (b) Carry out a Benedict's test on each of solutions A, B, C and D. Record your tests, observations and deductions in Table 2. (05 marks)

Table 2

| Solution | Benedict's test | Observations | Deductions |
|----------|---|---|---|
| A | 72°C for 5 min Add 1 cm ³ of Benedict's soln and boil 1 heat | soln remains blue ✓ or green ✓ → little red sup or present | Reducing sugar absent |
| B | " | green soln greenish yellow ppt / yellow ppt | Trace / Little red sugar / moderate red. sugar. |
| C | " | greenish tint on ppt / yellow / orange ppt ✓ red brown | moderate / much reducing sugars ✓ |
| D | | precipitate | little red sup |

Q2

Q3

Q3

= 08

- (c) Solutions E and F are extracts of seedlings of same type of seed, but different from seed type from which extracts A, B, C and D were obtained. Solution E is from seedlings of the same age as those from which extract A was obtained, while extract F is from seedlings of same age as of those from which extract C was obtained.
 Carry out the following tests on solutions, A, C, E and F.

Record your tests, observations and deductions in table 3.

Table 3

| Solution | Buiret Test | Observations | Deductions |
|----------|---|---------------------------------|--------------------------------|
| A | To 1cc of CuSO_4 add 1cc NaOH (ex) + 1/2 cc CuSO_4 drops of CuSO_4 | Solution remains blue | proteins absent |
| C | " | SOL remains blue | proteins absent |
| E | " | Solu turns purple // violet | moderate protein present |
| F | " | SOL turns pale purple // violet | trace / little protein present |

0.25
2

0.4

0.4

10.5

Table 3 continued...

| Solution | Benedict's Test | Observations | Conclusions |
|----------|-------------------|---|--|
| E | refer behind - | solution remains blue ✓ | reducing sugar absent ✓ |
| F | - | solution remains blue / turns pale. green solution ✓ | reducing sugar absent. Very little reducing sugar present ✓ |

02 02 = 04

- (d) (i) From your results in Table 1 and Table 2, arrange the solutions A, B, C and D in order, starting with the solution from the youngest seedlings and ending with that from the oldest seedlings. (01 mark)

Ignore D A B C 01

- (ii) Give reasons for your answer in (d) (i). (04 marks)

Because amount of starch decreases from SGLN A-C, while reducing sugars are increasing. Since starch is being broken down / hydrolysed into reducing sugar (reject converted or changed).

Part (i) and (ii) of d must be done and referred to tables.

- (c) (i) From your results in Table 3 compare the contents in solutions A and E and contents in solutions C and F. (02 marks)

A and C have no proteins ✓

E & F have proteins ✓ and 02

Ignore (Some reducing sugars)

- (ii) Explain your results in Table 3.

Seedlings from which extracts A and C were obtained do not store proteins while seedlings from which E and F were obtained store mainly proteins and some carbohydrates.
As germination proceeds some of the starch should be converted into maltose, some reducing sugar (F); and protein is known to be used up as germination progresses.

02

4½

37

3. (49 minutes)

Specimens Q, R, S, T and U are reproductive parts of different plants.

- (a) Remove one of the outer most flowers and one flower from the middle part of specimen U. Using a hand lens examine the two flowers and state two differences between them.

outer/petal/tepalete | middle/tubular/disc (02 marks)

(i) - Open Cervilat towards apex/tubular, at all time
.....
Any 2 @ 1 = 2

(ii) - Corolla white in Corolla yellow in color 02

- stigma of stamen - stigma stamen/antler
.....
.....

- (b) (i) Using a hand lens examine a flower from each of specimens Q and R. Describe the structure of each flower.

Spiculated flower from Q. (04 marks)

Bracts present; large; enclose stamens; bracts

dull coloured; boat shaped; curved; hard/tough.

Shift out bract hairy/rough; parallel veined; paired;

Inner bract papery/membranous/smooth; thin;

Only stamen present; with thin; flexible; long/elongated filaments; and large; bilobed anthers; which hang outside/are pendulous/loosely attached; paired florets; free stamens;

04

Spiculated flower from R. (04 marks)

Bract present; size variable (short/large); enclose

stamens and pistil; bract dull coloured; boat

shaped/curved; hairy/rough; stiff; parallel veined;

filmed; Beside/pistil and anther present;

stamens with thin; flexible; long filaments; and large; bilobed anthers;

which have outside coarse pendulous hair attached | some enclosed; stigma feathery; with two stigma heads; superior ovary; paired florets; smooth bracts; superior ovary; free stamens)

01

- (ii) State one advantage of specimen R over specimen Q in reproduction. (02 marks)

R is bisexual hermaphrodite and therefore capable of self pollination / seed formation (ovule) / fertilization; while Q is unisexual staminate and therefore requires another flower (opposite sex) for reproduction to occur;

02

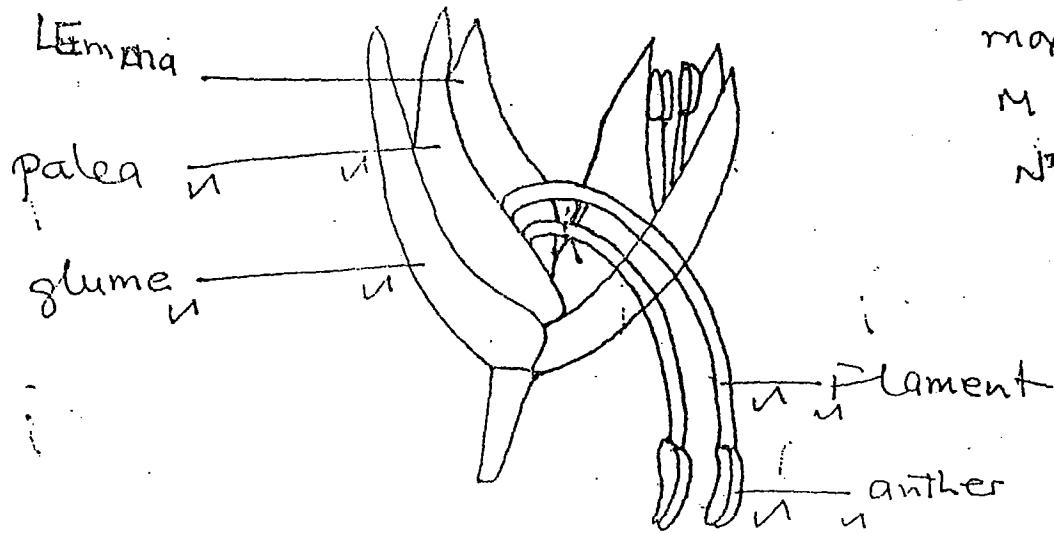
- (iii) How is specimen R adapted for pollination? (04 marks)

- It has both stamens and pistils / capsule discharges pollen produced by stamens and deposited easily on stigma;
accept any 3
any 3
④ 1 mark
- Elongated / long / flexible filaments to expose anther to wind.
- 03
- 2 stigma heads / feathery stigma to capture trap pollen due to large surface area for pollen.
- Hanging / pendulous / flexible / loosely attached anthers to easily shake off pollen.
- Exposed stigma to capture trap pollen to receive pollen.
- Large anthers to produce large quantities of pollen to increase chances of pollination.

- (c) Open up one flower from each of specimens Q and R. Draw and label each flower in the space provided.

Flower from Q.

(02 marks)



D -
L -
max 2

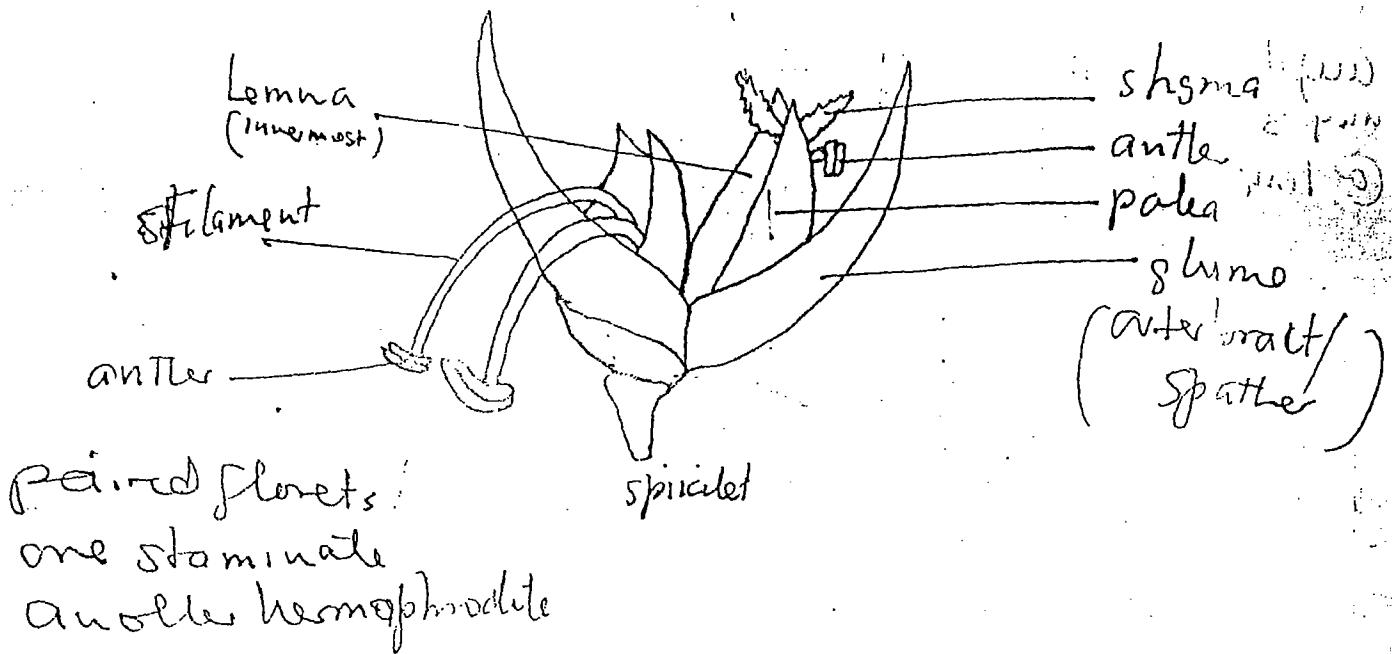
$$M = \frac{01}{2}$$

$$NT = \frac{02}{2}$$

$$\underline{\hspace{2cm}} \quad 03$$

Flower from R.

(03 marks)



(d) Construct a dichotomous key to identify specimens Q, R, S, T and U.

(08 marks)

X'tics of Specimens

Q

maize

Florets sessile

- has only stamen | unisexual
- Anthers bilobed, elongated, dull colored,
 - Large
- Stamen pendulous, and free
- Bracts have two florets enclosed within
 - inner bract thin/membranous, translucent.
 - outer bracts hairy/rough, thick
- Numerous florets | spikelets, paired
- Bracts dull coloured, broad
shaped/ Curved, paired, parallel
veined
- Filament flexible, elongated
- irregular florets | zygomorphic

R (*Panicum maximum*)

Floret sessile, spikelet stalk

(its stamen x'tics similar to (P))

Bracts of variable size, dull coloured,

Broad

Smooth, curved and smooth, paired.

Curved, curved and smooth, paired/florets

Bracts enclose stamens & pistil/florets

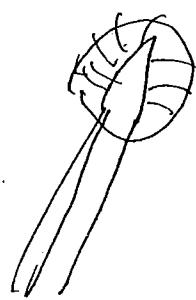
bisexual (some unisexual)

Free stamens

- Numerous short spicules
- Stigma feathery, stigma heads.
- Irregular floret. Superior ovary
- Alternating/spiral arrangement of spicules
- Spicules with variable length & shape

S Lantana Camara

- florets bisexual
- florets in 2 rows
- brightly coloured florets
- all florets tubular
- florets at same level
- florets at apex of the peduncle
- Brightly Coloured petals
- has involucre or bracts
- Regular/stichomorphous florets/radial symmetry.
- Superior ovary
- sessile florets ✓
- numerous florets ✓
- florets radially arranged.
- outer florets are older than inner ones
- clustered after a peduncle
- dull coloured bracts
- Free stamens



- bisexual
- brightly coloured petals ✓
- Single stellate (petal like bract) present ✓
- Spathe bract curved, parallel veined, hairy rough.
- Irregular/symomorphic florets ✓
- Stalked florets —
- Single stem florets —
- Superior ovary ✓
- Anthers brightly coloured ✓
- Long, thin and flexible filament —
- Bract dull coloured ✓
- florets have free petals (polysepalous) ✓
- three stamens —

U (*Bidens pilosa*)

- Has two types of florets (ray/ ligule and tubular disc)
- Brightly coloured
- It has involucre of bracts
- dull coloured bracts of diff height
- florets at different levels / heights (inner one longer)
- tubular florets regular while ray ones irregular

- ovary inferior.
- sessile florets
- tubular / small middle florets bisexual
- outer other ones lack stamens and pistil.
- many florets present
- Cup shaped and often beehive / curved.
- flowers radially arranged (corolla)
- clustered, zygomorphic, disc - Actinomorphic
- ~~fragrant flowers~~

To make extract:

10g of the seedlings ground fine, diluted
to 1 litre of mixture, leave and decant.
note and leave shorted be removed.

Name Centre / Index No. *Lyn*

Signature

P530 / 3
BIOLOGY
Paper 3
Nov. / Dec. 2004
3 hours

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Paper 3

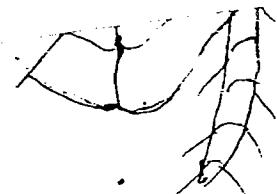
3 hours

INSTRUCTIONS TO CANDIDATES:

Answer all the questions.

*Answers must be written in the spaces provided.
Additional pages must not be inserted.*

| (DO NOT WRITE HERE) | |
|------------------------------|--|
| 1 | |
| 2 | |
| 3 | |
| Total | |



m6x1

1. (69 minutes) 36

You are provided with specimen K. Cockroach.

Has legs

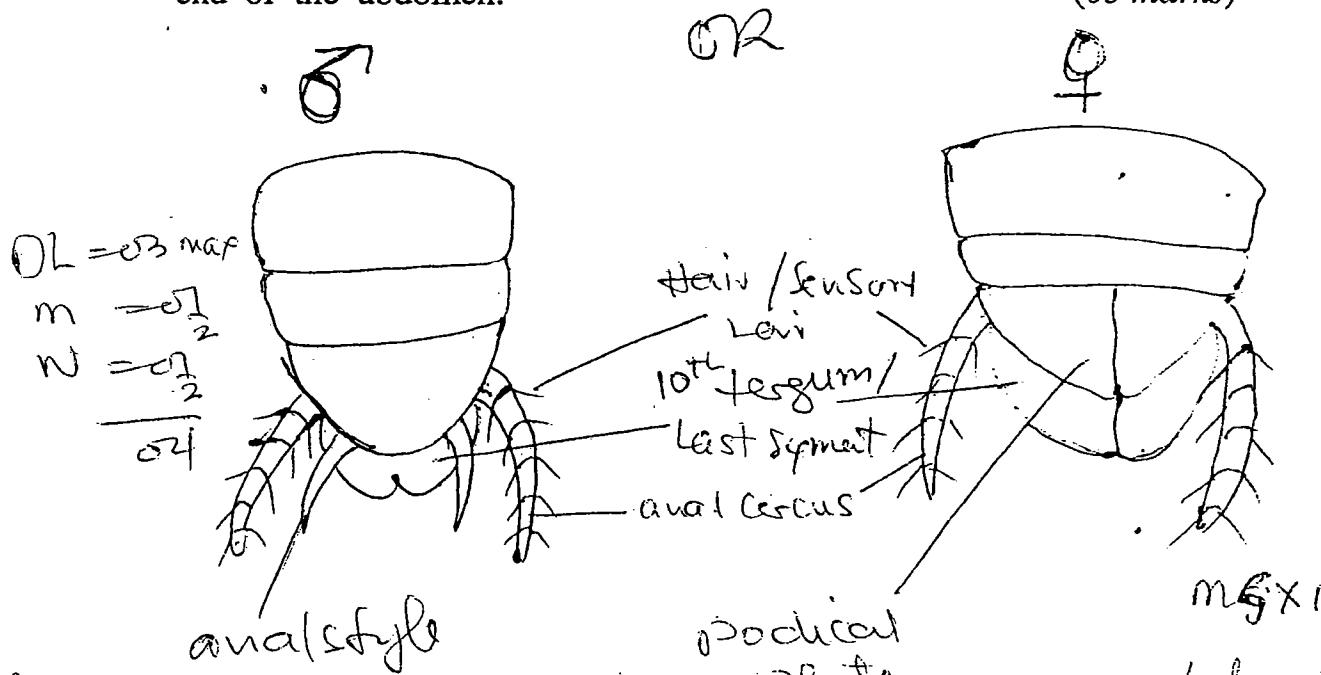
- (a) Examine the specimen and name the external features which are characteristic of the class to which the specimen belongs. (03 marks)

Rejo otte ^{several} - Three pairs of Limbs (Legs) | Six ^{limbs}
 + legs 7 +
 + three (distinct) body parts / Has head, abdomen
 + antennae, + Has a pair of antennae (Feeler);
 + post. + Thorax divided into three distinct segments,
 + et. + Prox., meso and meta Thorax. (03)
 Q = 05 m

- (b) From your observation of the external features, state with reasons the sex of the specimen. rej wide (02 marks)

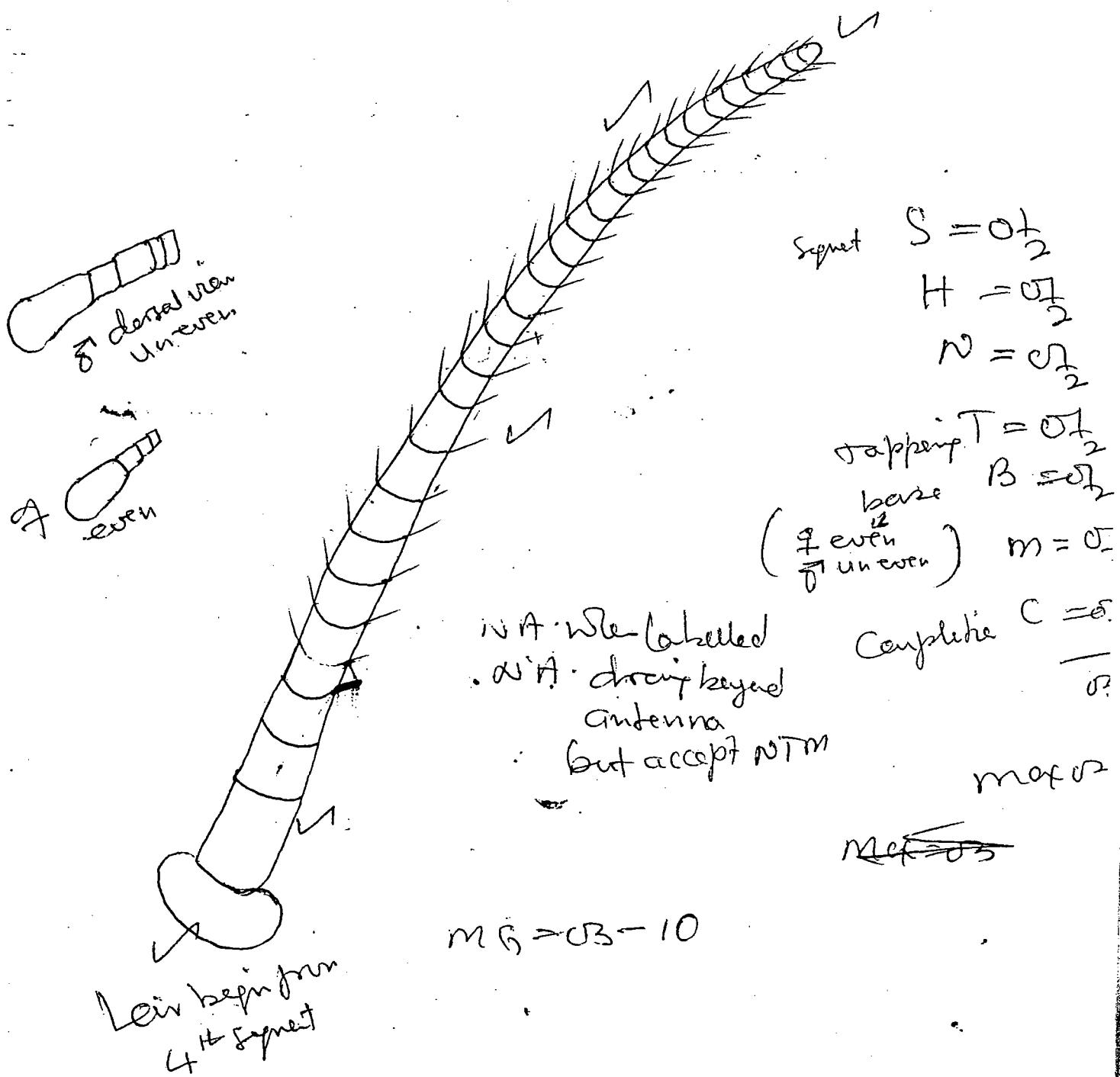
rej Sanopophyses, Podical plates; broad abdomen;
 Sanopophyses, even segments of antennae;
 rej absent OR: ♂, styles / anal styles; narrow abdomen;
 OR structures OR no style; uneven segments of antennae at the base;
 rej ♀

- (c) Place the specimen ventral side uppermost. Draw and label the end of the abdomen. OR (05 marks)



NA if whole specimen drawn / whole plate drawn / chain
 form dorsal view / more than 3 abdominal segments

- (d) Using a hand lens examine one antenna and draw. Do not label.
 (02 marks)



- (e) Place the specimen dorsal side uppermost and dissect to expose the structures within the abdominal cavity.
- (i) Displace the structures to display the salivary glands on the left of the specimen.

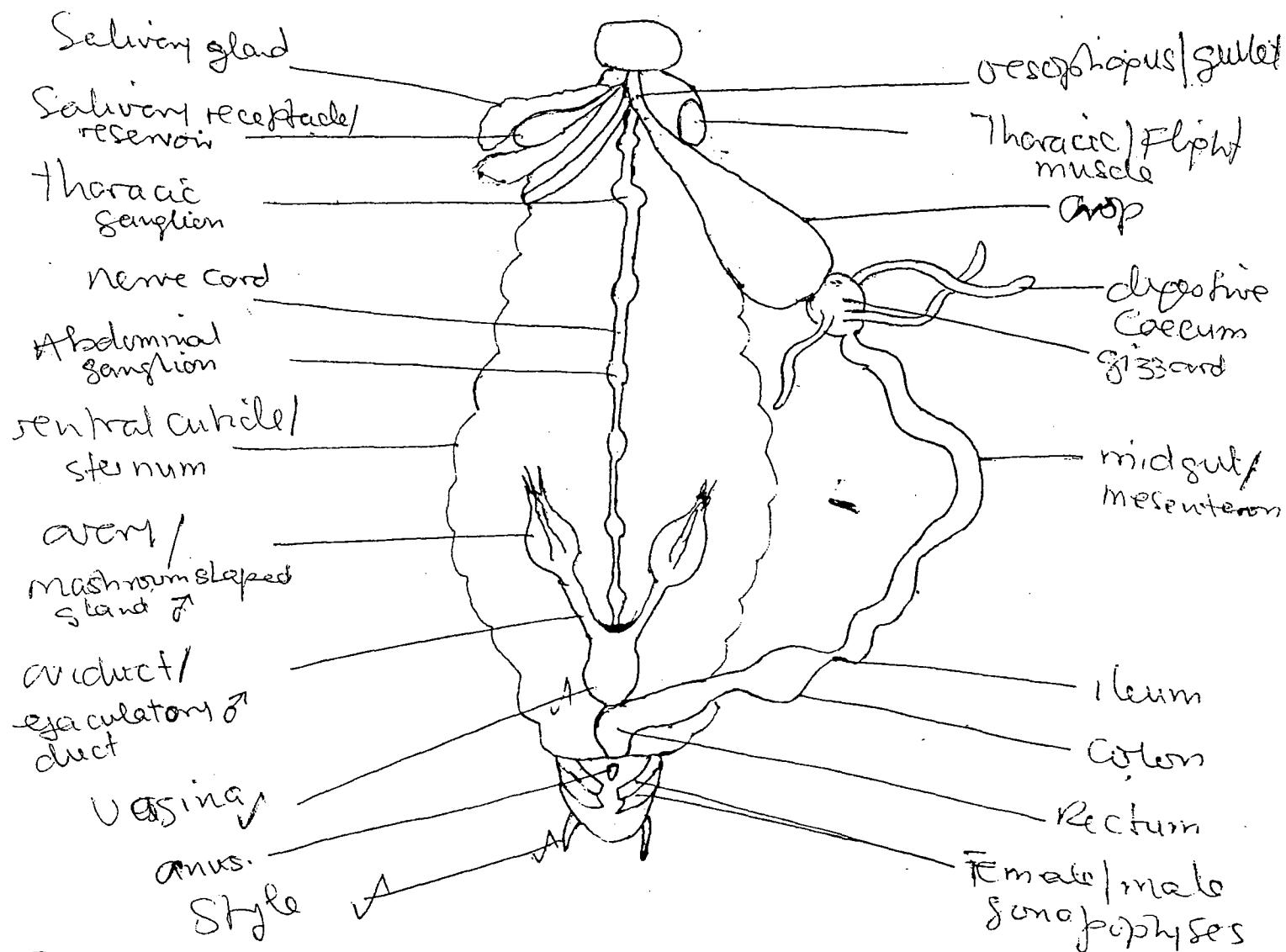
- (ii) Displace the alimentary canal to the right of the specimen. Remove all unnecessary tissue to display all the parts of the alimentary canal and the structures on the ventral cuticle.

Label with
the drawin

Draw and label.

(24 marks)

Drawing of Specimen K showing alimentary Canal and structures on the ventral cuticle;



NT. Alimentary Canal is $\frac{1}{2}$ blunt $\frac{1}{2}$ pointed
when the lead parts are labelled
or if malpighian tubes drawn
are labelled.

NT. If ventral cuticle (if any)
structure of dorsal cuticle is
drawn too and labelled

NT. If the PL if dorsal cuticle parts

$$DIL = 48$$

$$m = 07$$

$$T = 07$$

$$n = 01$$

$$G = 07$$

$$Gut = 07$$

$$S = 07$$

2. (72 minutes)

You are provided with specimen B. ~~1 m/s potato~~

- (a) Using a scalpel, peel the specimen then cut out two cubes from it. Cube B1 measuring, 1cm x 1cm x 1cm and cube B2 measuring, 2cm x 2cm x 2cm.
- (i) Calculate the surface area, the volume and the surface area to volume ratio of each cube in Table I. Show your working.

Table I

| | Surface area | Volume | Surface : Volume ratio |
|------------|--|--|------------------------|
| Female B1 | $2(1 \times 1) + 2(1 \times 1) + 2(1 \times 1)$ $2(L \times b)$ | $1 \times 1 \times 1$ | |
| Subrahmien | $2(1+1) + 2(1+1) + 2(1+1)$ $2 + 2 + 2$ | 1 cm^3 | $6:1$ |
| Answer | | | 0.3 |
| As above | $2(L+b) + 2(L+b) + 2(L+b)$ $2(2+2) + 2(2+2) + 2(2+2)$ $2(4) + 2(4) + 2(4)$ $8 + 8 + 8$ 24 cm^3 | $1 \times b \times h$ $2 + 2 + 2$ 8 cm^3 | $28:8$ or $3:1$ |
| | | | 0.2 |

not ans. if wrong
is wrong

(03 marks)

max 0.5

- (ii) Immerse each cube completely in a beaker containing potassium permanganate solution and leave for 15 minutes. After 15 minutes remove the cubes from the solution and wipe them using a blotting paper.

Using a razor blade, cut each cube into two halves. Using one half of each cube, measure the distance in mm, across the uncoloured portion as indicated in fig.1.

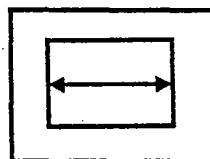


Fig.1

Record your results

B1 5 ≤ 9 ✓ mm.

B2 16 ≤ 19 ✓ mm.

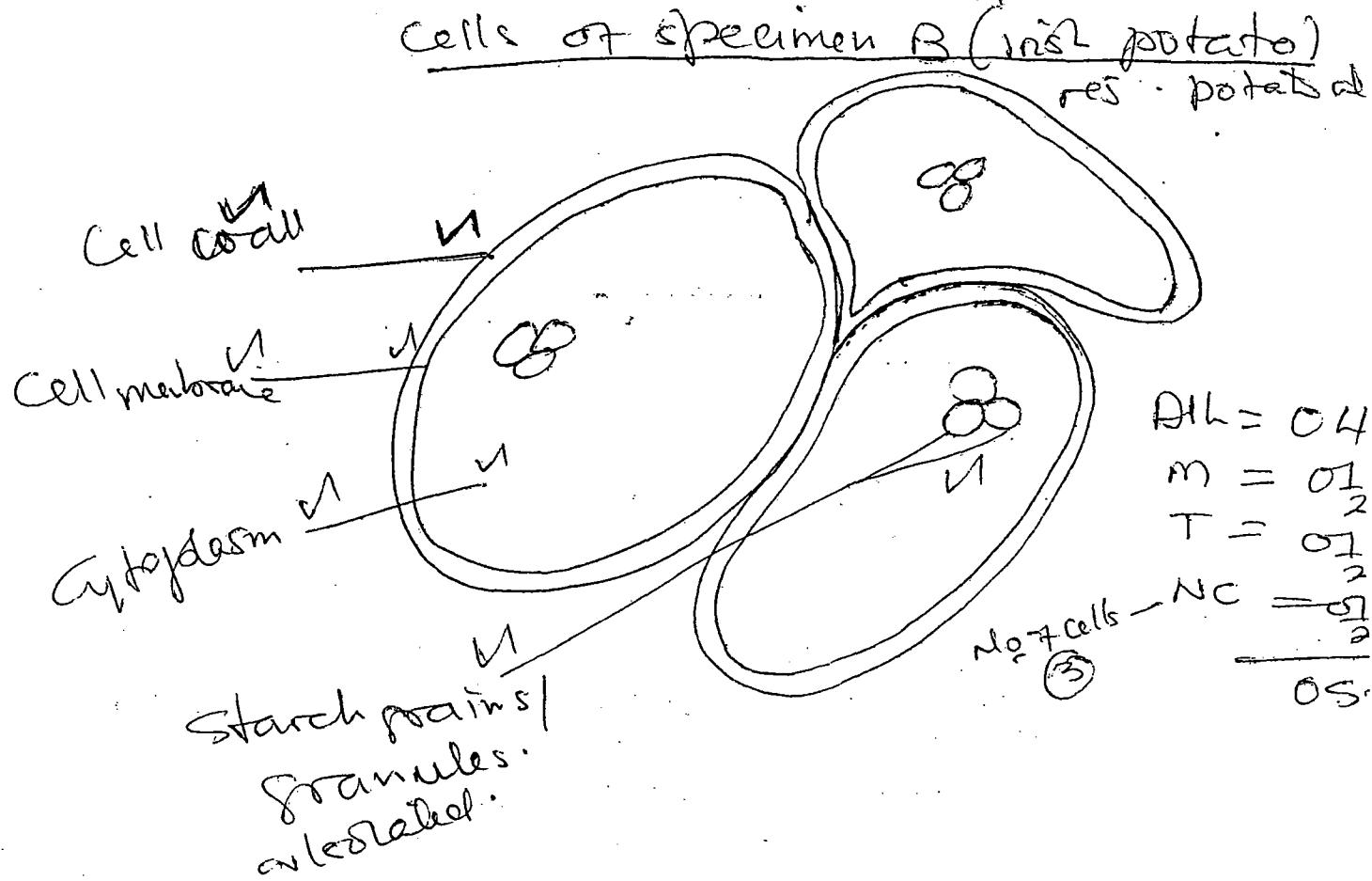
(02 marks)

- (iii) What physiological process is observed in (ii) ? (01 mark)

Diffusion ✓

per explainable (iv) How do the results in (ii) relate to the physiological process named in (c)(i), in living organisms ? (04 marks)
if process is wrong: The smaller the organism; the larger the surface area:volume ratio; the faster/greater the rate of diffusion; The bigger/larger organism the smaller the surface area: volume ratio; the lower/greater the rate of diffusion

- (b) Cut a very thin slice of specimen B using a sharp razor blade. Place the slice on a slide in a drop of water and irrigate with iodine solution. Observe the slice under the medium power of a microscope.
 draw 3 adjacent cells and label.
- (i) Draw and label three adjacent cells observed. (06 marks)



- (ii) Giving a reason, suggest the name of the tissue observed. (02 marks)

It is parenchyma tissue ✓
 Advantages: Thin walled | Compact cell | presence of starch granules | grain

- (iii) From your observation, state the function of the tissue observed. (02 marks)

For storage of starch

(c) Using a mortar and pestle, crush the remaining piece of specimen B. Add 10cm³ of water to it, stir then decant the liquid part into a test tube.

(i) Carry out tests for proteins, starch and reducing sugar on the solution, using the reagents provided.

Record your tests, observations and conclusions in Table II.

Table II

| | Test | Observations | Conclusion |
|-------------------|---|--|---|
| Protein | 10.1 cm ³ of B + 3 drops of m Iodine + heat | Red lumps Coag. Water | Protein present |
| OR | 1cc of B + 1/2 of NaOH + 3/2 drops of CuSO ₄ | purple Soluble | protein present |
| Starch | 10.1 cm ³ of B + 2 drops of iodine solution 2 or 3 drops Iodine | Black/blue blacy dark blue/deep blue R. purple deep blue/dark blue | Much starch present |
| Reducing Sugar | 10.1 cm ³ of B + 1cc of Benedict solution (3 drops) Fehling solution and heat / boil Rej warm | Green/yellow Soln / ppt R beyond yellow OK Blue soln | little/moderate reducing sugar present |

(10 marks)

Amylase

- (ii) To 5cm³ of solution B, add 2cm³ of solution Y provided. Incubate in a water bath at 35 – 40 °C for 5 minutes. Repeat the tests in Table II above using the incubated mixture. Record your observations and conclusions in Table III.

Table III

| Test | Observations | Conclusion |
|-------------------------|--|---|
| Test for protein | It turns purple It turns red / pink Coagulation ✓ | protein present ✓ 62 |
| | It turns purple / violet solution | protein present |
| Test for starch | Brown / yellow colour of iodine ✓ or pale blue (faint) specks of black | starch absent / starch hydrolysed ✓ 62 |
| | Red blue alone | traces of starch present |
| Test for reducing sugar | yellow (orange) brown precipitate ✓ Accept green solution if was blue in test sugar present | increased / much reduced sugar present ✓ 62 |
| | yellow spot | moderate reducing sugar |

Observations and Conclusions of amylase test (06 marks)

written in Table III but, if not written in the

now the observations & conclusions independent of

Turn Over

(iii) From the results in (c)(ii) suggest the nature of solution Y.

Starch hydrolysis / digest / break
acetyl esterase / catalyse / Carbohydrate
has enzymatic property / in nature. 5

Re - Amylase / salivary amylase / diastase / enzymes do
all 2ms / reject active substances / not action / work
as an ^(iv) State one property of solution Y shown by the results in (c)(ii).

It is specific in action. Since it hydrolyses
Starch only but not protein / hydrolyses
Fibre only. (02 marks)

3. (39 minutes) 4i

Banana Cassia rosea subsp. var. rosea

You are provided with specimens C, D, E and F which are inflorescences.

(a) Observe each specimen and describe the pattern of arrangement of florets. (04 marks)

Banana

C Whorled / crowded / clustered / grouped in
two rows; attached at base / one
point of spathe or bract / covered in
spathe / on inner surface \Rightarrow spadix /
bract. Attached directly / sessile / ur.
Keel on peduncle. any the

Cassia

D Alternately arranged (spirally), at
different part by a pedicel / stalk /
stouted / pedicellate (pedicel of
variable length). any the

Maize

E Florets paired; alternately arranged on
peduncle; one short stalk / ~~pedicel fused~~ /
pedicellate / stellate & another sessile;
enclosed in bract / spicule

Bougainvillea

F Attached on inner upper surface
bract; each floret attached on its
bract along midrib / main vein are
in threes onto the peduncle / at a
stalk / pedicel fused with midrib

(b) Remove a single floret from specimens C, D and E.
Examine the florets using a hand lens where necessary.

(i) Give two descriptive features on each of the following floral parts of each floret.

| Floral part | Banana Floret of Specimen C | Cassia Floret of Specimen D | Mango Floret of Specimen E |
|---|---|--|--|
| Pistil Any Pstl two. reg lens. | Labeled Stigma; fused stigmatic surfaces; inferior ovary; elevated rounded style; brightly colored stigma; elevated happen ovary; fused apex | elongated ovary; dull colored ovary; Curved ovary; superior ovary; monoecious ovary; short style; | absent/ alone |
| Anthers reg lens. | Flat; elongated; pale; rounded; whitish; dull colored; brightly colored; curved; Anthers | bulbous; elongated; thick; curved; variable size; other | bulbous; dull colored reg pendulous; variable; tiny |
| Petals <i>rect + 2</i> | None / absent | Curved; Free polyhedral; only fully colored; large; variegated size / prominently colored; papery/ | acute |
| Bracts | prominently veined; large shovel (boat shaped); curved; thick; spongy/fleshy; dull colored | outer bracts thick, many, oval. inner bracts: thin, brown semi-transparent & branched folly like surface own. | <i>Outer bracts</i> Cape MSX 1-5 |

or none

for all

- (ii) With reference to the information in the table in b(i), state how the florets from specimens D and E are adapted to their modes of pollination. (02 marks)

Florets from D..... Thick Conspicuous / brightly Coloured petals to attract pollinators / Insect
re^s brightly coloured only. 01

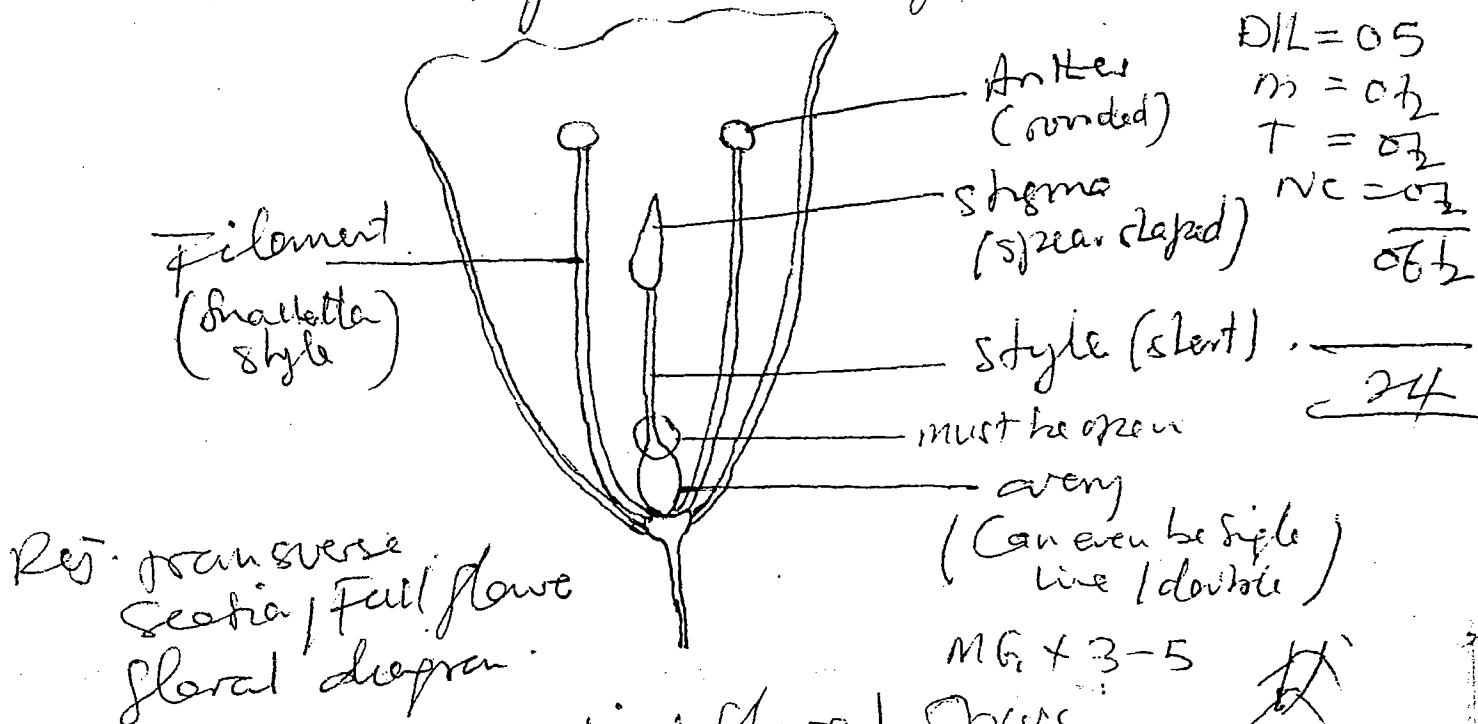
Florets from E..... elongated anthers for carrying large quantities of pollen to the flowers and blown by wind 01

N.B features must be stated in table (i)

- (c) Remove one floret from specimen F. Cut it symmetrically into two halves. Observe the internal structures using a hand lens.

Draw one half of the floret and label only the essential reproductive floral structures. (07 marks)

L.S./one half of Specimen F in L.S. showing essential reproductive floral structures



Note- If non-essential floral parts

"only essential reproductive f
drawn and labelled but ~~not~~ END"

if new essential is not labelled draw / draw

MG x 1-5

44
white spooned
calabash

Name W.M. Centre/Index No. /

Signature

P530/3
BIOLOGY
Paper 3
Nov./Dec. 2003
3 hours

Mwatah
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UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
PRACTICAL PAPER
Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

Answer all questions.

Answers must be written in the spaces provided. Additional pages must not be inserted.

| (DO NOT WRITE HERE) | |
|----------------------------|--|
| 1 | |
| 2 | |
| 3 | |
| Total | |

1. (72 minutes) ~~The prima traps not collects but receives channels~~
stained structure traps, or direct You are provided with a freshly killed specimen labelled R.

- (a) Study the external features of the specimen and list three observable features that enable the specimen to colonise land. (03 marks)

- (i) ~~Fur to reduce H_2O loss / conserve heat / temp regulation~~
~~Penta-dactyl limbs for locomotion~~
(ii) ~~External ear for hearing / sensing / trapping sound waves~~
~~Vibrissae / whiskers for sensitivity / burrowing (directly size)~~
(iii) ~~Claws for firm grip / support / digging tunnels / escape / protection~~
~~Eyes for seeing / hunting~~
(b) (i) ~~Long tail for support / balance / defence~~
~~Measure the length of the tail and that of the tail plus the rest of the body. Express your results as a ratio of, tail: tail + rest of the body. (01 mark)~~

1 : 2

05

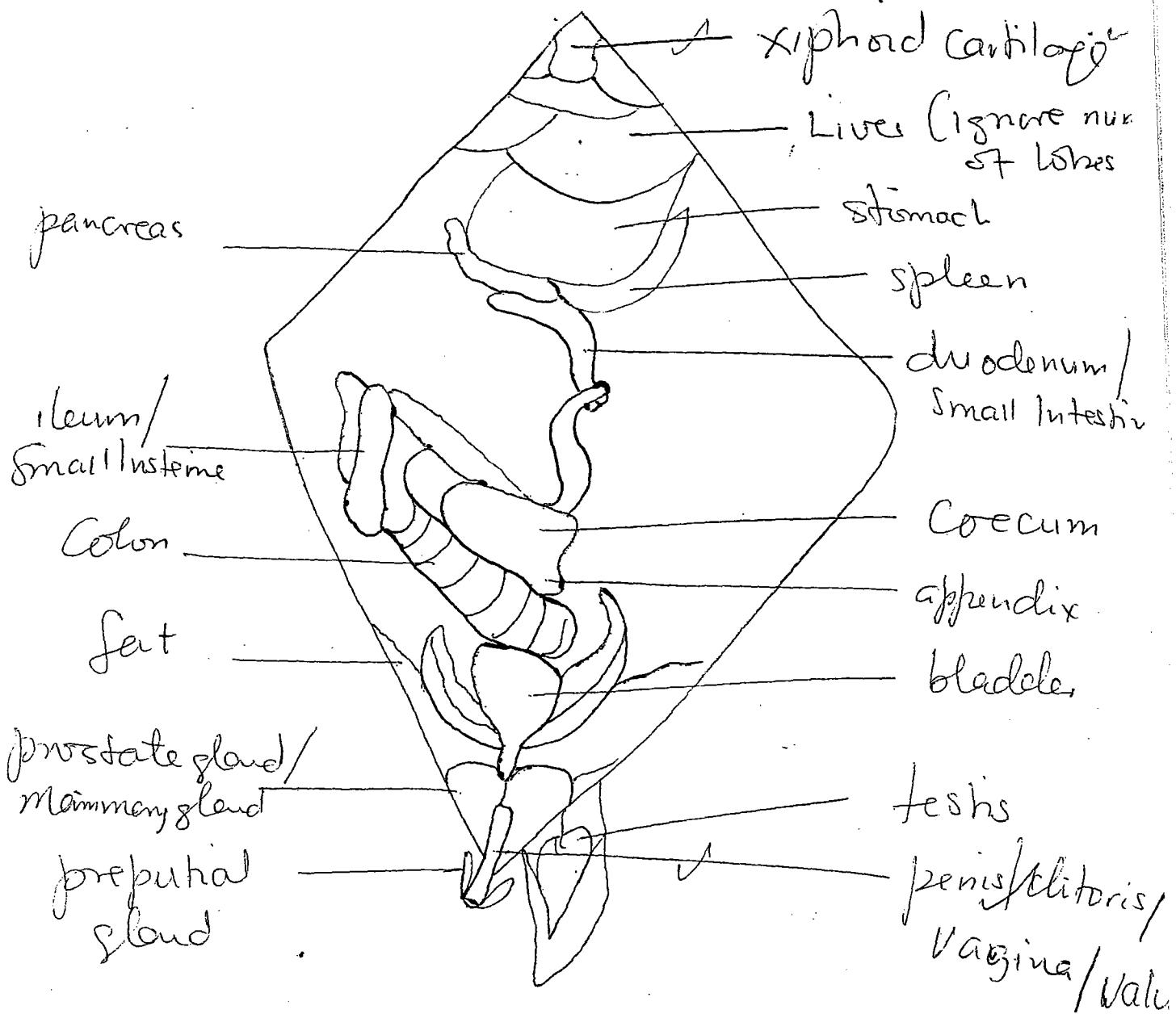
- (ii) Suggest the significance of this ratio in the life of the animal. (02 marks)

Tail being half the length of the whole body helps to give support / balance
Maintain raised head (associated w/ for locomotion)
OK... drive away other organisms / predators / defence

02

Since the ratio gives the length of the tail, only the significance is required.
Important.

- (c) (i) Dissect the specimen to clearly display the structures lying posteriorly to the diaphragm without displacing any organs.
Draw and label your dissection. (16 marks)



DIL @ drawing = 0.8 mm

@ labeling = $\frac{18}{2} = 9$ mm

m = 0.1

N = 0.4

O = 0.4

T = 0.1

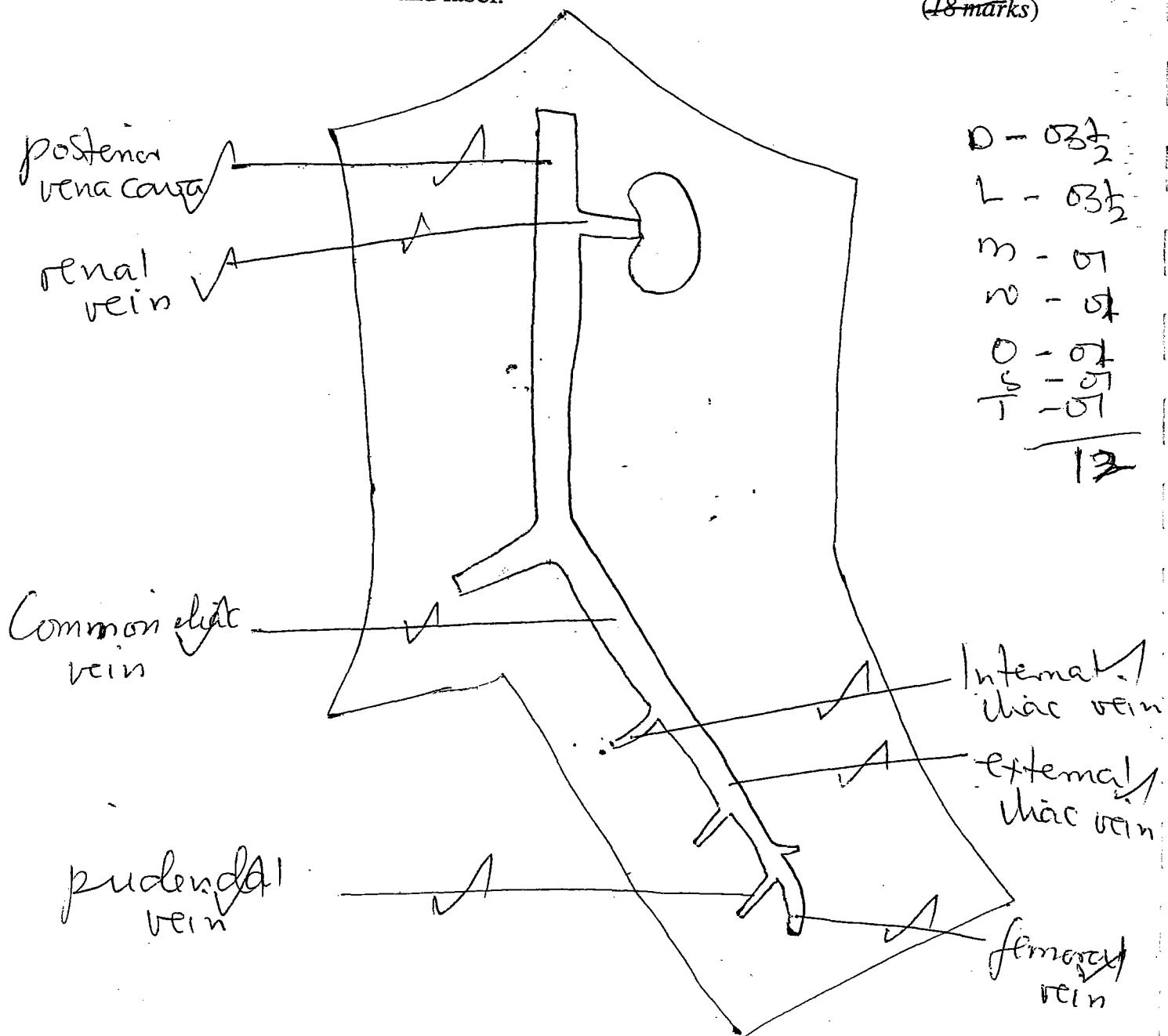
UD = 0.1

- | General function of the bacteria | |
|----------------------------------|------------------------|
| (i) | fixate nitrogen |
| (ii) | dinitrogen |
| (iii) | decomposes cellulose |
| (iv) | sewage treated |
| (v) | digestive tract flora |
| (vi) | bacteria |
| (vii) | N_2 fixation |
| (viii) | producers (some fungi) |

- (ii) Dissect the specimen further to display the blood vessels that drain blood from the thigh of the left hind limb and kidney back to the heart.

Draw and label.

(18 marks)



NB Left side implied in the drawing

~~NA~~ for artery (right side) distant structures
 except kidney / heart / left hind limb /
 Veins from other significant structure /
 branches from posterior vena cava.

2. (59 minutes)

1st Enzyme Catalase

1% H₂O₂

You are provided with solution Z which is a plant extract and solution V. Label six test tubes as A, B, C, D, E and F and put into each test tube 3 cm³ of solution V.

- (a) (i) To test tube A, add 1 cm³ of solution Z at once. Record the observations and the time taken for the reaction to stop, in Table 1.
- (ii) Repeat the procedure in (a) (i) with test tubes B, C and D in water bath of temperatures 30°C, 40°C and 50°C respectively and enter all the results in Table 1. (08 marks)

30g in 1000cm³ =>

Table 1

| Test tube | Temperature (°C) | Observations | Time taken for the reaction to stop (sec). |
|-----------|------------------|---|--|
| A | Room temperature | few / Little bubbles / Effervescence / Foamy / Fizzip | longest time 1000 ✓ 03 |
| B | 30 | Moderate / Many effervescence | Moderate time 500 - 1000 ✓ 03 |
| C | 40 | U. Many / much / rapid effervescence / ✓ | Shortest time 60 - 300 sec. ✓ 02 |
| D | 50 | No reaction / few / little / No effervescence / bubbles | Long time / ✓ Zero Sec. / No reaction. ✓ 02 |

= Extract to prepare

an active substance / enzyme

Cross wrong spelling. 12
bubble ✓ Turn Over

time in min. hrs = zero

- (b) Solutions W and X are common laboratory reagents.
 Add 5 drops of solution W into test tube E and 5 drops of solution X into tube F. Then add 1 cm³ of solution Z to each of test tubes E and F simultaneously. Record your observations in Table 2.

(02 marks)

Table 2

| Test tube | Contents | Observations |
|-----------|---|---|
| E | 1/6 H ₂ O 5 drops extract V + W + Z | much rapid lot of effervescence ✓ |
| F | 1/6 H ₂ O 5 drops extract V + X + Z | few or no effen cese / A little effervescence |

- (c) The concentration of solution V has been varied to give solutions V₁, V₂ and V₃. Add 1 cm³ of solution Z into each of the test tubes containing solution V₁, V₂ and V₃. Record your observations in Table 3.

(03 marks)

Table 3

| Contents of test tube | Observations |
|-----------------------|---|
| V ₁ + Z | few / slow effervescence / bubbling / foaming / fizzing |
| V ₂ + Z | many / moderate effervescence |
| V ₃ + Z | V. many / rapid effervescence ✓ |

(d) Explain the observations you have made in test tubes

(i) A, B, C and D in (a):

Test tube A (room temperature) (03 marks)

There is low ~~activity~~ break down decomposition of H_2O_2 / activation of enzyme due to low temperature. O₂

Test tube B (02 marks)

There is moderate break down of H_2O_2 due to increased temperature to moderate (relatively higher than room temp. (not too high)) O₂

Test Tube C (02 marks)

fast reaction / high activation / mobility of active substance due to optimum temperature

O₂

Test Tube D (02 marks)

C.e. consequential error
No activity / inactive substance due to denaturation of the enzyme by O₂ at high temperatures. ref. kill / inactivation

Change is brought about by enzyme activity / activation which is determined by temperature.

Turn Over

(ii) E and F in (b):

Test Tube E

(02 marks)

W is suitable | Favourable medium for reaction
between V and Z | break up dem | decomposition
of V by Z

07

Test tube F

(02 marks)

X Unfavourable | unsuitable medium for
reaction b/w V and Z | break down | decompositi
of V by Z

07

- (e) In part (c) where the concentration of V has been varied, arrange the solutions in order of increasing reactivity, starting with the least reactive.

$V_1 < V_2 < V_3$ (must get the whole order)

(01 mark)

07

- (f) ~~I must surely write C~~ ^{Correct} Table behind.
Giving two reasons, suggest the active substance in solution Z.

Active Substance is likely an enzyme
Organic Catalyst | catalase

(03 marks)

07

- Inactivated at low temp | room temp

- Most active at optimum temp | 40°C

Denatured at high temp | 50°C

02

Rej: pH Since experiment on pH gives no
due to solubility of active substance.

Any
two

(g) What properties of the active substance have been demonstrated?

(03 marks)

- Active substance is =
- Sensitive to lab reagents | ~~if pH mentioned~~ | ignore
 - Inactivated at low temp / room temp Any 3
 - Most active at optimum temp = C
 - Denatured / destroyed at high temp / 50°C
 - Breaks down / decomposes / catalyses the break down of activity comes into effect & substrate 34
3. (49 minutes)

You are provided with specimens P, Q, R, S, T and U. Open specimen Q longitudinally and cut the rest transversally.

I = pawpaw

P = Unripe mango

Q = green bean pod

R = unripe orange

S = cucumber

F = green peppers

V = raw paw

(fruits) X

(a) Looking at the sections, describe seed arrangement in each of the following specimens:

(i) P

(02 marks)

One Seed; at the Centre / middle /
within a single chamber / locule / O.

Attached at by the funicle at the base
avocado - Seed attached at apex by funicle
(ii) Q (02 marks)

Seeds attached along the side;
margin / periphery / on one side; O.
All arranged along one side

underline placenta ad cross

(iii) R

(02 marks)

Seeds radiate outwardly
Central point/placenta in a circular pattern

02

Seeds embedded in Juicy/fleshy endocarp

(iv) S

(02 marks)

Seed suspensory/radiate/ponty
Inward at 3 points/interior in a regular
Manner

02

(v) T

(02 marks)

Seeds clustered/crowded/concentrated
Concentrated on central placenta
Lat placenta

02

(b) (i) Give two internal features common to both specimens T and U.

- Both have placenta

(02 marks)

- possession of seeds / many seeds

- Mesocarp fleshy / succulent / reg-edible / oily

- divided pericarp or mesocarp and endocarp
divided

- Large / open locule (chamber) / hollow fundus

(ii) State one difference in the internal structure of specimens T and U.

Placenta at the centre | placenta at the periphery
anthers at the base | stigmas

posses septa / divided
locule

- thin mesocarp

no septum / undivided
locule

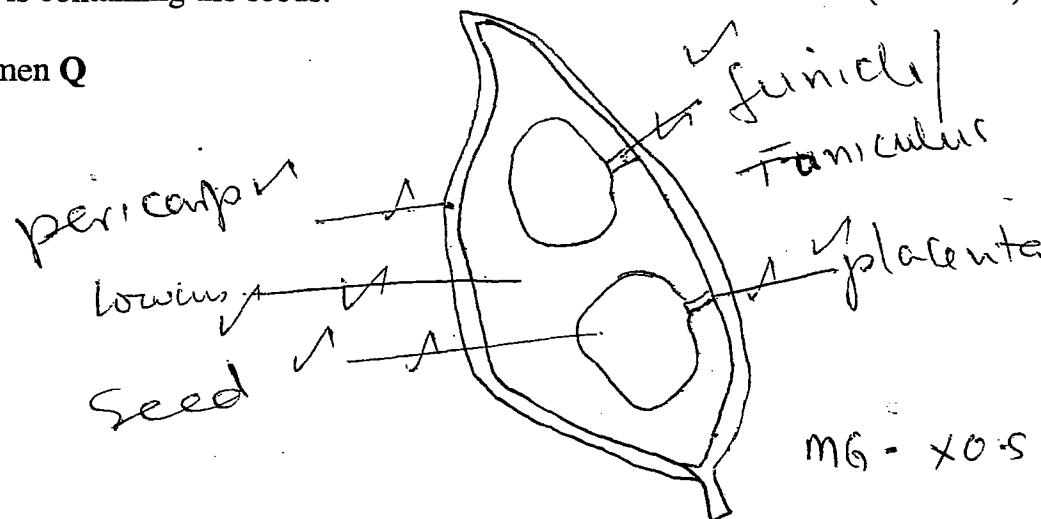
- thick mesocarp
reg-type of placentation

Any 1st
two

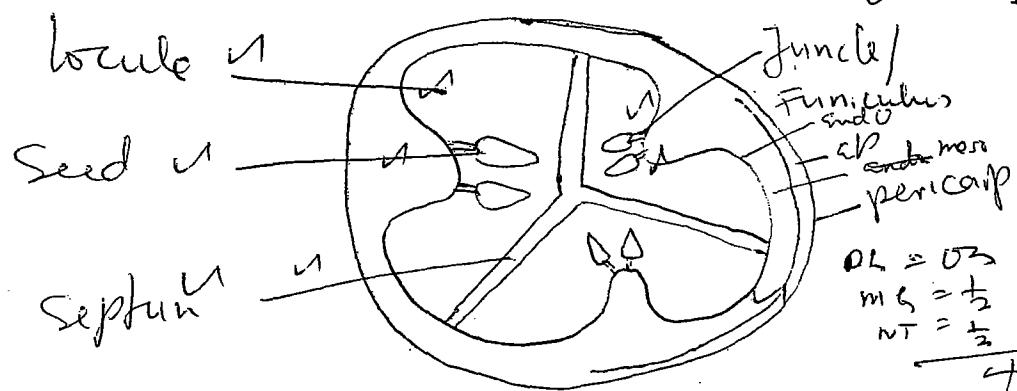
Any
one

- (c) Draw and label a transverse section of specimen S and one half of specimen Q which is containing the seeds. (04 marks)

Specimen Q



Specimen S



- (d) Limiting yourself to the internal features of the specimens, construct a dichotomous key to identify them. (10 marks)

pericarp initials
direct.

reg better
shape
bright or dull
may be used

52

Q (bean).

More than one seed; enlarged seed; fused endocarp and mesocarp; papery placenta; placenta along margin; single locule; short funicle.

reject the
whole key if the
names are used.

K (orange) Many seeds, divided pericarp (mesocarp & endocarp), placenta at the centre, thick endocarp, tiny endocarp, stony seeds, seeds radially arranged.

S = (accuse)

many seeds, divided pericarp (mesocarp and endocarp), placenta at the periphery / outer side, fleshy / succulent mesocarp and endocarp, placenta at 3 points, seeds arranged in regular manner, 3 locules / chamber has septa, prominent / large funicle.

T (green pepper) Many seeds, divided pericarp, placenta central, placenta arises from base, 3 locules / chamber has septa, seeds clustered on placenta.

U (pepper) Many seeds, divided pericarp (mesocarp and Endocarp) placenta at periphery / outer side, fleshy / succulent mesocarp, papery / thin endocarp, rough seeds

NB - Any of the given internal features may be considered for the dichotomous key

- The dichotomous key must flow to ---

to to 3

- ~~forward~~ only after successful felicitate after

using descriptive internal features
who repetition of the same constantly
statement

Name Centre/Index No.

Signature

P530/3
BIOLOGY
PRACTICAL
Paper 3
Nov./Dec. 2006
3 hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY
PRACTICAL
Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

Answer all questions

Answers must be written in the spaces provided. Additional sheets of paper must not be inserted.

| For Examiner's Use Only | |
|-------------------------|-------|
| Question | Marks |
| 1 | 40 |
| 2 | 35 |
| 3 | |
| Total | |

(72 minutes)

1. (a) You are provided with specimen R. Classify it into the following groups:

(1½ marks)

~~Rept.~~
R = Toad.
Kingdom Animalia

Phylum Chordata

Class Amphibia

0 1/2

- (b) Observe the head of the specimen and state how it is adapted to its habitat.

(3½ marks)

- poison gland for defence
- nictitating membrane for cleaning & protection of the eye
- triangular head to eat swim and burrowing
- protruding eyes for wide field / clear vision / better vision
- large mouth, protruding wide jaws for capturing prey
- nostrils/nares for breathing
- brown/green/grey patches/dull colored for camo. / camouflage
- flat ear drum / tympanic membrane / no pinna for streamlined shape for easy swim.

0 3 1/2

- (c) Dissect specimen R to display the main superficial muscles of the left

thigh of the specimen. Draw and label the muscles.

(09 marks)

Adiagram I draw of main
superficial muscles of
left thigh of specimen R.

$$DL = 06$$

$$M = 07$$

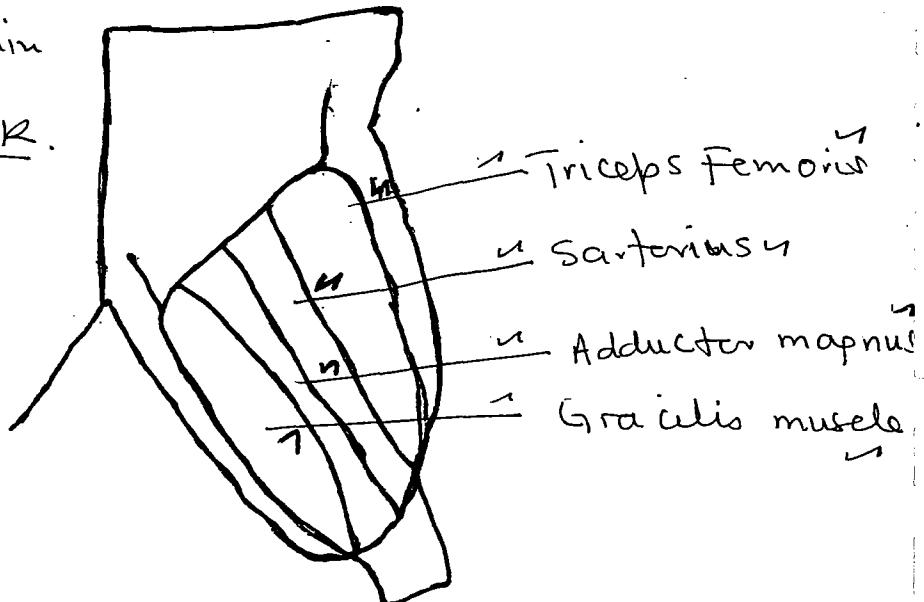
$$O = 07$$

$$H = 07$$

$$T = 07$$

$$S = 07$$

$$\underline{11}$$

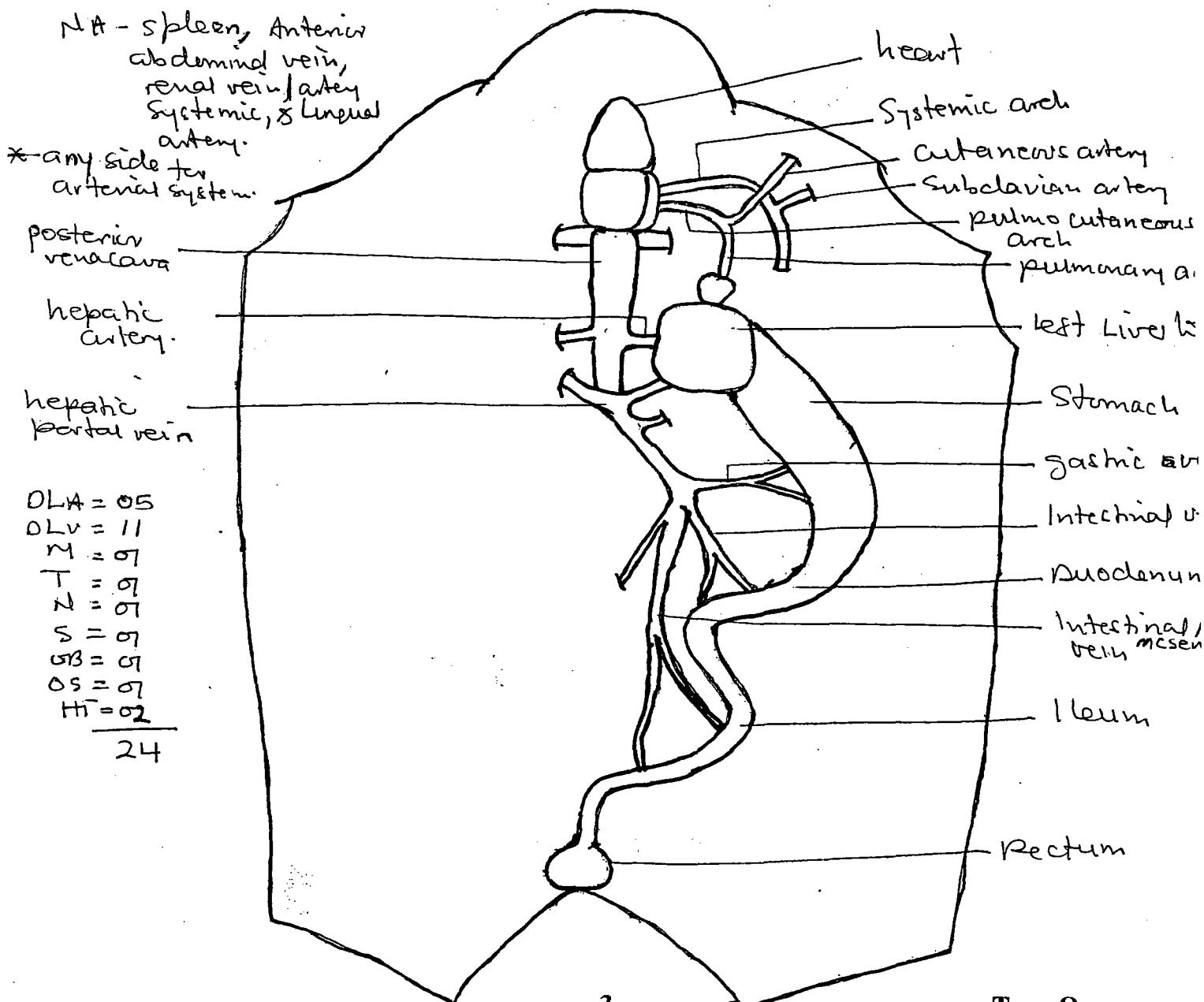


(d) Continue to dissect the specimen to display,

- (i) the blood vessels that drain blood from the alimentary canal and its associated organs back to the heart, with the alimentary canal displaced to your right and the heart turned upwards and pinned through the ventricle.
- (ii) the blood vessels that take blood from the heart to the thoracic region of the animal.

Draw and label your dissection showing (i) and (ii) on one diagram.

A drawing of specimen R showing blood vessels
draining alimentary Canal displaced on the left of the
animal and its associated organs and the vessels
that supply the thoracic region of the animal. (26 marks)



(a) Sheet 15mls of @ soln
P = Inst. potato
(63 minutes)

2. You are provided with specimen P and sugar solutions of varying concentrations labelled A, B, C, D, E and F.

25cc measuring cylinder
Cork borer
Microscope
Scales, clock
Stopper

(a) Measure 8.0 cm³ of each solution and transfer the solutions into test tubes labelled correspondingly. Using a cork borer, obtain six equal sized cylinders of at least 1cm diameter, from specimen P and trim the cylinders to a uniform length of 6.0 cm. Immerse a cylinder into each of the solutions in the test tubes and leave for 1½ hours.

(You may proceed with other work)

- (i) After 1½ hours, transfer solution A into a measuring cylinder and record the final volume in Table 1.

Repeat the procedure for the remaining solutions. (06 marks)

Table 1

| Solutions | 1.0M | 0.8M | 0.5M | 0.3M | 0.1M | 0.05M | |
|--|--------------------------------|-----------|-----------|-----------|-----------|-----------|------------|
| Final volume | 8.5 - 9 | 8.8 - 8.4 | 8.6 - 8.1 | 8.3 - 7.8 | 7.9 - 7.4 | 7.6 - 7.0 | 0.6 |
| Initial volume: final volume ratio | 8.0 x | " | " | " | " | " | 0.3 0.3 |

- (ii) Calculate the initial volume to final volume ratio, of the solutions, in the spaces provided in Table 1. (06 marks)

- (b) From the table,

- (i) suggest the solution with the concentration nearest to that of the cell sap of specimen P. Explain your answer. (03 marks)

Solution D; (C, D, E in relation to table)

The initial and final volts of the soln remains the same

Closest to the original volⁿ; ✓

Gives the ratio of 1:1 nearest to 1:1 meaning no net movement of H₂O in or out of the plant tissue.

.....

- (ii) arrange solutions A to F in order of decreasing osmotic potential.
Explain your answer. (06 marks)

F < D < C < B < A < J (F > E > D > C > B > A)

F has greatest tendency to lose H_2O ; thus loses most.

H_2O to cylinder leading to great decrease in $VOL^{\frac{1}{2}}$;
followed by E in that order. A has the lowest tendency
to lose H_2O ; thus loses the least H_2O to cylinder/gain
more H_2O leading to the greatest rise in volume b/c it is most concentrated; C

- (c) Explain the results obtained in test tubes A, D and E. (09 marks)

Test tube A

Is more concentrated / lowest vw , T & pressure, & o.potential (hypotonic) b/c cell sap < cylinder;

H_2O is lost from the cylinder by osmosis and gained by
the solⁿ causing an increase in volume of the solution;

Test tube D

Solⁿ 2 is isotonic to the cell sap of the cylinder;

No net osmotic mov't of H_2O ; causing no

change in volume;

03

Test tube E

Is hypotonic to the cell sap of the cylinder;

Water is osmotically gained by the cylinder; causing a

decrease in volume of the solution;

03

14

(d) Examine the cylinders placed in solutions B and F.

- (i) Compare the physical condition of the cylinders from the two solutions. (04 marks)

| B | F | |
|--------------------------|--------------------------------------|----|
| - shorter | longer | |
| - shrunken ↓ in volume | swollen bigger | 04 |
| - Flabby soft limp | Turgid hard firm rigid stiff | |
| - Smooth texture | Rough texture | |

- (ii) Suggest the ecological significance of your observations in (d)(i) in the life cycle of specimen P. (01 mark)

H₂O intake leads to turgidity for growth / support

~~Refr
scale~~ more so in herbaceous plants causing them to stand upright for photosynthesis.

Turgidity enables the plant to store more H₂O

Flabby leads to wrinkling of plant leaves to reduce H₂O loss

02

06

35

(45 minutes)

3. You are provided with specimens S and T.

- (a) Observe the specimens and state the type of nutrition that occurs in each, giving a reason. (02 marks)

~~A is the more complex~~ S - Autotrophic | photosynthetic |
hollow pink due to being green | because it has chlorophyll

T - Heterotrophic due to absence of chlorophyll

02

You are provided with specimen Q which is a freshly killed animal.

Toad frog

- (a) (i) Examine the head and describe its shape.

triangular shape, dorsoventrally flattened /
compressed, tapering to the snout / broad at rear part
03

- (ii) Measure the thickness, width and length of the head.

Thickness - 1.0 (0.5-1.5) cm ✓

Width - 3.0 (1-3) cm ✓

Length - 4.0 2.5 cm ✓

constant diff in measurements

01

- (iii) State the ratio of

Thickness to width 1:3 ✓ yes ✓

Thickness to length 1:4 ✓

- (iv) What is the significance of the shape and proportions of the head in relation to its mode of life?

It offers a streamlined shape to ease movement in water / swimming / burrowing;

rej if ease movt alone

to feed head ce

(9 marks)

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P530/3
BIOLOGY
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3 hours

MARKING SCHEME

P530/3 - 2001

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY

PRACTICAL PAPER

Paper 3

3 hours

INSTRUCTIONS TO CANDIDATES:

Answer all questions.

Answers must be written in the spaces provided. Additional pages must not be inserted.

(DO NOT WRITE HERE)

| | |
|-------|--|
| 1 | |
| 2 | |
| 3 | |
| Total | |

(c) Remove a small portion of specimen T and examine it under a microscope.

(i) Name and describe four major vegetative parts of specimen T in Table 2. (06 marks)

Table 2

| Part | Description |
|----------------------------|--|
| Spore capsule / Sporangium | ball shaped / swollen / spherical / dull colored / black lead. |
| Sporangio sphere | thin / slender / long |
| Rhizoid / Root-like hyphae | numerous, thin, slender |
| Stolen / Linicarp hyphae | thin, slender, form network of threads / hyphae. |

(ii) From the descriptive features in Table 2, state how any two parts are adapted to their functions. (02 marks)

- Sporangio sphere thin / flexible / long for spore dispersal
- Rhizoid thin to penetrate the soil to absorb many nutrients.
- Sporangium ball like / round / enlarged / swollen to store many spores.
- Stolen form network for support / cover wide area.

(d) For survival in its habitat, state one advantage

(i) specimen S has over T. (01 mark)

S. has chloroplasts for photosynthesis / septa for fragmentation (sexual reproduction)
pyrenoid for food storage / filaments for large surface to absorb more sunlight

(ii) specimen T has over S. (01 mark)

- Root-like hyphae to absorb ready made nutrients / anchorage
- Bears spores numerous for fast multiplication / rapid growth after new areas
- Long sporangio sphere for easy dispersal

(e) From the structural characteristics of S and T, classify the specimens according to the groups in Table 3. (02 marks)

Table 3

| Specimen | Phylum | Class |
|----------|--|---------------|
| S | Chlorophyta | Chlorophyceae |
| T | Zygomycota / Eumycophyta / Zygomycetes | Zygomycetes |

S = ~~sporangia~~
T = broad mad (fibrozyme)

(b) Examine **one** filament of specimen S using a microscope.

(i) Give **two** structural characteristics of the specimen. (02 marks)

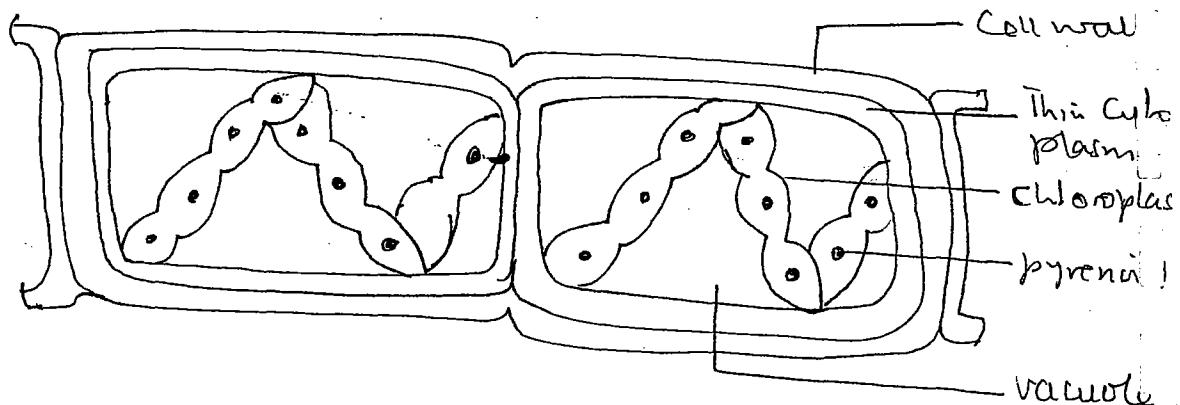
- spiral chloroplast
- Cell joined end to end | septated lengthwise to make a filament
- Thick Cell wall
- pyrenoids within the chloroplast
- peripheral cytoplasm | thin cytoplasm
- large vacuole

(ii) State **three** structural features which enable specimen S to survive in its habitat. (03 marks)

- Chloroplas - for photosynthesis & septate for flexibility
- filamentous for water in H₂O | absorb more light for photosynthesis
- long filaments for sun exposure
- pyrenoids for food storage
- spiral chloroplast increase surface area for trapping more light

(iii) Draw and label **two** cells of S that you can see clearly. (06 marks)

Drawing of two cells of specimen S



$$D = 0.4$$

$$M = 0.7$$

$$N = 0.7$$

$$T = 0.7$$

$$A = 0.7$$

$$\underline{0.8}$$

(b) (i) Examine the limbs of the specimen and draw a fore limb and hind limb to the same magnification, in the space below.

D - 01
M - 01
W - 01
Z - 01
S - 01
OS

upper arm
Fore limb (brachium)

fore arm
(antebrachium)

(Size (S) = 8)
(M = 8t) ulna & t.
carpus

Hind limb

tarsus (ankle)

Mag X 0.5 - X 5

(ii) Explain the significance of the differences between the fore limb and the hind limb to the mode of life of the animal.

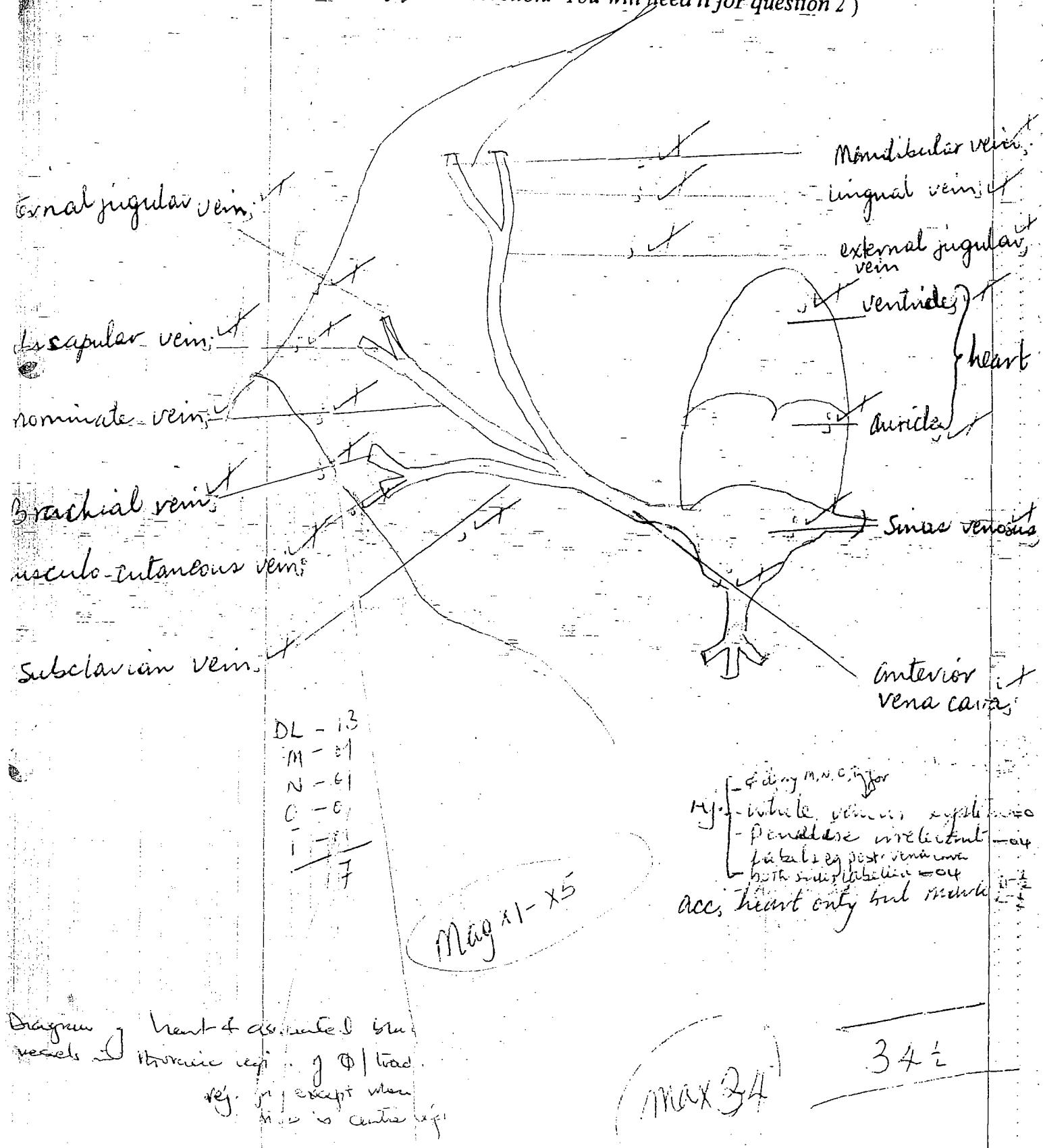
Any four

Hind limb is webbed to provide a large surface for pushing the animal forward
Long hind limb for jumping (acc. leaping)
Short front limbs for shock absorption when landing.
These limbs (for generating force) / in leaping / in landing / etc...
(11 marks)

Turn Over

(c) Dissect the animal to display the heart and the associated blood vessels that drain blood from the fore limbs, head region and skin in the thoracic region. Draw and label the heart and the associated vessels on one side of your dissection.

(Do not throw away your dissection. You will need it for question 2)



You are provided with solutions X and Y.

- (a) Identify the food substances in the solutions X and Y using iodine solution, Benedict's solution and millon's reagent only.
Record your tests, observations and deduction in the table below.

| Tests | Observations | Deductions |
|--|--|------------------------|
| To 1cm ³ of X add 3 drops of iodine solution | Remains yellow/brown | Starch absent |
| To 1cm ³ of X add 1cm ³ of Benedict's and boil/heat it | Remains blue | No reducing sugars |
| To 1cm ³ of X add 3 drops of Millon's reagent and heat it | Changes to pink ppt as soln/pink colour | Proteins present |
| Starch test on Y | Changes to blue/black | Starch present |
| Reducing Sugar test on Y | Remains blue | Reducing sugars absent |
| Proteins test on Y | Remains colourless solution | Proteins absent |

(6 marks)

X - 10cm³ of egg albumen (1 egg alb. diluted to 1 litre)

Y - 10cm³ of 3% starch solution

Turn Over

- (b) Cut a piece of the stomach from the dissection in question 1, measuring 1 cm^2 . Wash and grind it in a mortar. Add 4 cm^3 of distilled water, leave to settle then decant. Label the extract, S.

Label four test tubes 1, 2, 3 and 4 and add contents to each test tube as shown in the table below.

| | |
|-------------|--|
| Test tube 1 | 2 cm^3 of X and 1 cm^3 of dilute hydrochloric acid solution. |
| Test tube 2 | 2 cm^3 of X and 1 cm^3 of dilute sodium hydroxide solution. |
| Test tube 3 | 2 cm^3 of Y and 1 cm^3 of dilute hydrochloric acid. |
| Test tube 4 | 2 cm^3 of Y and 1 cm^3 of dilute sodium hydroxide solution. |

Divide extract S into four equal portions and add a portion to each of test tube 1, test tube 2, test tube 3 and test tube 4 above.

Incubate the test tubes at 40°C for 20 minutes.

After 20 minutes,

- (i) observe test tubes 1 and 2 and record your observations and deductions in the table below.

| | Observations | Deductions |
|-------------|-------------------------------------|--|
| Test tube 1 | Clear Solution, less turbid | Proteins absent, Hydrolysis & digestion/breakdown |
| Test tube 2 | Solution remains Cloudy & turbid | Proteins present, No hydrolysis/digestion/breakdown |

QJ-XII

- (ii) identify the food substances in test tubes 3 and 4 using the reagents provided. Record your tests, observations and deductions in the table below.

| Test tube | Tests | Observations | Deductions |
|-----------|------------------------------------|-----------------------|--------------------|
| 3 | It. 3 + iodine | Changes to blue-black | Starch present |
| | It. 3 + Benedict's solution + heat | Remains blue | No reducing sugars |
| 4 | It. 4 + Iodine | Changes to blue-black | Starch present |
| | It. 4 + Benedict's solution + heat | Remains blue | No reducing sugars |

38

- (iii) From your results, state two properties of the active substance in solution S.

It is specific in action (breaks down proteins but not starch). It works best in acidic medium. (12 marks)

02

Answer
Q3 (iii) (a)

(c) You have been provided with a fresh bean seed labelled E. Remove the testa and split the seed into two.

Cut another piece of the stomach, two pieces of the liver, a piece of the leg muscle and a piece of lung, from the dissection in question 1.

All the pieces should be the same size as one half of the split bean seed. Boil one half of the bean seed and one piece of the liver, separately, for 3 minutes then cool.

Label six test tubes 1,2,3,4,5 and 6 then add 2 cm³ of hydrogen peroxide to each test tube followed by the different cut pieces to each test tube as indicated in the table below. Record your observations and deductions.

| | Observations | Deductions |
|--|--|---|
| Test tube 1 add <u>unboiled</u> half of bean seed. | Less moderate effervescence | less moderate/little catalase/enzyme present, <i>extra substance decomposes</i> |
| Test tube 2 add <u>boiled</u> half of bean seed. | No effervescence no reaction ↓↓↓↓↓ | No catalase/no enzyme |
| Test tube 3 add <u>unboiled</u> piece of liver. | Vigorous effervescence | Much catalase/enzyme present |
| Test tube 4 add <u>boiled</u> piece of liver. | No effervescence | No catalase/enzyme |
| Test tube 5 add piece of leg muscle. | Moderate effervescence | Moderate catalase/enzyme present |
| Test tube 6 add piece of lung | Very little/least effervescence | Very little catalase/enzyme present |

12

(12 marks)

20 cm³ of 10% Hydrogen peroxide

(d) From your results state three conclusions from the experiment in (c).

The Catalase enzyme is found in both animal and plant tissues.

Catalase enzyme is in different amounts in different tissues. except order but very "finely" if seen

Catalase enzyme is destroyed by heat.

In water lily leaf, Action of H_2O_2 break down into water molecules and O_2 .

C₁ - sunny conditions

C₂ - shade conditions

D₁ - dust not system

D₂ - insect (49 minutes)

3. You are provided with specimens B, C₁, C₂, D₁ and D₂. C₁ and C₂ are whole plants while B, D₁ and D₂ are plants parts.

Specimens B, C₁ and C₂ are each from a different habitat.

(3 marks)

Mark 40

40

(a) State three observable differences between specimen C₁ and C₂.

| <i>Any three</i> | C ₁ (sunny) | C ₂ (shade) |
|------------------|------------------------|------------------------|
| | Has pale green leaves | Dark green leaves |
| | Short internodes | Long internodes |
| | Thin stems smaller | Thick stems bigger |
| | More hairy leaves | Less hairy leaves |
| | Narrow / short leaves | Broad / longer leaves |

(3 marks)

(b) Obtain a small piece of the epidermis from the upper surface and lower surface of specimen B. Mount each epidermis in a drop of water, one at a time. View under low power of a microscope, count and record the number of stomata in a field of view, for each surface, in the table below.

Repeat the procedure with leaves of specimens C₁ and C₂.

Turn Over

Ref if
stomata
is greater
lower side

lower side
has much
more than
upper side

upper surface
more

Same of C₁
but lower
than C₂
lower surface

| Specimen | Surface | No. of Stomata |
|----------------|---------|----------------|
| B | Upper | 06+ 105 |
| | Lower | 00 none |
| C ₁ | Upper | 00/01 100-150 |
| | Lower | 04+ 300-500 |
| C ₂ | Upper | 03 50-100 |
| | Lower | 05+ 250-500 |

(3 marks)

- (c) (i) Suggest a suitable habitat from which each specimen was obtained.

B Water ✓

C₁ Sunny / open / dry area ✓

C₂ Shade / humid area

- (ii) State adaptations of each specimen to its habitat stated in (c). (i).

B Has many stomata on upper surface so that excess water is got rid of. No stomata on lower surface of leaf since it is submerged / stomata would play no role.

large surface for photosynthesis, reduced evaporation
long leaf stalk for photosynthesis light for phs.
Hollow leaf stalk for photosynthesis

02

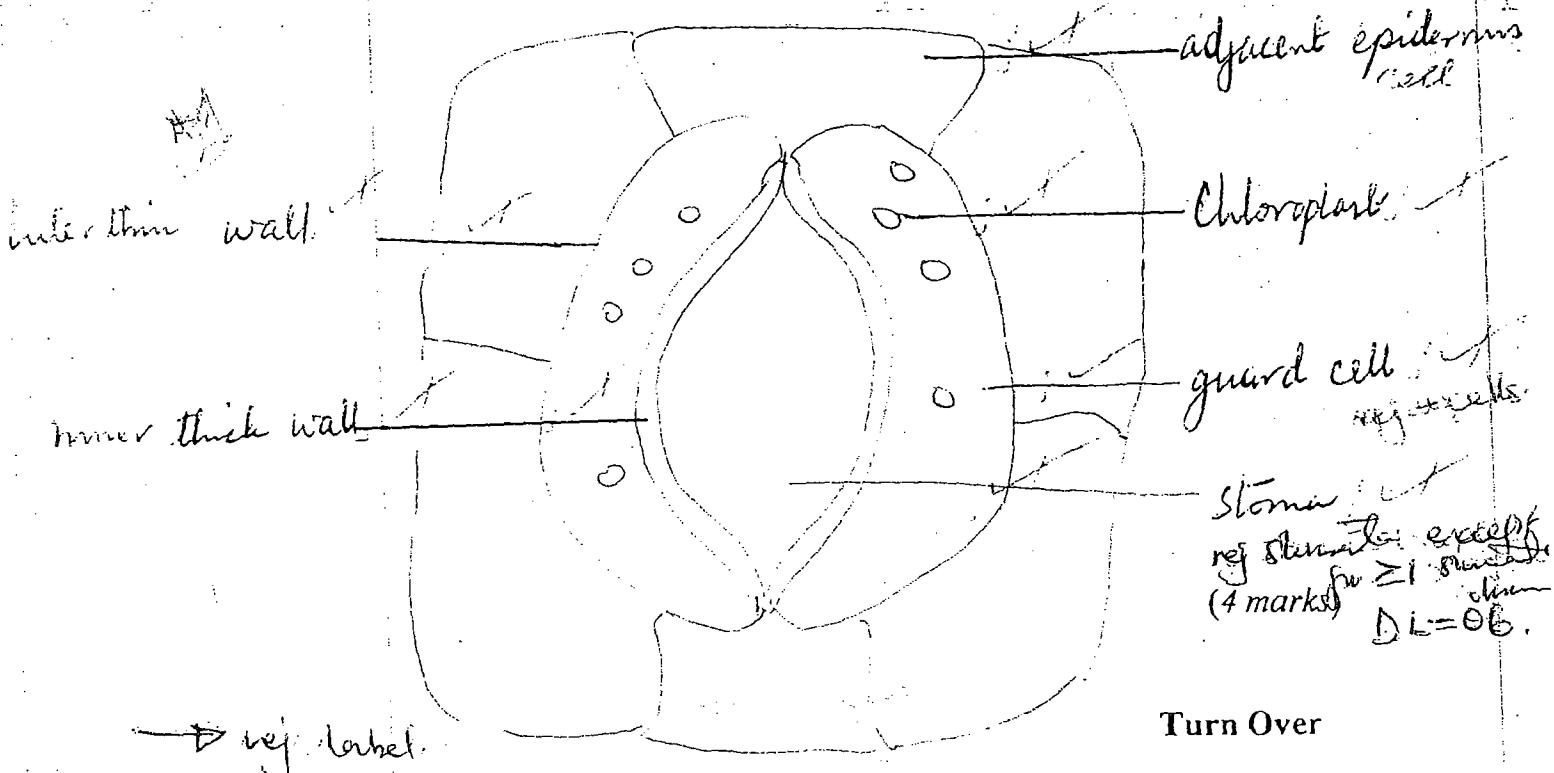
more stomata on lower surface to check water loss.

- ② Hairy to minimise water loss (by trapping water vapour increasing humidity).
- ③ Narrow / short leaves to minimise exposure to heat, minimise water loss.

- c. ① Almost equal number of stomata on both lower and upper surfaces because it is not directly exposed to light.
- ② Dark leaves should have large leaves to maximise capture of light.
- ④ Less hairy as there is little danger of water loss.
- ① Few stomata on upper surface more on lower surface to reduce water loss.

(14 marks.)

(d) Draw and label a stoma from specimen C₁.



Turn Over

Stoma
ref. Stoma (for excep)
for 21. Branch
(4 marks)

$$DL = 06.$$

(e) (i) State one difference between specimen D₁ and D₂.

One main root with small roots. All roots about same size.

Big long main root

All thin/small roots/films in.

Few roots

Numerous roots

- Has (ii) Giving reasons, state two advantages of specimen D₁ over D₂ and salt

Long tapering root can get access water from deeper levels.

Big and long root offers better anchorage.

- Big g. nodules. It has有利 for fixing nitrogen.

(3 marks)

Mark 20

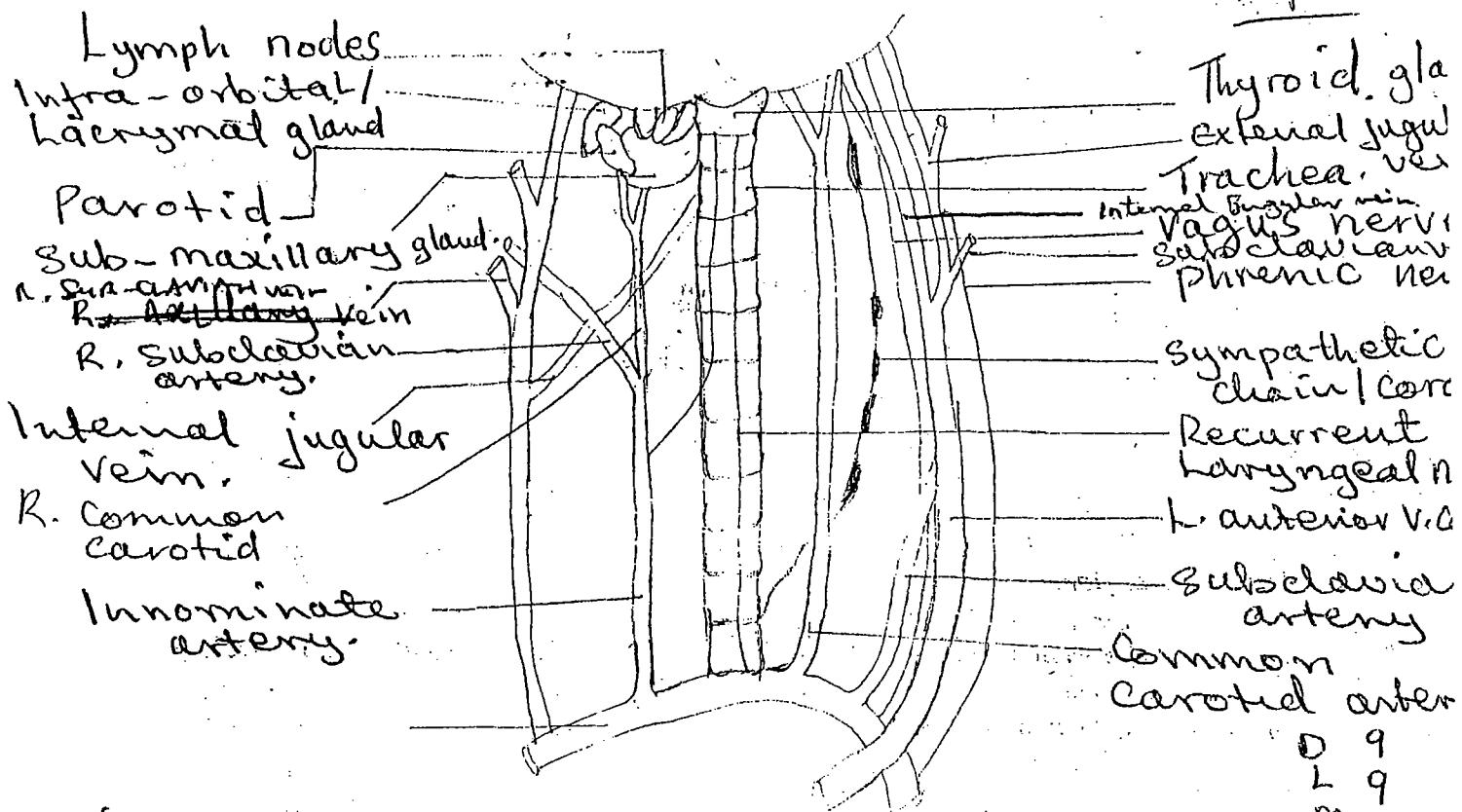
27

END

1. You are provided with specimen T. Carry out the dissection of the specimen using the following procedure.

Pin the animal with the ventral side uppermost. Remove the skin of the thoracic region including the neck. Lift the xiphoid cartilage and cut along the lower edge of the rib cage. Tie the xiphoid cartilage, pull it back and pin it down. Cut along the side wall of the thorax on both sides to remove the rib cage. This should expose the main blood vessels, nerves, respiratory tract and glands in the region.

- (a) Draw the neck region and label fully.



Drawing showing structures in neck region

- If given Right/Left give drawing mark for both sides but mark one side

- (b) Locate the trachea and examine it. Describe its structure. If right/left one

Cartilagenous; rigid; ringed; open; hollow; tubelike; cylindrical; Any four.

OK

(c) How is the structure of the trachea related to its function?

All Proges

Rigid to keep trachea open; support/k
Cartilagenous for flexibility;
Ringed to keep it open/flexible;
Tube like / hollow to allow air passage;

30

Stomach

2. (a) You are provided with food extract E and you are also required to make two other extracts X and Y from the dissection of question 1, as follows:

Stomach Pancreas

- (i) Obtain a whole stomach from the dissection, cut it open and wash out the contents.
- (ii) Chop the stomach into small pieces and grind it into a paste and add 10 ml of distilled water to obtain an extract.
- (iii) Allow to stand for 5 minutes and pour off the liquid, label it X
- (iv) Obtain a whole pancreas and follow steps (ii) and (iii) to obtain an extract and label it Y.

Label 6 test tubes 1 - 6. Put 1 ml of food substances E in each test tube, add 1 ml of X into each of the tubes 1, 2 and 3 and 1 ml of Y into each of the tubes 4, 5 and 6. To each of the test tubes 1 and 4 add 1 ml of distilled water; to each of the tubes 2 and 5 add 1 ml of dilute hydrochloric acid, to each of the tubes 3 and 6 add 1 ml of dilute sodium hydroxide. A summary of the contents of each tube is indicated in the table below. Place all the test tubes in a water bath at temperature (35 - 40°C) and leave for 20 minutes shaking ~~too short~~ periodically. Observe and record your results in the table below.

(b)

| TESTS | OBSERVATIONS | CONCLUSIONS |
|---|------------------------|--------------------------------------|
| (i) Test tube 1 contains 2 ml of E + 1 ml of X + 1 ml of water. | Remains cloudy/turbid. | No digestion/ breakdown/ hydrolysis. |
| (ii) Test tube 2 contains 2 ml of E + 1 ml of X + 1 ml of dil hydrochloric acid. | Remains cloudy/turbid. | No digestion/ breakdown/ hydrolysis. |
| (iii) Test tube 3 contains 2 ml of E + 1 ml of X + 1 ml of dil sodium hydroxide solution. | Remains cloudy/turbid. | No digestion/ breakdown/ hydrolysis. |

| | | |
|---|-----------------------------|---|
| (iv) Test tube 4 put 2 ml of E + 1 ml of Y + 1 ml of water. | Clears Partially clear; ✓ | Digestion occurs hydrolysis/ breakdown. |
| (v) Test tube 5 contains 2 ml of E + 1 ml of Y and 1 ml of dil hydrochloric acid. | Remains turbid Cloudy; ✓ | No digestion/ hydrolysis/ breakdown. |
| (vi) Test tube 6 contains 2 ml of E + 1 ml of Y + 1 ml of dil sodium hydroxide. | Clears; ✓ | Digestion/ hydrolysis/ breakdown, occurs. |

Questions:

Comment state

(c) From your results, describe the nature of substance E.

E cannot be digested under conditions in the stomach; and in acidic conditions; it be digested under conditions of the pancreas in neutral conditions; alkaline conditions by enzymes that complete sugar breakdown; Reg. sucrose/maltose sugars only.

(d) What do the above results tell you about the behaviour of extracts X and Y?

Extract X does not hydrolyse substance E under any conditions | pH; Extract Y does not hydrolyse E; Under neutral | alkaline conditions; but not in acidic cond

3 Total 40 (Max 40)
You are provided with specimens K, L, M, N, O and P which are flowers.

Actino = Mpa) Using a hand lens, carefully examine specimen L and one flower of specimen K and state three observable differences between them.

Zyg = K) NO K - maize

1. Dull Coloured

2. Has bracts only

3. Unsexual/staminate/ Has curly stamens

4. Anthers hanging

outside bracts.

1 - Crotonia

Brightly Coloured.

Has ~~bracts~~, petals, Sep.

Bisexual/ has both stam and pistil.

Anthers within petals

Any

3

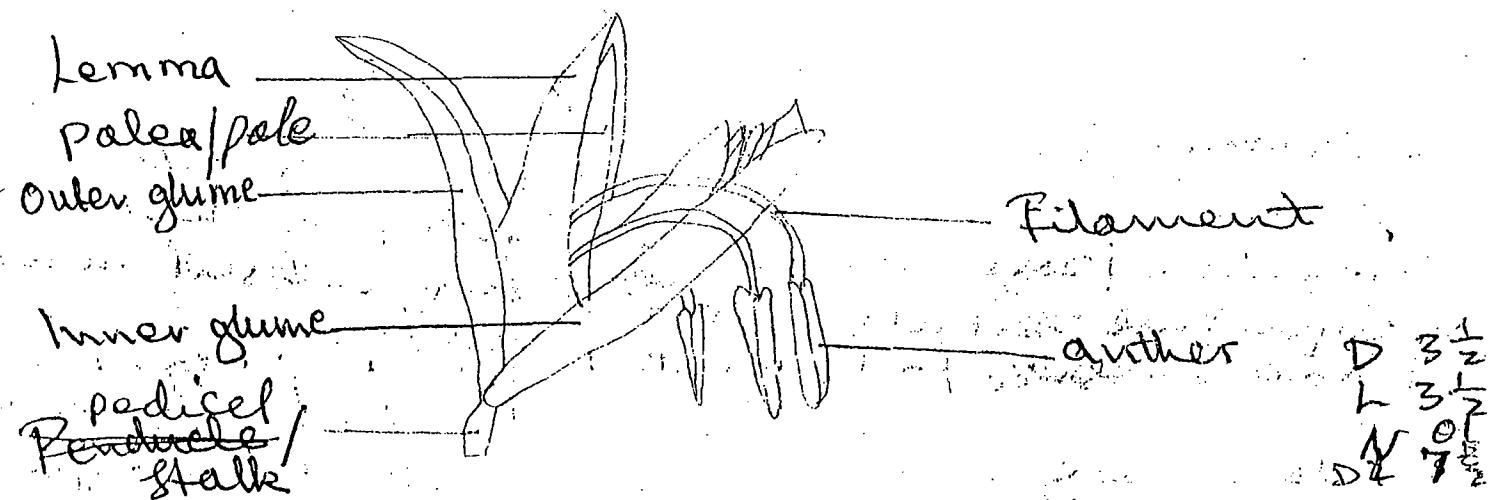
- (b) State one functional difference between specimens K and L.

K produces only male gametes/pollen grains²
while L - can produce both male & female gamet
Reproduction of male/female parts. ⁰²

- (c) Give one functional advantage which specimen L has over specimen K.

Production of seeds/fruits can occur within L while K requires presence of a female flower in order to produce seeds. ⁰²
Accept: Bright colour/sticky stigma

- (d) Using a hand lens, examine one flower of specimen K carefully. Make a large well-labelled drawing of the specimen.



- (e) Using specimens K - P, construct a dichotomous key to identify the specimens.

Identification - 2 each $2 \times 6 = 12$

Dichotomy $\frac{1}{1} = 02$

- paired $\frac{1}{1} = 13$

Accept: petaloid bracts leaves for bracts

Superior = LMN | Perianth all 13

Inferior = OP | except L

830

L - K

all coloured
Unisexual / staminate
Anthers hanging outside
bracts.
Has bracts only.
An inflorescence / raceme
Flowers borne in pairs /
spikelets.
Pendulous stamen
Zygomorphic

Bangavillea - M

1. An inflorescence.
2. Brightly Coloured bracts.
3. fused perianth / tubular
4. bisexual
5. 3 stamen
6. elongated stigma
7. Superior ovary
8. Petaloid leaves for bracts.

L - Crotalaria

Bisexual.
Irregular / zygomorphic
Calyx - five sepals; not
of same size / 2 big ones
Corolla - five petals
Two fused keels / 3 free ones
in Cassia all free (one large) &
one small (one large) & one small
Androecium - ten stamens
9 fused and one free
Lower part of the filaments
joined (9 fused) to form a tube
(Not in cassia) adelphous.
Two types of anther / 7 elongated
3 rounded and shorter.
Monocarpous;
Very short style in cassia,
bent inwards and hairy
in crotalaria & been.
Simple flower (bean / Crotalaria)

Commelinaceae - N

1. brightly coloured.
2. Flower enclosed in a bract / spathe.
3. Irregular / zygomorphic
4. Perianth of two types
one long / short.
5. Two types of stamens

Musa - O.

1. An inflorescence
2. Presence of large bract which is coloured.
3. Spathe
4. Two types of perianth
Large & free / tubular and split at the base
5. Five free stamens
6. Inferior ovary
7. Syncarpous / 3/6.
8. Irregular / Actinomorphic

Bidens - P

1. An inflorescence — Peduncle hairy.
2. It is a capitulum — Stamens fused to form a tube around the —
3. Overlapping ring of bracts / Involucel.
4. Two types of florets.
~~Tubular / liguletless~~ / ray.
5. Corolla — five fused petals to form a tube.
6. Brightly Coloured.
7. Syncarpous capel / 2 carpels
8. One style ending in a forked stigma.
9. Stigma projects above the corolla.
10. Inferior ovary.

You are provided with a freshly killed specimen labelled R ~~Rat~~ ^{small} ~~Rabbit~~ ^{large}.
Each feature mentioned one ~~need~~ ^{need} to reduce noise escape from predators.

- (a) Study the external features of the specimen and list three observable features that enable the specimen to colonise land. (03 marks)

- (i) ~~streamlined~~ ^{long} body to facilitate running
- (ii) Fur to reduce water loss / conserve heat / keep regulate ~~converge~~
- External ear for hearing / ~~listening~~ listening sound waves
- (iii) Vibrissae / whiskers for sensitivity, barometric pressure / size
- (iv) Claws for digging soil / defence
- Scaly tail to conserve heat
- (v) Eyes for seeing surrounding
- Long tail for support / balance / defence
- (vi) Nostrils for detecting gases
- (vii) Furry tail / limbs for locomotion / support
- (viii) Measure the length of the tail and that of the tail plus the rest of the body. Express your results as a ratio of

* N.A. length of animal ~~without tail~~ tail + rest of the body. (01 mark)

Simplified: ✓ Rat 1 : 2 ^{2 : 4} (0.5 - 1.0) Guinea pig N.A. or no tail Ei

not simplified: ✓ Rabbit ~~+ tail~~ 1.5 - 1.0

- (ii) Suggest the significance of this ratio in the life of the animal. (01 mark)

Tail being half the length of whole body helps to give support / balance / maintain tail & head in air to drive away other organisms / predators.

Rabbits ... ~~mountain~~ Reduces drag force during running

Guinea pig - N.A.

No mark for blank space

05

Go

(c) (ii) Dissect the specimen to clearly display the structures posterior to the diaphragm without displacing any organs → must be cut
posteriorly to the diaphragm without displacing any organs → must be cut
Draw and label your dissection. (16 marks)

- 0# 7 max 2L = 16
 - 0# Lat x 0. # - 3' nose nose rabbit - & C15-1.
 - 0# - 5 marks for using real rubber, skinning, cutting
 - 0# Body - C1
 - 0# Bladder
 - C1
 - D - 01
- ~~21+9+2+19~~

21
displaced (even if not labelled)

pancreas

all intestine
marked once

* ileum
small intestine

colon

empty, stretched
bladder
ejaculatory

fat

coagulating gland

prostate gland/
mammary gland

preputial gland

DIAGRAM OF SPECIMEN 2 SHOWING STRUCTURES POSTERIOLY
TO THE DIAPHRAGM UNDISPLACED

NOT: naming rabbit, rat, or pig
specify structure posterior to diaphr

epipharyngeal cartilage

Mark one & underline the
ver. (ignore number).

ver. lobes

stomach

duodenum / small
intestine

jejunum

appendix

bladder

seminal vesicle

testis, uterus

ovary, clitoris

ignore connective tissue
ignore spermatic duct
rectum is ignored

for male prostate, vascular seminalis instead of prostate

loses marks for drawing displaced marks but gets for labeling

* If only small intestine marked once for label but drawing marked independently
* Coagulating/gemmat vesicle (vesicula seminalis) may be seen or not seen

NA for kidney/blood vessels except testis/nerves/interior arteries to liver/organ

if marks are lost centra
if both main thoracic structures are present in addition with no other
and decide which organ & L marks are lost for the part incorrectly labelled

- No writing tests (must be in pencil)
- (Spermatic) must not seem intercostal (spine)
- colon must be picked up with a string
- anything else will be labelled TMA

Even if this is not over written
marks are TMA, not given

anything else will be labelled TMA

- (b) Solutions W and X are common laboratory reagents.
Add 5 drops of solution W into test tube E and 5 drops of solution X into tube F. Then add 1 cm³ of solution Z to each of test tubes E and F simultaneously. Record your observations in Table 2.

(0.2 marks)

Table 2

| Test tube | Contents | Observations |
|-----------|-----------------------------------|---|
| E | 1/6 H ₂ O V + W + Z | some few bubbles / moderate slow high rapid / lots many effervescence / bubbling (foaming) fizzing |
| F | 1/6 H ₂ O V + X + Z | some few or no effervescence / bubbling (foaming) fizzing |

* There must be comparison in E & F but not same observation
 * The concentration of solution V has been varied to give solutions V₁, V₂ and V₃. Add 1 cm³ of solution Z into each of the test tubes containing solution V₁, V₂ and V₃. Record your observations in Table 3.

(0.3 marks)

Table 3

| Contents of test tube | Observations |
|-----------------------|---|
| V ₁ + Z | few / very few bubbles / X slow; effervescence / bubbling / foaming / fizzing |
| V ₂ + Z | many / few / X Moderate effervescence / bubbling / foaming / fizzing |
| V ₃ + Z | many / X Rapid; effervescence / bubbling / foaming / fizzing / S |

A.C. answer
Begins
with French

TK
05

- (e) Solutions W and X are e. common laboratory reagents. Add 5 drops of solution W into test tube E and 5 drops of solution X into tube F. Then add 1 cm³ of solution Z to each of test tubes E and F simultaneously. Record your observations in Table 2.

0.2 marks

Table 2

| Test tube | Contents | Observations |
|-----------|--|---|
| E | 1/6 ^W 5 drops V + W + Z | some very bubbles, moderate slow bubbles rapid short many effervescence bubbling foaming fizzing, fizzing, ✓ 0.4 |
| F | 1/6 ^X 5 drops V + X + Z | some few or no effervescence bubbling very foaming fizzing, ✗ 0.4 |

* There must be comparison in E & F but not same concentration

(if) The concentration of solution V has been varied to give solutions V₁, V₂ and V₃. Add 1 cm³ of solution Z into each of the test tubes containing solution V₁, V₂ and V₃. Record your observations in Table 3.

0.3 marks

Table 3

| Contents of test tube | Observations |
|---|--|
| 1/6 ^{V₁} 5 drops V ₁ + Z | few few slow; effervescence/ bubbling foaming fizzing ✗ 0.2 |
| 1/6 ^{V₂} 5 drops V ₂ + Z | many few Moderate effervescence/ bubbling foaming fizzing ✗ 0.2 |
| 1/6 ^{V₃} 5 drops V ₃ + Z | many many Rapid, extremely bubbling foaming fizzing ✗ 0.1 |

N.B: emphasize
on order of
observation.

A/C. suggested

Organic
intended

KS

DS

✓; posterior Vena Cava
Inferior vena cava

✓; renal vein

S1-4 - 1
D-C3A] DL = 3
L-C3A] 4
M-G-convex - 2
N-Ot - 3 or 1
C-Ot - 2 or 1
T-Ot - 1
17

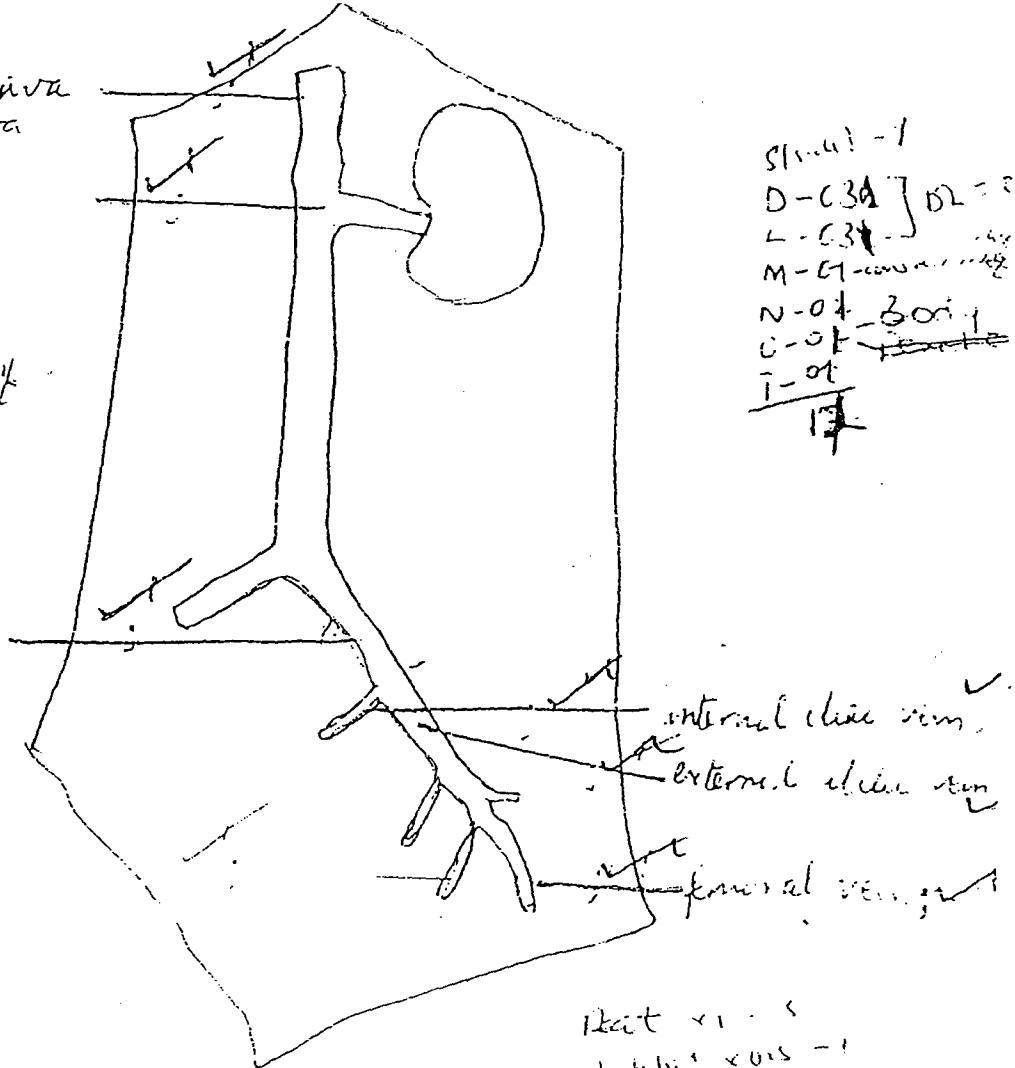
- * no mark for drawing if vessel not closed but curved fit is failing.
- * NO mark for tempering vessel 1

✓; common iliac vein

Vein of liver

ignore

✓; pudendal vein



NB left side implied in the drawing

✓ for artery/right side/distant structures except (kidney, heart, hand).
Veins from other significant structures/branches from posterior Vena Cava

- * if any un required parts are drawn but not labelled, award marks
- * if some part has more than one level, score + reward differently, award only to one drawn part no matter to levels w/ the other part

$$\text{Tot} = 40$$

$$= 35$$

$$(37)$$

11

13

4

You are provided with solution Z, which is a plant extract and solution V. Label six test tubes as A, B, C, D, E and F and put into each test tube 3 cm³ of solution V.

- (a) (i) To test tube A, add 1 cm³ of solution Z at once. Record the observations and the time taken for the reaction to stop, in Table 1.

(ii) Repeat the procedure in (a) (i) with test tubes B, C and D in water bath of temperatures 30° C, 40° C and 50° C respectively and enter all the results in Table 1 (0.9 marks)

Table 1

| Test tube | Temperature ($^{\circ}\text{C}$) | Observations | Time taken for the reaction to stop (sec) |
|-----------|---|--|--|
| A | Room temperature ($23 - 27^{\circ}\text{C}$) | very few, very slow few/little; \downarrow Effervescence/ bubbles/ foaming/fizzing | (longest time) \uparrow looks like 400 sec. 1 min \approx 1 hr |
| B | 30 | Moderate/ many; Effervescence/ bubbles/ foaming/fizzing | (Moderate time) \uparrow 500 sec \rightarrow |
| C | 40 | Very many! Much/ rapid; Effervescence/ bubbles/foaming/ fizzing | (shortest time) \uparrow 60 sec \rightarrow |
| D | 50 | Few/little/No; Effervescence/ bubbles/foaming/ fizzing stop | long time Zero seconds. \uparrow 60 sec |

Acc. J. F. S. 1913

+ accept no observable

5 change (firmness) Then One

* N₂ effervescence (2 minutes) Turn On

* Trend should be strictly
predicted under observation only
and consider relevance to

" why is sick rate ok

- (i) Explain the observations you have made in test tubes. Temp. should be explained as low, moderate, high temp; marks: 01 not with temp. 3rd, 4th

slow rate

Test tube A

low (at 25°C)

01 min.

Low activation/mobility of active substance;

(Q3)

due to low temperature / room temp / 23-27°C (Q3)

Maintain
breakdown
dehydrogen
oxidative
reactions

Slow decomposition
breakdown of active substance (Q3)

oxidation

reactions

reactions

Test tube B

02 marks

Moderate activation/mobility of active

Substance; due to increase in / moderate o2
temp / at 30°C which is a high temp

Test Tube C

02 marks

High activation/mobility of active substance;

due to optimum temperature / 40°C 02

Test Tube D

02 marks

Low activity; due to high temp / 50°C; which
denatures/destroys / kills active substance 03
rej. kills/inactivation

Put a wavy line if table 1 doesn't tally & explained
but if difference appears in table 1, circled out Turn Over
10%

less sensitive except for cold storage

- (g) What properties of the active substance have been demonstrated? (03 marks)

Active substance is:-

- Affected by - / Sensitive to lab reagents (ignore if pH mentioned here)
 - Inactivated at low temp / room temp / 23-27°C; $\frac{1}{2}$
- Any 3 - Most active at optimum temp / 40°C; $\frac{1}{2}$ 03
 - Denatured / destroyed at high temp / 50°C.

Breaks down / decomposes / catalyses the breakdown
varying conc's of sub's rate (v) of Z;
more for higher rates
(49 minutes) $\frac{1}{2}$ 03

You are provided with specimens P, Q, R, S, T and U. Open specimen Q longitudinally and cut the rest transversally

- (a) Looking at the sections, describe seed arrangement in each of the following specimens:

* Reg. Placenta (i) P (Mango/Avocado) $\frac{1}{2}$ 02 (02 marks)

..... One seed at the centre; $\frac{1}{2}$ 02

* Reg. Placenta (ii) P (Mango/Avocado) $\frac{1}{2}$ 02 (02 marks)

..... free seed attached at the base / apex; (Avocado); $\frac{1}{2}$

(ii) Q (Bean pod). $\frac{1}{2}$ 02 (02 marks)

Seeds attached along one side / margin; $\frac{1}{2}$ 02 (02 marks)

..... seeds arranged along longitudinal axis $\frac{1}{2}$ 02

02

04

(iii) E and F in (b): Rej: pH were mentioned
Test tube E provides optimum/appropriate
pH (probable)

(02 marks)

X is unsuitable favourable medium for reaction
between V and Z / breakdown/decomposition of V by Z
01

Test tube F Not optimum/Inhibit reaction
Not appropriate

(02 marks)

X unsuitable / unsuitable medium for reaction
between V and Z / breakdown/decomposition of V by Z
01

- (e) In part (c) where the concentration of V has been varied, arrange the solutions in order of increasing reactivity, starting with the least reactive.

V₁, V₂, V₃ ✓ (must get the whole order correct)
must tally with table II
(01 mark)

01

- (f) Giving two reasons, suggest the active substance in solution Z.

(03 marks)

Active Substance is likely an enzyme/organic catalyst/Catalase; reasons:-

Any 2 { Inactivated at low temp/ room temp;
most active at Optimum temp/ 40°C;

02

Denatured at high temp/ 50°C.

- Rate of rxn affected by concentration of substrates ✓

Rej: pH Since experimental on Z pH gives no
clue on identity of active substance ✓

* Mainly only the 1st two.

06

(iii) R (Orange) - Axile (in a circular pattern) ✓ (02 marks)

Seeds/seed radiating outwardly from (common) central point (placenta); food is a circular pattern};

Seeds, embedded in juicy/succulent endocarp;

(iv) S (Cucumber) - Paraxial (02 marks)

Two Seeds suspended/radiating/pointing inwards; at 4/3 positions/sites in a regular manner; 02 along peripheral wall/outer wall,

If only placenta is given inscription given
note if placenta

(v) T (GREEN PEPPER) - Central (02 marks)

any two Seeds clustered/Crowded/randomly concentrated closely attached on central placenta; or radiating outwards 02

(b) (i) Give two internal features common to both specimens T and U. (02 marks)

- Possession of Seeds/many seeds; 02

- Mesocarp fleshy/succulent; (Rej. Edible/colour)

Divided pericarp or (Mesocarp and endocarp);

- Large/Open/hollow locale (Chamber);

- Both have mesocarp & endocarp
- scarcely suspended by funicles to placenta/short funicles/both have placenta

locule over

U

(01 mark)

- Placenta at the Centre/Placenta at the periphery; 01

arises at the base

except parietal

- Rej. free central

locule shallow or open

- Possesses Septal locules into 3

No Septum

- flattened seeds

- has round seeds

NB Diff. must be correct for

10

rough seeds

both T and U

01

mark placed at the centre of

which is containing the seeds.

Specimen Q

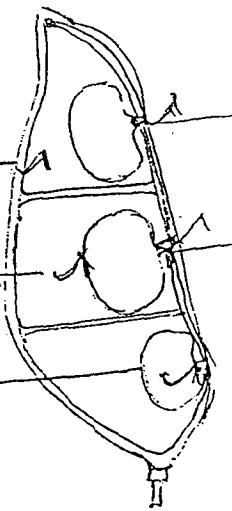
DLC = ~~double~~ Pericarp

MG = $0\frac{1}{2}$ (double line)

NT = $0\frac{1}{2}$ Locule

OF

Seed



MG - $\times 0.5 - \times 2$

10

Specimen S

Exocarp / Locule

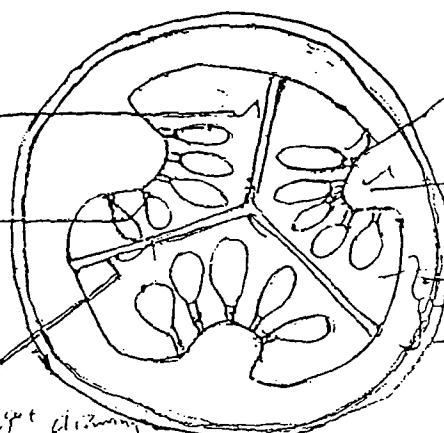
DLC = ~~double~~ Seed

MG = $0\frac{1}{2}$

NT = $0\frac{1}{2}$

OF

Septum



Funicle/Funiculus

Placenta

endocarp
mesocarp
epicarp
double line

MG - $\times 0.5 - \times 2$

(10 marks)

*locules for it to get air
Locules for water & enz. comp.
Limiting yourself to the internal features of the specimens. construct a dichotomous key to identify them.

(d) (c) (b) (a)

(Mango/Avocado)

I = 06

Single seed, enlarged seed, divided pericarp D = 01
mesocarp and endocarp, stony endocarp, OF

fleshy/succulent mesocarp, thick mesocarp, seed at Centre, placenta at base, single locule long funicle
Bival. placentation

(Bean)

pericarp ie O

More than one seed, enlarged seed, fused endocarp and mesocarp, papery placenta, placenta along margin

many single locule, short funicle, seeds separated by septa (i.e. nojau)

R - (Orange) - ~~not~~

many seeds, divided pericarp or (mesocarp and endocarp)
placenta at the centre, thick endocarp?...fleshy
endocarp, stony seeds, seeds radially arranged.

succulent juice hours, many locules or several locules turn over
short funicle; septa present; membranous septa
only glands present,

11

S. (Cucumber)

Many seeds, divided pericarp or (mesocarp and endocarp),
placenta at the periphery/outer side, fleshy/succulent
mesocarp and endocarp. Placenta at 4/3 points, seeds
arranged in regular manner, locule divided/3 locules/
chambers/stries. Septa prominent, long fr. nicles.
~~non, non ribbed septa; flattened seeds~~

T. (Green pepper)

Many seeds, divided pericarp, placenta ^{base} central, placenta
arises from base, locule ^{partially} divided has septa; seeds
clustered in placenta; flattened seeds, hard seeds, thick placenta

U. (Paw paw)

Many seeds, divided pericarp or (mesocarp and Endocarp)
placenta at periphery/outer side, fleshy/succulent
mesocarp, ~~especially~~ thin Endocarp; rough seeds; thin placentae
~~hollow mesocarp~~

LB - Any of the given internal features may be considered
for the dichotomous key

- The dichotomous key must flow ie. --- Go to 3,
etc.
- Award I only after successful identification
using descriptive internal features.
- No repetition of the same contrasting statements
- ~~D = indicating I have 1 statement~~ 1 more

Total = 29 26 MAX
I = 26

Fig. 7 own chart

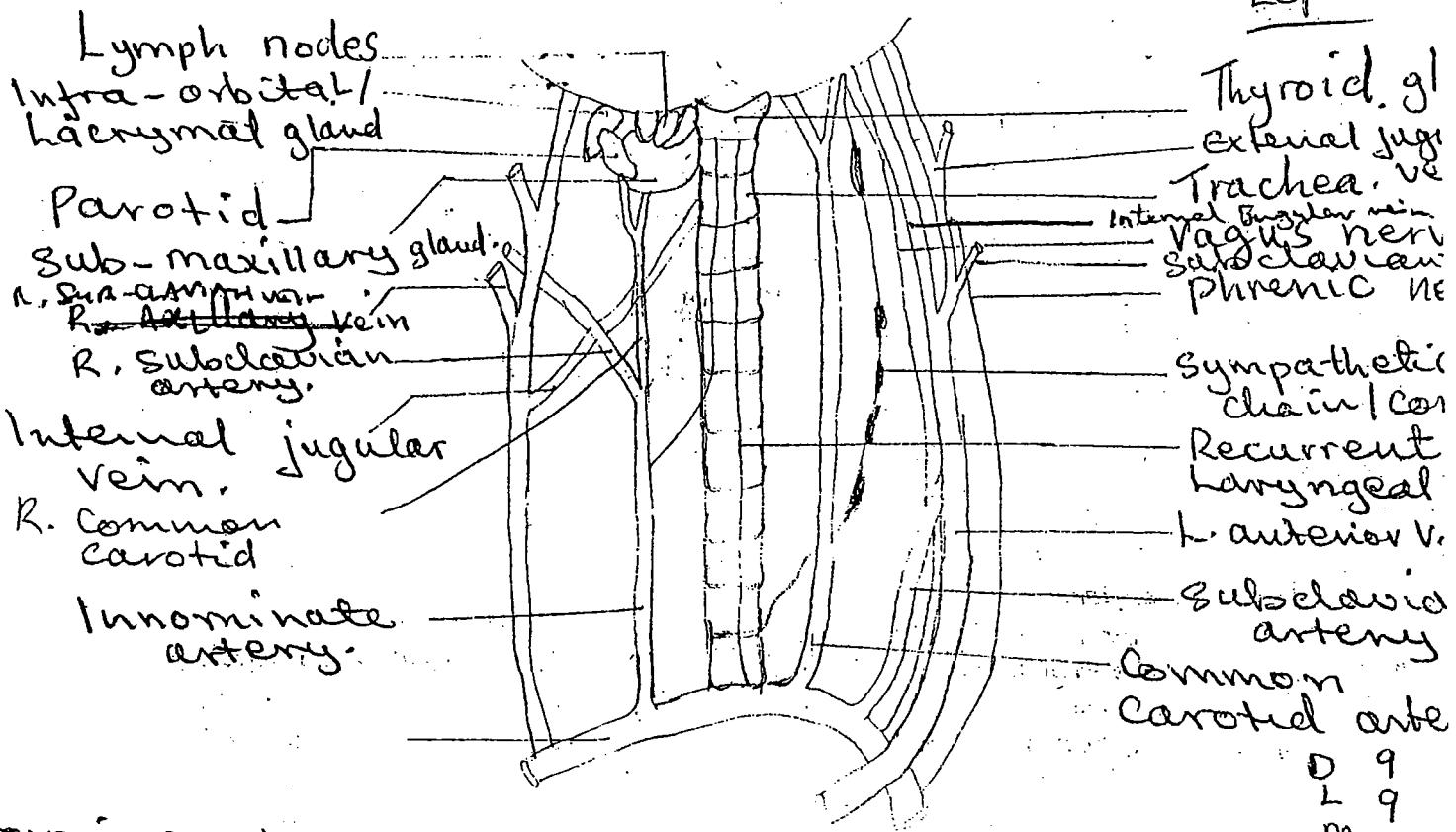
28
27
26
11x 2.7

END

1. You are provided with specimen T. Carry out the dissection of the specimen using the following procedure.

Pin the animal with the ventral side uppermost. Remove the skin of the thoracic region including the neck. Lift the xiphoid cartilage and cut along the lower edge of the rib cage. Tie the xiphoid cartilage, pull it back and pin it down. Cut along the side wall of the thorax on both sides to remove the rib cage. This should expose the main blood vessels, nerves, respiratory tract and glands in the region.

- (a) Draw the neck region and label fully.

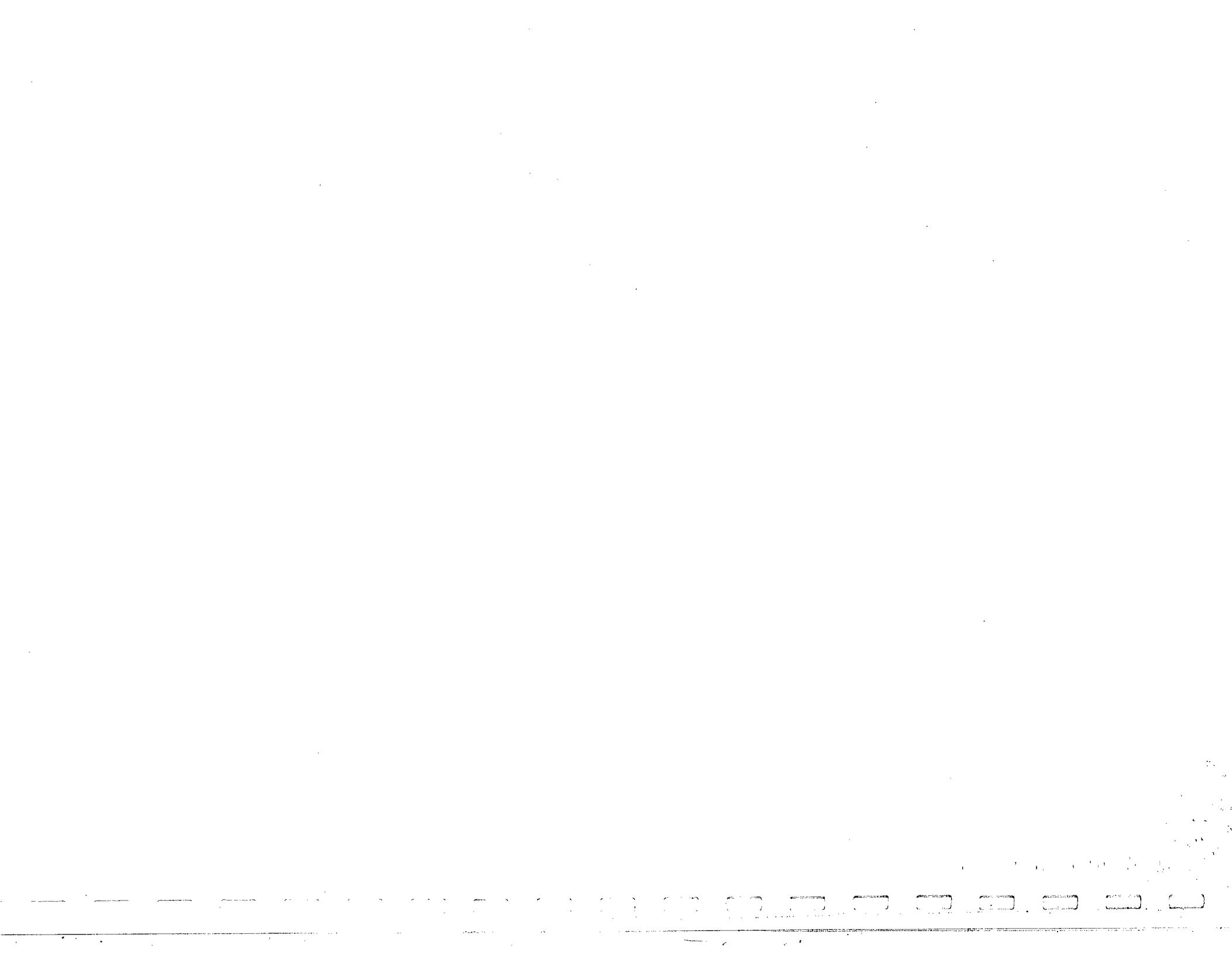


Drawing showing structures in Neck region

If given Right/Left give drawing mark for both sides but mark one side

- (b) Locate the trachea and examine it. Describe its structure. If Right/left out

Cartilagenous; rigid; ringed; open/hollow/tubelike; cylindrical; Any four.



(c) How is the structure of the trachea related to its function?

Acc. to me

ACC

Rigid to keep trachea open, support
Cartilaginous for flexibility;
Ringed to keep it open / flexible
Tube like / hollow to allow air passage

30

Stomach

2. (a) You are provided with food extract E and you are also required to make two other extracts X and Y from the dissection of question 1, as follows:

Stomach Pancreas

- (i) Obtain a whole stomach from the dissection, cut it open and wash out the contents.
- (ii) Chop the stomach into small pieces and grind it into a paste and add 10 ml of distilled water to obtain an extract.
- (iii) Allow to stand for 5 minutes and pour off the liquid; label it X
- (iv) Obtain a whole pancreas and follow steps (ii) and (iii) to obtain an extract and label it Y.

Label 6 test tubes 1 - 6. Put 1 ml of food substances E in each test tube, add 1 ml of X into each of the tubes 1, 2 and 3 and 1 ml of Y into each of the tubes 4, 5 and 6. To each of the test tubes 1 and 4 add 1 ml of distilled water; to each of the tubes 2 and 5 add 1 ml of dilute hydrochloric acid, to each of the tubes 3 and 6 add 1 ml of dilute sodium hydroxide. A summary of the contents of each tube is indicated in the table below. Place all the test tubes in a water bath at temperature (35 - 40°C) and leave for 20 minutes shaking ~~too slow~~ periodically. Observe and record your results in the table below.

(b)

| TESTS | OBSERVATIONS | CONCLUSIONS |
|---|------------------------|--------------------------------------|
| (i) Test tube 1 contains 2 ml of E - 1 ml of X + 1 ml of water. | Remains cloudy/turbid. | No digestion/ breakdown/ hydrolysis. |
| (ii) Test tube 2 contains 2 ml of E + 1 ml of X + 1 ml of dil hydrochloric acid. | Remains cloudy/turbid. | No digestion/ breakdown/ hydrolysis |
| (iii) Test tube 3 contains 2 ml of E + 1 ml of X + 1 ml of dil sodium hydroxide solution. | Remains cloudy/turbid. | No digestion/ breakdown/ hydrolysis |

| | | |
|---|----------------------------|--|
| (iv) Test tube 4 put 2 ml of E + 1 ml of Y + 1 ml of water. | Clears / Partially clears; | Digestion occurs hydrolysis / breakdown |
| (v) Test tube 5 contains 2 ml of E + 1 ml of Y and 1 ml of dil hydrochloric acid. | Remains turbid Cloudy; | No digestion hydrolysis / breakdown. |
| (vi) Test tube 6 contains 2 ml of E + 1 ml of Y + 1 ml of dil sodium hydroxide. | Clears ; | Digestion hydrolysis / breakdown, occurs |

Questions:

Comment state

30

(c) From your results, describe the nature of substance E.

E cannot be digested under conditions in the mouth/stomach; and in acidic conditions; it can be digested under conditions of the pancreas in neutral conditions; alkaline condition by enzyme X. It is not digested by enzyme Y; Res: Sucrose / maltose is digested.

(d) What do the above results tell you about the behaviour of extracts X and Y?

Extract X does not hydrolyse substance E; under any conditions / pH; Extract Y digests substance E; Under neutral / alkaline conditions; but not in acidic condit

3. Total 40 Max 40
You are provided with specimens K, L, M, N, O and P which are flowers.

zygomorphic
irregular

Using a hand lens, carefully examine specimen L and one flower of specimen K and state three observable differences between them.

2yg = K₁NO₃ K - maize

1 - Crotalaria

1. dull Coloured

brightly Coloured.

2. Has bracts only

Has ~~bracts~~, petals, Sepal

3. Unsexual/sterile/
Has curly stamens

Bisexual / has both stamens
and pistil.

4. Anthers hanging
outside bracts.

Anthers within petals. /
Anthers

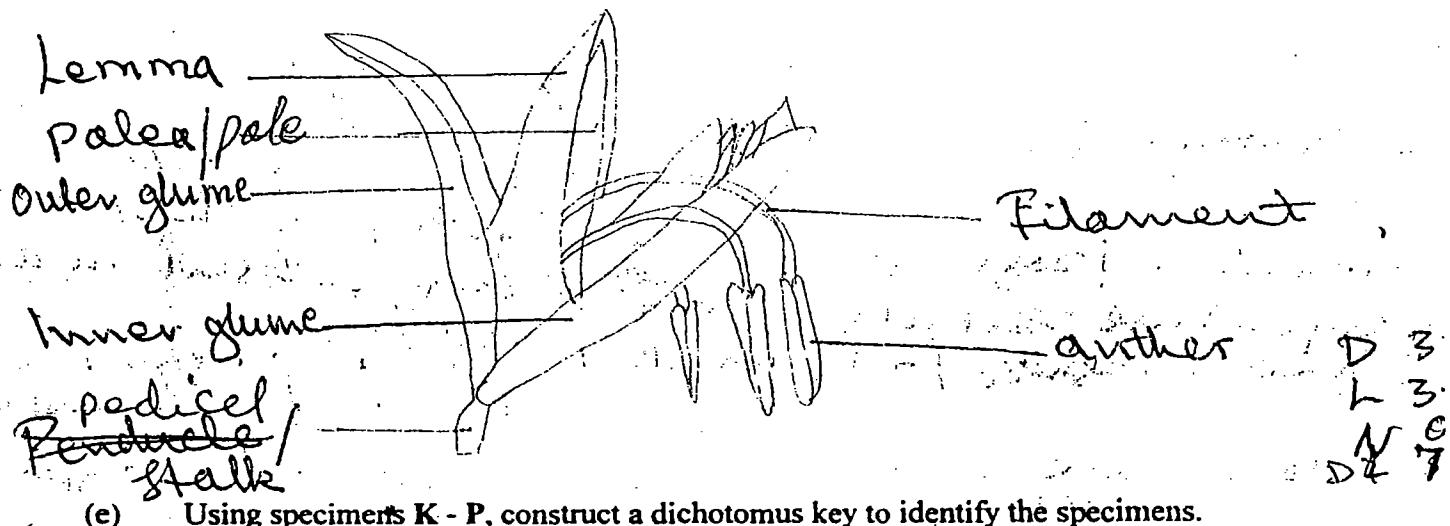
- (b) State one functional difference between specimens K and L.

K produces only male gametes / pollen grains²
while L - can produce both male & female gametes.
Reg: mention of male/female parts.

- (c) Give one functional advantage which specimen L has over specimen K.

here once side of L is given.
Production of seeds / fruits can occur within,
while K requires presence of a female
flower in order to produce seeds.

- (d) Using a hand lens, examine one flower of specimen K carefully. Make a large well-labelled drawing of the specimen.



- (e) Using specimens K - P, construct a dichotomous key to identify the specimens.

Identification - 2 each $2 \times 6 = 12$

Dichotomous

- paired

$\frac{1}{2} = 6$

13

Accept: petioloid bracts leaves for bracts.

| | |
|----------------|-----------------|
| Superior = LMN | Perianth all 13 |
| inferior = OP | except L. |

83

ee - K

all coloured
Unsexual / staminate
Anthers hanging outside
bracts.
Has bracts only.
An inflorescence / raceme
Flowers borne in pairs /
spikelets.
Pendulous stamen
zygomorphic

Bangavitiella - II

1. An inflorescence.
2. Brightly coloured bracts.
3. fused perianth / tubular
4. bisexual
5. 3 stamen
6. elongated stigma
7. superior ovary
8. petaloid leaves for bracts

L - Crotalaria

Bisexual.
Irregular / zygomorphic
Calyx - five sepals; not
of same size / 2 big ones
Corolla - five petals
Two fused ^{keel} petals / 3 free ones
in Cassia all free (one largest)
Androecium - ten stamen
9 fused and one free
Lower part of the filaments
joined (9 fused) to form a tube
(Not in cassia) adelpheous.
Two types of anther / 7 elongated
3 rounded and shorter.
Monocarpous;
Very short style in cassia,
bent inwards and hairy
in crotalaria as been.
Simple flower (bean) / crotalaria
inflorescence for cassia.

Commelinaceae - M

1. brightly coloured
2. Flower enclosed in a bract / spathe.
3. Irregular / zygomorp.
4. Perianth of two types
one long / short.
5. Two types of stamine

Musa - O.

1. An inflorescence
2. Presence of 1 large bract which is coloured.
(spathe)
3. Two types of perianth
large & free / tubular and split at the base
4. Five free stamens
5. Inferior ovary
6. Syncarpous / 3/6.
7. Irregular / Actinomorphic



Bidens - P

1. An inflorescence : — Peduncle hairy.
2. It is a capitulum — Stamens fused to a tube around the
3. Overlapping ring of bracts / involucre.
4. Two types of florets.
(Tubular / ligule of disc/fay.)
5. Corolla - five fused petals to form a tube.
6. Brightly Coloured.
7. Syncarpous carpel / 2 carpels
8. One style ending in a forked stigma.
9. Stigma projects above the corolla.
10. Inferior ovary.

