BIOLOGY PRACTICALS

P530/3. 3hrs.

Albert Katumwesigye; of BIO/CHEM. BSc(Edu) welcome 2018.

The paper consist of 3 Numbers;

No one; Dissection — Cockroach.
— Toad.
— Rat.

No Two; physiological work of ~~Food~~ tests; Heat influence enzymatic reactions.

No Three; Classification; plant anatomy (flowers;) insects; Microscopy;

Need - Sharp pencil; Dissection Kit; White book;
- Proper Knowledge of theory;

COCKROACH:

1 You are provided with specimen Q which is freshly Killed;

a) classify the specimen as far as you can;

Soln:

Kingdom - Animalia; ✗
phylum - Arthropoda; ✗ ✗
Class - Insecta;
order - Dictyoptera; ✗

Family - Blattidae; ✗
Genus - Periplaneta; ✗
species - P americana; ✗ ✗ ✗

b) state the features that are characteristic to/that make specimen Q belong to.

i) ~~phylum~~ Arthropoda.
Segmented body; Exo-skeleton; Jointed limbs/~~appendages~~; (wide)

ii) Class insecta
Three main body parts; ✗
three pairs of jointed legs; ✗
Pair of antenae; ✗
Thorax has three segments/parts; ✗ — prothorax, meso-thorax, meta thorax
pair of compound eyes;

02

02

iii) order Dictyoptera.

Chewing mouth parts;

Anal cerci;

Antennae are long thread-like;

iv) Family Blattidae

Long; flat coxa at the roots of the legs;

v) Genus: periplaneta:

Possession of wing in both sexes;

Note: Viewing of the specimen;

Anterior - Front part

posterior - Behind part

Lateral - side wide.

Dorsal - The upper part

Ventral - The lower part.

- Left of specimen; when the ventral view is upper most, it is your right;
- The left of specimen when the dorsal view is upper most, is your left;

c). Turn the specimen ~~when~~ dorsal side uppermost and examine the wings when pulled outwords; Describe the structure of

i) outer wings;

ii) Inner wings;

Soln:

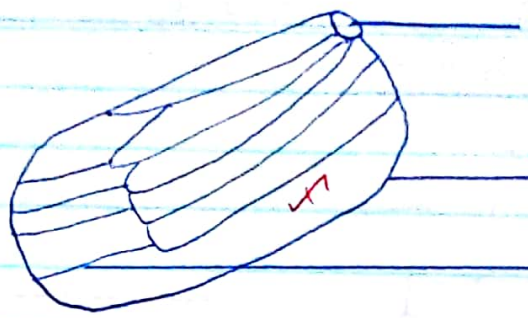
Outer wings - long; narrow; hard; straight; Net-venation;

Function:

protects the inner wings; protects body against injuries;

Inner wings; Broad; Folded; Membranous; Net-veined;

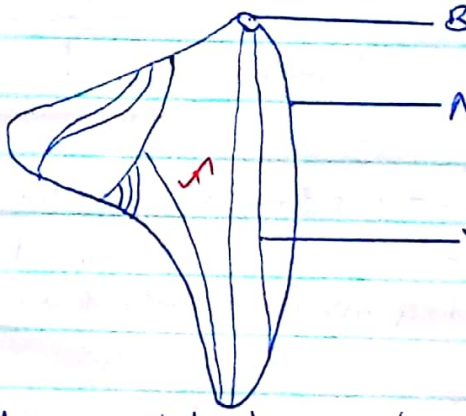
A drawing showing of the outer wing of specimen Q ✓ 03



X2 ✓

T - 1
M - 1
O - 1
D - 1½
N - 1½
L - 2½
6½

A drawing showing of inner wing of specimen Q.



Absents

X2; ✓

Note: The label lines must be horizontal; and drawn with a ruler; .

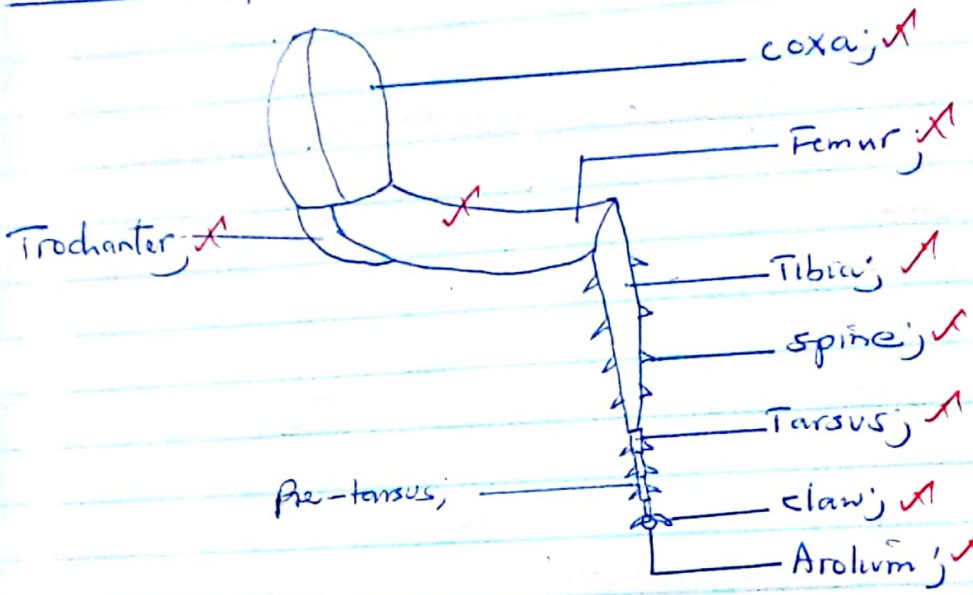
2a) You are provided with specimen R;
i) Examine the hind limb and describe how it is adapted to its function (3mks).

Soln:
- Spines for defence; / for moving on rough surface; ✓
- Long enough; for propulsive force; ✓
- Jointed for flexibility during movement; ✓ any 05
- Granular pad / arolium; for moving on smooth surface; ✓
- Large coxa; for fast locomotion / running; ✓
- Dull coloured for camouflage; ✓
- claws for firm grip on rough surface; ✓

b) Carefully cut and remove the right hind limb of specimen R when placed dorsal side uppermost; (5mks)
horizontal and labelled

Soln:

A drawing showing the right hind limb of specimen R when placed dorsal side upper most.

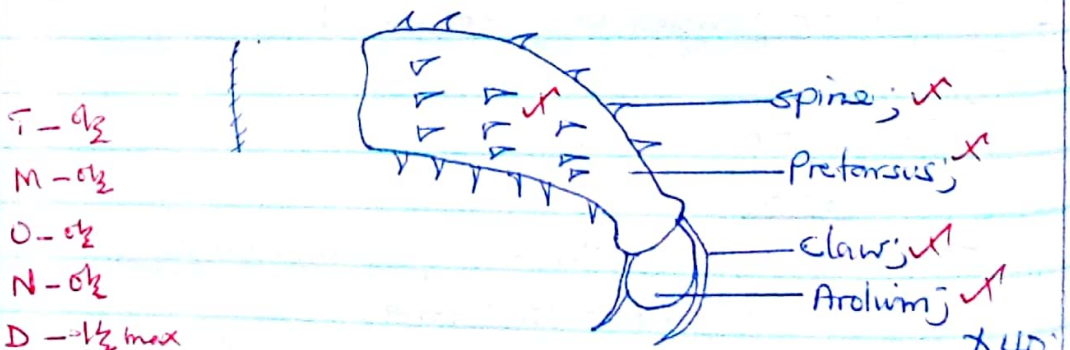


X7

C) Cut off the pre-tarsus from the hind limb of specimen R. Observe it under a low power microscope; Draw and label the pretarsus and its associated structures;

About 6cm

A drawing of the pretarsus and its associated structures of specimen R.



T - ½
M - ½
O - ½
N - ½
D - ½ max
L ½ max
05

X40
80

D) How do the structures observed in C, above suitable to enable the pretarsus carryout its functions; (3mks)

it has pointed/curved claws for firm grip on rugh surface;

Has aronium/glandular pad; For secretion of adhesive

sticky substance to allow grip on smooth/slippery surfaces;
- Has pointed spines; for defence/increase grip; (03)

3. You are provided with specimen M.

a) 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 (4mks).

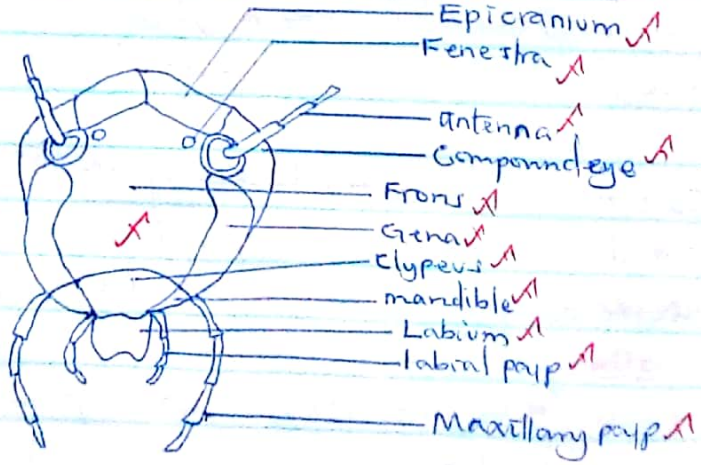
Soln.

- Pair of antennae; that are long for sensitivity;
- Compound eye; are large; curved outwards for wide view;
- Mandibles; sharp for cutting/crushing food;
- Maxillary palp; are long; to reach out for food;
- labial palp { are hairy for sensitivity;
  are segmented for flexibility to push food into the mouth; (4 max)
- Labium/upperlip - large; curved; to prevent food from falling out of the mouth;

b) View the anterior part of the head using a hand lens, draw and label; (3 mks) - (11 names)

Soln.

A drawing showing anterior part of the head of specimen M



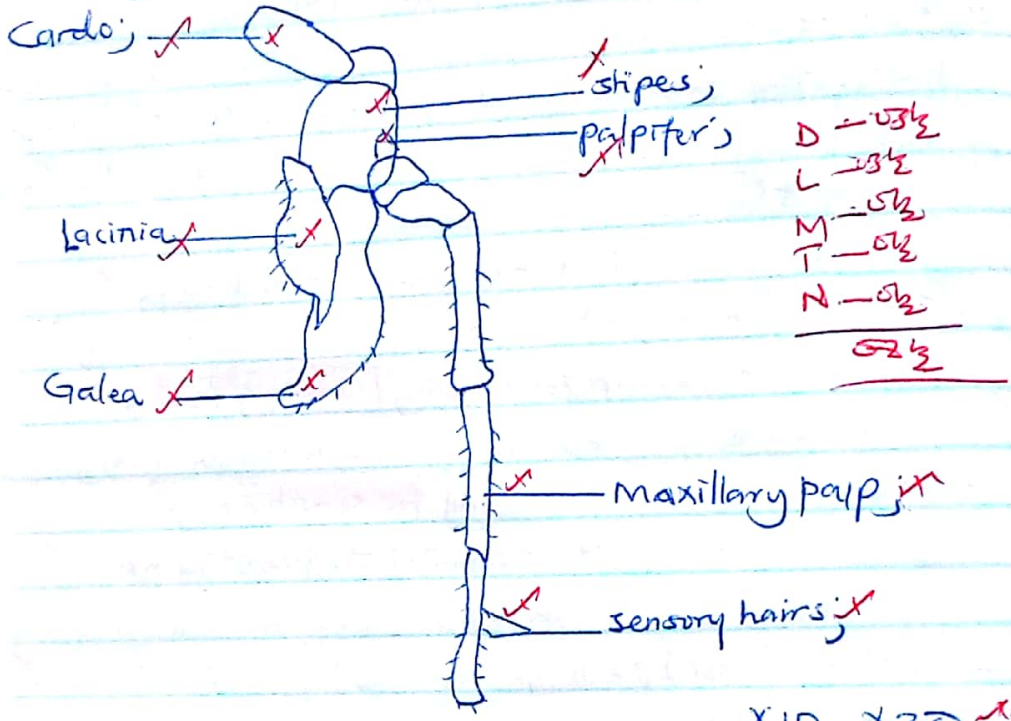
T ½
M - ½
O - ½
N - ½
D - 4½
L - 4½
AV - ½
11½ max.

X5 - X15

X7

b) Carefully cut off the whole left maxilla of specimen M when placed ventral side upwards and observe using a hand lens; Draw and label; (8mks)

Soln:
A drawing showing whole of the left maxilla of specimen M when placed ventral side upwards



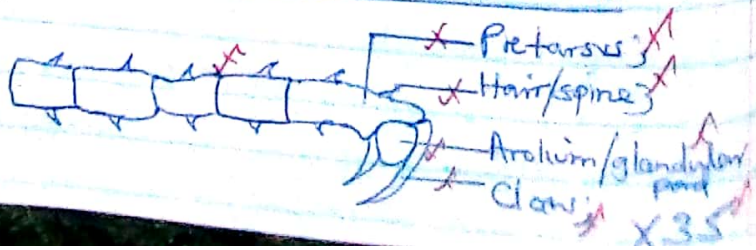
D — 3½
L — 3½
M — 5½
T — 5½
N — 5½
25½

c) Give three adaptations of the maxilla to its function; (3mks)

Soln.
- Hairy; for increasing sensitivity;
- Jointed for flexibility when feeling;
- Sharp edges for cutting food;
- Long palp for holding food;
- Hooked galea for holding food;

d) Cut and examine the tarsus of the hind limb of specimen M under low power microscope; Draw and label the tarsus with its associated structures; (5mks).

Soln.
A drawing showing of the tarsus of the hind limb of specimen M with its associated structures.



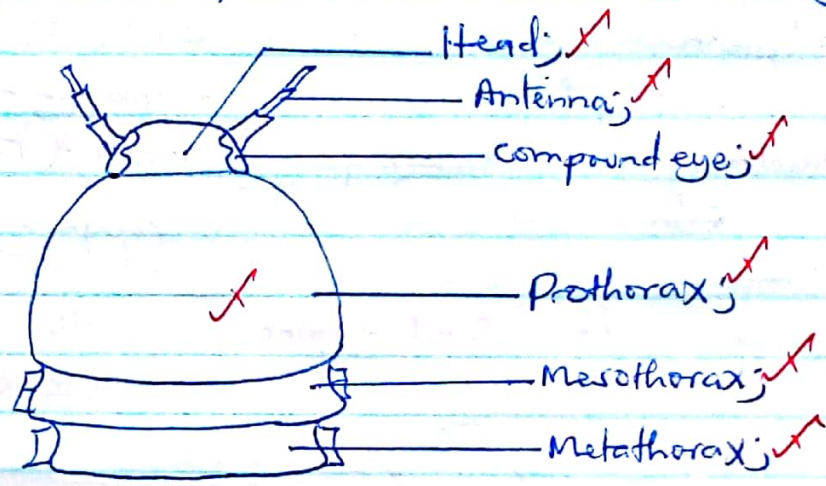
You are provided with specimen M. 07

i) Pin the specimen M dorsal side uppermost and cut off its wings;

ii) Draw and label the structures of the head and thorax excluding the limbs; (8mks)

Soln:

A drawing showing the structures of the head and thorax excluding the limbs of specimen M from the dorsal side without wings;



X2—X6;

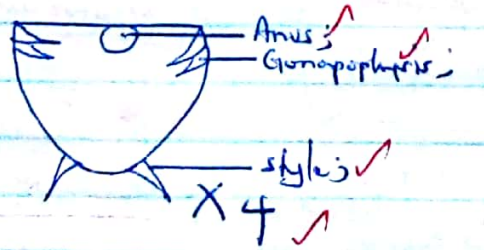
T—½
M—½
O—½
N—½
D—03
L—03
08

ii) Lift the last abdominal tergum with forceps, and cut it off. Draw and label the observed structures on the last segment;

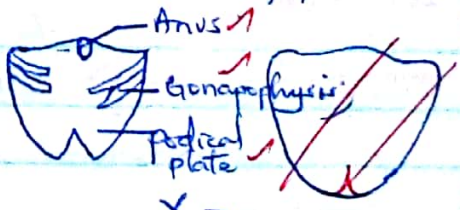
Soln

A drawing showing the structures on the last segment of specimen M

If male;



If female



T - ½
M - ½
O - ½
N - ½
D - 7 mm
L - 7 mm
04.

iii) From the observed structures in ii) above, state with reasons the sex of the specimen;

If female sex. - pedical plate
- Blunt ended gonapophysis;
Even segmentents of antennae;
Broad abdomen;

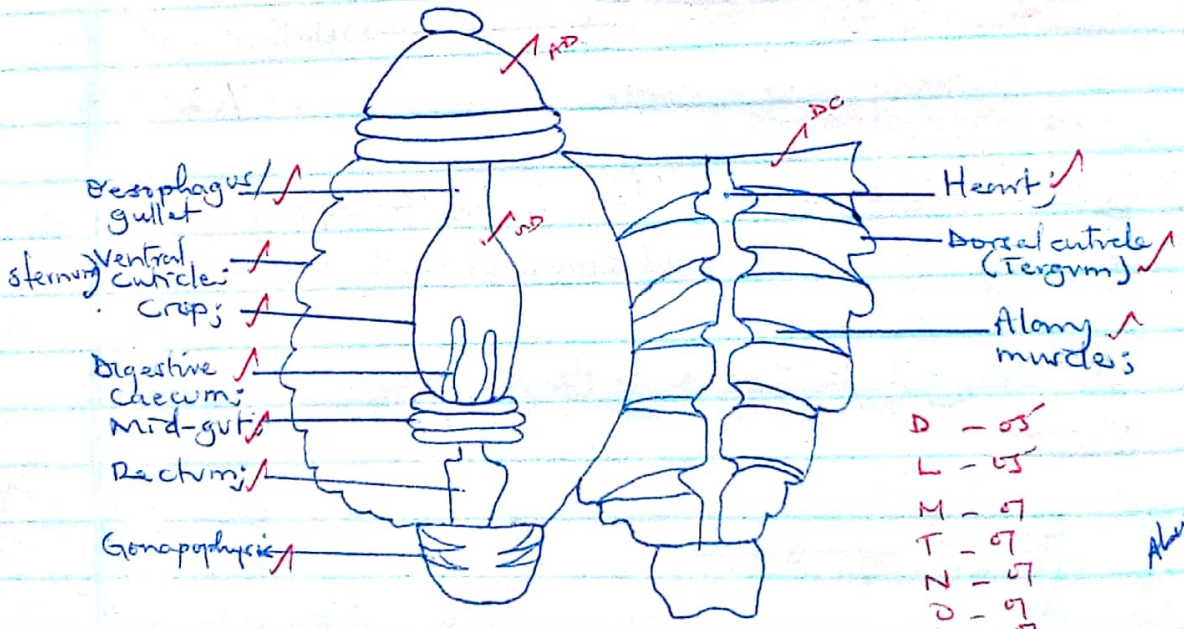
Scanned by CamScanner

If male sex - anal style; ✓
- sharp/pointed gonapophysis; ✓
- Narrow abdomen;
Uneven segments of antennae;

4. You are provided with specimen Q which is freshly killed. a) Pin the specimen with dorsal side uppermost. Dissect along the left lateral line of the abdomen. Display the dorsal cuticle and clear any fat tissue, without displacing any other structures, draw and label your dissection. (17 mks)

Soln:

A drawing showing structures exposed on abdominal cuticles (ventral and dorsal) of specimen Q with out displacing any other structures;



X2 - X6; ✓

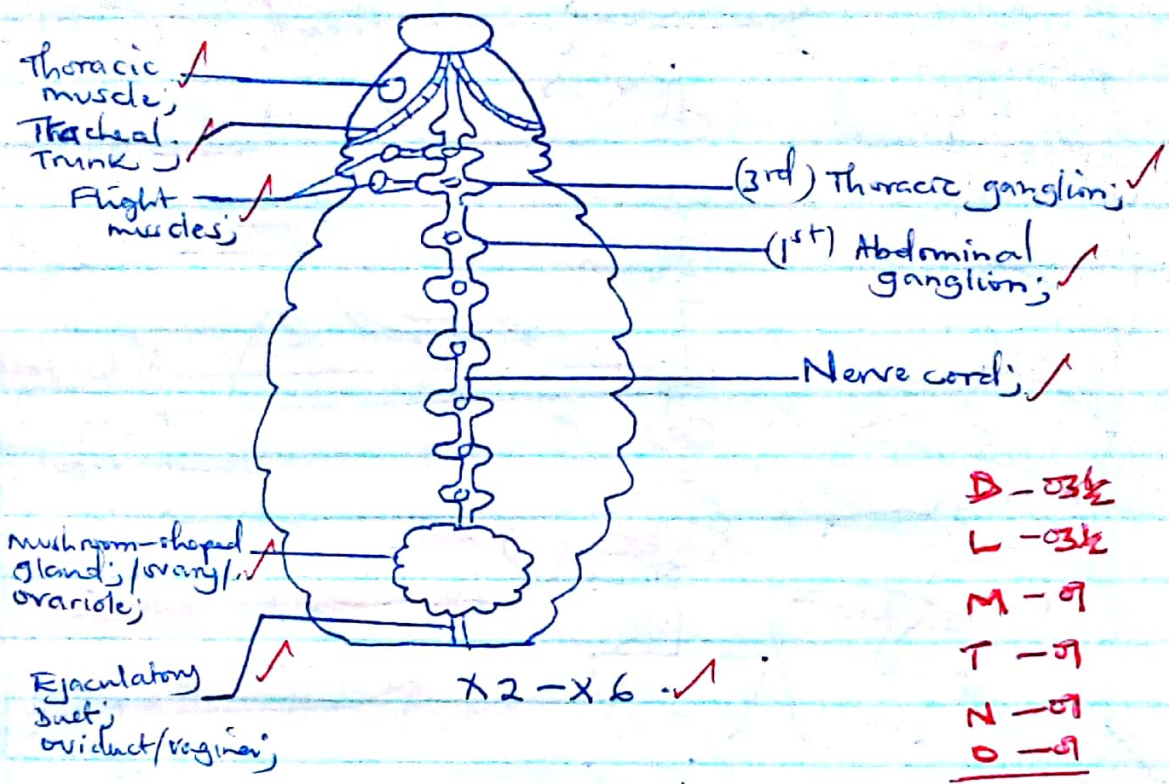
D - 05
L - 05
M - 07
T - 07
N - 07
O - 07
AD - 07
DC - 07
VD - 07
17

Above

b) By further dissection cut and remove the whole alimentary canal to clearly display the structures on the ventral cuticle. Draw and label the structures associated with the ventral cuticle anterior to the last abdominal segment (13mks)

Soln:

A drawing showing the structures on the ventral cuticle of specimen Q anterior to the last abdominal segment without the alimentary canal;



B - 03½
L - 03½
M - 09
T - 09
N - 09
O - 09
11

IP= If alimentary canal included; testes; vas deferens; while salivary appendages ignored;
NA Any structure on last abdominal segment drawn & labeled Heart or any of the gonads known & labeled.

5) You are provided with specimen Q.

a) Dissect the specimen along the right lateral line of the abdomen. Displace the dorsal cuticle and clear any fat tissue. Gently displace the alimentary canal to the right of the specimen. Draw and label the exposed digestive system and structures associated with the sternum, anterior to last abdominal segment. (18mks)

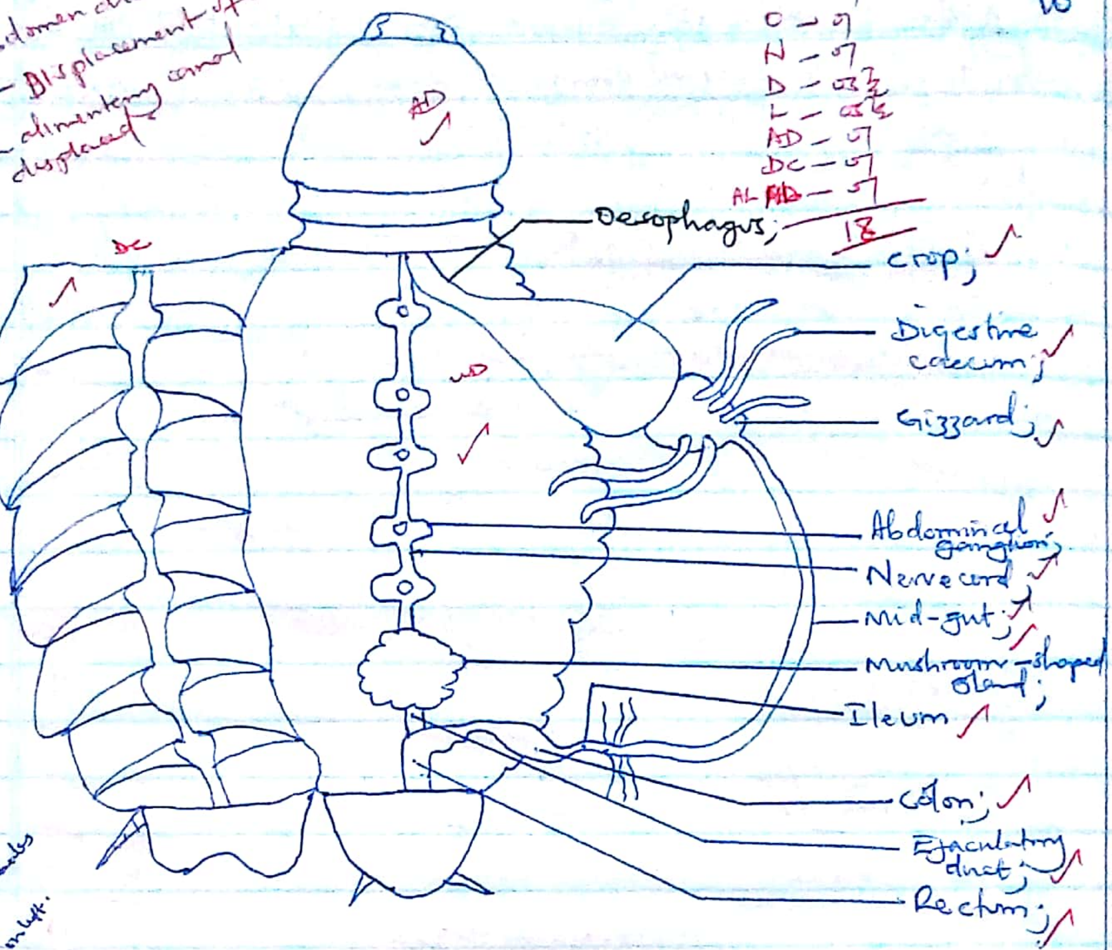
Soln.

A drawing showing the digestive system and the structures associated with the sternum anterior to the last abdominal segment with the alimentary canal displaced to the right of specimen Q.

T — 07
M — 07
O — 07
N — 07
D — 03½
L — 03½
AD — 07
DC — 07
AL — 07
18

10

AD - abdomen dissected
DC - Displacement of cuticle
AL - alimentary canal displaced



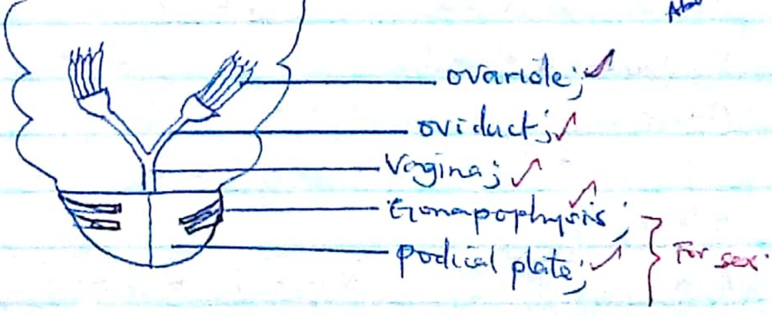
X2 — X6

Ignore
- if malphigian tubules labeled
- if drawn is on left.

Note.

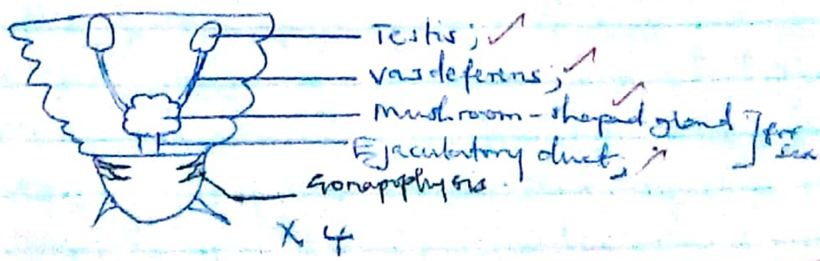
A drawing showing the Female reproductive system of specimen Q.

Must



X 4

A drawing showing the male reproductive system of specimen Q

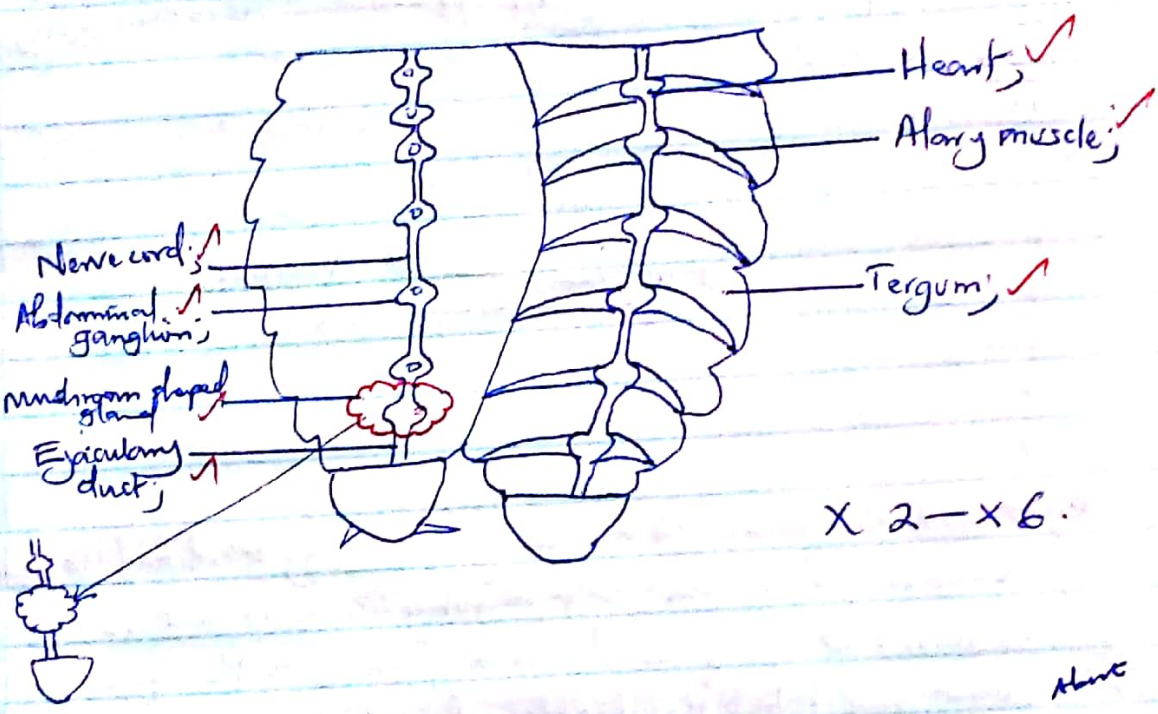


X 4

(dorsal side specimen)

b) Dissect the specimen along the left lateral line of the abdomen; Displace the tergum; cut out the alimentary canal remove any excess fat tissue to display the structures of the sternum and tergum. Draw and label.

A drawing of specimen Qn showing structures on the abdominal sternum and tergum with the alimentary canal cut out.



X 2 — X 6.

Qn. You are provided with specimen A.;

a) Give any five observable structural adaptations for its mode of life. (5mks)

b) Basing on external features, Identify its sex. (1mk)

c) Draw and label the features that have enabled you to Identify its sex. (4½ mks)

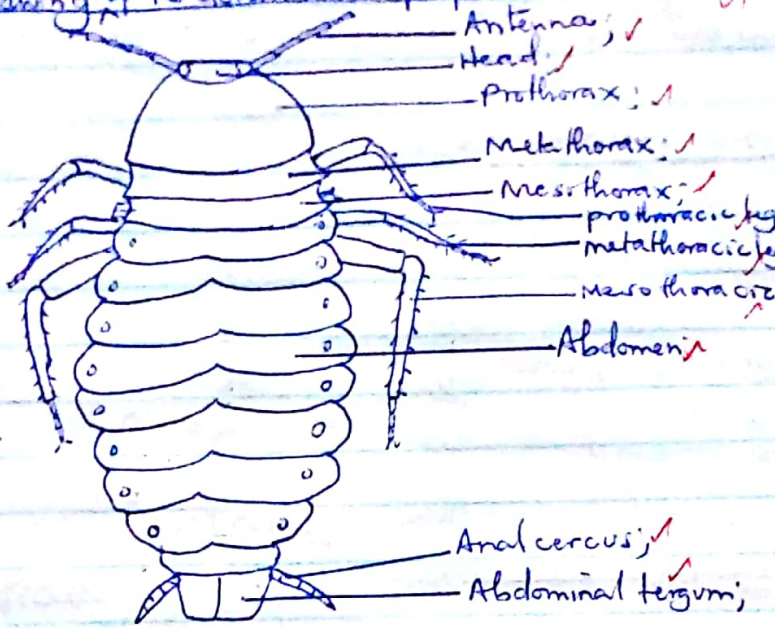
A drawing showing features that Identify the sex of specimen A.

X 2

D — ½
L — ½
M — ½
T — 1
N — 1
O — 1
4½

d) Carefully remove the wings and draw and label the dorsal view of the specimen. (15mks)

A drawing showing the dorsal view of specimen A without wings.



D - 5½
L - 5½
M - 1
T - 1
N - 1
O - 1
15 max.

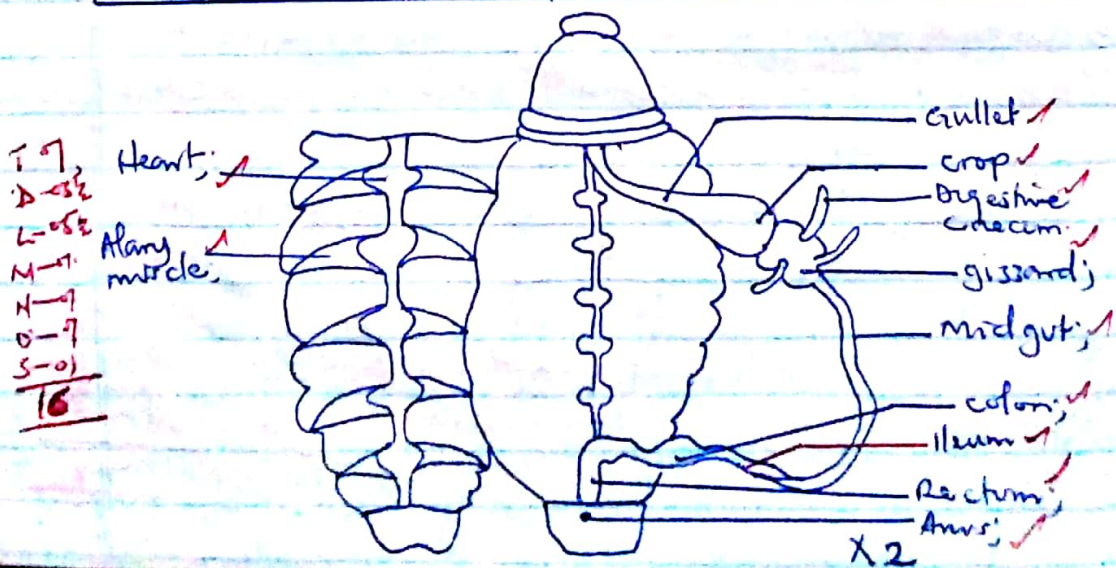
X 2

e) Dissect the specimen to display the alimentary canal and its accessory structures; Also display the heart and its associated muscles. Display the alimentary canal to the right. Draw and label the displayed parts;.

Abdo

Soln.

A drawing showing the parts of alimentary canal displayed to the right and its accessory structures; and the heart and its associated muscles of specimen A.



T 1
D - 5½
L - 5½
M - 1
N - 1
O - 1
S - 01
16

X 2

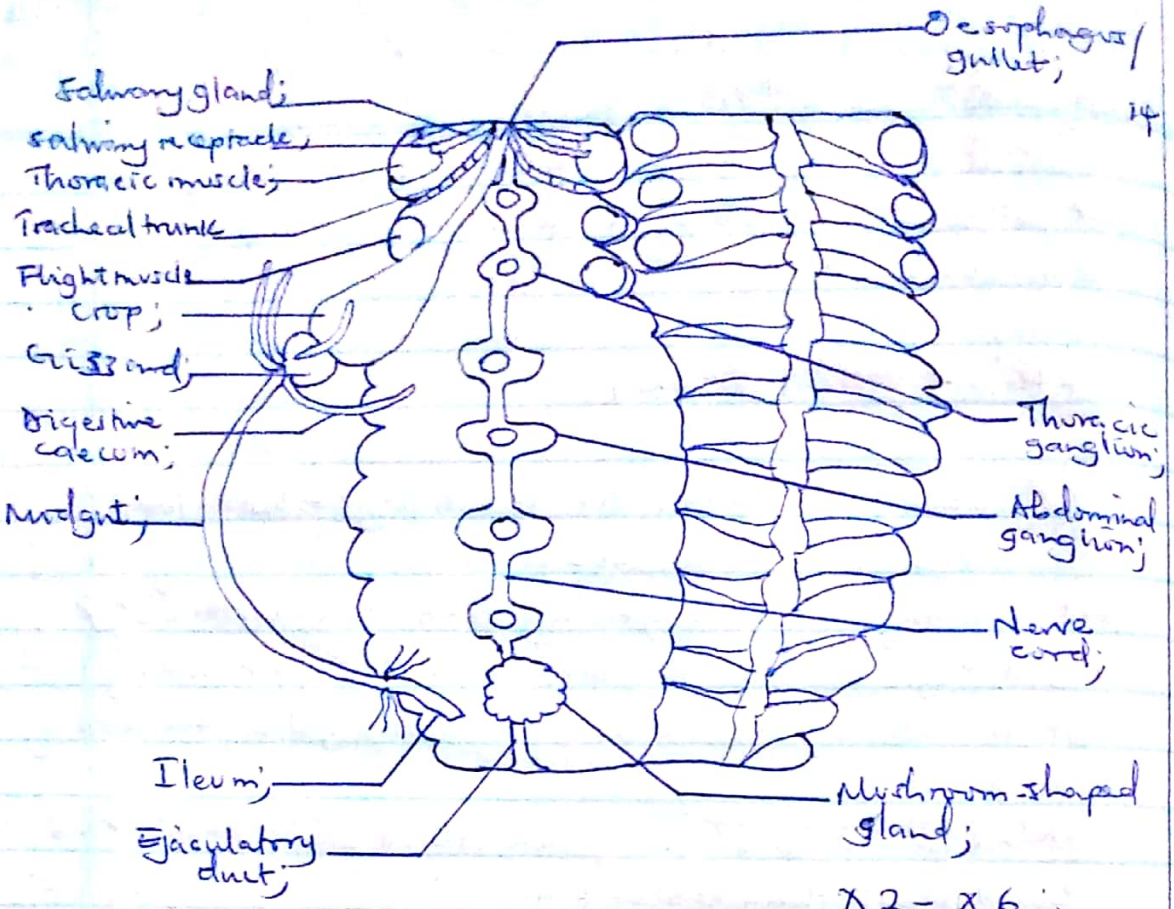
You are provided with specimen K.

Q3. a) cut off the head of the specimen.
Carefully cut off the labium and one maxilla. Observe the respective labium and maxilla under low power objective lens of a microscope.
Compare the suitability of the observed structures in relation to their functions (5 mks)

Soln.
Both have jointed palps for flexibility; to hold food; ✓
Both are hairy to increase sensitivity / for tasting food; ✓
Have long palps for grabing food at a distance; ✓
Both have sharp parts (glossa / lacinia; for cutting food; ✓
Have hooded structures (paraglossa / galea; for holding food; ✓
Maxillary palp is longer than labial palp to grab food at far distant than labial palp; ✓ (any 05)

b) Pin the specimen with dorsal side up;
i) Dissect the specimen along the left lateral line of the abdomen and thorax. Displace the dorsal cuticle and clear any fat tissue. Displace the alimentary canal to the left.
Draw and label the alimentary canal up to the point of absorption of digested food and all the * structures associated with the sternum, anterior to the last abdominal segment; (19 mks)

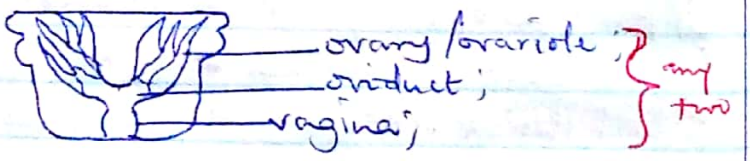
Soln.
Drawing showing the alimentary canal up to the point of absorption of digested food displaced to the left and all the structures associated with the sternum, anterior to the last abdominal segment of specimen K.



X2 - X6;

T = ♂
M — ♂
O — ♂
N — ♂
D — ♂ ♀ mx
L — ♂ ♀ mx
At — ♂
De — ♂
19

♀ female.



NA if
- malpighian labelled
- any part beyond Hamm drawn and labelled gonapophyses;

ii) Basing on the internal structures from your dissection, state with reasons the sex of the specimen; (2mks)

✓ - Male; ✓
- Mushroom-shaped gland; ✓
- Ejaculatory duct; ✓
- pointed gonapophyses; ✓ 02

✓ - Female ✓
- ovary / ovarioles ✓
- Oviduct; ✓
- Vagina; ✓
- blunthy-ended gonapophyses; ✓ any 3 02

c) By further dissection, cut out the tracheal trunk from the specimen. Observe it under low power of a microscope

i) Describe its structure; (02 mks)

It is ringed / formed by ringed structures; ✓

It is hollow / tubular; ✓

It is long; ✓ any 2

ii) What is the significance of your observation in (c)(i) above to the specimen? (02 mks)

Ringed to keep it open for passage of respiratory gases; ✓

Hollow / tubular to allow passage of respiratory gases; ✓

long to convey / reach respiratory tissues at ~~four~~ far ✓ distance; / all parts of the body; any 02

Note:

Adaptations of antennae to the habitat; (02 mks)

- long to feel / sense at a distance; ✓
- segmented / jointed for flexibility; / to ease movement (in all directions); ✓
- Tapering to reduce weight to ease movement; ✓ any 02
- Thin / slender to ease movement; ✓

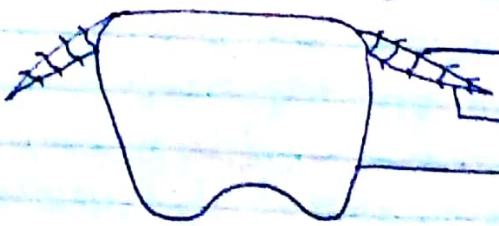
Abort

Q. You are provided with specimen G.

a) Examine the last tergum of the specimen from the ventral view

i) Draw and label. (06 mks)

Drawing showing structures on the last tergum of specimen G from the ventral view;



x2 - x6,

T - 02
M - 02
O - 02
N - 02
D - 1½
L - 1½
05

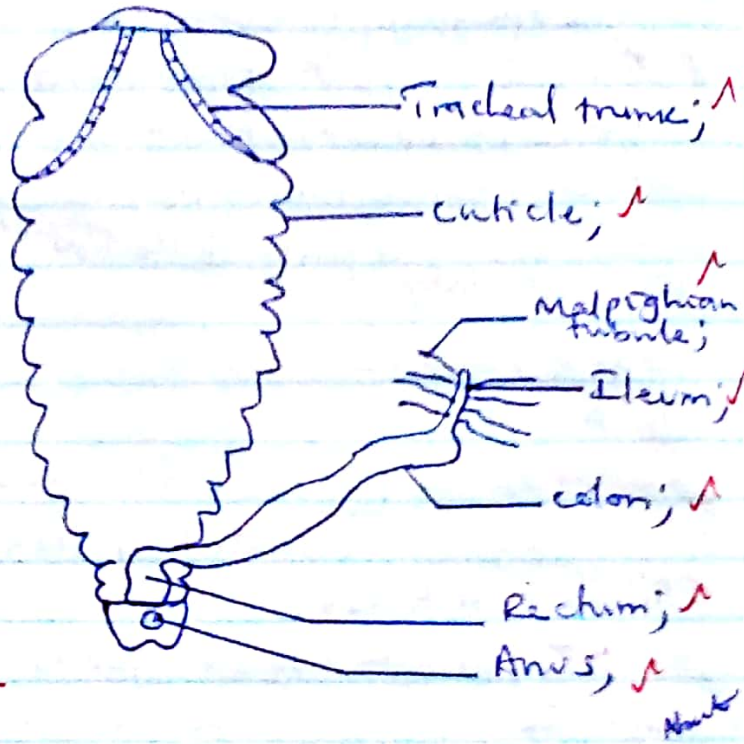
NB
If any other structure labelled
IR if only sternum drawn
- Whole specimen drawn
- Genitalia drawn

b) With the dorsal side uppermost, dissect the specimen to display the structures used for the removal of undigested and excretory materials from the specimen's body. Draw and label (10mks)

A drawing showing the structures for the removal of undigested and excretory materials from the body of specimen G:

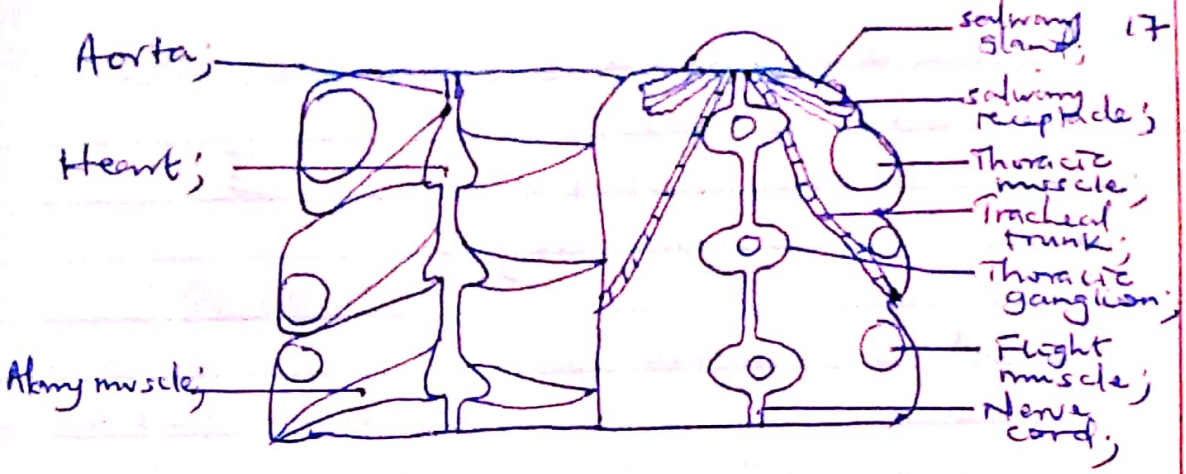
Ignore structures on dorsal cuticle;
NA Any structures of the gut drawn/labelled
- Nerve cord stems eg nerves, reproductive structures of the head.

T — 0½
M — 0½
O — 0½
N — 0½
D — 0½
L — 0½
09



c) 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. (14mks)

A drawing showing structures in the thoracic region/thoracic tergum and sternum/dorsal and ventral cuticles/thoracic cuticles of specimen G with the gut/alimentary canal removed/cut out;



17

N·A
- Ventral cuticle if more than 3 ganglia
- Dorsal if more than 3 heart chambers
- if gut or any part of gut drawn;
- white cockroach drawn & labelled;
- Any structure on the head drawn and labelled;

T-✓
M-✓
O-✓
N-✓
D-✓
L-✓
A-✓
15

x2 - x5

About

Qn You are provided with specimen K.

a) 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 mks)

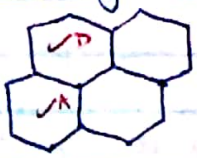
Six-sided / hexagonal / polygonal; ✓
placed side by side / adjacent each other; ✓
Regularly arranged; ✓
Numerous / many; ✓
compact / closely packed / no space between each unit; ✓

05

ii) Draw four adjacent eye units. Do not label (6 mks)

Drawing showing four adjacent eye units of specimen K.

D-Hexagonal
A-Accurately only 4 units;



T-✓
O-✓
N-✓
D-✓
A-✓
Nu-✓

5.6

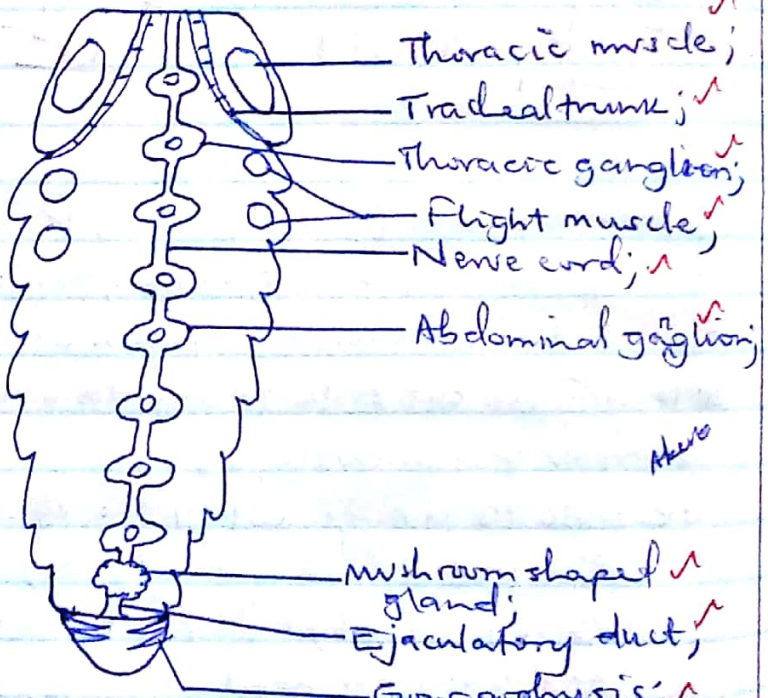
iii) What is the significance of the arrangement of the units? (2 mks)

Increases field of view; ✓ 02
Increases sensitivity; ✓

b) 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 mks)

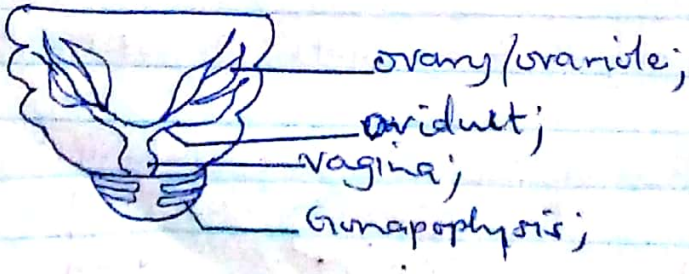
A drawing showing the structures on the ventral cuticle of specimen K without the digestive system;

T – 01
M – 01
D – 01
N – 01
D – 04
L – 04
Dc – 01
13



X2 – X6;

Female;



NOTE to be done.