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P530/3
BIOLOGY
PRACTICAL
Paper 3
AUGUST, 2022
3¼hours

JINJA JOINT EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS – AUGUST, 2022

BIOLOGY

PRACTICAL

Paper 3

3¼ hours

INSTRUCTIONS TO CANDIDATES

Answer **ALL** *questions.*

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

For Examiner's Use Only

QUESTION	MARKS
1	42
2	35
3	23
TOTAL	100

-Freshly killed toad.

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

(a) How does the head structure contribute to the survival of the specimen in its habitat? (3 marks)

Rej. - Head triangular Deny for function.
- Head features.

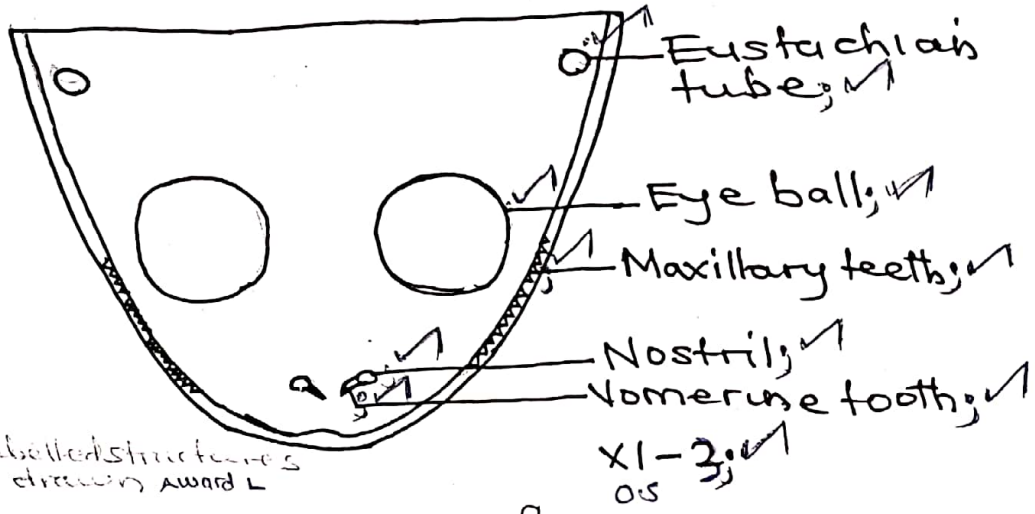
The head is dorso-ventrally flattened; and tapers towards the snout; making it streamlined to reduce water resistance during swimming/ease entry into hidden places; 03

(b) Place specimen ventral side up with the head facing towards you.

(i) Using forceps, open the mouth fully to expose and examine structures within the roof of the buccal cavity. Draw and label. (7 marks)

Drawing showing structures within the roof of the buccal cavity of specimen F; ✓

✓10
✓N



T - 01/2
M - 01/2
O - 01/2
N - 01/2
D - 02 1/2
L - 02 1/2
07

NA - Floor drawn and labelled structures
NA Drawing - Dorsal view drawn Award L

(ii) Explain the importance of the structure within the ~~roof~~ floor of buccal cavity to the organism. (4 marks)

- Tongue is (long and) elastic; for it to be stretched to capture prey/insects;
- Tongue is sticky; to trap prey/insects;
- Tongue is forked; at tip which increases surface area for trapping insects;
- Tongue is attached at tip of the floor of buccal cavity; for it to be easily flipped out to trap insects/prey; 04

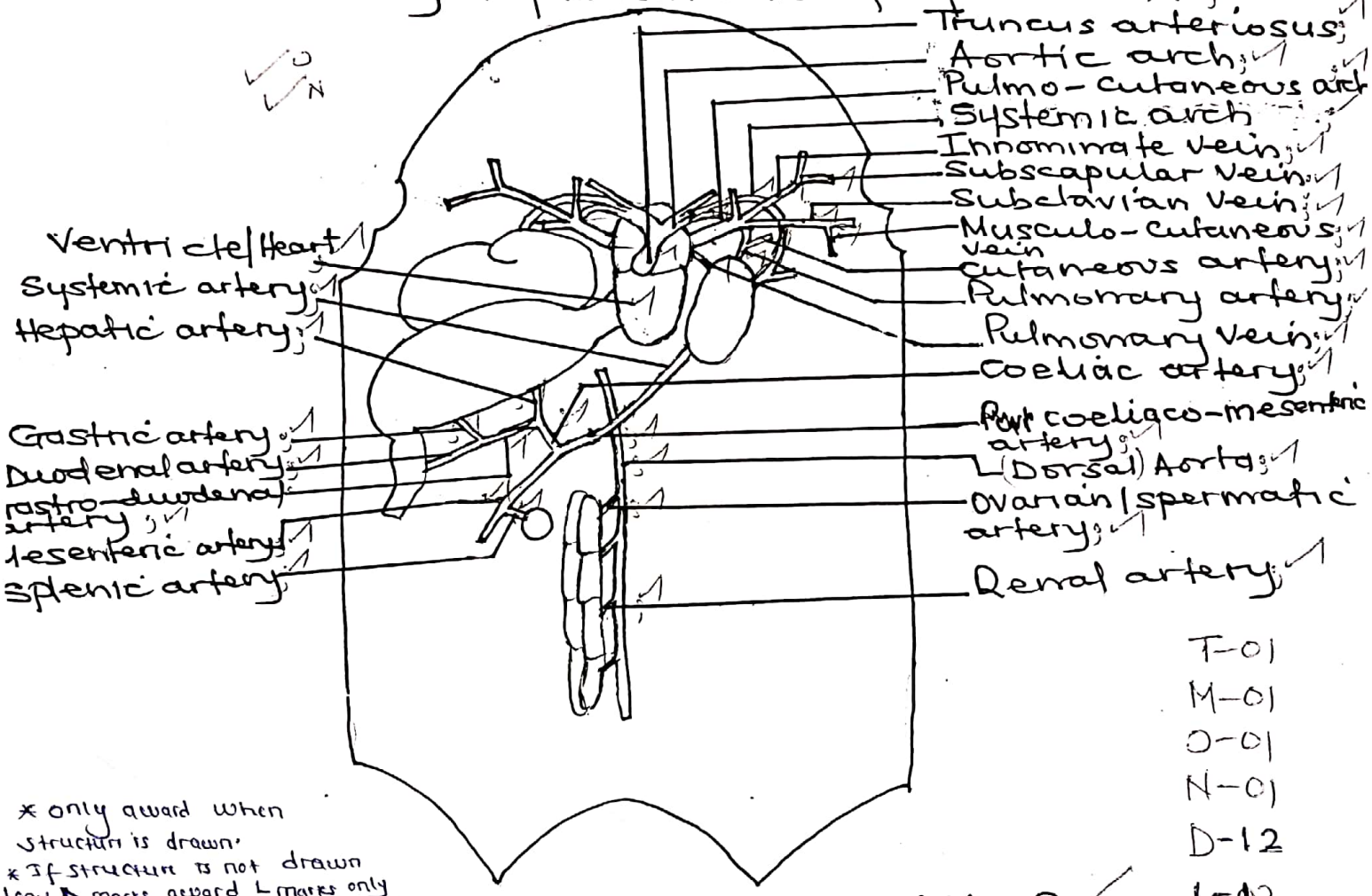
(c) Dissect the specimen to open the body cavity. Trace and expose

(i) blood vessels within the upper trunk region. → Thoracic region

(ii) blood vessels supplying structures which are on the left of abdominal cavity when in-situ with necessary displacements. ↓ spleen, stomach, Duodenum, Left kidney, testis/ovary

With undisplaced heart, draw and label the blood vessels. (28 marks)

Drawing showing blood vessels within the upper trunk region and blood vessels supplying structures which are on the left of abdominal cavity when in-situ with necessary displacements of specimen F ✓



T-01
M-01
O-01
N-01
D-12
L-12

28

X1-2 ✓

* only award when structure is drawn.
* If structure is not drawn deny D marks award L marks only
Ignore labelled structures.

NA-(i) – Head and forelimb vessels drawn and labelled

NA-(ii) – Other arterial blood vessels of alimentary canal drawn and labelled.

IR-(iii) – Structures and vessels drawn on left of specimen

4-2

Fresh cube of Irish potato (cm³)
Half boiled cube of Irish potato

2. You are provided with tissues B_1 and B_2 obtained from same plant organ which have been treated differently and solutions Z and X which are laboratory reagents.

10% H_2O_2 ← Z

X → 0·1M Sucrose solution

(a) Cut tissues B_1 and B_2 into four equal cubes. Obtain liver and thigh muscle tissue from specimen F in question 1 of equal cubes as cut tissues of B_1 and B_2.

Label seven test tubes (i) and (vii). Add contents to each of the test tubes as shown in Table 1 and in each case record your comparative observations and deductions.

Table I (10 marks)

Test tube	Contents	Observations	Deductions
(i)	$2cm^3$ of Z and cube of liver	Very rapid; effervescence/ froth formation; Rej. bubbles	Very rapid; breakdown of Solution Z;
(ii)	$2cm^3$ of Z and cube of muscle	Rapid; efferves cence/ Rapid froth formation; Rej. bubbles.	Rapid; break-down of solution Z;
(iii)	$2cm^3$ of Z and one cube of B_1	Few/Many; bubbles; Rej. Effervescence.	Slow/Fast; breakdown of Solution Z;
(iv)	$2cm^3$ of Z and one cube of B_2	No bubble formation/ No effervescence occurs/No froth formation; Acc Very few bubbles/slow effervescence	No breakdown of Solution Z;
(v)	$2cm^3$ of Z and one crushes cube of B_1	Very many; bubbles/ Rapid effervescence;	Fast; breakdown of solution Z;

10

(b) Explain your results for the following test tubes.

(i) Test tubes (i) and (ii) (6 marks)

Both liver and muscle tissues had an enzyme/active substance which catalysed the breakdown of solution Z. The liver had a higher concentration of enzyme while the muscle had lower concentration of enzyme hence much higher rate of breakdown/decomposition of solution Z by liver tissue than muscle tissue. 06

Rej. Enzymes/ Active substances Deny all marks

(ii) Test tubes (iii), (iv) and (v) (6 marks)

Tissue B, had an active enzyme/substance to catalyse breakdown of solution Z. Crushing the tissue of B, exposes all the enzyme molecules to substrate molecules, increasing chances of collision, hence rapid/fast rate of breakdown while whole tissue of B, only few enzyme molecules are exposed to substrate molecules, hence low rate of breakdown of solution Z. Treatment of the B_2 tissue denatures enzyme molecules. 06

Acc. increase surface area of enzyme molecules

Acc. small surface of enzyme molecules

Ignore boiled

(c) Suggest two conclusions that can be drawn from your results and give a reason. (3 marks)

Both plant and animal living tissues have enzyme/catalase whose concentration varies depending on the metabolic activity of tissue.

Treating tissues with unfavourable conditions denature enzymes. 03

Rej. boiling

(d) In test tubes(vi) and (vii) add into each 5cm^3 of solution x followed by two cubes of B_1 into test tube (vi) and two cubes of B_2 into test tube(vii). Leave to stand for 30 minutes.

(i) After 30 minutes, measure and record the final volume from each of the test tubes Acc. 4·0 – 4·8 (1 mark)

Test tube (vi) 4 < 5 cm^3; ✓1

Test tube (vii) 5 Acc. 4·9 cm^3; ✓1 0-1

Explain the changes in volumes (5 marks)

In test tube (vi) the volume decreased because the cell sap of tissue cells had a higher solute concentration than solution X; ✓ The tissue therefore gained water from solution X; ✓ by osmosis; ✓

Acc. Low ψ_{cell}/ψ_s or high osmotic pressure

In test tube (vii) the volume remained ~~the~~ same because the treatment of tissue killed the cells; making them to be osmotically inactive/no osmosis takes place hence no gain or loss of water; ✓

05

(ii) Examine and state the physical states of tissue from test tube (vi) (2 marks)

- Hard; ✓
- Swollen/Expanded ✓
- Rough; ✓ @1mk
- Stiff/Rigid; ✓ 02

35

2 Leaves of commelina plant obtained from open sunny terrestenal habitat

Small pieces of fresh Irish Potato

You are provided with specimens P and Q which are obtained from plant organs and solutions R and S. 10 cm³ 1.0 M sucrose solution

10 cm³ 0.0 M sucrose solution/Distilled water.

(a) Carefully peel off a piece of the outermost upper and lower layers from P and place them near to each other on a slide and cover with slip. Examine each under medium power of microscope.

(i) State two differences between the upper and lower layers. (2 marks)

Rej hairly

Upper layer	Lower layer
Few scattered stomata	Numerous/Many stomata ✓
More hairy/Hairy	Less hairy/Not hairy; ✓

02

(ii) Suggest the possible habitat of the plant from which the specimen was obtained and explain the ecological significance of the differences in (a) (i) above. (4 marks)

Open sunny terrestenal habitat; ✓ Acc. dry/semi arid terrestenal Habitat;

- Few stomata to reduce transpiration to avoid excessive water loss/dessication/so as to conserve water ✓
- Hairy to trap moist air so as to reduce transpiration ✓
- Numerous stomata for effective gaseous exchange ✓
- Less/Not hairy because its not directly exposed to sunlight; ✓

Any 3.

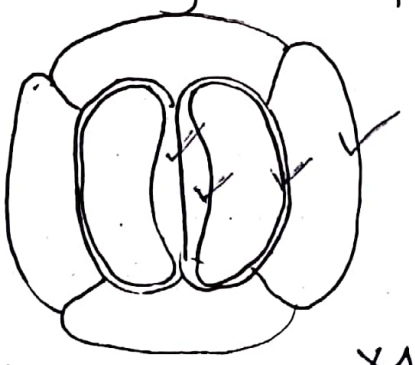
04

Rej. Significance if habitat is wrong

(b) Further peel off two fresh pieces of lower layer and place into separate labelled petri dishes R and S containing corresponding solutions. Leave to stand for 10 minutes.

(i) Remove the piece from solution R and mount it on a drop of solution R on a slide and cover with cover slip. Observe under high power of microscope to identify two adjacent guard cells including other surrounding cells. Draw the cells. (5 marks)

Drawing of two adjacent guard cells including other surrounding cells of the lower layer of specimen P ✓



- Closed stoma ✓
- Thicker inner cellwall ✓
- Thinner outer cellwall ✓
- Surrounding cells ✓

T-0½
M-0½
D-04

05

X400-800 ✓

Acc. X1200

* Ignore labels.
* If stoma open deny all the marks
* Ignore other internal structures if drawn

(ii) Observe the piece placed on solution S under high power of microscope using same procedure in (b) (i) above.

Explain the physiological significance of the state of cells to a plant. (4 marks)

- Turgid cells makes stomata to open for effective gaseous exchange;✓
- Turgid cells provides support especially in harbaceous plants;✓
- Turgid cells makes leaves become open which increases surface area for trapping sunlight;✓
- Turgid cells makes flower petals to open which enables pollination;✓ 04

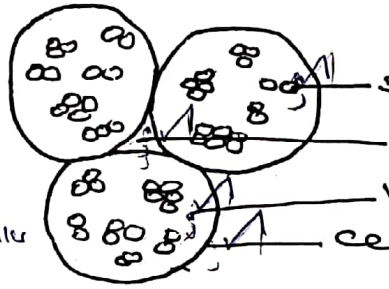
(c) Using a razor blade, obtain a thin section of tissue from specimen Q and place it on a slide, stain using a drop of iodine solution which should be drained using blotting paper. Observe under medium / high power of microscope.

(i) Identify and state the type of tissue. Explain how its adapted to the survival of the plant. (4 marks)

- Parenchyma tissue;✓
- Starch granules for food storage;✓
- Air spaces for gaseous exchange;✓
- Thin cell walls which allows osmotic uptake of water making cells turgid to provide support;✓ 04

(ii) Draw and label three adjacent cells. (5 marks)

Drawing of three adjacent cells of specimen Q viewed under medium/high power of microscope;✓



Ignore double cellwall
* Acc thin very close double cell wall lines drawn.

* Award only starch granules when scattered.

T-0½
M-0½
D-02
L-02
05

X 400–800 – high power;✓
X 100–400 – medium power

END

Each candidate should be provided with the following:

- Freshly killed toad labeled F
- 1cm^3 of Irish potato cube labelled B_1
- 1cm^3 of slightly boiled not to soften Irish potato cube labelled B_2.
- 20cm^3 of 10% hydrogen peroxide solution labelled Z.
- 10 cm^3 of 0.1M sucrose solution labeled X.
- 10 cm^3 of 10% trypsin enzyme solution labelled Y
- Two leaves of commelina plant obtained from open sunny terrestrial habitat labelled P.
- Small piece of fresh Irish potato labelled Q
- 10 cm^3 of 1.0M sucrose solution labelled R
- 10 cm^3 of distilled water labelled S
- Iodine solution
- Dropper
- 8 test tubes
- 10 cm^3 measuring cylinder
- Razor blade
- Blotting paper
- Microscope
- 2 slides and cover slips
- 2 petri-dishes
- Stop clock.