UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

BIOLOGY PRACTICAL INSTRUCTIONS

P530/3 Inst. Sch.

November/December, 2023

CONFIDENTIAL

This information is given only to facilitate preparation of examination.

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

INSTRUCTIONS FOR PREPARING SPECIMENS AND APPARATUS

The teacher responsible for preparing specimens **must** ensure that candidates are provided with correct specimens and other materials as specified in these instructions.

Specimens and solutions which have been assigned **codes** must be presented to candidates using those **codes only** and not any other identity.

The head teacher **must** ensure that the teacher responsible for preparing the specimens hands in his/her trial results for the physiology/biochemistry question, properly sealed in a separate envelope and **firmly** fastened (attached) to the candidates' script envelope(s).

Each candidate should be provided with the following:

A freshly killed rat, labelled **X.**
20 cm^3 of 20 volumes hydrogen peroxide, labelled solution **Q.**
2 M hydrochloric acid solution, labelled solution **P.**
2 M sodium hydroxide solution, labelled solution **R.**
Medium sized Irish potato, labelled **S.**
6 cm^3 of 0.6 M commercial sucrose solution, labelled solution **T.**
Bread mould, labelled **E.**
Lichen, labelled **F.**
Whole fern plant, labelled **G.**
Dissecting kit, pins, board and cotton wool.
Stop clock.
4 plastic beakers (100 cm^3 - 250 cm^3).
Thermometer.
Ruler (15 cm – 30 cm long).
6 test tubes.
10 ml measuring cylinder.
50 ml measuring cylinder.
2 Droppers.
Labels.
Mortar and pestle.
Knife.
Filter paper.
Glass rod.
Hand lens.
Light microscope, slides and cover slips.
Razor blade.
A piece of thread (1.5 m long).
A petri dish.

Access to:

- Distilled water.
- Reagents for carrying out food tests.
- Source of heat.
- Hot water/water bath.

Candidate's Name: I AM MUZAFALU .....

Signature: 0777396759 Whatsapp .....

Random No.					Personal No.		

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

P530/3
BIOLOGY
(Practical)
Paper 3
Nov./Dec. 2023
3¼ 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** *the questions.*

Write the answers in the spaces provided. **No** *additional sheets of paper should 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 require.*

For Examiners' Use Only		
Question	**Marks**	**Examiner's Signature & No**
1	40	Muzafalu
2	35	Muzafalu
3	25	Muzafalu
Total	100	0777396759 whatsapp.

1. You are provided with a freshly killed specimen **X**.

(a) (i) Giving **three** reasons, state the class to which it belongs. *(04 marks)*

Class Mammalia; ✓

Reasons

Pinna / Pinnae / External earlobe; ✓

Hairs / Fur / Hairy body; ✓

External genitalia; ✓ 04 max

Nipples / Teats; ✓

Award only the first 3 reasons

(ii) Open the mouth of specimen **X** and examine the teeth. What special teeth adaptations do you observe? *(04 marks)*

Sharp/pointed incisor teeth; ✓✗ for easy cutting of food; ✗

Long/elongated incisor teeth; ✗ ✓ food deep cutting of food; ✗

Ridged Molar teeth; ✗ ✓ to increase surface area for chewing food; ✗

Large molar teeth; ✗ ✓ to provide large surface area for grinding food; ✗

04 marks

08.

(iii) View the head of specimen **X** from the dorsal side and state how the features are suitable for environmental perception.

(05 marks)

- long vibrissae / elongated vibrissae / whiskers ; ✓ to increase surface area for easy sensitivity at long distances ; ✓
- Vibrissae / whiskers of varying lengths / short and long vibrissae ; to increase S.A for detection ; ✓
- stiff vibrissae / whiskers ; ✓ for increased sensitivity ; ✓
- Large / enlarged eyes ; ✓ to provide a wide field of view ; ✓
- Large pinna / pinnae / external ear lobe ; ✓ to provide a large surface area for collection of sound waves ; ✓
- Funnel shaped pinna / pinnae / ~~external~~ ear lobe ; ✓ to increase surface area to concentration of sound waves ; ✓

05 max

(b) (i) Dissect specimen **X** to open the abdominal cavity. Carefully disentangle the alimentary canal without causing much bleeding. Ligature the hepatic portal vein to prevent much bleeding. Stretch out the full length of the alimentary canal from the cardiac end of the stomach to the posterior end of the colon.

Measure the length of each portion of the alimentary canal as indicated in table **1**, record your results in the table and complete the table.

% Considering lower lengths only

Table 1 *(06 marks)*

Portion (along outer part)	Length (mm)	Percentage length of each section
stomach	30 – 80 ; ✓	3.44 ; ✓
duodenum	80 – 150 ; ✓	9.17 ; ✓
ileum	680 – 1030 ; ✓	77.98 ; ✓
caecum & appendix	50 – 90 ; ✓	5.73 ; ✓
colon	32 – 75 ; ✓	3.66 ; ✓
full length	872 – 1425 ; ✓	99.98 ≃ 100 ; ✓

eg $\frac{30 \times 100}{872}$

06

11

(ii) What is the significance of the observed differences in the length and shape of the different portions of the alimentary canal?

Stomach (2 ½ marks)

C-shaped / Curve / Bean shaped; ↓ to increase surface area; ↓ for digestion of food; ↓ Short / shorter; ↓ for quick passage of food; ↓ 02½

Duodenum (02 marks)

Long / longer; ↓ to provide large surface area; ↓ for digestion of food; ↓ and absorption of food; ↓ 02

Ileum (02 marks)

Longest / long; ↓ to provide large surface area; ↓ for digestion; ↓ and absorption of food; ↓ 02

Caecum and appendix (02 marks)

C-shaped / Curve-shaped; ↓ for temporary storage of undigested food; ↓ Short; ↓ for quick passage of food materials; ↓ 02

Colon (1 ½ marks)

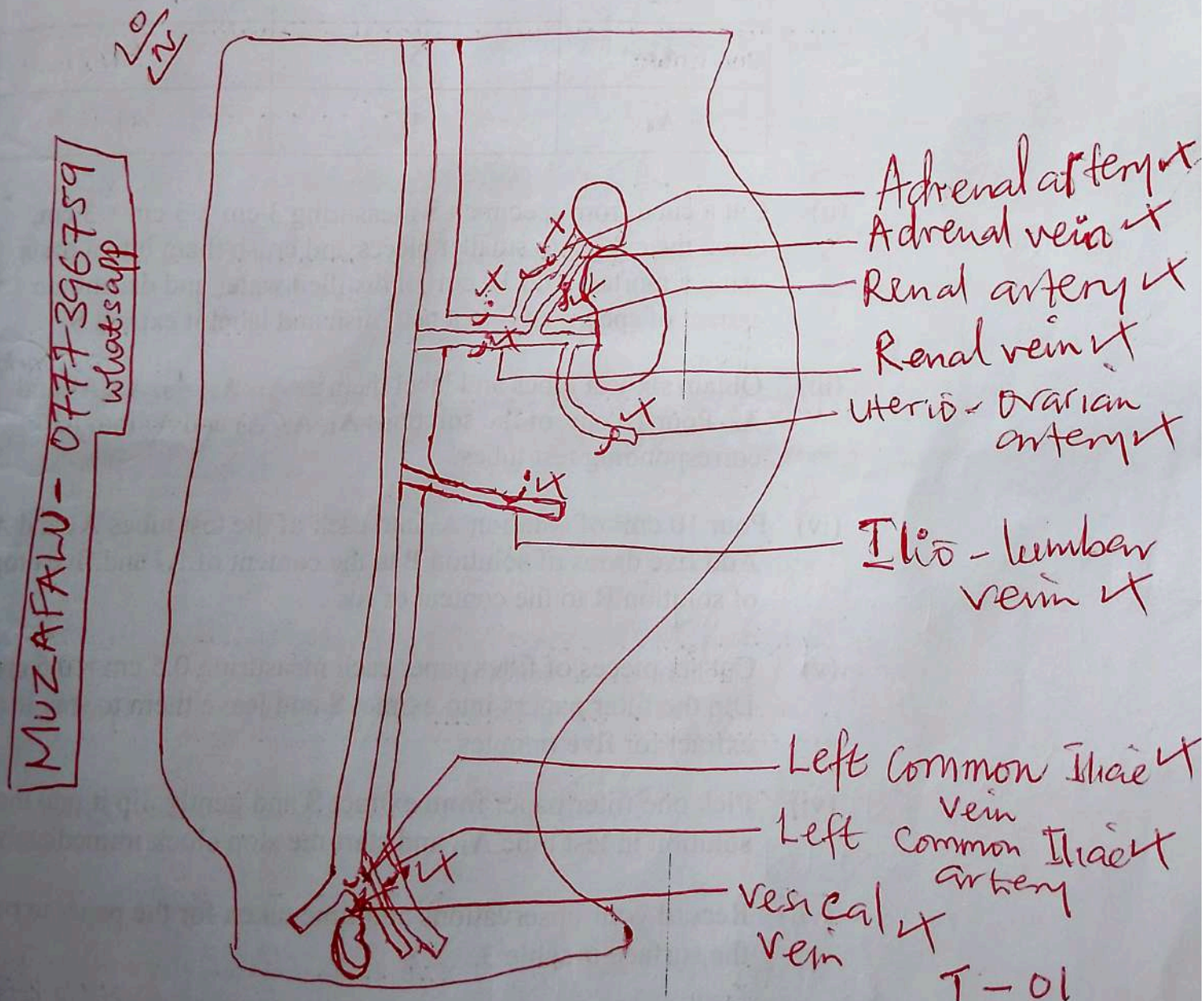
Short / shorter; ↓ for quick passage of food; ↓ and temporary storage of food; ↓ 01½

09

(c) Proceed with the dissection by removing the unnecessary structures in order to display the major blood vessels of the left side of the abdominal cavity.

Draw and label the major blood vessels displayed. *(12 marks)*

A drawing of major blood vessels of the left side of the abdominal cavity of specimen X; ✓



X1 - X3 ✓

T - 01
M - 01
D - 01
N - 01
D - 04½
L - 04½

12 max

2. You are provided with solutions; **P**, **Q**, **R** and specimen **S**. Solutions **P** and **R** provide different pH media.

(a) (i) Label four beakers; A_1, A_2, A_3 and A_4, and prepare their corresponding solutions as shown in table **2**.

Table 2

Solution (cm^3)	Volume of solution **Q** (cm^3)	Volume of water added (cm^3)
A_1	7	7
A_2	4	8
A_3	5	30
A_4	1	11

(ii) Cut a cube from specimen **S** measuring 3 cm × 3 cm × 3 cm. Chop the cube into smaller pieces and crush them into a paste using a mortar. Add 10 cm^3 of distilled water and decant the extract of specimen **S** in a petri dish and label it extract **S**.

(iii) Obtain six test tubes and label them as A_1, A_2, A_3, A_4, A_5 and A_6. Pour 10 cm^3 of the solutions A_1, A_2, A_3 and A_4 into the corresponding test tubes.

(iv) Pour 10 cm^3 of solution A_3 into each of the test tubes A_5 and A_6. Add five drops of solution **P** to the content of A_5 and five drops of solution **R** to the content of A_6.

(v) Cut six pieces of filter paper each measuring 0.5 cm × 0.5 cm. Dip the filter papers into extract **S** and leave them to stay in the extract for **five** minutes.

(vi) Pick one filter paper from extract **S** and gently dip it into the solution in test tube A_1, and start the stop clock immediately.

(vii) Record your observations and time taken for the paper to rise to the surface in table **3**.

(viii) Repeat procedure (vi) - (vii) using solutions in test tubes; A_2, A_3, A_4, A_5 and A_6.

Table 3 *(11 marks)*

Test Tube	Content	Observations	Time taken for paper to return to surface (seconds)
A_1	Solution A_1 + filter paper	Very rapid/very many bubbles/effervescence; filter paper rises very rapidly;	3-15;
A_2	Solution A_2 + filter paper	Rapid/many bubbles/effervescence; Filter paper rises rapidly/fastly;	4-16;
A_3	Solution A_3 + filter paper	Moderate bubbles/effervescence; Filter paper rises moderately;	7-24;
A_4	Solution A_4 + filter paper	Few bubbles/effervescence; Filter paper rises slowly;	13-35;
A_5	Solution A_3 +P + filter paper	Very few/No bubbles; filter rises slowly and/or did not rise;	Infinity/∞;
A_6	Solution A_3 +R + filter paper	Moderate/many bubbles; Filter paper rises moderately;	10-26;

12

(b) Explain the results in the following test tubes.

(i) A_1 *(03 marks)*

Solution S/Extract S contain an active substance/enzyme/~~catalase~~ Catalase; Highest Concentration of Substrate Q/Hydrogen peroxide; provide highest chances of collision between Substrate Q/Hydrogen peroxide with Catalase/enzyme; Very rapid decomposition/breakdown of Substrate Q/Hydrogen peroxide by catalase/active substance/enzyme;

04max

16

(ii) A3 (03 marks)

Moderate Concentration of substrate Q/ Hydrogen peroxide; ✓ providing moderate chances of Collision between substrate molecules and enzyme/ Catalase molecules; ✓ Moderate decomposition/ breakdown/ enzyme activity; ✓ 03

(iii) A4 (03 marks)

Low Concentration of substrate Q/ Hydrogen peroxide; ✓ providing few chances of Collision between substrate Q and enzyme molecules/ catalase; ✓ 03

Low decomposition of substrate Q/ Hydrogen peroxide by catalase/ enzyme; ✓

(iv) A5 (03 marks)

Substance P provided unfavourable Medium/unsuitable medium/ pH; ✓ No/low breakdown/decomposition of substrate Q/ Hydrogen peroxide/ ~~low enzyme~~ low enzyme activity; ✓ 02

(v) A6 (03 marks)

Substance R provided slightly favourable/ favourable/ optimum pH; ✓ for slow/rapid/ Moderate decomposition/ breakdown of Substrate Q/ Hydrogen peroxide/ enzyme activity; ✓ 02

10

.....

.....

.....

DD

(c) (i) Explain the significance of the reactions in the experiment to multicellular organisms. (05 marks)

Hydrogen peroxide; is a toxic by-product of metabolism; which is harmful and broken down / decomposed by catalase; to harmless; products water and oxygen; which protects / prevents the cells from death; Multicellular Organisms are able to regulate the cell pH medium which enables cells to function properly; 05 max

(ii) How were errors minimised during the experiment? (03 marks)

- Usage of equal size of filter paper to ensure equal Concentration of enzyme Molecules from extract S;
- Usage of ~~equal~~ same volume of test tubes to provide equal surface area for enzyme activity;
- Soaking of filter ~~at~~ for the same period of time to ensure same Concentration of enzyme molecules ~~from extract S~~ from extract S; 03 04
- Usage of same volume of solution in test tubes A_1 ~~to~~ A_4 to ensure same Concentration of Substrate S; 09

3. You are provided with specimens; **E**, **F** and **G**.

(a) Mount a small portion of specimen **E** in a drop of water and observe under low power of a light microscope.

(i) Giving **two** reasons, state the division to which specimen **E** belongs. *(03 marks)*

Division Zygomycota/zygomycete; ✓

Reasons Rhizoids; ✓

Sporangia; ✓

Sporangiophere; ✓

Award the first two reasons

03

(ii) From your observations, state how the features of specimen **E** ensures its survival in the habitat. *(04 marks)*

- Long sporangiophere; ✓+ to hold the sporangia at ✓+ High height to increase chances of spore dispersal;
- Thin/Slender Rhizoids; for easy penetration into substratum increasing surface area for absorption of food; ✓+
- Numerous sporangia; ✓+ to provide large surface for storage/production of numerous spores increasing chances of colonisation; ✓+
- Numerous spores; ✓+ increasing chances of easy propagation/colonisation/dispersal; ✓+
- Numerous Rhizoids; ✓+ for easy penetration into the substratum to increase surface area for firm anchorage; ✓+

05

(b) (i) Using a hand lens, examine the upper surface of the pinna of specimen **G**. Describe the role of the observable structures in the survival of the organism. *(04 marks)*

- Numerous sori; ✓+ for storage/production of many spores; ✓+

03

- Many veins; ✓+ to provide support; ✓+
- Large pinna; to provide large surface area for increase rate of transpiration; ✓+

11

.....

~~area~~

.....

.....

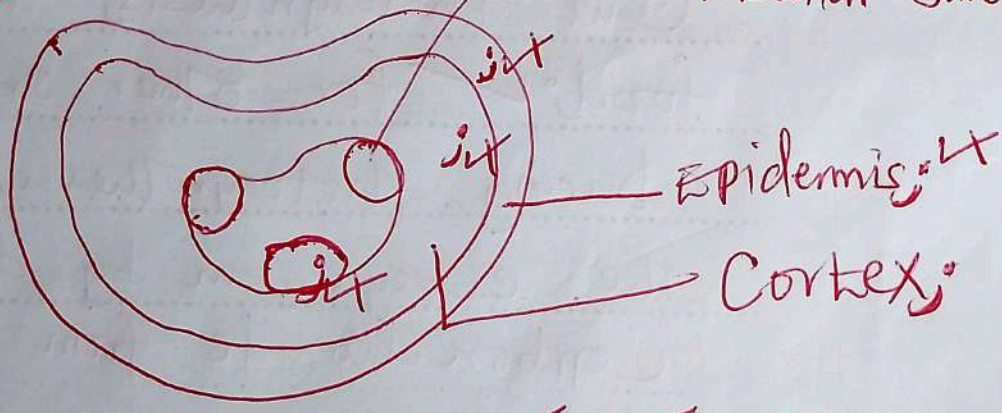
.....

60

(ii) Cut a thin transverse section of the rachis of specimen **G**. Observe under low power of a light microscope. Draw and label the tissue plan observed. *(07 marks)*

~~Adraw~~

A drawing of transverse section of the rachis of tissue plan of specimen G Under low power;



X30-X100

T -01
M -01
O -01
N -01
D -01½
L -01½

07

(c) Use a hand lens to examine specimen **F**. *(04 marks)*

(i) Describe the structure of specimen **F**.

Flattened body; ✓
Undifferentiated body;
Broad / Large body;
Thin / slender body;
04

(ii) Explain the ecological significance of specimen **F**. *(03 marks)*

F contain Chlorophyll pigment; ✓ which traps sunlight to enable it carry out photosynthesis; thus making food; ✓ for other organisms.
During photosynthesis, it detoxifies the ecosystem by absorbing Carbondioxide from the atmosphere; ✓
03 max

Muzafalu - 0777396759 whatsapp.
07

END