



UGANDA NATIONAL EXAMINATIONS BOARD
Uganda Advanced Certificate of Education

P530/2 BIOLOGY

(Practical)

SCORING GUIDE
FOR THE SAMPLE PAPER

P530/2 BIOLOGY

Item 1

This item assesses observational investigation skills

(a) Obtain data from specimen E

To obtain the highest achievement, candidate is expected to ;

i. Produce a clear and logical procedure for dissection

- *correct orientation of the specimen;*
- *opening the body cavity to expose internal structures; and systematic*
- *displacement of internal organs to display the required structures.*

ii. Make a well labelled drawing of structures

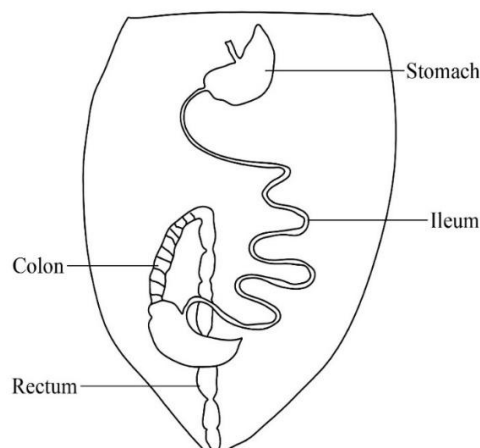
iii. Make systematic observations with accurate measurements of external and internal structures;

Responses.

Procedure of dissection

- Place specimen E ventral side uppermost on the dissecting board and pin it through the feet.
- Lift the skin at the mid-ventral line and make an incision along this line, extending from the lower jaw to the genitals.
- Loosen the skin from the body wall and pin it back on both sides of the specimen.
- Make a mid-line incision along the abdomen, cutting from the diaphragm to the pelvic girdle.
- Pin back the separated body wall to expose the abdominal viscera clearly.
- Displace the liver lobes anteriorly to reveal the stomach.
- Displace the bulk of the ileum to the left, and the caecum & colon to the lower right, to expose all relevant structures.

A drawing of specimen E showing relevant structures of the gut.



Measurements

Structure	Toad(mm)	Rat (mm)
Stomach	48	80
Ileum	150	840
Hindgut	58	175

b) Microscopic evidence of the nutritional advantage the rats

A drawing of one cell of specimen C stained with iodine as observed under medium power.

(The diagram shows a plant cell with starch filled structures)

(c) Analysis of the findings to justify the differences in the survival abilities of the common toad and the rat.

Candidates should:

- (i) *make meaningful comparisons between specimens; and link structural features directly to their adaptive significance for survival in the habitat.*

Rats are better adapted to terrestrial habitats than toads because:

- The much longer ileum in rats provides a large surface area for absorbing digested nutrients increasing energy gain
- The longer hindgut allows more time to complete digestion and absorption of nutrients, hence ensuring food availability to the rat.
- The combination of a starch-rich diet enables rats to accumulate larger energy stores allowing them to withstand periods of food shortage better than toads.

Item 2: SCIENTIFIC INVESTIGATION

This item assesses candidates' ability to plan, conduct, and interpret an investigation, then use results to make justified recommendations

Enzyme Activity Investigation

This item 2 assesses candidates' ability to plan, conduct, and interpret an experiment investigating the effect of enzyme concentration and activators on the rate of gas production.

Aspect	
Aim	An experiment to determine which enzyme extract (A,B or C) and activator (X or Y) combination maximises gas production from breakdown of P and recommend it to Joan
Hypothesis	Extract A produces the highest rate of gas when combined with activator X, because it contains the highest enzyme concentration and activator X provides more favourable conditions for enzyme activity.
Variables	Independent variables: <ul style="list-style-type: none">• Concentration of enzyme extracts (solutions A, B and C).• Type of activator (solutions X and Y). Dependent variable: <ul style="list-style-type: none">• Volume / rate of gas produced. Controlled variables: <ul style="list-style-type: none">• Volume of each solution/extract used.• Temperature of the reaction.• Duration of the experiment.
Risks and Mitigations	Risk 1: Reagents may cause skin burns on contact due to their corrosive nature. <ul style="list-style-type: none">• Mitigation: Handle reagents carefully and wear protective gloves throughout. Risk 2: Careless handling of knives may cause injury. <ul style="list-style-type: none">• Mitigation: Handle all cutting instruments with care.
Procedure	Effect of enzyme concentration (extracts A, B and C) on gas production: <ol style="list-style-type: none">1) Label three test tubes A, B and C.2) Add 2 cm³ of the respective solution (A, B or C) to each labelled test tube.3) Add 2 cm³ of solution P to test tube A and record the rate of bubbling.4) Repeat step 3 for test tubes B and C, recording observations for each. Effect of activators (solutions X and Y) on enzyme activity: <ul style="list-style-type: none">• Label two test tubes X and Y.• Add 2 cm³ of solution A to each test tube.• Add 2 drops of solution X to test tube X and 2 drops of solution Y to test tube Y.• Add 2 cm³ of solution P to each test tube and record the rate of bubbling in each.

Results Table	Results:	Solution mixture	Observation	
		P + A	Rapid effervescence	
		P + B	Moderate effervescence	
		P + C	Slow effervescence	
		P + A + X	Rapid effervescence	
		P + A + Y	Slow effervescence	
Explanation	<ul style="list-style-type: none"> Increasing enzyme concentration increases the frequency of enzyme-substrate collisions, leading to the formation of more enzyme-substrate complexes and a higher rate of gas production. Activator X enhanced the rate of reaction by modifying the enzyme or substrate to facilitate formation of the enzyme-substrate complex more readily. Solution Y inhibited enzyme activity by providing unfavourable conditions for the reaction, thereby reducing the rate of gas production. 			
Conclusion	<p>The results confirm that increasing enzyme concentration and the use of activator X both increase the rate of gas production, consistent with the stated hypothesis.</p> <p>Recommendation: Joan should use extract A (highest enzyme concentration) combined with activator X to achieve the greatest rate of gas production in her project.</p>			