7.0 BIOLOGY (231)

This was the sixth time the revised KCSE Biology syllabus was tested.

7.1 CANDIDATES' GENERAL PERFORMANCE

The performance of the candidates in the three Biology papers is given in the table below. The performance of the candidates in the years 2008, 2009 and 2010 is also given for comparison.

Table 19 **Candidates' Overall Performance in Biology In the years 2008, 2009, 2010 and 2011**

Year	Paper	Candidature	Maximum score	Mean score	Standard Deviation
2008	1		80	22.24	14.42
	2		80	21.09	11.55
	3		40	17.30	6.76
	Overall	**274,215**	200	**60.64**	**29.12**
2009	1		80	20.14	12.31
	2		80	18.41	10.30
	3		40	15.86	8.43
	Overall	**299,302**		**54.29**	**28.80**
2010	1		80	21.39	13.76
	2		80	18.67	10.82
	3		40	18.42	8.31
	Overall	**317,135**	200	**58.39**	**30.44**
2011	1		80	22.74	12.41
	2		80	23.31	13.04
	3		40	18.84	8.10
	Overall	**363,817**	200	**64.87**	**31.05**

From the table it can be observed that:

- There has been an increase in candidature for the past four years.
- There was improvement in performance for the year 2011 compared to 2010 as indicated by the mean scores of the papers.
- The standard deviation values indicate that the papers adequately discriminated learners of different abilities.
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7.2 ANALYSIS OF POORLY PERFORMED QUESTIONS

The questions that were performed poorly by the candidates are discussed below.

7.3 Paper 1 (231/1)

Question 2

a) Write the dental formula of an adult human. (1 mark)
b) Name **two** dental diseases. (2 marks)

Weaknesses

In some candidates:

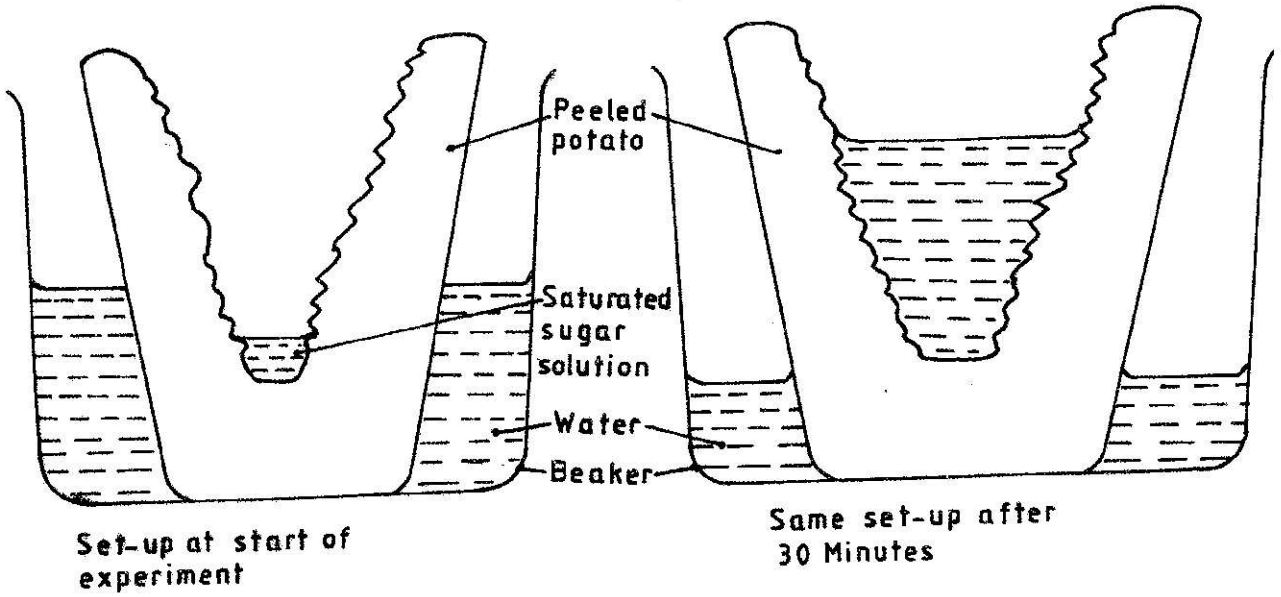
- commas and capital letters were used in the dental formula
- divisional line was not used in the dental formula
- spelling mistakes in dental diseases

Expected responses

a) $i\frac{2}{2}\ c\frac{1}{1}\ pm\frac{2}{2}\ m\frac{3}{3}$
b) Dental carries;
Periodontal/gingivitis/pyorrhoea;

Question 7

The diagrams below show an experimental set-up to investigate a certain process in a plant
tissue.



Explain the results obtained after 30 minutes. (4 marks)

Some candidates:

- failed to distinguish between hypotonic and hypertonic solutions
- likened the entire tissue to one cell

Expected response

- Water was hypotonic to cell sap of adjacent cells; the cells absorbed water by osmosis; and their cell sap became less concentrated than those of the next cells; The process was repeated until water reached the sugar solution;

(4 mark)

Question 8

State **three** characteristics of the class crustacea. (3 marks)

Weaknesses

- Some candidates gave general characteristics of arthropods instead of specific characteristics of crustacea.
- Some were not specific on the number of appendages and compound eyes

Expected response

- Fused head and thorax/cephalothorax often protected by a carapace;
- Gaseous exchange through gills;
- Two pairs of antennae;
- Five to 20 pairs of limbs;
- A pair of compound eyes;

Question 16

a) Describe the condition known as varicose veins. (2 marks)

b) What is the role of blood platelets in the blood clotting process? (2 marks)

Weaknesses

- Some candidates just gave the observation of swelling and equated it to oedema
- Some candidates substituted weakened valves with non-functional valves
- Some candidates explained the process of blood clotting instead of the role of platelets

Expected response

a) Weakened/defective valves in veins; causing blood/body fluid to accumulate; leading to the swelling.

(2 marks)

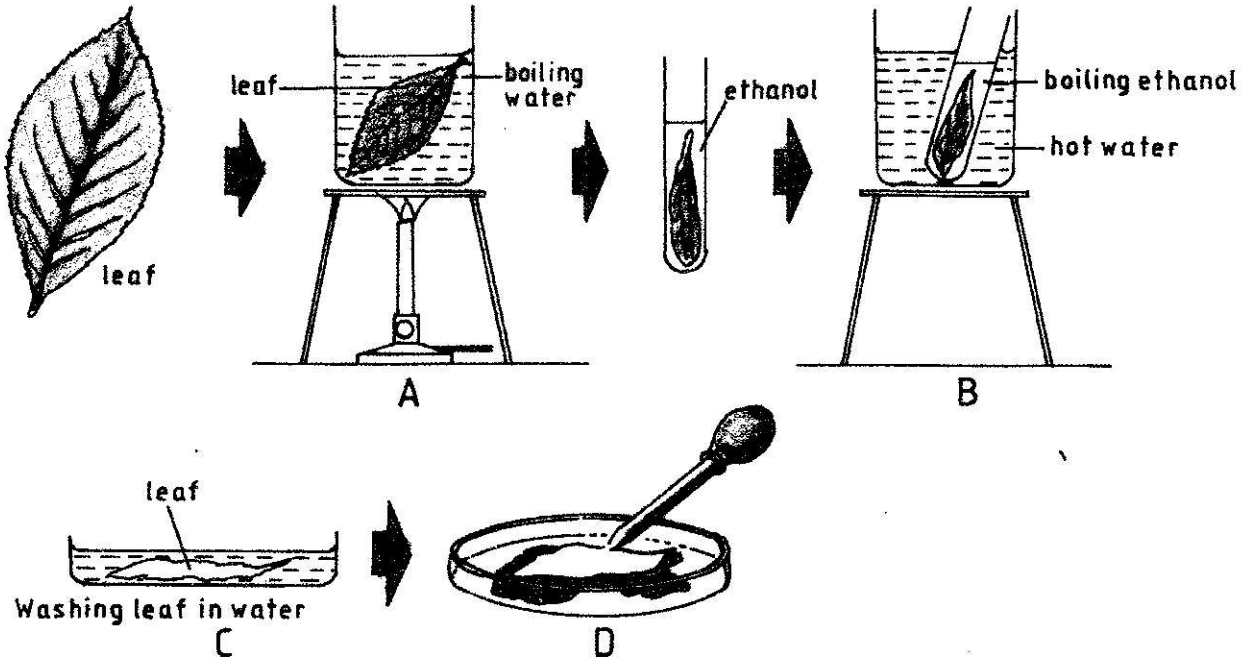
b) When exposed to air platletes disintegrate; releasing thromboplastin;

(2 marks)

7.4 Papaer 2 (231/2)

Question 1

The set-up below illustrates a procedure that was carried out in the laboratory with a leaf plucked from a green plant that had been growing in sunlight.



(i) What was the purpose of the above procedure? (1 mark)
(ii) Give reasons for carrying out steps **A**, **B** and **C** in this procedure. (3 marks)
(iii) Name the reagent that was used at the stage labelled **D**. (1 mark)
(iv) State the expected result on the leaf after adding the reagent named in (iii) above. (1 mark)

Weaknesses

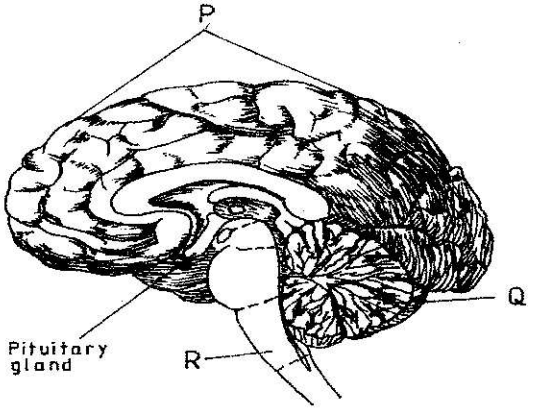
- Some candidates did not know the steps and the reasons for each step in the procedure
- Some candidates did not know the difference between iodine and iodine solution.

Expected response

(i) - Testing a leaf for the presence of starch;
(ii)
A - Kill the leaf/break down cells/stop enzymatic activity;
B - Removal of chlorophyll;
C - Soften leaf/makes leaf less brittle;
(iii) Iodine solution;
(iv) Areas where starch is present stain blue/blue black; Total (6 marks)

Question 4

(a) The diagram below represents a section of the human brain.



(i) Name the structures labelled P and R. (2 marks)
(ii) State **two** functions of the part labelled Q. (2 marks)

(b) (i) Name **two** reproductive hormones secreted by the pituitary gland in women. (2 marks)

(ii) State **one** function of each of the hormones named in (b) (i) above. (2 mark)

Weaknesses

Most candidates did not know:

- Parts of the brain and their function
- Reproductive hormones secreted by the pituitary gland

Expected response

(a) (i) P - is cerebral hemisphere/cerebrum;
R - medulla oblongata;
(2 marks)

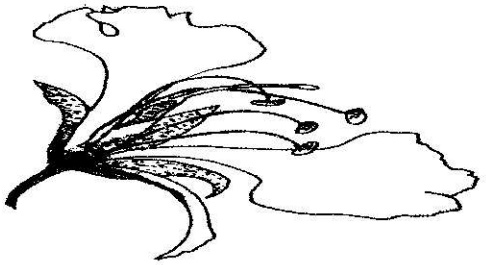
(ii) Muscular co-ordination; maintaining body posture; manual dexterity;
(first two)(2 marks)

(b) (i) Follicle stimulation hormone; luteinizing hormone; oxytocin; prolactin;
(first two)(2 marks)

(ii) FSH - stimulates secretion of oestrogen; stimulates development of the Graafian follicle;
LH - Brings about ovulation; develops corpus luteum; Oxytocin - causes contraction of uterus; causes expulsion of milk from mammary glands; Prolactin - stimulates milk production/secretion;
(first two)(2 marks)Total (8 marks)

Question 5

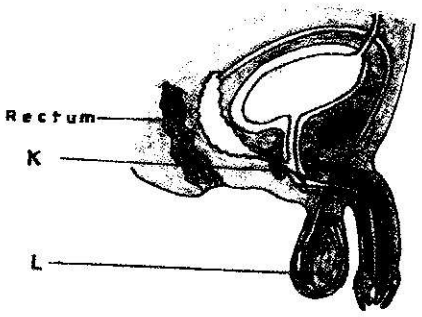
(a) The diagram below represents a flower.



(i) On the diagram, name **two** structures where meiosis occurs. (2 mark)

(ii) How is the flower adapted to prevent self-pollination? (2 marks)

(b) The diagram below represents a human reproductive organ.



(i) Explain **two** adaptations of the structure labelled **L** to its functions. (2 marks)

(ii) Explain the role of the gland labelled **K**. (2 marks)

Weaknesses

- Some candidates did not know where meiosis specifically occurs
- Many candidates could not identify K.

Expected response

(a) (i) Anthers; Ovary; (2 marks)

(ii) Anthers are below the stigma to minimise self pollination;
- petals are large/conspicuous, for insects to land on/ to attract insects encouraging cross pollination; (2 marks)

(b) (i) L is hanging outside the body to ensure optimal temperature for sperm production; it has many, long and coiled somniferous tubules to increase the surface area for production/storage of sperms; (2 marks)

(ii) K produces an alkaline fluid that neutralizes acid in the vagina; this fluid contains nutrients for the sperms; and also activates sperms; (2 marks)

Total (8 marks)

Question 8

(a) Describe the exoskeleton and its functions in insects. (13 marks)

(b) Describe how accommodation in the human eye is brought about when focusing on a near object. (7 marks)

Weaknesses

- Some candidates could not distinguish between endo and exoskeleton
- Most candidates were unable to describe the exoskeleton
- Candidates did not know that suspensory ligaments slacken

Expected response

(a) The exoskeleton is made of chitin; chitin is not evenly distributed; hence it allows for movement; exoskeleton is secreted by the epidermal cells; when still soft it allows for growth of the insect; when in contact with the air it hardens limiting growth;
It is shed regularly; thus regulating the growth of insects. It also supports the internal structures; Because it is hard; it protects; internal organs from mechanical damage.
It is water proof; preventing water loss/desiccation; of the insect. It also provides a surface for attachment of muscles;

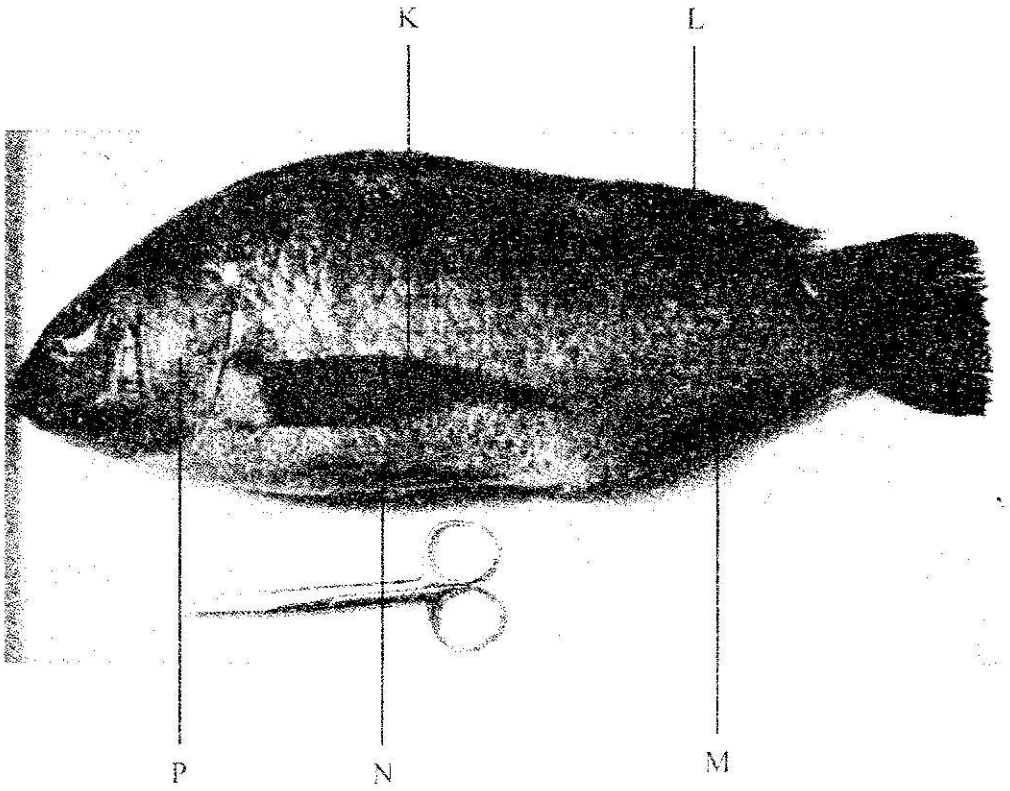
(13 marks)

(b) Light rays from a near object need to bend more; in order to be focused properly on the retina; ciliary muscles contract; suspensory ligaments attached to the ciliary muscles relax; the lens becomes thicker; increasing its curvature/becomes more convex; light f rom the object is refracted more;
(7 marks)

7.5 Paper 3 (231/3)

Question 1

Below is a photograph of a fish. Examine it and answer the questions that follow.



(a) Name the parts labelled K, L , M and N. (4 marks)

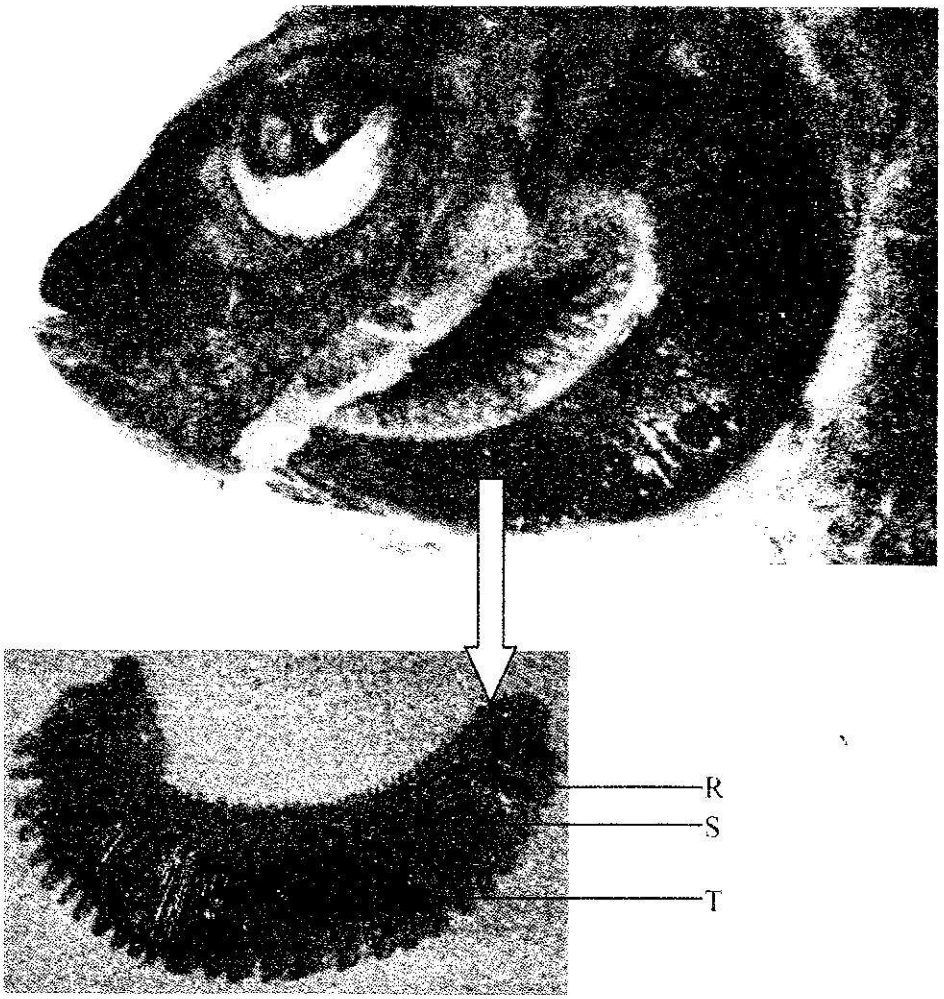
(b) The actual length of the pair of scissors next to the fish is 12.5cm. Using this information, calculate the actual length of the fish. (3 marks)

(c) Name the fins that prevent the following movements of fish during swimming. (3 marks)

(i) Yawing: .....

(ii) Pitching: ..... and .....

(d) The photograph below shows structures visible after removing the part labelled P. The inset is a magnified view of one of the structures.



(i) Name the parts labelled R, S and T. (3 marks)

(ii) Explain how each of the parts named in (d) (i) above is adapted to its function. (3 marks)

Weaknesses

- Wrong spelling of terms
- Omission of units of measurement
- Inability to measure/measure accurately
- Wrong use of measurement units
- Plural and singular used wrongly in the naming

Expected response

(a)
K - Pectoral fin;
L - Dorsal fin;
M - Anal fin;
N - Pelvic fin;

(4 marks)

(b) The size of scissors on the photograph is 4.6
The length of fish on the photograph is 13.6 ;

Mg = Image length
Actual length
Actual length of fish is ; = 36.96 cm; (3 marks)

(c) (i) Yawing - Dorsal fin;
(ii) Pitching - Pectoral fin; Pelvic fin; (3 marks)

(d) (i)
R - gill rakers;
S - gill bar;
T - gill filaments; (3 marks)

(ii)
R - sharp/numerous/pointed/arranged closely in a row to trap solids that can damage the filaments;

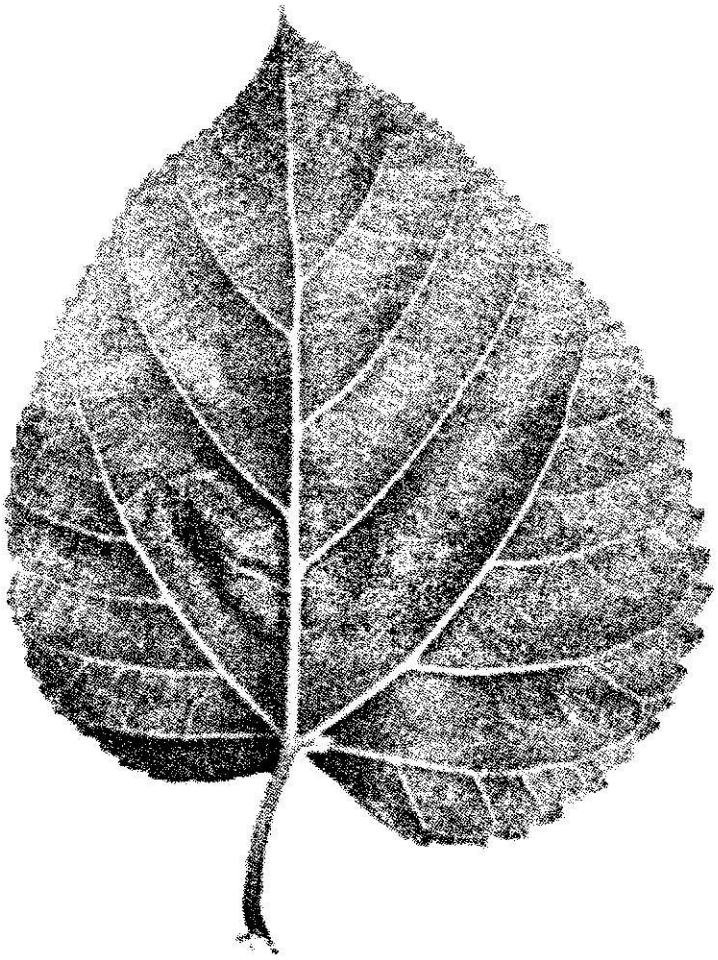
S - rigid/firm to hold gill filaments in place;
T - numerous to increase surface area for gaseous exchange/thin to reduce the distance for gaseous exchange/vascularized to transport respiratory gases away from the respiratory surface/ moist to dissolve oxygen for diffusion;

(3 marks)

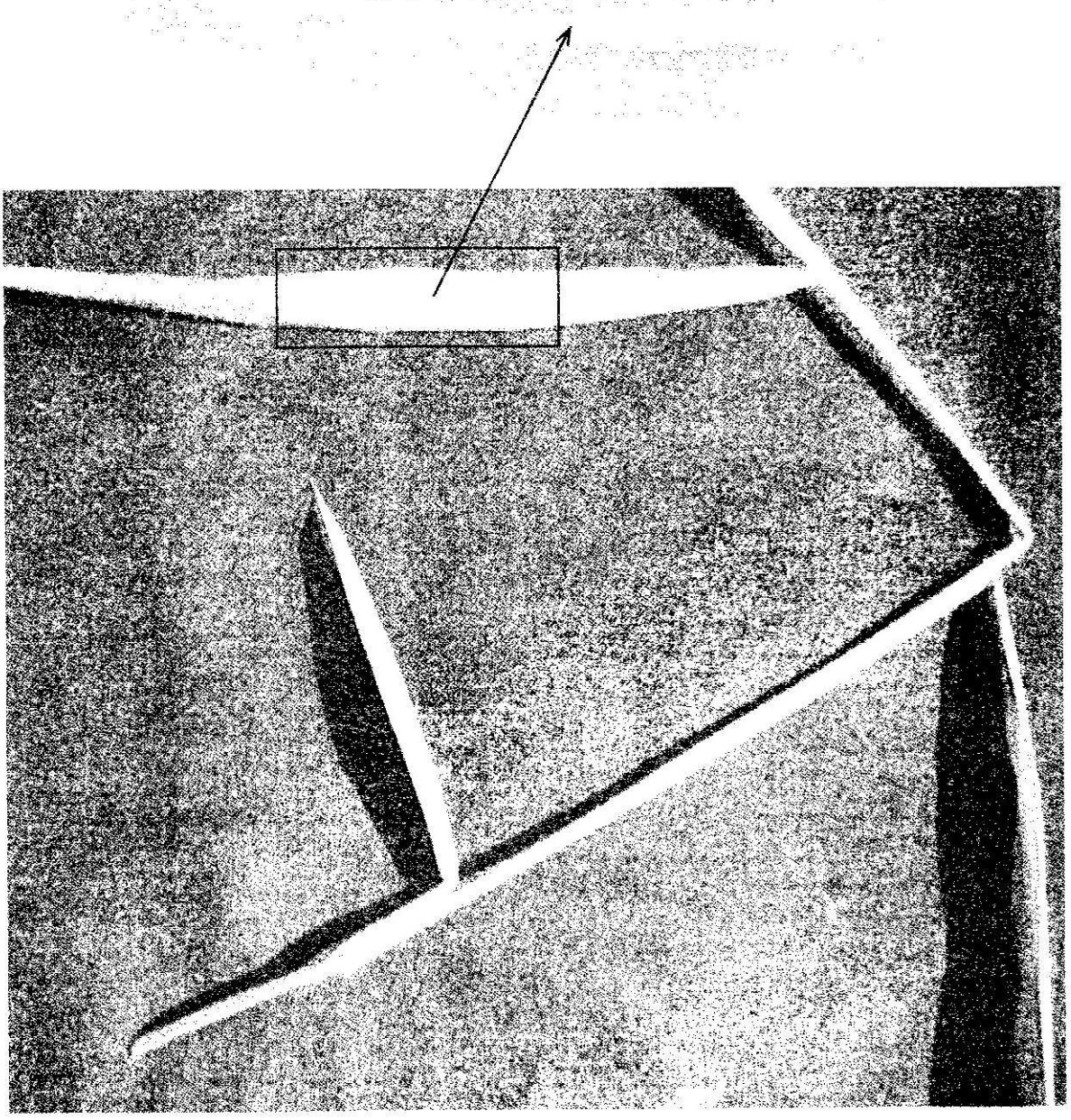
(Total = 16 marks)

Question 2

The photographs labelled D and E show two types of leaves.



PHOTOGRAPH D

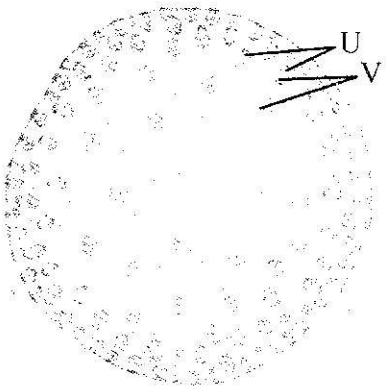


PHOTOGRAPH E

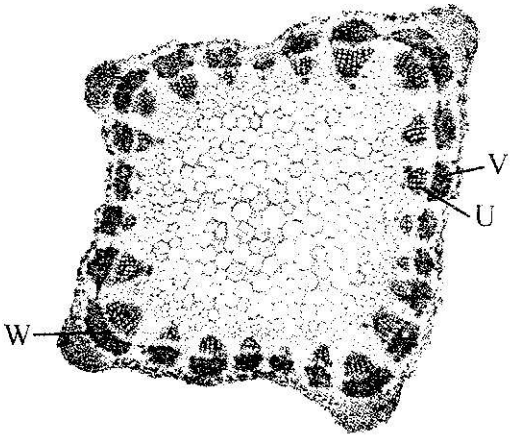
(a) With a reason, state the classes of plants from which the leaves in Photographs D and E were obtained. (4 marks)

(b) State **three** features in the leaf shown in photograph D that adapt it to its functions. (3 marks)

(c) The photographs below show the structures observed in cross sections of parts of two types of plants as seen under a light microscope.



PHOTOGRAPH F



PHOTOGRAPH G

(i) Name the parts labelled U, V and W. (3 marks)

(ii) Identify **five** differences between cross sections F and G and record them in the table below. (5 marks)

Weaknesses

- Wrong spelling of technical terms
- Use common English words instead of scientific names e.g. Dicotyledonous instead of Dicotyledonae
- Inability to interpret the word adaptation
- Incorrect tallying of differences

Expected response

(a) Leaf D - class dicotyledonae;
Reason - network of veins/presence of petiole;

Leaf E - class monocotyledonae;
Reason - parallel venation/presence of leaf sheath;

(4 marks)

(b) Broad and flat to offer a large surface area for photosynthesis;
Thin to reduce distance over which carbon IV oxide diffuses to reach the mesophyll cells;
Rich supply of veins to transport water to photosynthetic cells;
Presence of chlorophyll to absorb light for photosynthesis; (first 3 = 3 marks)

(c) (i) U - xylem;
V - phloem;
W - cambium;

(3 marks)

(ii)

	Cross section of F	**Cross section of G**
i	No pith	pith present;
ii	Vascular bundles scattered	vascular bundles in a ring;
iii	Vascular bundles numerous	vascular bundles few;
iv	Cambium absent	cambium present;
v	Cortex absent	cortex present;
vi	Small vascular bundles	large vascular bundles;
	(First 5)	

(5 marks)

(Total = 15 marks)

Question 3

You are provided with a sample of food labelled **X** in solution form, solution **J** (Iodine solution), solution **K** (Benedict's solution) and solution **L** (Biuret's reagent). Carry out tests on the food sample to identify the type of food substances present. (9 marks)

Food being tested for	Procedure	Observations	Conclusion

Weaknesses

- Use of wrong units in the measurement of volumes and percentages
- Wrong sequence of colour changes
- Unexpected wrong observations from procedures
-

Expected response

PROCEDURE	OBSERVATION	CONCLUSION
Iodine solution/solution J (added to the food sample drop by drop while shaking;)	Blue black colour formed;	Starch present in food sample;
Benedict's solution/solution K added to the food sample in test tube in equal amounts. The test tube is then placed in a hot water bath;	Solution changes colour to green, yellow and then orange/brown;	More reducing sugar present in food sample;
Biuret's reagent/solution L added to the food sample drop by drop while shaking;	Colour of reagent retained;	Protein absent in the food sample;

Award marks for correct procedure, observation and conclusion only. (9 marks)

Advice to Teachers

Questions involving experimental procedures were poorly performed by candidates. This could be a likely indication that the candidates were not or were inadequately exposed and involved in practical aspects of the syllabus. Candidates appeared to have the knowledge of facts but were inadequate in answering performance based questions.

Teachers should cover the syllabus adequately to enable students to have a clear grasp of the content. All the suggested activities should be covered practically for the candidates to internalize the scientific concepts behind them.

The technical words used in biology should be fully embraced and candidates adequately exposed to their use in their scientific communication. Use of correct biological terms with correct spelling should be emphasized during teaching.

The correct way of drawing and labeling of diagrams should be given emphasis during teaching-learning process. Biology cannot be taught without using diagrams. Techniques of answering questions on adaptations should be taught. Candidates should clearly relate the structure to the function in order to score.