



6.0 BIOLOGY (231)

This was the second time the Biology examination was offered under the revised KCSE examination curriculum.

6.1 CANDIDATES' GENERAL PERFORMANCE

The performance of the candidates in the three Biology papers is given in the table below. The performance of candidates in the year 2006 is also given for comparison.

Table 9: Candidates' Overall Performance in Biology 2006 and 2007

Year	Paper	Candidature	Maximum Score	Mean Score	Standard Deviation
2006	1		80	19.83	13.35
	2		80	23.2	13.06
	3		40	11.63	7.00
	Overall	217,675	200	54.89	31.00
2007	1		80	27.10	13.68
	2		80	35.01	14.63
	3		40	21.81	8.73
	Overall	248,519	200	83.90	33.00

From the table above, it can be observed that:

6.1.1 The candidature increased by over *30,000* candidates in the year 2007 from *217,675* candidates in the year 2006 to *248,519* in the year 2007.

6.1.2 The performance in the year 2007 was better than in the year 2006 with better mean scores and standard deviations in all the three papers.

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

6.2 PAPER 1 (231/1)

Question 1

- What is meant by the term binomial nomenclature?
- Give two reasons why classification is important.

The candidates were required to know the meaning of binomial nomenclature and give reasons why classification is important.

Weaknesses

Most candidates used the expression "*double naming*" with no mention of generic and species names. Importance of classification was not very clear and some candidates gave more than two reasons.

Expected Responses

- (a) A Scientific system of naming organisms using the generic and specific species names.
- (b)
- Placing/grouping of living organisms into correct groups/taxa/identification.
 - Arrange information about living organisms into orderly and sequential manner.
 - Easy to study organisms according to groups.
 - Helps in the understanding of evolutionary relationships.
 - Monitoring the disappearance and appearance of organisms/predict the characteristics of organisms.

Question 3

Plant cells do not burst when immersed in distilled water. Explain.

Candidates had to explain why cell wall in plants prevents the cell from bursting when in a hypotonic solution, in this case, distilled water.

Weaknesses

Candidates confused the roles of turgor pressure and wall pressure. Cell wall and its rigidity were not brought out clearly. Candidates confused the terms "*cell wall*" and "*cell membrane*" in their responses.

Expected Responses

Presence of cell wall; which is rigid/doesn't stretch/ tough.

Question 5

Distinguish between diffusion and osmosis.

Knowledge about diffusion and osmosis was required in order to distinguish between the two terms.

Weaknesses

In defining osmosis, the aspect of concentration of solutions was not clear. The candidates did not understand the difference between "*osmotic pressure*" and "*osmotic potential*".

Expected Responses

- *Diffusion*: - Movement of substances from a region of high concentration to a region of low concentration (until equilibrium is reached).
- *Osmosis*: - Movement of water or solvent molecules from a dilute/ hypotonic solution to a more concentrated / hypertonic solution across a semi-permeable membrane.

Question 6

Describe what happens during the light stage of photosynthesis.

A description of the events that take place during the light stage of photosynthesis was required.

Weaknesses

Candidates did not know the products that would arise after splitting water molecules. They referred to water molecules as atoms. Hydrogen should have been referred to as "*hydrogen ions*" and not just "*hydrogen*" or "*hydrogen gas*".

Expected Responses

Light (energy) is absorbed by chlorophyll. The light splits the water molecule to form Hydrogen atom/ions and Oxygen gas. Light is converted to form Adenosine Triphosphate (ATP).

Question 8

- (a) Name a fat soluble vitamin manufactured by the human body.
- (b) State two functions of potassium ions in the human body.

Candidates were required to specifically have knowledge of vitamins that are fat soluble and manufactured in the body and functions of potassium ions in the human body.

Weaknesses

Candidates listed all the vitamins and hence lost marks. The concepts of fat solubility and manufacture in the body were important in assisting candidates to eliminate vitamins that are not fat soluble and those that are not manufactured in the body.

Expected Responses

- (a) Vitamin D/Calciferol;
- (b)
 - Nerve impulse conduction.
 - Muscle contraction.
 - Helps maintain osmotic/anion – cation balance in cells.
 - Assists in active transport, needed in protein synthesis.

Question 9

State two ways in which the root hairs are adapted to their function.

A question that tested adaptation of root hairs, where the structure had to be related to function.

Weaknesses

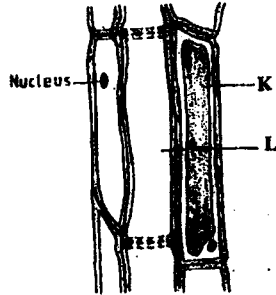
Candidates gave wrong responses because the functions were not linked to structures.

Expected Responses

- The root hairs are long/narrow/many (numerous) to increase the surface area for absorption of water/mineral salts.
- Many mitochondria (in cytoplasm) to supply energy for active transport of mineral salts; /thin walls to speed rate of absorption of water/mineral salts.

Question 10

The diagram below represents a plant tissue.



- Name the tissue.
- Name the cells labelled K and L.
- What is the function of the companion cell?

The structure and function of phloem had to be known by the candidates in order for them to be able to label the parts of the plant tissue and state the functions of the structures found in phloem.

Weaknesses

Most candidates labeled K as a companion cell, while others confused “*sieve tube*” for “*the companion cell*”. The functions of the companion cell were not brought out clearly by candidates.

Expected Responses

- Phloem.
- | | | |
|---|---|---------------------------------------|
| K | - | Phloem / parenchyma cell. |
| L | - | Sieve tube element/sieve tube (cell). |
- Supply of nutrients to sieve tube element for translocation.
 - Regulates the activities of the sieve tube cell / sieve element.

Question 13

- Name the products of anaerobic respiration in
 - plants
 - animals.

(b) What is oxygen debt?

Candidates were required to name products of anaerobic respiration in plants and animals and define the term oxygen debt.

Weaknesses

Candidates used the term "*carbon dioxide*" instead of "*carbon (iv) oxide*" as required by the syllabus. It was evident from the candidates' responses that the concept of oxygen debt was not well understood by most candidates.

Expected Responses

- (a) (i) Ethanol/Ethyl alcohol, Carbon (iv) oxide, Energy (210KJ).
(ii) Lactic Acid, Energy.
- (b) The amount of oxygen required to convert accumulated lactic acid to water, carbon dioxide and energy.

Question 14

- (a) What is the meaning of the following terms:
- (i) homeostasis
(ii) osmoregulation?
- (b) Name the hormones involved in regulating glucose level in blood.

Clear understanding of homeostasis and osmoregulation was required in order to give the meaning of the terms.

Weaknesses

In their explanation, candidates could not differentiate between the two terms, while others brought in "*thermoregulation*" which was not clearly explained either.

Expected Responses

- a) (i) **Homeostasis**: maintenance of a constant internal environment.
(ii) **Osmoregulation**: mechanisms which regulate osmotic pressure of internal environment of an organism/regulation of water and solutes/salt balance of the internal environment of an organism in the body.
- (b)
- Insulin.
 - Glucagon.

Question 16

State two ways in which schistosoma species is adapted to parasitic mode of life.

The life history of schistosoma species and its adaptive features that are of importance to its survival was important information to arrive at the correct responses.

Weaknesses

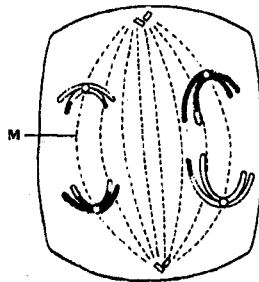
Candidates gave general responses and majority omitted the intermediate stages in the life history, that is, egg to larvac. The adaptive features of each stage of development were not clearly stated. Most candidates seemed not to know that each stage of development of schistosoma has its own special adaptation.

Expected Responses

- The eggs have a hook-like structure which raptures walls of intestines or bladder.
- It lays a large number of eggs to ensure survival.
- The larva has a sucker for attachment on human skin which it digests.
- Larva has a tail for swimming in search of a host in water.
- It has a prolonged association between male and female to ensure that fertilization takes place.
- It (adult) tolerates low oxygen.
- (Adult) secretes chemicals against antibodies of host.
- Larva/egg secretes lytic enzymes which soften tissue for ease of penetration.
- It has two hosts to increase chances of survival.
- Larva encysted to survive adverse conditions.

Question 17

The diagram below represents a stage during cell division.



- (a) (i) Identify the stage of cell division.
(ii) Give **three** reasons for your answer in (a) (i) above.
- (b) Name the structures labelled M.

Knowledge of cell division and the various stages involved in the process was required in order to identify the stage of cell division and give reasons for the response.

Weaknesses

Some candidates did not know the acceptable conventional way of writing correct responses, thus wrote "*anaphase one*" instead of "*anaphase I*". Others wrote "*first stage anaphase*" which is not acceptable.

Expected Responses

- (a) (i) Anaphase I.

- (ii)
- Centromere of bivalent pair not split.
 - Homologous chromosomes separate; are moving towards poles of the cell.
- (b) Spindle fibre(s)

Question 18

State two disadvantages of sexual reproduction in animals.

Knowledge about reproduction in animals and specifically sexual reproduction was required.

Weaknesses

Some candidates confused sexual reproduction with pregnancy. Majority failed to state that sexual reproduction involves separate sexes, that is, female and male individuals.

Expected Responses

- Offspring can inherit undesirable characteristics from parents;
- Sexual reproduction takes a long time.
- Fewer offspring are produced.
- Involves two different sexes (which must mate).

Question 19

- (a) State two environmental conditions that can cause seed dormancy.
- (b) Name the part of a bean seed that elongates to bring about epigeal germination.

Knowledge about environmental conditions that cause seed dormancy was necessary to correctly respond to this question.

Weaknesses

Most candidates did not quantify their answers thus never stated the factors that caused dormancy, for example: temperature alone was not enough; it had to be qualified hence low temperature.

Expected Responses

- (a) Low temperature, light (O₂), and water/water moisture.
- (b) Hypocotyl.

Question 20

- (a) What is meant by the term allele?
- (b) Explain how the following occur during gene mutation:
- (i) deletion
 - (ii) inversion.
- (c) What is a test-cross?

This question tested candidates' knowledge and understanding of genetics.

Weaknesses

Candidates failed to identify bases as components of genes hence could not explain how deletion and inversion occur in genes. Others confused between chromosomal and gene mutations.

Expected Responses

- (a) Allele refers to alternative forms of a gene; one of two or more alternative states of a gene.
- (b)
 - (i) **Deletion:** Some bases/nucleotides of a gene reversed.
 - (ii) **Inversion:** The order of some bases/nucleotides of a gene reversed.
- (c) A cross made between a homozygous recessive parent and a parent of unknown genotype (to determine whether the unknown type is homozygous or heterozygous for a dominant gene).

Question 21

- (a) What is adaptive radiation?
- (b) Give a reason why organisms become resistant to drugs.

In this question, candidates' knowledge and understanding of evolution was tested.

Weaknesses

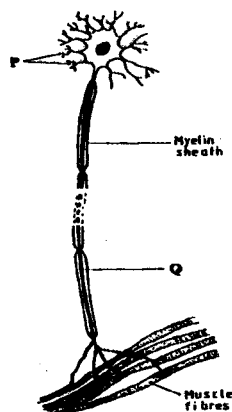
Most candidates did not understand what "**mutation**" means with some describing mutation as process of or as a result of getting used to drugs. "**Adaptive radiation**" was confused with "**divergent evolution**".

Expected Responses

- (a) A situation where organisms have a homologous structure; which is modified to perform different functions; so as to adapt to different ecological niches/habitat.
- (b) The organisms mutate.

Question 22

- (a) Where in the human body are relay neurones found?
- (b) The diagram below represents a neurone.



- (i) Name the neurone.
- (ii) Name the parts labelled P and Q.
- (c) State a function of myelin sheath.

Knowledge about the Central Nervous System and its parts was required for candidates to respond to this question.

Weaknesses

Some candidates gave wrong spelling of “motor” as “motar” and “dendrites” as “tendril” which have different meaning. Most failed to differentiate between “Central Nervous System” and “Central Nerve System”.

Expected Responses

- (a) Brain/Spinal cord/Central nervous system.
- (b)
 - (i) Motor.
 - (ii) P: Dendrites.
Q: Axon/Axoplasm
- (c) Insulates the axon/enhances transmission of nerve impulses.

Question 25

- (a) The action of ptyalin stops at the stomach. Explain.
- (b) State a factor that denatures enzymes.
- (c) Name the features that increase the surface area of small intestines.

Enzyme, enzymatic activity and the factors that affect enzymatic activity were tested in this question.

Weaknesses

Most candidates gave wrong biological facts, for example. “Dilute hydrochloric acid in the stomach neutralizes enzyme ptyalin from the mouth thus stopping its function/action”. Most candidates thought enzymes have pH values in them instead of pH value of the medium in which they function.

Expected Responses

- (a) Acidic medium due to presence of Hcl (hydrochloric acid).
- (b) High temperature.
- (c) Increased length, presence of villi.

Question 26

State one way by which HIV/AIDS is transmitted from mother to child.

To respond to this question, knowledge about HIV/AIDS and modes of transmission was required.

Weaknesses

Candidates failed to state clearly how HIV/AIDS is transmitted from mother to child. Poor expressions, for example: "*child feeding on mothers' breast*" were common.

Expected Responses

- Time of birth.
- Breast feeding.

6.3 PAPER 2 (231/2)

Question 2

- (a) Explain what happens to excess amino acids in the liver of humans.
- (b) Which portions of the human nephron are only found in the cortex?
- (c)
 - (i) What would happen if a person produced less antidiuretic hormone?
 - (ii) What term is given to the condition described in (c)(i) above?

Candidates were required to know how deamination occurs, the role of ADH in osmoregulation and various parts of the human nephron found in the cortex.

Weaknesses

The chemistry of breakdown of excess amino acids was not known to many candidates. Candidates could not distinguish between "*condition*", "*disease*" or "*disorder*" in part (c) (ii) of the question.

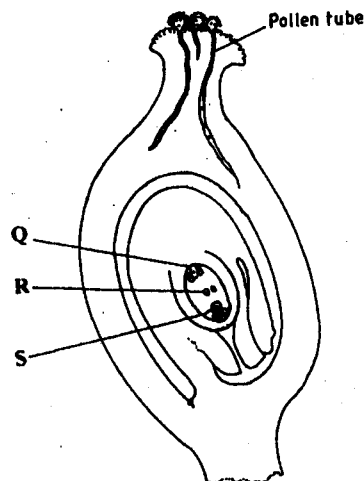
Expected Responses

- (a) Excess amino acids are deaminated/amino group is removed; amino group is converted to ammonia; ammonia combines with carbon dioxide (in ornithine cycle) to form urea. The carbohydrate group is converted to glucose for respiration/glycogen for storage.
- (b)
 - Glomerulus; Bowman's capsule;
 - Proximal convoluted tubule; distal convoluted tubule.
- (c)
 - (i) Production of copious urine/large amounts of dilute urine.
 - (ii) Diabetes insipidus

Question 3

- (a) What is meant by the following terms:
 - (i) protandry
 - (ii) self sterility?

(b) The diagram below shows a stage during fertilization in a plant.



- (i) Name the parts labelled Q, R and S.
(ii) State two functions of the pollen tube.

(c) On the diagram, label the micropyle.

In this question, candidates were required to have knowledge of the meaning of protandry and self sterility. Candidates were also required to label various structures in the carpel, label the micropyle and also state the functions of the pollen tube.

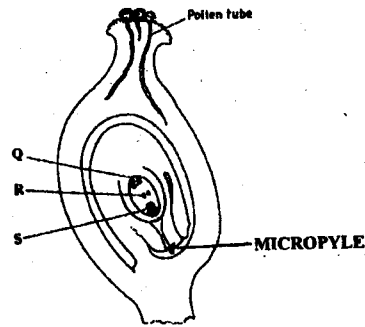
Weaknesses

Candidates did not know the parts of the cross-section of the pistil.

Expected Responses

- (a) (i) **Protandry**: a condition in which the male parts/anthers/stamens of a flower mature before the carpel/ stigma/pistil/female parts.
(ii) **Self-sterility**: Pollen grains from anthers of a flower are sterile/ fail to germinate on the stigma of the same flower/ flower on the same plant.
- (b) (i) Q - Antipodal cell.
R - Polar nucleus/ Polar nuclei.
S - Ovum.
- (ii)
- Secretes enzymes that digest the stigma/style/ovary tissue.
 - Offer passage for male nuclei to ovum and polar nuclei/embryosac.

(c)



Question 4

(a) Name the three types of muscles found in mammals and give an example of where each one of them is found.

Type of muscle	Where found
(i)
(ii)
(iii)

(b) State the difference between ball and socket and hinge joint.

(c) State the functions of synovial fluid.

(d) State two advantages of having an exoskeleton.

Candidates were expected to know the types of muscles, joints, advantages of exoskeleton and functions of synovial fluid.

Weaknesses

Candidates gave parts of the body where muscles are found, for example: - arm, leg or even specific muscles. The difference between "protect" and "prevent" is not known to many candidates.

Expected Responses

- (a)
- | Type of Muscle | Where found |
|--|--------------------------------|
| (i) Skeletal/striated/stripped muscles | On bones |
| (ii) Smooth muscles | Alimentary canal/blood vessels |
| (iii) Cardiac muscles | In the heart |
- (b) Ball and socket joint allows movement in all planes (360°) while Hinge joint allows movement in one plane (180°)
- (c)
- Shock absorber/Distributes pressure/ cushions.
 - Lubricates joints/reducing friction.
 - Supply nourishment to the cartilage.

- (d)
- Supports/protects the delicate inner parts.
 - Waterproof/prevents drying up of the body.
 - Provides a surface/space for muscle attachment.

Question 5

In maize the gene for purple colour is dominant to the gene for white colour.
A pure breeding maize plant with purple grains was crossed with a heterozygous plant.

- (a) (i) Using letter G to represent the gene for purple colour, work out the genotypic ratio of the offspring.
(ii) State the phenotype of the offspring.
- (b) What is genetic engineering?
- (c) What is meant by hybrid vigour?

A genetics question that required candidates to have knowledge on dominance in monohybrid inheritance, working out of genotypic ratios and stating of the phenotypes. In the second part of the question, candidates were required to define genetic engineering and hybrid vigour.

Weaknesses

Some candidates did not use the given letter G. Others confused “genotypes” and “phenotype”. Many candidates did not simplify the ratio, while others could not define *genetic engineering* and *hybrid vigour* correctly.

Expected Responses

- (a) (i) Parental phenotypes purple grains x purple grains.

Genotypes- GG × Gg;

Gametes	G	G
G	GG	Gg
g	Gg	gg

Genotypic ratio 2GG : 2Gg
1 : 1

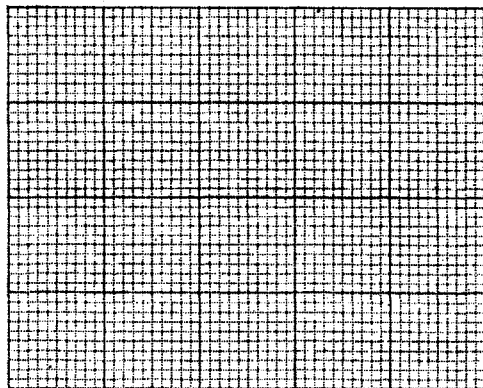
- (ii) All offspring have purple grains;
- (b) Genetic manipulation to produce desired characteristics.
- (c) A situation where offsprings show characteristics which are superior to either of the parental stocks.

Question 6

In an experiment to determine the effect of ringing on the concentration of sugar in phloem, a ring of bark from the stem of a tree was cut and removed. The amount of sugar in grammes per 16cm³ piece of bark above the ring was measured over a 24 hour period. Sugar was also measured in the bark of a similar stem of a tree which was not ringed. The results are shown in the table below.

Time of the day	Amount of sugar in grammes per 16 cm ³ piece of bark	
	Normal stem	Ringed stem
06 45	0.78	0.78
09 45	0.80	0.91
12 45	0.81	1.01
15 45	0.80	1.04
18 45	0.77	1.00
21 45	0.73	0.95
00 45	0.65	0.88

- (a) Using the same axes, plot a graph of the amount of sugar against time.



- (b) At what time was the amount of sugar highest in the
- ringed stem
 - normal stem?
- (c) How much sugar would be in the ringed stem if it was measured at 03:45 hours?
- (d) Give reasons why there was sugar in the stems of both trees at 06 45 hours.
- (e) Account for the shape of the graph for the tree with ringed stem between:
- 06 45 hours and 15 45 hours
 - 15 45 hours and 00 45 hours.
- (f) Name the structures in phloem that are involved in the translocation of sugars.
- (g) Other than sugars name two compounds that are translocated in phloem.

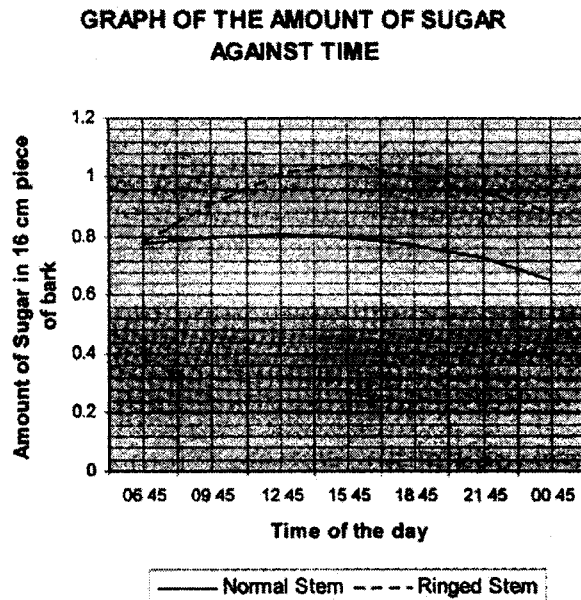
Candidates were to draw a graph, take a reading and interpret. Knowledge of structure of phloem tissue and materials translocated was required.

Weaknesses

Candidates did not understand the 24 hour cycle. The small units on the vertical axis confused some candidates and accounting for the shape of the graph was difficult.

Expected Responses

(a)



- (b) (i) 15 45hrs; 3.45pm.
(ii) 12.45hrs; 12.45pm.
- (c)
- 0.80 grammes/16cm³
 - 0.81 grammes.
- (d)
- Stored sugar.
 - Photosynthesis had started taking place.
- (e)
- (i) 06.45hrs to 15.45 hrs: Fast/high/rapid increase in sugar level; due to photosynthesis; and accumulation of sugar (above the ring).
- (ii) 15.45 hrs to 00.45hrs: Decrease in sugar level; due to respiration/ slowed down rate of photosynthesis.
- (f) Sieve tube elements/ Sieve elements/Sieve tubes; cytoplasm study /filaments/Protein fibres/filaments.
- (g)
- Amino acids.
 - Hormones.

- Oils/lipids.
- Resins.
- Vitamins.

Question 7

Describe the structure and functions of the various parts of the human ear.

Knowledge of parts and functions of the ear was required to respond to this question.

Weaknesses

Candidates could not differentiate between “waves”, “vibrations” or “impulses”. Some candidates confused between “oval” and “round windows”. Many candidates drew a diagram which was incorrect and irrelevant.

Expected Responses

The outer ear/pinna collects/channels sound waves (down the) auditory canal/meatus. The auditory canal concentrates /directs sound waves to the tympanic membrane/tympanum/ear drum which sets into vibration/vibrates/converts sound waves into vibrations. The vibrations are transmitted to the ear ossicles malleus incus and stapes that amplify the sound vibrations. The vibrations are then transmitted to the oval window which amplifies vibrations/transmits to the fluids in the cochlea. The sensory hairs/cells are set into Endolymph and Perilymph producing nerve impulses in the auditory nerve which transmit nerve impulses (by the auditory nerve) to the brain (for interpretation); for hearing.

In the inner ear are semi-circular canals/utricle/sacculus/vestibular apparatus which become stimulated due to movement of the fluids/endolymph in them generating sensory impulses. The auditory nerve transmits impulses to the brain (for interpretation); of the position/positive balance of the body. The Eustachian tube connects the middle ear to the back of the throat and equalizes the air pressure in the middle ear with the atmospheric air pressure.

Question 8

Describe causes and methods of controlling water pollution.

In this question, candidates were expected to have knowledge on pollutants, causes of water pollution and methods of controlling it.

Weaknesses

Some candidates talked about “air pollution” and “soil pollution”. Candidates also described effects of pollution which were not required, while others could not differentiate between pollution of air, water, soil and the effects as well as control of each.

Expected Responses

- **Domestic effluents/ sewage/faeces/urine:** nitrogenous wastes, garbage, detergents pollute water. Pollution caused by domestic effluents may be controlled by treating domestic waste/using biotechnology, banning the use of phosphate – based detergents, using plastic pipes instead of those made from lead and recycling of garbage.
- **Industrial Wastes/ radioactive wastes:** heavy metals in industrial wastes include lead/zinc/copper chromium/mercury/ hot water/ hot effluents which pollute water. Pollution caused by industrial

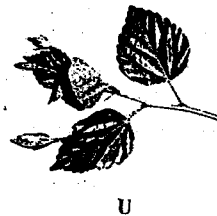
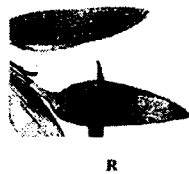
wastes may be controlled by treating/ cooling industrial wastes/ carrying out environmental impact assessment before establishment of industries.

- **Spillage of oils:** oil spillage may be controlled by cleaning spilled oil/biotechnology and penalizing the companies /industries/individuals which cause oils spills/water pollution.
- **Agro chemical:** these include inorganic fertilizers; herbicides/insecticides/pesticides/fungicides. Pollution caused by agrochemicals may be controlled by using mechanical/biological control of weeds/pests, biodegradable organic fertilizers/herbicides/insecticides/pesticides; organic farming/educating farmers on use of correct amounts of agrochemicals;
- **Silting:** soil erosion contributes to silting and may be controlled by appropriate farming practices/contour farming/reafforestation/building gabions/terracing.

6.4 PAPER 3 (231/3)

Question 1

Below are photographs labelled P, Q, R, S, T, U and V of twigs obtained from plants. Examine them.



(a) Using observable features in the photographs, complete the dichotomous key given below.

- | | |
|-----------------------------------|---------------|
| 1 a Simple leaves | go to 2 |
| b Compound leaves | go to 5 |
| 2 a Leaves net-veined | go to 3 |
| b Leaves parallel-veined | Commelinaceae |
| 3 a | go to 4 |
| b Leaves with smooth margin | Nyctaginaceae |
| 4 a Leaves alternate | Malvaceae |
| b | Verbenaceae |
| 5 a | go to 6 |
| b Leaves bipinnate | Bignoniaceae |
| 6 a Leaflets with serrated margin | Compositae |
| b Leaflets with smooth margin | Papilionaceae |

(b) Use the completed dichotomous key to identify the family to which each plant belongs. In each case show the steps you followed to arrive at the identity.

	Identity	Steps followed
P
Q
R
S
T
U
V

Candidates were required to identify and use observable features in the construction and use of a dichotomous key.

Weaknesses

Candidates used negative statements, spelling errors were common especially of technical terms, were unable to follow instructions and used non-conventional ways of writing the steps followed.

Expected Responses

(a)

- 3 (a) Leaves with serrated margin/toothed/saw like/teeth like.
- 4(b) Leaves opposite.
- 5(a) Leaves pinnate.

(b)	Specimen	Identity	Steps followed
	P	Compositae;	1b,5a,6a
	Q	Nyctaginaceae;	1a,2a,3b
	R	Commelinaceae;	1a,2b
	S	Bignoniaceae;	1b,5b
	T	Papilionaceae;	1b,5a,6b
	U	Malvaceae;	1a,2a,3a,4a
	V	Verbenaceae;	1a,2a,3a,4b

Question 2

You are provided with solutions labelled **P**, **Q**, **S** and a filter paper. The solution labelled **P** will be used in parts (a), (b) and (c).
Solution **Q** is iodine solution.

- (a) Use the iodine solution to test for the presence of the food substance in solution **P**.

Food substance

Procedure

Observation

Conclusion

Solution **S** is Benedict's solution.

- (b) Use the Benedict's solution to test for the presence of the food substance in solution **P**.

Food substance

Procedure

Observation

Conclusion

- (c) Using the filter paper provided, test for the presence of lipids in solution **P**.

Procedure

Observation

Conclusion

The requirement in this question was the ability to carry out food tests by relating the given reagents to the food substances, recording correct procedure, making correct observations and arriving at conclusions from positive and negative results.

Weaknesses

Some candidates referred to food substance as "*test for starch*", "*test for reducing sugar*" etc. There was apparent inability to relate test reagents to foods to be tested, for example: - Benedict's solution for testing protein. There was incorrect identification of colours and the sequence of colour changes. In their responses, candidates showed poor knowledge of testing lipids.

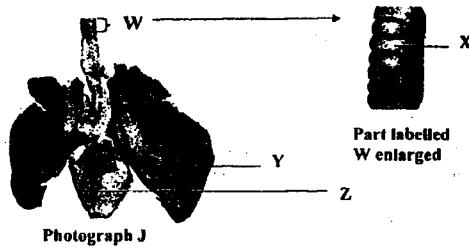
Expected Responses

- (a) **Food substance:** Starch.
Procedure: Add (2) drops of iodine to solution **P**.
Observation: Bluish black/Blue/black.
Conclusion: Starch present.

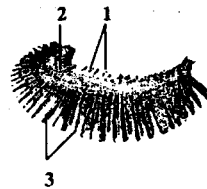
- (b) **Food substance:** Reducing sugar.
Procedure: To (1 ml) of solution P, add equal amount of Benedict's solution/S. Warm/heat/boil the mixture.
Observation: Green to yellow to orange/ brown;
Conclusion: Reducing sugar present
- (c) **Procedure:** Place a drop of solution P onto a filter paper. Gently dry over flame.
Observation: No permanent translucent spot/mark
Conclusion: Lipids absent.

Question 3

Below are photographs labelled J and K of organs obtained from different animals. The organs perform similar functions. Examine them.



Photograph J



Photograph K

- (a) Identify the organs.
J
- K**
- (b) State the function performed by the organs.
- (c) Name the parts labelled X, Y and Z in photograph J.
- (d) (i) Identify the parts labelled 1, 2 and 3 in photograph K.
(ii) Using observable features, state how the parts labelled 1 and 3 you identified in (d) (i) above are adapted to their functions.

Candidates had to identify some organs of respiration from photographs, make observations and relate the structures to their functions.

Weaknesses

Candidates' responses had numerous spelling mistakes, for example: "*filament*" spelt as "*fillament*". There was misunderstanding of concepts such as "*breathing*", "*respiration*" and "*gaseous exchange*" because they were used interchangeably. Some candidates reproduced information learned in the class situation instead of relying on observations made from the photographs as required.

Expected Responses

- (a) J - Lungs
K - Gills.
- (b) Gaseous exchange /external respiration.
- (c)
- X - Ring of cartilage.
 - Y - Lung.
 - Z - Heart.
- (d) (i) 1: Gill rakers.
2: Gill arch/bar.
3: Gill filaments.
- (ii)
- Rakelike/projections for trapping solid particles.
 - Rakelike/pointed/tooth like/needle like projections for trapping/sieving/filtering solid particles form reaching and damaging the filaments.
 - Many/numerous/long/filaments to increase surface area for gaseous exchange.

6.5 ADVICE TO TEACHERS

- 6.5.1 Teachers should emphasize more on the need for candidates to follow the instructions given in the questions. Candidates are expected to give the number of responses required by the question and not more or less.
- 6.5.2 Teachers should advise students to answer questions as required; if an observation from a diagram is required they should respond according to what they see on the diagram.
- 6.5.3 Testing Biology in three papers means that questions will come from nearly all the topics in the syllabus and as a result all the topics should be covered adequately during teaching.
- 6.5.4 Spelling errors were common in candidates' responses especially of biological terms and this has to be avoided to reduce loss of marks.
- 6.5.5 Teachers should teach candidates the correct and conventional way of writing particular aspects in Biology, for example: "*Anaphase I*" and not "*Anaphase one*" or "*first stage of anaphase*".
- 6.5.6 Students should be trained to read questions properly and comprehend them before attempting them.
- 6.5.7 Topics such as "*Support in plants and animals*" should be taught using a practical approach and students should be exposed to structures and illustrations on their adaptive features.
- 6.5.8 There is need for teachers to emphasize on use of acceptable/correct scientific terms. Use of correct examples as teachers teach will reinforce concepts.
- 6.5.9 Difficult concepts such as "*genetic engineering*" and "*hybrid vigour*" can be learned easily by taking students to research centers.
- 6.5.10 Teachers should familiarize students on the use of the twenty- four (24) hour clock.
- 6.5.11 Students should be exposed to more practice in construction and use of the dichotomous key. Teachers should help the students to identify errors in text books that they use. Students should also be encouraged to use standard recommended text books.