BIOLOGY 2

1. GENERAL COMMENTS

The standard of the paper compared favourably with that of previous years. The questions set were within the syllabus. Generally, candidates performed satisfactorily.

2. SUMMARY OF CANDIDATES' STRENGTHS

The Chief Examiner reported that there was an improvement in the expressions of candidates. Many candidates could correctly provide satisfactory responses to questions demanding action words like list, name, state and explain briefly.
Candidates complied with the paper instructions which required that, they should answer two questions only from Section A and all questions in Section B.
Most of the candidates exhibited satisfactory knowledge in the following questions:

- Components of the stoma of a plant and mechanism of opening of stomata in plants
- Explaining the term nutrition
- Mode of nutrition in the Fern, Plasmodium, Tapeworm, Toad, Rhizopus, Chlamydomonas and Hibiscus respectively
- Explaining the term humidity and listing the abiotic factors that affected humidity
- Determining rhesus factor of offspring from a genetic cross
- Type of muscles in mammals
- Type of root modifications in plants found in swampy areas
- Ways in which additives are important in food substances
- Harmful effects of additives

3. SUMMARY OF CANDIDATES' WEAKNESSES

The Chief Examiner noted generally that, candidates showed weakness in linking structural features with their correct functions
Most candidates could not make satisfactory biological drawings.
Technical words and labels of parts of biological drawings were wrongly spelt
Candidates had challenges in answering questions from the following areas:

- Explaining briefly, the reason why the cell is considered a fundamental unit of life.
- The process of endocytosis and function of endocytosis in organisms
- Role of pheromones in insects and its application in biological control of pests
- Ways by which the feeding habit of Paramecium is (i) similar to and (ii) different from that of humans.
- Explaining how food swallowed by a patient lying flat on a hospital bed reaches the stomach of the patient
- Effects of temperature, rainfall, light intensity and pH on Spirogyra in its habitat
- Explaining the process of natural selection in a population.
- Naming the causative organism of cholera, measles and malaria
- Distinguishing between antibodies and antigens.
- Listing mineral salts found in soil.

4. SUGGESTED REMEDIES

The Chief Examiner made the following suggestions meant to remedy the weaknesses of candidates:

- Teachers should ensure that candidates work sufficient tutorials and assignments on how to provide concise and accurate answers
- Teachers should make effort to adequately cover the topics in the syllabus
- Candidates should read and understand examination question demands before attempting them

5. DETAILED COMMENTS

Question 1

(a) Explain briefly the reason why a cell is considered a functional unit of life.
(b) Outline the process of endocytosis.
(c) State two functions of endocytosis.
(d) Explain briefly the role of pheromones in insects.
(e) State two applications of pheromones in biological pest control.
(f) (i) Name the two components of the stoma of a plant.
(ii) Explain briefly the mechanism of opening of the stomata in plants.

Few candidates attempted this question. The performance of candidates was very poor.
The expected answers were;

1. (a) Reason cell is considered a functional unit of life
The cell is considered a functional unit of life because:
- all living organisms are made up of cells;
- all functions taking place in the body of an organism are performed by cells;
- cells come in discrete recognisable packages / forms;
- a cell can independently replicate itself;
- a cell is capable of all life activities.

(b) Process of endocytosis in a cell
- cell membrane folds in / over a substance;
- portion of cell membrane encircles extracellular fluid/fluid is drawn into the infolding/various molecules / organisms / nutrients / pathogens;
- the pockets of the infolding break off;
- form a vesicle in the cytoplasm.

(c) Functions of endocytosis in organisms
- absorbing nutrients for cellular function/unicellular feeding;
- engulfing pathogens;
- engulfing old / damaged cells /red blood cells;
- disposing of old / damaged cells / part of cell.

(d) Role of Pheromones in insects

Pheromones are chemicals secreted by insects to:

- communicate with each other;
- attract mates;
- warn other members of the presence of predators;
- trace / find food sources;
- promote social cohesion / coordination / recognition in the colonies;
- ward off invaders / secure territory.

(e) Application of Pheromones in biological pest control

Pheromones are used to

- lure pests into traps;
- monitor / control target pests in agriculture;
- disrupt mating / reproductive cycles of insect pests.

(f) (i) Components of the stoma of a plant

- Stomatal pore;
- Guard cells;
- Sub-stomatal chamber / stomatal air chamber.

(ii) Mechanism of opening of the stomata in plants

- photosynthesis occurs in the guard cells;
- more glucose is produced;
- higher osmotic concentration occurs in the guard cells;
- causing water to move from the surrounding epidermal cells into guard cells by osmosis;
- guard cells become turgid;
- guard cells bulge out like bean shape;
- causing the stomatal pore to widen / open.

Question 2

(a) (i) Explain the term nutrition.

(ii) Name the mode of nutrition in the following organisms:

Fern;
Plasmodium;
Tapeworm;
Toad;
Rhizopus;
Chlamydomonas;
Hibiscus.

(b) State four ways by which the feeding habit of Paramecium is:

(i) similar to that of humans;
(ii) different from that of humans.

(c) Explain briefly how food swallowed by a patient lying flat on a hospital bed reaches the stomach of the patient.

Many candidates attempted this question and performed fairly well in answering the question.

The expected answers were;

2. (a) (i) Explanation of the term nutrition
It is the process; by which organisms make/obtain food/nutrients; for the body's life processes.

(ii) Mode of nutrition in:
Fern
Holophytic / autotrophic;

Plasmodium
Parasitic / Holozoic / Heterotrophic

Tapeworm
Parasitic;

Toad
Holozoic / heterotrophic

Rhizopus
Saprophytic / Heterotrophic

Chlamydomonas
Holophytic / autotrophic;

Hibiscus
Holophytic / autotrophic;

(b) (i) Ways by which the feeding habit of *Paramecium* is similar to that of humans
- both are holozoic feed / take in complex food substances;
- both breakdown complex food substances in simple soluble form;
- both have defined external openings for food intake / ingestion;
- both carry out digestion of food within the body;
- digestion in both involves chemical action of enzymes;
- products of digestion in both are diffused into the cells of the body;
- both egest / remove undigested remains / materials.

(ii) Ways by which the feeding habit of *Paramecium* is different from that of humans
- *Paramecium* has a simple feeding process, while humans have complex feeding process;
- *Paramecium* has simple structure for feeding, while humans have complex structures / specialised organs for feeding;
- in *Paramecium*, food intake is by phagocytosis, while in humans food intake is by ingestion;
- in *Paramecium*, food taken in is broken down by chemical digestion only**,** while in humans food taken in is broken down by teeth mechanically and chemically by enzymes;

- in *Paramecium*, absorption of nutrients is simple, while in humans absorption of nutrients is complex;
- in *Paramecium*, nutrients are absorbed directly, while in humans nutrients are absorbed first into the bloodstream and then into the cells;
- in *Paramecium*, undigested materials are expelled / removed through the anal pore, while in humans undigested materials/remains are eliminated / expelled through the anus;
- in *Paramecium*, food particles are directed into the oral groove by cilia, while in humans food is taken into the mouth with the hands.

(c) Explanation of how food swallowed by a patient lying flat on a hospital bed reaches the stomach of the patient

The oesophagus comprises circular and longitudinal muscles; which contract and relax rhythmically / through peristalsis; to push the food along the gut; the pyloric sphincter opens; food enters the stomach.

Question 3

(a) (i) What is humidity?
(ii) List three abiotic factors that are affected by humidity.
(b) State two effects each of the following factors on spirogyra in its habitat:
(i) temperature
(ii) rainfall
(iii) light intensity
(iv) pH
(c) Explain briefly the process of natural selection in a population.
(d) Name the causative organism of each of the following diseases.
(i) cholera
(ii) measles
(iii) malaria

The questions were popular and therefore was attempted by many candidates.
Generally, candidates performed fairly in answering this question.
The expected answers were;

3. (a) (i) Meaning of humidity
- is the amount of water vapour/moisture content; in a given volume of air/atmosphere; at a given temperature.

(ii) Abiotic factors that are affected by humidity
- Water levels of pond/water bodies; soil water; temperature; rainfall; wind; pH, light intensity; oxygen concentration; atmospheric pressure.

(b) Effects of abiotic factors on *Spirogyra* in its habitat

(i) Temperature

Low temperature will slow down cellular activities; high temperature will denature its enzymes / destroy the cell; high temperature causes the cell to lose water.

(ii) Rainfall

Low / absence of rainfall will dehydrate the cells / may kill zygospores; high / heavy rainfall will dislocate / flush out filament of the organism / conjugation is impeded.

(iii) Light intensity

Low light intensity will reduce the rate of photosynthesis; high light intensity will increase rate of photosynthesis.

(iv) pH

High / low pH / will destroy the cell; suitable / optimum pH will improve the health of the cell.

(c) Explanation of natural selection in a population

- in every population, there are variations;
- some of the variations are heritable others are not;
- some of the variations are favourable others are unfavourable;
- the favourable heritable variations have a selective advantage over unfavourable heritable variations;
- as a result, individuals with favourable variations survive;
- and pass on their favourable variations / characteristics to their offspring;
- those with unfavourable variations do not survive / are eliminated;
- with time, the population will be made up of mainly individuals with favourable heritable variations / characteristics.

(d) Name of causative organism of each of the diseases

(i) Cholera

Vibrio cholerae

(ii) Measles

Virus

(iii) Malaria

Plasmodium vivax/Plasmodium falciparum/Plasmodium malariae/Plasmodium sp.

Question 4

(a) List two causes of diseases in humans.

(b) (i) Complete the table below by naming two blood components that protect the body against diseases and explain one function of each.

Blood components	One function
I	
II	

(ii) Distinguish between antibodies and antigens.

(c) A man with homozygous Rhesus positive blood (RR) married a woman with homozygous Rhesus negative (rr) and had four offspring.

(i) With the aid of a genetic diagram, determine the Rhesus factors of their offspring.
(ii) What is the phenotype of the offspring?
(iii) What is the genotypic ratio of the offspring?

Generally, candidates performed satisfactorily in answering this question.
Candidates were expected to provide the following detailed answers;

4. (a) Causes of diseases in humans
- hereditary / genetic disorders;
- dietary / diet / nutrient deficiencies;
- hormonal imbalance/deficiencies;
- environmental pollution;
- negative / harmful / antisocial lifestyle choices;
- parasitic worms / helminths;
- protozoan parasites;
- viruses;
- bacteria;
- fungi;
- eating contaminated foods / drinking contaminated water

(b) (i) Table

Blood components	function
(I) White blood cells/white blood corpuscles / leucocytes (phagocytes) White blood cells / white blood corpuscles/leucocytes (lymphocytes)	- engulf / Ingest / destroy pathogen / foreign matter that enters the body; - release antibodies that immobilise the antigens of pathogens;
(II) (Blood) Platelets / Thrombocytes	- form blood clots over wounds to prevent entry of pathogens / foreign matter into the body / prevent / control bleeding.

(ii) Distinguishing explanation

Antibodies
are chemical substances / protein; produced by white blood cells / lymphocytes; which protect the body / immobilise antigens produced by harmful foreign matter / pathogens in the body.

Antigens
are chemical substances / protein; produced from pathogens; which stimulate the production of antibodies.

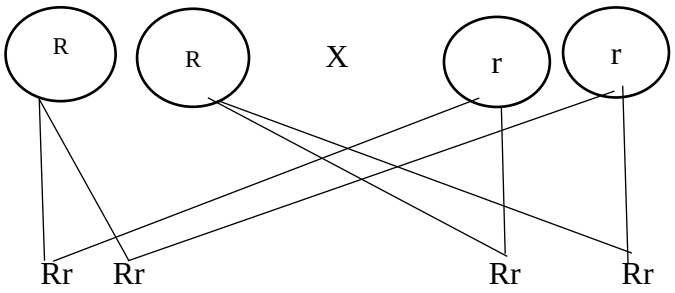
(c) (i) Genetic diagram

Parental Phenotypes: Rhesus positive man and Rhesus negative woman

Parental Genotypes: RR X rr

Gametes: R R X r r

Correct Crossing (CC):



Rhesus factors of Offspring: Rr Rr Rr Rr

USING PUNNETT SQUARE

Parental Phenotypes: Rhesus positive man and Rhesus negative woman

Parental Genotypes: RR X rr

Male Gametes

♀ \ ♂	R	R
r	Rr	Rr
r	Rr	Rr

Female Gametes

(ii) Phenotype of offspring

All the offspring are Rhesus positive

(iii) Genotypic ratio of offspring

4:0

Question 5

(a) List four processes by which substances are transported into the cells of mammals.

(b) List four mineral salts that could be found in a soil sample.

(c) Name three types of muscles in mammals.

(d) Name two types of root modifications in plants found in swampy areas of Ghana.

(e) State one adaptation each of the root modifications named in 5(d).

(f) Explain briefly the involvement of the Forestry Commission in Integrated Water Resources Management.

(g) (i) State four ways in which additives are important in food industries.

(ii) State two harmful effects of food additives to humans.

(h) Outline four steps in the procedure of identifying iron in a soil sample.

Generally, candidates performed well in answering these questions.
The expected answers were;

(a) Processes by which substances are transported into cells of mammals
- osmosis;
- simple / (facilitated) diffusion;
- active transport;
- endocytosis;
- phagocytosis;
- pinocytosis.

(b) Mineral salts found in soil sample
- Calcium salts / Calcium sulphate / Calcium nitrate / Calcium phosphate;
- Iron salts / Iron sulphate / Iron nitrate / Iron phosphate;
- Magnesium salts / Magnesium sulphate / Magnesium nitrate / Magnesium phosphate;
- Ammonium salts / Ammonium sulphate / Ammonium nitrate / Ammonium phosphate;
- Sodium salts / Sodium sulphate / Sodium nitrate / Sodium phosphate;
- Potassium salts / Potassium sulphate / Potassium nitrate / Potassium phosphate.

(c) Types of muscles found in mammals
- Smooth / unstriped / unstriated muscles;
- Striped / striated/skeletal muscles;
- Cardiac / heart muscles.

(d) Root modifications in plants found in swampy areas of Ghana
- stilt roots;
- breathing roots / pneumatophores;
- prop roots.

(e) Adaptations of root modifications in plants found in swampy areas of Ghana

Stilt roots
- they are branched; to anchor the plant into the soil.

Prop roots
- they emerge as clusters of roots from nodes; to provide extra support to the plant.

Breathing roots / Pneumatophores
- they emerge out of the muddy water into the air; and are spongy with lenticels; which allow atmospheric oxygen to be absorbed by the roots.

(f) Explanation of involvement of the Forestry Commission in Integrated Water Resources Management

The Forestry Commission is involved in:
- protection of the forests of Ghana; because many water bodies have their sources in the forest; forest tree canopy protects the water body sources from being exposed to direct sunlight / prevents excessive evaporation of water.

- protection of forest trees from overlogging; this is because the trees through transpiration produce water vapour; which brings about clouds / rainfall that fill water bodies with water.

(g) (i) Importance of additives in food industries

- enhance the taste of food;
- preserve the flavour of food;
- enhance food appearance / colour;
- maintain food texture / viscosity / gelling;
- maintain food consistency;
- preserve / prevent food from getting stale / spoilt / decayed.

(ii) Harmful effects of food additives to humans

Cause:

- diarrhoea;
- indigestion;
- abdominal cramps / pains;
- nausea / vomiting;
- excessive belching;
- insomnia;
- asthma;
- skin diseases / itching / allergies / swelling / rashes;
- cancer;
- excessive weight gain / obesity

(h) Procedure of identifying iron in a soil sample

- a soil sample is put in a flask / beaker;
- distilled water is added;
- the mixture is shaken thoroughly;
- the solution is filtered into a flask;
- this procedure is repeated until a clear filtrate is obtained;
- the filtrate is boiled to reduce the volume of the filtrate;
- potassium ferrocyanide solution is added to the filtrate;
- if the filtrate turns blue;
- it indicates the presence of iron in the soil.

BIOLOGY 3

1. GENERAL COMMENTS

The standard of the paper compared favourably well with that of previous years. Most of the specimens provided were known by candidates and within the syllabus.

2. SUMMARY OF CANDIDATES' STRENGTHS

The chief Examiner reported that most of the candidates exhibited satisfactory knowledge in the following areas:

- identification of specimens
- adherence to prescribed length of biological drawings
- symmetry of specimen provided
- types of placentation of flowers
- stating similarities of pairs of specimens provided
- stating adaptations of specimen

3. SUMMARY OF CANDIDATES' WEAKNESSES

The chief Examiner reported that candidates had problems with

- correct spelling of technical words
- starting taxonomic names with lower case letters
- corresponding differences between pairs of specimens provided
- structural linkages between pairs of specimens
- producing smooth unbroken lines for their biological drawings.
- determining the correct magnification of their biological drawings
- showing details of biological drawings
- linking structural features to their correct function

4. SUGGESTED REMEDIES

The Chief Examiner made the following suggestions meant to remedy the weaknesses of candidates:

- Teachers should intensify the teaching of biological drawings to ensure that candidates know the rubrics of biological drawings.
- Teachers should ensure that candidates work sufficient tutorials and assignments on technical words to provide correct spellings.

5. DETAILED COMMENTS

Question 1

Study specimens A and C and use them to answer questions 1(a) to 1(d).

(a) State the:

(i) Division of plants from which specimens A and C were obtained.

(ii) Class of plants from which specimens A and C were obtained.

(b)(i) State five observable differences between specimens A and C.

(ii) State three observable similarities between specimens A and C.

(c) State two adaptations of specimen A to its habitat.

(d) Make a drawing 8 cm to 10 cm long of specimen C and label fully.

1 (a) This question was generally well answered. However, some candidates either spelt technical words wrongly or provided the genus of taxonomic names beginning with a small letter.

The expected answers were;

(i) Division of plants from which specimen A / Cassava stem and specimen C / stem of mature maize were obtained

A – Angiospermophyta / Angiospermatophyta / Magniliophyta

C – Angiospermophyta / Angiospermatophyta / Magniliophyta

(ii) Class of plants from which specimen A / Cassava stem and specimen C/stem of mature maize were obtained

A – Dicotyledonaea / Dicotyledonea / Magniliopsida / Dicotyledoneae

C – Monocotyledonaea / Monocotyledonea / Liliopsida / Monocotyledoneae

(b) (i) Some answers provided by candidates did not correspond. Eg: compound leaves do not correspond with narrow leaves.

The expected answers were;

Differences between specimen A / Cassava stem and specimen C / stem of mature maize

Specimen A / Cassava stem	**Specimen C / stem of mature maize**
net venation	parallel venation
indented leaf margin	entire leaf margin
woody / hard / corky /solid stem	non-woody / herbaceous / soft / hollow stem
palmate / lobed / oval / digitate / fan-shaped broad leaves	elongated / linear / lanceolate / narrow leaves
petiole present	leaf sheath present
compound leaves	simple leaves
short internodes	long internodes
stilt / brace / prop roots absent	stilt / brace / prop roots present
taproot / root tuber / swollen root present	taproot / root tuber / swollen root absent

lateral branch present	lateral branch absent
has buds	has no buds
tassels absent	tassels present
bracts present	bracts absent
fibrous root absent	fibrous root present

(b) (ii) Some candidates wrongly spelt words like venation as veination, leaves as leave, stem as sterm, lenticels as lenticles and inflorescence as infloresence.

The expected answers were;

Observable similarities between specimen A / Cassava stem and specimen C / stem of mature maize

Both have:

- leaves
- nodes
- internodes
- stems
- roots
- male and female inflorescence / dioecious
- adventitious roots
- lenticels
- leaf veins / venation

(c) Generally, candidates showed weakness in linking correct structural feature with correct functions. They also stated, leaves for photosynthesis instead of green leaves for photosynthesis. Some also stated chlorophyll without linking it to leaves.

The expected answers were;

Adaptation of specimen A / Cassava stem to its habitat

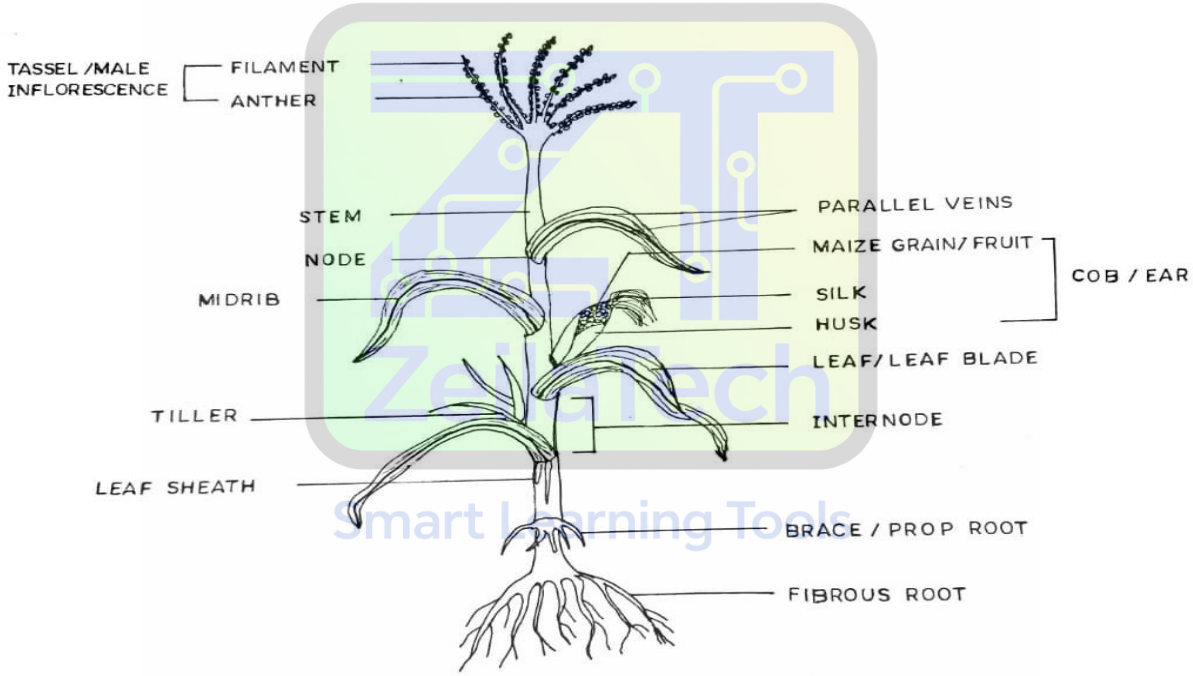
- possession of tuber / tuberous / swollen roots; for anchorage / absorption / storage of nutrients
- possession of primary and secondary roots; for anchorage / absorption/storage of nutrients
- possession of long petiole / leaf stalk; for holding leaves in place for photosynthesis
- possession of elaborate stem / shoot system / branches; for holding leaves in place for photosynthesis
- possession of green leaves; for photosynthesis
- possession of buds; for vegetative propagation
- possession of apetalous flowers; for easy pollination/fertilization
- possession of waxy cuticle; to reduce transpiration

Generally candidates showed weakness in the drawing of specimen C (mature maize plant).
Title: Most candidates stated the title wrongly.
Clarity of lines: Generally was poorly done. Lines of drawing produced by candidates were wooly, with dots, broken and uneven.

Neatness of label: Majority of the candidates did well in providing labels except a few of them who used free hand to show guide lines instead of ruled guide lines as well as vertical or diagonal labelling instead of horizontal.
Size of drawing: Many of the candidates drew within the specified length of (8 -10) cm. However, a few also made drawings those were too big or too small.
Magnification: This was a major challenge. Many candidates could not determine the magnification of their drawings correctly. A few candidates also failed to state the magnification.
Details of drawing: Details of specimen C (mature maize plant) such as prop roots, male / female inflorescence and narrow leaves were not vividly shown or pronounce in the drawing of candidates.
Labels: Labels were wrongly spelt or singular for plural and vice versa.

The expected answer is as presented;

(d) Diagram / Drawing of specimen C / mature maize plant



Title (TL)
Diagram / Drawing of specimen C / stem of mature maize

Quality (Q)
Size (Sz) (8cm to 10 cm) was required as length of drawing

Clarity of lines (CL) (not woolly, not broken/not dotted)
Neatness of labels (NL) (horizontal labels and all guidelines ruled not crossing and no arrowheads)
Magnification (Mg) range of X 0.3 to X 0.6 was required

Details (D)
Prop root shown (PR) : prop roots was required to be shown
Male inflorescence (MI) : tassel / male inflorescence was required to be shown

Labels (L)
prop roots, leaf, leaf sheath, fibrous root, stem; parallel vein, filament, anther, tassel / male inflorescence, node, midrib, tiller, cob / ear, internode were required.

Question 2

Study specimens D, E, G and H and use them to answer questions 2(a) to 2(d).
(a) (i) State one function each of specimen D and E to the plants that possess them.
(ii) Give two reasons each for the answers in 2(a)(i).
(b) (i) Complete the table below:

Floral part of specimen E	Number of the part	One function of the part
Sepal		
Petal		
Stamen		
Stigma		

(ii) Name the symmetry of specimen E.
(c) (i) Give the placentation of each of specimens G and H.
(ii) State four observable differences between specimens G and H.
(d) State four similarities between specimens G and H.

(a) Some candidates could not provide correct reasons for the functions of specimen D and E that they correctly identified. Some also wrongly spelt words like photosynthesis, pollination, gynaecium / gynoecium, androecium etc. Others could not state the full components that constitute the female organ and only stated stigma as the female organ.

The expected answers were;
(i) Function of specimens D / Leaf of Mango plant and E / Flower of *Hibiscus* to the plants that possess them
D – photosynthesis / manufacture of food / translocation of food / transpiration / guttation / gaseous exchange / regulation of temperature
E – reproduction / production of seeds / fruits / pollination / fertilization

(ii) Reasons
D/Leaf of Mango plant
- presence of green pigment / chlorophyll
- presence of midrib / veins
- presence of wide lamina / leaf blade
- presence of stomata

E/Flower of *Hibiscus* plant
- presence of androecium / stamen / anther and filament
- presence of gynoecium / pistil / stigma, style and ovary
- presence of large / conspicuous / brightly coloured petals
- presence of sweet scent
- presence of nectar

(b) Generally this question was well answered but majority of candidates lost marks for wrong spellings. Some also lost marks for wrong symbol to represent numerous stamen in the Hibiscus flower. There was no problem with the naming of symmetry possess by the flower.

The expected answer is as presented;

(i) Table

Floral parts of specimen **E**	Number of the part	**One** function of part
Sepal	5	- photosynthesis / food production - protection of flower (at the bud stage)
Petal	5	- pollination / attraction of pollinators - protection (of other floral parts)
Stamen	numerous / many / multiple / infinite / ∞	- production of male gametes / pollen grains
Stigma	4/5	- receives pollen grains

(ii) Symmetry of specimen E / Flower of *Hibiscus* plant
- Radial / Actinomorphic

(c) The placentation though known by candidates was spelt as axial instead of axile. For observable differences between specimens G and H, majority of the candidates stated two instead of four required. No candidate included loculi as a distinguishing feature in their answers. However, the similarities between specimens G and H were well stated.

The expected answers were;

(i) Placentation of G / Guava fruit / Garden egg fruit (cross-section) and H / Orange fruit (cross-section)
- G – Axile
- H – Axile

(ii) Observable differences between G / Guava fruit / Garden egg fruit (cross-section) and H / Orange fruit (cross-section)

G / Guava fruit / Garden egg fruit (cross-section)	H / Orange fruit (cross-section)
- has many seeds	- has fewer seeds
- seeds are smaller in size	- seeds are bigger in size
- pericarp is succulent	- endocarp is succulent
- no distinct loculi	- has distinct loculi

(d) Observable similarities between G / Guava fruit / Garden egg fruit (cross-section) and H / Orange fruit (cross-section)

- presence of pericarp / epicarp, mesocarp, and endocarp
- presence of seeds
- presence of succulent parts
- presence of placenta
- presence of radial symmetry
- presence of axile placentation
- both are fruits / berries

Question 3

Study specimens K, L and M and answer questions 3(a) to 3(c).

(a) (i) Name the class of each of specimens K, L and M.

(ii) State four features that adapt specimen K to its habitat.

(b) (i) State five observable differences between specimens K and M.

(ii) State four observable similarities between specimens K and M.

(c) Make a drawing 8 cm to 10 cm long of the side view of the head region up to the middle of the trunk of specimen K and label fully.

(a) This question was generally well answered by candidates. However, several of them spelt Reptilia, Insecta and Osteichthyes wrongly. Others also started the words with lower case letters. For adaptations of K (lizard), candidates could state the structure but failed to link it to the correct function.

The expected answers were

(i) Classes of Specimens K / *Agama* lizard, L / Adult cockroach and M / *Tilapia*

K / *Agama* lizard

- Reptilia

L / Adult cockroach

- Insecta

M / *Tilapia*

- Osteichthyes / Pisces

(ii) Features that adapt specimen K / *Agama* lizard to its habitat

- possession of dry scales; to reduce/resist desiccation
- possession of two pairs of muscular limbs; for movement
- possession of a pair of bulging eyes; for sharp vision
- possession of a pair of nostrils; for breathing/gaseous exchange
- possession of homodont teeth; for capturing prey
- possession of sharp claws; for climbing / escaping from predators
- possession of long tail; for balancing / defense / offense
- possession of retractable tongue; for catching insects
- possession of (dorsoventrally) flattened body; to move through narrow crevices
- possession of bright skin colour which blends with the environment / camouflage; to escape predators

(b) This question was largely answered by candidates but structures mentioned did not correspond to
score. Structural features were also spelt wrongly i.e: gular fold, lateral line, operculum, tympanum etc.

The expected answers were;

(i) Observable differences between Specimen K / *Agama* lizard and Specimen M / *Tilapia*

Specimen K / *Agama* lizard	Specimen M / *Tilapia*
- fins absent	- fins present
- limbs present	- limb absent
- claws present	- claws absent
- body with dry scales	- body with slimy scales
- operculum absent	- operculum present
- slant/bulging eye	- round eye
- tail is long	- tail is short
- lateral line absent	- lateral line present
- nuchal crest present	- nuchal crest absent
- gular fold present	- gular fold absent
- neck present	- neck absent
- eyelids present	- eyelids absent
- body not streamlined	- body streamlined
- tympanum/tympanic membrane present	- tympanum/tympanic membrane absent
- dorsoventrally flattened	- laterally flattened

(ii) Observable similarities between specimen K / *Agama* lizard and specimen M / *Tilapia*

They both possess

- eyes
- mouth
- nostrils
- tail
- anal opening / cloaca
- scales
- head
- tongue
- trunk

(c) Candidates performed poorly in this question as drawing of specimen K was poorly done by majority of the candidates.

Title: Many of the candidates could not state the title correctly.
Clarity of lines: Most candidates score zero as lines were uneven, broken or woolly.
Neatness of label: Some candidates had guide lines crossing each other.
Size of drawing: Many of the candidates could not draw the required size.
Magnification: Generally, this was well answered.
Details of drawing: Details such as correct view, overlapping scales and claws on digits were appropriately shown. However, a few candidates drew a dorsal view instead of the side view / lateral view requested by the question.
Labels: Wrong spelling of parts was observed.

The drawing required by the question is as shown;

Drawing of the side view of the head region up to the middle of the trunk of Specimen K / *Agama* lizard

Title (TL)
Diagram / Drawing of the side view of the head region up to the middle of the trunk of Specimen K / *Agama* lizard

Quality (Q)
Size (Sz): (8cm to 10 cm) required as length of drawing

Clarity of lines (CL): smooth unbroken lines required
Neatness of labels (NL): ruled horizontal labels required
Magnification (Mg): range of X 0.25 to X 1was required

Details (D)
Correct view (CV): lateral view required

Claws on digits shown (CD): claws required
Overlapping scales (OS): overlapping scales required

Labels (L)
Head, eye, claw(s), mouth, gular fold, nuchal crest, nostril, scale, digit / finger, tympanum / eardrum, neck, trunk, forelimb / hand were required.