SC5042&1
WASSCE 2020
BIOLOGY 2&1
Essay & Objective
2½ hours

2&1

**THE WEST AFRICAN EXAMINATIONS COUNCIL**
**West African Senior School Certificate Examination**
**for School Candidates**

SC 2020 BIOLOGY 2&1 2½ hours

*Do* **not** *open this booklet until you are told to do so. While you are waiting, read the following instructions carefully.*

*Write your* **name** *and* **index number** *in* **ink** *in the spaces provided at the top right-hand corner of this booklet.*

*This booklet consists of* **two** *papers. Answer Paper* **2** *which comes first, in your answer booklet and Paper* **1** *in your Objective Test answer sheet. Paper* **2** *will last for* **1** hour **40** minutes *after which the answer booklet will be collected. Do* **not** *start Paper* **1** *until you are told to do so. Paper* **1** *will last for* **50** minutes.

PAPER 2 — 1 hour 40 minutes
ESSAY
[70 marks]

*Answer* **three** *questions in all;* **two** *questions from Section* A *and the* **only** *compulsory question in* **either** *Section* B *or Section* C.

**No** *marks will be awarded for answering questions* **not peculiar** *to your own country.*

*Write your answers in* **ink** *in your answer booklet.*

*Large labelled diagrams should be used where they make an answer clearer. The names given for chosen species* **must** *be* English *or scientific and* **not** *vernacular.*

*Credit will be given for clarity of expression and orderly presentation of answers.*

SECTION A

**FOR ALL CANDIDATES**

*Answer* **two** *questions* **only** *from this section.*

1. (*a*) (i) List **four** supporting tissues in plants. [4 marks]
(ii) State **one** characteristic feature **each** that adapts **each** of the supporting tissues listed in 1(*a*)(i) to its function. [8 marks]

(*b*) Make a diagram, 6 cm to 8 cm long of the transverse section of the stem of a monocotyledonous plant and label fully. [8 marks]

2. (*a*) (i) What is *deficiency disease*? [2 marks]
(ii) Name **five** nutrient deficiency diseases in humans. [5 marks]
(iii) State **one** remedy **each** for the diseases named in 2(*a*)(ii). [5 marks]

(*b*) Outline a chemical test for:
(i) glucose in orange fruit; [4 marks]
(ii) starch in a tuber of yam. [4 marks]

3. (*a*) Explain **briefly** food preservation in the following facilities:
(i) silo;
(ii) refrigerator. [6 marks]

(*b*) List **four** examples **each** of food types that can be preserved in the facilities in 3(*a*)(i) and 3(*a*)(ii). [8 marks]

(*c*) List **six** factors that affect population size of living organisms. [6 marks]

4. (*a*) Explain **briefly** the reason why blood groups **A** and **B** in humans can exist **both** in the heterozygous and homozygous forms while blood group **O** can only exist in homozygous form. [5 marks]

(*b*) (i) Name the Classes of vertebrates in order of their evolutionary trend. [5 marks]

(ii) Give **one** example **each** of the Classes of vertebrates named in 4(*b*)(i). [5 marks]

(*c*) Explain **briefly** independent assortment of genes. [5 marks]

SECTION B

**FOR CANDIDATES IN GHANA ONLY**

*Answer* the *questions in this section.*

5. (*a*) (i) What is *guttation*? [2 marks]

(ii) Explain **briefly** the biological principles underlying the process of guttation. [4 marks]

(*b*) (i) List **three** organelles in the cell that are involved in protein synthesis. [3 marks]

(ii) Name **one** source of amino acids used in protein synthesis in cells. [1 mark]

(*c*) Outline the steps taken to change from viewing an object placed under a low power magnification to a high power magnification when using an optical microscope. [4 marks]

(*d*) Describe **briefly** the process of dissecting a rabbit to expose its alimentary canal. [6 marks]

(*e*) Name **six** life processes which living organisms are capable of performing. [6 marks]

(*f*) Name the branch of Biology which is concerned with the study of:

(i) tissues;

(ii) plants;

(iii) DNA;

(iv) the environment. [4 marks]

SECTION C

**FOR CANDIDATES IN NIGERIA, SIERRA LEONE, THE GAMBIA AND LIBERIA**

*Answer the questions in this section.*

6. (*a*) Explain **briefly** the following types of fertilization in animals:
   (i) external fertilization;
   (ii) internal fertilization.

[4 marks]

(*b*) Name **two** groups of animals **each** that exhibit the types of fertilization in 6(*a*)(i) and (ii). [4 marks]

(*c*) (i) If the placenta in a pregnant woman is detached from the uterine wall, give **three** effects this would have on the foetus. [3 marks]

(ii) Name **three** other features present in the uterus of a pregnant woman useful for the development of the foetus. [3 marks]

(*d*) Explain **briefly** how the activities of organisms bring about dynamic equilibrium in the habitat. [4 marks]

(*e*) State **four** problems that organisms in the intertidal zone of a marine habitat could encounter. [4 marks]

(*f*) Explain **briefly** the reason the following factors are necessary for germination:
   (i) moisture;
   (ii) viable seed.

[4 marks]

(*g*) Explain **briefly** the reason light energy is considered a limiting factor in the production of food by autotrophs. [4 marks]

***END OF ESSAY TEST***

# DO NOT TURN OVER THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

## YOU WILL BE PENALIZED SEVERELY IF YOU ARE FOUND LOOKING AT THE NEXT PAGE BEFORE YOU ARE TOLD TO DO SO.

PAPER 1 — 50 minutes
OBJECTIVE TEST
[50 marks]

1. Use 2B pencil throughout.
2. On the pre-printed answer sheet, check that the following details are **correctly** printed:
   (*a*) In the space marked *Name*, check your **surname** followed by your **other names**.
   (*b*) In the spaces marked *Examination, Year, Subject* and *Paper*, check '**WASSCE**', '**SC 2020**', '**BIOLOGY**', and '**1**' in that order.
   (*c*) In the box marked *Index Number,* your **index number** has been printed vertically in the spaces on the left-hand side, and each numbered space has been shaded in line with each digit. **Reshade** each of the shaded spaces.
   (*d*) In the box marked *Subject Code*, the digits 504113 are printed vertically in the spaces on the left-hand side. **Reshade** the corresponding numbered spaces as you did for your index number.
3. An example is given below. This is for a male candidate whose *name* is Elliot Kofi AGBANA. His *index number* is 7102143958 and he is offering *Biology* 1.

**THE WEST AFRICAN EXAMINATIONS COUNCIL**
**ANSWER SHEET**

PRINT IN BLOCK LETTERS
Name: AGBANA ELLIOT KOFI — GHA
Examination: WASSCE — Year: SC 2020
Subject: BIOLOGY — Paper: 1

INSTRUCTIONS TO CANDIDATES
1. Use grade 2B pencil throughout.
2. Answer each question by choosing one letter and shading it like this: ⊏A⊐ ⊏B⊐ ⊏C⊐ ⊏D⊐ ⊏E⊐
3. Erase completely any answer you wish to change.
4. Leave extra spaces blank if the answer spaces provided are more than you need.
5. Do not make any markings across the heavy black marks at the right-hand edge of your answer sheet.

INDEX NUMBER
7 1 0 2 1 4 3 9 5 8

SUBJECT CODE
5 0 4 1 1 3

For Supervisors only
If candidate is absent shade this space.

*Answer* **all** *the questions.*

**Each** *question is followed by* **four** *options lettered* A *to* D. *Find the* **correct** *option for* **each** *question and shade in* **pencil** *on your answer sheet, the answer space which bears the same letter as the option you have chosen.*

*Give only* **one** *answer to* **each** *question. An example is given below.*

Which part of the gill of fish is involved in gaseous exchange?

A. Gill slits
B. Gill bars
C. Gill covers
D. Gill filaments

*The correct answer is* Gill filaments, *which is lettered* D, *and therefore answer space* D *would be shaded.*

⊏A⊐ ⊏B⊐ ⊏C⊐ ■D■

*Think carefully before you shade the answer spaces; erase completely any answers you wish to change.*

*Do* **all** *rough work on this question paper.*

*Now answer the following questions.*

**1.** The cell as the basic unit of life consists of

A. cytoplasm and vacuole.
B. cytoplasm and nucleus.
C. nucleus and cell wall.
D. cell wall and vacuole.

*Use the following Classes of Arthropoda to answer questions* **2** *and* **3**.

**I.** Crustacea
**II.** Insecta
**III.** Arachnida
**IV.** Chilopoda

**2.** Which members of the Classes live **mainly** in an aquatic habitat?

A. **I**
B. **II**
C. **III**
D. **IV**

**3.** Which of the Classes is characterized by the possession of two pairs of antennae?

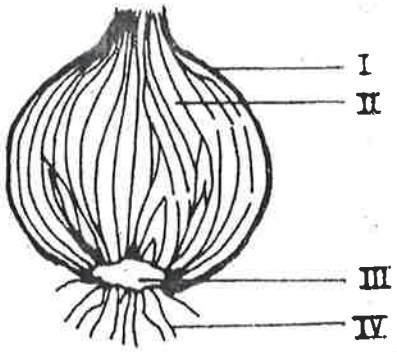
A. **IV**
B. **III**
C. **II**
D. **I**

**4.** The organism with spiral chloroplasts and nucleus suspended by cytoplasmic strands is

A. *Euglena.*
B. *Paramecium.*
C. *Spirogyra.*
D. *Volvox.*

5. The network of double membrane that conveys materials through the cytoplasm is the
   A. endoplasmic reticulum.
   B. mitochondrion.
   C. nuclear membrane.
   D. plasma membrane.

The diagram below is an illustration of the longitudinal section of a plant organ. *Study it and answer questions* **6** *to* **8**.




6. Food is stored in the part labelled
   A. **IV.**
   B. **III.**
   C. **II.**
   D. **I.**

7. The plant is a
   A. runner.
   B. stolon.
   C. bulb.
   D. stem tuber.

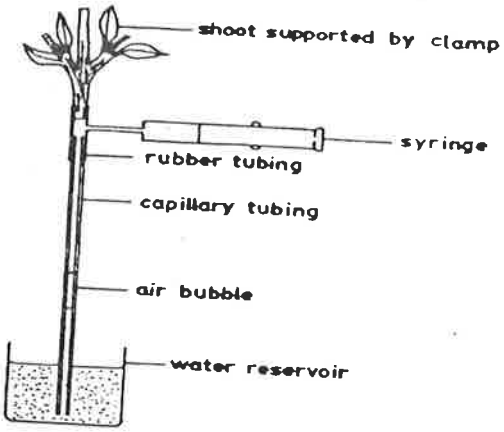
8. The part labelled **I** is the
   A. fleshy leaf.
   B. adventitious root.
   C. scale leaf.
   D. apical bud.

9. Which of the following materials is **not** a living semi-permeable membrane?
   A. Sheet of cellophane
   B. Yam tuber
   C. Unripe pawpaw fruit
   D. Pig's bladder

10. In an experiment, mould and yeast cells were transferred into an environment with low oxygen concentration. After a few days, the mould died while the yeast cells did not. Which of the following statements **best** explains the above observation?
   A. Respiration does not occur in the mould
   B. Respiration can take place in yeast cells in the absence of oxygen
   C. Photosynthesis does not take place in the absence of oxygen
   D. The yeast cells carried out photosynthesis while the mould did not

11. Which of the following tissues does **not** provide support in flowering plants?
   A. Phloem
   B. Xylem
   C. Parenchyma
   D. Collenchyma

The diagram below is an illustration of an experimental set-up. *Study it and answer questions* **12** *and* **13**.




**12.** The set-up directly measures
- A. loss of mineral salts from the leaves.
- B. absorption of water by the shoot.
- C. evaporation of water from the leaves.
- D. transpiration of water by the shoot.

**13.** The set-up can measure comparatively the rate of
- A. water uptake by roots of different plants.
- B. transpiration of a single shoot of a plant under different experimental conditions.
- C. salt uptake by shoots from different plants.
- D. evaporation from leaves on a single shoot under different experimental conditions.

**14.** The respiratory organ of a cockroach is the
- A. lung.
- B. lung book.
- C. trachea.
- D. air sac.

**15.** The excretory product of some reptiles, birds and insects is
- A. uric acid.
- B. ammonia.
- C. urine.
- D. urea.

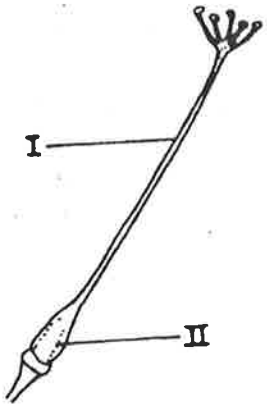
**16.** The part of the mammalian kidney that stores urine is the
- A. bladder.
- B. pelvis.
- C. medulla.
- D. capsule.

**17.** The properties of endocrine system include the following **except**
- A. release of secretions into ducts.
- B. having specific effect.
- C. transportation by blood to target organs.
- D. secretion of hormones.

18. The part of the central nervous system that controls unconscious actions in humans is the
A. optic nerves.
B. spinal cord.
C. cerebrum.
D. cerebellum.

19. What happens when the ciliary muscles of the eye contract? The
A. suspensory ligament becomes tight.
B. lens gets a longer focal length.
C. lens becomes more convex.
D. lens becomes more concave.

The diagram below is an illustration of a part of a flower.
*Study it and answer questions* **20** *and* **21**.




20. The function of the part labelled **I** is
A. site for double fertilization in the plant.
B. germination of the pollen grain.
C. passage for the male gamete to the ovary.
D. receiving the pollen grain.

21. The part labelled **II** is the
A. unfused anthers.
B. fused ovaries.
C. fused style.
D. unfused stigma.

22. The reagent used in testing for carbon (IV) oxide is
A. copper sulphate solution.
B. lime water.
C. hydrochloric acid.
D. sodium hydroxide solution.

23. Oxygen comes out of the stomata during photosynthesis through the process known as
A. active transport.
B. osmosis.
C. transpiration pull.
D. diffusion.

24. The **first** stable product of photosynthesis is
A. sucrose.
B. glucose.
C. fructose.
D. starch.

25. An example of a trace element is
A. copper.
B. magnesium.
C. calcium.
D. potassium.

26. Which of the following statements about a mixture of a protein-digesting enzyme and starch solution would be **correct**? The protein digesting enzyme
A. digests the starch.
B. leads to the production of glucose.
C. leads to the production of amino acids.
D. has no effect on the starch solution.

27. A mutualism type of relationship is different from a parasitic relationship because in mutualism,
A. only one of the organisms is harmed.
B. both organisms harm each other.
C. none of the organisms benefits or harms each other.
D. both organisms involved benefit.

The table below shows the number of some organisms in habitats *W* and *Y*. *Study it and answer questions* **28** *to* **30**.

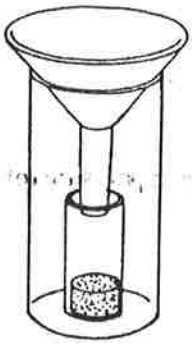
| *Organism* | *Number in the habitat* | |
|---|---|---|
| | *habitat W* | *habitat Y* |
| Plankton | 126 | 0 |
| Antelope | 0 | 51 |
| Water flea | 10 | 0 |
| Tilapia | 23 | 0 |
| Lion | 0 | 6 |
| Frog | 6 | 0 |
| Grass | 0 | 250 |

28. What type of habitat is *W*?
A. Ocean
B. Desert
C. Pond
D. Rainforest

29. Which of the following statements about habitat *W* is **correct**? The
A. absence of grasses indicates the habitat is terrestrial.
B. type of organisms present indicate the habitat is aquatic.
C. presence of tilapia and planktons shows the habitat is not aquatic.
D. absence of lions and antelopes shows the habitat is terrestrial.

30. The number of lions and antelopes in habitat *Y* shows that the lion
A. and the antelope are predators.
B. and the antelope are preys to each other.
C. is the predator while the antelope is the prey.
D. is the prey while the antelope is the predator.

The diagram below is an illustration of an ecological instrument. *Study it and answer questions* **31** *and* **32**.



31. A disadvantage of the abiotic factor measured by the instrument is that it
A. is used for irrigation.
B. leads to flooding when in excess.
C. is necessary for germination.
D. is an agent of pollination.

32. When the instrument is in use, it is usually
A. suspended on moving water.
B. suspended in air.
C. placed on a table.
D. placed slightly above soil level.

33. Soil with the finest texture is
A. gravel.
B. sand.
C. clay.
D. silt.

34. The position occupied by an organism in a food chain is the
A. energy level.
B. niche.
C. trophic level.
D. biomass.

35. The depletion of the ozone layer will result in the earth surface receiving more
A. X-rays.
B. ultraviolet rays.
C. Infra-red rays.
D. gamma rays.

*Use the list of insects below to answer questions* **36** *and* **37**.

**I.** Cotton stainer
**II.** Honeybee
**III.** Termite
**IV.** Weevil

36. The insects whose activities are **both** beneficial and harmful to humans are
A. **III** and **IV**.
B. **II** and **IV**.
C. **II** and **III**.
D. **I** and **II**.

37. Which of the insects destroys grains?
A. **IV**
B. **III**
C. **II**
D. **I**

38. Conservation of natural resources does **not**
A. threaten the survival of species.
B. attract tourists.
C. preserve the beauty of nature.
D. maintain a balanced ecosystem.

39. A company was prohibited from producing bags made from natural leopard skin. This is an attempt to conserve
A. minerals.
B. wildlife.
C. water.
D. land.

40. Which of the following substances is **not** a conservable natural resource?
A. Water
B. Soil
C. Air
D. Mineral

41. A child that can receive blood from anybody belongs to the blood group
A. **AB**.
B. **B**.
C. **A**.
D. **O**.

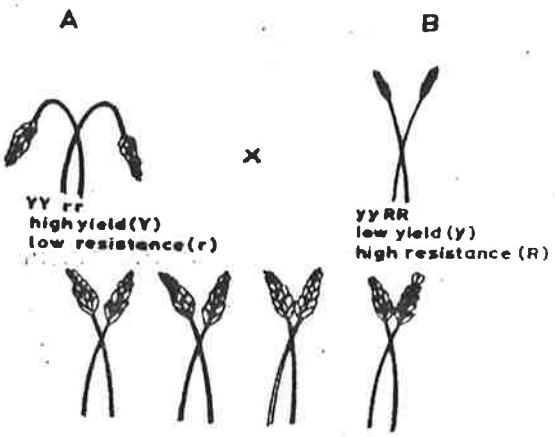
42. Variation which exhibits a wide range from one extreme to the other is
A. genotypic variation.
B. continuous variation.
C. discontinuous variation.
D. phenotypic variation.

43. Measurements of height and weight of students in a class show
A. fatness is less prevalent.
B. shortness is more prevalent.
C. continuous variation.
D. discontinuous variation.

44. Which of the following statements about chromosomes is correct?
A. They bear ribosomes on their outer membranes.
B. They are neatly arranged in the cytoplasm.
C. The number present in a species is constant.
D. All the chromosomes of a species are the same in shape.

45. Which of the following diseases can be inherited?
A. Malaria
B. Sickle cell anaemia
C. Whooping cough
D. Pneumonia

The diagram below is an illustration of a cross between plants **A** and **B** of the same species. *Study it and answer questions* **46** *and* **47**.




$F_1$ generation

46. If the $F_1$ generation are plants with high yield and high resistance, the genotype of the $F_1$ generation plants would be
A. *yyrr.*
B. *yyRr.*
C. *YyRr.*
D. *YYRR.*

47. The process that gave rise to the $F_1$ generation is
A. test cross.
B. out-breeding.
C. cross fertilization.
D. self fertilization.

48. Replication of DNA molecules is catalysed by an enzyme called
A. amylase.
B. pepsin.
C. ptyalin.
D. polymerase.

49. Who proposed the theory of evolution by natural selection?
A. Linnaeus
B. Aristotle
C. Lamarck
D. Darwin

50. Which of the following statements **best** explains the reason why termites swarm at night?
A. They can only see in the dark
B. Light destroys their wings
C. They avoid day-flying birds
D. Light is not necessary for swarming

***END OF PAPER***

SC5043
WASSCE 2020
BIOLOGY 3
Practical
2 hours

3

# THE WEST AFRICAN EXAMINATIONS COUNCIL

## West African Senior School Certificate Examination

## for School Candidates

SC 2020 BIOLOGY 3 2 hours

PRACTICAL

*Write your* **name** *and* **index number** *in* **ink** *in the spaces provided above.*

*Answer* **all** *the questions in Section* A, *and in addition* **all** *the questions in* **either** *Section* B *or* C.

**No mark** *will be awarded for answering questions from any part* **not** *peculiar to your own country.*

*Write your answers in your practical answer booklet.*

*Use* **both** *sides of the blank sheets in your answer booklet for writing and drawing.*

*Work done on any paper other than that provided will receive* **no** *mark.*

*You are advised to use sharp pencils for your drawings. Do* **not** *shade or colour. Great importance is attached to the accuracy of all drawings and observations.*

SECTION A
[50 marks]

**FOR ALL CANDIDATES**

*Answer* **all** *the questions in this section.*

**1.** *Study specimens* **A** *and* **B** *and answer questions* **1**(*a*) *to* **1**(*e*).

(*a*) (i) Name the class to which specimen **B** belongs. [1 mark]
(ii) State **two** reasons for the answer in **1**(*a*) (i). [2 marks]

(*b*) (i) Name the habitat of specimen **A**. [1 mark]
(ii) State **one** structural feature that adapts specimen **A** to its habitat. [2 marks]

(*c*) (i) In a tabular form, state **two** observable structural differences between specimens **A** and **B**. [2 marks]
(ii) State **two** observable structural similarities between specimens **A** and **B**. [2 marks]

(*d*) (i) What is the symmetry of specimen **B**? [1 mark]
(ii) Name **one** tool **each** which could be used to collect samples of specimens **A** and **B** for scientific studies. [2 marks]
(iii) Name **two** structures in specimen **B** that could be affected by oil spillage in its habitat. [2 marks]

(*e*) Make a drawing, 6 cm to 8 cm long of the ventral view of specimen **A** and label fully. [10 marks]

**2.** *Study specimens* **D**, **G** *and* **H** *and answer questions* **2**(*a*) *to* **2**(*e*).

(*a*) (i) Place **two** drops of specimen **D** on a white tile and add **two** drops of iodine solution. Copy and complete the table below, stating the test, observation and inference.

| *Test* | *Observation* | *Inference* |
|---|---|---|
| | | |

[3 marks]

(ii) Put 5 ml of specimen **D** into a test tube and add 2 ml of sodium hydroxide solution followed by **three** drops of copper (II) tetraoxosulphate (VI) and shake. Copy and complete the table below, stating the test, observation and inference.

| *Test* | *Observation* | *Inference* |
|---|---|---|
| | | |

[3 marks]

(iii) Give the name of **each** of the tests in **2**(*a*)(i) and **2**(*a*)(ii). [2 marks]

(*b*) State **two** ways by which specimen **G** is of economic importance. [2 marks]

(*c*) (i) Name the kingdom to which specimen **G** belongs. [1 mark]
(ii) State **two** reasons for the answer in **2**(*c*)(i). [2 marks]
(iii) Name **four** other organisms that belong to the same kingdom as specimen **G**. [4 marks]

(*d*) (i) Name the Phylum to which specimen **H** belongs. [2 marks]
(ii) State **three** reasons for the answer in **2**(*d*)(i). [3 marks]

(*e*) (i) Explain **briefly** the role of specimen **G** in nutrient recycling. [2 marks]
(ii) What is the mode of nutrition of specimen **G**? [1 mark]

SECTION B
[30 marks]

**FOR CANDIDATES IN GHANA ONLY**

*Answer the questions in this section.*

**3.** *Study specimens* **J**, **K**, **L** and **M** *and answer questions* **3**(*a*) to **3**(*g*).

(*a*) Classify specimen **J** into its:
(i) Phylum,
(ii) Class.
[2 marks]

(*b*) State **two** reasons **each** for the answers in **3**(*a*) (i) and(ii). [4 marks]

(*c*) Use arrows to indicate the relationship among specimens **J**, **K** and **L** in a cycle. [4 marks]

(*d*) (i) State **two** observable characteristic features that adapt specimen **L** to its habitat. [4 marks]
(ii) State **two** observable structures that adapt specimen **M** to its habitat. [4 marks]

(*e*) In a tabular form, state **two** observable structural differences between specimens **J** and **M**. [2 marks]

(*f*) (i) Name **one** habitat **each** of specimens **J** and **M**. [2 marks]
(ii) State **three** ways **each** by which specimens **J** and **M** are of economic importance. [6 marks]

(g) Classify specimen **M** into:
(i) Division;
(ii) Class.
[2 marks]

SECTION C
[30 marks]

**FOR CANDIDATES IN NIGERIA, SIERRA LEONE, THE GAMBIA AND LIBERIA**

*Answer the questions in this section.*

**4.** *Study specimens* **N**, **P**, **Q**, **R**, **S** and **T** *and answer questions* **4**(*a*) *to* **4**(*c*).

(*a*) (i) Copy and complete the table below by placing **each** of specimens **N**, **P**, **Q**, **R**, **S** and **T** under the appropriate headings

| *Dry indehiscent fruit* | *Dry dehiscent fruit* | *Succulent Fruit* |
|---|---|---|
| | | |

[6 marks]

(ii) Name the type of fruit to which **each** of specimens **N**, **P**, **Q**, **R**, **S** and **T** belongs. [6 marks]

(iii) State **three** observable structural differences between specimens **S** and **T**. [3 marks]

(*b*) State **two** observable features of biological importance of **each** of specimens **N**, **P** and **T**. [6 marks]

(*c*) Make a drawing, 6 cm to 8 cm long of specimen **T** and label fully. [9 marks]

***END OF PAPER***