



KCSE 2024
BIOLOGY
231/1
PAPER 1(THEORY)



NAME.....

INDEX NO..... CANDIDATE'S SIGN.....

DATE

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

- a) All Questions are Compulsory*
- b) Write your Answers in the Spaces Provided*
- c) Wrong Spelling of Technical Terms shall be Penalized*

FOR EXAMINERS' USE ONLY

MAX SCORE	STUDENT'S SCORE
80	

Answer ALL questions in the spaces provided.

1. State **TWO** ways in which the study of Biology has helped the world in the accelerated fight against the recent Covid-19 pandemic. **(2mks)**

.....
.....
.....

2. a) Give **ONE** function of centrioles **(1mk)**

.....
.....

- b) Name a Kingdom in which all members lack centrioles in their cells **(1mk)**

.....

3. a) Name the skin pigment formed by cells in the mammalian skin **(1mk)**

.....

- b) Which genetic disorder is associated with the absence of the pigment named in 2a)? **(1mk)**

.....

- c) How does the skin pigment help protect human beings against skin cancer? **(1mk)**

.....
.....

4. Explain the following observations

- a) More water hyacinth plants are found growing along the shore of Lake Victoria than in the deep waters **(1mk)**

.....
.....

b) Green plants grow faster in lower altitudes areas than in higher altitude areas

(2mks)

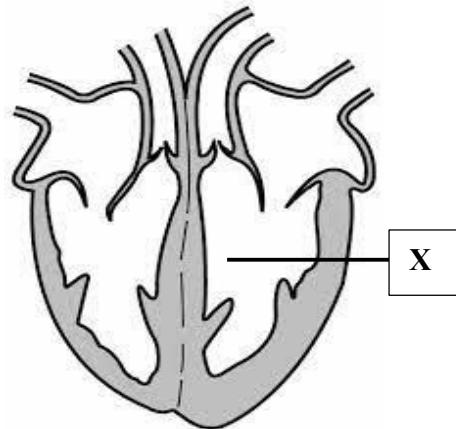
.....
.....
.....

5. State **TWO** functions of a cover slip in light microscope work

(2mks)

.....
.....
.....

6. Use the diagram of the heart shown below to answer the questions that follow



a) From the diagram, give a reason to show that X is the left ventricle

(1mk)

.....
.....

b) Name a class of organisms where all members have the heart structure above

(1mk)

.....

c) Why are the muscles found in the heart above said to be myogenic?

(1mk)

.....
.....

7. Account for the following

a) Red blood cells lack mitochondria

(1mk)

.....
.....

b) The testes are found hanging outside the body in male human beings

(1mk)

.....
.....

8. a) Why is pancreas said to be a dual gland?

(1mk)

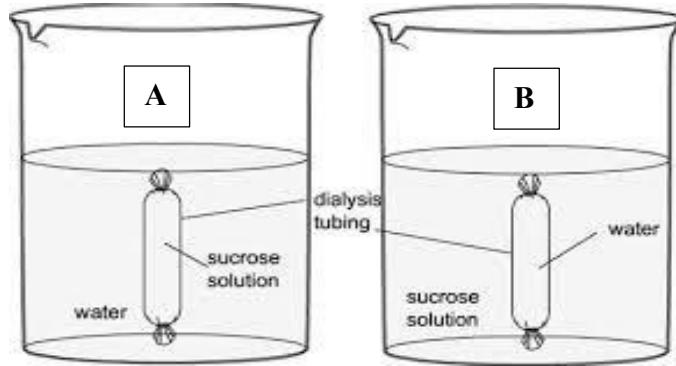
.....
.....

b) Name the endocrine tissue in the pancreas

(1mk)

.....

9. A student made a set up shown below to study a physiological process



a) In which beaker did the dialysis tubing reduce in size?

(1mk)

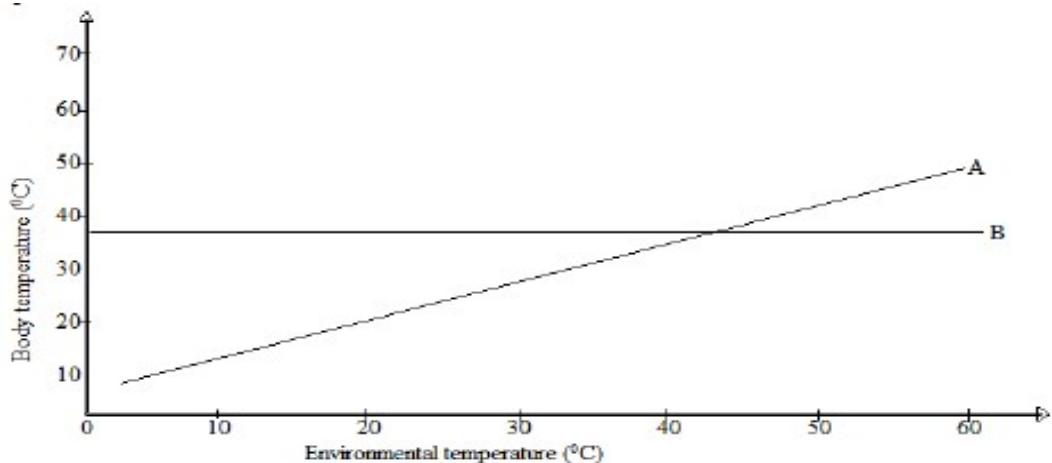
.....

b) Account for your answer in a) above

(2mks)

.....
.....
.....

10. The diagram below shows a graph of body temperature of two different organisms against changing environmental temperature



- a) State the name used to refer to animal A in terms of thermoregulation (1mks)

.....

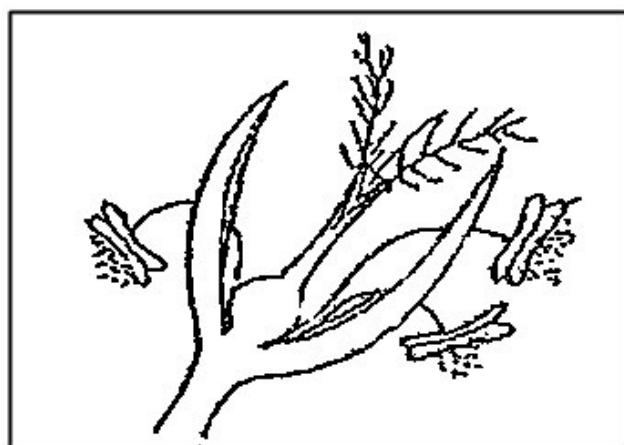
- b) State **TWO** advantages animal B has over animal A (2mks)

.....

.....

.....

11. The diagram shown below is of a flower



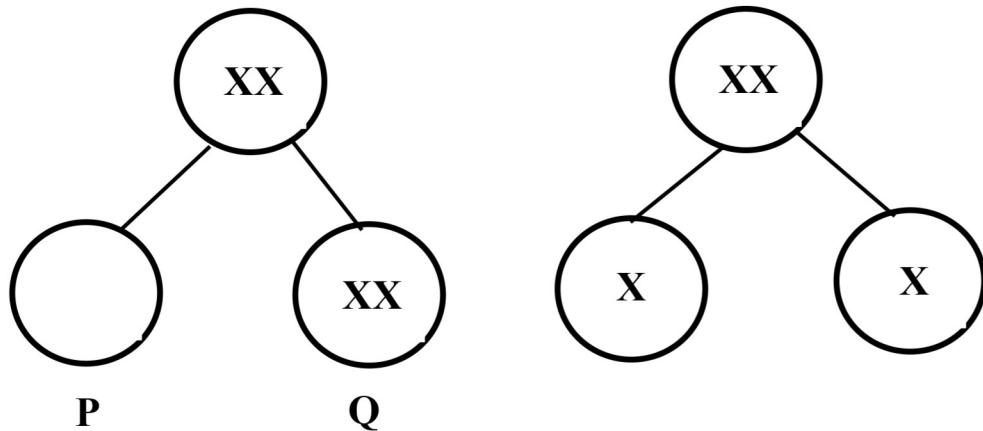
- a) Name the agent of pollination for this flower (1mks)

.....

b) Give **TWO** adaptive features from the diagram to support your answer in a) above **(2mks)**

.....
.....
.....

12. The process of gamete formation is represented below



a) State a reason why the process above represents gamete formation in female mammals **(1mk)**

.....
.....

b) Name the chromosomal mutation represented above **(1mk)**

.....

c) Identify the genetic disorder that arise when the following gametes are fertilized

i) P **(1mk)**

ii) Q **(1mk)**

13. A sample of air was passed through pyrogallic acid and its volume reduced from 8 cm³ to 7 cm³.

When it was later passed through lime water, the volume reduced to 6.8cm³.

a) What was the role of pyrogallic acid in this experiment? **(1mk)**

.....
.....

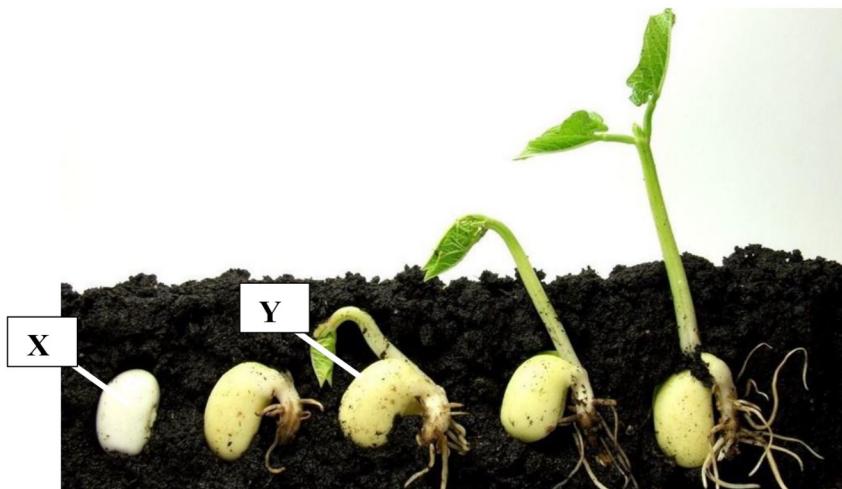
b) Determine the percentage of Carbon (IV) oxide in the sample of air (2mks)

.....
.....
.....
.....

c) Is this sample of air exhaled air or inhaled air? (1mk)

.....
.....

14. The stage-wise process of germination of a seed is shown below



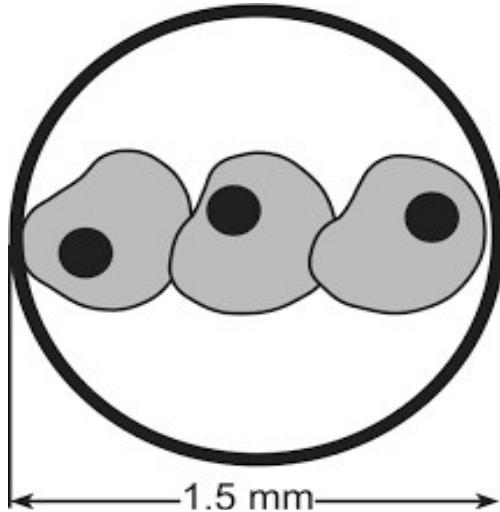
a) Give a reason why the diagram above represents hypogea germination (1mk)

.....
.....

b) Account for the change in dry weight of the cotyledon at stage X and Y (2mks)

.....
.....
.....

15. Barbra observed animal cells in a field of view of a light microscope as shown below. If she used a total magnification of X1000 determine the actual diameter of one cell (3 mks)



16. Explain the importance of the following features

a) Acrosome in the spermatozoa (2mks)

.....
.....
.....

b) Hair-like structures in the fallopian tube (1mk)

.....
.....

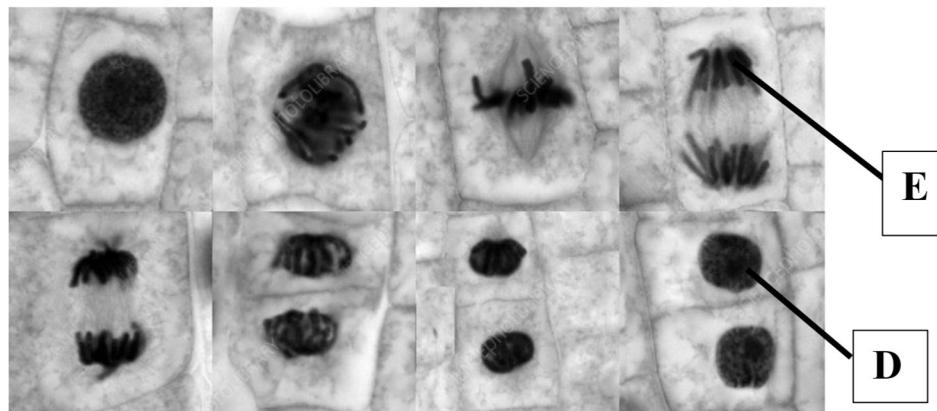
17. a) What are vestigial structures? (1mk)

.....
.....

b) Explain why divergent evolution is advantageous to living organisms? **(2mks)**

.....
.....
.....

18. The various stages of mitosis are represented below



a) Identify the stages represented by the letters:

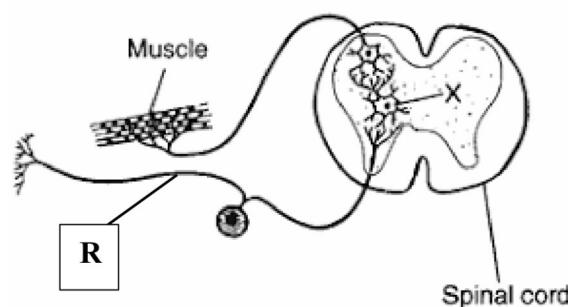
i) D **(1mk)**

ii) E **(1mk)**

b) What shows that the process represented above is taking place in a plant cell? **(1mk)**

.....
.....

19. The diagram shown below represents the various nerve cells



a) Use arrows to show direction of impulse in a reflex arc in the diagram above **(1mk)**

b) Outline expected **TWO** structural differences between nerve cell **R** and **X** **(2mks)**

.....
.....
.....

20. State the function of the following muscles in the body

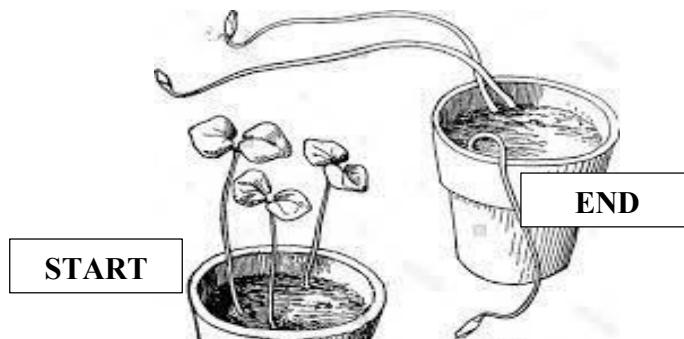
i) Cardiac sphincter muscles **(1mk)**

.....
.....

ii) Erector pili muscles **(1mk)**

.....
.....

21. The diagrams below are of seedlings before and after an experiment.



a) Under which light condition was the experiment carried out **(1mk)**

.....

b) Which term describes the appearance of the seedlings at the end of the experiment **(1mk)**

.....

c) What is the importance of the above experiment in crop production? **(1mk)**

.....
.....

22. State the function of the following cells in the body of organisms

a) Palisade

(1mk)

.....
b) Schwann

(1mk)

.....
c) Sertoli

(1mk)

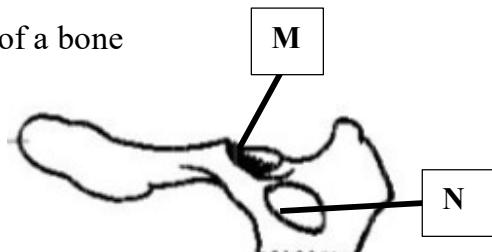
23.a) Mary suspects that she has diabetes mellitus. Using a sample of her urine describe a school laboratory procedure she can follow to confirm it is true (3mks)

.....
.....
.....
.....
.....

b) Why is insulin not administered orally? (1mk)

.....
.....

24. The following is an illustration of a bone



a) Give the name of the bone (1mk)

.....

b) State an advantage of the joint formed at the part labelled M (1mk)

.....

c) State the function of the part labelled N (1mk)

.....

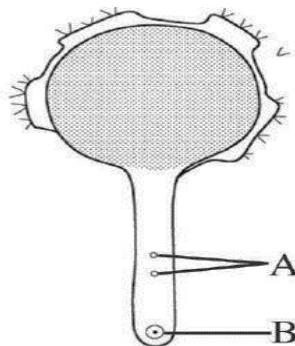
25.a) Distinguish between population and community as used in ecological studies (2mks)

.....
.....
.....

b) State the formula for population estimation using capture recapture method (1mk)

.....

26. The diagram below shows the structure of germinating pollen grain



a) Name the type of cell division that formed the parts labelled A (1mk)

.....

b) State the role of part labelled B (1mk)

.....

27. The picture of a common animal is represented below



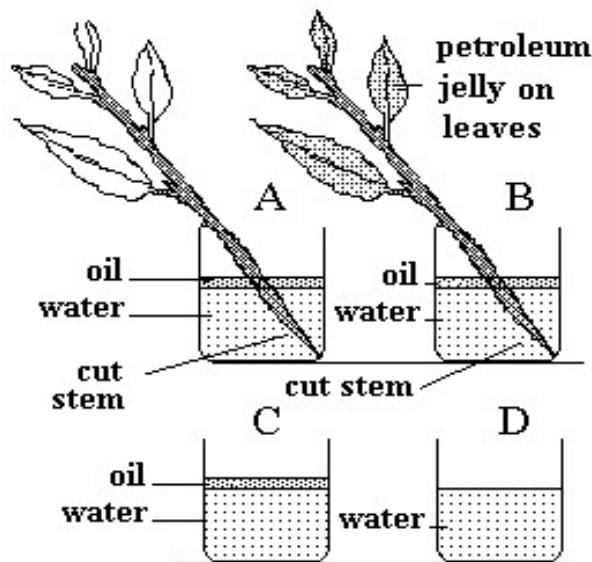
a) Name the class to which the organism shown above belongs

(1mk)

b) Give TWO reasons for your answer in a) above

(2mks)

28. The following experimental set up was placed in sunshine to investigate a biological process



a) Account for the expected result in the level of water in the beaker labelled B

2mks

b) Why were the set up C and D included in the experiment?

(1mk)



KCSE 2024

BIOLOGY

231/2

PAPER 2 (THEORY)

TIME: 2 HOURS

NAME.....

INDEX NO..... CANDIDATE'S SIGN.....

DATE

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES

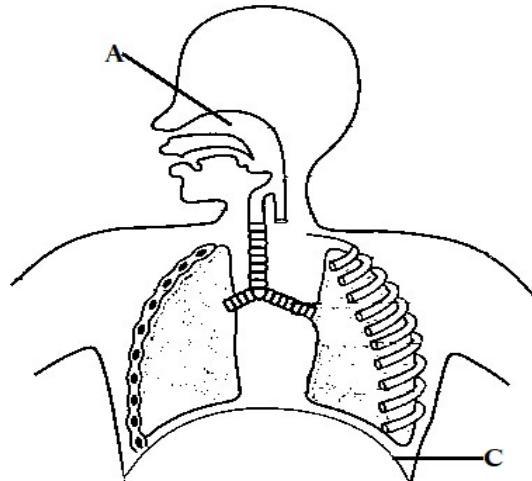
1. Write your name and Index Number in the spaces provided above.
 2. This paper consists of two sections: A and B. Answer **ALL** questions in section A in the spaces provided. In section B, answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

FOR EXAMINERS' USE ONLY

SECTION A (40MARKS)

Answer all the questions in this section in the spaces provided.

1. The diagram below represents the human respiratory system.



- a) How is structure labelled A adapted to its function? (4 marks)

.....
.....
.....
.....
.....
.....
.....

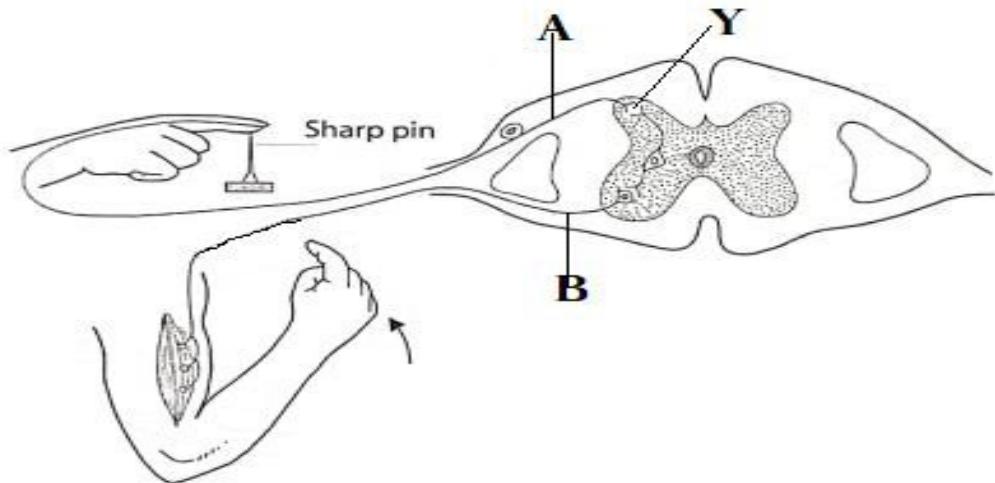
- b) What would be the effect of contractions of the muscles of the structure labelled C during breathing in. (3 marks)

.....
.....
.....
.....
.....
.....

- c) Give the scientific name of the organism that causes whooping cough? (1 marks)

.....

2. The diagram below represents a section of the spinal cord.



a) State **one** structural and functional differences between A and B. (2 marks)

Structural

.....
.....

Functional

.....
.....

b) State **three** differences between a simple and a conditioned reflex? (3 marks)

.....
.....
.....
.....
.....

c) Explain how an impulse is transmitted across region Y? (3 marks)

.....
.....
.....
.....

3. Form 3 students were assigned to study a particular ecosystem around the school.

a) Distinguish between an ecosystem and ecological niche.

(2 marks)

.....
.....
.....
.....

b) Name a suitable method they would have used to estimate the population of wild animals.

(1 marks)

.....

c) State *three* methods which could be used to determine the diet of the wild animals. **(3 marks)**

.....
.....
.....
.....

d) Name biotic factors that could have regulated the animal population? **(2 marks)**

.....
.....
.....

4. a) How is sex in humans determined. **(3 marks)**

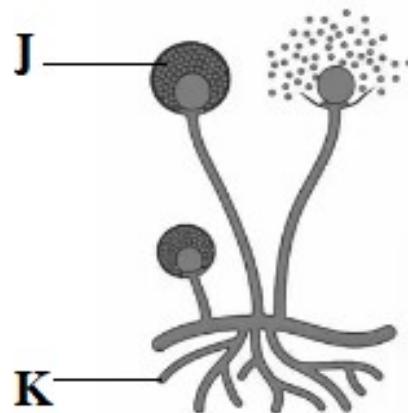
.....
.....
.....
.....
.....

b) In human, hairy ears is controlled by a gene on the Y chromosome. Using letter Y^H to represent the chromosomes carrying the gene for hairy ears, work out a cross between a hairy eared man and his wife. **(4 marks)**

c) Girls will not display hairy ears, explain. **(1 mark)**

.....
.....

5. The diagram below illustrates the structure of bread mould.



a) State the function of the structure labelled K. **(2 marks)**

.....
.....
.....

b) Describe the mode of reproduction.

(5 marks)

.....
.....
.....
.....
.....
.....
.....
.....
.....

c) State any *one* economic importance of members of this kingdom

(1 mark)

.....
.....

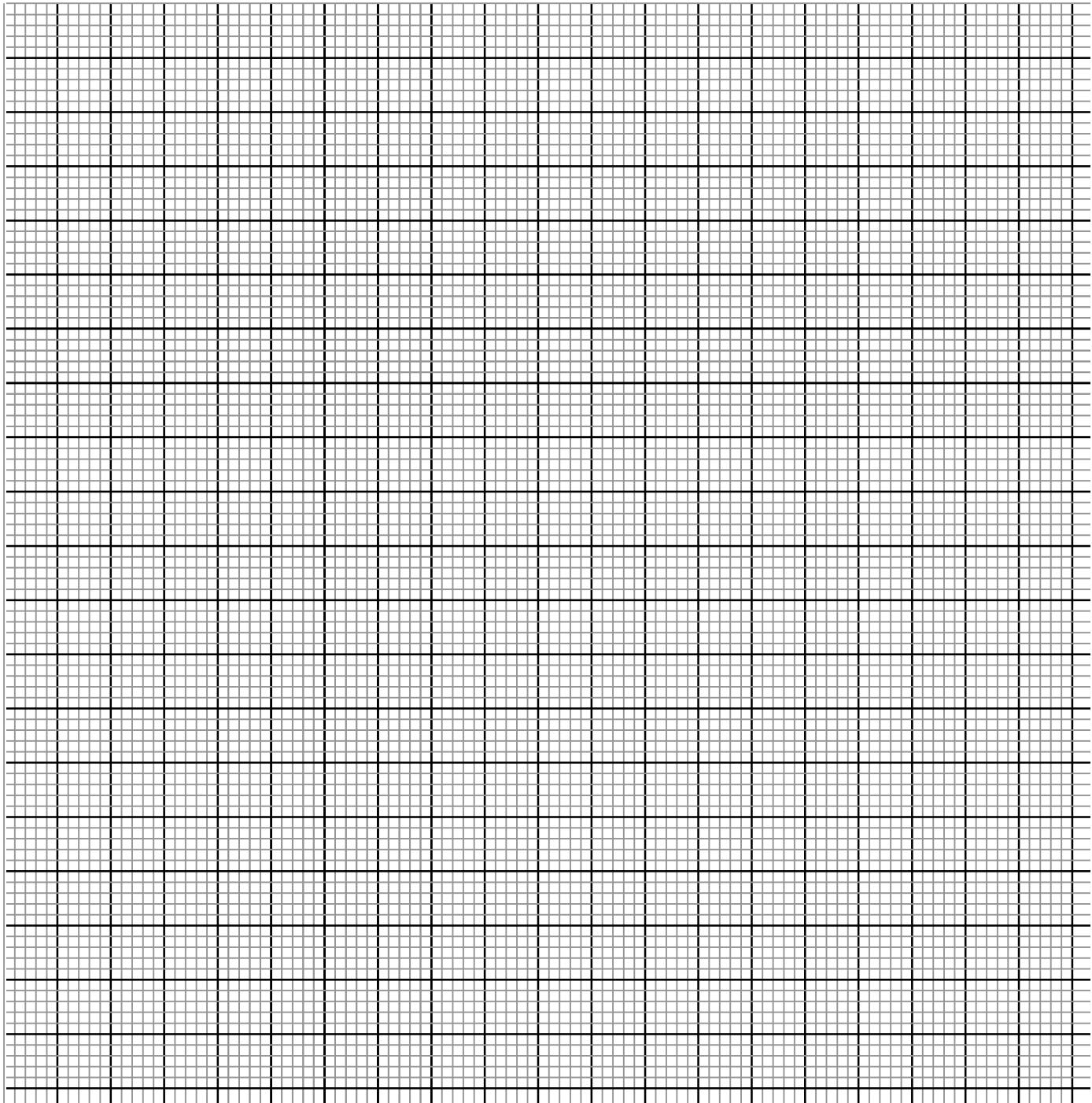
SECTION B

Answer question 6 (compulsory) and either question 7 or 8 in the space provided after question 8.

6. In an experiment carried out in a tropical country, carbon (IV) oxide concentration was measured around a plant in an open air at two hours intervals for a period of 24 hours. The results were as shown in the table below.

Time	%of co ₂ concentration(x10 ⁻²)
3am	3.40
5am	3.60
7am	3.90
9am	3.20
11am	2.95
1pm	2.90
3pm	2.90
5pm	2.92
7pm	3.02
9pm	3.10
11pm	3.20
1 am	3.30
3 am	3.40

a) Plot a graph of % carbon (IV) oxide concentration against time on the grid provided. **(5 marks)**



b) Calculate the rate of change in CO₂ concentration between 4 a.m. and 7 a.m. **(2 marks)**

c) Give a reason for the change in CO₂ concentration between:-

i) 7 a.m. to 11 a.m. (2 marks)

.....
.....
.....

ii) 12 noon to 4 p.m. (2 marks)

.....
.....

iii) 5p.m. and 5 a.m. (3 marks)

.....
.....
.....

d) With reasons identify *three* environmental factors that are likely to affect the results. (6 marks)

.....
.....
.....
.....
.....
.....

7. **Describe** how the male reproductive system is adapted to perform its functions. (20 marks)

8. **Explain** the role of the following hormones in growth and development:

(a)(i) Indole acetic acid. (5 marks)

(ii) Gibberellin. (5 marks)

(iii) Cytokinin. (5 marks)

(b) Describe role of hormones in insect metamorphosis. (5 marks)



KCSE 2024



BIOLOGY

231/3

PAPER 3 (PRACTICAL)

TIME: 1 $\frac{3}{4}$ HRS

NAME.....

INDEX NO..... CANDIDATE'S SIGN.....

DATE

BIOLOGY (CONFIDENTIAL REPORT)

Each candidate should have the following;

- a) Transparent ruler
- b) 20mls of distilled water in a boiling tube labelled **solution X**.
- c) 20mls of saturated NaCl solution in a boiling tube labelled **solution Y**.
- d) DCPIP solution
- e) A large sized maize grain labelled **specimen X**
- f) Scalpel
- g) NaOH solution (about 5ml)
- h) Bunsen burner
- i) Labels (2 pieces)
- j) Medium sized passion fruit labelled **Specimen Z**.
- k) Test tube holder
- l) Test tubes (3 pieces)
- m) Complete leaf (medium sized) of **Sukuma wiki** (kales) labelled **Specimen A**.
- n) Boiling tubes (2 pieces)
- o) Mortar and pestle
- p) Distilled water (about 15ml) in a small beaker
- q) Benedict's solution (about 5mls)
- r) CuSO₄ solution (about 2mls) with a dropper
- s) Measuring cylinder (50ml capacity)
- t) Test tube holder
- u) Bean pod (any type of bean) or Crotalaria pod labelled **Specimen Y**.



KCSE 2024

BIOLOGY

231/3

PAPER 3 (PRACTICAL)

TIME: 1 $\frac{3}{4}$ HRS

NAME.....

INDEX NO..... CANDIDATE'S SIGN.....

DATE

Kenya Certificate of Secondary Education.

INSTRUCTIONS TO CANDIDATES:

- Write your **name, index number, admission number, school and stream** in the spaces provided.
- Sign and write the **date of examination** in the spaces provided above.
- You are required to spend the first 15 minutes of the 1 $\frac{3}{4}$ hours allowed for this paper reading the whole paper carefully before commencing your work.
- Answer **ALL** the questions in this paper in the spaces provided.
- Candidates **should** answer the questions in English.

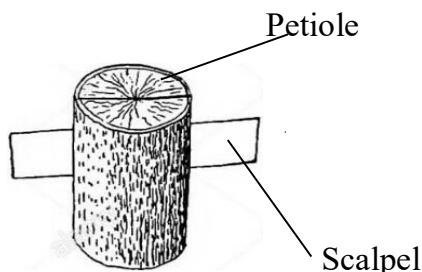
FOR EXAMINER'S USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	16	
2	12	
3	12	
Total	40	

Answer ALL the questions in this paper.

1. You are provided with **Specimen A**, **Solution X** and **Solution Y**.

(a) Cut out a cylindrical portion of the petiole from **Specimen A** measuring 5cm long (reserve the leaves for **part b** of the question). Make a longitudinal section through the petiole so as to divide it into two identical straight halves as shown below;



Place one straight half of the petiole into the boiling tube containing **solution X**, and label the tube as **Set up I**. Place the other straight half of the petiole into the boiling tube containing **solution Y**, and label the tube as **Set up II**. Leave the two set ups to stand for 30 minutes.

Remove the two halves of the petiole from the solutions and examine them.

(i) Account for the curvature of half of the petiole in **set up I**. (5marks)

.....
.....
.....
.....
.....
.....
.....

(ii) Based on your observation of the curvature of half of the petiole in **set up II**, state the nature of **solution Y** in relation to plant cells. (1mark)

.....

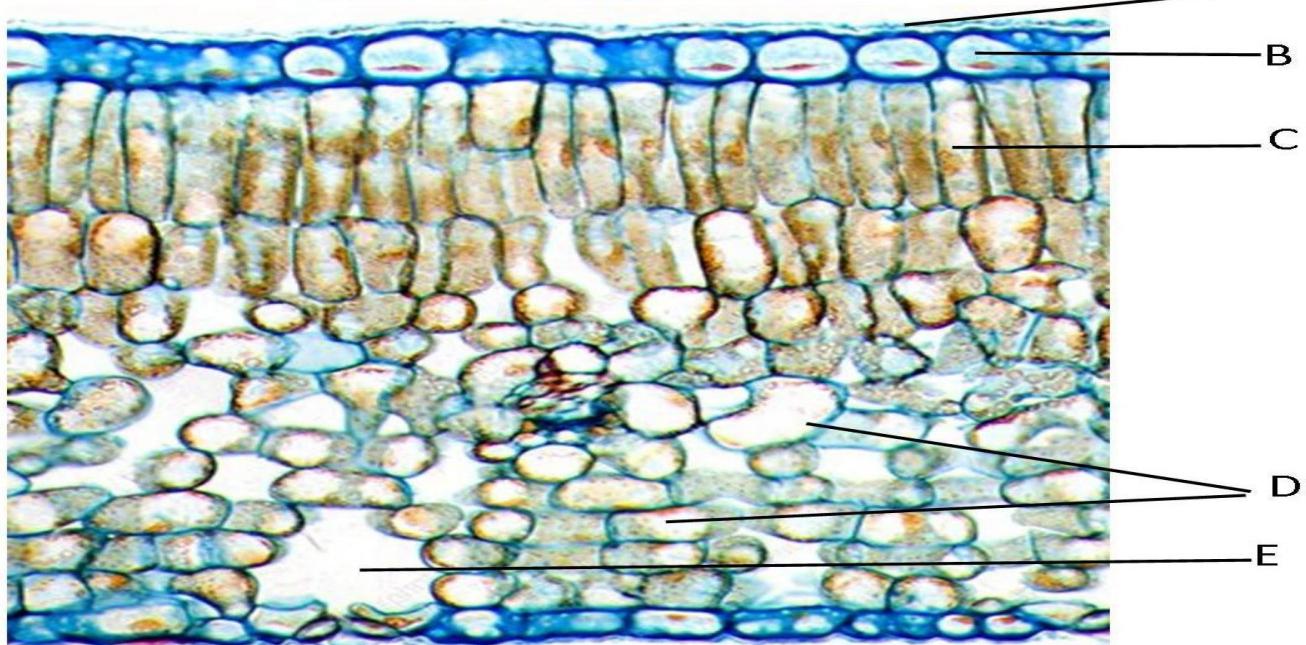
(b) Cut the leaves of specimen A into small pieces and place them into a mortar. Add 10ml of distilled water, then grind them using a pestle so as to obtain an extract called **solution R**. Using the reagents provided, carry out various tests using the procedures in the table below to determine the food substances in the solution R. In each case, state the observation and conclusion made.

(6 marks)

Food substance	Procedure	Observation	Conclusion
Proteins	-Place 2ml of solution R into a test tube. - Add equal amount of NaOH solution. -Add CuSO ₄ solution dropwise and shake		
Reducing sugars	-Place 2ml of solution R into a test tube. -Add equal amount of Benedict's solution. -Boil the mixture.		
Vitamin C	-Place 2ml of DCPIP into a test tube. -Add solution R dropwise as you shake.		

(c) The photograph I below shows the internal structure of Specimen A. Study it carefully and answer the questions that follow.

PHOTOGRAPH I



(i) Identify the structures labelled A and B.

(2marks)

A.....

B.....

(ii) State **one** structural difference between cells C and D. **(1mark)**

.....
.....

(iii) What is the function of the part labelled E ? **(1mark)**

.....

2. You are provided with **Specimens X, Y and Z**.

(a) State the type of dry, indehiscent fruit represented by **specimen X**. **(1mark)**

.....

(b) With a reason, state the method of dispersal of **specimen Y**. **(2marks)**

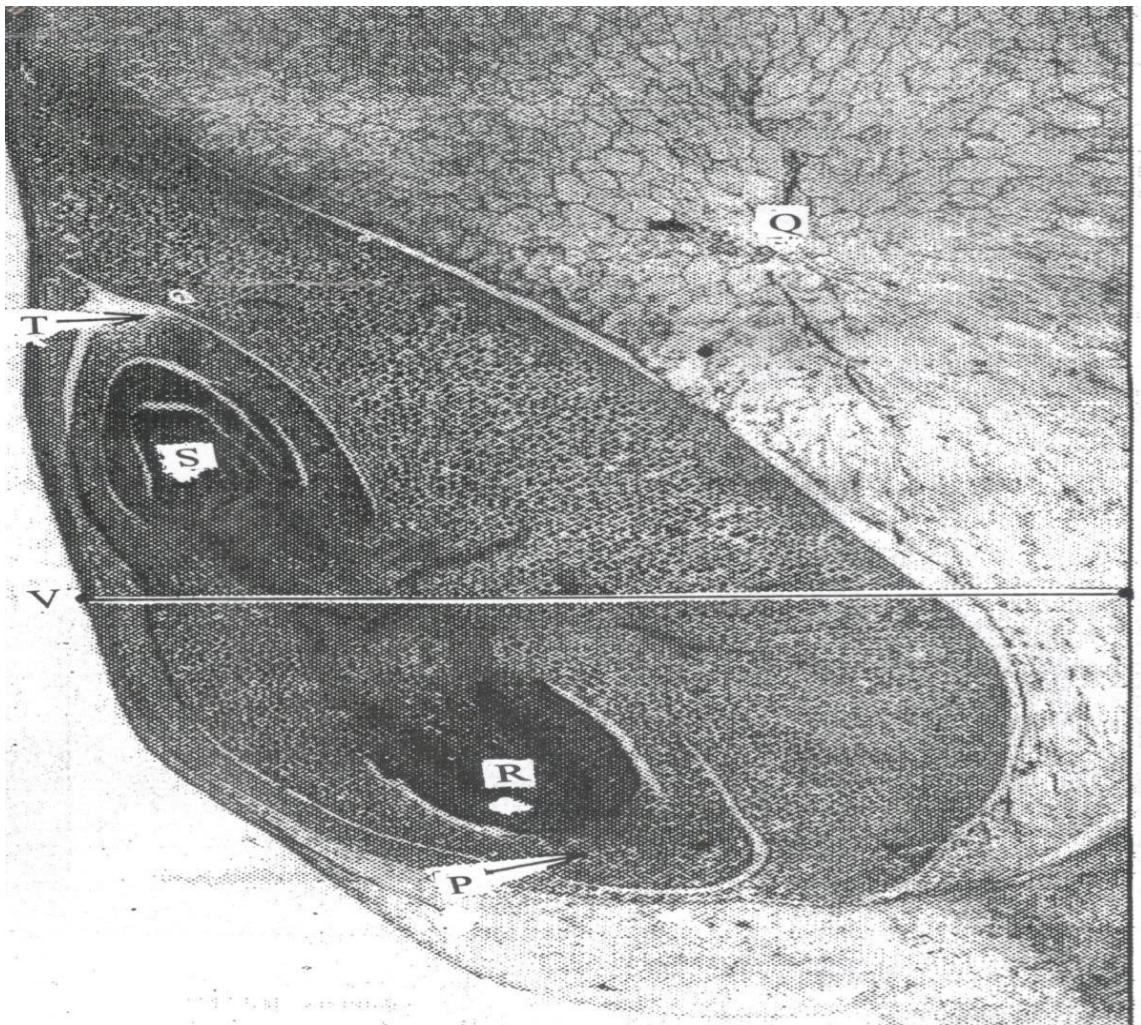
(i) Method of dispersal.....

(ii) Reason

.....
.....

(c) Cut **specimen Z** transversely so as to obtain two identical halves. Draw and label the cut surface of one half. **(3marks)**

(d) Below is a photograph of the internal longitudinal section of **Specimen X**.



(i) Name the parts labelled P and S.

(2marks)

P.....

S.....

(ii) State the function of the part labelled T.

(1mark)

.....

(iii) Identify the region that would stain blue black with iodine solution.

(1mark)

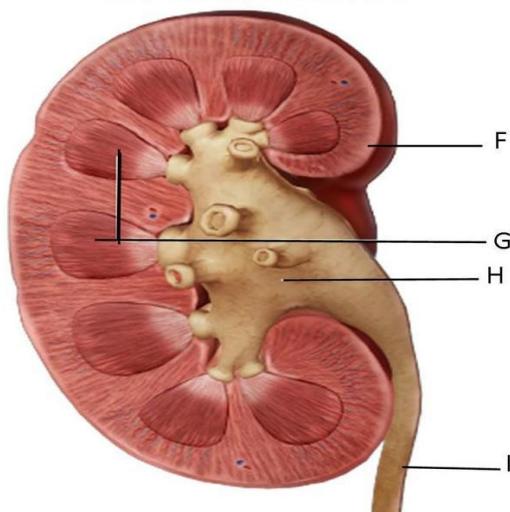
.....

(e) The magnification of the internal longitudinal section in the above photomicrograph was X30,000. Measure the distance of the dark horizontal line between V and W in millimetres. Calculate the actual width of the section between V and W in micrometres. (2marks)

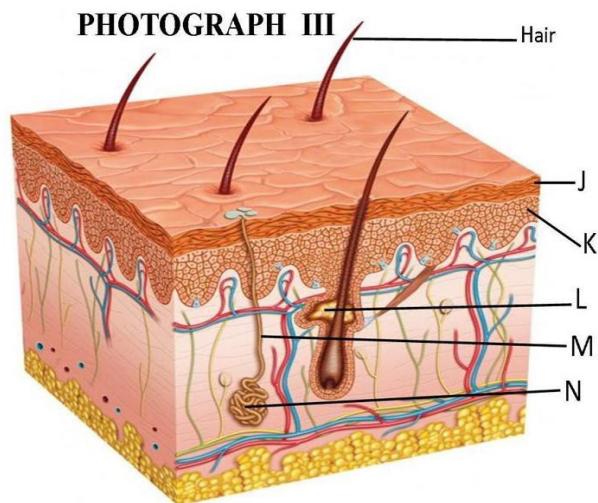
.....
.....
.....

3. Below are photographs II and III of the mammalian kidney and skin respectively.

PHOTOGRAPH II



PHOTOGRAPH III



(a) Identify the layers labelled F, J and K. (3marks)

F.....

J.....

K.....

(b) State the function of each of the parts labelled L and M. (2marks)

L

M.....

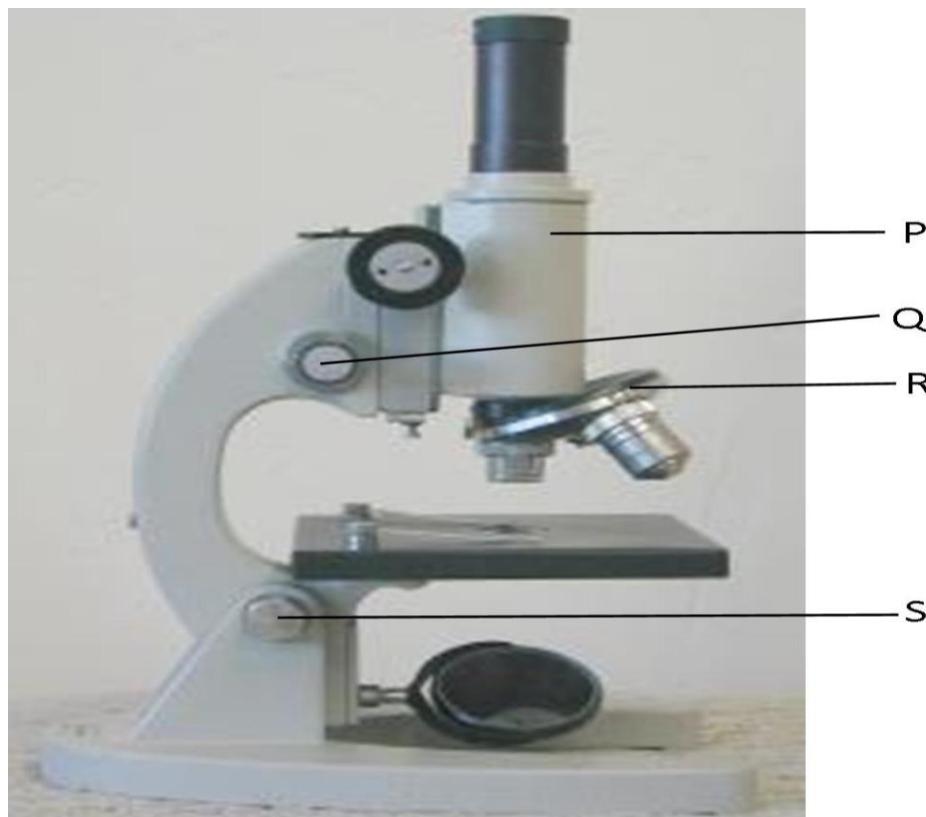
(c) Explain how the structure labelled N is adapted to its function. (1mark)

.....
.....

(d) Identify part in photograph II that contains glomeruli. (1mark)

.....

(e) The cells in the layer labelled J can be examined using the light microscope shown below.



(i) Identify on the above photograph the structure that would be adjusted to improve on the clarity of blurred images of the cells in layer J. (1mark)

(ii) State the significance of using a sharp razor or scalpel to cut through layer J to obtain the cells for examination in the above microscope. (1mark)

(iii) Name the part labelled S in the above microscope. (1mark)

(iv) State two functions of the light microscope during examination of the cells in layer J. (2marks)