BIOLOGY

K.C.S.E PAPER 231/2 1995

PRACTICAL

QUESTIONS

1. You are provided with a specimen labelled K. With the help of a hand lens examine the specimen.

   a) (i) State the phylum to which the specimen belongs

   (ii) Using the observable features only, name the class to which the specimen belongs.

   (iii) Give your answer in (a) (ii) above

   b) Using the observable features, only state how the animal is adapted to living in its habitat.

   c) Cut three of specimen K into tiny pieces. Place the pieces into a boiling tube. Add 5m if water. Boil for five minutes. Decant the extract into a clean test tube.
   Using the reagents provided, identity the food substances in the extract. Record the food substances being tested for observations and conclusions in the table below.

Food substance	procedure	observations	Conclusion
Protein			
Reducing sugar			

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2. You are provided with a specimen labeled M. Make a longitudinal section through the flower.

a) (i) Draw and label the longitudinal section of the flower.

(ii) State the magnification of your drawing

b) (i) Name the agent of pollination of the flower

(ii) State two ways, which the flower is adapted for pollination by the agent named in b(i) above.

3. You are provided with specimens labeled N, P and Q. examine them.

a) With a reason in each case, state whether the animal leaves in a dry or moist environment.

Animal	Type of Environment	Reason
N		
P		
Q		

b) With a reason in each case, state the type of locomotion each animal exhibits.

Animal	Type of locomotion	Reason
N		
P		
Q		

c) (i) Adult / imago;

(ii) Larva Rej; maggot

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BIOLOGY
K.C.S.E PAPER 231/2 1996
PRACTICAL
QUESTIONS

1. You are provided with a specimen labelled D, which is part of a plant.

a) (i) Using external features only, identify the part of plant leaf.

(ii) Give three reasons for your answer in a (i) above.

b) Peel off the epidermis of the lower surface of the specimen. Mount a portion of the epidermis in a drop of water on a microscope slide. Stain with methylene blue, cover slip, observe the specimen under high power objective and count the number of stomata in the field of view. Record the number of stomata in the table below. Repeat the counting of stomata two times, each time moving the slide to another field of view. Record the number of stomata for each field of view in the table.

Field of view	Number of stomata in	Each field of view
	Lower	Upper epidermis
1. High power		
2. High power		
3. High power		
Average number of stomata		

c) Repeat the procedure in (b) above using a peeling of the upper epidermis. Record the number of stomata in the table.

d) Record the following from the microscope you used to count the stomata.
(i) Magnification of eyepiece lensx10/x15
(ii) Magnification of objective lens used x40 / x45
(iii) From the data in d(i) and (ii) above, calculate the total Magnification. Show your working.

e) Account for the average number of stomata on each side of the specimen.
Upper epidermis-
Lower epidermis –

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2. You are provided with a specimen labeled H, which is a piece of mammalian intestine. Squeeze the contents in the lumen into a test tube. Add 3ml of water and shake the contents.

Reserve the piece of intestine for question (b)

a) (i) Use the reagents provided to test for the presence of Starch, proteins and reducing sugars in the contents. Record the procedures, observations and conclusions in the table below.

Food substance	procedure	Observations	Conclusion
Starch			
Proteins			
Reducing Sugars			

(ii) Account for the results obtained in (a) (i) above

b) Cut specimen H along its length to expose the inner surface.

(i) Feel the inner and outer surfaces of the specimen. Record your Observations.

Inner surface-
Outer surface: Smooth

(ii) Account for your observations of the inner surface.

3. You are provided with a specimen labeled J.

a) Using observable features only, identify the class to which the specimen belongs.

Use the observable features used to identify the class, which the Specimen belongs.

(i) Presence of fins
(ii) Presence of scales / overlapping
(iii) Present gills/operculum
(iv) Presence of lateral line

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b) Stroke the specimen on the lateral side from the head end to the tail end. Repeat the stroking from tail end to head end.

(i) Record your observations

(ii) Observe the arrangement of the scales .Record your Observations

(iii) State the significance of the arrangement of the scales.

c) i) Cut and remove the operculum to expose the gills. Remove one complete gill from the specimen and place it in a Petri dish containing enough water to cover it. Examine the gill using a hand lens.

(ii) How is the gill adapted to its function?

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BIOLOGY

K.C.S.E PAPER 231/2 1997

PRACTICAL

QUESTIONS

1. You are provided with a specimen labeled Q. Make a transverse section of the specimen.

   (a) (i) Draw and label the section

   (ii) Work out the magnification of your drawing

   (b) What type of fruit is specimen Q?

   (c) Slice off about 2cm thick disc from the specimen. Peel it. Place piece into a beaker and mash it into paste using a glass rod. Add 20ml of distilled water and stir. Tie one end of the transparent tubing provided. Decant the extract into the tubing and tie the other end tightly.
   ENSURE THERE IS NO LEAKAGE AND BOTH ENDS OF THE TUBING
   Rinse the outside of the tubing with water. Immerse the tubing with its content in 100ml beaker containing iodine solution. Allow standing for 20 minutes.

   (i) Record your observations in the table below.

Before the experiment		
After the experiment		

   (ii) Account for the results obtained in c (i) above

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2. Below is a photograph of a dissected mammal. Study the photograph and answer the questions that follow

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(a) Name the structures labeled

(b) (i) state the functions of the structure labeled

F1 –

F2-

(ii) With reasons, state the sex of the dissected mammal

(c) (i) Name the dissecting tool placed at the anterior end of the mammal

(ii) State the use of the tool during a dissection

(d) The actual length of the tool you have named in c(i) is 15cm. Measure the actual length of the tool in the photograph and calculate the magnification of the photograph.

3. You are provided with specimens P1, P2, P3, P4, P5, P6, P7, P8, P9 and P 10

Below is a dichotomous key, which can be used to identity specimen P1 – P9.

(a) Identify the specimens using the key. Indicate the steps followed to identify each specimen.

1 a; Leaf simple	go to 3
b; leaf compound	go to 2
2 a; Leaf lobbed	Oxalidaceae
b; Leaf with unlobbed leaflets	go to 8
3 a; Leaf parallel veined or with a spine	go to 4
b; leaf net- veined	go to 6
4 a; leaf succulent	go to 5
b; Leaf not succulent	Graminae
5 a; Leaf with sheath	Commelinaceae
b; leaf without sheath	Agavaceae
6 a; leaf rough on the upper surface	go to 9
b; leaf surface smooth or hairy	go to 7
7 a; leaf surface smooth	Anacardiaceae
b; Leaf surface hairy	Solanaceae
8 a; leaflets margins serrated	Compositae

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b; leaflets margins smooth Mimosaceae

9 a; Leaf surface not spiny Verbanaceae
b; Leaf surface spiny Rosaceae

Specimen	Identity	Steps Followed
P1	……..	……..
P2	……..	……..
P 3	……..	……..
P5	……..	……..
P6	……..	……..
P7	……..	……..
P8	……..	……..
P9	……..	……..

(b) Using a razor blade, make a thin section of the petiole of specimen P 10. Stain the section methylene blue and mount on a microscope slide Observe using the hand lens

(i) Make a labeled plan diagram of the section

(ii) From your observations of the section, to which class does the specimen belong?

Class
Reason

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BIOLOGY

K.C.S.E PAPER 231/2 1998

PRACTICAL

QUESTIONS

1. You are provided with specimen labeled M and N. Examine them.

   (a) Describe the arrangement of the stamens in specimens M and N.

   (b) Carefully remove one stamen from specimen M. Examine it using a hand lens. Draw and label it.

   (c) Remove another stamen from specimen M. Cut the anther transversely into two equal parts. Tap the pollen grains from the lower half onto a microscope slide.
   Add a drop of iodine. Place a cover slip and press on the cover slip gently to spread out the pollen grains. Observe the pollen grains under medium power.

      i. Draw one pollen grain.

      ii. State the magnification

   (d) Remove an anther from specimen N. Place it on a microscope slide. Add a drop of iodine. Cover with a cover slip. Press gently on the cover slip to spread out the pollen grains. Observe the pollen grains under medium power.

   Draw one pollen grain

   State the magnification X 100

   (e) State two observable differences between the corolla of specimen N and M

   (f) State four observable differences between the corolla of specimen M and N

2. You are provided with a solution labelled L, starch solution and sodium chloride in two different concentration 0.1% and 1.4%. Place 3ml of starch solution in test tubes labelled 1,2 and 3. Add 3 drops of 0.1% sodium chloride to the test

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tube labelled 3.

Add 3 ml of solution L to each test tube labelled 2 and 3

(a) Place a drop of the contents from each test tube 1, 2 and 3, on a white tile. To each drop add iodine solution. Record your results in the table below.

Test tube	Observation at start of experiment	Observation at end of experiment

(b) Place the test tube in water bath maintained at 37^0C. Allow to stand for 30 minutes. Place a drop f the contents from each test on a white tile. To each drop add iodine solution. Record your observations in the table.

(c) Add equal amounts of Benedict's Solution in test tubes labelled 2 and 3 boil. Record your observations

(d) Why was the test tube labeled 1 included in the experiment?

(e) Account for the results in test tube 1,2 and 3 at the end of the experiment.

(f) Suggest the Identity of solution L

(g) Why were the test tubes placed in a water bath maintained at 37^0 C?

3. You are provided with specimens labeled R and S. Examine them.

(a) (i) Name the phylum and the class to which the specimens belong

(ii) State two distinguishing features found in the members of

(b) State two differences between the wings of specimen R and S

(c) Remove one whole hind legs from specimens R and S.
Draw and label them.

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(d) Draw and label the front view of the head of specimen S.

BIOLOGY

K.C.S.E PAPER 231/2 1999

PRACTICAL

QUESTIONS

1. You are provided with specimens labeled S and T. draw a plan diagram of the cut surface of specimen S. label it.

(b) Open specimen T longitudinally. State three differences between specimen S and T

(c) With reasons in each case state the type of fruit and method of dispersal for specimen S and T

2. You are provided with specimen labeled X, Y and Z

(a) Identify the specimens

(b) Name the part of the mammalian body from which the specimens were obtained.

(c) Make a drawing to show how X, Y, and Z are articulated

State the magnification of your drawing

(d) With reasons name the type of joint formed at the proximal and distal ends of Specimen Y

(e) What is the significance of the part labelled W

(f) You are provided with a specimen labeled R. Examine it

(i) Name the observable features that adapt the specimen to:
Forward movement

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3. You are provided test for the food substances in the suspension in the table below.

(a) Using reagents provided test for the food substances in the suspension. In the table below, record the food tested, your procedures, observations and conclusions.

Food Substance	Procedure	Observation	Conclusion
Starch			
Reducing sugar			
No reducing sugar			
Protein			

(b) Name two enzymes that may be required to digest suspension M in the alimentary canal in human beings.

(c) State the role of hydrochloric acid and sodium hydrogen carbonate in the experiment.

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BIOLOGY

K.C.S.E PAPER 231/2 2000

PRACTICAL

QUESTIONS

1 (a) You are provided with a specimen labeled D

(i) Name the specimen to which the specimen belong Arthropoda

(ii) State three characteristics found in the members belonging to the phylum

(b) (i) Name the class to which the specimen belongs

(ii) State four characteristics found in the members of class

(c) Remove, draw, and label the mouth parts used for:

(i) Biting and chewing food

(ii) Hold food

(iii) Feeling and tasting food

(c) Examine the wings of the specimen. State the differences between them.

2. You are provided with specimens labelled E, F and G.

(a) With reasons state which part of plant are specimens E, F and G.

Make a longitudinal section through G

(b) Draw and label the specimen

(c) (i) name the vitamin present in specimen E

(ii) What are two functions of the vitamin named in (c) (i) above.

(d) State three differences in specimen F and G

3. You are provided with a substance labelled H. Filter the substance and collect filtrate. Filtration is expected to be complete after about 30 minutes. Using the reagents provided, test for the food substances in the residue and the filtrate.

Record your procedures, observations and conclusions in the table below.

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BIOLOGY

K.C.S.E PAPER 231/2 2001

PRACTICAL

QUESTIONS

1. You are provided with a portion of the onion bulb. Remove one fleshy leaf from the portion. Peel the epidermis from the inner surface of the leaf. Place it in a drop of water on a slide. Place a cover slip on the epidermis. Place one drop of iodine solution at one edge of the cover slip. Using a blotting paper drain of excess iodine solution and water from the opposite edge of the cover slip. Observe the epidermis under low power, then under medium power.

   (a) Draw and label the two neighbouring cells

   (b) Why is the staining of the epidermis necessary?

   (c) Work out the length and the width of one cell as seen under medium power.

   (d) Place a drop of liquid L at the edge of the cover slip. Drain the liquid form the opposite edge to allow it flow across the epidermis. Leave the set up for about five minutes.
   Observe under medium power.

   Draw and label two neighbouring cells

2. You are provided with specimen labelled M and N. examine them.

   (a) Identify the specimens and state the organism from which they were obtained

Specimen	Part	Organism
M		
N		

   (b) Draw and label specimen M

   (c) Using observable features only, explain how specimen M is adapted to its function

   (d) State three distinguishing features of specimen N

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(e) State the functional relationship between specimens M and N

3. You are provided with specimens labelled P1, P2, P3, P4, P5 and P6. A dichotomous key shown below can be used to identify them.

1.	(a) Leaves simple	go to 2
	(b) Leaves compound	Cassia
2.	(a) Leaves green	go to 3
	(b) Leaves purple	Tradescantia
3.	(a) Leaves parallel veined	Zea
	(b) Leaves net veined	go to 4
4.	(a) Leaf margin serrated	go to 7
	(b) Leaf margin smooth	go to 5
5.	(a) Leaves hairy	Solanum
	(b) Leaves not hairy	go to 6
6.	(a) Leaves ovate	bouganviillea
	(b) Leaves lanceolate	Mangifera
7.	(a) Leaves fleshy	go to 8
	(b) Leaves not fleshy	Hibiscus
8.	(a) Leaves with pointed tip	Kalanchoe
	(b) Leaves with rounded tip	Bryophylum

(a) Use the dichotomous key to identify each of the plant specimens provided. In each case show the sequence the steps. (e.g 1a, 2b, 5b etc) In the key that have followed t arrive at the identity of each specimen.

Specimen	Steps Followed	Identity
P1	……..	…….……
P2	……..	…….……
P3	……..	…….……
P4	……..	…….……
P5	……..	…….……
P6	……..	…….……

(b) (i) Name the likely habitat of specimen P1

(ii) Give a reason for your answer in (i) above

(c) State the significant of the shinny upper surface of specimen P4

(d) Observe the floral parts of specimen P3. What is the significance of the brightly coloured structures onto which the flowers are attached?

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(e) Name two features that make specimen P5 adapted to its environment.

(f) Name a feature that is used to classify P6 as monocotyledonous plant

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BIOLOGY

K.C.S.E PAPER 231/2 2002

PRACTICAL

QUESTIONS

1. You are provided with specimens labeled D_1, D_2, D_3 and D_4. Examine them

   (a) Draw and label specimens D_1 and D_2

   (b) Giving reasons state the agent or method of dispersal of the specimens.

   (c) State the types of gynoeciums and placentation of specimen D_4.

2. You are provided with olive oil, liquids labelled L_1 and L_2 and an Irish potato. Label two test tubes A and B. Place 2 cm^3 of water into each test tube. To test tube labelled A, add 8 drops of liquid L_1. Shake both test tubes. Allow to stand for five minutes.

   (a) (i) Record your observations
   Test tube A

   Testy tube B

   (ii) Name the process that has taken place in test tube A.

   (iii) State the significance of the process named in (a) (ii) above to increase surface area.

   (iv) Name the digestive juice in humans that has the same effect on oil as liquid L_1

   Region of alimentary canal into which the juices is secreted

   (b) Label two test tubes C and D. place 2cm^3 of liquid L_2 into each. Add a drop of iodine into each test tube.

   (i) Record your observation

   (ii) Suggest the identity of L_2

   (iii) Record your observation.

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(iv) Account for the results in (b) (iii) above

(c) (i) Cut another cube whose sides are 1 cm from the Irish potato.
Crush the cube. Place the crushed paste into test tube.
Carry out food test with the reagent provided.
Record the procedure and results
Procedure
Add equal amount of benedicts solution to the paste and boil; heat/ to boil/ warm.

Results

(ii) Account for the results in (c) (i) above

3. You are provided with specimens labelled Q and R. examine them.

(a) Giving reasons state the phylum of the specimens

(b) (i) Name the class to which the specimen belong

(ii) State the features common to both specimens that are Characteristics of the class mentioned in (b) (i) above.

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BIOLOGY

K.C.S.E PAPER 231/2 2003

PRACTICAL

QUESTIONS

1. You are provided with specimens labelled C, D and a solution labelled L

(a) (i) State the habitat of specimen C

(ii) Name the trophic level occupied by specimen C.

(iii) Give a reason for your answer in (a) (ii) above

(b) (i) Place $5cm^3$ of solution L into a 100ml beaker. Using a straw, blow gently into the solution.

(ii) Give a reason for the observation in (b) (i) above.
Carbon dioxide in exhaled air / exhaled an contains carbon dioxide or carbon dioxide /carbon dioxide in air;

(c) Place $5cm^3$ of a solution L into 100ml beaker. Put the forceps, submerge specimen C into one of the 100ml beaker. Put the two beakers in the dark. Leave the set up for at least one hour and observe.

(i) Record your observation.

(ii) Explain the observation in (c)(i) above.

(d) Examine specimen D using a hand lens.
Giving a reason, state the division to which the specimen belongs.

(e) What role is played by specimen D in an ecosystem?

(f) Draw and label specimen D.

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2. You are provided with a specimen labeled E, 0.01% DCPIP and 0.1 Ascorbic acid. Examine specimen E.

a) (i) What part of the plant is specimen E.

(ii) Give a reason fro your answer in (a)(i) above.

b) Cut a transverse section through specimen E.

(i) Draw and label one of the cut surfaces.

State the magnification of your drawing?

(ii) State the type off placentation of specimen E.

c) Name the agent of dispersal of specimen E.

d) State how specimen C is adapted to its mode of dispersal.

e) i) To $1cm^3$ of DCPIP in a test tube, add 0.1% solution of ascorbic cid drop by drop until the colour of DCPIP disappears. Shake the test tube after addition of each drop. Record the number of droplets used.

ii) To another $1cm^3$ of DCPIP in a test tube add the juice from specimen E drop by drop. Shake the test tube after addition of each drop until the colour of DCPIP disappears. Record the number of drops used?

iii) From the results obtained in (e) (i) above, calculate the percentage of ascorbic acid in the juice obtained from specimen E.

iv) State two factors that would influence the accuracy of the results.

(f) (i) Suggest the expected results if the juice from specimen E was boiled for 30 minutes, cooled and added drop by drop to DCPIP solution.

(ii) Explain the expected results in (f) (i) above.

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3. You are provided with a specimen labeled B.

a) i) Name the class to which the specimen belongs
ii) Give two reasons from your answer in (a)(i) above.

b) What term is used to describe the shape of the specimen?

c) Stroke the specimen from the :
i) Head to tail. Record your observation
ii) Tail towards the head. Record your observation
iii) What is the significance of your observation in c (i) and (ii) above?

d) Measure in millimeters the length of the :

i) Specimen from the tip of the mouth to the tip of the tail.
Length_____ cm.

ii) Tail from the anus to the tip of the tail'
length _____ cm

iii) Using the measurements in (d) (i) and (ii) above, calculate the tail power.

e) Name and draw the fins on the specimen that:

i) Enable the specimen to balance, brake and change direction.

ii) Prevent the fish from rolling and yawing.

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BIOLOGY

K.C.S.E PAPER 231/2 2004

PRACTICAL

QUESTIONS

1. You are provided with specimens labeled j1, j2, K1 and K2. Examine them

a) With a reason, name the order to which specimens J1 and 72 and K1 and K2 belong. (4mks)

b) i) Name the curved part of specimen J1 (1mk)

ii) What is the importance of the curvature? (1mk)

c) Explain how the curve part in J1 will straighten so that the stem will look like that of J2 (4mks)

d) Name the part that protects the plumule is specimen k1 and k2 (1mks)

e) i) Which of the two types of seedlings may form swelling on the roots later in its life?

ii) What is the name of the swelling? (1mks)

iii) Name the organisms that would be found in the swellings. (1mk)

iv) Explain the relationship that exists between the named

f) i) Name the structures found on the stem just below the leaves of specimen J2 (1mk)

ii) State two functions of the structures named in (f)(i) above (2mks)

g) i) State the types of germination exhibited by specimen K1 and k2 (1mk)

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ii) Give a reason for your answer in (g)(i) above (1mks)

h) Name the root system found in specimens J1 and J2 (1mks)
K2 and K2

2. You are provided with specimen labeled M and N. Examine them

a) Identify the specimens and in each case give two reasons for your answer. (6mks)

i) Specimen M
Reasons 1.

ii) Specimen N
Reason 1.

b) State four ways in which specimen N is adapted to its functions (4mks)

c) State four differences between specimens M and N.

d) Draw and label the anterior view of specimen.

3. You are provided with a specimen labeled Q and hydrogen peroxide.

a) i) What part of plant is specimen Q? (1mk)

ii) Presence of buds / presence of scale leave;

b) State two roles played by specimen Q in the life cycle of plant from which it was obtained. (2mks)

c) Cut two equal cubes whose sides are about 1cm from specimen Q. Place one of the cubes into a boiling tube labeled A. Crush the other using pestle and mortar. place the crushed material in another boiling tube labeled B.

To each boiling tube add 4ml of hydrogen peroxide.

i) Record your observations. (2mks)

ii) Account for the results in (c)(i) above. (2mks)

iii) Write an equation for the breakdown of hydrogen peroxide. (1mk)

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d) Peel half of specimen Q and crush in a motar. Use the reagents provided to test for the various food substances in the extract obtained from the crushed material.

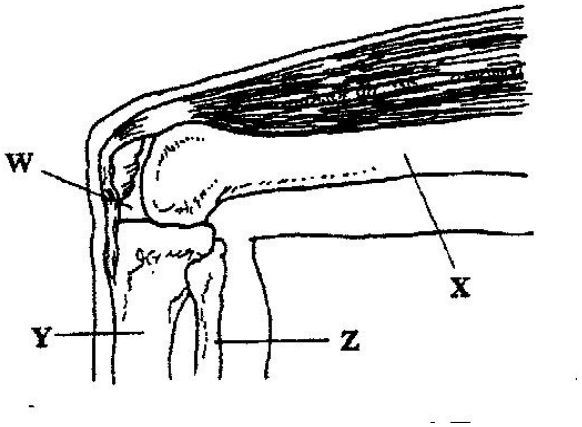
Record the procedures, observations and conclusions in the table below. (9mks)

BIOLOGY

K.C.S.E PAPER 231/2 2006

QUESTIONS

1. The diagram below represents bones at a joint found in the hind limb of a mammal.



a) Name the bones labeled XY and Z (3mks)

b) i) Name the substance found in the place labeled W. (1mk)

ii) State the function of the substance named in (b) (i) above. (1mk)

c) Name the structure that joins the bones together at the joint. (1mk)

d) State the differences between ball and socket joint and the one illustrated in the diagram above. (1mk)

e) Name the structure at the elbow that performs the same function as the same function as the patella. (1mk)

2. a) Name two disorder in human caused by gene mutation. (2mks)

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b) Describe the following chromosomal mutations. (2mks)

a. Inversion
b. Translocation.

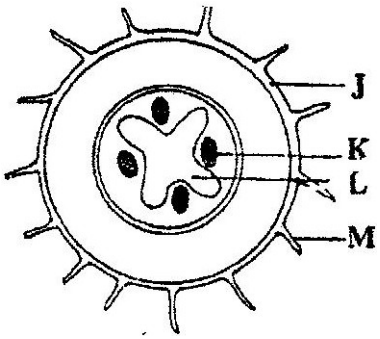
c) In mice the allele for black fur is dominant to the allele for brown fur.

What percentage offspring would have brown fur form across between heterozygous black mice? Show your working.
Use letter B to represent the allele for black colour.
(4mks)

3. a) Distinguish between pyramid of numbers and pyramid of biomass. (2mks)

b) Give three reasons for loss of energy from one trophic level to another in the food chain. (3mks)

4. The diagram below represents a traverse section through a plant organ



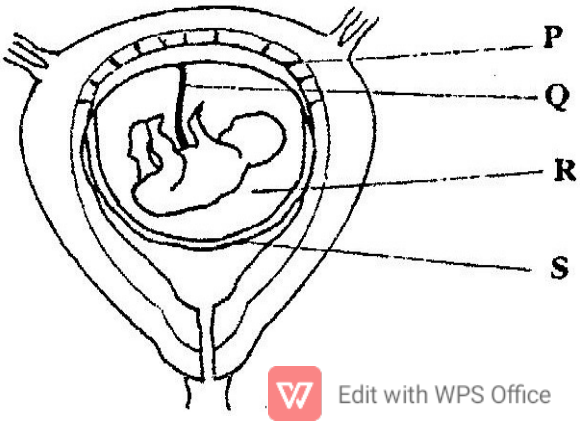
A. From which plant organ was the section obtained?
(1 mk)

B. Give two reasons for your answer in (a) above. (2mks)

C. Name the parts labeled J,K and L. (3mks)

D. State two functions of the part labeled M.
(2mks)

5. The diagram below represents human foetus in a uterus.



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a) Name the part labeled S. (1mk)

b) i) Name the types of blood vessels found in the structure labeled Q. (2mks)

ii) State the differences in composition of blood found in the vessels named in (b)(i) above. (2mks)

c) Name two features that enable the structure labeled P carry out its function. (2mks)

d) State the role of the part labeled R (1mk)

SECTION B

Answer question 6 (compulsory) in the spaces provided and either question 7 or 8 in the spaces provided

6. An experiment was carried out to investigate the effect of hormones on growth of lateral buds of three pea plants

The shoots were treated as follows:
Shoot A – Apical bud was removed.
Shoot B – Apical bud was removed and gibberellic acid placed on the cut shoot.
Shoot C – Apical bud was left intact.

The length of the branches developing from lateral buds were determined at Regular intervals.

The results obtained are as shown in the table below.

Time in days	Length of branches in millimeters		
	Shoot A	Shoot B	Shoot C
0	3	3	3
2	10	12	3
4	28	48	8
6	50	9	14
8	80	120	20

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10	118	152	26

a) Using the same axes, draw graphs to show the lengths of branches against time.

(8mks)

b) i) What was the length of the branch in shoot B on the 7th day?
(1mk)

ii) What would be the expected length of the branch developing from shoot A on the 11th day? (1mk)

c) Account for the results Obtained in the experiment

(6mks)

d) Why was shoot C included in the Experiment? (1mk)

e) What is the importance of gibberellic acid in agriculture?

(1mk)

f) State two physiological processes that are brought about by the application of gibberellic acid on plants.
(2mks)

7. Describe how human kidney functions
(20mks)

8. Describe how water moves from the soil to the leaves in a tree. (20mks)

BIOLOGY

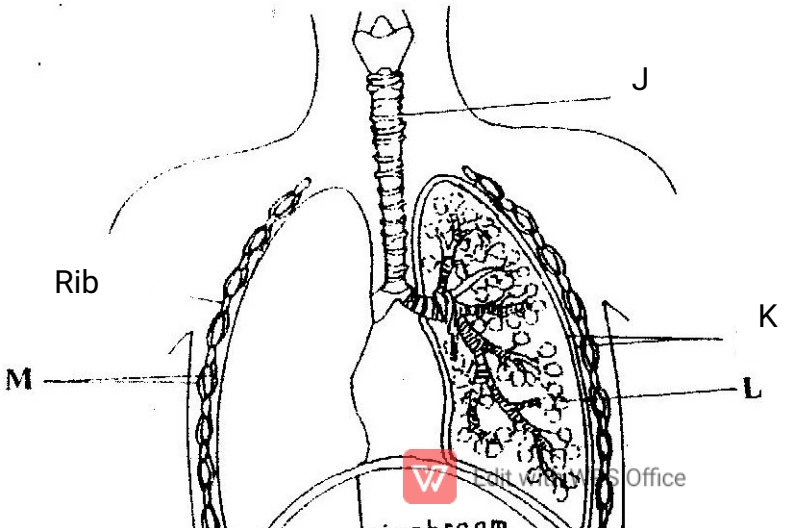
K.C.S.E PAPER 231/2 2007

QUESTIONS

SECTION A (40 mks)

Answer all questions in this section in the spaces provided

1. The diagram below represents some gaseous exchange structures in humans



M L

diaphragm

(a) Name the structures labeled K, L, and M (3 mks)
K…….
L…….
M……

(b) How is the structure labeled J suited to its function?
(3 mks)

(c) Name the process by which inhaled air moves from the structure labeled L into blood capillaries (1 mk)

(d) Give the scientific name of the organism that causes tuberculosis in humans
(1 mk)

2. (a) Explain what happens to excess amino- acids in the liver of humans
(3 mks)

(b) Which portion of the human nephron are only found in the cortex? (3 mks)

(c) (i) What would happen if a person produced less antidiuretic hormone? (1 mk)
(ii) What term is given to the condition described in (c) (i) above
(1 mk)

3. (a) What is meant by the following terms
(i) Protandry (1 mk)
(ii) Self sterility? (1 mk)

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

Pollen

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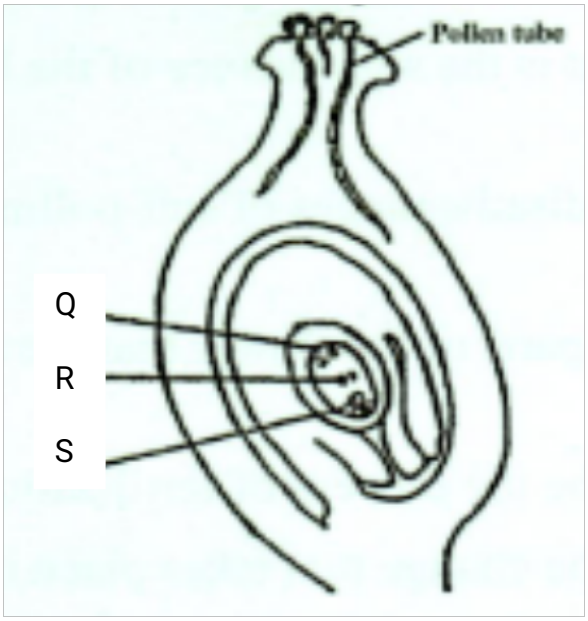

(i) Name the parts labeled Q, R, and S
(3 mks)

Q
R
S

(ii) State two functions of the pollen tube
(2 mks)

(c) On the diagram label the micropyle
(1 mk)

4 (a) Name the three type of muscles found in mammals and give an example of where each of them is found (3 mks)

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

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

(1 mk)

(c) State the functions of synovial fluid

(2 mks)

(d) State two advantages of having an exoskeleton (2 mks)

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 genotype ratio of the offspring (5 mks)

(ii) State the phenotype of the offspring

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(1 mk)

(b) What is genetic engineering?
(1 mk)

(c) What is meant by hybrid vigour?
(1 mk)

SECTION B (40 MKS)

Answer questions 6 (compulsory) in the spaces provided and either questions 7 or 8 in the spaces provided after questions 8

6. In the 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 16cm^3 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 16cm^3 piece of bark	
	Normal stem	Ringed stem
06 45	0.78	0.78
09.45	0.80	0.91
12.45	0.81	0.01
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
(6 mks)

(b) At what time was the amount of sugar highest in the
(i) Ringed stem (1 mk)
(ii) Normal stem?
(1 mk)

(c) How much sugar would be in the ringed stem if it was measured at 0345 hours?
(1 mk)

(d) Give reasons why there was sugar in the stems of both trees at 06 45 hours
(2 mks)

(e) Account for the shape of the graph for the tree with ringed stem between:
(i) 06 45 hours and 15 45 hours (3 mks)
(ii) 15 45 hours and 00 45 hours (2 mks)

(f) Name the structures in phloem that are involved in the translocation of

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sugars
(2 mks)

(g) Other than sugars name two compounds that are translocated in phloem
(2 mks)

7. Describe the structure and functions of the various parts of the human ear
(20 mks)

8. Describe causes and methods of controlling water pollution
(20 mks)

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BIOLOGY

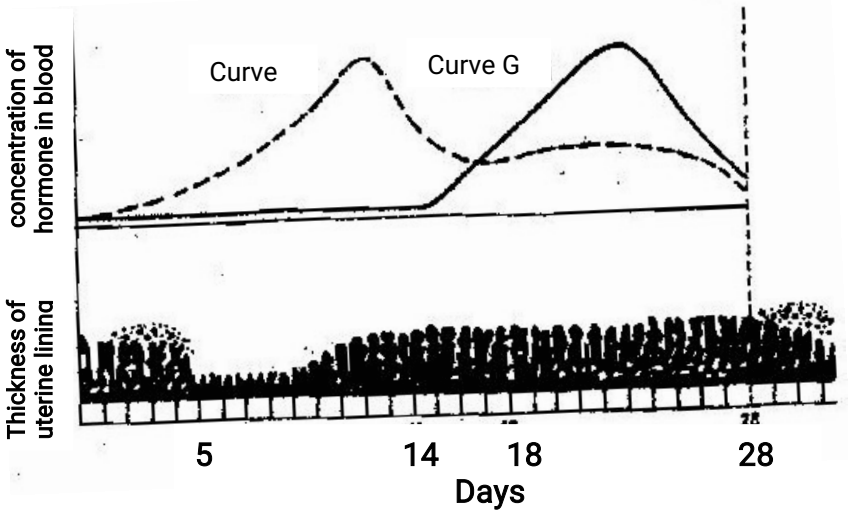
K.C.S.E PAPER 231/2 2008

QUESTIONS

SECTION A (40 MKS)

Answer all the questions in this section in the spaces provided

1. The figure shows changes that take place during menstrual cycle in human



a) Name the hormone whose concentrations are represented by curves F and G (2 mks)

b) State the effects of the hormones named in (a) above on the lining of the uterus
(2 mks)

c) (i) Name the hormone which is released by the pituitary gland in high concentration on the 14th day of the menstrual cycle (1 mk)

(ii) State two functions of the hormone named in (c) (I) above
(2 mks)

(d) State the fertile period during the menstrual cycle
(1 mk)

2. A pea plant with round seeds was crossed with a pea plant that had Wrinkled Seeds the gene for round seeds is dominant over that for wrinkled seeds

Using letter R to represent the dominant gene state:

i) The genotype of parents if plant with round seed was heterozygous
(2 mks)

ii) The gametes produced by the round and wrinkled seed parents
Round seed parent

Wrinkled seed parent

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The genotype and phenotype of F_1 generation. Show your working (3 mks)

3.
a) What is a test – cross? (1 mk)

b) The equation below represents a process that takes place in plants

$$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$$

(a) Name the process (1 mk)

(b) State two conditions necessary for the process to take place (2 mks)

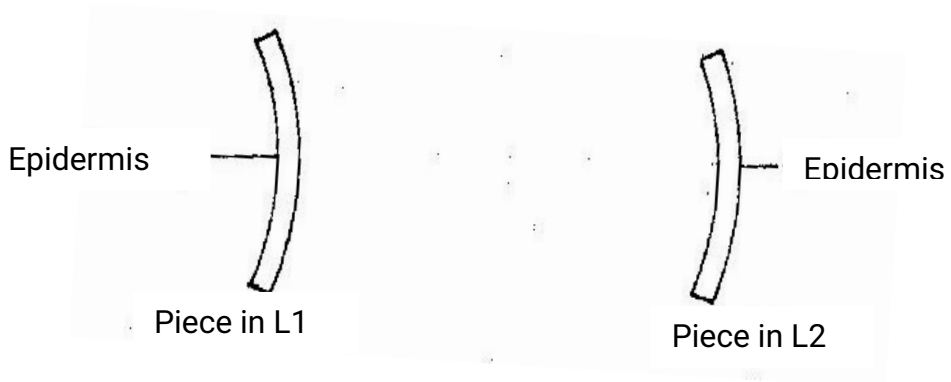
(c) State what happens to the end- products of the process (5 mks)

4. (a) Give three reasons in each case why support is necessary in
   (i) Plants (3 mks)
   (ii) animals (3 mks)

   (b) Why is movement necessary in animals (2 mks)

5. A freshly obtained dandelion stem measuring 5 cm long was split lengthwise to obtain two similar pieces. The pieces were placed in solutions of different concentrations in Petri dishes for 20 minutes.

The appearance after 20 minutes is as shown



a) Account for the appearance of the pieces in solutions L_1 and L_2 (6 mks)

b) State the significance of the biological process involved in the experiment (2 mks)

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SECTION B (40 Mks)

Answer question 6 (compulsory) and either questions 7 or 8 in the spaces provided

6. An experiment was carried out to investigate transpiration and absorption of water in sunflower plants in their natural environment with adequate supply of water. The account of water was determined in two hour intervals. The results are as shown in the table below

Time of day	Amounts of water in grammes	
	Transpiration	Absorption
11 00 - 13 00	33	20
13 00 - 15 00	45	30
15 00 - 17 00	52	42
17 00 - 19 00	46	46
19 00 - 21 00	25	32
21 00 - 23 00	16	20
23 00 - 01 00	08	15
01 00 - 03 00	04	11

a) Using the same axes, plot graphs to show transpiration and absorption of water in grammes against time of the day
(7 mks)

b) At what time of the day was the amount of water the same for transpiration and absorption? (1 mk)

c) Account for the shape of graph of:
Transpiration (3 mks)
Absorption (3 mks)

d) What would happen to transpiration and absorption of water if the experiment was continued till 05 00 hours? (2 mks)

e) Name two factors that may affect transpiration and absorption at any given time
(2 mks)

f) Explain how the factors you named in (e) above affect transpiration
(2 mks)

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g) Describe the nitrogen cycle (20 mks)

(a) State four characteristics of gaseous exchange surfaces
(4 mks)

(b) Describe the mechanism of gaseous exchange in a mammal
(16 mks)

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BIOLOGY

K.C.S.E PAPER 231/2 2009

QUESTIONS

SECTION A (40 MKS)

Answer all the questions in this section in the spaces provided

1. When the offspring of purple and white flowered pea plants were crossed, they produced purple and white flowered plants in the ratio of 3: 1

   Using letter H to represent the gene for purple colour

   (a) State the genotype of:

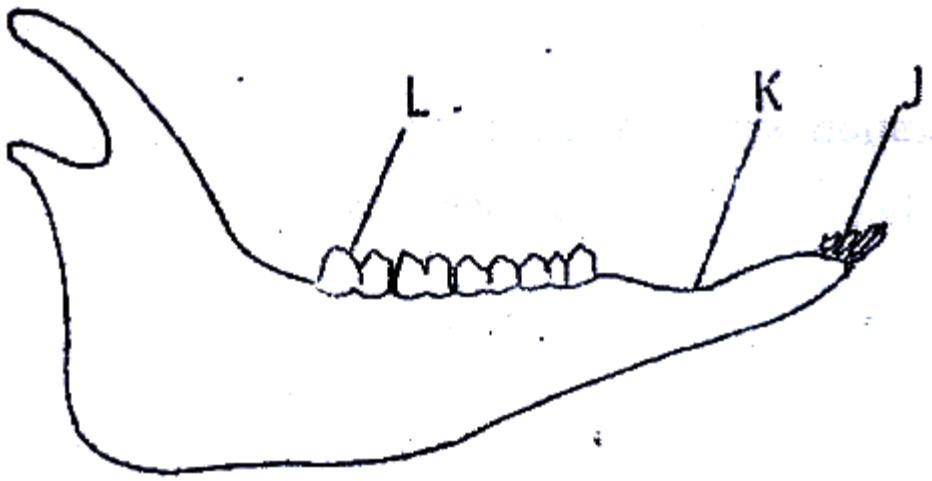
   (i) Parents (2 mks)

   (ii) F_1 Generation (1 mk)

   (b) Work out the cross between plants in the F_1 generation (4 mks)

   (c) Account for the colour the flowers in plants of the F_1 generation (1 mk)

2. The diagram below represents the lower jaw of a mammal



   (a) Name the mode of nutrition of the mammal whose jaw is shown (1 mk)

   (b) State one structural and one functional difference between the teeth labeled J and L

   Structural (1 mk)

   Functional (1 mk)

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(c) (i) name the toothless gap labeled K.
(1 mk)

(d) Name the substance that is responsible for hardening of teeth
(1 mk)

3.
(a) i) what is meant by the term biological control (1 mk)

(ii) Give an example of biological control (1 mk)

(b) (i) What is eutrophication? (3 mks)

(ii) What are the effects of eutrophication
(3 mks)

(c) Name a substance that is responsible for acid rain
(1 mk)

4.
(a)
(i) Explain the changes that take place in the pupil and iris of a human eye when a person moves from a dark room to a room with bright light
(3 mks)

(ii) What is the significance of the changes explained in (a) above
(1 mk)

(b) How does the human eye obtain nutrients?
(3 mks)

(c) Explain why images that form on the blind spot are not perceived
(2 mks)

5.
(a) what happens when a wilting young plants is well watered
(3 mks)

(b) Name a support tissue in plants thickened with
(i) Cellulose (1 mk)
(ii) Lignin (1 mk)

(c) Give three functions of pectoral and pelvic fins in a fish (3 mks)

SECTION B (40 MKS)

Answer questions 6 (compulsory) and either question 7 or 8 in the spaces provided

6. An experiment was carried out to investigate the effect of temperature on the rate of reaction catalyzed by an enzyme. The results are shown in the table below

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Temperature (^{0}C)	Rate of reaction in mg of products per unit time
5	0.2
10	0.5
15	0.8
20	1.1
25	1.5
30	2.1
35	3.0
40	3.7
45	3.4
50	2.8
55	2.1
60	1.1

a) On the grid provided draw a graph of rate of reaction against temperature (6 mks)

(b) When was the rate of reaction 2.6 mg of product per unit time? (2 mks)

(c) Account for the shape of the graph between

(i) 5^0 C and 40^0 C (2 mks)

(ii) 45^0 C and 60^0C (3 mks)

(d) Other than temperature name two ways in which the rate of reaction between 5^0C and 40^0C could be increased (2 mks)

(e) (i) Name one digestive enzymes in the human body which works best in acidic condition (1 mk)

(ii) How is the acidic condition for the enzyme named in (e) (i) above attained? (2 mks)

(f) The acidic conditions in (e) (ii) above is later neutralized

(i) Where does the neutralization take place?

(ii) Name the substance responsible for neutralization (1 mk)

7. How are flowers adapted to wind and insect pollination? (20 mks)

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8. Describe the role of the liver in homeostasis in the human body (20 mks)

BIOLOGY

K.C.S.E PAPER 231/2 2010

QUESTIONS

SECTION A (40 MKS)

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

1. In an experiment, disinfection soaked bean seeds were put in a vacuum flask which was then fitted with a thermometer as shown in the diagram below.

Thermometer

Disinfected soaked bean seeds

Cotton wool

Vaccum flask

Cotton wool

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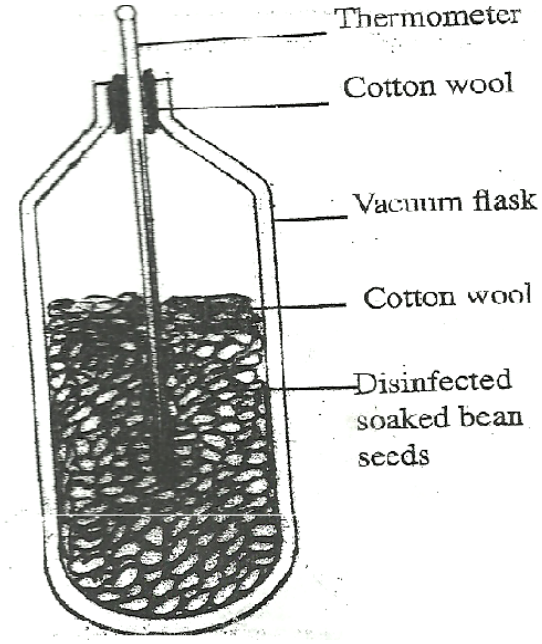

The temperature readings were taken every morning for three consecutive days.

Which process was being investigated? (1 mk)

i) What were the expected results?
(1 mk)

ii) Account for the answer in (b) (i) above?
(2 mks)

Why were the seeds disinfected? (2 mks)

Why was a vacuum flask used in the set-up?
(1 mk)

How would a control for this experiment be set?
(1mk)

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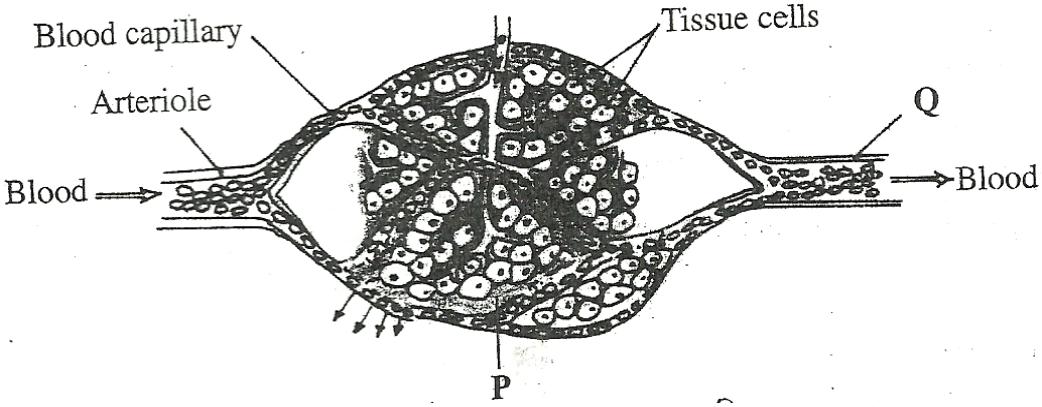
2. The diagram below shows blood circulation in a mammalian tissue.



a) Name the part labeled P and Q
(2 mks)

b) Name the substance that are:

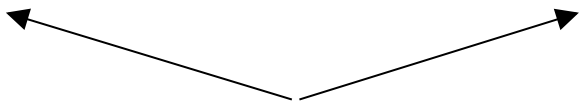
c) Required for respiration that move out of capillaries;
(2 mks)

d) Remove from tissue cells as a result of respiration
(2 mks)

e) Explain how substances move from blood capillaries into the tissue cells.
(2 mks)

f) Name one component of the blood that is not found in the part labeled P
(1 mk)

3. The diagram below represents a food web in certain ecosystem



Hawks

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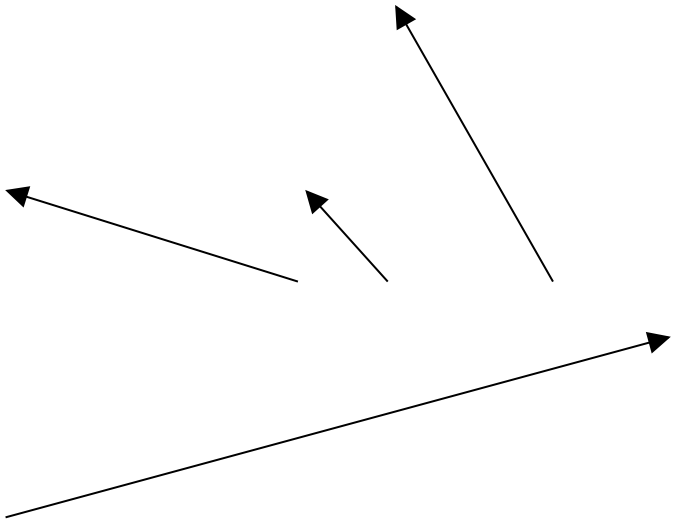
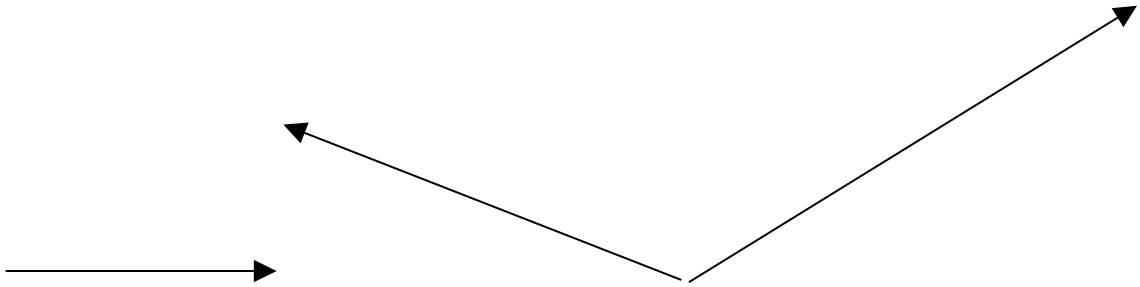
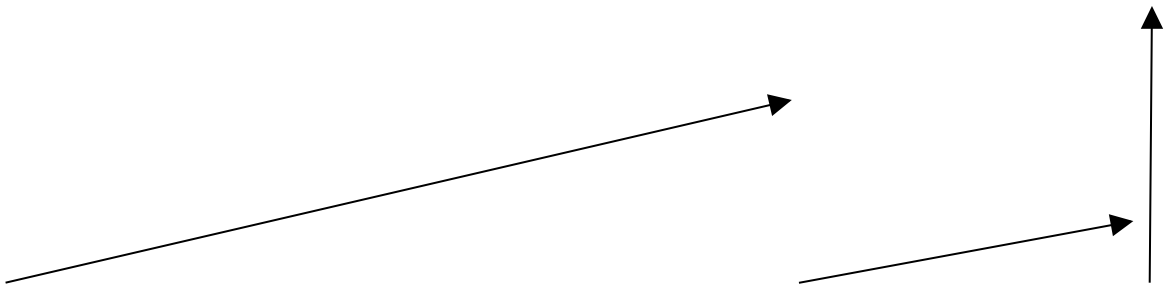


Lizard

Small Birds





Small insects

Large insect

Caterpillars

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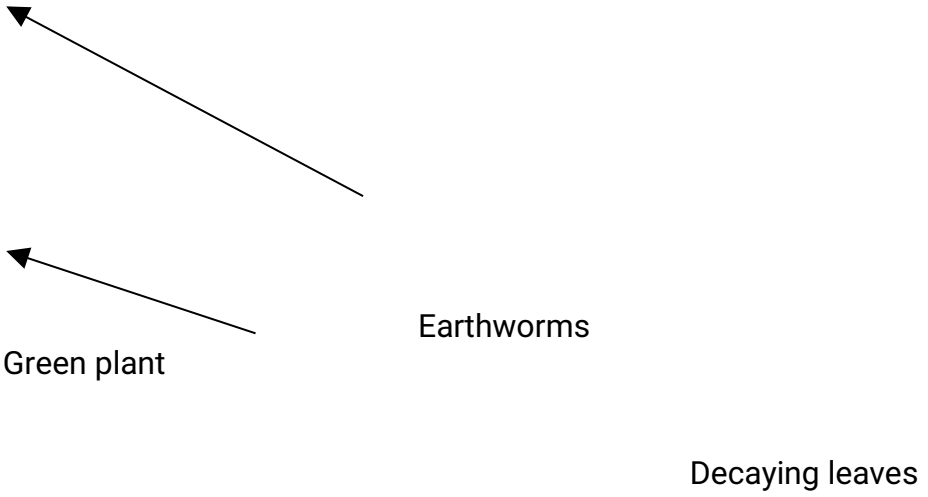


a) Name the trophic level occupied by each of the following:

Caterpillas
(1 mk)

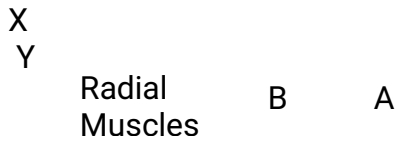
Small insect. (1 mk)

b) From the food web, construct two food chains which end with lizards as a tertiary consumer. (2 mks)

i) Which organisms have the least biomass in this ecosystem?
(1 mk)

ii) Explain the answer in (c)(i) above. (3 mks)

4. The diagram below shows how the iris and pupil of a human eye appear under different conditions.



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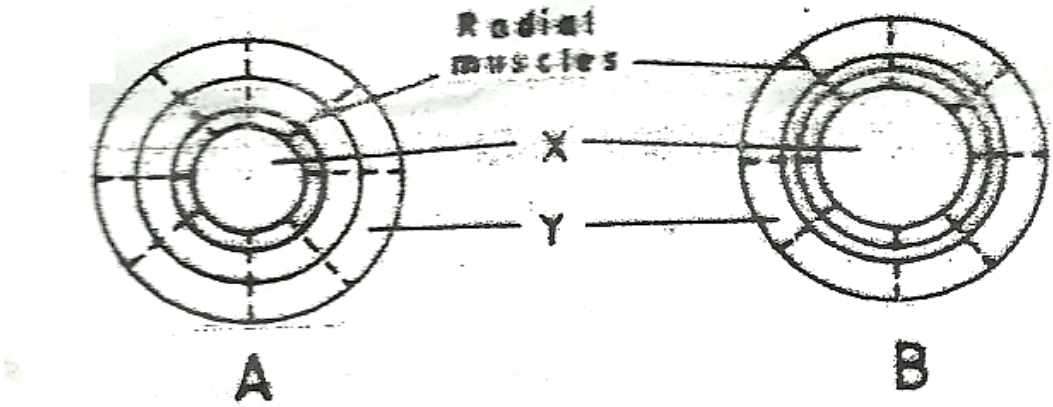

Name the structures labeled X and Y
(2 mks)

i) State the condition that leads to the change in appearance shown in the diagram labeled B
(2 mks)

ii) Describe the change that lead to the appearance of the iris and pupil as shown in the diagram labeled B.
(4 mks)

iiii) What is the significance of the change described in (b) (ii) above?
(1 mk)

When pure breeding black guinea pigs were crossed with pure breeding white guinea pigs, the offspring had a coat with black and white patches.

Using letter G to represent the gene for black coat colour and letter H for white coat colour, work out the genotypic ratio of F_2.

State the phenotypic ratio of F_2. (1 mk)

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i) Name the term used when two alleles in heterozygous state are fully expressed phenotyically in an organism. (1 mk)

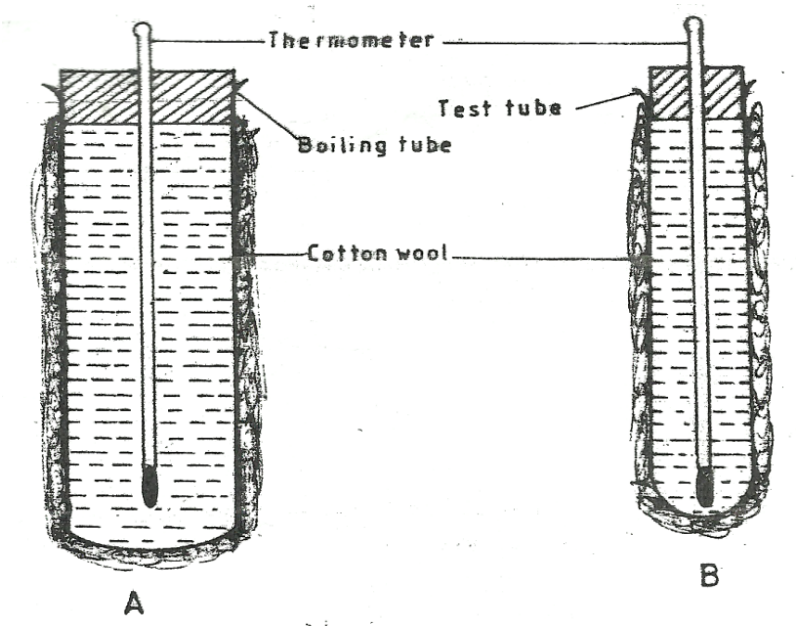
ii) Give an example of a trait in human beings where the condition whose term is named in (c) (i) above expresses itself.
(1 mk)

SECTION B

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

6. In an experiment to investigate a certain physiological process, a boiling tube labeled A and a test tube labeled B were covered with cotton wool. The two tubes were simultaneously filled with hot water and fitted with thermometers. The experimental set-up was as in the diagrams below.

Cotton Thermometer tube Test



The temperatures reading were taken at the start and after every two minutes

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for twenty minutes. The results were as shown in the table below.

Time (minutes)	Temperature (^0C)	
	Boiling tube A	Test tube B
0	60	60
2	59	54
4	57	50
6	55	46
8	53	43
10	52	40
12	51	37
14	49	35
16	48	33
18	47	32
20	46	30

Using the same axes, draw graphs of temperature against time.
(6 mks)

i) Work out the rate of heat in the boiling tube labeled A and test tube labeled B between the 5th and 15th minutes.

ii) Account for the answers in (b) (i) above.
(2 mks)

iii) How does the explanation in (b) (ii) above apply to an elephant and a rat?
(2 mks)

i) State the role of the cotton wool in this experiment. (1 mk)

ii) Name two structures in mammals that play the role stated in (c) (i) above
(2 mks)

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State three advantage of having constant body temperature in mammals.
(3 mks)

7. Describe the process of fertilization in flowering plants.

(20 mks)

8. Describe how a finned fish such as Tilapia moves in water.

(20 mks)

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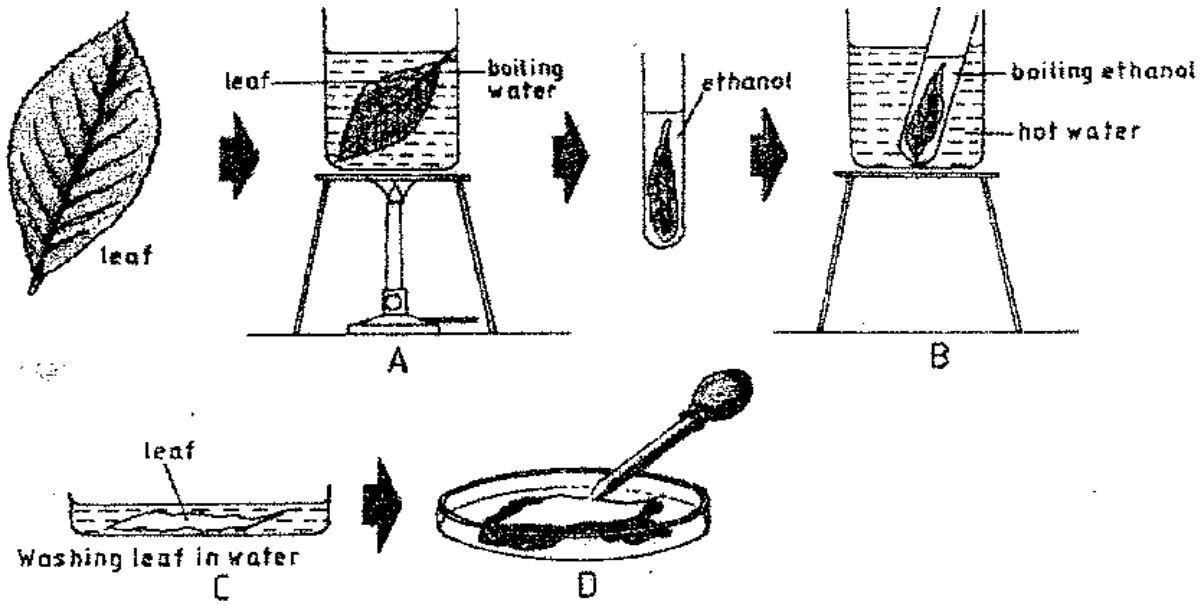
QUESTIONS

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

B A D Washing leaf in water C Leaf Leaf ethano . Leaf Boling water

Boiling ethanol Hot water



2.

What was the purpose of the above procedure ? (1mk)

Give reasons for carrying out step A,B and C in this procedure. (3mks)

(iii) Name the reagent that was used at the step labeled D . (1mk)

(iv) State the expected result on the leaf after adding the reagent named in (iii) above. Stain dark blue/ Blue dark

In humans, hairly ears is controlled by agene on the Y Chromosomes .

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Using letter Y^H to represents the chromosome carrying the gene for hairly ears, work out a cross between a hairy eared man and his wife. (4 mks)

(b) (i) What is the probability of the girls having hairly ears? (1 mk)

(ii)Give reason for your answer in (b (i) above. (1mk)

(c) Name two disorders inhumans that are determined by sex linked genes (2mks)

(d) Explain how comparative embryology is an evidence for organic evolution . (2mks)

3. (a) Name the causative agent for the following respiratory diseases. (2mks)

(i) Whooping cough.

(ii) Pneumonia

(b) Describe how oxygen in the alveolus reaches the red blood cells . (4mks)

(c) How are the pnematophores adapted to their function ? (2mks)

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

P

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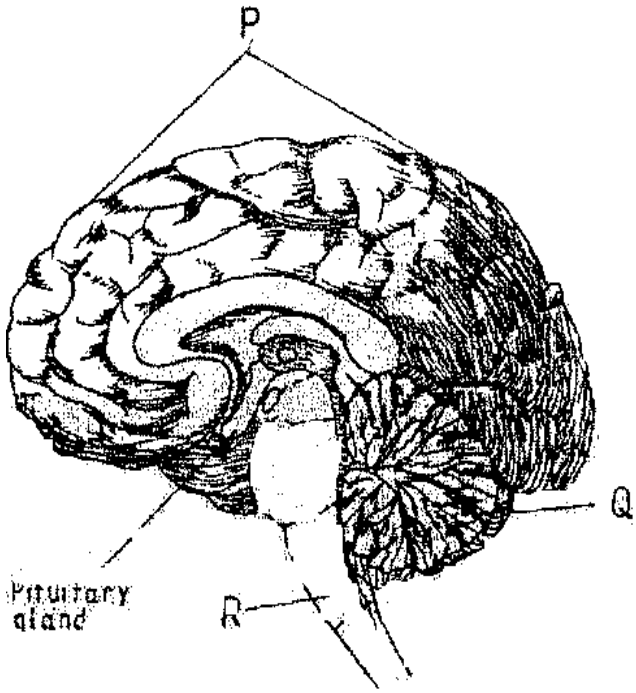

Q R Pituitary gland

Name the structure labeled Pand R.

State two functions of the part labeled Q

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

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

5. (a) The diagram below represents a flower.

(i)On the diagram, name two structures where meosis occurs. (2 mks)

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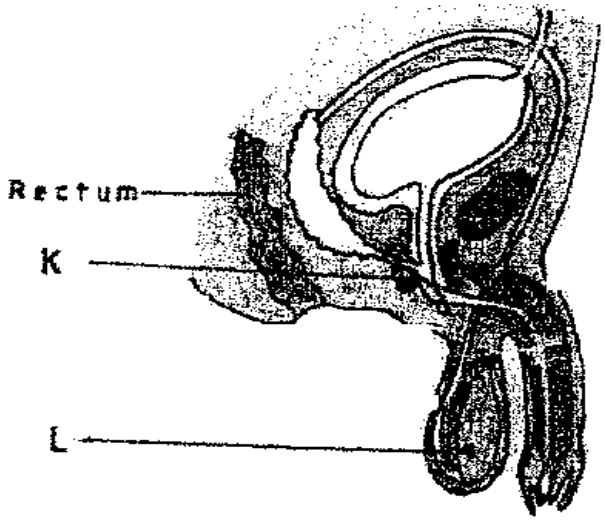
(ii) How is the flower adapted to prevent self-pollination?

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



L K Rectum

(i)Explain two adaptations of the structure labeled L to its functions (2 mks)

Explain the role of gland labeled K

SECTION B (40 MKS)

Answer 6(compulsory) and either question 7 or 8 in the spaces provided

6. (a)An experiment was carried out to investigate the population of a certain micro-organism.

Two petri-dishes were used . into the petri-dish labeled m ,60cm^{3}of a culture medium

was placed while 30cm^3 of the same culture medium was placed in petri-dish labeled N. Equal numbers of the micro - organisms were introduced in both petri-dishes . The set-ups were then incubated at 35^{0}c. The number of micro-organisms in each petri-dish was determined at irregular intervals for a period of 60 hours . The results were as shown in the table below

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Relative number of micri-organisms	**M**	40	40	180	280	1200	1720	1600	1840	1560	600
	N	40	40	120	200	680	560	560	600	600	400
Time in hours		0	5	10	15	23	30	35	42	45	60

i) On the same axes, draw the graphs of relative number of micro-organisms against time on the grid provided.

(7 mks)

(ii)After how many hours was the difference between the two populations greatest ? (1 mk)

(iii)Work out the difference the two populations at 50 hours
(2 mks)

(vi) With a reason state the effect on the population of micro-organisms in petri-dish M if the temperature was raised to 60^0c after 20 hours .
(2mks)

(v)Account for the shape of the curve for population in petri-dish N between 46hours and 59 hours.
(3mks)

(b) Explain how osmotic pressure in the human blood is maintained at normal level.
(5mks)

7. (a) Explain how structural features in terrestrial plants affect their rate of transpiration.
(13 mks)

(b)Explain how the human skin brings about cooling of the body on a hot day .

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(7mks)

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

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

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K.C.S.E PAPER 231/2 2012
QUESTIONS

SECTION A (40 mks)
Answer ALL the questions in this section in the spaces provided.

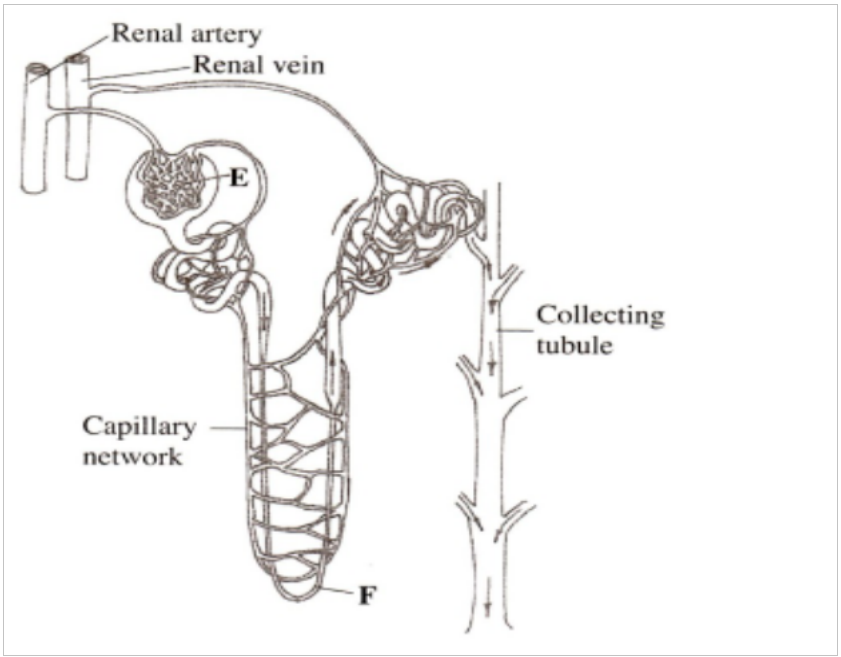
1. In a certain plant species which is normally green, a recessive gene for colour (n) causes
the plants to be white in colour. Such plants die at an early age. In the heterozygous state,
the plants are pale green in colour but grow to maturity.

Give a reason for the early death of the plants with the homozygous recessive gene. (2 mks)

(b) If a normal green plant was crossed with the pale green plant, what would be the genotype of the first filial generation (F generation)? Show your working. (4 mks)

(c) If heterozygous plants were self-pollinated and the resulting seeds planted,work out the proportion of their offspring that would grow to maturity. (2 mks)

2. The diagram below illustrates the structure of the kidney nephron.



(a) Name the part labelled E.

(b) How is the part labelled F adapted to its function?

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(c) State three physiological mechanisms of controlling the human body temperature during a cold day.

(a)In an investigation, equal amounts of water was placed in three test tubes labelled G, H and J. Pondweeds of equal. length were dropped in each test tube. The test tubes were then placed in identical conditions of light and carbon(IV) oxide at different temperatures for five minutes. After five minutes, the bubbles produced in each test tube were counted for one minute. The results were as shown in the table below.

Test tube	Temperature (°C)	Number of bubbles
G	20	28
H	35	42
J	55	10

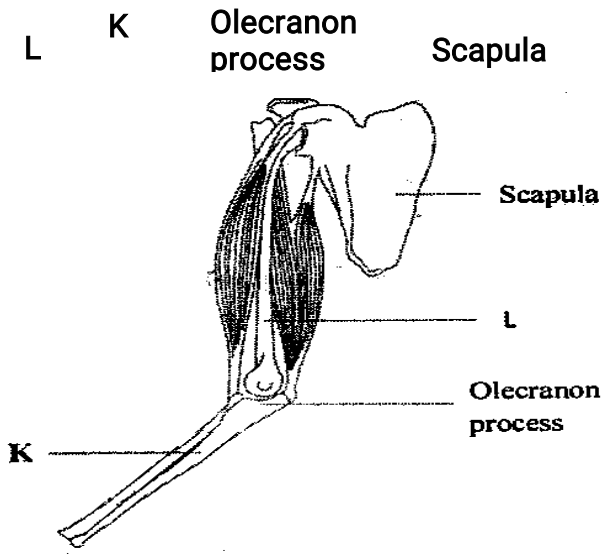
(i) Name one requirement for this process that is not mentioned in the investigation. (1 mk)

(ii) Name the gas produced in this investigation. (1 mk)

(iii) Account for the results in test tubes H and J. (2 mks)

(b) State two ways in which the human intestinal villus is adapted to its function. (4mks)

4. (a) The diagram below illustrates the arrangement of bones and muscles in the human arm.



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(i) Name the bones labelled K and L. (2mks)

K.....
L.....

(ii) Explain how the upward movement of the lower arm is brought about by the bones and muscles shown diagram above. (3 mks)

b) State three ways in which support is brought about in a leaf. (3 mk)

5. a) Describe the process of inhalation. (4mks)

b) Explain the mechanism of stomatal opening. (4mks)

SECTION B (40 mks)

Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided

6 The data provided below represent populations of a predator and its prey over a fifty years period.

TIME IN YEARS	POPULATION IN RELATIVE NUMBERS	
	POPULATION OF P	POPULATION OF Q
5 10	24500 30000	17000 20500
15	33500	26000
20	33500	30000
25	31000	33000
30	27000	32000

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35 40	25000 29000	30000 27500
45	32500	28000
50	34000	28500

(a) (i) Using the same axes, draw graphs of the relative populations of P and Q against time. (7 mks)

(ii) With a reason, identify the curve that represents the prey. (2 mks)

(iii) Account for the two populations between 25 and 32 years. (2 mks)

(iv) Which years were the two populations equal? (2 mks)

(v) Apart from predation, state three biotic factors that may have led to the decline of the prey population. (3 mks)

(b) Describe the hazards of air pollution by Sulphur (IV) Oxide. (4 mks)

7. Using a relevant example in each case, describe simple and conditional reflex actions. (20 mks)

8.
(a) Using a relevant example, describe how an allergic reaction occurs in a human being. (10 mks)

(b) Describe how environmental factors increase the rate of transpiration in terrestrial plants. (10 mks)

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BIOLOGY

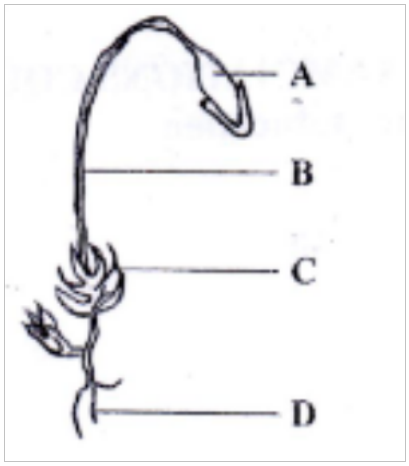
K.C.S.E PAPER 231/2 2013

QUESTIONS

SECTION A(40 mks)

Answer all the question in this section in the spaces provided

1. (a) The diagram below represents a plant in the division Bryophta.



Name the parts labelled B and D. (2 mks)

State one function for each of the parts labelled A and C.

b) The diagram below represents a member of the kingdom Animalia.
(2 mks)

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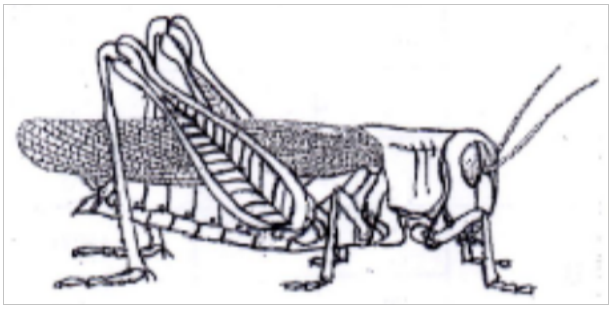
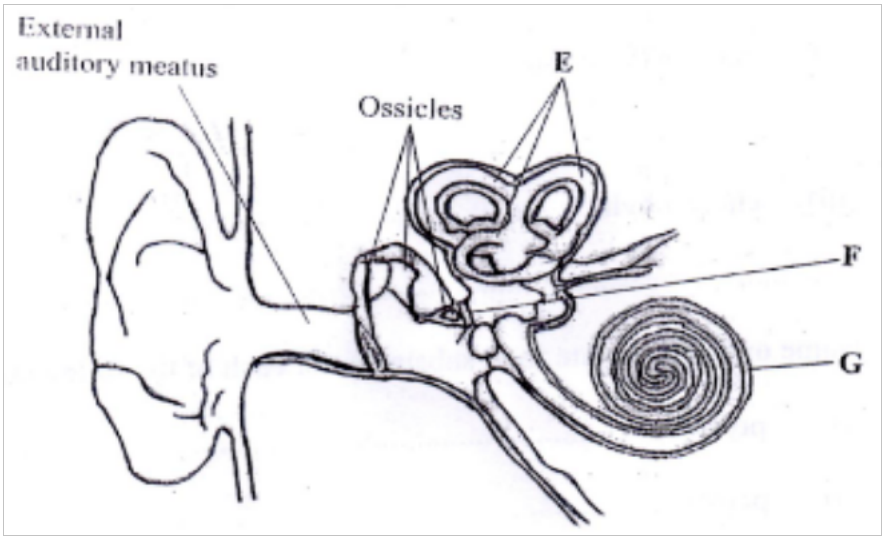


i) Name the phylum to which the organism belongs.
(1 mk)

ii) Using observable features in the diagram, give three reasons for the answer in b (i) (3 mks)

External
auditorv meatus 2. The diagram below represents the human ear.

G F E Ossicles



a) Name the labelled E, F, and G. (3 mks)

b) How is each of the following adapted to its function?

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i) External auditory meatus; (2 mks)

ii) Ear ossicles (2 mks)

c) Name one defect of the human ear.
(1 mk)

3. a) Explain the importance of the following in photosynthesis;
(3 mks)

Light;

Carbon IV oxide;

Chlorophyll

b) Name one appropriate food substance for each of the following enzymes:

Ptyalin.

Pepsin..

c) State the cause and two symptoms of Beri-beri.

Cause..... (1 mk)

Symptoms..... (2 mks)

4.

In an investigation, a variety of pea plants grown from seeds with smooth coats were crossed with plants grown form seeds with wrinkled coats. All the seeds obtained in the first filial (F) generation had smooth seed coats.

Using the letter R to represent the gene for smooth seed coat, work out the

genotype of the F_1 generation .show your working.
(3 mks)

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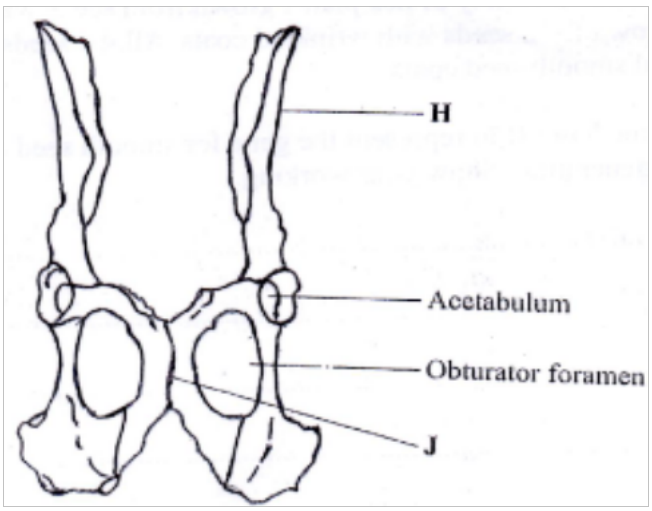
If the F_1 generation was selfed, determine the phenotypic ratio of the second filial (F_2) generation. Show your working.
(3 mks)

If the total number of seeds in the F_2 generation was 14640, calculate the number of seeds with wrinkled coats. Show your working.
(2 mks)

5. The diagram below represents a mammalian pelvic girdle.

J H Obturator foramen Acetabulum



a) How are the structures labelled H and J adapted to their function?

H..... (2 mks)

J..... (2 mks)

b) State the function of obturator foramen.
(1 mk)

i) Name the bone that articulates with the pelvic girdle at acetabulum

ii) Name the type of joint formed by the acetabulun and the bone named in(c)(i)above.

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c) Name the bone formed by the fusion of caudal vertebrae in human beings.

SECTION B (40 mks)
Answer question 6(compulsory) and either question 7 or 8 .

6. A scientist carried out an investigation to find out the population growth of mice under laboratory conditions. Twenty young mice were placed in a cage.teh results obtained form the investigation were as shown in the table below.

Time in months	0	2	4	6	8	10	12	16	18
Number if mice	20	20	65	115	310	455	450	145	160

On the grid provided, draw a graph of the number of mice against time.

account for the changes in mice population between

0 to 2 months
(2 mks)

2 to 6 months
(2 mks)

6 to 10 months
(2 mks)

10 to 12 months (2 mks)

i) Between which two months was the population change greatest?
(1 mk)

ii) Calculate the rate of population change over the period in (c) (i) above.

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(2 mks)

What change in population would be expected if the investigation was continued to the 19th month?
(1 mk)

To obtain the observed results state two variables that was kept constant during the investigation. (2 mks)

7. a) describe the process of blood clotting in human beings.
(10 mks)
b) How are respiratory surfaces in mammals adapted to their functions?
(10 mks)

8. Describe the role of the following organs in excretion and homeostasis.
the liver (10 mks)

b) The skin during hot environmental conditions
(10 mks)

BIOLOGY

K.C.S.E PAPER 231/2 2014

QUESTIONS

SECTION A (40 mks)

Answer all the questions in this section in the spaces provided

1.
(a) State four characteristics of fruits dispersed by animals.
(4 mks)

(b) State two roles of each of the following hormones in menstruation:

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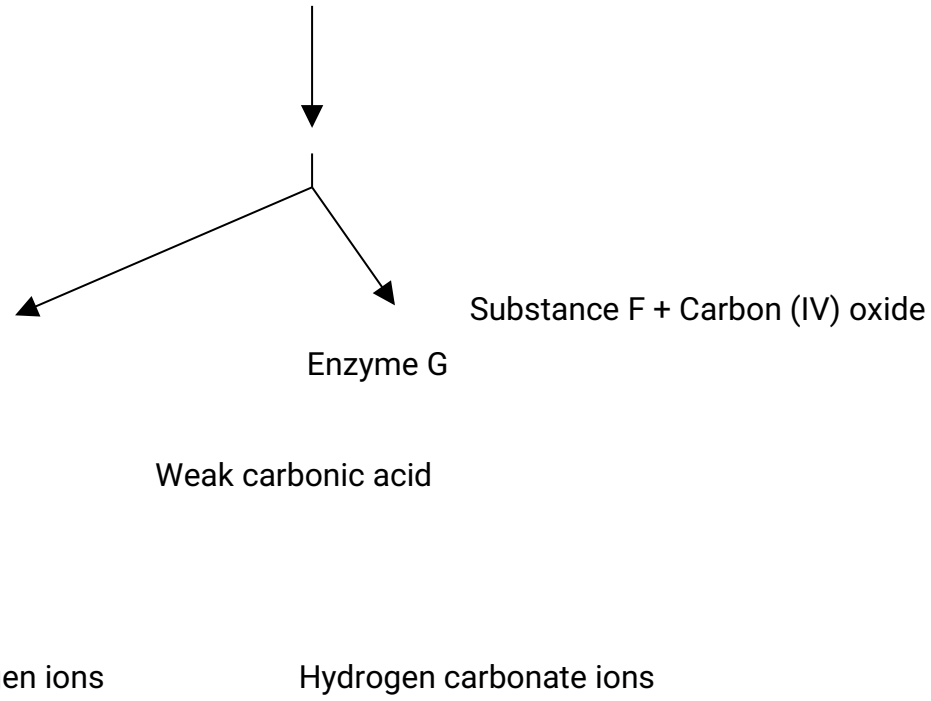
(i) Luteinising hormone (2 mks)
(ii) Oestrogen. (2 mks)

2. The diagram below illustrates the role played by red blood cells in the transportation of carbon (IV) oxide.



Other than carbon (IV) oxide transportation in the red blood cells, name

the other form of carbon (IV) oxide transportation in humans.
(1 mk)

(i) Name substance F (1 mk)

(ii) Name the enzyme mked G and state its role in the reaction.
Enzyme:
Role: (2 mks)

(c) Explain the transportation of carbon (IV) oxide in red blood cells is advantageous (2 mks)

(d) Explain the role of calcium ions in blood clotting
(2 mks)

3. (a) Describe the mechanism of gaseous exchange in plants through the lenticels
(3 mks)

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(b)Explain each of the following:

(i) The tracheoles lack spiral bands of chitin;
(3 mks)

(ii) The floor of the mouth is lowered during inhalation in a bony fish
(2 mks)

4. (a) How is sex determined in man?
(4 mks)

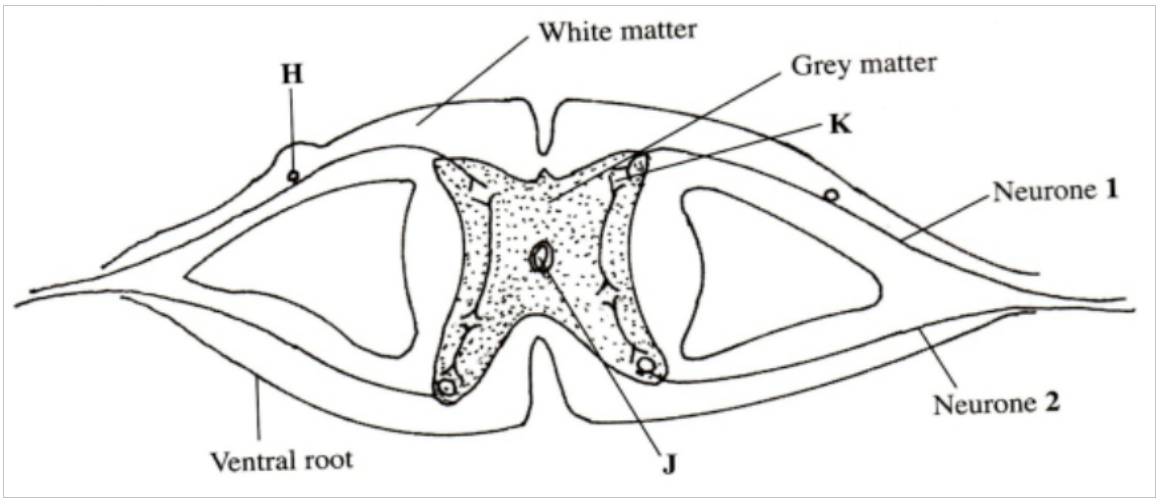
(b) (i) Differentiate between sickle cell anaemia and sickle cell trait
(2 mks)

(ii) Explain why people with sickle cell trait have an adaptive survival advantage over normal individuals in malaria endemic regions. (2 mks)

5. The diagram below represents the transverse section of the spinal cord.

J K H Neurone 2 Ventral root Neurone 1 Grey matter

White matter



(a) Name the part labelled H. (1 mk)

(b) State two functions of the fluid fount! in the part labelled J.
(2 mks)

(c) Give a reason for the colour of the white matter. (1 mk)

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(d) Name and give the function of the enzyme found at the part labeled K.

Name:
(1 mk)

Function:
(2 mks)

(e) On the diagram, use an arrow to show the direction of impulse transmission along the neurone labeled I. (1 mk)

SECTION B (40mks)

Answer questions 6(compulsory) and either question 7 or 8 in the spaces provided

6. An experiment was done to determine the uptake of nitrogen from the soil by broad bean seedlings. The experiment was done with one set of seedlings M grown in the atmosphere enriched with carbon (IV) oxide and another, set up of seedlings N grown in the normal atmosphere.

The amount of nitrogen in each seedling was measured in milligrams at intervals of ten days. The table below shows the results obtained.

	Amount of nitrogen in milligrams									
SET M	0	25	70	125	160	395	635	860	895	915
SET N	0	15	35	50	65	105	120	125	135	140
TIME (DAYS)	15	25	35	45	55	65	75	85	95	105

(a) Using the same axis draw line graphs of nitrogen uptake by the two (M and N) sets of broad bean seedlings against time. (8 mks)

(b) Determine the rate of uptake of nitrogen in Set M between 65 and 85 days.
(2 mks)

(c) i) What is the relationship between carbon (IV) oxide concentration in the air and nitrogen uptake?
(ii) Account for the relationship in (c) (i) above
(3 mks)

(d) i) What would happen to the concentration of nitrogen in the seedlings in set M, if after 75 days the seedlings are transferred to a normal atmosphere
(1mk)

ii) Explain your answer in (d) (i) above (2 mks)

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(e) State three ways in which nitrogen fixation occurs
(3 mks)

7a) Explain how each of the following factors affects the rate of photosynthesis:
(i) Temperature; (2 mks)

(ii)Chlorophyll concentration (2 mks)

b) Describe the process of carbohydrate digestion ion human beings
(16 mks)

8. a) How does excretion take place in plants? (4 mks)

b) Describe the role of the human skin in homeostasis
(16 mks)

BIOLOGY

K.C.S.E PAPER 231/2 2015
QUESTIONS

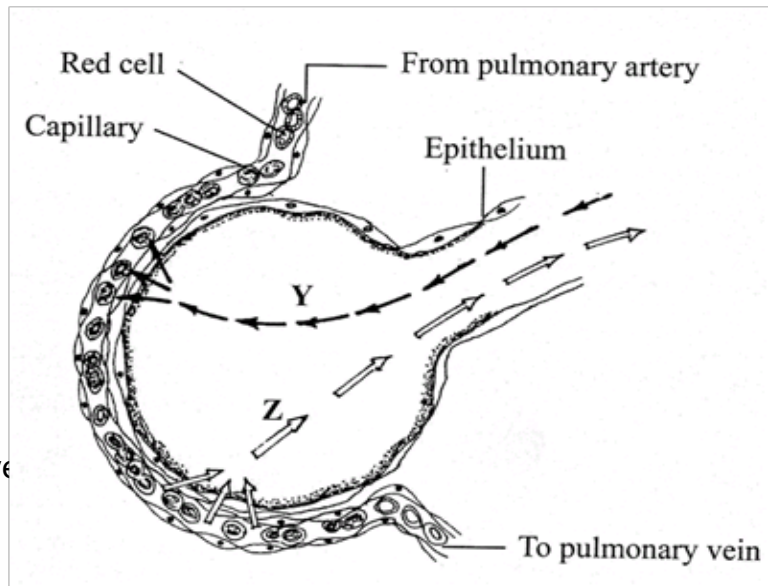
SECTION A (40 mks)

Answer all the questions in this section in the spaces provided

1. The diagram below illustrates a blood capillary surrounding a structure for gaseous exchange in human beings.

Red cell

Capillary



From pulmonary artery

Epitheliu

To pulmonary ve

a) Name the gaseous exchange structure (1mk)

b) Identify the gases labeled Y and Z

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Y (1 mk)

Z (1 mk)

c) How does the gas labeled Y reach the inside of the blood capillary? (3mks)

d) How does cigarette smoking lead to lung cancer? (2 mks)

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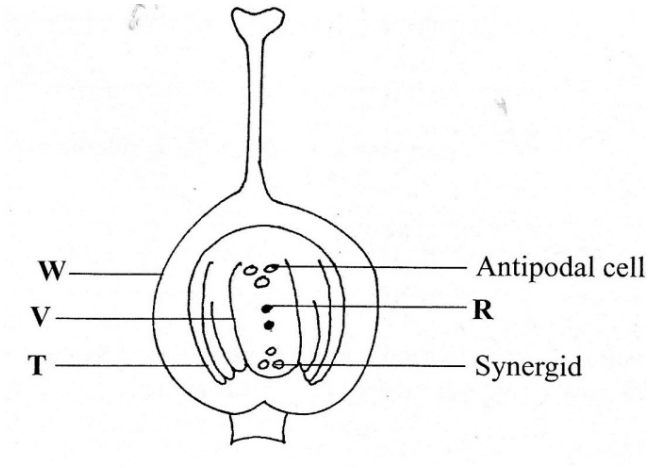
2. The diagram below illustrates the structure of the female part of a flower



a) Name the part labeled W (1 mk)

b) Describe what happens when the pollen tube enters the structure labeled V (5 mks)

c) What do the structures labeled R and T develop into after fertilization?
R (1 mk)
T (1 mk)

3. a) What is meant by the term genetics?
(1 mk)

b) State two examples of discontinuous variation
(2 mks)

c) A female which sickle cell trait marries a normal man. The allele for sickle cell is Hbs and the normal allele is HbA. Determine the probability that their first born will have the sickle cell trait. Show your working.
(5mks)

4. In an experiment to investigate a factor affecting photosynthesis, a potted plant which had been kept in the dark overnight was treated as shown in the diagram below and exposed to light.

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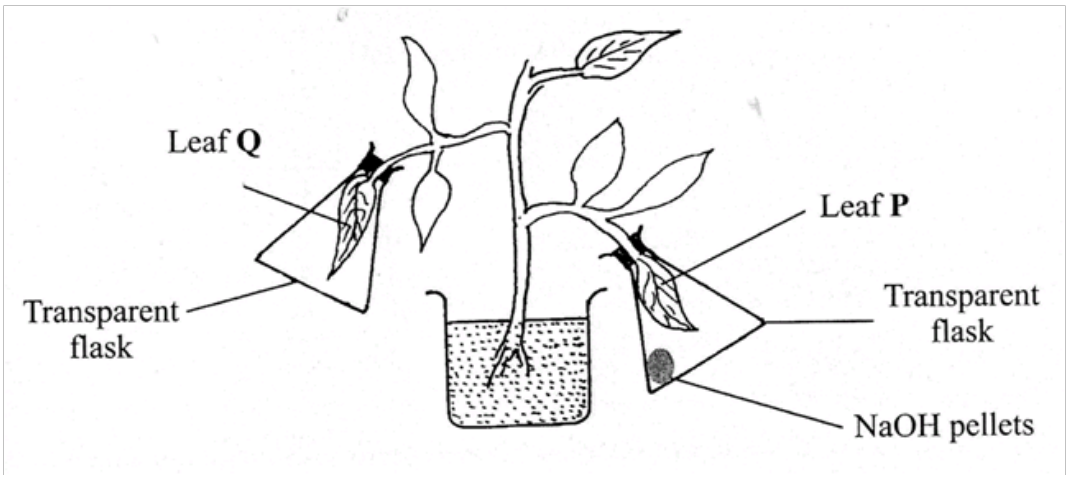


a) Why was the potted plant kept in the dark overnight? (1 mk)

b) Which factor was being investigated in the experiment? (1 mk)

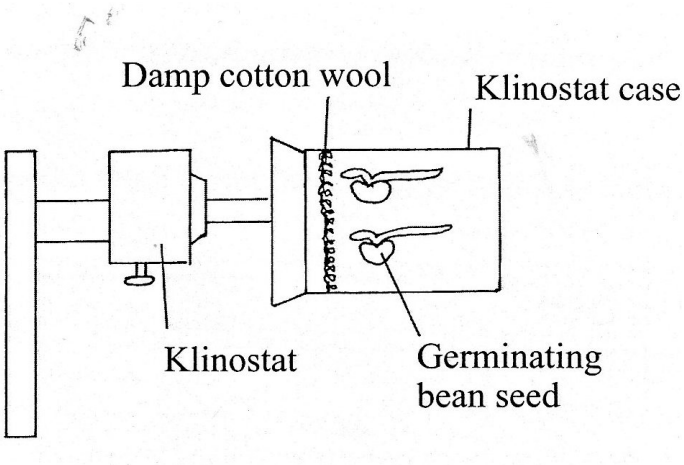
(i) Which test did the students perform to confirm photosynthesis in the leaves labeled P and Q? (1 mk)

(ii) State the results obtained in the leaves labeled P and Q (1 mk)

(iii)Explain the results obtained in the leaves labeled P and Q (1 mk)

(iv) What was the purpose of leaf Q in the experiment? (1 mk)

5. In an experiment to investigate a plant response, the set up shown in the diagram below was used.



a) Name the type of response that was being investigated (1 mk)

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b) If the klinostat was not rotating:
i)State the observations that would be made on the seedlings after three days
(2 mks)

ii) Explain the observations in (b) (i) above
(3 mks)

c) If the experiment was repeated with the klinostat rotating
i.State the observation that was made on the seedlings after three days;
(1 mk)

ii.Give a reason for the observation made on the seedlings
(1 mk)

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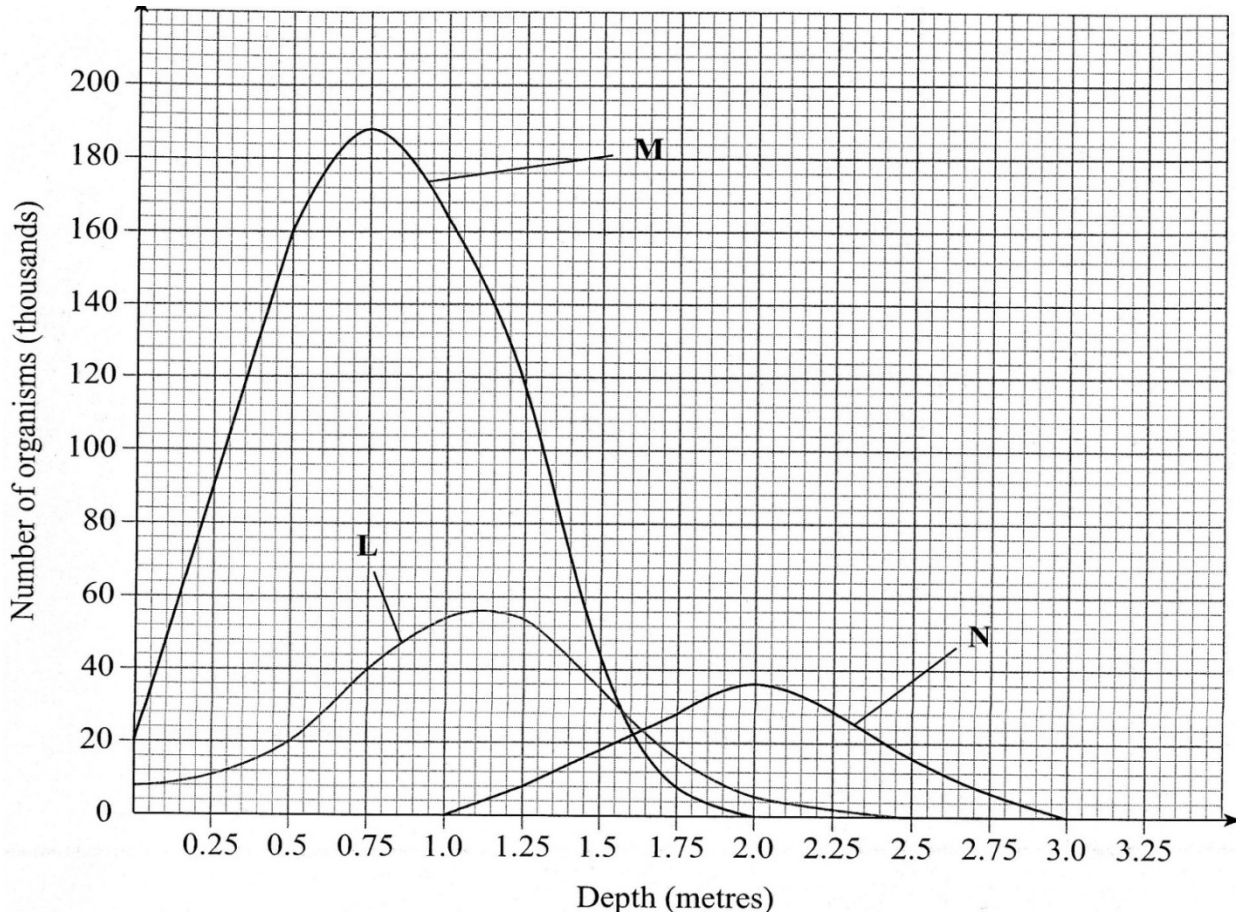
SECTION B (40 MKS)

Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided

6. The graph below shows the relative numbers of three main species of organisms in a pond



a) Giving a reason for your answer, which of the species is a
   (i)Producer? (1 mk)
   Reason (1mk)

   (ii)Secondary consumer? (1mk)
   Reason (1 mk)

b) State the depths at which each of the populations labeled L,M and N is at its optimum.
   L (1 mk)
   M (1 mk)
   N (1mk)

c) (i) Which method may have been used to determine the population of organisms labeled N in the pond? (1 mk)

   (ii) Give a reason for your answer in (c) (i) above (1mk)

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(iii)State the assumptions made when using the method in (c) (i) above
(4 mks)

d) State two reasons why primary productivity in the pond decreases with depth.
(2 mks)

e) Explain the ecological importance of fungi to plants
(2 mks)

f) Why is flooding likely to lead to a cholera outbreak?
(3mks)

7. Explain the various ways in which seeds and fruits are adapted to dispersal
(20 mks)

8. How is a mammalian heart structurally adapted to its function?
(20 mks)

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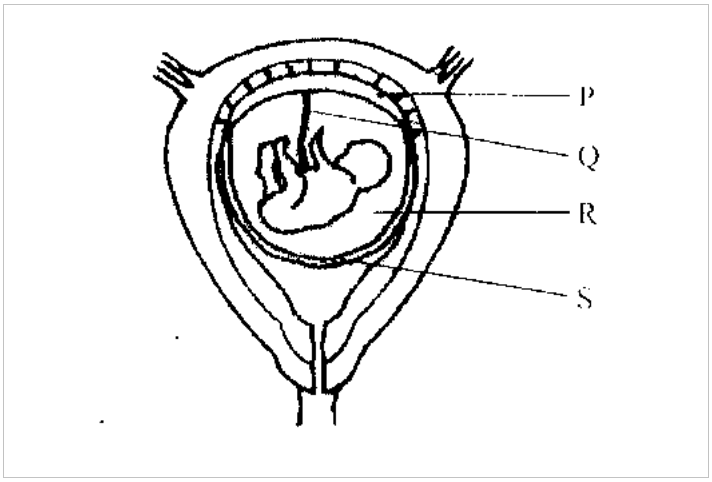
BIOLOGY
K.C.S.E PAPER 231/2 2016
MARKING SCHEME

SECTION A (40 MARKS)

Answer all the questions in this section in the spaces provided

1. The diagram below represents a human foetus in a uterus



a) Name the part labeled S. (1mks)

b) i)Name the types of blood vessels found in the structure labeled Q.
(2 mks)

ii) State the difference in composition of blood found in the vessels named in (b) (i) above (2mks)

c) Name two features that enable the structure labeled P to carry out its function.
(2 mks)

d) State the role of the part labeled R.
(1mk)

2. a) i) How is sex determined in man? (2 mk)

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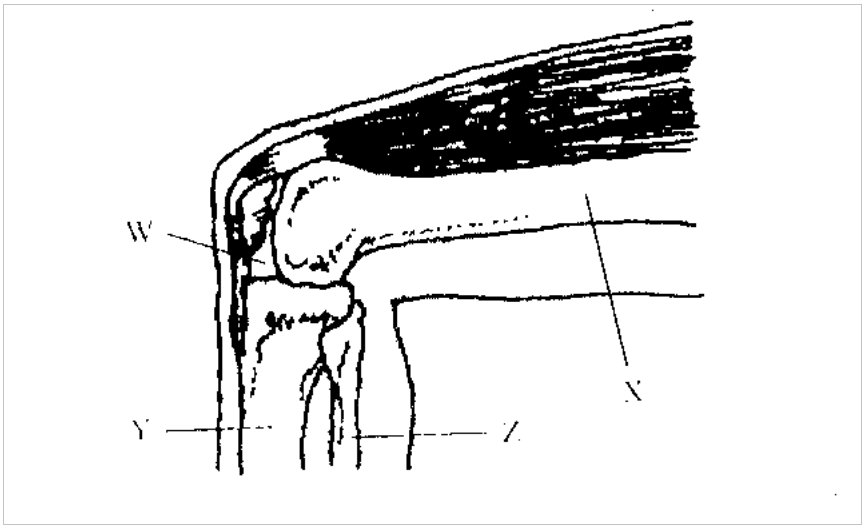
ii) Explain why people with sickle cell trait have an adaption survival advantage over normal individuals in malaria endemic regions.

(2 mks)

3. The diagram below represents bones at a join found in the hind limb of a mammal.



a) Name the bones labeled X, Y and Z

(3 mks)

X

Y

Z

Bi) Name the sub stance found in the place labeled w.

(1 mk)

ii) State the function of the substance name din (b) (i) above

(1 mks)

c) Name the structure that joins bones together at the joint.

(1 mk)

d) State the difference between ball and socket joint and the one illustrated in the diagram above. (1mks)

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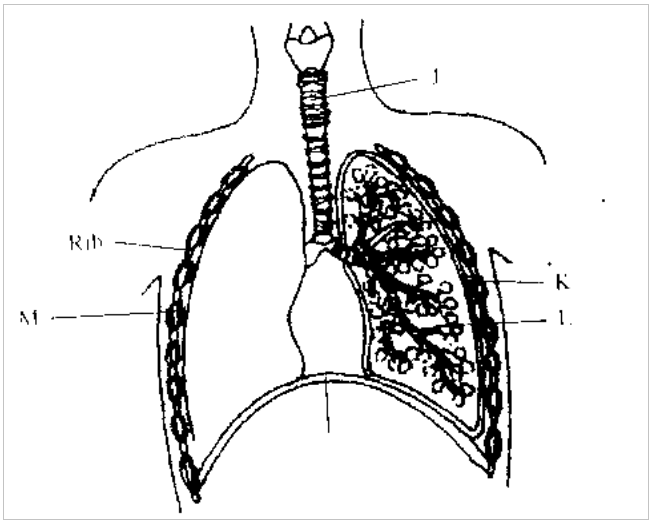
e) Name the structure at the elbow that performs the same function as the patella. (1mks)

4. The diagram below represents some gaseous exchange structures in humans.

K
L J M Rib



a) Name the structures labeled K, L and M.
(3 mks)

b) How is the structure labeled J suited to its function ? (3 mks)

c) Name the process by which inhaled air moves from the structure labeled L into blood capillaries (1 mks)

d) Give the scientific name of the organism t hat causes tuberculosis in humans
(1 mks)

5. A freshly obtained dandelion stem measuring 5cm long was split lengthwise to obtain two similar pieces. The piece were placed in two different solutions of

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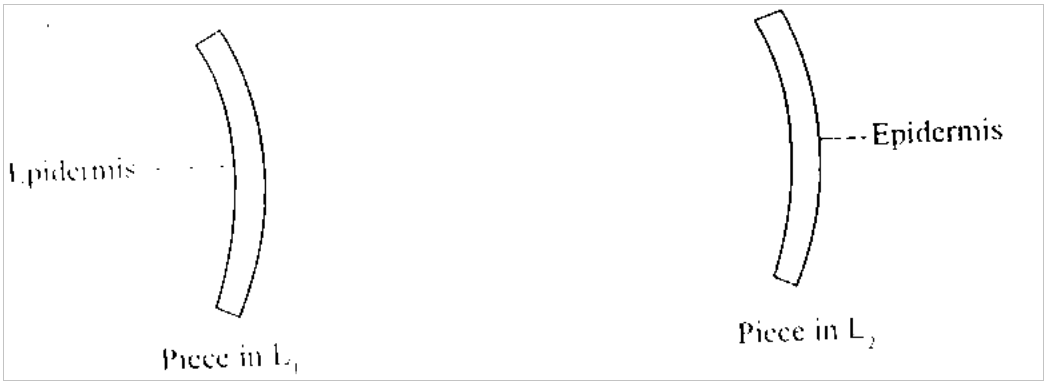
different concentration in petri-dishes (L_1 and L_2) for 20 minutes. The appearance after 20 minutes is as shown.

Epidermis **Piece in L_2** **Piece in L_1** **Epidermis**



a) Account for the appearance of the piece in solutions L_1 and L_2.
(6 mks)

b) State the significance of the biological process involved in the experiment
(2 mks)

SECTION B (40 mks)

*Answer question **6 (compulsory)** and either question 7 or 8*

6. An experiment was carried out to investigate the effect of temperature on the rate of reaction catalysed by an enzyme. The results are shown in the table below

Temperature (°C)	Rate of reaction in mg of products per unit time
5	0.2
10	0.5
15	0.8
20	l.l
25	1.5
30	2.1
35	3.0
40	3.7
45	3.4

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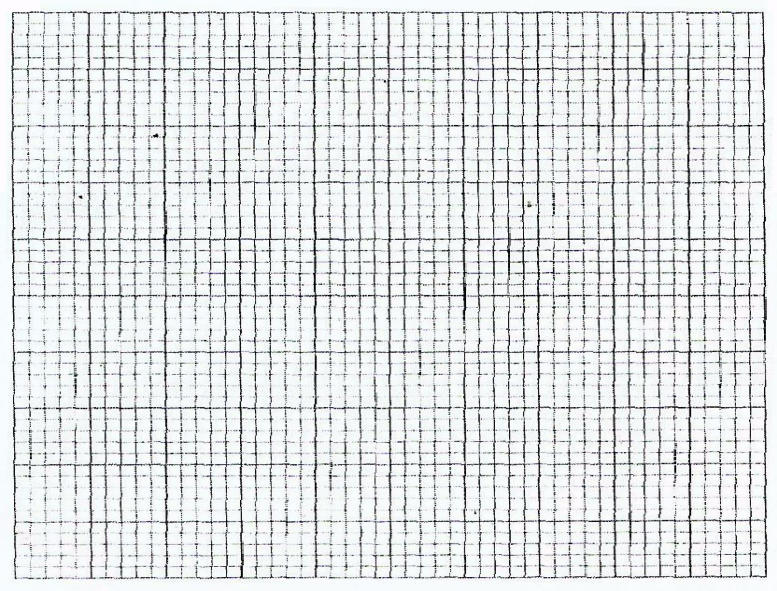
50	2.8
55	2.1
60	1.1

a) On the grid provided plot the rate of reaction against temperature.



b)When was the rate of reaction 2.6 mg of product per unit time?
(2 mks)

c) Account for the shape of the graph between

i) 5^0C and 40^0C (2 mks)

ii) 45^0C and 60^0C (3 mk)

d) Other than temperature name two ways in which the rate of reaction between 5^0C and 40^0C could be increased
(2 mks)

e i)Name one digestive enzyme in the human body which works best in acidic condition. (1 mks)

ii) How is the acidic condition for the enzyme named in (e) (i) above attained?
(2 mks)

f) The acidic condition in (e) (iii) above is later neutralized

i)Where does the neutralization take place? (1mk)

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ii)Name the substance responsible for the neutralization

(1 mk)

7. Using a relevant example in each case, describe simple and conditional reflex actions (20 mks)

8. Describe how the mammalian heart is structurally adapted to its function (20 mks)

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