

K.C.S.E BIOLOGY 1995
BIOLOGY 231/1
QUESTIONS
SECTION A (20 MKS)

Answer all questions in this section in spaces provided

1. Motor vehicles move, use energy and produce carbon dioxide and water. Similar characteristics occur in living organisms yet motor vehicles are not classified as living (3 mks)
2. Name the organelle that performs each of the following functions in a cell (2 mks)
 - Proteins synthesis
 - Transport of cell secretions
3. State two ways in which some fungi are harmful to man (2 mks)
4. Explain what would happen to red blood cells if they are placed in a concentrated salt solution (2 mks)
5. State the role of light photosynthesis (2 mks)
6. The diagram below represents a fern



Name

- (a) The parts labeled A and B (2 mks)
 - (b) The division to which the plant belongs (1 mk)
7. Complete the table below on mineral nutrition in plants (3 mks)

Mineral element	Function	Deficiency symptoms
	Synthesis of proteins and protoplasm	Stunted growth and yellowing of leaves
Calcium		
	Forms part of chlorophyll	Yellowing of leaves

8. Explain why Larmacks theory of evolution is not accepted by biologists today (2 mks)
9. name a is disorder of human blood that is caused by mutation (1 mk)

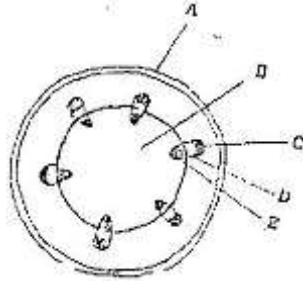
SECTION B (40 MARKS)

10. An experiment was carried out to investigate the rate of reaction shown below
 $\text{Sucrose} \rightarrow \text{Fructose} + \text{Glucose}$

For the products fructose and glucose to be formed, it was found that substance K was to be added and the temperature maintained at 37°C. When another substance L was added, the reaction slowed down and eventually stopped.

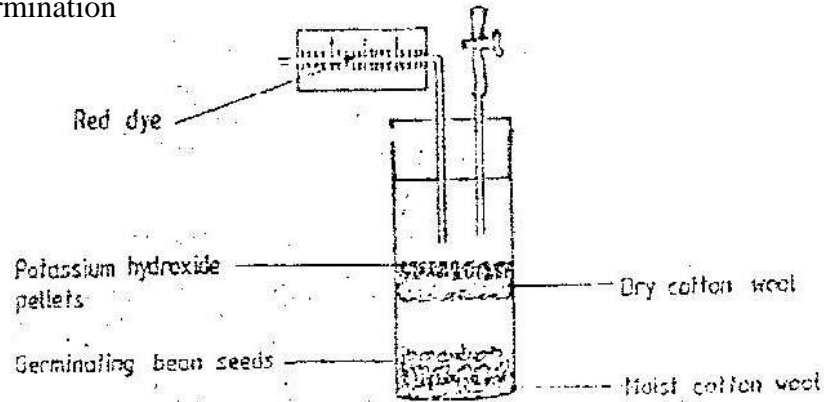
- (a) Suggest the identify of substances K and L (2 mks)
- (b) Other than temperature state three ways by which the rate of reaction could be increased (3 mks)
- (c) Explain how substance L slowed down the reaction (2 mks)

11. The diagram below represents a transverse section of a young stem



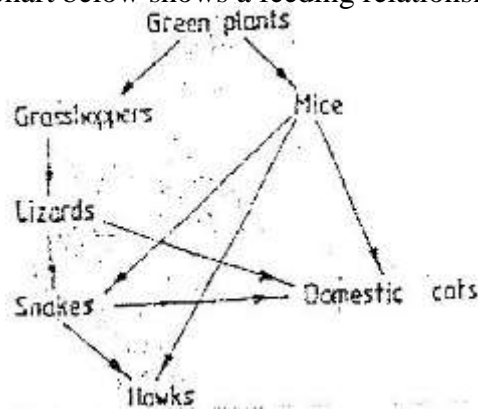
- (a) Name the parts labeled A and B (2 mks)
- (b) State the functions of the parts labeled C, D and E (4 mks)
- (c) List three differences between the section shown above and one that would be obtained from the root of the same plant (3 mks)

12. The diagram below shows an experimental soil up to investigate an aspect of germination



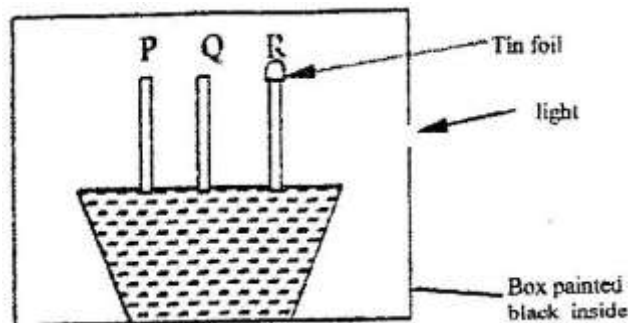
- (a) Why are sodium hydroxide pellets used in this experiment? (1 mk)
- (b) Why is moist cotton wool used in this experiment? (1 mk)
- (c) (i) By means of an arrow, indicate on the diagram the direction in which red dye would move during the experiment. (1 mk)
- (ii) Give reasons for your answer in (c) (i) above (3 mks)

13. The chart below shows a feeding relationship in a certain ecosystem



- Construct two food chains ending with a tertiary consumer in each case (2 mks)
- Which organism has the largest variety of predators in the food web? (1 mk)
- Name secondary consumers in food web (2 mks)
- Suggest three ways in which the ecosystem would be affected in there was a prolonged drought.

14. The diagram below represents growing seedlings which were subjected to unilateral light at the beginning of an experiment

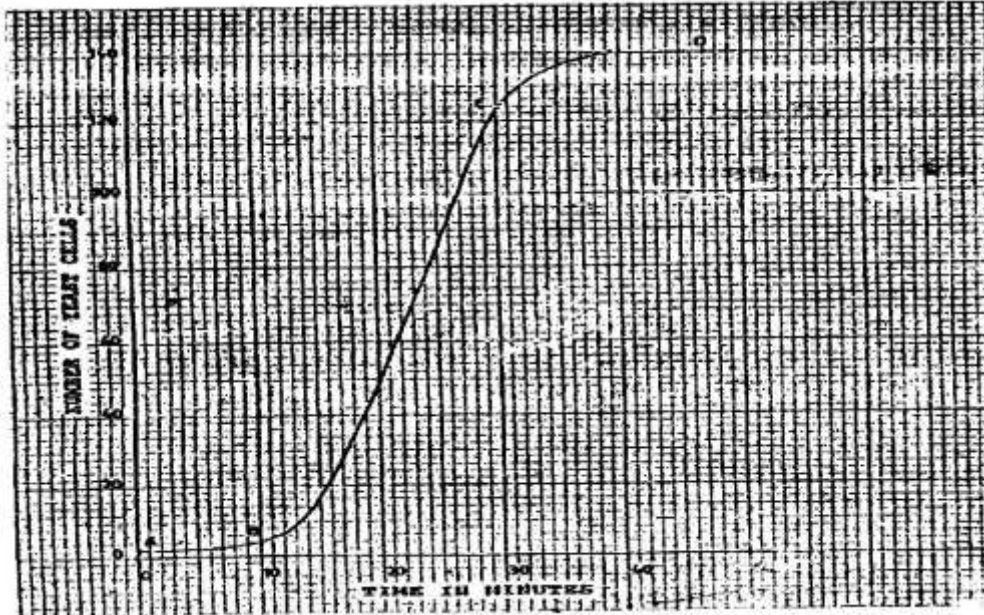


- State the results of P,Q and R after 5 days? (5 mks)
 - Account for your answer in (a) (i) above (3 mks)
- If the tin foil were removed from the tip of the seedling R, what results would be observed after 2 days? (1 mk)
- State the expected results after 3 days if the box were removed (1 mk)

SECTION C (40 Mks)

Answer questions 15 (compulsory) in the spaces provided and one question from this section in the spaces provided after question 17

15. The graph below represents the increase in the number of yeast cells over a period of 48 minutes



- (a) Name the type of curve shown (1 mk)
- (b) Determine the number of yeast cells after 26 minutes (1 mk)
- (c) Work out the rate of cell division between 24 and 28 minutes (2 mks)
- (d) After how long was the population of yeast cells 128? (1 mk)
- (e) Name the phase of the curve labeled
- A to B
 - B to C
- (f) Give reasons for the shape of the graph between points C and D (3 mks)
- (g) State five factors, which would cause human population growth to assume the shape of the graph curve between points B and C (5 mks)
- (h) Describe how the quadrat method can be used to estimate the population of various species of plants in a given habitat (5 mks)
16. (a) Describe how insect pollinated flowers are adapted to pollination
- (b) Describe the role of each of the following hormones in the human menstrual cycle
- Oestrogen
 - Progesterone
 - Luteinising hormone (9 mks)
17. Describe how excretion takes place in
- Mammalian Kidneys
 - Green plants (5 mks)

BIOLOGY PAPER 231/2 K.C.S.E 1995
PRACTICAL MARKING SCHEME

1. **Confidential requirement: Specimen K – 5 *Rastrineobolla argenti***
(Omena in Luo)

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

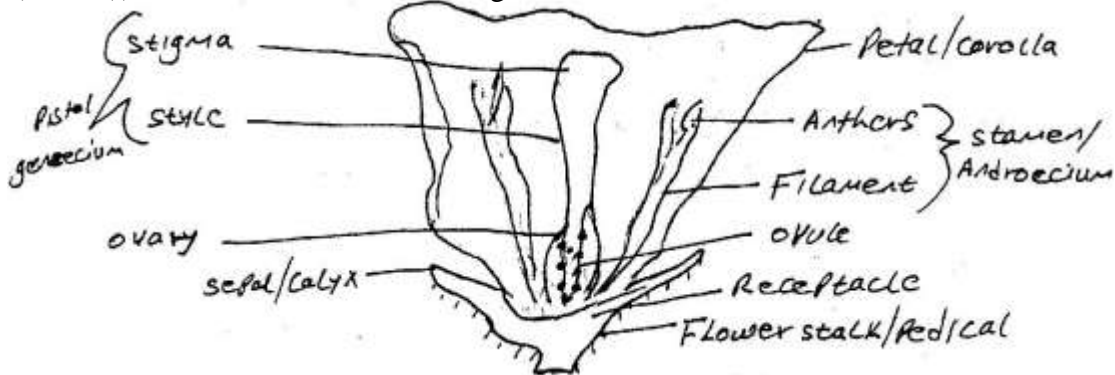
- a) (i) State the phylum to which the specimen belongs chordata;
(ii) Using the observable features only, name the class to which the specimen belongs.
Pisces.
(iii) Give your answer in (a) (ii) above
Lateral line / operculum / gill cover / gills, fins
Acc. fish, osteichythes / bonny fish etc
- b) Using the observable features, only state how the animal is adapted to living in its habitat.
-Streamlined body for easy movement / minimize friction (owwte)
-Presence of fins for swimming / balance
-presence of gills for breathing in water/gaseous
Exchange / operculum / gills cover to allow water of pass out.
-Presence of lateral line helps vibration / movements in water
Waves / disturbance in water.
- 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, identify 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	To the extract add dilute NaOH solution and 1% copper sulphate;	Violet/purple colour appears	Protein present
Reducing sugar	To the extract add Benedict's solution boil / warm	No colour change	Reducing sugar absent.

2. **Confidential requirement: Specimen M- Freshly picked and intact mature Flower obtained Solanum incanum or Lycopersicon.**

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
X1 – X10 (with or without the x)

- b) (i) Name the agent of pollination of the flower
Insects – (Reg – animal alone)
- (ii) State two ways, which the flower is adapted for pollination by the agent named in b(i) above.
Brightly coloured to attract insects.
Stigma is below another to avoid self – pollination
Smell/ scent to attract insects.

3. **Confidential requirement: Specimen N Freshly killed soldier termite. Specimen p – Freshly killed weevil, Specimen Q – Freshly killed maggot of a housefly.**

Animal	Type of Environment	Reason
N	Moist	Soft skeleton/cuticle/body/outer covering Thin
P	Dry	Hard wings / hard Exoskeleton
Q	Moist	Soft Exoskeleton/body/covering cuticle.

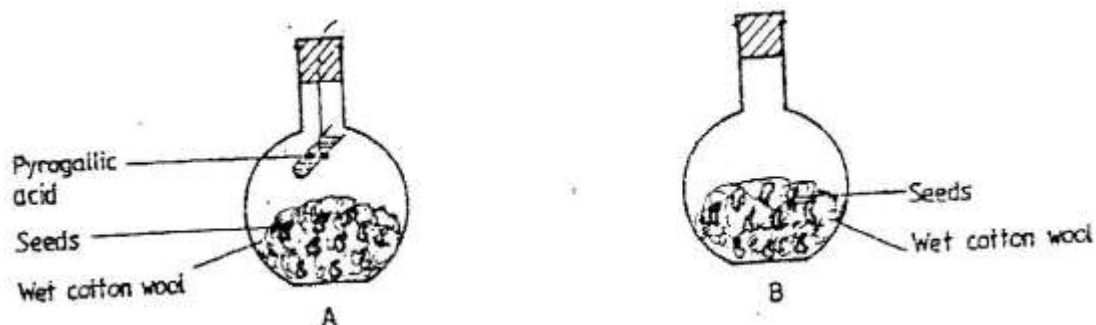
- b) With a reason in each case, state the type of locomotion each animal exhibits.

Animal	Type of locomotion	Reason
N	Walking	Presence of legs
P	Walking	Presence of legs
	Flying	Presence of wings
Q	Crawling / Wriggling	Presence of prolegs / no Legs / pseudo legs (false)

- C) (i) Adult / imago;
(ii) Larva Rej; maggot

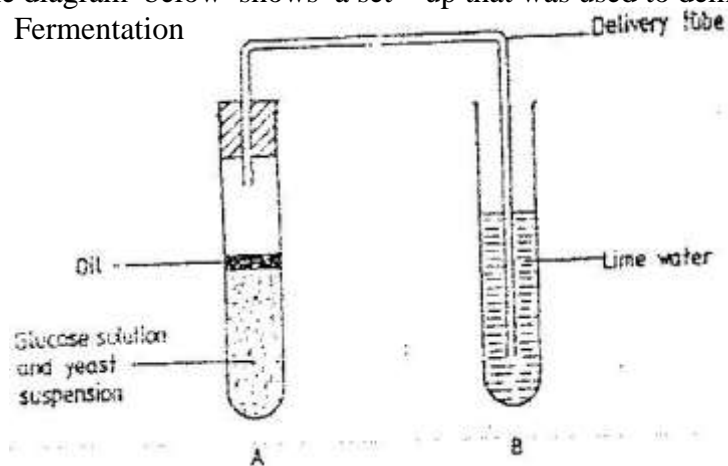
BIOLOGY PAPER 231/ 1 K.C.S.E 1996
QUESTIONS

1. State the function of Deoxyribonucleic acid (DNA) molecule (1mk)
2. State two ways by which acquired Immune deficiency syndrome (A.I.D.S) Virus is transmitted. (2 mks)
3. When is glycogen which is stored in the liver converted into glucose and released into the blood (1 mk)
4. Name the disease in humans that is caused by lack of vitamin C (1 mk)
5. An organ is with an exoskeleton, segmented body, two pairs of legs per segment, a pair of eyes and a pair short antennae belongs to the phylum (1 mk)
6. What are two organisms considered to belong to the same species (2 mks)
7. (a) state the role of light in the process of photosynthesis (1 mk)
(b) Name one end product of dark reaction in photosynthesis (1 mk)
8. State two functions of cell sap (2 mks)
9. State three characteristics that ensure cross – pollination takes place in flowering plants (3 mks)
10. A student set up an experiment as shown in the diagrams below



The set up was at room temperature for a week

- (a) What was the aim of the experiment? (1 mk)
 - (b) What would be the expected results at the end of the experiment (2 mks)
11. Give a reason why it is only mutation in genes of gametes that can influence evolution (1 mk)
 12. Give a reason why it is necessary for frogs to lay many eggs (1 mk)
 13. The diagram below shows a set – up that was used to demonstrate Fermentation

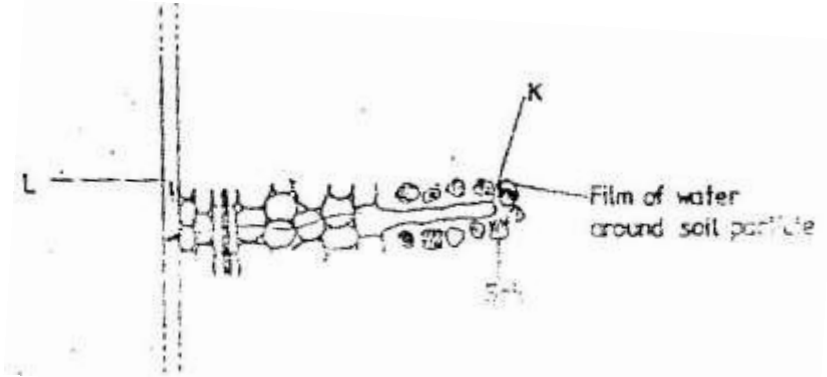


Glucose solution was boiled and oil added on top of it. The glucose solution was then allowed to cool before suspension.

- (a) Why was the glucose solution boiled before adding the yeast Suspension? (1 mk)
- (b) What was the importance of cooling the glucose solution before adding the yeast suspension? (1 mk)
- (c) What was the use of oil in the experiment? (1 mk)
- (d) What observation would be made in test tube B at the end of the experiment? (1 mk)
- (e) Suggest a control for this experiment (1mk)
14. (a) Describe the path taken by carbon dioxide released from the tissue of an insect to the atmosphere (3 mks)
- (b) Name two structures used for gaseous exchange implants (2 mks)
15. To estimate the population size of crabs in a certain lagoon, traps were laid at random. 400 crabs were caught, marked and released back into the lagoon. Four days later, traps were laid again and crabs were caught. Out of the 374 crabs, 80 were found to be marked.
- (a) calculate the population size of the crabs in the lagoon using the formula below
- $$N = \frac{n \times M}{m}$$
- Where N = Total population of crabs in the lagoon
n = Total number of crabs in the second catch
M = Number of marked crabs during the first
m = Number of marked crabs in the second catch (2 mks)
- (b) State two assumptions that were made during the investigation (2 mks)
- (c) What is the name given to this method of estimating the population size (1 mk)
16. A shoot of seedling exposed to light on one side bends towards the source of light as it grows
- (a) Name the response exhibited by the shoot of the seedling (1 mk)
- (b) Explain how the bending towards the source of light occurs (3 mks)
17. (a) How may excessive bleeding results in death? (4 mks)
- (b) Name the process by which the human body naturally stops Bleeding? (1 mk)
- (c) How can low blood volume be brought back to normal (3mks)
18. In an experiment black mice were crossed and the offspring were black and brown. The gene for black colour is dominant over that of brown colour. Using letter B to represent the gene for black colour and b to represent the gene for brown colour

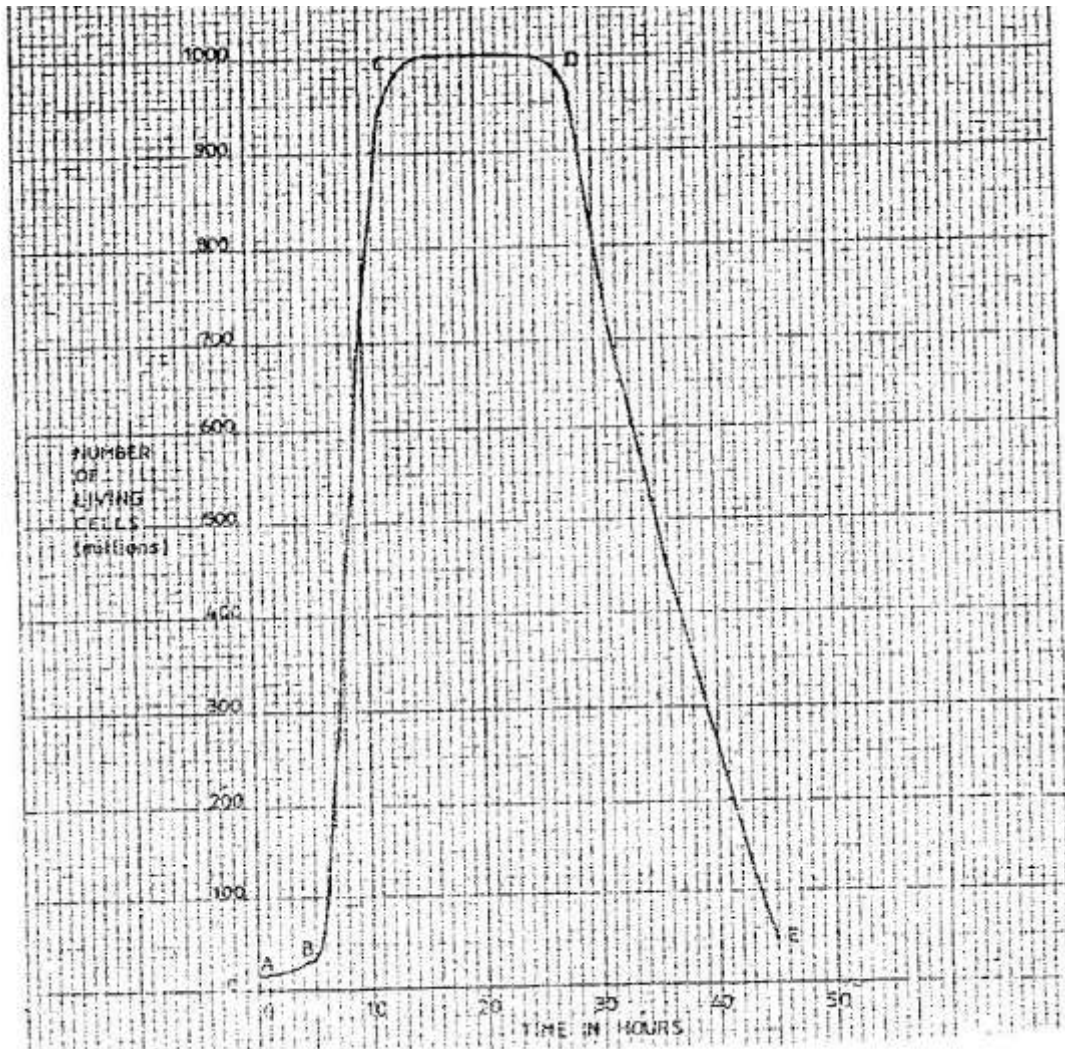
- (a) Work out the genotypes of the F_1 generation (4 mks)
(b) What is the phenotype ratio of the spring (1 mk)

19. The diagram below represents the pathways of water from the soil into the plant.



- (a) Name the structures labeled K and L. (2 mks)
(b) Explain how water from the soil reaches the structure labeled L. (5 mks)
(c) Name the process by which mineral salts enter into the plant (1 mk)

20. A culture of bacteria was incubated in nutrient agar at 35°C. Samples were taken at intervals in order to estimate the number of bacteria in the population. The data obtained is shown in the graph below.



- (a) When was the population of bacteria 350 million
- (b) Account for the shape of the graph between
- A and B
 - B and C
 - C and D
- (c) Give three reasons for the shape of the curve between D and E
- (d) (i) Suggest what would happen to the population of the bacteria if the temperature was lowered to 0° after incubating for 12 hours.
(ii) Give a reason for your answer in (d) (i) above
- (e) Give three reasons why it is important to control human population growth rate in Kenya?
21. Explain how the mammalian skin is adapted to perform its functions (20 mks)
22. Describe how new plants arise by asexual reproduction (20 mks)

**BIOLOGY PAPER 231/2 KCSE 1996
PRACTICAL MARKING SCHEME.**

1. Confidential requirement: Specimen D – ‘sukuma wiki’ kale.

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.
 -Leaf blade / lamina
 -Presence of petiole / mid – rib / leaf stalk.
 -Presence of veins Rej; venation
- 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	28	13
2. High power	33	12
3. High power	30	13
Average number of stomata	A-	A(Must be lower than that of upper epidermis)

Ref: Average if at least one count is wrong.

- 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 lens x10/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.

$$\text{Mag} = \text{Eye} \times \text{Objective}$$

$$10 \times 40 = 400$$

$$15 \times 45 = 675 (\text{Rej if working is not shown.})$$
- e) Account for the average number of stomata on each side of the specimen.
 Upper epidermis- fewer stomata / reduce transpiration / water loss / rate of evaporation / exposed to direct sunlight.
 Lower epidermis – more to increase rate of gaseous exchange // allow more gaseous exchange / more stomata away from the sun to reduce rate of transpiration.
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.

<u>Food substance</u>	<u>procedure</u>	<u>Observations</u>	<u>Conclusion</u>
Starch	Iodine solution added drop wise		
Proteins	Add NaOH to solution then copper sulphate (1%) /CuSO ₄ +NaOH	Violet / purple colour observed	Reducing sugars
Reducing Sugars		Colour changes from Blue – green – yellow-orange / Red ppt/Brick red ppt. Acc any of the colour.	Reducing sugars present

- (ii) Account for the results obtained in (a) (i) above
 -No starch because it has been Digested / converted / broken / changed to simple / reducing sugar.
 -Reducing sugar present / incomplete digestion of protein
 -Digestion / incomplete absorption.
 No link / tied with table.
- 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-
 Slimmy / slippery / wavy / undulating / protrusion / projections/folds/s wellings / lumps Rej: rough
 Outer surface: Smooth
- (ii) Account for your observations of the inner surface.
 -Slimmy due to presence of mucus secreted by intestinal walls to protect walls from enzyme digestion / lubricate the walls.
 -Projections – presence of villi / finger like structure; for absorption of food / folds to increase surface area for absorption.

3. Confidential requirement J: Fish /Tilapia

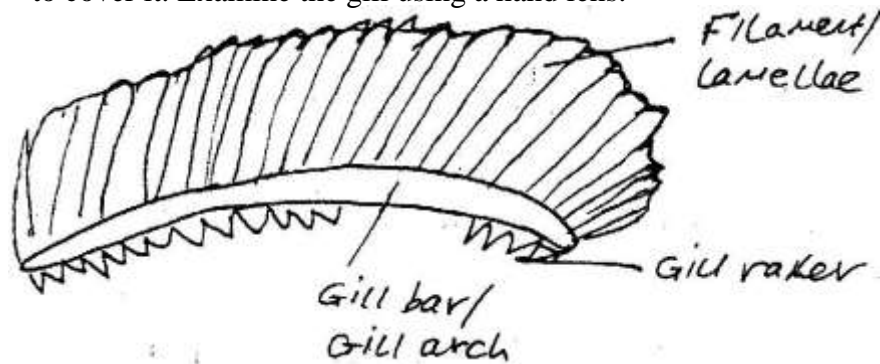
You are provided with a specimen labeled J.

- a) Using observable features only, identify the class to which the specimen belongs.
 -Class Pisces (Rej Fish (es)

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

- 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
Tail – head – Rough
Head – tail – Smooth
 - (ii) Observe the arrangement of the scales .Record your Observations
-Scales overlap
-Free ends point backwards (owwte)
 - (iii) State the significance of the arrangement of the scales.
 - minimize / reduce friction (during motion)
 - Prevent water contact with body / skin
 - Protection
 (Rej (iii) if (ii) is wrong.
- c) 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.



Gill filament -Closed a top
-Arranged closely
-Proportionality
-Origin, gill bar

Gill bar -Continuous lines
-Curved
-Closed both ends

Gill rakes -Serrated
-Close to one another
-Origin – gill bar
-No shading

- (ii) How is the gill adapted to its function?
- Many/numerous gill filaments to increase surface area for gaseous exchange.
 - Extensive vascularisation / many capillaries /blood vessels; for gaseous exchange.
 - Presence of rakers to filter / trap solid particles, which might damage the gill filaments.

-Gill bar / arc / is bony / cartilaginous / bony / hard / firm for support / attachment gill filaments and / or strong rakers.
-Thin filaments; to facilitate diffusion of gases / to shorten distance for diffusion of gases.

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QUESTIONS

Answer all the questions in this section in the spaces provided

1. State the functions of the following cell organelles
 - (a) Golgi apparatus
 - (b) Ribosomes

2. A student caught an animal which had the following characteristics:
Body divide into two parts
Simple eyes
Eight legs
The animal belong to the class

3. What are the three end products of anaerobic respiration in plants

4. state two ways in which xylem vessels are adapted to their function

5. In an accident a victim suffered brain injury. Consequently he had loss of memory. Which part of the brain was damaged?

6. Oil can be applied on the stagnant water to control the spread of malaria.
 - (a) How does this practice control the spread of malaria?
 - (b) Give a reason why this practice should be discouraged

7. State three structural differences between biceps muscles of the gut.

Biceps	Gut Muscles
Striated	Unstriated
Multinucleated	Uninucleated
Long fibres	Short fibres
Cylindrical	Spindle shaped

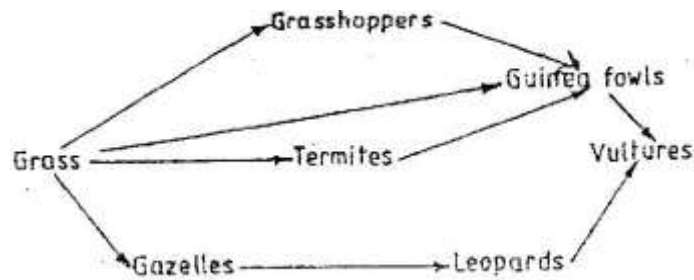
8. A person was found to pass out large volumes of dilute urine frequently.
Name the
 - (a) Disease the person was suffering from
 - (b) Hormone that was deficient

9. state three pieces of evidence that support the theory of evolution

10. Name a disease caused by lack of each of the following in human diet.
Vitamin D
Iodine

SECTION B (40 MARKS)

11. The following below represents a feeding relationship in an ecosystem

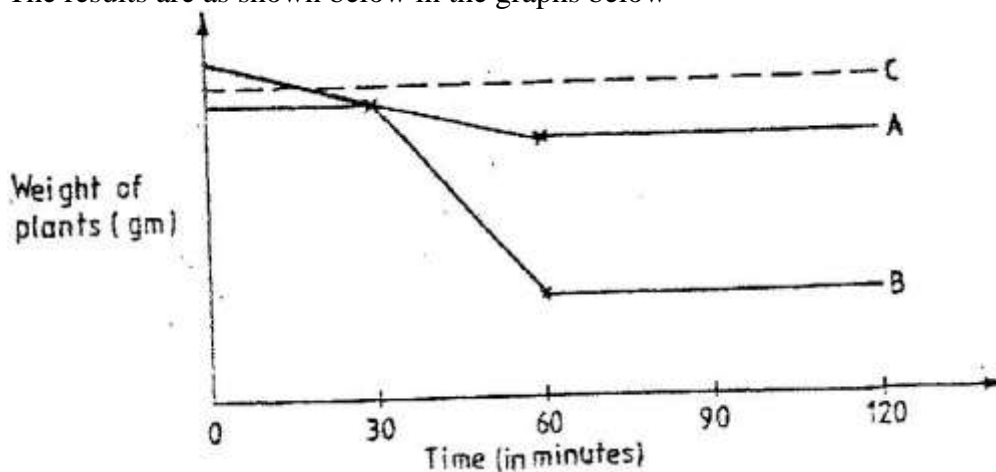


- Write down the food chains in which the guinea fowls are secondary consumers
- What would be the short term effects on the ecosystem if lions invaded the area?
- Name the organism through which energy from the sun enters the food web.

12. A person was able to read a book clearly at arm's length but at normal reading distance.

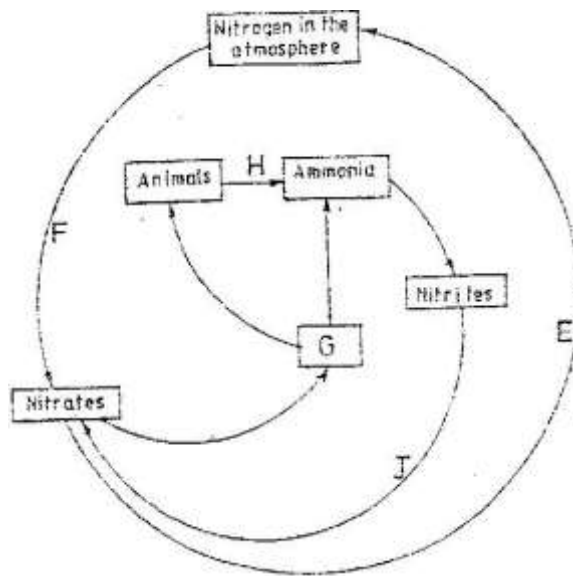
- State the defect the person suffered from?
- Why was he unable to read book clearly at normal distance
- How can the defect be corrected?

13. An experiment was carried out to determine the rate of transpiration in three plants A, B and C. Plants, A and B belonged to different species while plants B and C belonged to the same species. Plant C had all its leaves removed. The three plants were of similar size and were exposed to the same environment conditions. The results are as shown below in the graphs below



- Suggest possible environment conditions under which the experiment was carried out between 30 and 60 minutes
- Account for the results obtained for plant C
- Suggest the habitat for plant A and B. Give reasons for your answer.
 Habitat for plant A
 Habitat for plant B

14. The diagram below represents a simplified nitrogen cycle.



- Name the organisms that cause process E and J
- Name the process represented by F and H.
- Name the group of organism represented by G

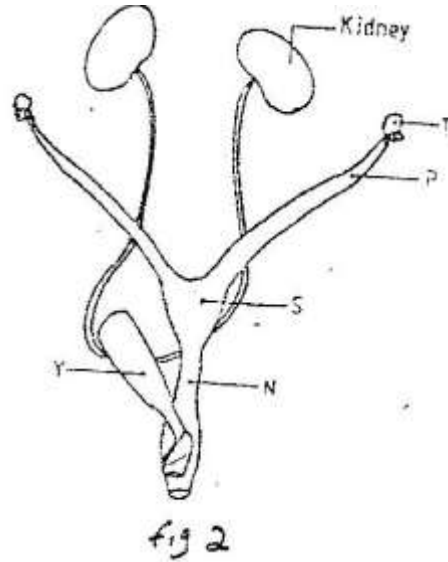
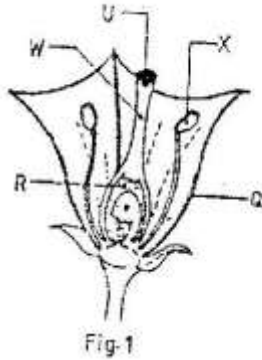
15. The equation below represent a metabolic that occurs in the mammalian live
 Amino acids \rightarrow Organic compounds + urea

- Name the process.
- What is the importance of the process to the mammal?
- What is the source of amino acids in this process
- What is the difference between essential and nonessential amino acids?

16. In a breeding experiment, plants with red flowers were crossed. The produced 123 plants with red flowers and 41 with white flowers

- Identify the recessive character
 Give a reason
- What was the genotype of the parent plants that gave rise to the plants with a red and white flowers?

17. Figures 1 and 2 below represent reproductive organ of plants and an animal respectively.



- (a) Which letters in figures 1 and 2 represents the organs that produce female gametes?
 Figure 1
 Figure 2
- (b) What is the function of the structure labeled S?
- (c) Name the structure labeled W
- (d) Which letters in figures 1 and 2 represents the structures where fertilization takes place
- (e) Which letter in figure 1 represents the structure where male gametes are produced?

SECTION C (40 marks)

18. An experiment was carried out to determine the growth rates of bamboo and a variety of maize plants in two adjacent plots. The average height and average dry weight of plants from the two populations were determined over a period of twenty weeks. The data is as shown in the table below.

Age in weeks	Bamboo		Maize	
	Average height (Metres)	Average weight (Grams)	Average height (Metres)	Average weight (Grams)
2	1.3	52	0.3	20
4	4.0	182	0.5	29
6	8.2	445	0.8	57
8	12.1	682	1.2	78
10	13.9	801	1.7	172
12	14.1	957	1.9	420
14	14.3	1025	2.1	704
16	14.4	1062	2.1	895
18	14.6	1127	2.1	926
20	14.6	1229	2.1	908

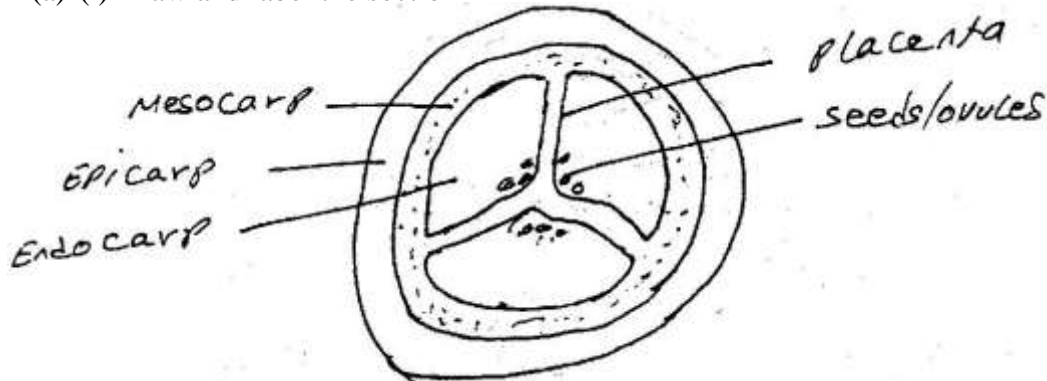
- (a) Between which two weeks did the greatest increase in weight occur in
- (b) (i) Bamboo plants
(ii) Maize plants
- (c) (i) Which of the two types of plants had a higher productivity by the end of the experiment
(ii) Give a reason for your answer in (b) (i) above
- (d) Between weeks 14 and 18, the average height of the maize plants remained constant while average dry weight increased.
Explain this observation
- (e) Suggest how the change in the average dry weight bamboo and maize plants would have been at week 22 if the experiment was continued.
- (f) Why was it appropriate for this experiment to use
- (i) Dry weight instead of fresh weight
(ii) Weight and height
- (g) Describe how the average height and weight of the plants were determined in this experiment.
Average height
Average dry Weight
- (h) Give a reason why secondary thickening does not occur in bamboo and maize plants
19. (a) What is parasitism?
(b) Describe how the tapeworm is adapted to a parasitic mode of life
20. (a) What is meant by the term digestion?
(b) Describe how the mammalian small intestine is adapted to its function

**BIOLOGY PAPER 231/2 K.C.S.E 1997
PRACTICAL MARKING SCHEME**

1. Confidential Requirement specimen Q- Ripe banana

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

X ½ - X3

$$\text{Mag} = \frac{\text{Size of diagram}}{\text{Size of object}} = X \frac{1}{2} - X3$$

(b) What type of fruit is specimen Q?

Freshly/simple/berry/succulent

(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.

	Extract inside tubing	Iodine solution Outside tubing
Before the experiment	Cream/white/cream white/pale yellow/ light yellow Rej. Yellow	Colour of iodine Yellow/brown Reddish brown/ orange
After the experiment	Blue + Black/ blue Black Rej purple	As above no colour change

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

Iodine/ dissolved/ entered and reacted with starch concentration

Gradient

Reaction

Extra mole cannot come out- too large to diffuse out.

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



(a) Name the structures labeled

S1 - Oesophagus/gullet/trachea

S3 - Lungs

S4 – Gal bladder/ liver

S7 – Kidney

S9- Ovary/uterus/womb

S10- Uterus/ womb

S12 – Caecum

S13- Colon/ large intestine/ileum/small intestine

S14- Stomach

S15- Liver

S16 – Heart

S20- Tongue/ mouth

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

F1 – Bladder; storage of urine/holding/ keeping

F2- Hepatic portal vein/bile duct; transport of digested food into the liver

- Transport of bile juice/ salts to duodenum

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

Sex- Female

Reasons – Ovaries/ pregnant/fallopian tubes/ uterus present.

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

- Forceps

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

Holding tissues during dissection/ lifting/ caching/ pulling parts in place/
removing parts.

(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.

Length of the tool in the photograph; 4.5 to 5 cm

= Length of the tool

Actual length of the object

$$\frac{4.5}{15} = 0.3 = \times 0.3$$

Magnification of the photograph

Length of diagram/ photo

Length of object

$$\frac{4.5 \text{ cm}}{15 \text{ cm}} = 0.3 \text{ mag}$$

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.

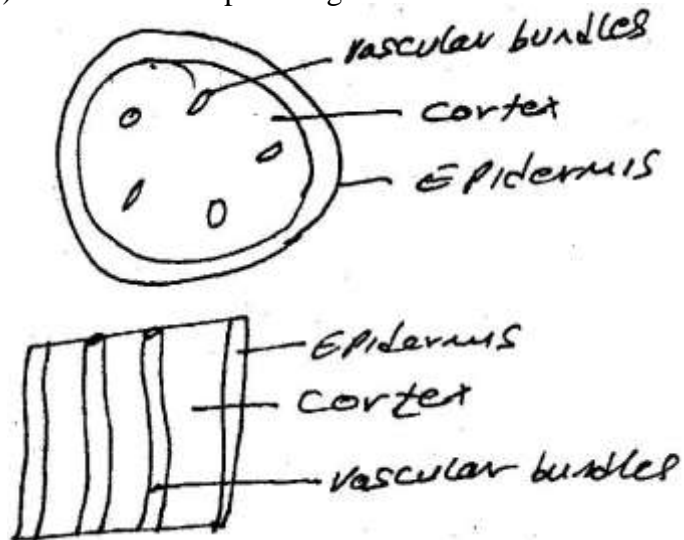
1 a; Leaf simple	go to 3
b; leaf compound	go to 2
2 a; Leaf lobbed	Oxalidaceae
b; Leaf with unlobbed leaflets	go to 8
3 a; Leaf parallel veined or with a spine	go to 4
b; leaf net- veined	go to 6
4 a; leaf succulent	go to 5
b; Leaf not succulent	Graminae
5 a; Leaf with sheath	Commelinaceae
b; leaf without 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
b; leaflets margins smooth	Mimosaceae
9 a; Leaf surface not spiny	Verbanaceae
b; Leaf surface spiny	Rosaceae

Specimen	Identity	Steps Followed
P1	Commelinaceae	1a, 3a, 4a, 5a
P2	Compositae	1 b. 2b, 5a
P 3	Anacardoceae	1a, 3b, 6b, 7a
P4	Mimosaceae	1b, 2b, 8b
P5	Solanaceae	1a, 3b, 6b, 7b
P6	Oxalidaceae	1b, 2c
P7	Agavaceae	1a, 3a, 4a, 5b
P8	Verbanaceae	1a, 3b, 6a, 9a
P9	Graminae	1a, 3a 4b

Wrong steps, wrong identity no mark

- (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 Dicotyledonous – rej. Dicot and cotyledon

Reason Vascular bundles arranged in a ring/ circle/ vascular bundles is on either side of pith/distinct cortex.

BIOLOGY PAPER 231/1 KC.S.E 1998
QUESTIONS

1. Why are people with blood group O universal donors?
2. State one effect of magnesium deficiency in green plants
3. Which organelle would be abundant in:
Skeletal muscle cell
Palisade cell
4. Why are gills in fish highly vascularized?
5. What is the relationship between leguminous plants and bacteria found in their root nodules?
6. In an experiment it was found that when maggots are exposed to light they move to dark areas.
(a) Name the type of response exhibited by the maggots
(b) Name the advantages of the response to the maggots
7. The diagram below represents a mammalian bone

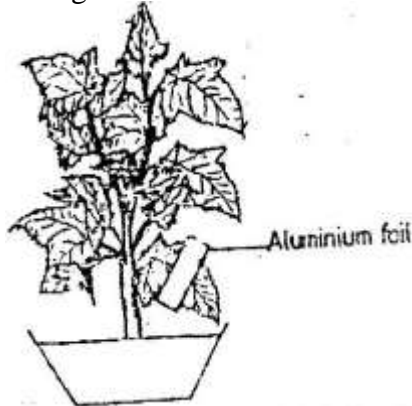


- (a) Name the bone
- (b) Name the type of the joint formed by the bone at its anterior end with the adjacent bone
8. A flower was found to have the following characteristics:
Inconspicuous petals
Long feathery stigma
Small, light pollen grains
(a) What is the likely agent of pollination of the flower
(b) What is the significance of the long feathery stigma in the flower?
9. What makes young herbaceous plant remain upright?
10. Give two reasons why primary productivity in an aquatic ecosystem decreases with depth.
11. State two ways by which the human immuno deficiency (H.I.V) is transmitted other than through sexual intercourse?
12. In a family with four children, three were found to have normal skin pigmentation while one was an albino.
Using letter A to represent gene for normal skin pigmentation and a to represent the gene for albinism,
(a) What are the genotypes of the parents?
(b) Work out the genotype of
(i) Normal pigmentation
(ii) The albino child
Genotype of normal pigmented children
(c) What is the probability that the fifth child will be an albino?
13. (a) List four differences between meiosis and mitosis
(b) Which sex chromosomes are found in human?

Sperm cell?

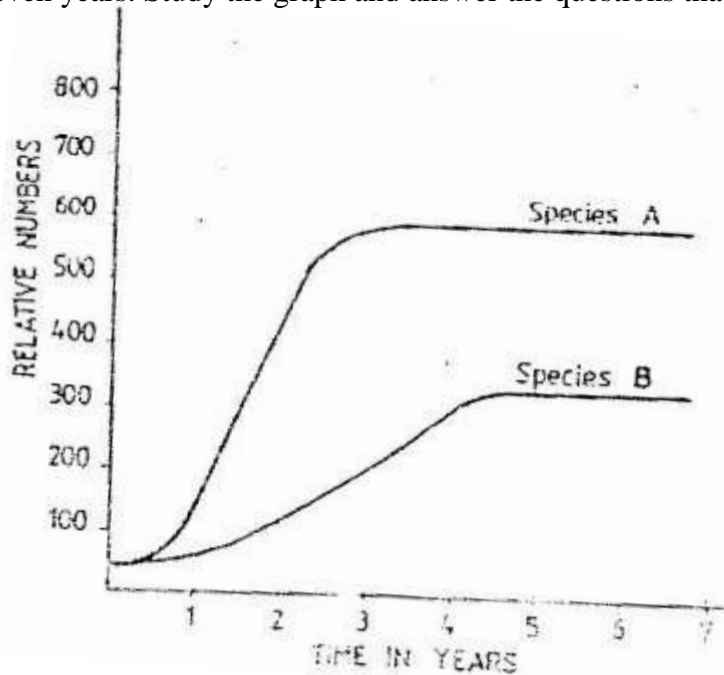
Ova?

14. In an experiment to investigate a factor affecting photosynthesis, a leaf of a potted plant which had been kept in the dark overnight was covered with aluminium foil as shown in the diagram below



The set up was kept in sunlight for three hours after which a food test was carried out on the leaf.

- (a) Which factor was being investigated in the experiment?
(b) What food test was carried out?
(c) (i) State the results of the food test
(ii) Account for the results in c (i) above
(d) Why was it necessary to keep the plant in darkness; before the experiment?
15. The herbivorous mammalian species were introduced into an ecosystem at the same time and in equal numbers. The graph below represents their populations during the first seven years. Study the graph and answer the questions that follow.

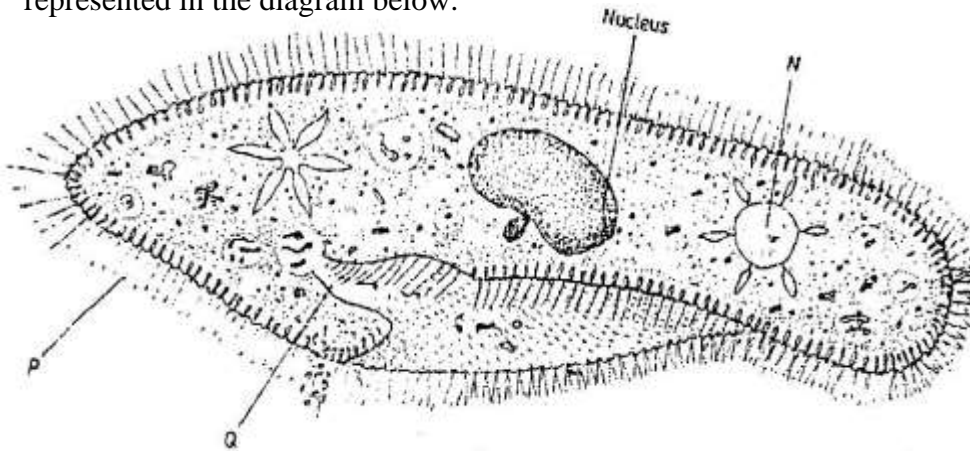


- (a) (i) Which species has a better competitive ability?
(ii) Give reason for your answer
(b) Account for the shape of the curve species A between

- (i) One year and three years
- (ii) Three years and seven years
- (c) A natural predator for species A was introduced into the ecosystem.

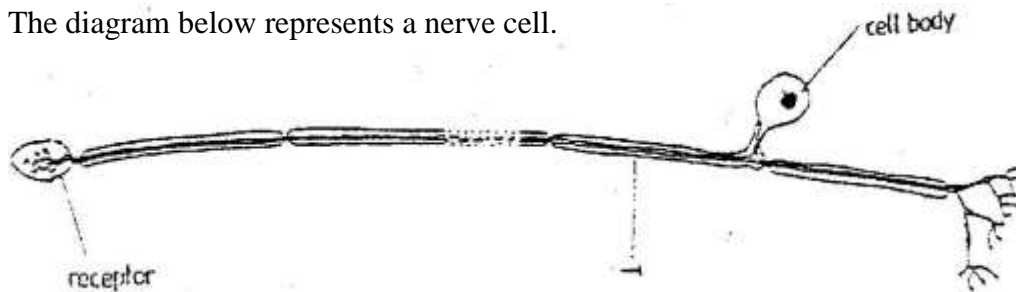
With a reason state how the population of each species would be affected.

16. A student placed a drop of pond water in a cavity slide and observed it under the microscope. The student observed many fast moving organisms, one of which is represented in the diagram below.



- (a) (i) Name the phylum to which the organism belongs
- (ii) Give a reason for your answer in (a) (i) above
- (b) Name the structures labeled N, P and Q.
- (c) State two observable features that enable the organism to move fast.

17. The diagram below represents a nerve cell.



- (a) (i) Identify the nerve cell.
- (ii) Give a reason your answer in (a) (i) above
- (b) Name the structure labeled T
- (c) Using an arrow indicate on the diagram the direction of movement of an impulse in the cell.

18. A hungry person had a meal, after which the concentration of glucose and amino acids in the blood were determined. This was measured hourly as the blood passed through the hepatic portal vein and the iliac vein in the leg. The results were as shown in the table below.

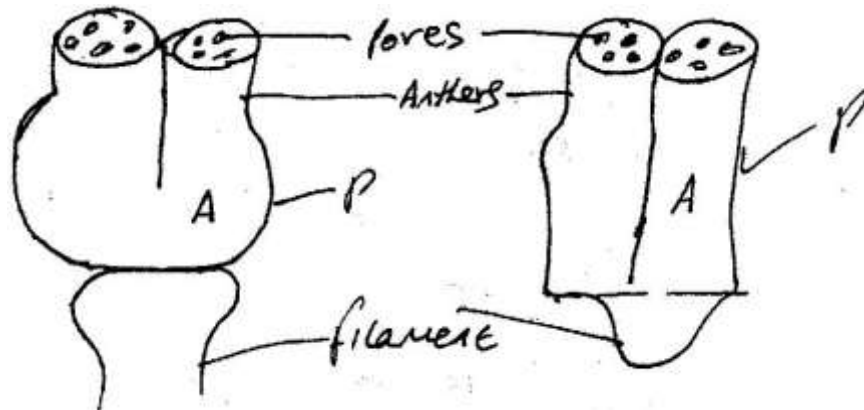
Time (Hrs)	Concentration of contents in hepatic portal vein (mg/100ml)	Concentration of contents in the iliac vein of the leg (mg/100ml)		
	Glucose	Amino acids	Glucose	Amino Acids
0	85	1.0	85	1.0
1	85	1.0	85	1.0
2	140	1.0	125	1.0
3	130	1.5	110	1.5
4	110	1.5	90	3.0
5	90	3.0	90	2.0
6	90	2.0	90	1.0
7	90	1.0	90	1.0

- (a) Using the same axes draw graphs of concentration of glucose in the hepatic portal vein and the iliac vein in the leg against time
 - (b) Account for the concentration of glucose in the hepatic vein from:
 - (i) 0/1 hour
 - (ii) 1-2 hour
 - (iii) 2- 4 hours
 - (iv) 5 – 7 hours
 - (c) Account for the difference in the concentration of glucose in hepatic portal vein and the iliac vein between 2 and 4 hours.
 - (d) Using the data provided in the table explain why the concentration of amino acids in the hepatic portal vein took longer to increase.
19. Discuss the various evidences, which show that evolution has taken place.
20. Explain how the mammalian intestines are adapted to perform their function.

BIOLOGY PAPER 231/2 K.C.S.E 1998
PRACTICAL MARKING SCHEME

Confidential requirement: Specimen M- Solanum (Sodom apple), Specimen N – Hibiscus rosanensis

1. You are provided with specimen labeled M and N. Examine them.
- (a) Describe the arrangement of the stamens in specimens M and N.
M- Stamens; five in number arranged around/ arising from free/separate/lease of ovary/corolla/anthers below stigma
N- Many numerous stamens; filaments/ fused; to form a (common) stigma (tube) stamen below stigma.
- (b) Carefully remove one stamen from specimen M. Examine it using a hand lens. Draw and label it.



Conditions P- Filament shorter than anther $\frac{1}{4}$ of anther = filament
A- All parts to be drawn; continuous lines

- (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.

Draw one pollen grain.



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
M- Smooth and small/ smaller
N- Rough/ Spiked and larger/larger
- (f) State four observable differences between the corolla of specimen M and N
- | | |
|---------------------------------------|---|
| M- Petals fused – gamopetalous | N- Free petals/ overlapping/corolla Polypetalous |
| M- Small corolla | N- Corolla large/ broad |
| M- Petals pointed tips | N- Petals rounded tips |
| M- Nectar guides not easily | N- Nectar guides noticed |

2. Confidential requirement: Solution L- Diastase/amylase

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 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
Starch 1	Blue – black Blue/black/dark blue	Blue- black/blue/black/dark blue
Starch + 0.1% NaCl + L.2	Blue black as in T1	Retained the colour of iodine/yellow/brown/reddish/orange Acc. Traces of blue Rej. Red
Starch + 1.4% NaCl + LI. 3	Blue black as in T1	Retained iodine colour as in T2

- (b) Place the test tube in water bath maintained at 37°C. Allow to stand for 30 minutes. Place a drop of 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
- Test tube 2**
 Changed to green/ yellow
- Test tube 3**
 Colour changed to orange/ brown/ red/reddish/brick red
- (d) Why was the test tube labeled 1 included in the experiment?
 Control experiment

- (e) Account for the results in test tube 1,2 and 3 at the end of the experiment.
- Starch converted/ hydrated/digested/broken down; sugars/reducing/glucose and maltose. In test tubes 2 and 3
 - Starch was not converted into reducing sugars, in test tube 1; due to lack of NaCl and enzyme (sol-L)
 - More reducing sugar in test tube 3 than H₂; due to high concentration of NaCl in H₃
 - NaCl accelerates digestion/ hydrolysis of starch.
- (f) Suggest the Identity of solution L
Enzyme /diastase /amylase /ptyalin..
- (g) Why were the test tubes placed in a water bath maintained at 37⁰ C? Provide optimum temp/best temp/for enzyme activity. (Ideal / most suitable.

3. Confidential requirements: Specimen R- Housefly, Specimen S- Bee.

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

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

Phylum.....Arthropoda

Class..... Insecta

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

Phylum Presence of exoskeleton

Joined/appendage/limps

Class..... 3 pairs of legs/ six legs

3 body parts/ namely head, thorax, abdomen.

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

S..... 2 pairs

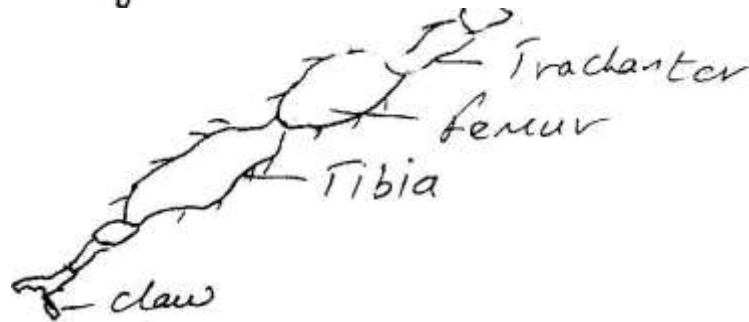
Absence of halteres/ hind wings

R.....1 pair of wings

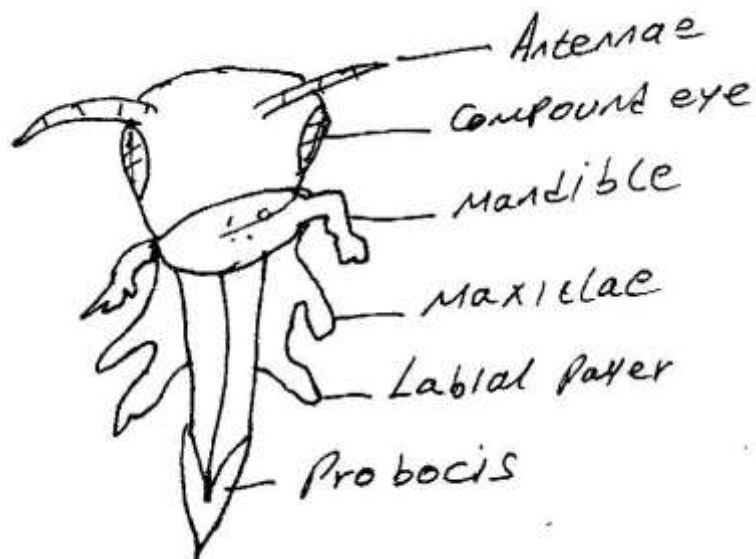
Has halteres/ hind wings

Modified wing

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



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

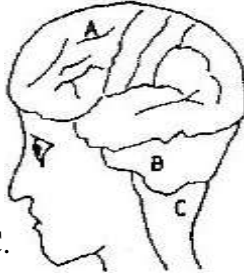


BIOLOGY PAPER 231/1 K.C.S.E 1999
QUESTIONS
SECTION A

1. Name two processes that bring about the translocation of manufactured food
2. Give two reasons why accumulation of lactic acid during vigorous exercise leads to an increase in heartbeat.
3. Explain why sexual reproduction is important in organisms
4. State two advantages of natural selection to organisms
5. Suggest three reasons why green plants are included in a fish aquarium.
6. State three ways by which plants compensate for lack of ability to move from one place to another.
7. An investigation plants with red flowers were crossed with plants with white flowers.
 All the plants in the F1 generation had pink flowers.
 - a) Give a reason for the appearance of pink flowers in the F1 generation.
 - b) If the plants the F1 generation were selfed, state the phenotypic ratio of the F2 generation.
8. State two disadvantages of self-pollination.

SECTION B (40 MKS)

9. The diagram below shows surface view of a human brain.



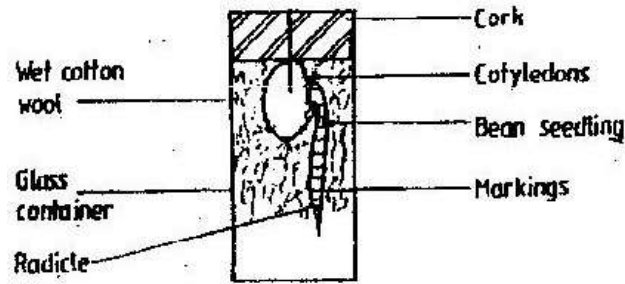
Name the parts labeled B and C.

- b) State three functions of the part labelled A
 - c) State what would happen if the part labeled B was damaged.
10. Below is a list of organisms, which belong to classes Insecta, Myriapoda and Archnida: Tick, centipede, praying mantis, tsetse fly, millipede and spider.
 Place the organisms in their respective classes in the table below.
 Give reason in each case.

Classes	Organisms	Reasons
Insecta		
Myriapoda		
Arachnida		

11. Give reasons for each of the following:
 - a) Constant body temperature is maintained in mammals.
 - b) Low blood sugar level is harmful to the body.

12. A student set up an experiment as shown in the diagram below.

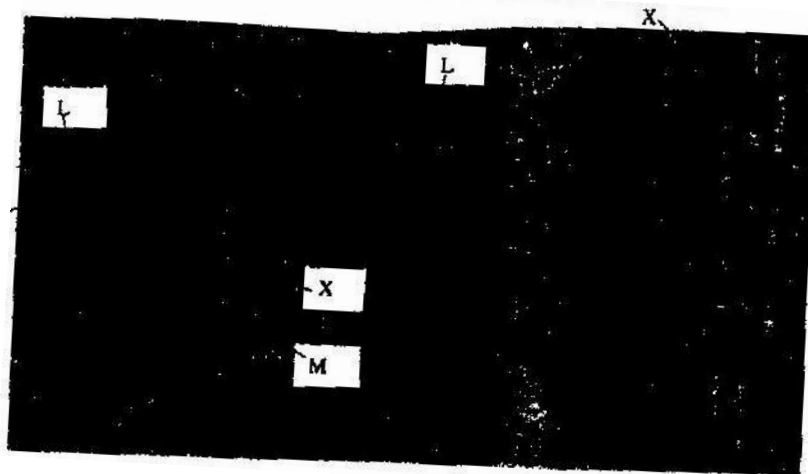


AT THE START

- a) i) What is being investigated in the experiment?
 ii) On the diagram below indicate the expected results after three days.



- iii) Why was it necessary to have wet cotton wool in the container?
 b) What is the role of the following to a germinating seed/
 i) Oxygen
 ii) Cotyledons.
13. a) Distinguish between a community and population.
 b) Describe how population of grasshoppers in a given area can be estimated.
14. The photograph below represents a blood smear obtained from a person suffering from a certain disease.



- a) Name the structure labeled X.
 b) i) Name the structure labeled L
 ii) State the function of the source labeled M
 c) What disease was the person suffering from?
 d) List three ways by which micro-organisms enter the human body.

SECTION C (40 MARKS)

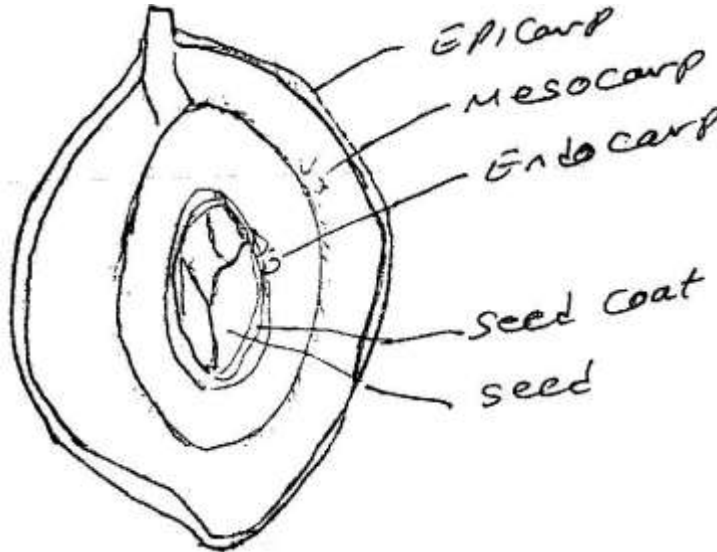
15. An experiment was carried out to investigate haemolysis of human red blood cells. The red blood cells were placed in different concentrations of sodium chloride solution. The percentage of haemolysed cells was determined. The results were as shown in the table below.

Salt concentration g/100cm ³ (%)	0.33	0.36	0.38	0.39	0.42	0.44	0.48
Red blood cells Haemolysed (%)	100	91	82	69	30	15	0

- a) i) On the grid provided, plot a graph of haemolysed red blood cells against salt concentration.
ii) at what concentration of salt solution was the proportion of haemolysed cells equal to non-haemolysed cells?
iii) State the percentage of cells haemolysed at salt concentration of 0.45%
- b) Account for the results obtained at:
i) 0.33 percent salt concentration.
ii) 0.48 percent salt concentration.
- c) What would happen to the red blood cells if they were placed in 0.50 percent salt solution?
- d) Explain what would happen to onion epidermal cells if they were placed in distilled water.
16. Describe the:
a) Process of inhalation in mammals.
b) Mechanisms of opening and closing of stomata in plants.
17. Explain how the various activities of man have caused pollution of air.

**BIOLOGY PAPER 231/2 K.C.S.E 1999
PRACTICAL MARKING SCHEME**

1. **Confidential requirement: Specimen S- Mango fruit, mature but not ripe, Specimen T- Leguminous pod (bean fruit) any legume.**
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

S- One seed - Meso-carp/ epicarp and endocarp separated	T – Several seeds/ many, two – ten - Mesocarp fused with epicarp and endocarp
- Placentation central - Fleshly succulent fruit	- Placentation marginal - Dry fruit
- Absence of sutures/ lines of weaknesses - Pericarp thick	- Presence of sutures/ lines of weakness - Pericarp thin

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

Specimen S

Type of fruit – Drupe

Reason - One seed/ hard endocarp/ fibrous endocarp/owwte

Method of dispersal - Animal/ Man

Reason – Fleshly mesocarp/ scented/ juicy/succulent/ brightly Coloured. Rej. Edible

Specimen T.

Type of fruit - legume pod/ leguminous fruit

Reason – two sutures/ lines of weakness

Method of dispersal- Mechanical (self) explosive mechanism

Reason – lines of dehiscence(two) lines of weakness.

2. You are provided with specimen labeled X, Y and Z
(a) Identify the specimens
X – Ulna

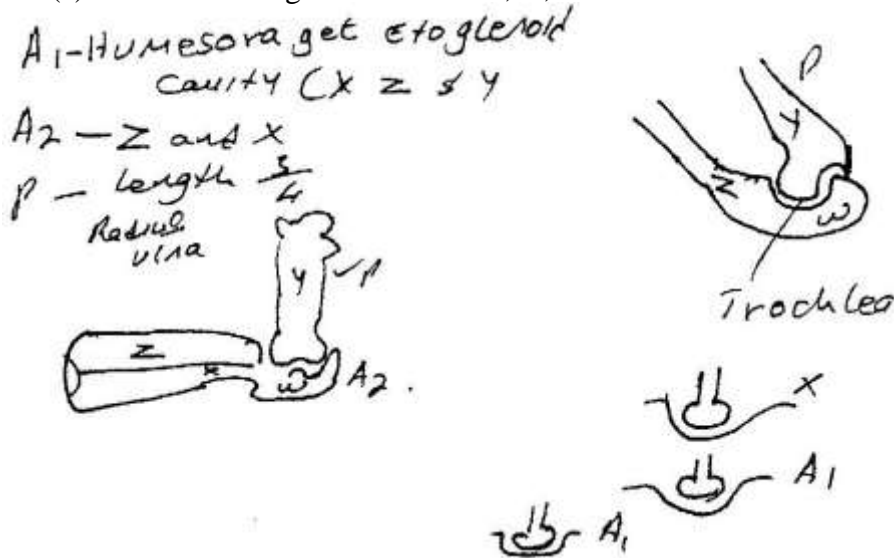
Y- Humerus Rej. Humerous

Z- Radius

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

- Forelimb/arm/legs/ humerus/ upper arm/ ulna and radius lower arm

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



State the magnification of your drawing X $\frac{1}{4}$ - X1

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

Proximal end- Ball and socket

Reason- Head shaped like a ball/ ball like/ rounded head/ round head/ allow movement.

Distal end- Hinge joint

Reason – allow movement in only one plane/ presence of a groove/ presence of condy/ troches which articulates with sigmoid notch.

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

Attachment of muscles/ tendons; formation of hinge joint; with adjacent bone)

Prevent overstretching of forearm backwards; allows movements in only plane/ 180 degrees.

You are provided with a specimen labeled R. Examine it

(f) Name the observable features that adapt the specimen to:

Forward movement

- Tail/ tail fin/tail muscles/candal fin

Balancing

- Pectoral fins; pelvic fins

Staying upright

- Dorsal fins; anal fins/ventral fins

Fast movement

- Streamlined body

- backward facing scales,
- Slimy/ Mucoid surface

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	Add a drop of iodine on M on a white tile	Brown colour/ retain colour of iodine/ yellow/ reddish Acc. No colour change Rej. Red/No change alone	Starch absent
Reducing sugar	Add a few drops of benedict's solution and warm/ heat/ boil	Blue colour of benedict's solution/ colour change to purple/ violet Rej. No change alone	Reducing sugar absent/ monosachariaple sugar absent/ Rej specific names of sugars e.g glucose
No reducing sugar	Add a few drops of HCl and heat; (cool), add sodium bicarbonate; add benedict's solution and heat Note – stop heating if step is omitted.	Fizzing/ effervescence/bubbling; Red precipitate/ colour changed from blue to green, yellow orange/ brown/ red; order of colour must be correct. Acc. Final colour change. E.g green, yellow, orange brown	Non- reducing sugar; presence of reducing sugar after hydrolysis.
Protein	Add 1% CuSO ₄ ; Sulphate and then sodium hydroxide - If formula is used must be correct. Order does not matter	Colour change to purple/violet	Protein present

- If food substance is omitted or wrong, procedure, observation and conclusion wrong
- If cooling absent in non- reducing sugars stop marking

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

- Pepsin/ trysin/ erepsin /sucrose/ invertase

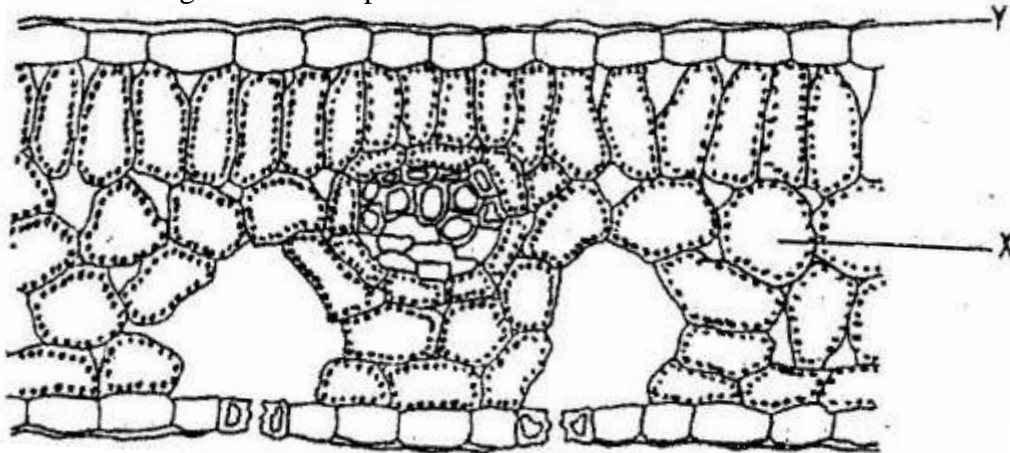
- (c) State the role of hydrochloric acid and sodium hydrogen carbonate in the experiment.
- HCl hydrolyze/breakdown/ digest/convert/ change; non- reducing sugars/disaccharides/ complex sugars/(rej sucrose) for reducing sugars/simple sugars/ monosaccharides

**BIOLOGY PAPER 231/1 K.C.S.E 2000
QUESTIONS**

1. What is the function of the following cells in the retina of human eye ? Cones
2. Give a reason why two species in ecosystems cannot occupy the same niche.
3. State two ways in which some fungi are beneficial to humans
4. State two ways in which some fungi are beneficial to humans.
5. State the importance of osmo-regulation in organisms
6. Give a reason why lumbar vertebrae have long and broad transverse process
7. Give reason why each of the following is important in the study of evolution:
 - a) Fossils records
 - b) Comparative anatomy.
8. Why is oxygen important in the process of active transport in cells?
9. State two advantages of metamorphosis to the life of insects.
10. Explain how birds of prey are adapted to obtaining their food.

SECTION B

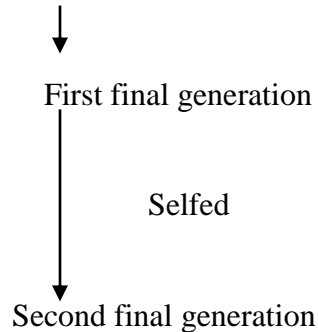
11. The diagram below represents a section of a leaf.



- (b) Name the parts labeled X, and Y
- (c) Using arrows indicate on the diagram the direction of flow of water during the transpiration stream
- (d) State two ways in which the leaf is suited to gaseous exchange

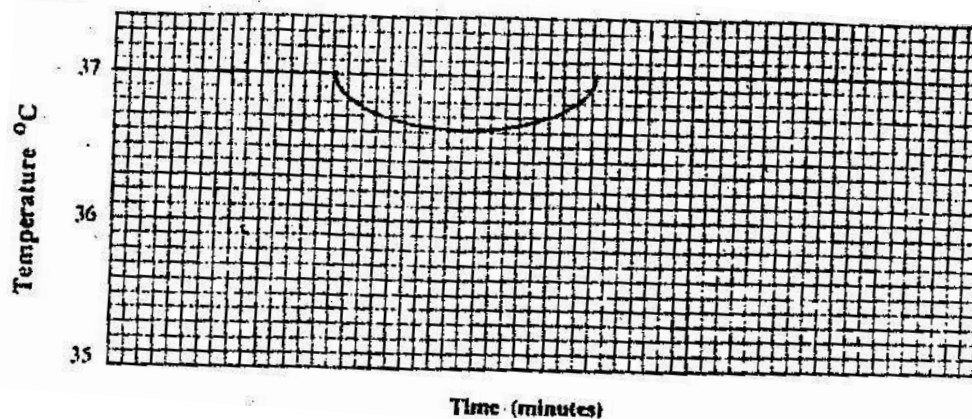
12. The chart below represents the result of successive crosses, starting with red-flowered plants and white flowered plants and in which both plants are pure breeding.

Parental genotypes: Red flowers x white flowers



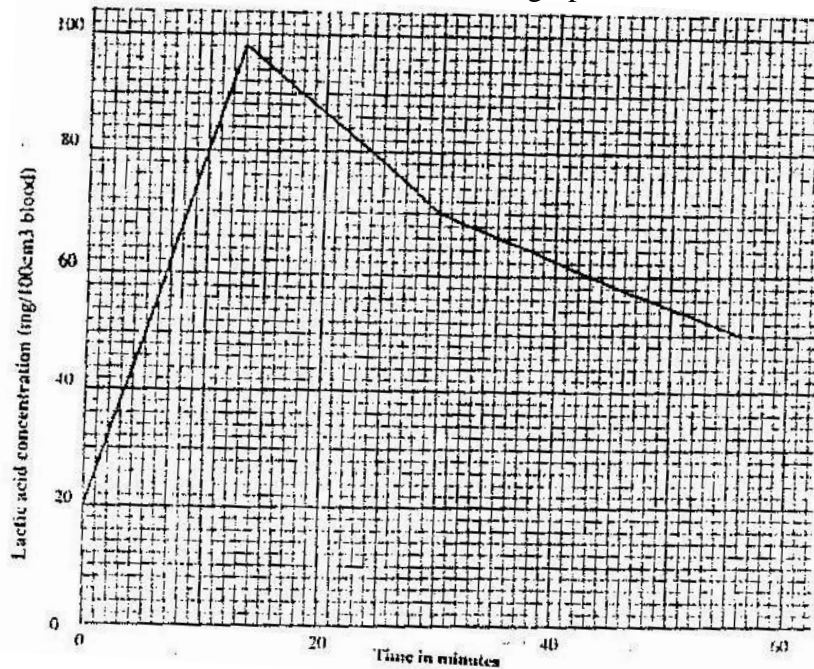
3 red flowers: 1 white flower
3: 1

- (a) What were parental genotype? Use letter R to represent the gene for red colour and r for white colour
- (b) (i) What was the colour of the flowers in the first filial generation?
(ii) Give a reason for your answer in b (i) above
- (c) If 480 red flowered plants were obtained in the second filial generation, how many F₂ plants and white flowers? Show your working.
13. The temperature of a person was taken before, during and after taking a cold bath. The results are shown in the graph below



- (a) Explain why the temperature fell during bath
- (b) What changes occurred in the skin that enabled the body temperature to return to normal?
14. (a) Name the crop infested by phytophthora infestans and the disease it causes
Crop / Disease
- (b) State four control measures against the disease

15. The concentration of the lactic acid in blood during and after an exercise was determined. The results are shown in the graph below



- (a) (i) By how much did the lactic acid increase at the end of 13 minutes?
(ii) After how many minutes was the lactic acid concentration 71mg/100cm³?
(iii) What would be the concentration of lactic acid at the 60th minute?
- (b) Give a reason for the high rate of production of lactic acid during the Exercise
- (c) Give a reason for the decrease in the concentration of lactic acid after the exercise
16. (a) What is the significance of sexual reproduction?
(b) State three advantages of asexual reproduction

17. The numbers of different types of animals supported by a square kilometer in two terrestrial ecosystems are shown in the table below

Type of ecosystem	Type of animal	Number of animals supported per sq. km
Acacia savannah	Domestic animals	
	Cattle	7
	Goat	30
	Sheep	10
Bush land	Wild games	
	Thomsons's gazelles	450
	Eland	20
	Wildebeest	60
	Domestic animals	
	Cattle	2
	Goats	15
	Sheep	5
	Wild game	
	Thomson's gazelles	200
Eland	12	
Wildebeest	10	

- (a) (i) Which domestic animal is better adapted to both ecosystems?
(ii) Give a reason why the animal named in (a) (i) above is better adapted to the two ecosystems.
- (b) Why are cattle and sheep fewer in the bush land than in the savannah?
- (c) (i) Name suitable methods that were used to estimate the population of:
Domestic animals
Wild animals
(ii) Give a reason why the method named for wild animals in (c) (i) above is suitable
- (d) state three methods which could be used to determine the diet of wild animals in an ecosystem
- (e) Name four biotic factors that could have regulated the animal population in both ecosystems
- (f) State four human activities that affect population of animals in game parks
- (g) What is the importance of national park to a nation?
18. describe the role of hormones in the human menstrual cycle
19. how are leaves of mesophytes suited to their functions

BIOLOGY PAPER 231/2 K.C.S.E 2000
PRACTICAL MARKING SCHEME

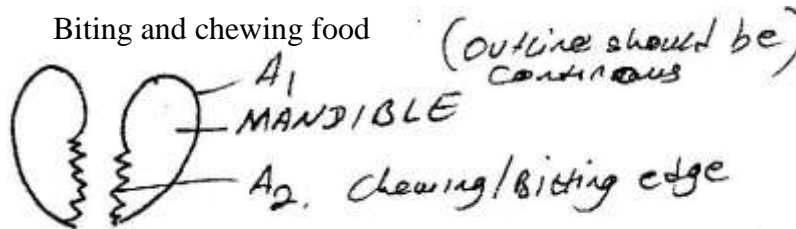
- 1 (a) You are provided with a specimen labeled D
- (i) Name the specimen to which the specimen belong Arthropoda
- (ii) State three characteristics found in the members belonging to the phylum
- presence of exoskeleton/ Ectoskeleton
 - Jointed limbs/ appendages/ legs
 - Segmented body parts

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

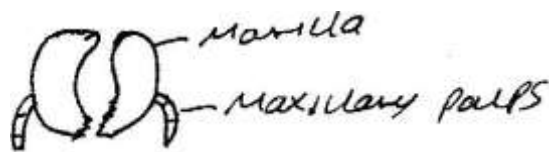
- (ii) State four characteristics found in the members of class
- Body divided into three (head, thorax, and abdomen)
 - Three pairs (six legs)
 - One pair (2 antennae)
 - Presence of spiracles/ breath through spiracles
 - Compound eyes (one pair)

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

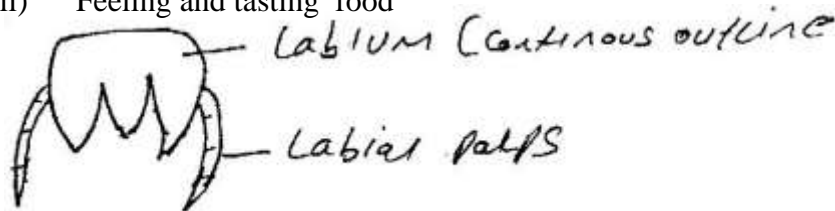
- (i) Biting and chewing food



- (ii) Hold food



- (iii) Feeling and tasting food



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

Forewing/outer wing

- Hard
- Narrow/ small surface/ small
- Stiff/ rigid/ inflexible
- Opaque

Hind wing/ Inner wing

- Soft/ Membranous
- Wide/ broad/ large surface area
- Flexible/ can fold
- Translucent

2. Confidential requirements:

Specimens:

G- onion bulb (Sprouting) E- Taproot/Taproot tuber/ swollen tap root/main root/Carrot root hairs/ F- stem tuber

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

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

E- carrot root hairs

Reasons

- Presence of lateral roots
- Short stem. Swollen with food

F- Irish Potato

Reasons

F- Stem tuber

- Presence of lateral buds/ auxiliary/ auxiliary buds
- Presence of scale leaves
- Swollen with food

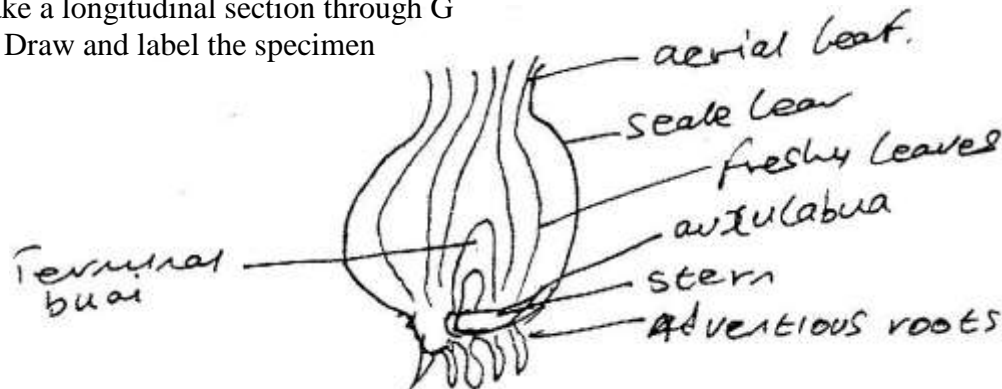
G- Bulb/ Onion bulb/ Onion plant bulb

Reasons

- Scale leaves / scaly leaves
- Short stem/ flattered stem
- Fleshy leaf bases/ leaves swollen with food.

Make a longitudinal section through G

(b) Draw and label the specimen



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

Vitamin A retinal

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

- Protein of skin and cornea form dying
- Synthesis of Rhodopsin pigment
- Improves night vision/ vision in poor light

(d) State three differences in specimen F and G

F

- Food stored in stem
- Swollen stem
- Rudimentary/ not well Developed scaly leaves
- Small/ inconspicuous scale leaves
- Absence of adventitious roots

G

- Food stored in leaves
- small short/flattened stem
- Dry papery/ well developed scale leaves
- Presence of adventitious roots

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.

Residue

Food substance	procedure	Observations	Conclusion
starch	Add a drop of iodine	Colour of iodine/yellow/ orange/ brown/ reddish brown / no colour change	Starch absent
proteins	Add NaOH then a drop of 1% CuSO ₄ and shake	Purple violet colour	Presence of proteins
Reducing Simple sugars	Add benedict's solution and heat in warm water bath	Green colour/ yellow/Orange/ red/brown/ colour	Traces of reducing sugar of colour change is greenish. Reducing/ Simple sugars present

Filtrate

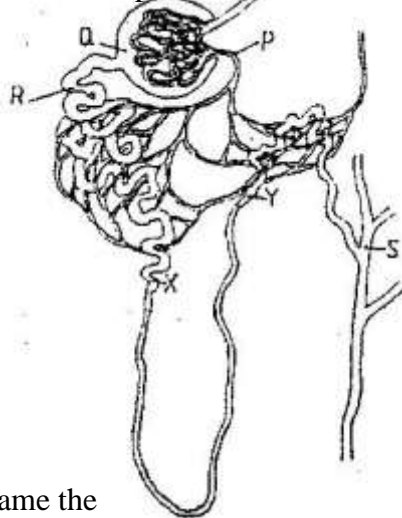
Food Substance	Procedure	Observations	Conclusion
Starch	Add a drop of iodine	No colour change/colour of iodine/ yellow/ brown/ orange/ reddish brown colour	No starch present
Protein	Add NaoH then CuSO ₄ and shake	Blue colour/ light blue/ No colour change/ Colour of copper sulphate retained. Purple colouration	Absence of proteins or presence of proteins according to observations
Reducing/ simple sugars	Add Benedict's solution and heat/ place in a warm water bath	Green/ yellow/ orange / red/ brick red ppt	Greenish colouration Traces of reducing/ simple sugars

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QUESTIONS

1. Other than having many features in common, state the other characteristics of a species
2. Why are green plants referred to as primary producers in an ecosystem?
3. A person whose blood groups is AB requires a blood transfusion. Name the blood groups of the donors.
4. Name the parts of the flower that are responsible the production of gametes
5. State two functions of muscles found in the alimentary canal of mammals.
6. Adult elephants flap their ears twice as much as their calves in order to cool their bodies when it is hot. Explain.
7. Name the organelle in which protein synthesis takes place
8. (a) The type of circulatory system found in members of the class insecta is
(b) Name the blood vessel that transports blood from:
 - (i) Small intestines to the liver
 - (ii) Lungs to the heart
9. Name three types of chromosomal mutations
10. Name three sites where gaseous exchange takes place in terrestrial plants.

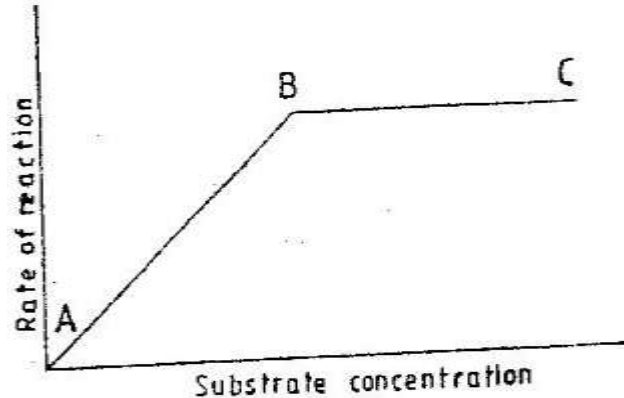
SECTION B

11. The diagram below represents a mammalian nephron

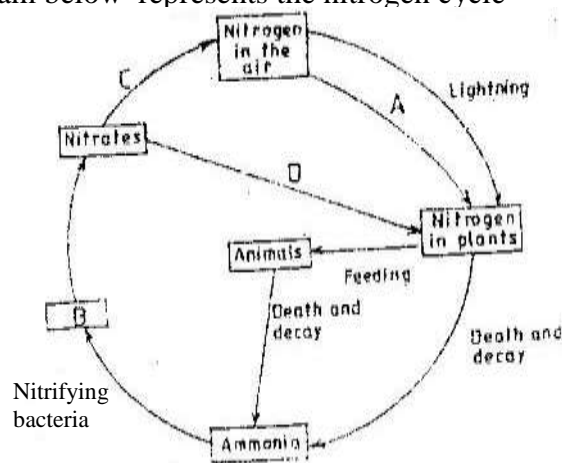


- (a) Name the
 - (i) Structure labeled P
 - (ii) Portion of the nephron between point X and Y
- (b) Name the process that takes place at point Q
- (c) Name one substance present at point R but absent at point S in a healthy mammal
- (d) The appearance of the substance you have mentioned in (c) above is a symptom of a certain disease caused by a hormone deficiency. Name the
 - (i) Disease
 - (ii) Hormone
- (e) State the structural modifications of nephrons found in the desert mammals

12. The graph below shows the effect of substance concentration of the rate of enzyme reaction.

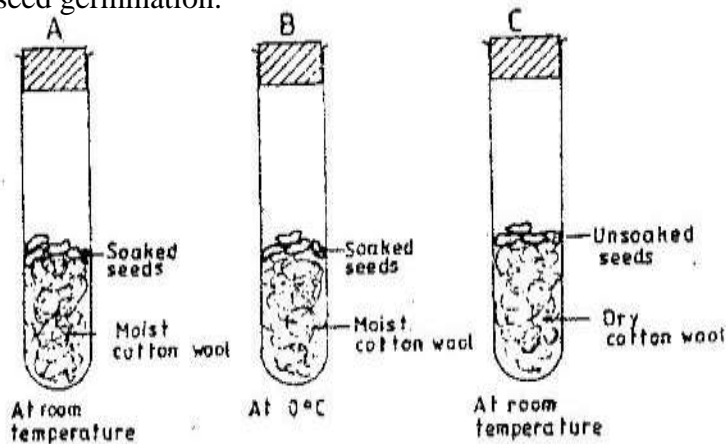


- (a) (i) Account for the shape of the graph between A and B
(ii) B and C
- (b) How can the rate of reaction be increased after point B?
- (c) State two other factors that effect the rate of reaction of enzyme reaction
13. The diagram below represents the nitrogen cycle



- (a) State the process labeled
A
D
- (b) Name the compound represented by B
- (c) Name the group of organisms labeled C
- (d) (i) name the group of plants which promote process A
(ii) State the part of the plant where process A takes place
- (e) How would excess pesticides in the soil interfere with process A
14. Tallness in pea plants is due to a dominant gene
Two tall pea plants were crossed and their F1 generation were in the ratio of 3 tall:
1 short. Using letter T to represents the gene for tallness and t for shortness give the
- (a) (i) genotype of the parents
(ii) Gamete of the parents
(iii) Genotype ratio of the F1 generation
- (b) What is meant by the term testcross in genetic studies?

15. The diagram below represents a set up to investigate the conditions necessary for seed germination.



The set up was left for 7 days

- What conditions were being investigated in the experiment?
- State three reasons for soaking seeds in set ups A and B
- What were the expected results after seven days?

SECTION C

16. An experiment was carried out to investigate the nutritional value of two dry powder animal feeds X and Y over a period of six months. Twenty 5 month's old castrated goats were used. The goats were divided into two equal groups A and B.

The animals in group A were fed on feed X throughout the experiment while those of group B were fed on feed Y.

The feeds were supplemented with dry hay and water. The average body weight of each group of goats and the weight of the dry powder feeds were determined and recorded each month. The faeces produced by each group was dried and weighed and the average dry faecal output per month was also recorded. The results are as shown below.

	GROUP A			GROUP B		
Months since commencement of the experiment	Average total weight of goats (kg)	Average weight of total feed.(kg)	Average monthly dry faecal output (kg)	Average total weight of goats(kg)	Average weight of total feed (kg)	Average monthly dry faecal output (kg)
0	20.4	26.7	10.5	20.5	35.4	16.5
1	22.5	27.5	10.7	19.5	34.3	17.7
2	24.5	25.8	10.3	19.0	35.2	17.2
3	26.3	18.5	8.8	18.5	36.1	17.5
4	28.0	16.6	7.2	17.1	36.0	16.9
5	29.4	16.3	6.0	16.3	35.8	16.8
6	29.5	16.1	5.6	15.6	35.5	16.6

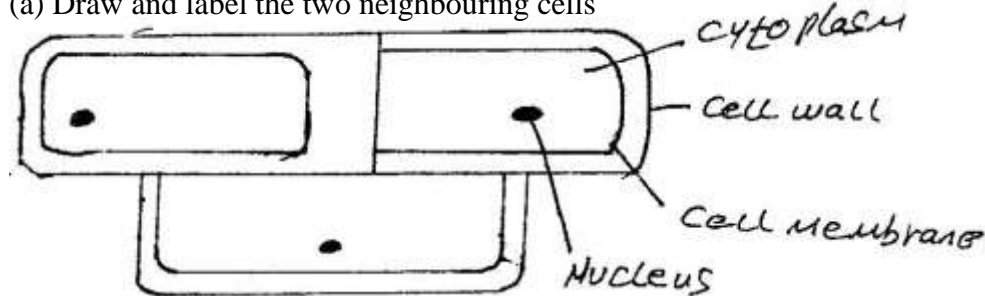
- What is the relationship between the amount of feed and the faecal

- output
- (ii) Work out the average increase in weight for the animal's in group A during
The first four months
The last two months
 - (iii) Account for the average increase weight in goats in group A during the
first four months
The last two months
 - (iv) Which of the two feeds is more nutritious?
Give reason for your answer
- (b) State four uses of digested food in the bodies of animals
- (c) State four uses of water in the bodies of animals
17. (a) State the functions of the following parts of the mammalian ear;
- (i) Tympanic membrane
 - (ii) Eustachian tube
 - (iii) Ear ossicles
- (b) Describe how semicircular canals perform their functions
18. (a) Describe the process of fertilization in a flowering plant
- (b) State the change that take place in a flower after fertilization

**BIOLOGY PAPER 231/2 K.C.S.E 2001
PRACTICAL MARKING SCHEME**

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



Accuracy:

- Outline continuous
- Cell elongated
- Double line
- Nucleus placed side
- No shading
- Mag x 20 x 25 x 40 x 50 x 60 x 75 x 100 x 150 x 225

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

- To make different part of the cell distinct

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

$$\begin{aligned} \text{Diameter field of view} &= (1-2 \text{ mm}) \\ &= 1000(1-2) \text{ cm} \end{aligned}$$

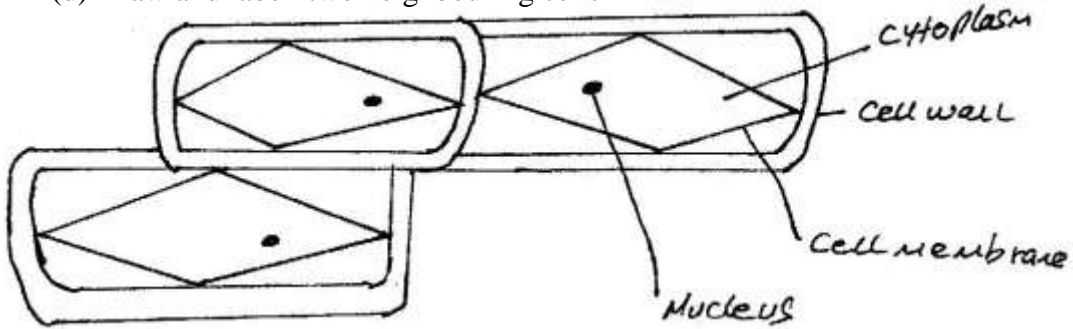
Number of cells in the field of view = 10 – 20 across width

$$\text{Width of one cell} = \frac{100(1-2)}{(10 - 20)}$$

$$\text{Length of one cell} = \frac{100(1-2)}{(3-5)}$$

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

(d) Draw and label two neighbouring cells



Account for the results in (d) above

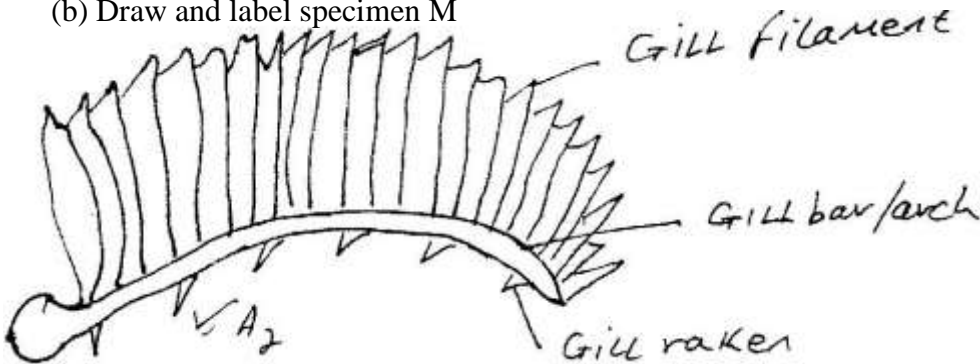
Liquid is hypertonic (owwte) water is drawn out of the cell by osmosis making the cytoplasm membrane shrink plasmolysed.

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

<u>Specimen</u>	<u>Part</u>	<u>Organism</u>
M	Gills/fish gills	Fish
N	Piece of lung	mammal

(b) Draw and label specimen M



Accuracy – continuous outline- three parts of gills drawn
No shading – Three parts gills drawn proportionality

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

- Many/ numerous/ several gill filaments to increase surface area of gaseous exchange/ absorption of oxygen.
- Filament to reduce distance through which gas diffuse
- Gill bar to provide form of support or attachment of gill filament/ gill rakers
- Gill rakers prevent particles from reaching gill filament
- Long filaments increases surface area for gaseous

(d) State three distinguishing features of specimen N

Presence of bronchioles/ alveolar ducts/ pleural/ membrane, spongy/ air spaces

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

- Both for gaseous exchange

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 | bougainvillea |
| | (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 | Bryophyllum |

- (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)

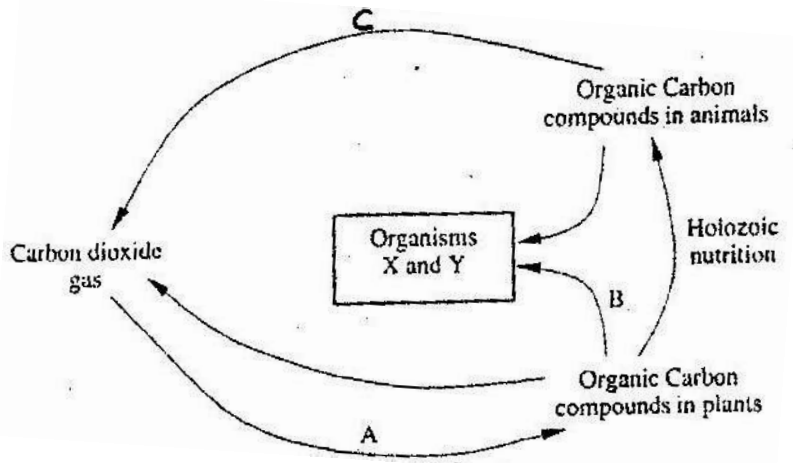
In the key that have followed t arrive at the identity of each specimen.

Specimen	Steps Followed	Identity
P1	1a, 2a, 3b, 4a, 7a, 7b	Bryophyllum
P2	1a, 2b	Tradescantia
P3	1a, 2a, 3b, 4b, 5b, 6a	Bougainvillea
P4	1a, 2a, 3b, 4b, 5b, 6b	Mangifera
P5	1a, 2a, 3b, 4b, 5a	Solanum
P6	1a, 2a, 3a	Zea

- (b) (i) Name the likely habitat of specimen P1
Arid/ semi arid/ desert/ dry areas/ dry land
- (ii) Give a reason for your answer in (i) above
Fleshy/succulent/ (leaves) juicy/ thick cuticle
- (c) State the significant of the shiny upper surface of specimen P4
- To reflect away sun rays
- To reduce transpiration/ water loss
- (d) Observe the floral parts of specimen P3. What is the significance of the brightly coloured structures onto which the flowers are attached?
- To attract insects (pollination)
- (e) Name two features that make specimen P5 adapted to its environment.
- Hairy (to reduce water loss)
- Presence of thorn/ spines/ spikes
- (f) Name a feature that is used to classify P6 as monocotyledonous plant
- Parallel veins/ veins/ arrangements of veins
- Presence of sheath/ leaf sheath.

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- Beside the abdomen, name the other body part of members of Arachnida,
 - Name the bacteria found in the root nodules of leguminous plant
 - State the association of the bacteria named in (a) above with the leguminous plants.
 - State the function for co-factors in cell metabolism
 - Give one example of a metallic co – factor
 - During germination and early growth, the dry weight of the endosperm decreases while that of the embryo increases. Explain.
 - State two characters that researchers select in breeding programme.
 - In what form is oxygen transported from the lungs to the tissues?
 - Explain why the carrying of wild animals is higher than that for cattle in a given piece of land.
 - Which type of joint is found at the articulations of
 - Pelvic girdle and femur
 - Humerus and ulna?
 - Name two gaseous exchange structures in higher plants.
 - What happens to excess fatty acids and glycerol in the body?
 - Give an example of a sex – linked trait in humans on:
Y CHROMOSOME.
X CHROMOSOME.
12. The chart below represents a simplified carbon cycle.



(a) Name the process labeled A, B, and C

A

B

C

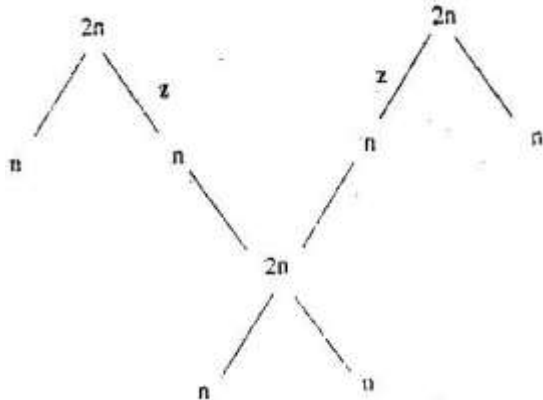
b) Name the organisms X and Y

X

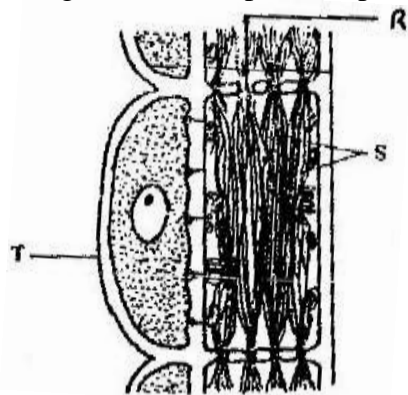
Y

c) State the importance of carbon cycle in nature

13. The chart below shows the number of chromosomes before and after cell division and fertilization in a mammal.



- a) What type of cell division takes place at Z
 - b) Where in the body of a female does process Z occur
 - c) On the chart, indicate the position of parents and gametes
 - d) Name the process that leads to addition or loss of one or more chromosomes.
 - e) State three benefits of polyploidy in plants to a farmer
- 14.
- a) What is organic evolution
 - b) State two ways in which Homo sapiens differs from Homo habilis
 - c) Distinguish between divergent and convergent evolution giving example in each case.
15. *Ascaris lumbricoides* is an example for an endo – parasite
- a) The name *Ascaris* refers to
 - b) State the habitat of the organism
 - c) State three ways in which the organism is adapted to living in its habitat.
16. The diagram below represents part of phloem tissue.



- a) Name the structures labeled R and S and the cell labeled T.
 R-
 S-
 Cell labeled T
- b) State the function of the structure labeled S
- c) Explain why xylem is a mechanical tissue

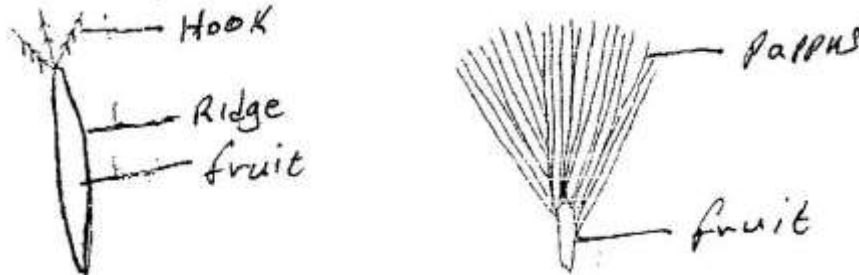
17. a) What structures are produced by sisal for vegetative propagation?
 b) Give a reason for grafting in plants
 c) State four advantages of vegetation propagation.

Time (minutes)	Glucose level in blood (Mg / 100cm ³)	
	X	Y
0	87	84
15	112	123
30	139	170
45	116	188
60	100	208
90	95	202
120	92	144
150	88	123

18. Two person X and Y drunk volumes of concentrated solution of glucose. The amount of glucose in their food was determined at intervals. The results are shown in the table below:
- a) On the grid provided, plot graphs of glucose level in blood against time on the same axes.
- b) What was the concentration of glucose in the blood of X and Y at the 20th minute?
 X = 120 + -3)
 Y = 140 +-3)
- c) Suggest why the glucose level in person X stopped rising after 30 minutes while it continued rising in person Y.
- d) Account for the decrease in glucose level in person X after 30 minutes and person Y after 60 minutes (3 minutes)
- e) Name the compound that stores energy released during oxidation of glucose.
- f) Explain what happens to excess amino acids and development of plants.
19. Describe the role of hormones in the growth and development of plants.
20. a) Name three types of skeletons found in multicellular animals
 b) Describe how the cervical, lumbar and sacral vertebrae are suited to their functions.

**BIOLOGY PAPER 231/2 K.C.S.E 2002
PRACTICAL MARKING SCHEME**

1. You are provided with specimens labeled D₁, D₂, D₃ and D₄. Examine them
(a) Draw and label specimens D₁ and D₂



Magnification X3 – X7

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

Specimen	Agent or method of dispersal	Reasons
D ₁	Animal/ man	Presence of hooks acc. Hook like structures Rej. Spikes, spines, thorns e.t.c
D ₂	Wind	Presence, of pappus; light/ air like extensions
D ₃	Wind	Presence of wings; light/ wing like structures
D ₄	Explosive	Line of weakness along the ovary wall.

- (c) State the types of gynoeciums and placentation of specimen D₄.

Type of (i) Gynoecium Monocarpus
(ii) Placentation Marginal

2. You are provided with olive oil, liquids labelled L₁ and L₂ and an Irish potato. Label two test tubes A and B. Place 2 cm³ of water into each test tube. To test tube labelled A, add 8 drops of liquid L₁. Shake both test tubes. Allow to stand for five minutes.

- (a) (i) Record your observations
Test tube A
Oil is broken up into small droplets; which are dispersed/ spread/ throughout in liquid oil becomes emulsified/ debules/ tiny droplets; which forms a suspension/ becomes cloudy/ turbid/Forms a white ppt.

Testy tube B
Oil floats on water / of mixing takes place/ Two separate/ immiscible layers are seen.
(ii) Name the process that has taken place in test tube A.
Emulsification

- (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 L₁
I- Bile

Region of alimentary canal into which the juices is secreted
II- Duodenum

- (b) Label two test tubes C and D. place 2cm³ of liquid L₂ into each. Add a drop of iodine into each test tube.

- (i) Record your observation
Blue black/ black/ bluish/ blue/ grayish/ purple blue

- (ii) Suggest the identity of L₂
Starch

Cut out a tube whose sides are 1 cm from the Irish potato provided. Crush the cube to obtain a paste. Place the paste into a test tube labelled C. Leave the set up for at least 30 minutes.

- (iii) Record your observation.

Contents of D remain unchanged/ blue black; blue black in C
Disappeared / fades light yellow/ brown/ orange

- (iv) Account for the results in (b) (iii) above
Enzymes amylase; in potato breaks down starch; into sugars; that do not give blue- black colours with iodine.

- (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

Grey/ yellow/ orange/ brown/ brick

- (ii) Account for the results in (c) (i) above
Starch in potato is converted to maltose/ reducing sugar/ simple sugar; by enzyme amylase/maltose (owwtte)

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

- (a) Giving reasons state the phylum of the specimens
Phylum Arthropoda
Reasons Exoskeleton/ chitinous
- (b) (i) Name the class to which the specimen belong
Insecta.
- (ii) State the features common to both specimens that are
Characteristics of the class mentioned in (b) (i) above.
- 3 body parts
 - 3 pairs of legs
 - A pair of antennae

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SECTION A (20 MARKS)

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

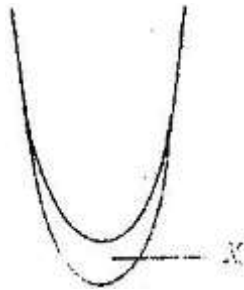
1. A process that occurs in plants is represented by the equation below.
$$\text{C}_6\text{H}_{12}\text{O}_6 \longrightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2 + \text{Energy}$$

(Glucose) (Ethanol) (Carbon dioxide)

 - a) Name the process.
 - b) State the economic importance of the process named in (a) above
2. Name the phylum whose members possess notochord
3. How do the male gamete nuclei reach the ovule after pollen grains land on the stigma?
4.
 - a) Name the bacteria found in root nodules of leguminous plants.
 - b) What is the role of the bacteria named in (a) above?
5. A bone obtained from a mammal is represented by the diagram below.



- a) Name the bone.
 - b) Which bones articulate with the bone shown in the diagram at the notch?
6. Distinguish between analogous and homologous structures.
Analogous structures –
Homologous structures –
 7. The diagram below represents regions of a root tip.



- a) Name the two regions above X in ascending order
 - b) State the function of the part labeled X
8. State a function of the large intestine in humans
 9. Name the:
 - a) Material that strengthens xylem tissue.
 - b) Tissue that is removed when the bark of a dicotyledonous plant is ringed.
 10. How are leaves of submerged adapted plants for photosynthesis?
 11. Name the causative agent of typhoid.

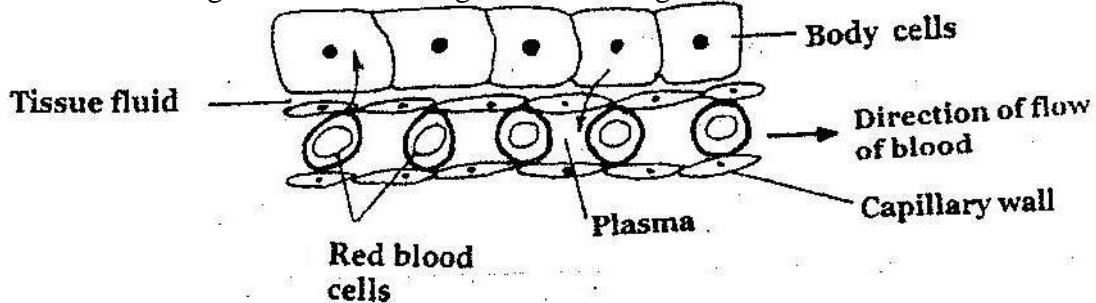
SECTION B (40 MARKS)

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

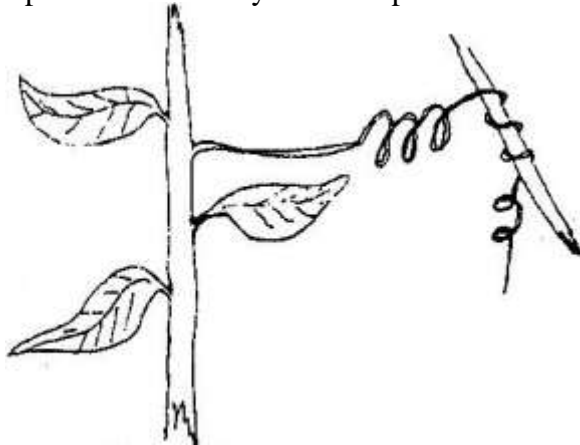
12.
 - a) What is meant by the term sex – linkage?
 - b) Name two sex – linked traits in humans.

- c) In *Drosophila Melanogaster*, the inheritance of eye colour is sex – linked. The gene of red eye is dominant. A cross was made between a homozygous red – eyed female and a white – eyed male. Work out the phenotypic ratio of F₁ generation. (Use R to represent the gene for red eyes).

13. The diagram below shows gaseous exchange in tissues.



- a) Name the gas that diffuses:
- To the body cells
 - From the body cells
- b) Which compound dissociates to release the gas named in (a) (i) above?
- c) i) what is tissue fluid?
ii) What is the importance of tissue fluid?
- d) Name the blood vessel with the highest concentration of:
- Glucose
 - Carbon dioxide
14. a) Explain how marine fish regulate their osmotic pressure.
b) Explain the role of antidiuretic hormone when there is excess water in the human body.
15. A response exhibited by a certain plant tendril is illustrated below.



- a) i) Name the type of response
ii) Explain how the response named in (a)(i) above occurs
- b) What is the importance of tactic responses to microscopic plants?
- c) State four applications of plant hormones in agriculture.
16. a) What is meant by:
- Autecology
 - Synecology?
- b) The number and distribution of stomata on three different leaves are shown in the table below:

Leaf	Number of stomata	
	Upper epidermis	Lower epidermis
A	300	
B	150	
C	02	

Suggest the possible habitat of the plants from which the leaves were obtained

Leaf **Habitat**

A

B

C

(c) State the modifications found in the stomata of leaf C.

SECTION C (40 marks)

Answer question 17 (compulsory) in the spaces provided and either question 18 or 19 in the spaces provided after question 19.

17. Some students used a model to demonstrate the effect of sweating on human body temperature. Two boiling tubes A and B were filled with hot water. The temperature of water in the tubes was taken at the start of the experiment and then at 5 minutes interval. The surface of tube A was continuously wiped with a piece of cotton wool soaked in methylated spirit. The results obtained are shown in the table below.

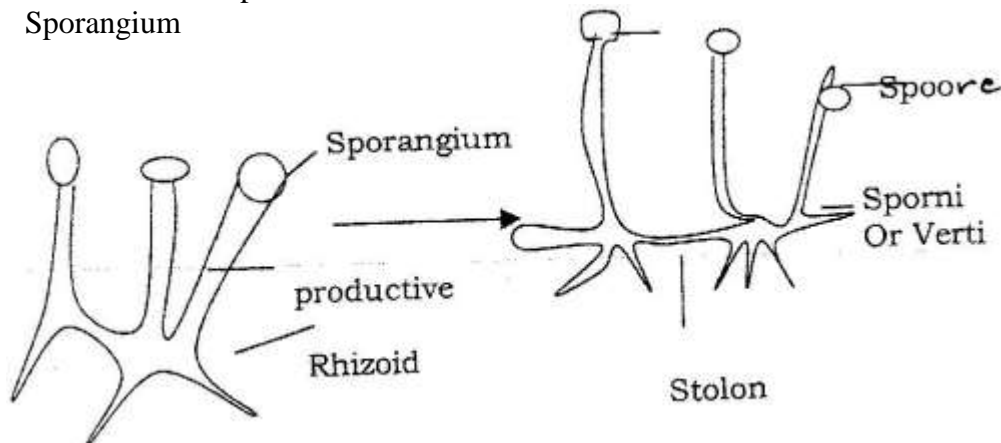
Time (minutes)	Temperature ⁰ C in tubes	
	A	B
0	80	80
5	54	67
10	40	59
15	29	52
20	21	47
25	18	46

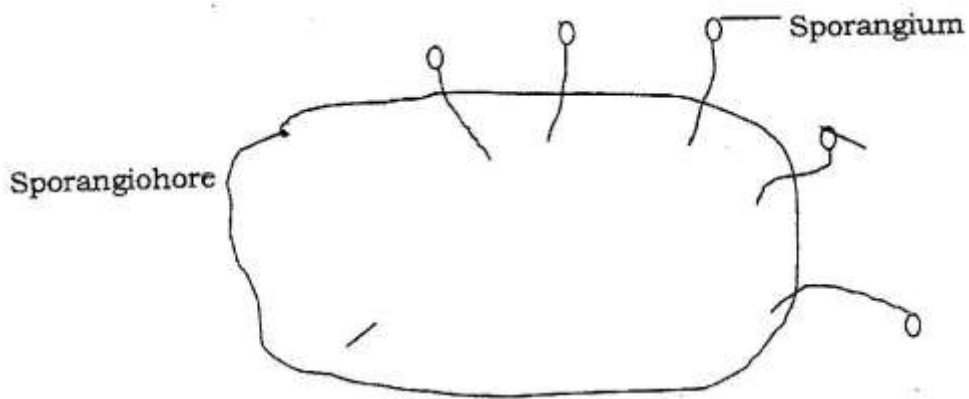
- On the same axes, plot graphs of temperature of water in the tubes against time.
 - At what rate was the water – cooling in tube A?
 - Why was tube B included in the set up?
 - Account for the rate of cooling in tube A.
 - State two processes of heat loss in tube b.
 - What would be the expected results if tube A was insulated?
 - What would the insulation be comparable to in:
 - Bird
 - Mammals?
 - Name the structures in the human body that detect:
 - External temperature changes
 - Internal temperature changes
18. Describe the functions of the various parts of the human eye.
19. Describe how fruits and seeds are suited to their modes of dispersal.

BIOLOGY PAPER 232/2 K.C.S.E 2003
PRACTICAL MARKING SCHEME

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

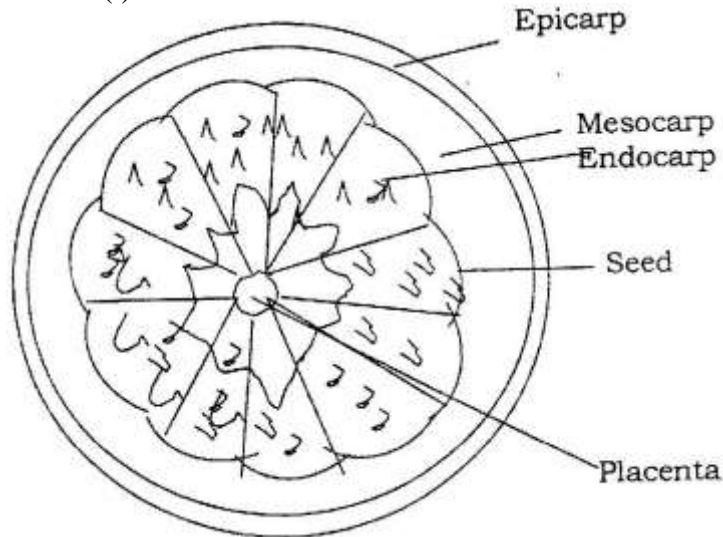
- (a) (i) State the habitat of specimen C
a. Aquatic/ water
- (ii) Name the trophic level occupied by specimen C.
Producer/ first trophic level
- (iii) Give a reason for your answer in (a) (ii) above
It has chlorophyll for photosynthesis
- (b) (i) Place 5cm³ of solution L into a 100ml beaker. Using a straw, blow gently into the solution.
Colour changes to yellow / greenish yellow/orange
- (ii) Give a reason for the observation in (b) (i) above.
Carbon dioxide in exhaled air / exhaled air contains carbon dioxide or carbon dioxide /carbon dioxide in air;
- (c) Place 5cm³ 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.
Solution in the beaker with spirogyra turns yellow; while the other remained blue or solution in the beaker containing specimen C/spogya turns yellow / green / greenish yellow;
- (ii) Explain the observation in (c)(i) above.
Spirogyra respire, in the dark producing carbon dioxide; which changes the colour of solution to yellow while the solution in other beaker served as a control;
- (d) Examine specimen D using a hand lens.
Giving a reason, state the division to which the specimen belongs.
Division: Micophyta / mycophyta;
Reason: Non – green / has hyphae / has no chlorophyll.
- (e) What role is played by specimen D in an ecosystem?
Decomposer / causes decay of dead organic matter;
- (f) Draw and label specimen D.
Sporangium





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.
Fruit
- (ii) Give a reason for your answer in (a)(i) above.
- b) Cut a transverse section through specimen E.



State the magnification of your drawing?

Mag: range between $X^{1/2}$ to $x 3$ (must be x not x)

- (ii) State the type of placentation of specimen E.
Axial / Axile (accept axile for axial.)
- c) Name the agent of dispersal of specimen E.
Animal; accept man alone as an agent.
- d) State how specimen C is adapted to its mode of dispersal.
Seeds have hard / slimy seed coats / with mucus which prevent indigestion.
Scented to attract animal / dispersal animal;
Succulent to attract / so that it is edible / can be eaten;
- e) i) To 1cm^3 of DCPIP in a test tube, add 0.1% solution of ascorbic acid drop by drop until the colour of DCPIP disappears. Shake the test tube after addition of each drop. Record the number of droplets used.
2 drops; drops from 1 to 4 drops.

- Squeeze out the juice from specimen E into a beaker. Filter and discard the residue.
- ii) To another 1cm³ 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. Show your working
2/8x0.1;025%
Calculation done only if the drops are within the stated rang above.
 - iv) State two factors that would influence the accuracy of the results.
Size of dropper / size of the drops.
Period of storage of specimen E/extent/degree of ripening.
Impurities.
 - (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.
Boiling/heat destroys Ascorbic acid;

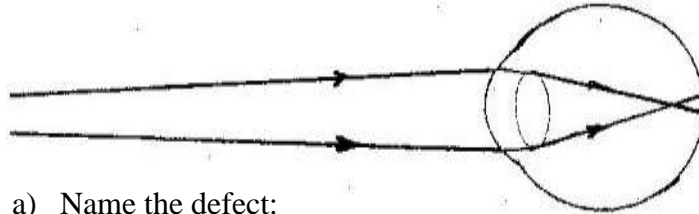
3. You are provided with a specimen labeled B.

- 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.

**K.C.S.E 2004 BIOLOGY 231 /1
QUESTIONS**

Section A (20 mks)

- 1.a) Name the cartilage found between the bones of the vertebral column(1mk)
- b) State the function of the cartilage named in (a) above (1mk)
2. Distinguish between natural and acquired immunity (2mks)
3. How is aerenchyma tissue adapted to its function (2mks)
4. Other than carbon dioxide, name other products of anaerobic respiration(2mks)
5. During which phase of meiosis does crossing over occur. (2mks)
6. The diagram below shows the position of an image formed in a defective eye.

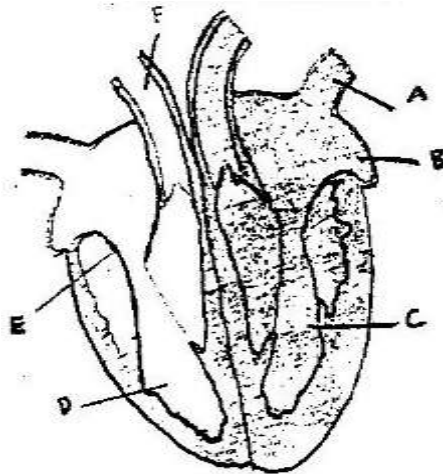


- a) Name the defect:
- b) Explain how the defect named in (a) above can be corrected 2mks)
7. State the function of the organelles:
 - a) Lysosomes (1mks)
 - b) Golgi apparatus (2mks)
8. Name the class in the phylum arthropoda which has the largest number of individuals? (1mks)
9. Name two mineral elements that are necessary in the synthesis of chlorophyll. (2mks)
10. How are the xylem vessels adapted for support? (1mk)
11. Fruit formation without fertilization is called (1mk)

SECTION B (40 MKS)

12. A cross between a red flowered plant and white flowered produced plants with pink flowers.
Using letter R to represent the gene for red colour , and W for white colour
 - a) What were the parental genotypes (1mks)
 - b) Workout a cross between F1 plants (4mks)
 - c) Give the i) Phenotypic ratio of F₂ plants (1mk)
 ii) Genotypic ratio of F₂ plants (1mk)
 - d) Name a characteristic in humans, which is controlled through a mammalian heart?

13. The diagram below shows a vertical section through a mammalian heart.



- a) Name the parts labeled A,B,E and F (4mks)
- b) Use arrows to show the direction in which blood flows in the heart. (2mks)
- c) Give a reason why the wall of chamber C is thicker than chamber D (2mks)
14. a) What is the difference between Darwinian and Lamarckian theories of evolution? (2mks)
- b) What is meant by the following terms? Give an example in each case. (6mks)
- Homologous structures
 - Example
 - Vestigial structures
Example
15. a) Give the differences between the following structures in wind and insect pollinated flowers. (3mks)
- Anther
 - Pollen grains
 - Stigma (1mk)
- b) What is the importance of cross pollination? (1mk)
- c) Explain how a seed is formed after an ovule is fertilized (4mks)
16. a) What is diffusion (2mks)
- b) how do the following factors affect the rate of diffusion?
- Diffusion gradient (1mk)
 - Surface area volume ratio (1mk)
 - Temperature (1mk)
- c) Outliner three roles of active transport in the human body (3mks)

SECTION C (40 MKS)

Answer question 17. (Compulsory) in the space provided and either question 18 or 19 in the spaces provided after question 19.

17. During germination and growth of a cereal, the dry weight of endosperm, the embryo and total dry weight were determined at two – day intervals. The results are shown in the table below.

Time after planting (days)	Dry weight of endosperm	Dry weight of embryo (mg)	Total dry weight (mg)
0	43	2	45
2	40	2	42
4	33	7	40
6	20	17	37
8	10	25	35
10	6	33	39

- a) Using the same axes, draw graphs of dry weigh of endosperm, embryo and the total dry weight against time (7mks)
- b) What is the total dry weight on day 5?
- c) Account for:
- i) Decrease in dry weight of endosperm from day 0 to 10 (2mks)
 - ii) Increase in dry weight of embryo from day 0 day 10 (2mks)
 - iii) Decrease in total dry weight from day 0 to day 8 (2mks)
 - iv) Increase in total dry weight after day 8 (1mks)
- Dormancy.
- i) Within a seed
 - ii) Outside the seed
- e) Give two characteristics of meristematic cells (2mks)
18. How is the mammalian skin adapted to its functions? (20mks)
19. Explain how a biotic factors affect plants (20mks)

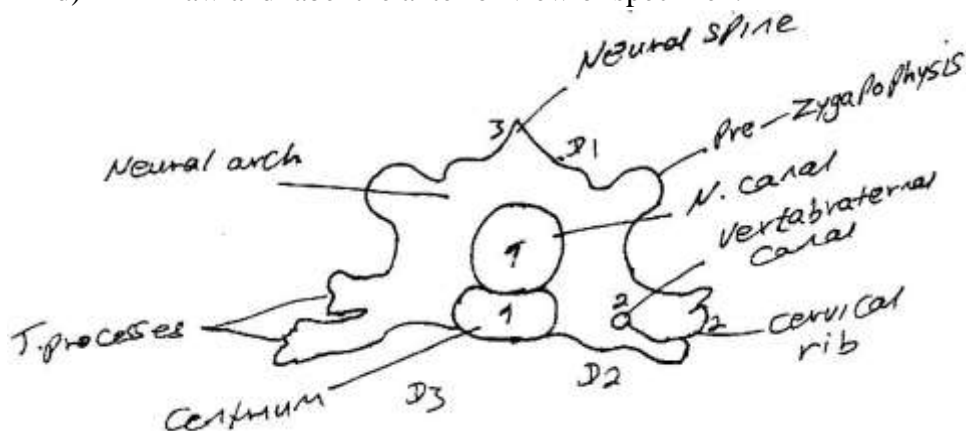
BIOLOGY PAPER 231/2 K.C.S.E 2004
PRACTICAL MARKING SCHEME.

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 J2 and K1 and K2 belong. (4mks)
- J1 and J2 Rosales / Dicotyledonae
Reason Net veined / Net venation / two cotyledons / reticulate / tap root system / petiole
K1 and K2 Parallel veined / parallel venation / one cotyledon / fibrous Root system / sheath.
- b) i) Name the curved part of specimen J1
Hypocotyl; (correct spelling) (1mk)
ii) What is the importance of the curvature? (1mk)
Protects plumule / shoot tip / first foliage leaves / opens space through the soil for cotyledons to pass.
- c) Explain how the curve part in J1 will straighten so that the stem will look like that of J2 (4mks)
Exposure of curvature to light, auxins migrate to lower side/ opposite side; Faster growth of cells on lower side/ opp. Side; hence stem straighten; (Straightening tied to faster growth)
- d) Name the part that protects the plumule in specimen k1 and k2 (1mks)
Coleoptile ; protective cover or coat.
- 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)
Nodules / root nodules;
iii) Name the organisms that would be found in the swellings.(1mk)
Rhizobium / Rhizobia / Rhizobium bacteria / nitrogen fixing bacteria; root; bacterial nodules;
iv) Explain the relationship that exists between the named organisms and the plant.
- f) i) Name the structures found on the stem just below the leaves of specimen J2 (1mk)
Cotyledons / seed leaves
ii) State two functions of the structures named in (f)(i) above (2mks)
Photosynthesis; stores food; root; provides food alone acc. Provide for germinating seedling / young plants.
- g) i) State the types of germination exhibited by specimen K1 and k2 (1mk)
Hypogeal;
ii) Give a reason for your answer in (g)(i) above (1mks)
remains of fruit / grain /cotyledon underground /remains of endosperms;
- h) Name the root system found in specimens J1 and J2 (1mks)
Taproot (system)
K2 and K2
Fibrous root (system)
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 Lumbar vertebra / vertebrae Ref; lumbar alone /bone
Reasons 1. Wide / large / broad centrum ref; Thick
2. Long/ broad to process; presence of metapophysis;
Anapophysis; broad / wide neural spine
- ii) Specimen N cervical vertebral / cervical bone
Ref; Cervical alone or cervical bone
Reason 1. Point / short / small neural Spine;
2. Presence of vertebrarterial canals;
Winged forked / branched / divided to. Processes;
Presences of cervical ribs.
- b) State four ways in which specimen N is adapted to its functions (4mks)
- Presence of neural canal for passage of spinal cord;
 - Neural spine for attachment of muscles;
 - Transverse process for attachment of muscles;
 - Facets for articulation with other vertebrae;
 - Vertebrarterial canals for passage of blood vessels & (nerves) and neural arch & centrum for protection of spinal cord (Both indicated; first four.
- c) State four differences between specimens M and N.

M	N
Canals absent	Veterbrarterial canals present
Large / long / un F/B /D T.	Processes
Processes small / short / transverse	Neural spine small / narrow.
Presence of meta / anapophysis	Absence of metapophysis / anapophysis.
Cervical ribs absent	Cervical ribs present
Neural canal narrow	nueral canal wide.

- d) Draw and label the anterior view of specimen.



- D1 Complete outline & proportionality – Centrum smaller than Neural canal / No shading
- D2 T processes should be forked / Veterbrarterial columns near centrum / fairly identical.
- D3 Centrum & neural spine properly drawn.

3. You are provided with a specimen labeled Q and hydrogen peroxide.
- a) i) What part of plant is specimen Q? (1mk)
Stem tuber / stem;
- ii) Presence of buds / presence of scale leave;
Acc. Lateral buds / Rej. Scaly leaves, swollen with food, lenticels.
- b) State two roles played by specimen Q in the life cycle of plant from which it was obtained. (2mks)
Food reserve / storage organ / provide food during sprouting.
Ref. Provide food alone / Reproduction organ / parenting organ used for vegetative reproduction.(OWWTE)
- 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)
In A – Less / few bubbles / slow effervescence / fizzing / froth
In B – Rapid bubbling / effervescence / fizzing / froth / foam.
- ii) Account for the results in (c)(i) above. (2mks)
Large surface area in B than in A, for enzymatic activity in T.T.B
- iii) Write an equation for the breakdown of hydrogen peroxide. (1mk)
 $2\text{H}_2\text{O}_2 \longrightarrow 2\text{H}_2\text{O} + \text{O}_2$ (must be balanced)
With or without enzyme over water.
Bubbles because of enzymatic reaction.
- d) Peel half of specimen Q and crush in a mortar. Use the reagents provided to test for the various food substances in the extract obtained from the crushed material.

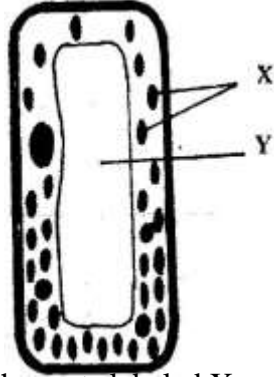
Record the procedures, observations and conclusions in the table below.(9mks)

Food substance	Procedure	Observations	Conclusion
Starch	Add a drop of iodine solution	Blue black colour (brown to blue acc.	Starch present
Reducing Sugars	Add benedicts soln & boil/heat/warm. Acc. Hot water bath.	(i) Green (Colour) (ii) Yellow Orange (colour) Rej. Brown	Traces / little reducing sugar present. Reducing sugar present.
Protein	Add NaOH, followed by CuSO_4	No colour change / blue / colour remain Light purple/Violet / purple	Proteins present Proteins present.

BIOLOGY 231/1 K.C.S.E 2005
QUESTIONS
SECTION A (20 MARKS)

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

1. Apart from hearing, state another function of the human ear. (1mk)
2. The diagram below represents a cell.

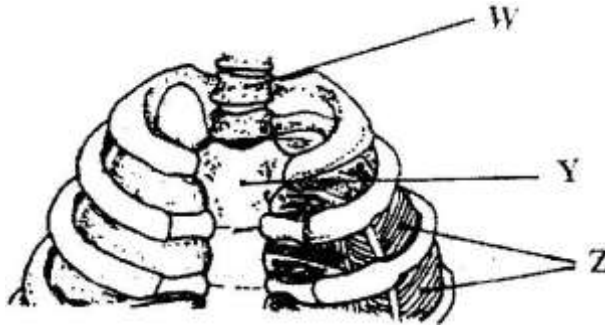


- (a) Name the parts labeled X and Y (2mk)
 - X
 - Y
- (b) Suggest why the structures labelled X would be more on one side than the other. (1mks)
3. What is the role of the vascular bundles in plant nutrition? (3mks)
4. What is meant by
 - a) Organic evolution (1mks)
 - b) Continental drift? (1mks)
5. To which class does an animal with two body parts and four Pairs of legs belong? (1mk)
6. Name the substance which accumulates in muscles when respiration occurs with insufficient oxygen. (1mks)
7. State the importance of osmosis in plants. (3mks)
8. Name three factors in seeds that cause dormancy. (3mks)
9. Why would carboxyhaemoglobin lead to death? (2mks)
10. Name the organism that causes amoebic dysentery. (1mks)
 - a) Name the process through which energy from the sun is incorporated into the food web. (1mk)
 - b) State the mode of feeding of the birds in the food web (1mk)
 - c) Name two ecosystems in which the organisms in the food web live (1mk)
 - d) From the information in the food web, construct a food chain with the large bird as a quaternary consumer. (1mk)
 - e) What would happen to the organisms in the food web if bird N migrated? (3mks)
 - f) Not all the energy from one trophic level is available to the next level. Explain (3mks)
 - g) (i) Two organisms which play a role in the ecosystems are not included in the food web. Name them. (2mks)
 - (ii) State the role played by the organisms named in g(i) above. (1mk)

SECTION B (40 MARKS)

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

11. The diagram below represents a part of the rib cage.

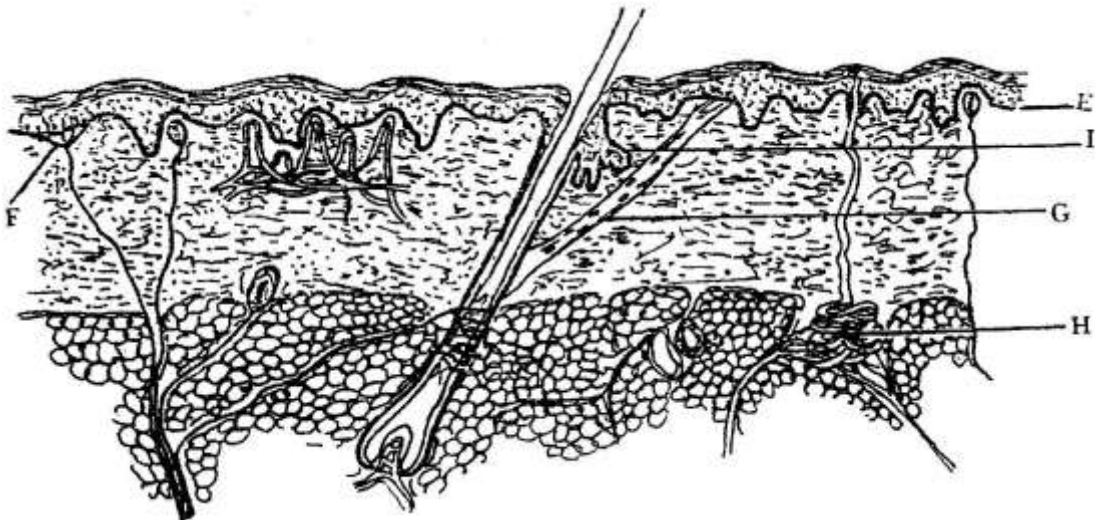


- a) Name the parts labeled W, Y and Z. (3mks)
 W
 Y
 Z
- b) How does the part labeled Z facilitates breathing in? (3mks)

12. In a garden with plants of same species, 705 plants had red flowers while 224 had white flowers.

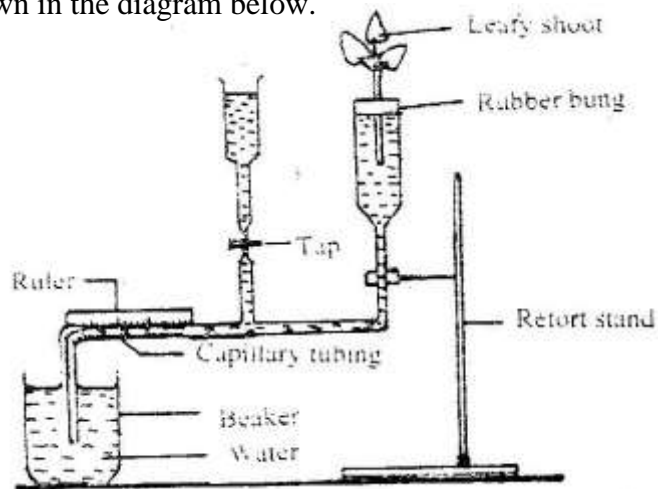
- a) Work out the ratio of red to white flowered plants (1mk)
- b) (i) Using letter R to represent the dominant gene, work out a cross between F1 offspring and a white flowered plant.(4mks)
 (ii) What is the genotypic ratio from the cross in b(i) above?(1mk)
- c) What is meant by the term allele? (1mk)

13. The diagram below shows a section through the mammalian skin.



- a) Name the parts labeled E, F and G. (3mks)
 E
 F
 G
- b) State two functions in each case of substance secreted by the structures labeled.
 (i) H (2mks)
 (ii) I (2mks)

14. A set up that was used to investigate certain process in plants is shown in the diagram below.

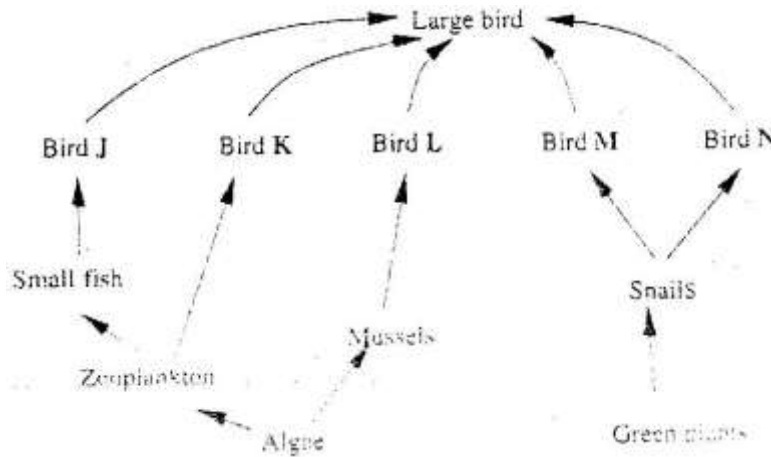


- a) What process was being investigated? (1mk)
- b) (i) State two precautions that should be taken when setting up the experiment. (2mks)
- (ii) Give a reason for each precaution stated in b(i) above. (2mks)
- c) State three environmental factors that influence the process Under investigation. (3mks)
15. a) What is meant by the terms
- (i) Epigymous flower (1mk)
- (ii) Staminate flower? (1mk)
- b) How are the male parts of wild pollinated flowers adapted to their function? (4mks)
16. a) Name two organisms that cause food spoilage (2mks)
- b) Name two modern methods of food preservation and for each state the biologic principle behind it. (4mks)

SECTION C (40 MARKS)

Answer question 17 (compulsory) and either question 18 or 19 in the spaces provided after question 19.

17. After an ecological study of feeding relationships students constructed the food web below.



- a) i) State three human activities that would affect the ecosystems. (3mks)
- ii) Explain how the activities stated in h(i) above would affect the ecosystems. (3mks)
18. Describe how gaseous exchange takes place in terrestrial Plants. (20mks)
19. How is the human eye adapted to its function? (20mks)

**MARKING SCHEME BIOLOGY PAPER 2 (PRACTICAL)
KCSE 2005**

Each candidate will require the following

A shoot of maize plant with some leaves labeled specimen X

A leafy shoot of *Bidens pilosa* labeled specimen Y

Iodine solution

Benedict's solution

Means of heating / water bath

Means of cutting / scalpel

6 test tubes

Test tube rack

Test tube holder

Water in 50ml beaker

Dropper

Means of labeling

Pestle and mortar

A hand lens

Dissecting needle / pins

A leafy twig of hibiscus plant with regular flowers labelled specimen S1

A leafy twig of bougainvillea with some mature flowers labeled specimen S2

An onion bulb with growing roots and growing aerial leaves labelled specimen p.

A shoot of tradescantia with flowers labeled specimen Q

Note: onion bulbs can be made to develop roots and leaves by planting them in saw dust / sand.

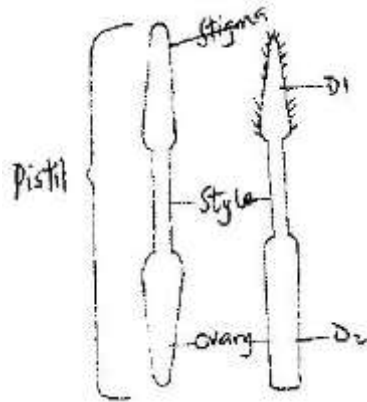
Fleshly picked growing onions with roots intact can be used.

1.

Specimen	Steps followed	Identity
S1	1a,2a,3b,4b,6b	Malvaceae
S2	1a,2a,3b,4a,5b,8a	Nyctaginaceae
Q	1a,2b,	Commelinaceae
X	1a,2a,3a	Graminae
Y	1b,	Asteraceae

- b) i) S₁- Dicotyledonous
Q- Monocotyledonae
- ii) S₁ – Floral parts in threes (3, s0 multiples of 3/6 stamens / 6 anthers /3 petals.
- c) -Presence of large brightly coloured bracts / petals / perianth, to attract insects.
(Reject it is brightly coloured)
-Anthers and stigma enclosed in a tube, to be reached by insects
- Scented to attract insects.

d)



D1 – Continuous outline

- No shading

D2 – Proportionality and accuracy

- Long stigma (feathering) stigma thinner than stigma and ovary

- Oblong ovary

Magnification = $\frac{\text{Length of drawing / image (units)}}{\text{Length of actual specimen (units)}}$

= x (2-10)

* No units = Ref. answer

Wrong computation = Ref. answer

2. (a) T1 – Molar tooth

Reasons

i) Presence of cusps / ridges

ii) Presence of three roots

T2 - Incisors

Reasons

i) Chisel shaped / wide (sharp) edge / wedge shaped

Ref. one root

b) Cusps /ridges any upper white part

Crown – Black part below cusps

Neck - Boundary between white and black parts

Root – white lower part divided into 3

Enamel – All over the part seen

Dentine – Upper part below the cusps

c) J – vegetation, grass, shrubs, herbs, plants / leaves

Ref. vegetative , pasture, greens, grass eaters, herbivore, herbivorous but mark reason.

Reasons

-Presence of diastema

- Absence of teeth (incisors and canines) at the front part of the upper jaw

-Presence of horny pad

-Presence of(premolars)cusps(for grinding vegetation)

K- Flesh/meat

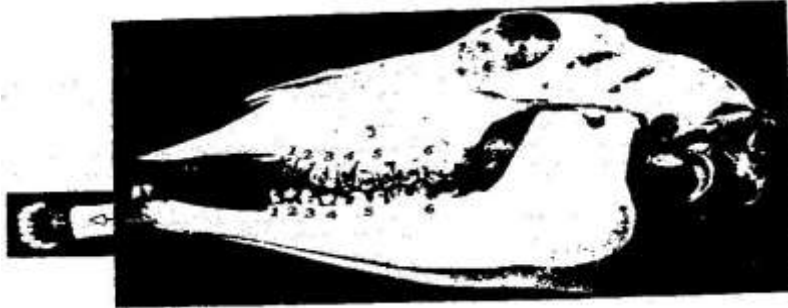
Rej; carnivores/carnivorous, flesh eater but mark reason

Reasons

Presence of (pronounced) long curved sharp pointed canines for gripping / tearing, holding/grasping prey

Ref; large

-Presence of carnassial teeth, for cutting and crushing bone



Inset – last on both sides

Photo – 2nd to the inside

e) $J - 2 (10/3Co/1pm3/3m 3/3) = 32$

$K - 2 (13/3C1/1pm4/4m 2/3) = 42$

*teeth types must be identified using letters

Rej; If missing

*Demarcating lines must be present

f) J

g) Refer to diagram area below main white part.

3. P(onion bulb with leaves and roots)

a) i) Inner succulent/ juicy /flesh while outer is dry

- Inner is thicker while outer is thin / membranous / scaly

NB: Comparison must be seen otherwise deny a marks

ii) Inner swollen with food for storage and outer for protection against desiccation /mechanical injury / excessive loss of water/ microorganisms / invasion by fungi.

Rej: Storage of water alone, & prevent water loss.

5.

Extract	Procedure	Observations	Conclusion
Roots	Add iodine	No colour changed colour of iodine Brown yellow retained / persist	Starch absent
	Add benedicts solution and boil/ heat/warm/place in a hot water bath	Blue to green to orange/ brown (acc. brick red,ref.red	Reducing sugars present/simple sugars.
Bulbs	Add iodine	No colour change colour of iodine	Starch absent
	Add benedict solution and boil	Green to yellow to orange /brown	Reducing sugars present
Aerial leaves	Add iodine	No colour change	Starch absent
	Add benedicts solution and boil	Green to yellow to orange to brown	Reducing sugars present

* Green end – conclusions must be traces of reducing sugars

* Wrong procedures, deny observation and conclusion marks

c) Roots

- Presence of reducing sugars translocated from the bulb/aerial Leaves, for provision of energy/respiration for growth and development/respiration for growth and development/metabolic activities.
- Absence of starch because roots are not a storage organ.

ii) Bulb

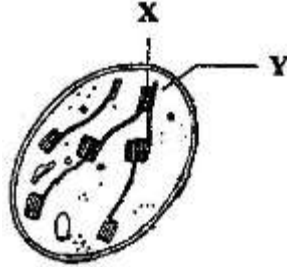
- Presence of reducing sugars translocated from aerial leaves, for storage to be stored.
- Absence of starch because fleshy leaves of the bulb do not store starch (Stores Volatile oils)

Aerial leaves

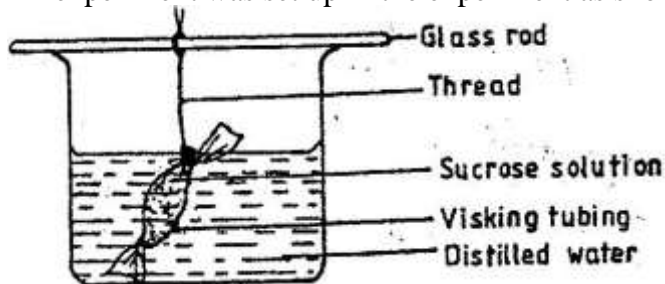
- Presence of reducing sugars due to photosynthesis
- Absence of starch because the reducing sugars had not been converted into starch.

**BIOLOGY PAPER 231/1 K.C.SE 2006
QUESTIONS.**

1. a) State the functions of cristae in mitochondria.
b) The diagram below represents a cell organelle.



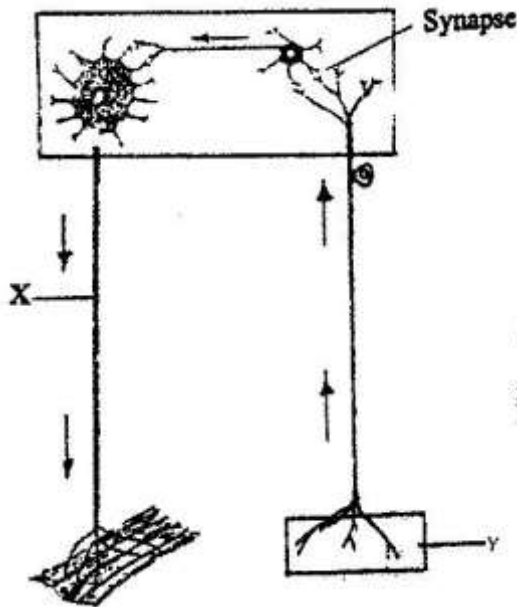
- (i) Name the part labeled Y. (1mk)
(ii) State the functions of the part labeled X. (1mk)
2. Name the part of the flower that develops into
a) Seed
b) Fruit (1mk)
3. a) Name two tissues in plants which are thickened with lignin. (2mks)
b) How is support attained herbaceous plants? (1mks)
4. a) Name the fluid that is produced by sebaceous glands. (1mk)
b) What is the role of sweat in human skin? (2mks)
5. State two ways in which floating leaves of aquatic plants are adapted to gaseous exchange. (2mks)
6. a) State three characteristics of Monera that are not found in other kingdoms. (3mks)
b) Name the class to which a termite belongs (1mk)
7. a) Name one defect of circulatory system in humans. (1mk)
b) state three functions of blood other than transport. (3mks)
8. State the role of vitamin C in humans. (2mks)
9. a) State two processes which occur during anaphase of mitosis. (2mks)
b) What is significance of meiosis? (2mks)
10. State the important of tactic response among some members of kingdom protista. (1mks)
11. State the role of insulin in human body. (1mks)
12. An experiment was set up in the experiment as show below.



The set up was left for 30 minutes.

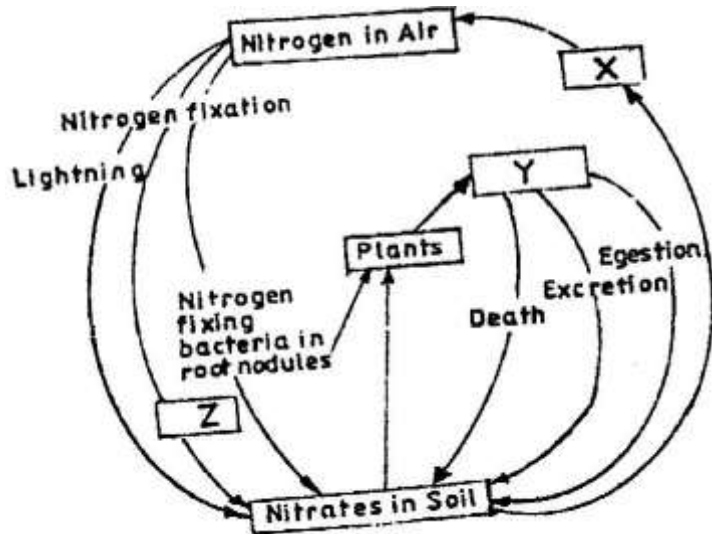
- a) State the expected results. (1mk)
b) Explain your answer in (a) above (3mks)

13. a) In what form is energy stored in muscles (1mk)
 b) State the economic important of anaerobic respiration in plants.(2mks)
14. a) Distinguish between epigeal and hypogeal germination. (1,mk)
 b) Why is oxygen necessary in the germination of seeds? (2mks)
15. Explain continental drift as an evidence of evolution. (3mks)
16. What is the importance of the following in an ecosystem? (2mks)
 a) Decomposers
 b) Predation
17. a) Distinguish between the terms homodont and heterodont. (1mk)
 b) What is the function of carnassials teeth? (1mk)
 c) A certain animal has no incisors, no canines, 6 premolars and 6 Molars in its upper jaw. In the lower jaw there are 6 incisors, 2 canines, 6 Premolars and six molars.
 Write its dental formula.
18. a) State two functions of bile juice in the digestion of food. (2mks)
 b) How does substrate concentration affect the rate of enzyme action?(1mk)
19. a) Explain how the following prevent self pollination. (1mk)
 (i) Protogyny
 (ii) Self – sterility.
 b) Give three advantages of cross pollination. (3mks)
20. a) What name is given to response to contact with surface exhibited by tendrils and climbing stems in plants?
 b) State three biological importance of tropisms plants.
21. The diagram below represents a reflex are in human.



- a) Name the parts labeled X and Y
 b) Name the substance that is responsible for the transmission of an impulse across the synapse. (1mks)
22. a) State the function of ciliary muscles in the human eye. (1mk)
 b) State two functional differences between the rods and cones in the human eye. (2mks)

23. State the function of each of the following parts of human ear. (4mks)
- Ear ossicles
 - Cochlea
 - Semi circular canals
 - Eustachian tube.
24. State four ways in which respiratory surfaces are suited to their function. (4mks)
25. a) A dog weighing 15.2kg requires 216kj while a mouse weighing 50g requires 2736kj per day. Explain. (2mks)
26. The chart below represents a simplified nitrogen cycle.

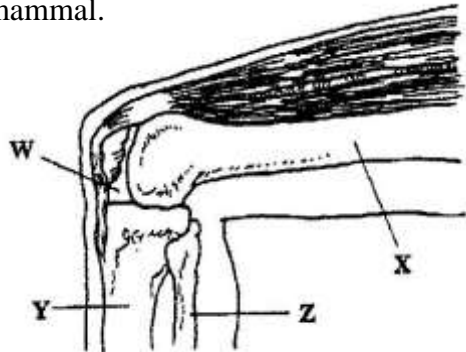


What is represented by X,Y, and Z?

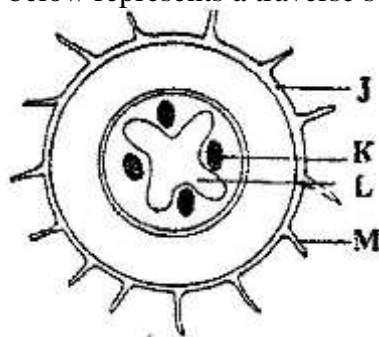
27. Name the end products of the light stage in photosynthesis.

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

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

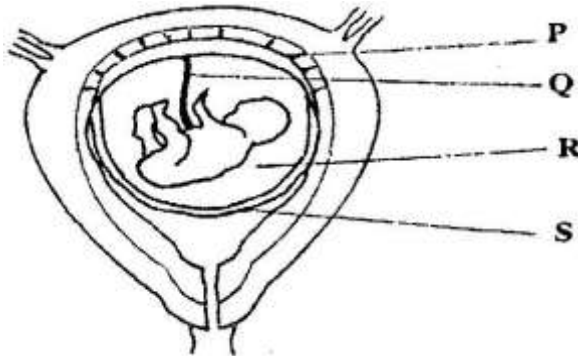


- a) Name the bones labeled XY and Z (3mks)
 - b)
 - i) Name the substance found in the place labeled W. (1mk)
 - ii) State the function of the substance named in (b) (i) above. (1mk)
 - c) Name the structure that joins the bones together at the joint. (1mk)
 - d) State the differences between ball and 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)
 - 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.



- 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 and either question 8.

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.

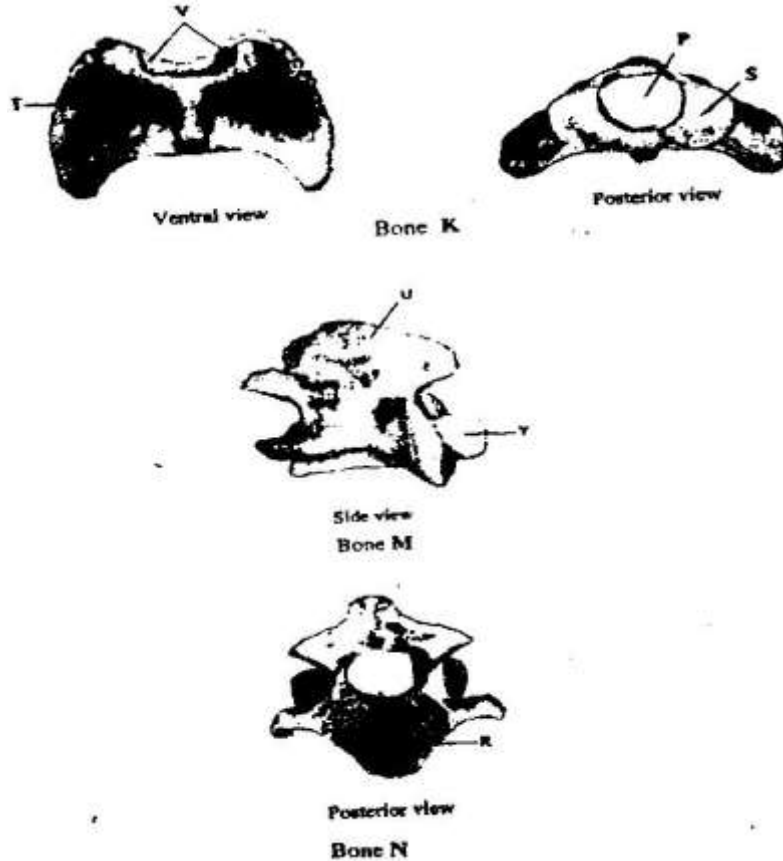
Time in days	Length of branches in millimeters		
	Shoot A	Shoot B	Shoot C
0	3	3	3
2	10	12	3
4	28	48	8
6	50	9	14
8	80	120	20
10	118	152	26

- 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)

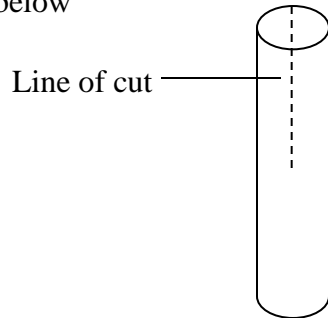
BIOLOGY PAPER 3 (231/3) 2006
PRACTICAL QUESTIONS

1. The photographs below are bones obtained from the same region of a mammalian body. Photograph labeled K are different views but same bone while M and N are views of different bones.



- (a) Name the region from which the bones were obtained (1 mark)
- (b) Identify the bones (3 marks)
- K.....
- M.....
- N.....
- (c) State three characteristics feature of the bone in photographs labeled K (3 marks)
- (d) Name the structure that fit in the opening labeled P in the photograph of bone K (2 marks)
- (e) State the functions of the parts labeled S and T in photographs of bone K (2 marks)
- (f) Name the structures that articulate with the parts labeled V in the photographs of bone K (1 mark)
- (g) Name the parts labeled U and Y in the photograph of bone M and R in the photograph of bone N (3 marks)

2. You are provided with two pieces of plant material labeled specimen D. Using a scalpel cut a slit halfway through the middle of each piece shown in the diagram below



Place one piece in the solution labeled L_1 and the other in solution labeled L_2 allow the set up to stand for 30 minutes.

- (a) After 30 minutes remove the pieces and press each gently between the fingers

- (i) Record your observations

L_1 (1 mark)

L_2 (1 mark)

- (b) Examine the pieces

i) Record other observations beside those made in (a) (i) above (3 marks)

ii) Account for the observations in (a) (i) above (5 marks)

iii) Account for the observation in (b) (i) above (2 marks)

3. You are provided with three sets of seedlings labeled A, B and C. Examine them

(a) State the conditions under which each set was grown (3 marks)

(b) State four different between the seedlings in set A and B (4 marks)

(c) (i) Name the phenomenon exhibited by seedling in set B (1 mark)

(ii) Give a reason why plants exhibit the phenomenon named in (c) (i) above (1 mark)

(d) Name the response exhibited by the seedling in set C (1 mark)

(e) Explain how the response named in (d) above occurred (3 marks)

**K.C.S.E 2007 BIOLOGY PAPER 1
QUESTIONS**

1. (a) What is meant by the term binomial nomenclature (1 mark)
(b) Give two reasons why classification is important (2 marks)

2. (a) What is the formula for calculating linear magnification of a specimen when using a hand lens? (1 mark)
(b) Give a reason why staining is necessary when preparing specimens for observation under the microscope (1 mark)

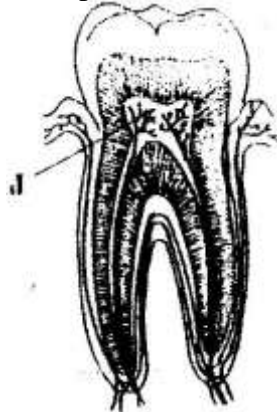
3. Plant cells do not burst when immersed in distilled water. Explain (2 marks)

4. State three functions of Golgi apparatus (3 marks)

5. Distinguish between diffusion and osmosis (2 marks)

6. Describe what happens during the light stage of photosynthesis (3 marks)

7. The diagram below represents a section through a human tooth



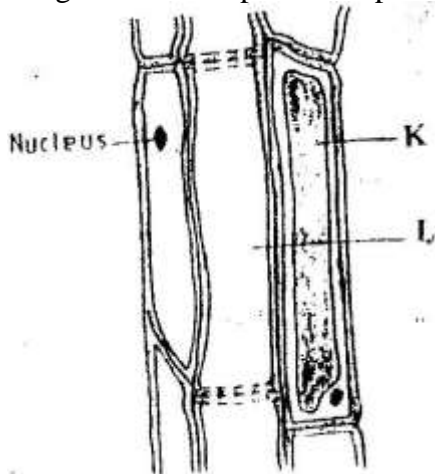
- (a) (i) Name the type of tooth shown (1 mark)
(ii) Give a reason for your answer in (a) (i) above (1 mark)

- (b) State the functions of the structures found in part labeled J (2 marks)

8. (a) Name a fat soluble vitamin manufactured by the human body (1 mark)
(b) State two functions of potassium in the human body (2 marks)

9. State two ways in which the root hairs are adapted to their function (2 marks)

10. The diagram below represents a plant tissue



(a) Name the tissue (1 mark)

(b) Name the cells labeled K and L. (2 marks)

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

(c) What is the function of the companion cell? (1 mark)

11. (a) What prevents blood in veins from flowing backwards? (1 mark)

(b) State two ways in which the blood cells are adapted to their function (2 marks)

12. (a) Name two structures for gaseous exchange in aquatic plants (2 marks)

(b) What is the effect of contraction of the diaphragm muscles during breathing in mammals? (3 marks)

13. (a) Name the products of anaerobic respiration in (i) Plants (1 mark)

(ii) Animals (1 mark)

(b) What is oxygen debt? (1 mark)

14. (a) What is the meaning of the terms (i) Homeostatic (1 mark)

(ii) Osmoregulation? (1 mark)

(b) Name the hormones involved in regulating glucose level in blood (2 marks)

15. (a) Distinguish between population and community (2 marks)

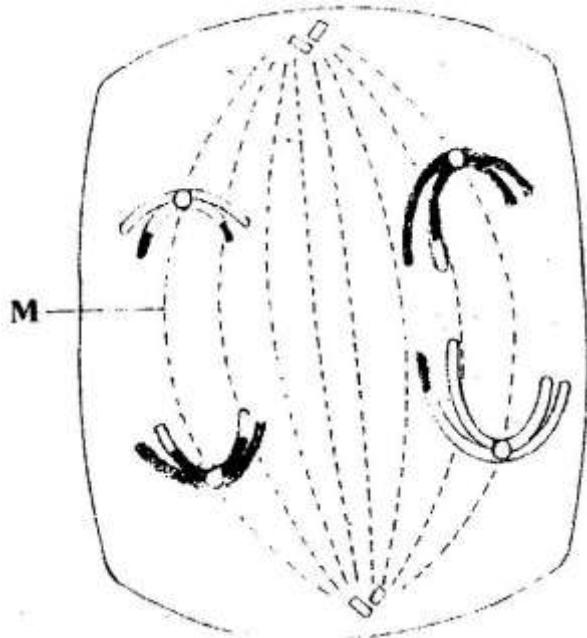
(b) Name a method that could be used to estimate the population size of the following organisms

(i) Fish in a pond (1 mark)

(ii) Black jack in a garden (1 mark)

16 State two ways in which schistosoma species is adapted to parasitic mode of life (2 marks)

17 The diagram below represents a stage during cell division



- (a) (i) Identify the stage of cell division (1 mark)
(ii) Give three reasons for your answer in (a) (i) above (2 marks)

(b) Name the structures labeled M (1 mark)

18. State two disadvantages of sexual reproduction in animals (2 marks)

19 (a) State two environmental conditions that can cause seed dormancy (2 marks)

(b) Name the part of a bean that elongates to bring about epigeal germination (1 mark)

20 (a) What is meant by the term allele? (1 mark)

(b) Explain how the following occur during gene mutation:

(i) Deletion (1 mark)

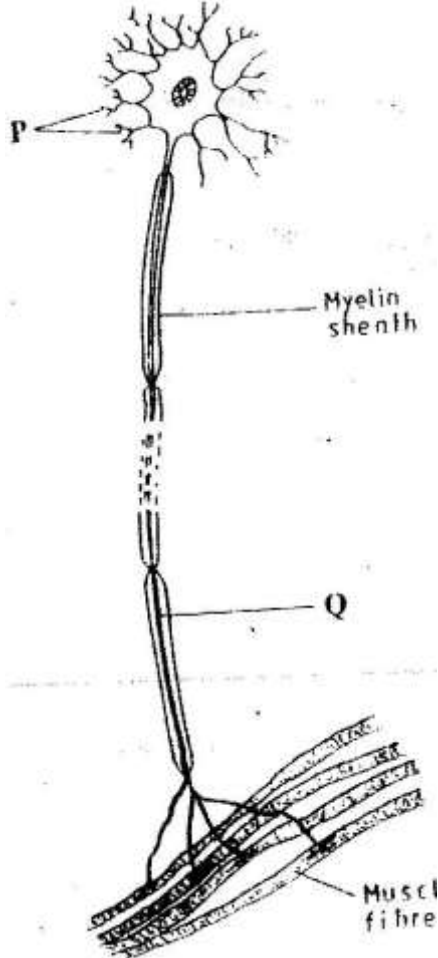
(ii) Inversion (1 mark)

(c) What is a test- cross? (1 mark)

21. (a) What is adaptive radiation (2 marks)

(b) Give a reason why organisms become resistant to drugs (1 mark)

22. (a) Where in the human body are relay neurons found (1 mark)
 (b) The diagram below represents a neurone (1 mark)



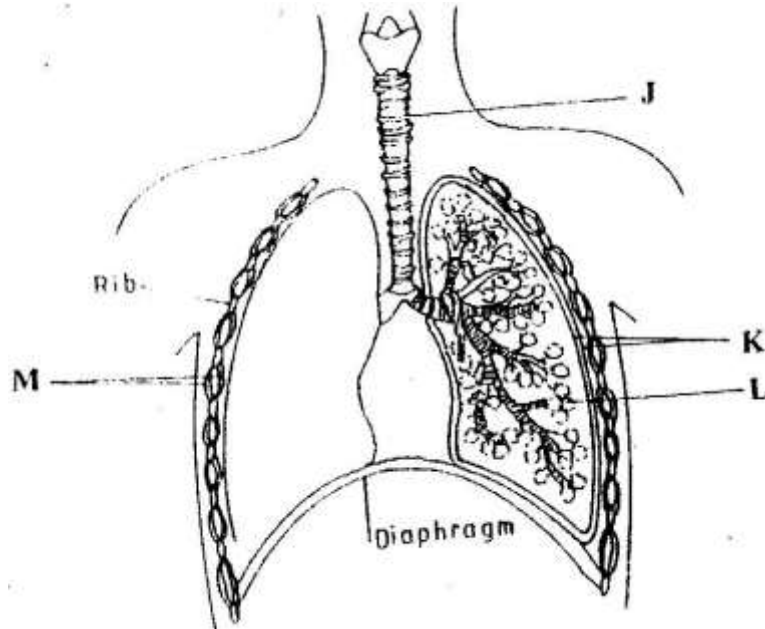
- (i) Name the neurone (1 mark)
 (ii) Name the parts labeled P and Q (2 marks)
 P.....
 Q.....
- (c) State a function of myelin sheath (1 mark)
- 23 (a) Name the hormone that is responsible for apical dominance (1 mark)
 (b) What is thigmotropism? (1 mark)
24. (a) state a characteristics that is common to all cervical vertebrae (1 mark)
 (b) Name two tissues in plants that provide mechanical support (2 marks)
25. (a) The action of ptyalin stops at the stomach. Explain (1 mark)
 (b) State a factor that denatures enzymes (1 mark)
 (c) Name the features that increase the surface area of small intestines (2 marks)
26. State one way by which HIV/AIDS is transmitted from mother to child (1 mark)

K.C.S.E 2007 BIOLOGY PAPER 2

SECTION A (40 marks)

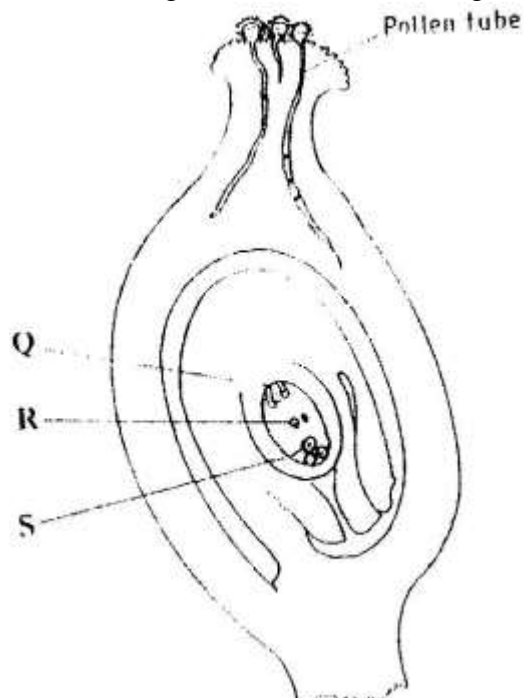
Answer all questions in this section in the spaces provided

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



- (a) Name the structures labeled K, L, and M (3 marks)
K.....
L.....
M.....
- (b) How is the structure labeled J suited to its function? (3 marks)
- (c) Name the process by which inhaled air moves from the structure labeled L into blood capillaries (1 mark)
- (d) Give the scientific name of the organism that causes tuberculosis in humans (1 mark)
- 2 (a) Explain what happens to excess amino- acids in the liver of humans (3 marks)
- (b) Which portion of the human nephron are only found in the cortex? (3 marks)
- (c) (i) What would happen if a person produced less antidiuretic hormone? (1 mark)
(ii) What term is given to the condition described in (c) (i) above (1 mark)
- 3 (a) What is meant by the following terms (1 mark)
(i) Protandry (1 mark)
(ii) Self sterility? (1 mark)

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



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

Q

R

S

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

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

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

Type of muscle

Where found

(i)

(ii)

(iii)

(b) State the difference between ball and socket and hinge joint (1 mark)

(c) State the functions of synovial fluid (2 marks)

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

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 marks)

(ii) State the phenotype of the offspring (1 mark)

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

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

SECTION B (40 MARKS)

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

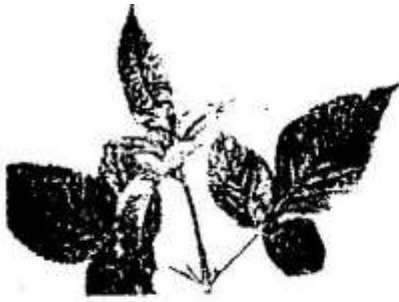
6. In the experiment to determine the effect of ringing on the concentration of sugar in phloem a ring of bark from the stem of a tree was cut and removed. The amount of sugar in grammes per 16cm^3 piece of bark above the ring was measured over a 24 hour period. Sugar was also measured in the bark of 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 marks)
- (b) At what time was the amount of sugar highest in the
- (i) Ringed stem (1 mark)
 - (ii) Normal stem? (1 mark)
- (c) How much sugar would be in the ringed stem if it was measured at 0345 hours? (1 mark)
- (d) Give reasons why there was sugar in the stems of both trees at 06 45 hours
(2 marks)
- (e) Account for the shape of the graph for the tree with ringed stem between:
- (i) 06 45 hours and 15 45 hours (3 marks)
 - (ii) 15 45 hours and 00 45 hours (2 marks)
- (f) Name the structures in phloem that are involved in the translocation of sugars
(2 marks)
- (g) Other than sugars name two compounds that are translocated in phloem
(2 marks)
7. Describe the structure and functions of the various parts of the human ear
(20 marks)
8. Describe causes and methods of controlling water pollution
(20 marks)

**K.C.S.E 2007 BIOLOGY PAPER 3
PRACTICAL QUESTIONS**

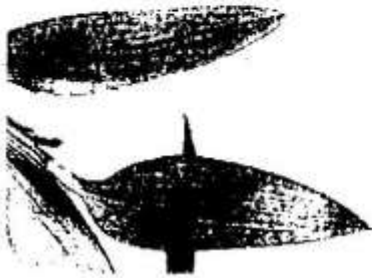
1. Below are photographs labeled P,Q,R,S,T,U and V of twigs obtained from plants examine them.



P



Q



R



S



T



U



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

1	a Simple leaves	go to 2
	b Compound leaves	go to 5
2	a Leaves net veined	go to 3
	b leaves parallel- veined	commerlinaceae
3	a.....	go to 4
	b leaves with smooth margin	Nyctsginaceae
4	a Leaves alternate	Malvaceae
	b	Verbenaceae
5	a.....	go to 6
	b leaves bipinnate	Bignoniaceae
6	a leaflet with serrated margin	Compositae
	b leaflets with smooth margin	Papilioceae

(b) Use the completed dichotomous key to identify the family to which each plant belongs

In each case show the steps you followed to arrive at the identity. (12 marks)

Identity	Steps Followed
P	
Q	
R	
S	
T	
U	
V	

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

(a) Use the iodine solution to test for the presence of food substance in solution P.
Food substance (1 mark)

Procedure (1 mark)

Observation (1 mark)

Conclusion (1 mark)

Solutions S is Benedict's solution

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

Food substance (1mark)

Procedure (2 marks)

Observation (1mark)

Conclusion (1 mark)

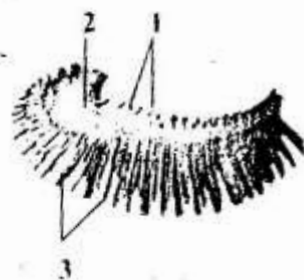
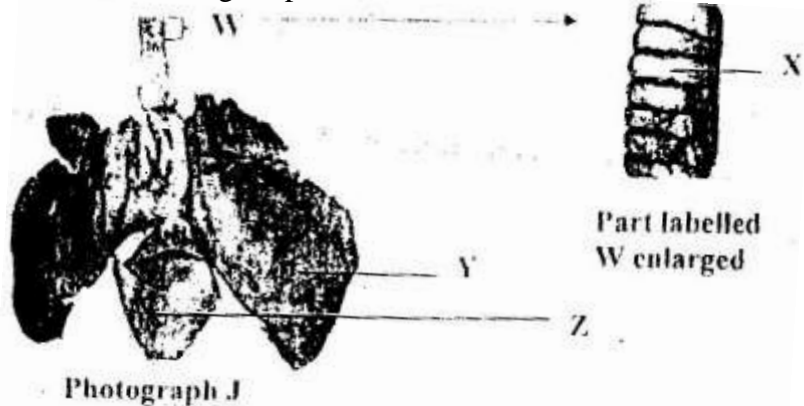
(c) Using the filter paper provided. Test for the presence of liquids in solutions P.

Procedure (2 marks)

Observation (1mark)

Conclusion (1 mark)

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



(a) Identify the organs (2 marks)

J

K

(b) State the functions performed by the organs (1 mark)

(c) Name the parts labeled X, Y and Z in photographs (3 marks)
X
Y
Z

(d) (i) Identify the parts labeled 1, 2 and 3 in photographs K (3 marks)
1.
2.
3.

(ii) Using observable features. State how the parts labeled 1 and 3 you identified in (d)(i) above are adapted to their function (4 mark)

1
2.
3

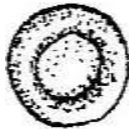
KCSE 2008 BIOLOGY PAPER 1
QUESTIONS

1. Name the tissues in plants responsible for:
 - (a) Transport of water and mineral salts
 - (b) Transport of carbohydrates
 - (c) Primary growth(3 mks)

2. State the importance of the following processes that take place in the nephrons of a human kidney
 - (a) Ultra filtration (1 mk)
 - (b) Selective reabsorption (1 mk)

3.
 - (a) Name a disease of the liver whose symptom is jaundice (1 mk)
 - (b) State the causative agent of:
 - (i) Cholera (1 mk)
 - (ii) Candidiasis (1 mk)

4. The diagrams below show a red blood cell that was subjected to a certain Treatment



At start



At the end of experiment

- (a) Account for shape of the cell at the end of the experiment (2 mks)
 - (b) Draw a diagram to illustrate how a plant cell would appear if subjected to the same treatment (1 mk)

5.
 - (a) State two factors that affect enzymatic activities (2 mks)
 - (b) Explain how one of the factors stated in (a) above affects enzymatic Activities (1 mk)

6.
 - (a) What is meant by non- disjunction? (1 mk)
 - (b) Give two examples of continuous variation in humans (2 mks)

7.
 - (a) what is fossil (1 mk)
 - (b) How does convergent evolution occur (3 mks)

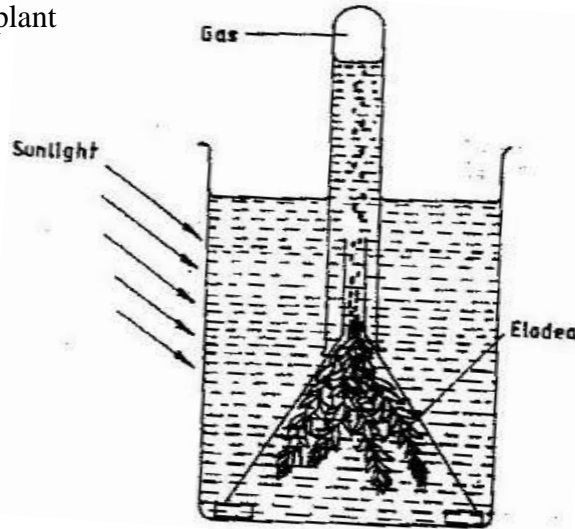
8. The diagram below shows a stage in mitosis in a plant cell



- (a) Name the stage of mitosis (1mk)
 - (b) Give two reasons for your answer in (a) above (2 mks)
 - (c) Name the part of the plant from which the cell used in preparation was Obtained (1 mk)

9. Give three factors that determine the amount of energy a human being require in a day (3 mks)

10. (a) Name the antigens that determine human blood groups (2 mks)
 (b) State the adaptation that enables the red blood cells to move in blood Capillaries (1 mk)
11. (a) What is homeostasis? (1 mk)
 (b) Name three processes in the human body in which homeostasis is Involved (3 mks)
12. State two functions of the endoplasmic reticulum (2 mks)
13. (a) Name the part of retina where image is formed (1mk)
 (b) State two characteristics of the image formed on the retina (2 mks)
14. Describe the three characteristics of a population (3 mks)
15. Explain what happens when there is oxygen debt in human muscles(2 mk)
16. The diagram below represents a set up that was used to investigate certain process in a plant



- (a) State the process that was being investigated (1 mk)
 (b) State a factor that would affect the process (1 mk)
17. Account for the following phases of a sigmoid curve of a growth of an organism
 (a) Lag phase (1 mk)
 (b) Plateau phase (1 mk)
18. How is the epidermis of a leaf of a green plant adapted to its function (2 mks)
19. The diagram below represents a tissue obtained from an animal



- (a) Identify the tissue (1 mk)
 (b) State the functions of the tissue named (a) above (1mk)
20. (a) what is a single circulatory system (1 mk)
 (b) Name an organism which has single circulatory system (1 mk)
 (c) Name the opening to the chamber of the heart of an insect (1 mk)
21. (a) What is seed dormancy (1 mk)
 (b) Name a growth inhibitor in seeds (1 mk)
22. State two characteristics of aerenchyma tissue (1 mk)
23. The diagram below shows a human tooth (2 mks)



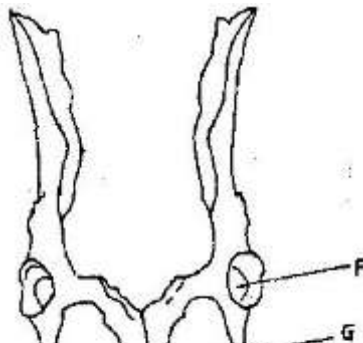
- (a) Identify the tooth (1 mk)
 (b) How is the tooth adapted to its function (1 mk)
 (c) State the role of the following vitamins in the human body
 (i) C (1 mk)
 (ii) K (1 mk)
24. Name the sites where light and dark reactions of photosynthesis take place (2 mks)

Light reaction

Dark reaction

25. Giving a reason in each case, name the class to which each of the following organisms (4 mks)
 Bean plant
 Reason
 Bat
 Reason

30. The diagram below shows two fused bones of a mammal

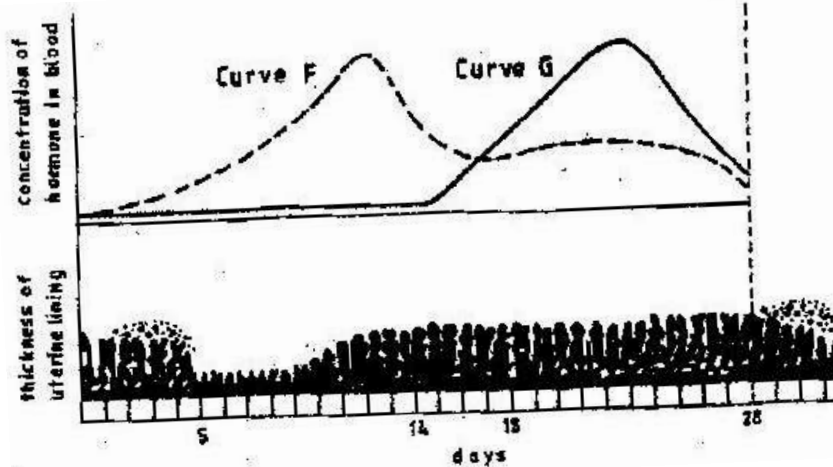


- (a) Identify the fused bone (1 mk)
- (b) Name the
- (i) Bone that articulates at the point labelled F (1 mk)
 - (ii) The hole labelled G (1 mk)

KCSE 2008 PAPER 2
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:

- (a) The genotype of parents if plant with round seed was heterozygous (2 mks)
- (b) The gametes produced by the round and wrinkled seed parents
Round seed parent
Wrinkled seed parent
- (c) The genotype and phenotype of F₁ generation. Show your working (3 mks)
- (d) What is a test – cross? (1 mk)

3. The equation below represents a process that takes place in plants
 $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

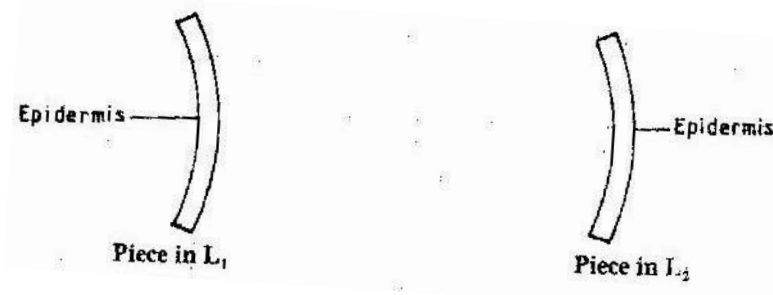
- (a) Name the process (1 mk)
- (b) State two conditions necessary for the process to take place (2 mks)
- (c) State what happens to the end- products of the process (5 mks)

- 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 L₁ and L₂(6 mks)
- (b) State the significance of the biological process involved in the experiment (2 mks)

SECTION B (40 Marks)

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

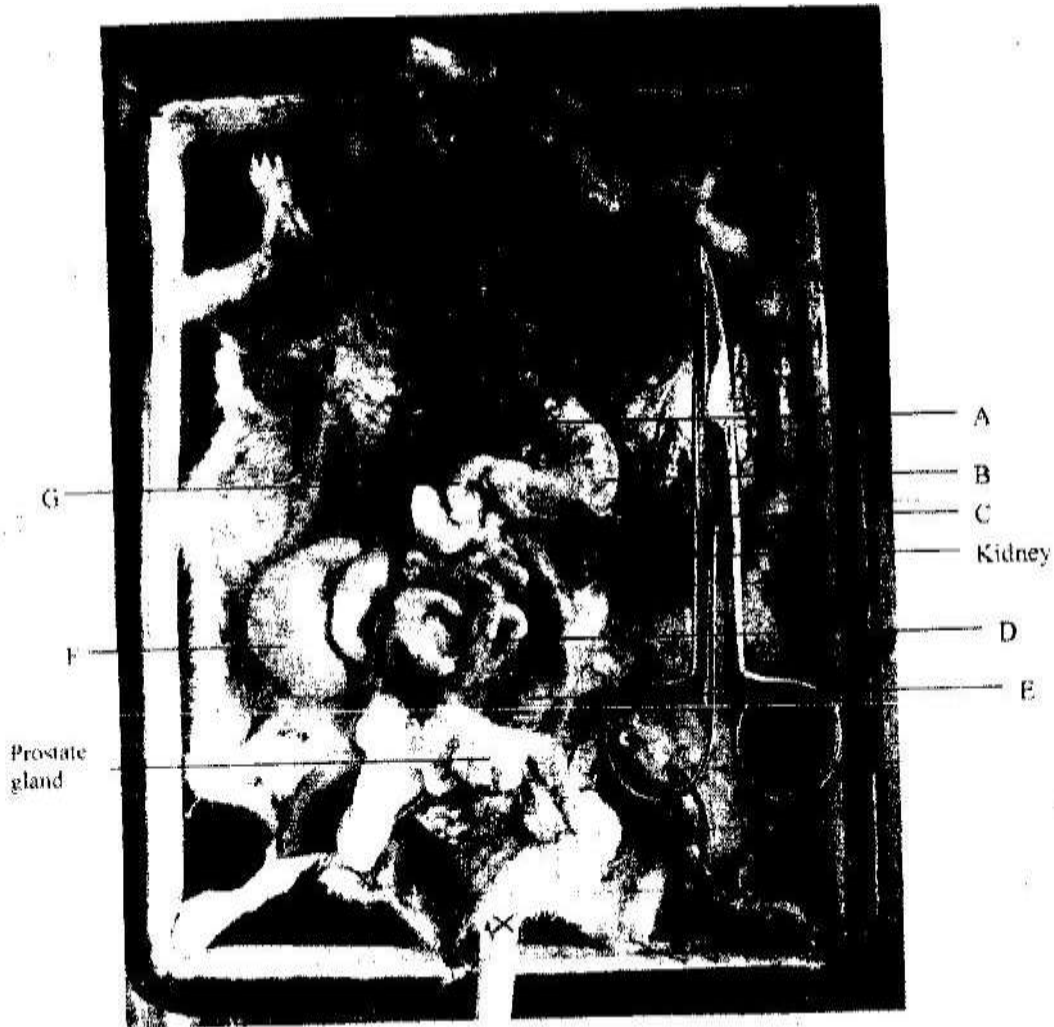
6. an experiment was carried out to investigate transpiration and absorption of water in sunflower plants in their natural environment with adequate supply of water. The account of water was determined in two hour intervals. The results are as shown in the table below

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:
- (i) Transpiration (3 mks)
 - (ii) 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)
7. Describe the nitrogen cycle (20 mks)
8. (a) State four characteristics of gaseous exchange surfaces (4 mks)
- (b) Describe the mechanism of gaseous exchange in a mammal (16 mks)

**KCSE BIOLOGY 2008 PAPER 3 QUESTIONS
PRACTICAL**

Below is a photograph of a dissected mammal. Examine the photograph

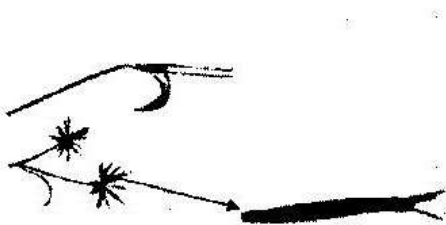


- (a) Name the parts labeled A, B, C D and G (5 mks)
- (b) State the function of the structures labeled E and F (1 mk)
- (c) In the photograph label the structure where vitamin K is produced (1 mk)
- (d) (i) Name the sex of the mammal in the photograph (1 mk)
(ii) Give a reason for your answer in (d) (i) above (1 mk)
- (e) (i) The actual length of the dissecting scissors in the photographs is 15 cm
Calculate the magnification of the photograph (2 mks)
- (ii) Calculate the actual length of the mammal from the tip of the nose to point X on the tail (2 mks)

2. You are provided with substance labeled S,T,U X and Y. S, T and U are food substance. While X is 10% sodium hydroxide solution and Y is 1% copper sulphate solution. Carry out tests to determine the food substance (s) in S. T and U. (9 mks)

Substance	Food substance being tested for	Procedure	Observations	Conclusion
S				
T				
U				

3. Below are photographs of specimens obtained from plants. Examine the photographs



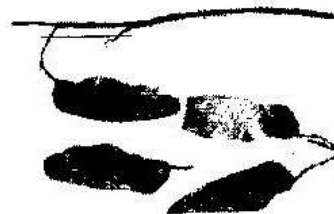
SPECIMEN K



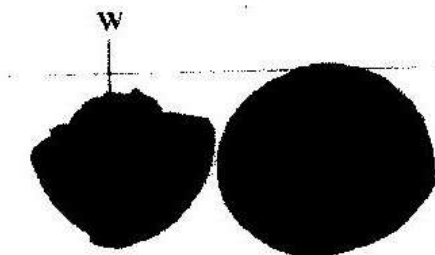
SPECIMEN L



SPECIMEN M



SPECIMEN N



SPECIMEN P



SPECIMEN Q

In the table below name the mode of dispersal and the features that adapt the specimen (s) to that mode of dispersal. (12 mks)

Specimen	Mode of dispersal	Adaptive features
K		
L		
M		
N		
P		
Q		

- (a) (i) Label any two parts on specimen L (2 mks)
(ii) State the type of placentaion in specimen L (1 mk)
(b) Name the structure labeled W on specimen P (1 mk)

BIOLOGY PAPER 1 YEAR 2009

1. (a) Name the external feature which is common in birds, fish and reptiles (1 mk)
(b) State two characteristics of fungi (2 mks)
2. Name two befits that a parasite derives from the host (2 mks)

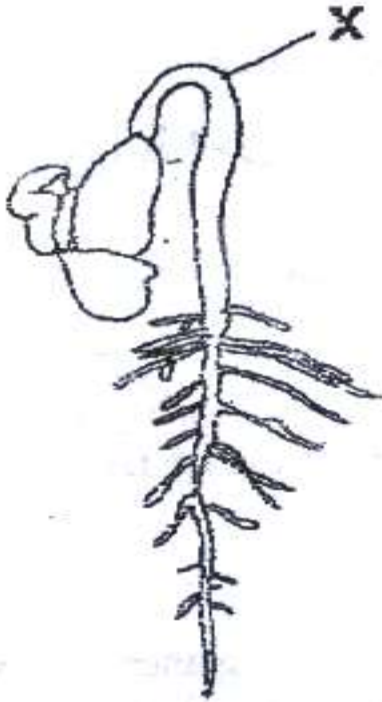
3. State the functions of the following parts of a light microscope (2 mks)

(a) Objective lens

(b) Diaphragm

4. (a) The state during which a seed cannot germinate even when conditions for Germination are suitable is called (1 mk)

(b) The diagram below represents a stage during germination of a seed



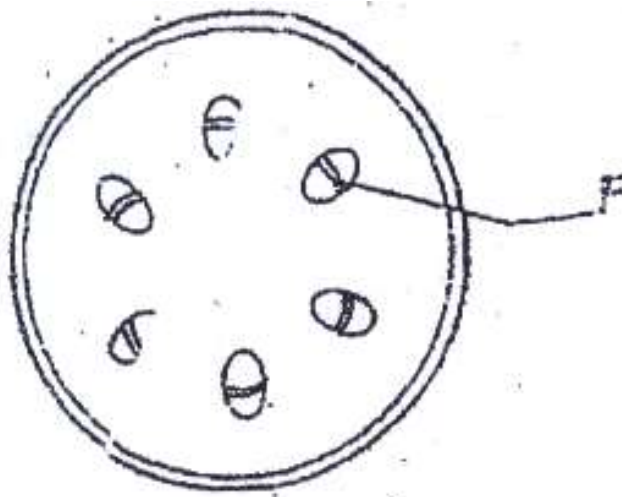
(i) Name the type of germination illustrated in the diagram (1mk)

(ii) State the role of the part labeled x during germination of the seed (2 mks)

5. (a) What is meant by the following terms

- (i) Hybrid vigour (1 mk)
- (ii) Polyploidy? (1 mk)
- (b) State two causes of chromosomal mutations (2 mks)

6. The diagram below shows a section through a plant organ



- (a) (i) Name the class of the plant which the section was obtained (1 mk)
- (ii) Give a reason for your answer in (a) (i) above
- (b) State the functions of the part labeled F (1 mk)

7. State the function of the following cell organelles

- (a) Ribosome (1 mk)

(b) Lysosomes (1 mk)

8. (a) Pregnancies continues if the ovary of an expectant mother is removed after 4 months explain (2 mks)

(b) What is the role of the testes in the mammalian reproductive systems? (2 mks)

9. (a) Name the causative agents of the following diseases in humans (2 mks)

(i) Typhoid

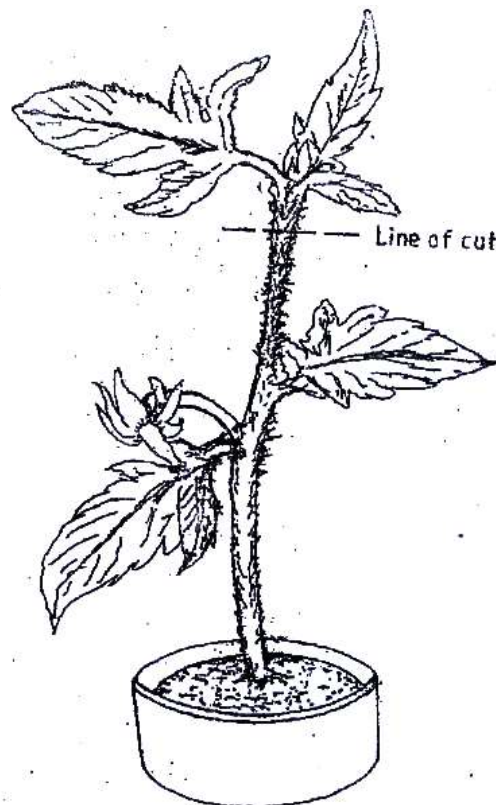
(ii) Amoebic dysentery

(b) Name the disease in humans caused by plasmodium falciparum (1 mk)

10. (a) (i) What is meant by vestigial structures ? (1 mk)

(ii) Give an example of a vestigial structure in human (1 mk)

(b) Explain why certain drugs become ineffective in curing a disease after many years of use.



(2 mks)

11. In an experiment the shoot tip of a young tomato plant

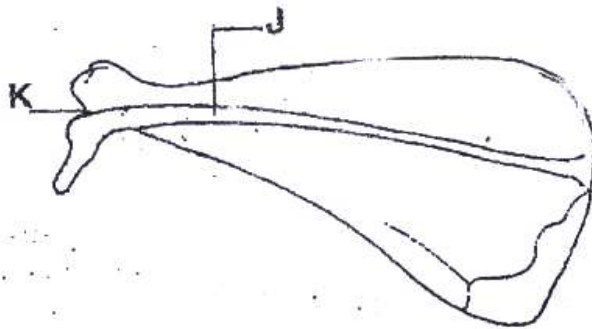
was decapitated as

shown in the diagram below

(a) State the expected results after 2 weeks (1 mk)

(b) Give a reason for your answer in (a) above (2 mks)

12. The diagram below represents a bone obtained from a mammal



(a) Name the bone (1 mk)

(b) Name the:

- (i) Bone which articulate with the bone named in (a) above at the cavity labeled K; (1 mk)
- (ii) Joint formed by the two bones (1 mk)
- (c) State the function of the part labeled J (1 mk)
13. (a) Distinguish between diffusion and active transport (2 mks)
- (b) State one role that is played by osmosis in (1 mk)
- (i) Plants
- (ii) Animals
14. Name a support tissue in plants that is not thickened with lignin (1 mk)
15. Name the type of movement that occurs within a plant cell (1 mk)
16. (a) Name the gaseous exchange surface in insects (1 mk)
- (b) How is the surface named in (a) above suited to its function (2 mks)
17. Explain why plants do not require specialized excretory organs (4 mks)
18. Explain how the following factors affect the rate of photosynthesis:

- (a) Concentration of carbon (iv) oxide (1 mk)
- (b) Light intensity (1mk)
19. (a) State three effects of dumping untreated sewage into a river (3 mks)
- (b) Name one process that is responsible for loss of energy from one trophic level to the next (1mk)
20. Other than using the quadratic, give two methods of estimating population of grass (2 mks)
21. Explain what happens in humans when concentration of glucose in the blood decreases below the normal level (4 mks)
22. Explain how the carnassials teeth of a dog are adapted to their function (2 mks)
23. state the function of iron in the human body (1 mk)
24. Explain how the following factors determine the daily energy requirement in human:
- (a) Age (1 mk)
- (b) Occupation (1 mk)

(c) Sex

(1 mk)

25. State two ways in which aerenchyma tissues in aquatic plants are adapted to their function (2 mks)

26. How are the mitochondria adapted to their functions? (2 mks)

27. State two ways in which anaerobic respiration is applied in industries (2 mks)

28. (a) State three structural differences between arteries and veins in mammals (3 mks)

(b) Name a disease that causes thickening and hardening of arteries (1 mk)

29. Explain why the rate of transpiration is reduced when humidity is high

BIOLOGY PAPER 2

SECTION A (40 MARKS)

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:

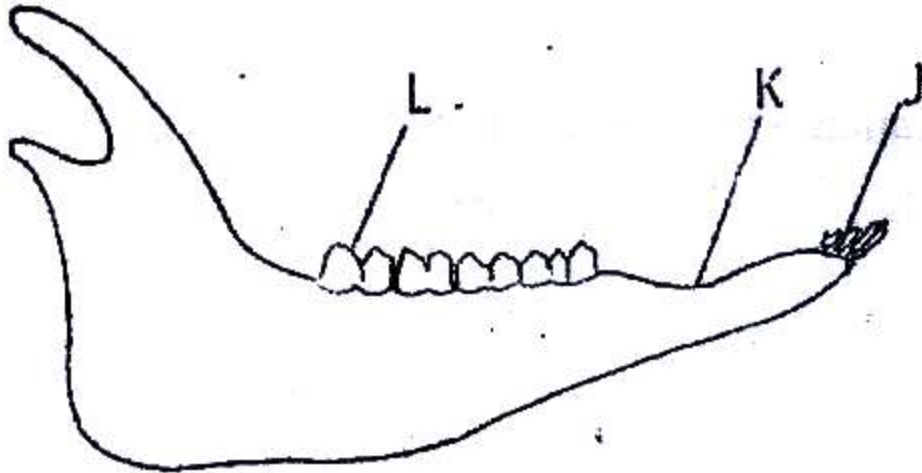
(i) Parents (2 mks)

(ii) F₁ Generation (1 mk)

(b) Work out the cross between plants in the F₁ generation (4 mks)

(c) Account for the colour the flowers in plants of the F₁ 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)

(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) what is meant by the term biological control (1 mk)

(i) 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 MARKS)

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

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

Temperature ($^{\circ}\text{C}$)	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

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) 5⁰ C and 40⁰ C (2 mks)

(ii) 45⁰ C and 60⁰C (3 mks)

(d) Other than temperature name two ways in which the rate of reaction between 5⁰C and 40⁰C 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?

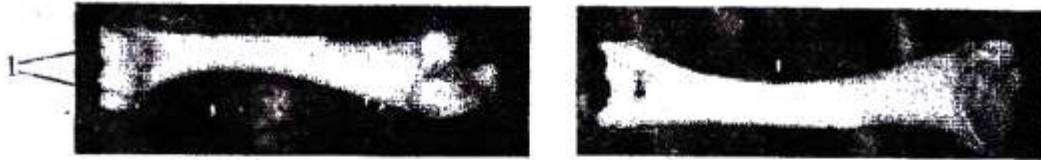
(ii) Name the substance responsible for neutralization (1 mk)

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

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

BIOLOGY PAPER 3

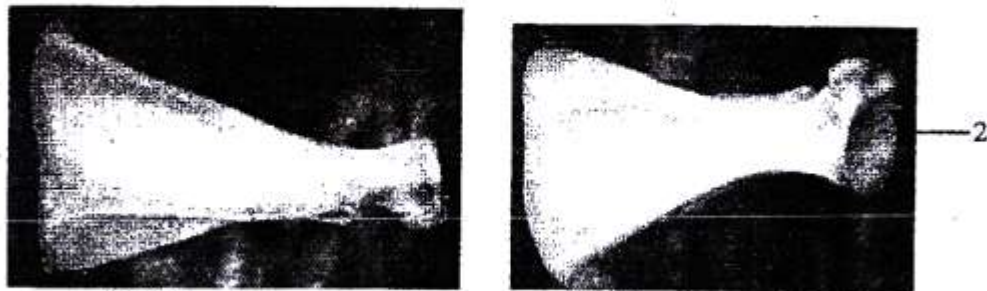
The photographs labeled K L, M, N and P below are of bones obtained from a mammal for each of the bones K, L and M two views are shown



View 1

View 2

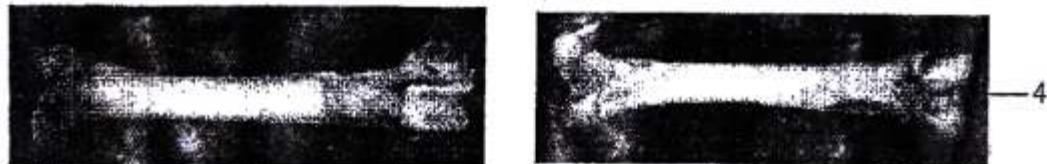
Bone K



View 1

View 2

Bone L



View 1

View 2

Bone M

3



Bone N



Bone P

5

6

Identify the bones and name the part of the mammalian body from which each was obtained

Body	Identity of the bone	where found
K
L
M
N
P

Name the parts labeled 1,2,3,4 and 5 (5 mks)

1.
2.
3.
4.
5.

Name the bones that form a joint with bone K at its anterior and posterior and in each case name the type of joint they form (4 mks)

(i) Bone(s)

(ii) Type of joint

Posterior end

(i) Bone (s)

(ii) Type of joint

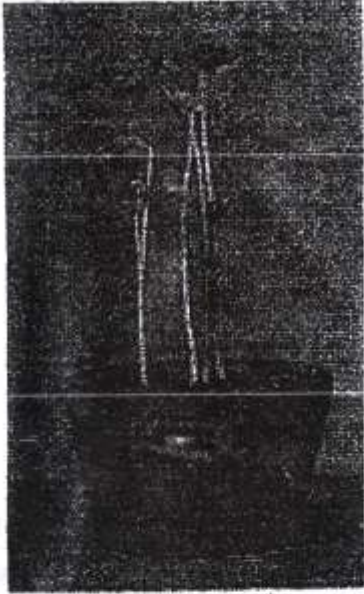
State the function of the structure labeled 6 in bone P (1 mks)

2. You are provided with substances labeled P,Q,X,Y and Z. P and Q are food substances, while X is dilute hydrochloric acid, Y is dilute sodium hydrogen carbonate and Z is Benedict's solution. Carry out tests to determine the food substance (s) in P and Q. (12 mks)

Substance	Food substances being tested for	Procedure	Observations	Conclusions
P				

Q				

3. The photographs labeled W, X, Y and Z show seedlings that were grown under different conditions. Examine them



W



X



Using observable features only state three differences between the seedling in photographs W and X (3 mks)

.....

.....

.....

Seedlings in photographs Y and Z were planted at the same time but under different conditions. Explain how the response exhibited by the seedlings in photographs Z occurred. (2 mks)

