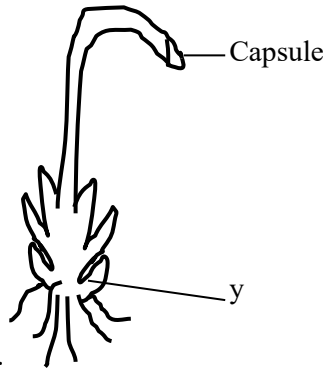


KIRINYAGA WEST
231/1
BIOLOGY
PAPER 1
JULY / AUGUST 2018

1. Name the branch of biology that deals with study of:-

- (a) Insects. (1 mark)
- (b) Micro-organisms. (1 mark)

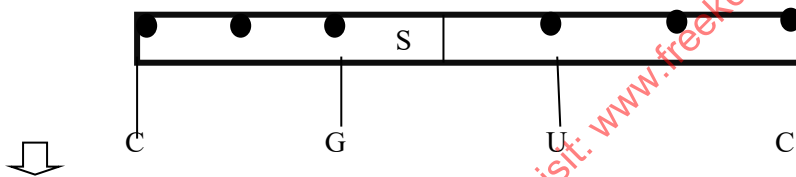
2. The figure below represents a plant.



- (a) State the division it belongs. (1 mark)
- (b) Label part marked y and state its function. (1 mark)

Function

3. The figure below represent a nucleic acid strand.

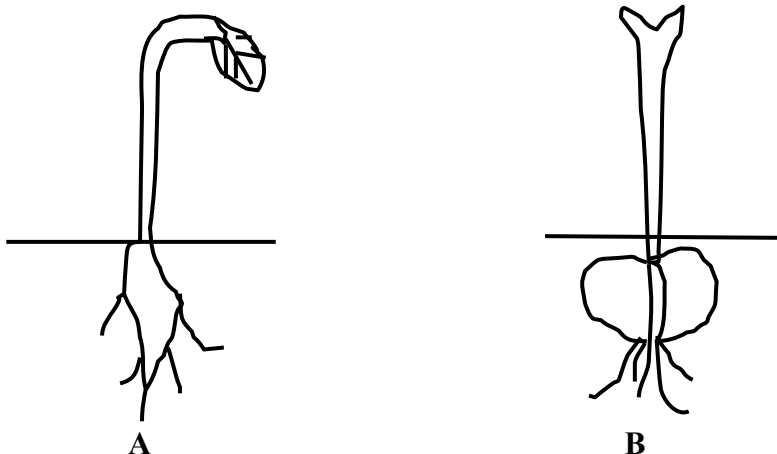


- (a) Giving a reason, name the nucleic acid to which the portion belongs. (2 marks)
 Name
 Reason
- (b) Write down the base sequence of the complimentary strand to that shown above. (1 mark)

4. Name the blood vessel that supply the blood to:-

- (a) (i) Heart muscles (1 mark)
- (ii) Kidney (1 mark)
- (b) Explain why it is not advisable to sleep in a room with burning charcoal stove. (3 marks)

5. The figure below represents germination in plants.

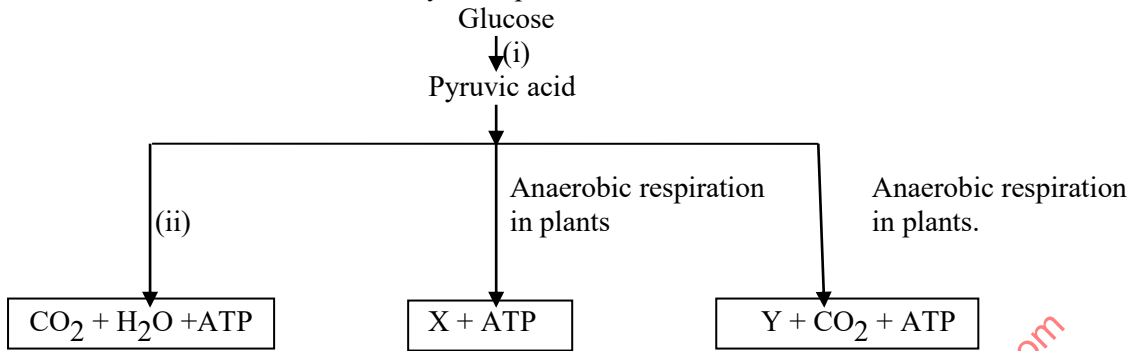


- (a) Name the type of germination in A and B above. (2 marks)
- (b) In seed germination the radicle grows before the shoot. Explain. (2 marks)

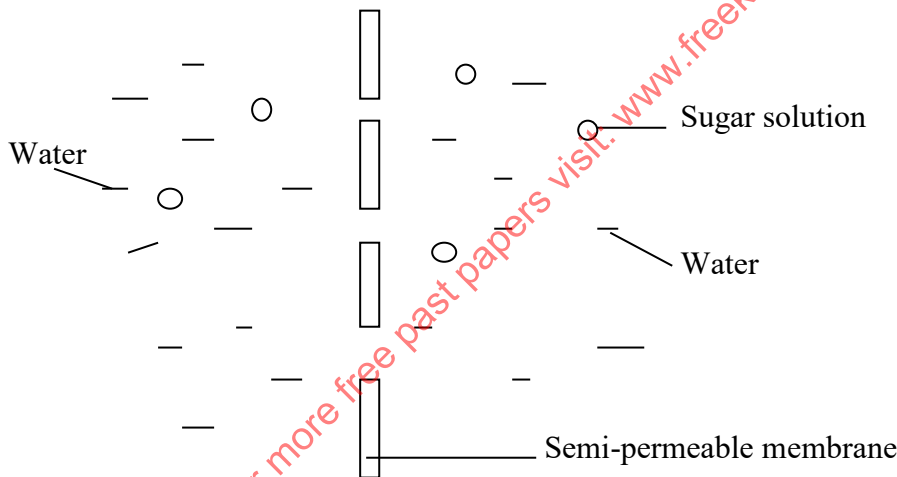
6. Identify with reasons the mode of feeding of the animal whose dental formula is given below.

0 c 0 pm 3 m 2
4 0 3 3

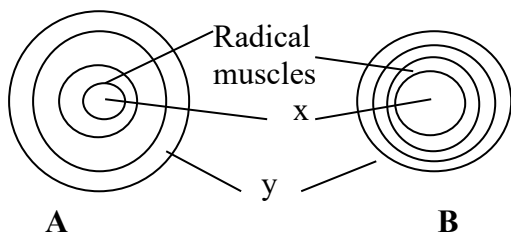
- (a) Mode of feeding. (1 mark)
- (b) Reason. (1 mark)
- 7. Name the support tissues in plants thickened with:-
 - (a) (i) Cellulose (1 mark)
 - (ii) Lignin (1 mark)
 - (b) Explain what happens when a wilting young plant is well watered. (3 marks)
- 8. The table below shows a summary of respiration.



- (a) Name the process labelled (i) and (ii) in the diagram above. (2 marks)
- (b) Name products X and Y. (2 marks)
- 9. Write **three** differences between mitosis and meiosis. (3 marks)
- 10. Study the figure below and answer the question that follows.



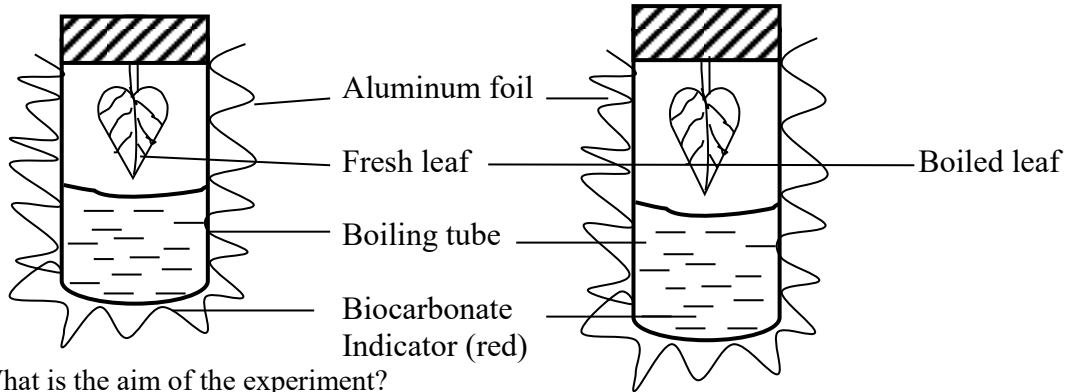
- (a) Which physiological process was being investigated. (1 mark)
- (b) Using arrows indicate in the diagram the direction of the physiological process named in (a) above. (1 mark)
- (c) State **two** role of the above physiological process in plants. (2 marks)
- 11. The diagram below shows how the iris and pupil of human eye appears.



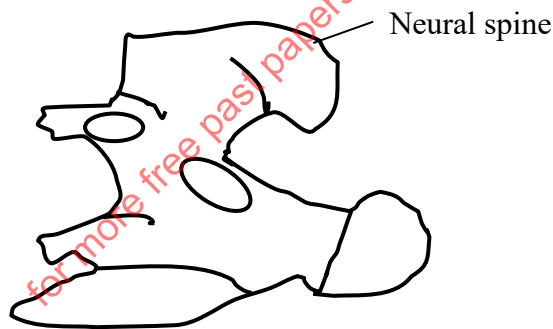
- (a) Name the structure labelled x and y. (2 marks)

- (b) Describe the changes that lead to the appearance of the iris and pupil as shown in the diagram labelled **B**. (3 marks)

12. The diagram below was used to investigate the release of a certain gas by the plant.

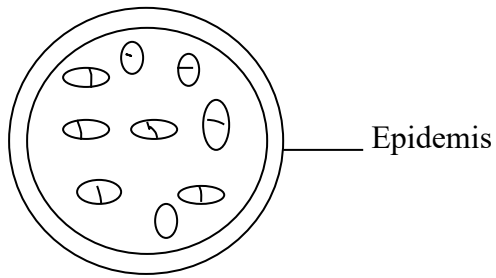


- (a) What is the aim of the experiment? (1 mark)
 (b) Account for the observation made in **A** at the end of the experiment. (3 marks)
 (c) What is the role of set up in the above experiment? (1 mark)
13. In an ecological study, form 4 student wanted to estimate the population of fish in a school pond.
 (a) State the most appropriate method they would use to estimate the fish population. (1 mark)
 (b) Briefly describe the method you have mentioned in (a) above. (3 marks)
14. State the function(s) of the following cell structure during cell division.
 (a) Centrioles. (1 mark)
 (b) Centromere. (1 mark)
15. (a) What are vestigial structures? (1 mark)
 (b) Give **two** examples of vestigial structures in man. (2 marks)
16. (a) Identify **two** methods by which plants eliminate their waste. (2 marks)
 (b) Explain why plants do not have complex excretory organs. (3 marks)
17. Explain why pregnancy remains even after removal of the ovaries after the fourth month of pregnancy. (3 marks)
18. (a) State the adaptations of the chloroplast to its function. (2 marks)
 (b) What is the role of the vascular bundles in plant nutrition. (2 marks)
19. The diagram below represent a type of bone in the mammalian skeleton.



- (a) Identify the bone illustrated in the diagram. (1 mark)
 (b) Give a reason for your answer in (a) above. (1 mark)
20. (a) Define the term eutrophication. (1 mark)
 (b) Explain why primary productivity in aquatic environment reduce with increase in depth. (2 marks)
21. (a) What is counter current flow? (1 mark)
 (b) State the importance of counter current flow. (1 mark)
22. Give a reason for each of the following biological phenomenon.
 (i) A mature plant cell does not loose its shape after loosing water maximumly. (1 mark)
 (ii) Amoeba will not burst when placed in a hypotonic solution. (1 mark)
23. State the fluid that provides cushion in the following organs.
 (i) Knee (1 mark)
 (ii) Heart (1 mark)

24. The diagram below shows a transverse section of a young plant organ.



- (i) Identify the organ from which it was obtained from.
(ii) Give a reason to your answer in (a) above.

(1 mark)

(1 mark)

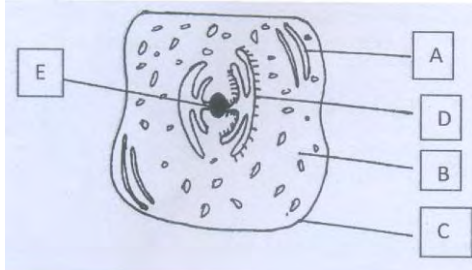
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231/2
BIOLOGY
PAPER 2
JULY / AUGUST 2018

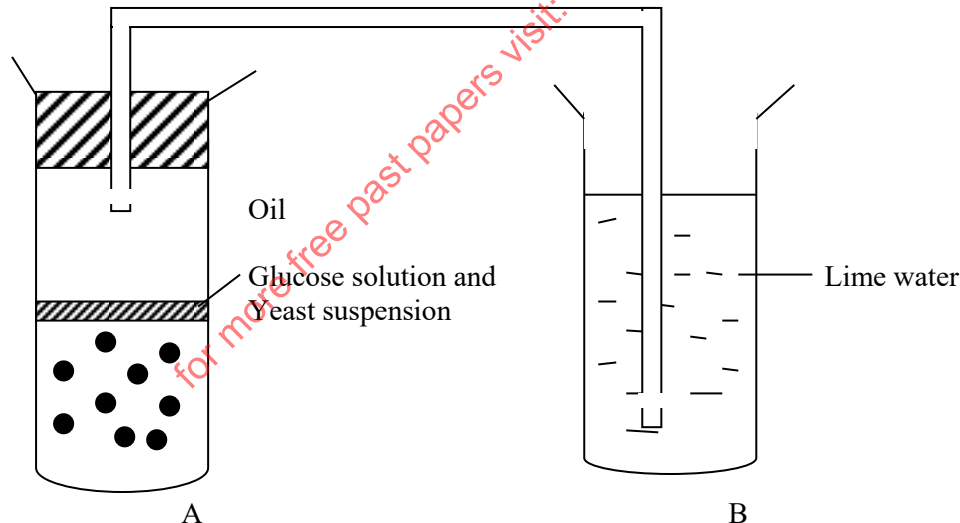
SECTION A

Answer all the questions in this section. (40 marks)

1. Below is a cell from a living organisms. Study it and answer the questions that follow.



- (a) From which kingdom of organism was the cell obtained? (1 mark)
 (b) Give **two** reasons for your answer in (a) above. (2 marks)
 (c) On the diagram, identify parts **A**, **B** and **C**. (3 marks)
 (d) State the role of parts **D** and **E**. (2 marks)
2. (a) What is gene linkage. (1 mark)
 (b) Name two sex - linked traits associated with the **Y** - chromosome in human beings. (2 marks)
 (c) The inheritance of colour vision is a sex-linked trait in man. The gene for normal colour vision is dominant. A marriage between a woman who is homozygous for normal colour vision and a colour blind man resulted in all the offsprings with the normal colour vision. Work out the phenotypic ratio in marriage between one of the daughters and a colour blind man. Use **N** to represent the gene for normal colour vision. (5 marks)
3. 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 yeast suspension was added.

- (a) Why was the glucose solution boiled before adding the yeast suspension? (1 mark)
 (b) What was the importance of cooling the glucose solution before adding the yeast suspension? (1 mark)
 (c) What was the use of oil in the experiment? (1 mark)
 (d) What observation would be made in the test tube **B** at the end of the experiment? (1 mark)
 (e) What do you understand by the term:-
 (i) Oxygen debt? (1 mark)
 (ii) Give the formula for calculating respiratory quotient. (1 mark)
 (f) State the economic importance of fermentation. (2 marks)
4. (a) State **two** reasons why cross pollination is considered advantageous over self-pollination. (2 marks)
 (b) State **three** mechanisms in plant that prevent self - pollination. (3 marks)

- (c) What are the functions of the following in animals?
- (i) Seminiferous tubules. (1 mark)
 - (ii) Oviduct (1 mark)
 - (iii) Prostate glands. (1 mark)
5. (a) Explain the following terms.
- (i) Organic evolution. (1 mark)
 - (ii) Special creation. (1 mark)
 - (iii) Adaptive radiation. (1 mark)
 - (iv) Analogous structures. (1 mark)
- (b) Explain:
- (i) Why an underdose insecticide spraying of mosquitoes may cause a serious problem on this mode of killing mosquitoes using the same spray in future. (2 marks)
 - (ii) Why soot on barks of trees due to industrial revolution caused emergence of black melanic moths that originally had white speckled types? (2 marks)

SECTION B (40 marks)

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

6. An experiment was set up to investigate how body temperatures vary with different temperature conditions of the environment. In this experiment a student and a frog were used as specimens. The data collected was tabulated as shown below.

Environmental temp °C	0	5	10	15	20	25	30	35	40	45
Frog's body temp °C	5	5	10	15	20	25	30	35	40	43
Student's body temp °C	37	38	37	38	37	38	37	38	38	37

- (a) (i) Using the same axis, draw graphs of the body temperature against environmental temperature for both specimens. (7 marks)
- (ii) At what environmental temperature was the body temperature of the student and frog equal? (1 mark)
- (b) Account for the trends in body temperature in both specimens.
- (i) Frog (3 marks)
 - (ii) Student (3 marks)
 - (iii) Which specimen is best adapted to live in any habitat? (1 mark)
- (c) (i) Explain how high osmotic pressure is reduced back to normal in the human body. (4 marks)
- (ii) What is deamination? (1 mark)
7. (a) Explain the roles of the mammalian placenta. (7 marks)
- (b) Describe how hormones regulate the menstrual cycle in human females. (13 marks)
8. (a) Discuss how the mesophyte leaves are adapted to the process of photosynthesis. (10 marks)
- (b) Describe digestion of proteins in man from mouth to ileum. (10 marks)

KIRINYAGA WEST
231/3
BIOLOGY
PAPER 3 (PRACTICAL)
JULY / AUGUST 2018

CONFIDENTIAL

Requirements.

Each candidate should have the following.

- One large table spoonful of sorghum soaked for not more than an hour labelled **M**.
- Distilled water.
- Pestle and mortar.
- Measuring cylinder.
- Two clean droppers.
- Means of labelling (4 labels)
- Thermometer.
- Means of timing (wall clock)
- 0.1 m HCL labelled **L**.
- Four clean test tubes.
- Iodine solution.
- Benedict's solution.
- Hot water bath.
- 250 ml glass beaker.
- Solution of amylase / diastase labelled **K**.
- Lumbar labelled vertebrae - **E**
- Thoracic labelled vertebrae - **F**
- Tradescantion spp twig labelled **K₁**
- Bidens pilosa (blackjack) labelled **K₂**
- Avocado leaf labelled **K₃**
- A jacaranda twig labelled **K₄**
- Solanum spp (Sodom apple) leaf labeled **K₅**
- Nappier grass labelled **K₆**

1. You are provided with specimen labelled **M** - soaked sorghum. Grind them using pestle and mortar, adding more water to get fine solution.

Label four clean test tubes **A, B, C** and **D**

Put 4 ml of the solution into each of the four test tubes.

- (a) To solution in test tube **A**, add four drops of iodine solution, shake to mix well.

(i) Record the observation made. (1 mark)

(ii) Account for your observation in (a) above. (1 mark)

- (b) Into solution in test tube **B** add four drops of Benedict's solution. place it in a boiling water bath.

(i) After about three minutes, record your observation. (1 mark)

(ii) What is your conclusion from the observation in (b) above? (1 mark)

- (c) For the remaining test tubes:-

– To test tube **C**, add about four drops of solution labeled **K**.

– To test tube **D**, add about four drops of solution labeled **K** and about three drops of solution **L**.

– Place both test tube **C** and **D** in a water bath. Maintain the water bath at 37⁰C.

– Allow them to stand in water bath for 30 minutes.

After 30 minutes, remove the test tubes.

Add about 2 drops of Benedict's solution to each test tube and shake well. Place the two test tube in a boiling water bath. After five minutes record your observation in the table below.

Test tube	Obervation	Deductions
C		

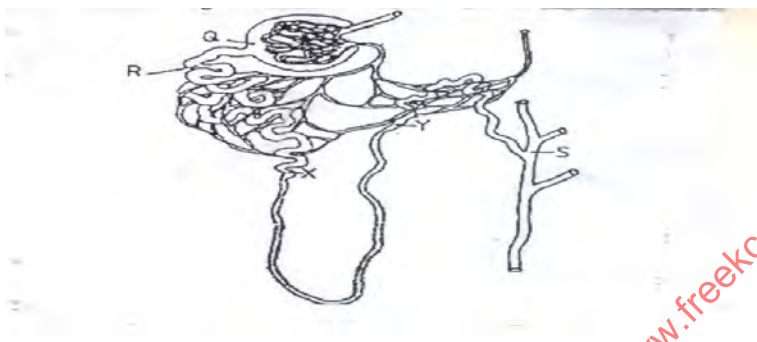
D

- (d) Account for your observation in test tubes **C** and **D**. (4 marks)
- (e) (i) Why was the set up placed at 37°C? (1 mark)
(ii) Suggest identity of solution **L** and **K**. (2 marks)
2. You are provided with different bones from a mammalian skeleton labelled **E** and **F**. Observe the specimen (**E** and **F**) and answer the questions that follows.
- (a) (i) Draw and label exterior view of the specimen labelled **E**. (5 marks)
(b) Name the bones **E** and **F**. (2 marks)
(c) State **three** observable differences between bones **E** and **F**. (3 marks)
(d) Explain **four** ways in which the specimen **E** is adapted to its functions. (4 marks)
3. You are provided with specimens labelled **K₁** - Tradescantia spp twig, **K₂** - Bidens pilosa (black jack), **K₃** - avocado leaf, **K₄** - jacaranda twig, **K₅** (sodom apple) **K₆** - Napier grass.
- (a) Using observable features of the specimen, construct a complete dichotomous key. Using the following features. (5 marks)
- (a) Type of the leaves.
(b) Leaf venation
(c) Leaf colour
(d) Texture of the leaf blade.
(e) Leaflets
- (b) To which division do the specimens **K₁** to **K₆** belong. (1 mark)
- (c) Give two reasons for your answers in (a) above. (2 marks)
- (d) State one adaptation of **K₆** to its habitat. (1 mark)
- (e)(i) Name the habitat of the specimen **K₁**. (1 mark)
(ii) Give a reason for your answer in (i) above. (1 mark)

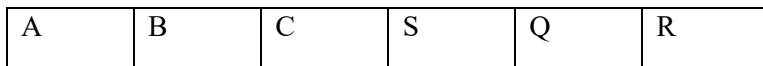
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GATANGA
231/1
BIOLOGY
Paper 1

- The diameter of field of view of a light microscope is 6.5mm. Plant cells lying across the diameter are 12. Determine the size of 1 cell in micrometers (2mks)
- List **two** structural adaptations that make xylem vessels suitable for transport of water and minerals salts (2mks)
- The equation below represents a certain biological process in cells.
 $C_6H_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + ATP$
 a) i) Name the biological process (1mk)
 ii) Name the cell organelle where the process occurs. (1mk)
- Name the tissue whose cells are thickened with cellulose and pectin. (1mk)
- a) i) Distinguish between the lymphocytes and phagocytes. (2mks)
 ii) Name the enzyme in erythrocytes that speeds up conversion of carbon (IV) oxide to carbonic acid. (1mk)
- Name the disease that causes thickening and hardening of arteries (1mk)
- The diagram below illustrates part of a nephron from a mammalian kidney.



- Name the fluid in the part labelled Q. (1mk)
 - Identify the process responsible for the formation of the tissue named in (a) above. (1mk)
 - Which **two** hormones exert their effect in the nephron? (1mk)
- i) When are **two** organisms considered to belong to the same species? (2mks)
 ii) Explain any **two** external features that distinguish organisms of class insect and class arachnida. (2mks)
 - Certain animals have the following dental formula
 A ; I 3/3, C 1/1, PM 4/4, M 2/3 B ; I 0/3, C 0/1, PM 2/2, M 3/3
 i) What is the most likely mode of feeding for animals A and B? (2mks)
 ii) Give a reason for your answer in (i) above. (1mk)
 - Name the Disease characterized by
 a) Glycosuria. _____ (1mk)
 b) Diuresis _____ (1mk)
 - a) The figure below illustrates a portion of a chromosome with genes named A, B, C, S, Q and R.



Use the diagrams similar to the ones above to illustrate the changes if the above chromosome undergoes the following mutations affecting only gene C and S.

- Deletion. (1mk)
- Inversion. (1mk)

b) Human-inherited features can be grouped under two headings as follows.

Group A	Group B
Weight, intelligence, height	tongue rolling, blood group, eye colour

What is the genetic explanation for the difference between the 2 groups.

(2mks)

a) The diagram below represents a stage in cell division



i) Identify the stage of cell division represented above and give a reason for your answer. (2mks)

ii) State two differences between mitosis and meiosis. (2mks)

b) State the function of structure X. (1mk)

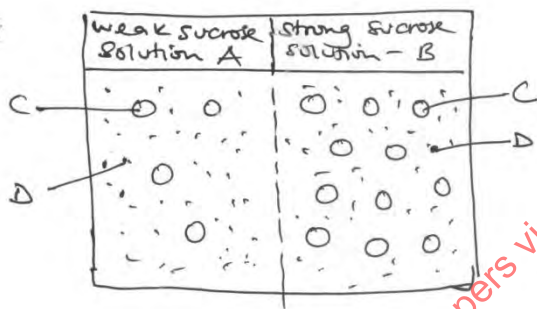
11. a) Giraffes and zebras coexist in the same habitat harmoniously. Explain. (2mks)

b) Explain why denitrification occurs mainly in waterlogged soils. (2mks)

12. a) Differentiate between gaseous exchange and respiration. (2mks)

b) Briefly explain two adaptive features present in animal respiratory surfaces that are absent in plant respiratory surfaces. (2mks)

13. Study the diagram below and answer the questions that follow



a) Name the process by which the molecules

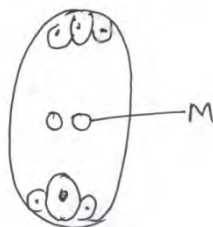
i) D moves from A to B. _____ (1mk)

ii) C moves from B to A. _____ (1mk)

b) State two importances of a cell membrane in active transport

14. a) Pregnancy continues if the ovary of an expectant mother is removed after 4 months. Explain. (2mks)

b) Below is a diagram of a structure found in plants.



i) Identify the structure above. _____ (1mk)

ii) Name the part labelled M. _____ (1mk)

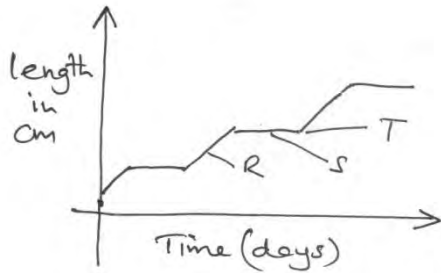
15. Name the branches of biology that involve the study of:

i) Organisms for the sake of classification. (1mk)

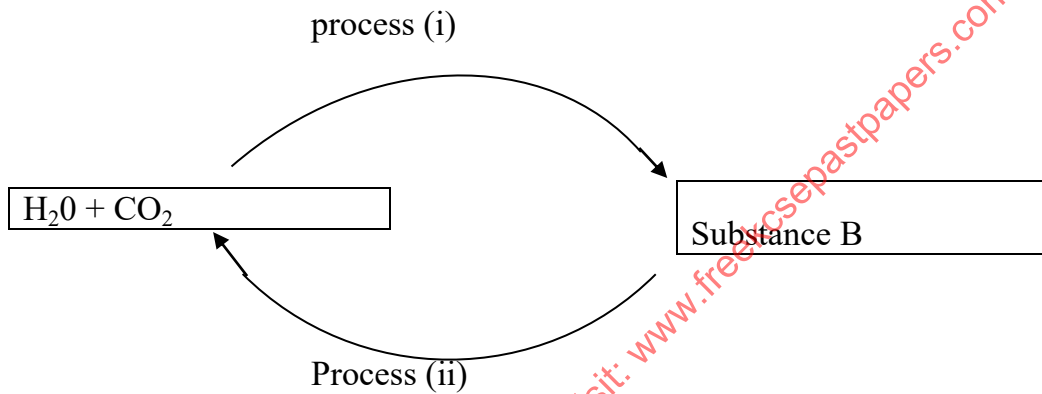
ii) Birds. _____ (1mk)

16. a) A student carved in the initials of his name in the bark of a young tree at a height of 1.5m above the ground. 3 years later, the initials were found at the same height although the tree had grown some metres taller. Explain this observation. (2mks)

b) Below is a growth curve showing increase in length of the short horned grasshopper.



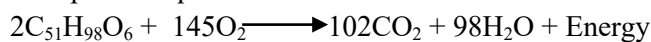
- i) What is the name given to such a growth curve? (1mk)
 - ii) Name the parts of the curve labelled R and T. (2mks)
17. Oil can be applied on stagnant water to control the spread of malaria.
- a) How does this practice work? (2mks)
 - b) Give two reasons why this practice should be discouraged. (2mks)
18. The diagram below represents a simple cycle of common biological processes.



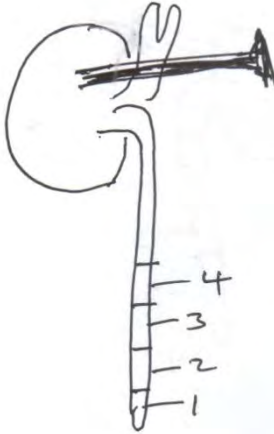
- a) i) Name processes (i) and (ii) (2mks)
 - ii) Identify the product B. (1mk)
 - b) State two differences between processes (i) and (ii) (2mks)
19. Name the organism that causes the following diseases. (2mks)
- i) Malaria _____
 - ii) HIV/AIDS _____
20. a) The table below represents Certain aspects of the circulatory system in Certain animals. Fill in the missing spaces (2mks)

Heart	No. Of atria	No. Of ventricles	Type of circulatory system.
A	2	1	
B	1	1	

- b) Give an example of the class of organisms with each of the types of circulatory systems in (a) above. (2mks)
21. Calculate the respiration quotient of the oxidation reaction below.



22. The diagram below shows a newly germinated seedling with ink marks 2mm apart. Study it and answer the questions that follow.

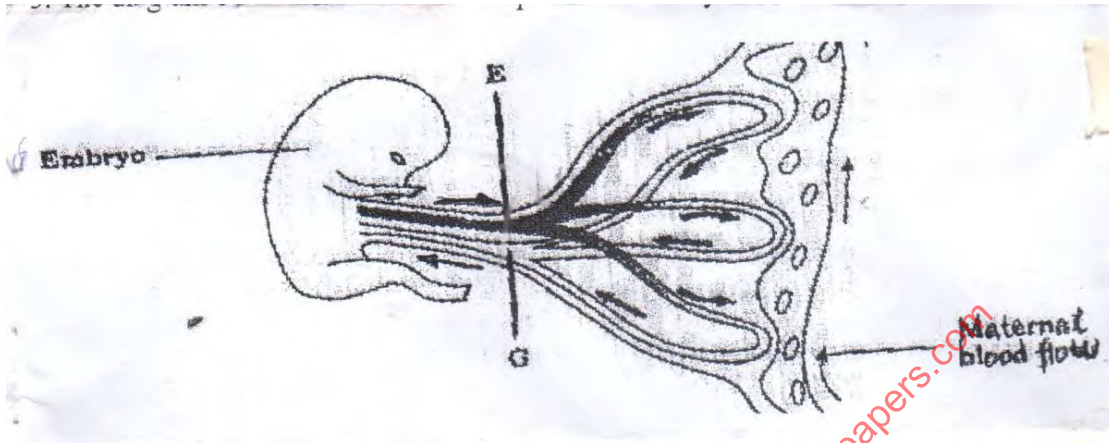


- a) Which region would you expect to be the longest after 5 days of further growth? (1mk)
 - b) In which region will you expect a lot of cell division? _____ (1mk)
 - c) In which region will the root hairs mostly appear? _____ (1mk)
23. Name the components of a DNA molecule. (3mks)

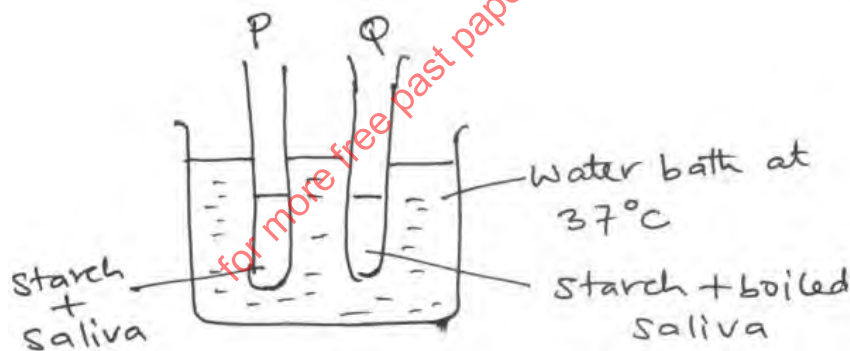
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GATANGA
231/2
BIOLOGY
Paper 2

1. The diagram below shows exchange of materials between embryo's bloodstreams and mother's blood stream



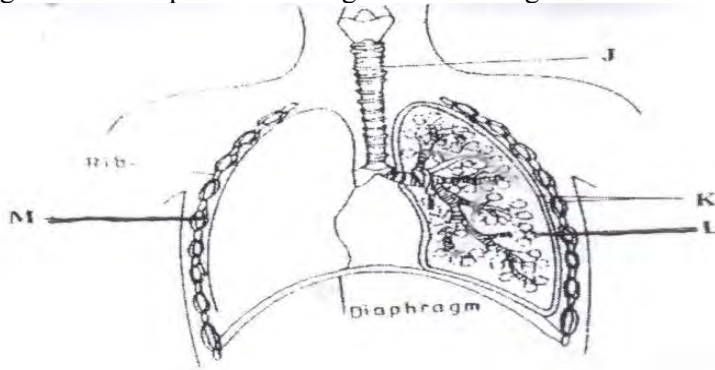
- (a) (i) Give the names of the parts labelled E and G (2mks)
(ii) Name one substance that is in high concentration in E (1mk)
(iii) In which organ does this kind of exchange shown occur? (1mk)
- (b) Suggest the biological significance of each of the following (1mk)
i) Development of the pollen tube in fertilization in plants. (1mk)
ii) Fusion of petals to form funnel-shaped corolla tube in certain flowers. (1mk)
- (c) Give 2 advantages of cross-pollination over self-pollination. (2mk)
2. In an experiment to investigate aspects of digestion, two test tubes P and Q were set up as shown below.



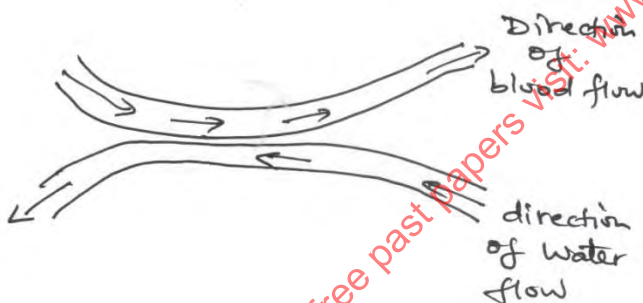
The test tubes were left in the water bath for 30 minutes. The content of each test tube was tested for starch using iodine solution.

- (a) What was the aim of the experiment? (2mks)
(b) What results were expected in P and Q? (2mks)
(c) Account for the results given in (b) above. (2mks)
(d) Why was the set up left at 37°C (1mk)
(e) Name the carbohydrate stored in:
i) Mammalian tube (1mk)
ii) Potato tuber. (1mk)

3. a) A common species of rats has individuals with white, black and grey coats. A cross was made between pure breeding black coated and white coated rats. Using letter B to represent the gene for a black coat and W for white coat;
- Work out, through genetic cross the phenotypes of the F1 generation (4mks)
 - Give a genetic explanation on the skin colour of offsprings in the F1 generation. (1mks)
- b) State the significance of test cross in study of genetics. (1mk)
- c) State the importance of crossing over in the study of genetics. (1mk)
- d) Name one example of a characteristic in man that is transmitted by multiple alleles. (1mk)
4. a) The diagram below represents some gaseous exchange in human beings.

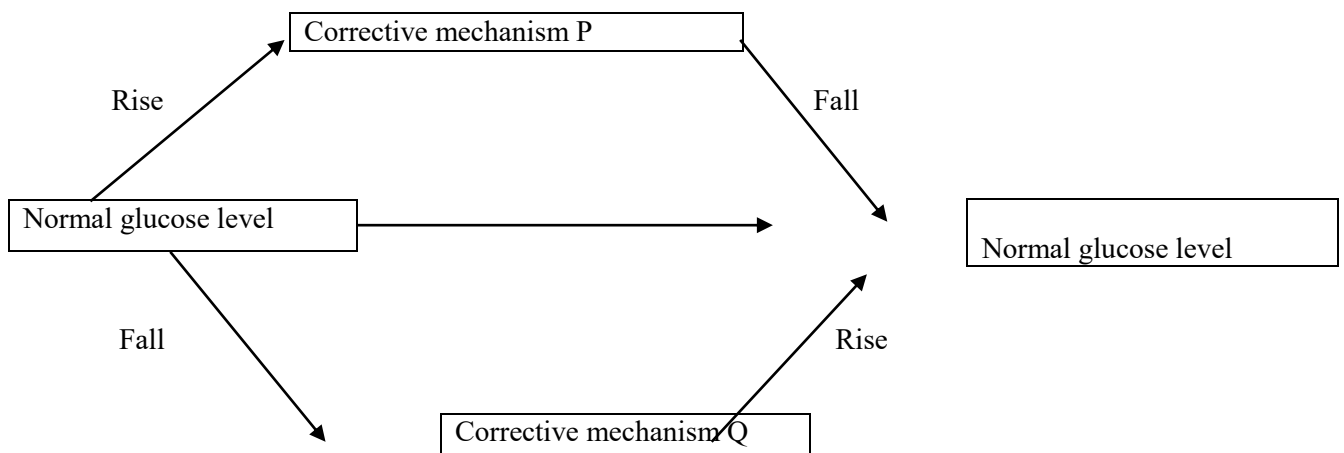


- Name structures M and L. (2mks)
 - How is structure J suited to its function? (2mks)
- b) The diagram below show how gaseous exchange occurs across the gills of fish.



- Give the term used to explain this flow. (1mk)
- Explain the advantage of the flow named above. (2mks)
- Name two organs in humans which display the above flow system. (1mk)

5. The diagram below shows how blood sugar in mammalian body is regulated.

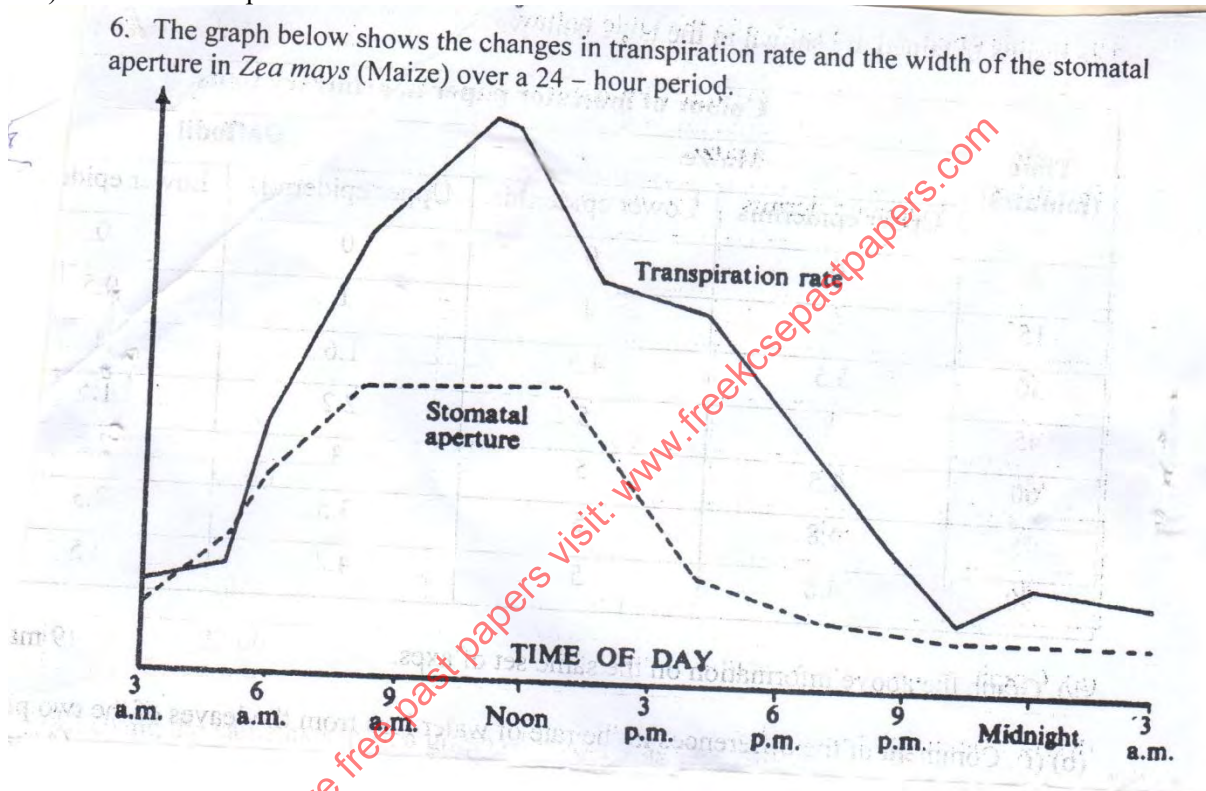


- a) Explain what happens during corrective mechanism (3mks)
- b) Name two organs involved in corrective mechanisms P and Q. (2mks)
- c) State the reasons why glucose level should be maintained constant. (2mks)
- d) What is osmoregulation? (1mk)

Section B

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

6. The graph below shows the changes in transpiration rate and the width of the stomatal aperture in *Zea mays* (maize) over a 24-hour period.



- a) What is meant by the term transpiration? (2mks)
 - b) Account for the rate of transpiration between
 - i) 3am and 5am (3mks)
 - ii) 6am -12 noon (3mks)
 - iii) 1.00 pm -9.00 pm (2mks)
 - c) Describe and explain the relationship between the stomatal aperture and transpiration rate. (4mks)
 - d) Other than stomatal aperture state and explain any two other structural features that affect transpiration rates in plants (4mks)
 - e) Explain one demerit of transpiration in plants
7. Discuss the role of hormones in plant growth and development (20mks)
8. Describe the functions of a mammalian skin. (20mks)

GATANGA
231/3
BIOLOGY
Paper 3
(PRACTICAL)

Q1. Study the organisms below.

A



B



C



D



E



F



Complete and use the dichotomous key below to identify the organisms.

1. a) Organism with endoskeleton.....go to 2.
 b) _____.....go to 3
2. a) Has scales on the body.....go to 4
 b) Has no scales on the body.....Mammalia

3. a) Has cephalothorax.....Arachnida
b) Has no cephalothorax.....go to 5
4. a) Pisces
b) Has no fins.....go to 7
5. a) Has 3 pairs of legs.....Insecta
b) Has more than 3 pairs of legs.....go to 6
6. a) Two pairs of legs per segmentDiplopoda
b) One pair of legs per segment.....Chilopoda
7. a) Has feathers.....Aves
b) Has no feathers.....go to 8
8. a) Has a tail.....Reptilia
b) Has no tail.....Amphibia

Specimen	Steps followed	Identity
A	_____	_____
B	_____	_____
C	_____	_____
D	_____	_____
E	_____	_____
F	_____	_____

Q2.

- a) Cut the cylinder into a length exactly 4cm. Place the cylinders in the solution labelled S1.the other 2 cylinders in solution S2. Allow the pieces to remain in the solutions for 30 minutes.
 - i) Remove the cylinder from the solution, dry them with tissue paper provided and measure their lengths. Record the final lengths and averages in the table below. (3mks)

Potato cylinder	Original length	Length of S1 after 30 mins	Length in S2 after 30 min.
1			
2			
average			

- ii) Account for the results in (a) above. (6mks)

- b) i) Grind the potato cylinders that were placed in solution S1. Using apparatus and reagents provided perform the appropriate food tests and fill in the table below. (6mks)

FOOD	PROCEDURE	OBSERVATION	CONCLUSION

- ii) How does the food accumulate in the potato? (2mks)

- Q3. You are provided with specimens Q an R obtained from the same animal. (4mks)
- a) Examine and identify each specimen giving a reason for your answer.

Q _____
Reason _____

R _____
Reason _____

- b) Using observable features only state 2 differences between specimens Q and R. (2mks)
- c) Explain how specimen R is adapted to its function (2mks)
- d) Suggest the feeding habit of the animal from which the specimens were obtained. (1mk)

BIOLOGY 231/3
CONFIDENTIAL

EACH CANDIDATE WILL REQUIRE THE FOLLOWING:

1. 4 potato cylinders of about 5cm length.
2. 30ml distilled water
3. 30ml conc. Salt solution
4. A piece of tissue paper
5. A ruler
6. Means of grinding (pestle and mortar)
7. 2ml iodine solution
8. Dropper
9. 5ml, 10% NaOH solution
10. 2ml, 1% Copper (II) sulphate
11. Two test tubes
12. Scalpel/ Razor blade

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- 17. State Lamark's theory of evolution. (2 marks)
- 18. Pure lines of black and white mice were crossed. All the F1 generation were grey. Using appropriate letters to represent genes for the colour, work out the phenotypic ratio of F2 generation. (4 marks)
- 19. What is the function of the following:
 - a) Eustachian tube (1 mark)
 - b) Cochlea (1 mark)
 - c) Ear ossicles (1 mark)
- 20. Explain why bile is an excretory products as well as a digestive secretion. (2 marks)
- 24. Below is an illustration that shows energy flow in an ecosystem.



- a) Name the tropic level occupied by the lion. (1 mark)
- b) State two types of ecological pyramids. (2 marks)
- 25. a) With a reason, state the structure responsible for intermittent growth in an insect. (2 marks)
 - Structure.....
 - Reason.....
- b) What is the hormone responsible for growth in an insect? (1 mark)
- 26. State four ways in which *Ascaris lumbricoides* are adapted to living in its habitat. (4 marks)
- 27. State four roles of water in seed germination. (4 marks)
- 28. State three adaptations of the tracheal system for its function. (3 marks)
- 29. a) What is the formula for calculating linear magnification using a light microscope. (1 mark)
- b) State two functions of centrioles. (2 marks)
- c) What is a prokaryotic cell? (1 mark)
- 30. State three ways in which the root hair cell is adapted to its functions. (3 marks)

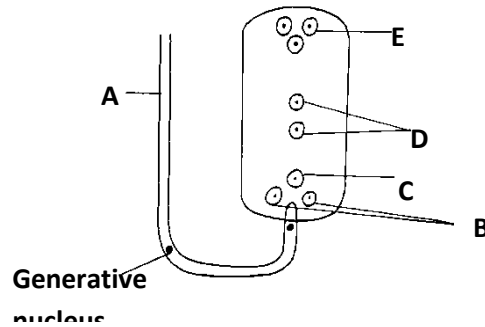
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231/2
BIOLOGY
PAPER 2 (THEORY)

SECTION A (40MRKS)

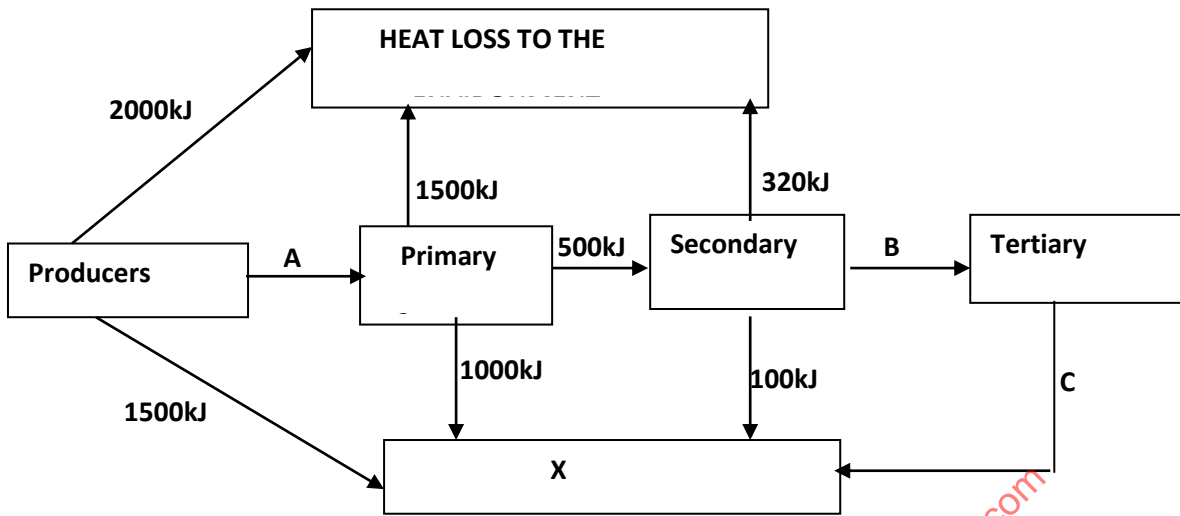
Answer all question in the spaces provided

1. The figure below shows the embryo-sac before fertilization.

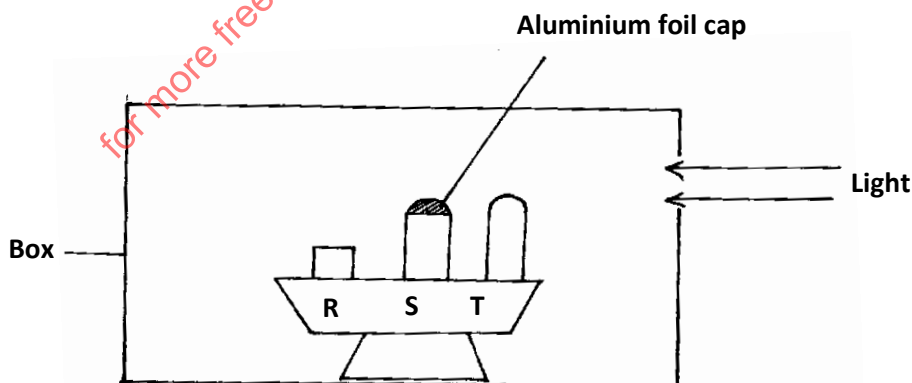


- (a) Identify the structures labelled **A** and **B**. (2mrks)
- (b) Identify the structures labelled in the diagram that will develop into the following after fertilization.
- i) Embryo..... (1mrk)
 - ii) Endosperm..... (1mrk)
- (c) State the ploidy of each the following nuclei after fertilization.
- i) **C** (1mrk)
 - ii) **D** (1mrk)
- (d) Briefly outline the process of “double” fertilization in flowering plants. (2mrks)
2. (a) Name **two** substances which are found in the intercellular air spaces in a green leaf during a hot sunny day. (2mrks)
- (b) Name the gaseous exchange structure found in the:
- i) Stem of a mesophyte plant..... (1mrk)
 - ii) Root of aquatic halophytes..... (1mrk)
 - iii) Terrestrial insects..... (1mrk)
- (c) State **three** ways in which the gill filaments are adapted to their functions. (3mrks)
3. In cats, sex is determined by **X** and **Y** chromosomes in the same way as humans. One gene for coat colour in cats is present on the **X** chromosome but not on the **Y** chromosome. The gene has two alleles orange (**B**) and black (**b**). Female cats that are homozygous for the **X^b** allele have black coats; female cats that are heterozygous have tortoise-shell coats (orange with dark patches).
- (a) Give the genotype of:
- (i) A female cat with tortoise shell coat. (1mrk)
 - (ii) A male cat with an orange coat. (1mrk)
 - (iii) A male cat with a black coat. (1mrk)
- (b) A black coated male cat is mated with a tortoise- shell coated female cat. Use a punnet square to determine the genotypic and phenotypic ratios of the kittens that could be produced by this cross . (5mrks)

4. In a Savanna grassland ecosystem, the following organisms were identified; grasses, squirrels, gazelles, lizards, insect larvae, wild dogs, snakes, hawks, vultures and lions, Energy flow in the ecosystem was also determined as follows.



- Define the term ecosystem (1mrk)
 - Name the process through which:
 - Producers convert sun's energy into chemical energy (1mrk)
 - Living organisms convert chemical energy into heat energy lost to the environment (1mrk)
 - Identify organism X (1mrk)
 - Determine the amount of energy represented by A and B (2mrks)
 - If 75% of the energy in the tertiary consumers is lost as heat. Calculate the amount of energy represented by C (2mrks)
5. Three potted seedlings labelled R, S and T were treated as follows:
R- Tip of seedling was cut off.
S- Tip was covered with aluminium foil cap.
T- Tip was left intact
 The seedlings were placed in, a box which had a hole on one side and painted black on the inside.



The experiment was left for four days.

- State the expected observations (3mrks)
- Explain the observations in a (i) above

SECTION B- (40MRKS)

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

6. An experiment was set up to investigate the effect of light on the rate of photosynthesis in the shoot of a water weed. The shoot was immersed in a 2% sodium hydrogen carbonate solution. The gas given off by the shoot was collected for five minutes at different light intensities and the volume measured. The results obtained are shown in the table below.

Light intensity(arb units)	1	2	3	5	10	20	30	40	50
Gas collected (cm ³ /5minutes)	0.35	0.6	0.85	1.20	1.55	1.70	1.80	1.79	1.79

Using the data given in the table, plot a graph of volume of the gas collected against the light intensity

(6mrks)

- b) Account for the rate of gas production in the following intervals of light intensity.
- 1 - 10 (2mrks)
 - 30 - 50 (2mrks)
- c) What is the use of sodium hydrogen carbonate in this experiment. (1mrk)
- d) State the products of light stage of photosynthesis. (2mrks)
- e) State the functions of each of the products of the dark stage of photosynthesis in man. (3mrks)
- f) Why are plants referred to as producers in an ecosystem. (2mrks)
- g) Other than light intensity, name **two** other factors that affect the rate of photosynthesis. (2mrks)
7. a) Define the term secondary thickening (2mrks)
- b) Briefly describe how secondary thickening occurs in woody plants (14mrks)
- c) i) State **two** ways in which growth in plants is different from that in animals (2mrks)
- ii) State how ecdysis affects the growth of insects (2mrks)
8. a) State **five** differences between aerobic and anaerobic respiration. (5mrks)
- b) Discuss the application of anaerobic respiration in industry and at home (15mks)

231/3
Biology
Paper 3
(PRACTICAL)

1. You are provided with solutions labeled L₁, L₂ and L₃ is the same as L₂ except that L₃ has been boiled.
 Label three test-tubes **A**, **B** and **C**.
 Into the test-tube labeled **A** add 1ml of solution L₁.
 Into the test-tube labeled **B** add 1ml of L₁ and 1ml of L₂.
 Into the test-tube labeled **C** add 1ml of L₁ and 1ml of L₃.
 - a) Withdraw a drop from test-tube **A** and place it on a white tile. To the drop add one drop of iodine solution.
 Record your observations in the table below. (3mks)
 Repeat the procedure with contents in test-tubes **B** and **C**. Record your observations in the table.
 Place the three test-tubes labeled **A**, **B** and **C** into a water bath at 37°C
NB. Ensure that the temperature of the water bath does not fall below 35°C or exceed 38°C.
 - b) After 30 minutes, test the contents of each of the test-tubes labeled **A**, **B** and **C** following the procedure in (a) above. Record your observations in the table below. (3mks)
 - c) Why was test-tube labeled **A** included in the experiment? (1mk)
 - d) (i) Suggest the identity of solution L₂. (1mk)
 (ii) Give a reason for your answer in (d) above. (1mk)
 - e) Suggest a part of the alimentary in the body of a mammal where the process being investigated in this experiment would take place. (1mk)
 - f) Account for the results at the end of the experiment in the test-tube labeled.
 - i) **B** (1mk)
 - ii) **C** (2mks)

2. You are provided with specimens Labeled **R**, **S** and **T**. Use them to answer the following questions.
 - a) Identify Specimens **R**, **S** and **T**. (3mks)
 - b) Name the region from which bone **T** was obtained. (1mk)
 - c) Name any three observable features that are common in **S** and **T** and for each state its function (6mks)
 - d) State two observable differences between specimens **S** and **T**. (2mks)
 - e) How is specimen **R** adapted to its function? (2mks)
3. You are provided with specimens **P** and **Q**
 - a) What type of fruits are specimen **P** and **Q**? (2mks)
 - b) Make a transverse section through specimen **P**
 Draw the transverse section of the specimen and label any **three** parts. (4mks)
 - c) Squeeze the juice from specimen **P** into a small beaker. Using reagents provided that is **X** (Benedict's solution and **Y** (DCPIP), test for the food substances in the juice. Record the food substances, procedures, observations and conclusions in the table below. (3mks)

Food substance	Procedure	Observation	Conclusion

- d) Name the type of placentation of specimen **Q** (1mk)
- e) (i) With a **reason**, name the class to which specimen **Q** belongs (2mks)
 Class –
 Reason –
 (ii) State the method of dispersal of the specimen **Q**. (1mk)

CONFIDENTIAL

231/3

BIOLOGY**PAPER 3****PRACTICAL****REQUIREMENTS**

Each candidate will require the following:

- 5 test-tubes
- 5ml of solution L₁ – starch solution 0.5%
- 2ml of solution L₂ – Diastase solution 10%
- 2ml of solution L₃ – Boiled diastase solution 10%

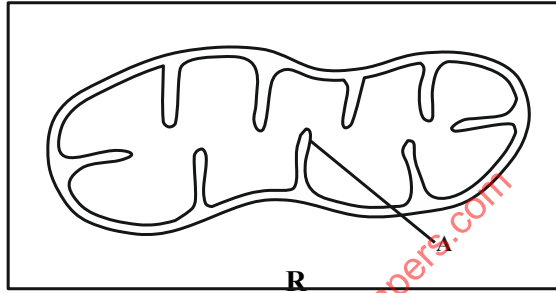
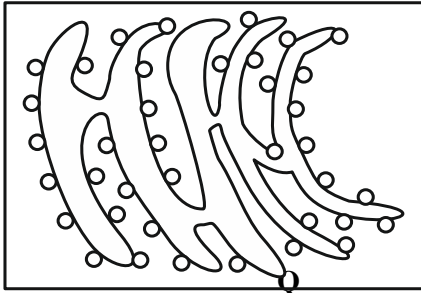
NB: boiled for 10 minutes

- Means of labeling – 3 labels
- Water bath
- Thermometer
- Iodine solution
- 3 droppers
- A white tile
- Means of timing
- 10ml measuring cylinder
- Specimen **R** – molar/ premolar tooth
- Specimen **S** – Cervical vertebra
- Specimen **T** – thoracic vertebra
- Specimen **P** – Ripe orange
- Specimen **Q** – mature pea pod
- Solution **X** – Benedict's solution
- Solution **Y** – DCPIP
- Scapel
- Hand lens
- 50ml/100ml beaker.

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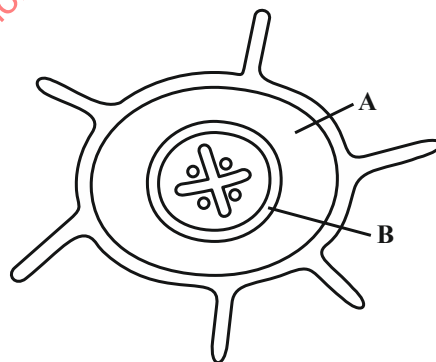
EMBU CLUSTER
231/1
BIOLOGY
Paper 1
Term 2 2018

1. For each of the following examples, state the characteristic of life that is being demonstrated.
 - a) Seeds producing heat during germination. (1 mark)
 - b) An athlete breathing heavily after running. (1 mark)
2. Name the apparatus used for the following functions.
 - i) Sucking small animals from rock surfaces. (1 mark)
 - ii) Attracting and trapping small animals. (1 mark)
3. The diagrams below shows 2 organelles Q and R

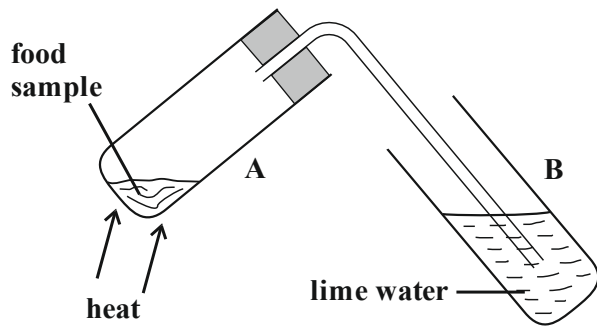


- a) Identify the organelles Q and R (2 marks)
- b) i) Explain why the organelle R would be abundant in a sperm cell. (1 mark)
- ii) State the function of the structure marked A in the organelle R (1 mark)
4. Explain why :
 - a) Red blood cells bursts when placed in distilled water while plant cells remain intact. (1 mark)
 - b) Fresh water protozoans like amoeba do not burst when placed in distilled water. (1 mark)
5. The scientific name of a housefly is Musca domestica. Which taxonomic units do the names represent? (2 marks)

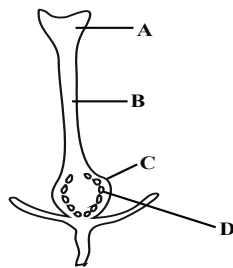
Musca
 domestica
6. Distinguish between haemolysis and crenation. (2 marks)
7. Explain how sunken stomata lower the rate of transpiration. (2 marks)
8. Diagram below represents a transverse section of a plant organ. Study it and answer the questions that follow.



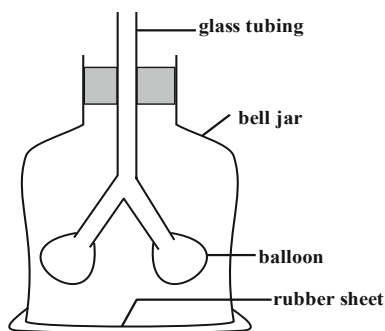
- i) Identify the part labelled A (1 mark)
- ii) State the function of the part labelled B (1 mark)
9. State three characteristics of apical meristems cells. (3 marks)
10. Name the causative agents of the following diseases in man :
 - a) Candidiasis (1 mark)
 - b) Syphilis (1 mark)
11. Study the diagram below.



- i) What are the expected results in tube A and B
- ii) Name the likely chemical elements to be detected in the food substances. (1 mark)
- 12. State the strengthening material in each of the following support tissues. (2 marks)
 - i) Collenchyma
 - ii) Sclerenchyma
- 13. During an ecological study, a form three student collected and marked 140 ants and then released them. After two days, the student captured another 100 ants, 40 of which had been marked previously. How many ants were there in the compound ? Show your working. (3 marks)
- 14. a) Distinguish between homodont and heterodont. (2 marks)
- b) Protease enzymes are usually secreted in their inactive form, give a reason. (1 mark)
- 15. The diagram below shows a reproductive structure in a plant.



- a) Name the parts labelled A and B (2 marks)
- b) Explain the fate of C and D after fertilisation
- 16. What is meant by the following terms?
 - i) Hybrid vigour (1 mark)
 - ii) Polyploidy (1 mark)
- 17. What name is given to a group of hormones that controls the development of secondary sexual characteristics in human male. (1 mark)
- 18. Give two ways in which leaves are adapted to absorb light. (2 marks)
- 19. The diagram below illustrates a model of thoracic cavity.



- a) What do the following parts represent in a mammal. (2 marks)
 - i) Glass tubing
 - ii) Balloon
- b) Explain how the balloon get inflated. (3 marks)
- 20. a) State two functions of sebum. (2 marks)

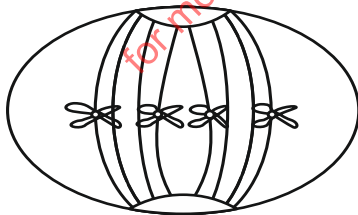
- b) A student visiting a game park observed that an adult elephant flapping its ears twice as much as its calf in order to cool its body when its hot. Explain. (2 marks)
- c) State the economic importance of the following plant excretory products : (2 marks)
- Caffein
 - Cocaine
21. a) Name the antigen that determines human blood groups. (2 marks)
- b) Explain how the red blood cells of a mammal are adapted for efficient transport of oxygen. (2 marks)
22. The following statement represent a type of gene mutation.

Intended message	Actual message
i) Eat the meat	Heat the meat
ii) This is my team	This is my tea

- a) Identify the type of gene mutation illustrated in (i) and (ii) above. (2 marks)
23. a) The wings of a dove and those of a locust are adapted for flying. Name the evolutionary term used to describe these structure. (1 mark)
- b) Give two examples of natural selection in action. (2 marks)
- c) Give a reason why comparative anatomy is important in the study of evolution. (1 mark)
24. a) State the functions of the following parts of a mammalian ear. (1 mark)
- Ear ossicles
 - Eustachian tube
- b) i) What is a reflex action. (1 mark)
- ii) Distinguish between simple and conditioned reflex actions. (1 mark)
25. State three characteristics of the class crustacea. (3 marks)
26. A bone obtained from a mammal is represented by the diagram below.



- i) Name the bone shown above. (1 mark)
- ii) State one reason for your answer in (i) above. (1 mark)
27. What is the function of the following structures in the human reproductive organs ? (1 mark)
- Epididymis
 - Scrotal sac
28. The diagram below shows a cell undergoing mitosis.

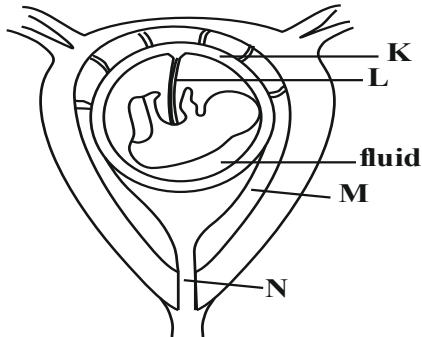


- a) i) What stage of cell division is represented by the diagram above ? (1 mark)
- ii) Give a reason for your answer in (i) above. (1 mark)
29. Name the type of response exhibited by the following :
- Development of a pollen tube towards the ovary. (1 mark)
 - Seedlings growing towards a source of light (1 mark)
 - Passion fruits tendrils curling around a mango tree (1 mark)

231/2
BIOLOGY
Paper 2
July / August 2018
Time: 2 Hour

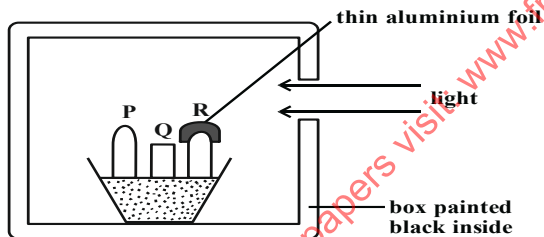
SECTION A : (40 Marks)

1. Study the diagram below and answer the questions that follow.



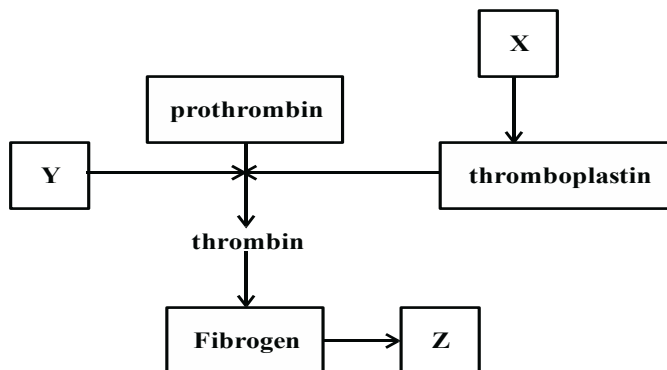
- a) Name the parts labelled K, L and N (3 marks)
- b) State the functions of the part labelled N (2 marks)
- c) Identify the fluid in the above diagram and state its function.
 - Fluid (1 mark)
 - Function (1 mark)
- d) Identify the part in the diagram that respond to the hormone progesterone. (1 mark)

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



- a) i) State the results of P, Q and R after 5 days. (3 marks)
 - ii) Account for your answers in a(i) above. (5 marks)
3. In human beings colour blindness is a sex linked trait caused by a mutant gene. A man, whose mother was colour blind and father normal, married a woman whose mother was normal and father colourblind.
- a) Differentiate between the terms mutations and mutant. (2 marks)
 - b) Using N to represent the gene for normal colour vision, state the genotypes of the couple. (2 marks)
 - Man
 - Woman
 - c) i) Work out the genotypic cross showing the genotypes of the offsprings resulting from the couple whose genotypes are stated in (b) above. (3 marks)
 - ii) What is the probability of getting a daughter who is a carrier from this marriage. (1 mark)

4. The chart below shows blood clotting mechanism.



- a) Name the :
- blood cells represented by X (1 mark)
 - blood protein represented by Z (1 mark)
 - metal ions represented by Y (1 mark)
- b) Which vitamin is required for blood clotting. (1 mark)
- c) State the conditions under which blood transfusion may be necessary. (2 marks)
- d) State two factors to be considered before blood transfusion. (2 marks)
5. In a certain habitat
- gazelles, termites, guinea fowls and grasshoppers feed on grass
 - guinea fowl feed on grasshoppers and termites
 - vultures feed on guinea fowls and leopards
 - leopards feed on gazelles
- Construct a food web to show the above feeding relationship. (4 marks)
 - Extract two food chains where vultures are tertiary consumers. (2 marks)
 - What would be the short term effects on the ecosystem if lions invaded the area. (2 marks)

SECTION B : (40 Marks)

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

6. An experiment was carried out in which red blood cells were put in salt solutions of different concentrations. The table below shows the percentage of cells which were destroyed by haemolysis in different salt concentrations.

Salt concentrations (g/dm ³)	% RBC destroyed by haemolysis
0	100
1	100
2	100
2.5	100
3.0	100
3.5	96
3.7	80
4.0	60
4.5	16
4.7	0
5	0
6	0

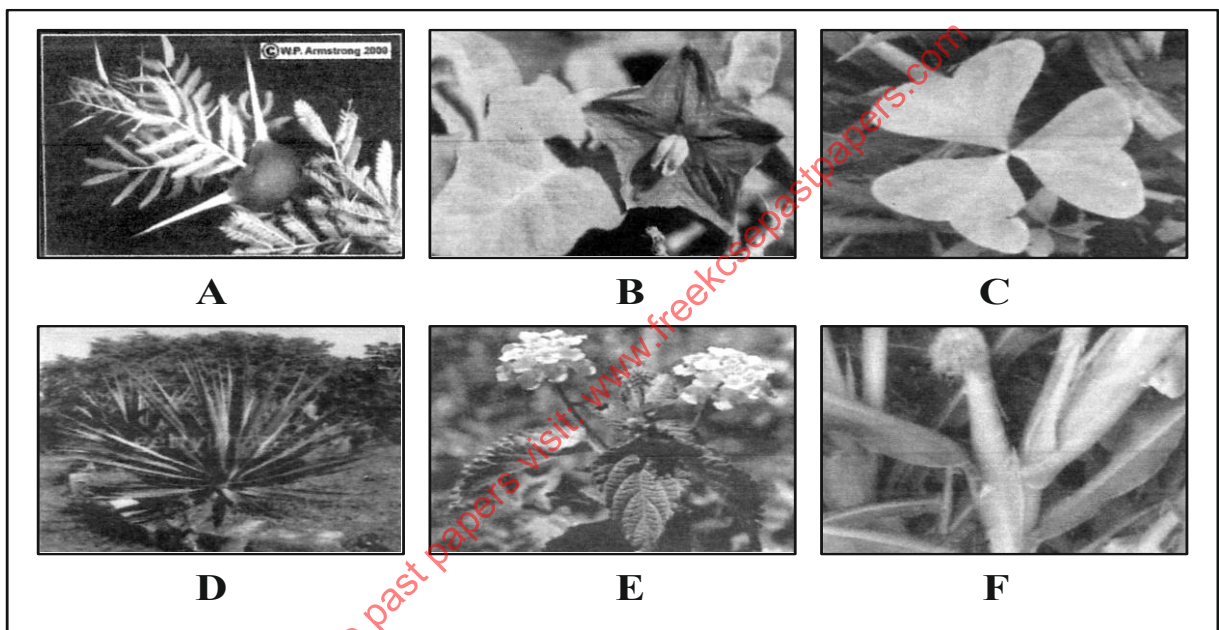
- Draw a graph of percentage of red blood cells haemolysed against salt concentration. (7 marks)
(Graph provided on page 7)
 - Explain haemolysis of red blood cells. (3 marks)
 - From the graph, state
 - the salt concentration at which 50% of red blood cells were haemolysed. (1 mark)
 - the highest salt concentration when the largest number of red blood cells were haemolysed. (1 mark)
 - Suggest the normal salt concentration in the blood of the mammal from which the red blood cells were obtained. (1 mark)
 - Give a reason for your answer in d(i) above. (1 mark)
 - What term is used to describe the solution with equal solute concentration as that of the cells. (1 mark)
 - Name the process in the human body that ensures that haemolysis of red blood cells is prevented. (1 mark)
 - State the role of osmosis in organisms. (4 marks)
7.
 - What is meant by natural selection ? (3 marks)
 - Describe how natural selection brings about adaptations of species to its environment. (17 marks)
8.
 - Explain what happens when the level of blood sugar rises above normal. (7 marks)
 - Explain how the various environmental factors increases the rate of transpiration in plants. (13 marks)

231/3
BIOLOGY
Paper 3
Term 2 2018
Time: 1³/₄ Hours

1. a) You are provided with suspension labelled Q, using the reagent provided, test the food substances present in the suspension. Record your results in the table below. (9 marks)

Food substance	Procedure	Observation	Conclusion
----------------	-----------	-------------	------------

- b) i) State the nutritional value of the food substances present in Q (2 marks)
 ii) What was the role of hydrochloric acid in the food test you carried out above. (1 mark)
 iii) Name two enzymes that may be required to digest suspension Q in the alimentary canal in human beings. (2 marks)
2. The photographs below shows twigs obtained from plants. Examine them and answer the following questions.



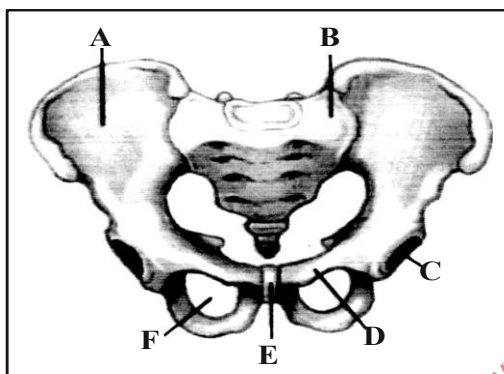
1. a) Leaves simple go to 2
 b) Leaves compound go to 3
2. a) Leaves with network venation go to 4
 b) Leaves with parallel venation go to 5
3. a) Leaves trifoliate Oxalidaceae
 b) Leaves bi-pinnate Mimosaceae
4. a) Leaves with smooth margin Solanaceae
 b) Leaves with serrated margin Verbenaceae
5. a) Leaves with sheath-like petiole Graminae
 b) Leaves without sheath like petiole Agavaceae

- a) Use the dichotomous key above to identify the taxonomic group of each of the six specimen

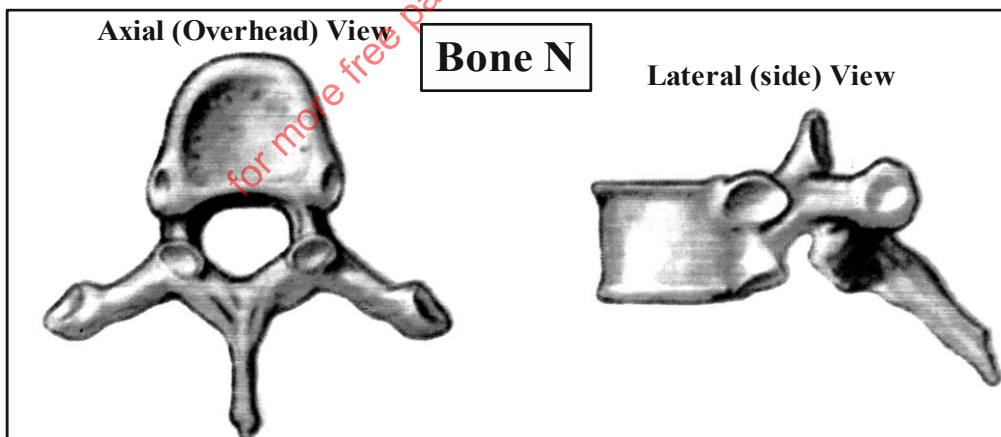
provided. In each case, show in sequence the steps that you followed to arrive at the identify of each specimen. (12 marks)

Specimen	Identity	Steps followed
A		
B		
C		
D		
E		
F		

- b) i) State the habitat of the plant in photograph A (1 mark)
 ii) Give a reason for your answer. (1 mark)
 iii) State the agent of pollination for the flower of the plant in photograph F (1 mark)
3. a) Below is a photograph of bones from a mammal. Use it to answer the questions that follow.



- i) Identify the bones labelled A and B (2 marks)
 ii) Name the hole labelled F and state its function. (2 marks)
 iii) Name the bone that articulate at point C (1 mark)
 iv) What type of joint forms at point C? (1 mark)
- b) You are provided with photographs of two bones of the vertebral column, bone M and bone N. Examine them and answer the questions that follow.



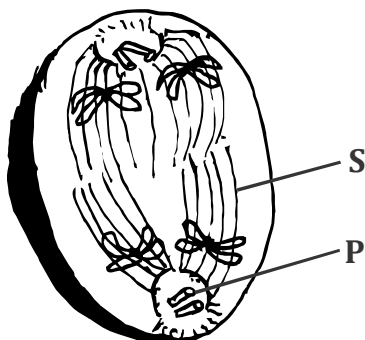
- i) With a reason, identify bone M (2 marks)
 ii) On bone N, label the centrum. (1 mark)
 iii) Give one observable difference between bone M and bone N (1 mark)
 iv) From which region of the backbone was bone N obtained from? (1 mark)

MERU CLUSTER
231/1
BIOLOGY
Paper 1
July 2018
Time: 2 Hours

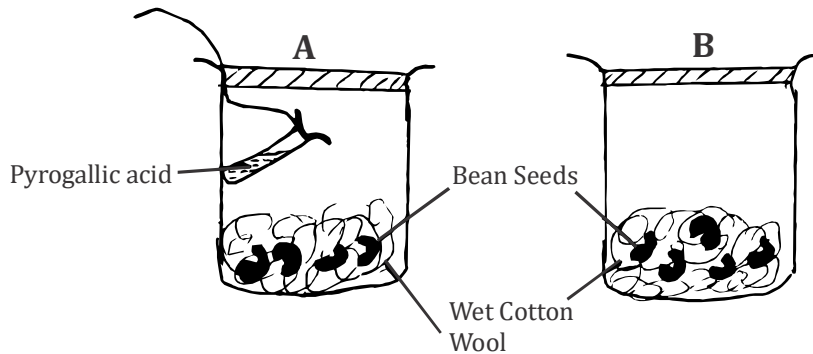
1. a. Explain why drug addicts are prone to HIV/AIDS infection. (3 marks)
 b. State three ways of preventing malaria (3 marks)
2. a. A man of blood group A married a woman of blood group A. What are their children's blood groups likely to be? (2 marks)
 b. State the importance of blood clotting. (2 marks)
3. a. What is sex linkage? (1 mark)
 b. Give two examples of human traits that are sex linked. (2 marks)
4. Give one use of the following tools in a biology laboratory .
 a. Dissecting needle. (1 mark)
 b. A pair of forceps (1 mark)
5. Name the types of response shown by the following.
 a. Movement of ants away from naphthalene balls. (1mark)
 b. Rose flower opening in day light. (1mark)
 c. Euglena moving near the surface of water. (1mark)
 d. Irish potatoes adventitious roots growing downwards. (1mark)
6. a. Why does a pregnant woman require more proteins than a very active man? (1mark)
 b. What is the reason why a teenage girl may require more iron than a teenage boy? (1mark)
7. a. Give three structural differences between wind and insect - pollinated flowers. (3 marks)
 b. State the significance of cross pollination. (1mark)
8. State three characteristics of class Diplopoda. (3marks)
9. Describe the changes that take place in the ribcage and diaphragm during inhalation in mammals. (2marks)
10. State the role of the tongue in mammalian digestion. (2marks)
11. a. Name the method you could use to estimate the population of butterflies in a school field. (1mark)
 b. Give two reasons for your answer in 11(a) above. (2mark)
12. The diagram below shows the arrangement of ovules in an ovary.



- a. Name the parts labeled X and Y. (2marks)
- b. Identify the type of placentation shown above. (1mark)
13. State two adverse effects cosmetics have on human skin. (2marks)
14. The figure below represents a state during cell division.



- a. Name the stage of cell division. (1mark)
 - b. Give one reason for your answer in (a) above. (1mark)
 - c. Name the structures labeled P and S. (2marks)
15. In an experiment, a group of students set up two glass jars as shown below. The jars were maintained at 25° C for one week.



- a. Suggest the aim of the experiment. (1mark)
 - b. What results were likely to be obtained at the end of the experiment? (2marks)
 - c. What was the purpose of pyrogalllic acid? (1mark)
16. Name:
- a. The protein secreted by blood platelets necessary for blood clotting. (1mark)
 - b. The vitamin involved in blood clotting. (1mark)
17. Distinguish between analogous and homologous structures. (2marks)
18. Explain what would happen to onion epidermal cells when placed in distilled water. (3marks)
19. State three ways in which the tracheal system in an insect is adapted for gaseous exchange. (3marks)
20. Give reasons for each of the following conditions.
- a. A constant body temperature is maintained in mammals. (2marks)
 - b. Low blood sugar level is harmful to the body. (2marks)
21. a. State the functions of the condenser in a light microscope. (1mark)
- b. Why is it not likely to use an electron microscope in a school laboratory? (2marks)
22. The insecticide DDT is no longer effective on mosquitoes. Give a reason for this. (2marks)
23. Differentiate between tropic and tactic responses. (3marks)
24. State the differences between DNA and RNA. (3marks)
25. The figure below represents a type of muscle.

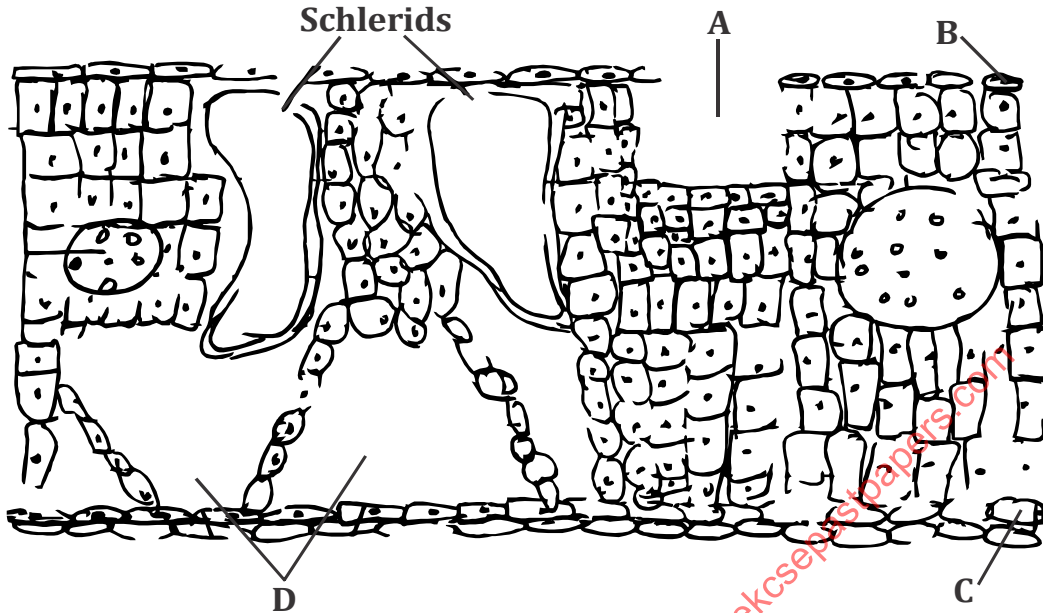


- a. Identify the type of muscle. (1mark)
 - b. Name two parts of human body where this type of muscle can be found. (2marks)
 - c. i. State one adaptation of cardiac muscles to its functions. (1mark)
 - ii. Where in the body do we find cardiac muscles? (1mark)
26. Explain why an exoskeleton restricts the size to which an animal can grow. (2marks)
27. What is the advantage of having a backbone made up of many separate short bones? (2marks)

231/2
BIOLOGY
Paper 2(Theory)
July /August 2018

SECTION A

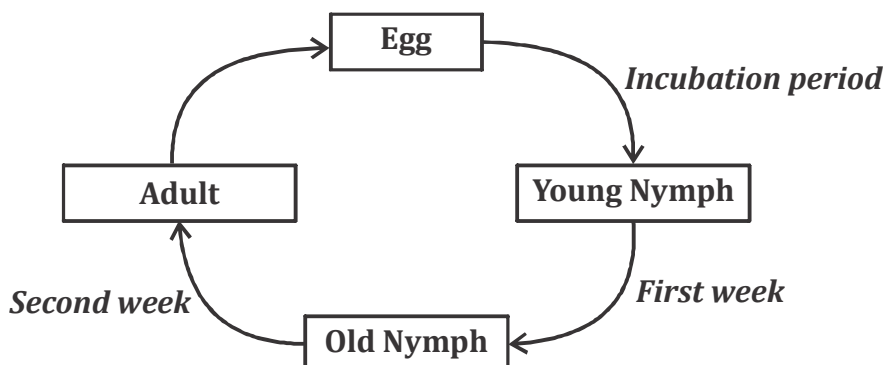
1. The diagram below shows a transverse section of hydrophyte leaf.



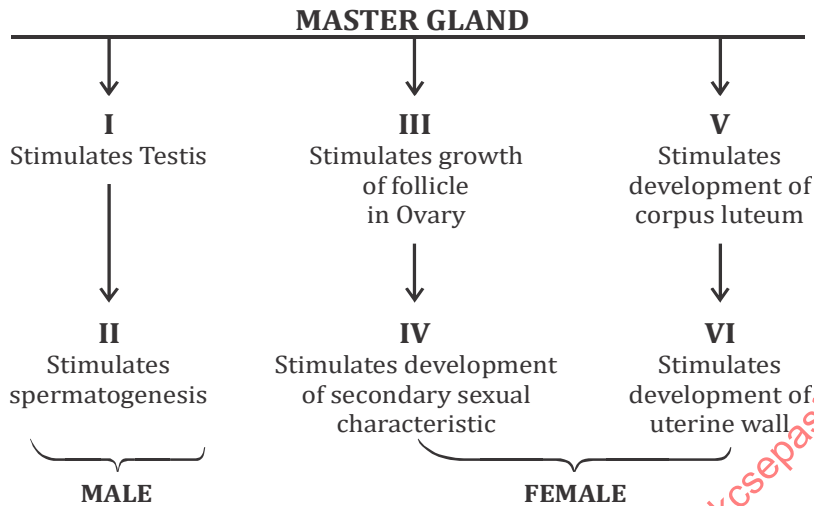
- a. What are sclerids (2 marks)
 - b. Name parts labeled A, B and D. (3 marks)
 - c. Using observable features only, explain how hydrophyte leaf is adapted to its environment.(2 marks)
 - d. List two adaptations of the guard cells to the opening and closing of stomata. (2 marks)
2. a. A yellow flowered heterozygous tomato plant was crossed with a white flowered plant. The phenotypic ratio of the F1 was yellow: white = 1:1. Using R to represent the gene for yellow colour. Work out the genotypes of the F1 generation. Show your working. (2 marks)
- b. If the yellow flowered plants in the F1 were selfed and the resulting seeds were planted. Using a punnet square determine the genotypic ratio of the plant. (2 marks)
- c. Briefly explain the significance of a test cross in genetics. (1 mark)
- d. The table below is a representation of chromosomal mutation.

Before mutation	L	M	N	O	P	Q
After mutation	L	O	N	M	P	O

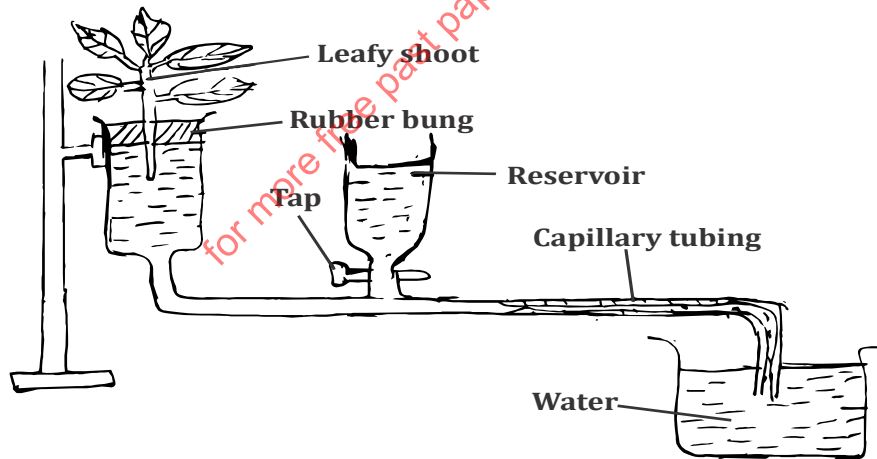
- i. Name the type of chromosomal mutation represented. (1 mark)
 - ii. Name an inheritance disease or condition in man that is caused by mutation. (1 mark)
3. The diagram below shows a life cycle of a cockroach.



- a. Name the hormone that would be at high concentration during the first and second week and their functions.
 - i. First week (2marks)
 - ii. Second week (2marks)
 - b. Name the structure that produces hormones named in a (i) above. (1 mark)
 - c. Name the process represented by the life cycle above. (1 mark)
 - d. State two importance for the process named in (c) above. (2 marks)
4. The diagram below represents some hormones, their sources and functions in a mammal.



- a. Identify the gland described as master gland. (1 mark)
 - b. Name the hormones (4 marks)
 - c. Describe the consequences of deficiency of hormone II in man. (2 marks)
 - d. Other than stimulating development of uterine wall, suggest one other function of hormone VI. (1 mark)
5. The set up below was used to investigate a certain process in plants.



- a. What is this apparatus used for? (1 mark)
- b. Giving reasons, state two precautions that should be taken when setting up the experiment. (4 marks)
- c. State three environmental factors that affect the process under investigation. (3 marks)

SECTION B

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

6. The table below shows how the quantities of sweat and urine vary with external temperature.

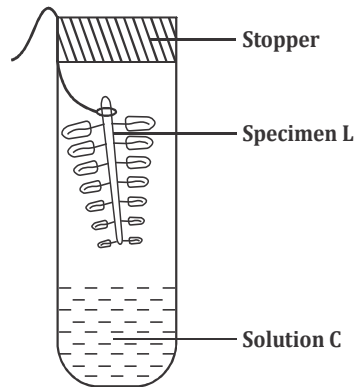
External temperature °C	Urine cm ³ /hr	sweat cm ³ /hr
0	100	5
5	90	6
10	80	10
15	70	20
20	60	30
25	50	60
30	40	120
35	30	200

- a. On the same graph, plot the quantities of urine and sweat produced against the external temperature. (7 marks)
- b. At what temperature are the amount of sweat and urine produced equal? (1 mark)
- c. What happens to the amount of sweat produced as temperature rises? Explain the observation. (3 marks)
- d. Explain the observation made on the amount of urine produced as temperature increases. (3 marks)
- e. How is the skin adapted for temperature regulation. (6 marks)
7. a. Describe how various factors influence photosynthesis. (15 marks)
- b. Explain the role of lipids in plants and animals. (5 marks)
8. Discuss the various evidences which show that evolution has taken place. (20 marks)

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MERU CLUSTER**231/3****BIOLOGY****Paper 3****July / August 2018****Time: 1³/₄ Hours**

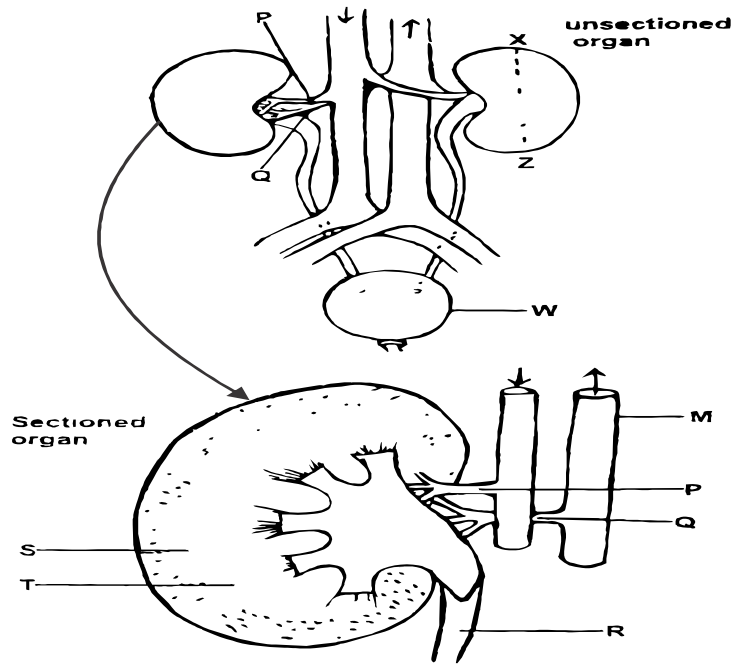
1. a. You are provided with specimen L, Solution C and a drinking straw.
- State the habitat of specimen L (1 mark)
 - Name the trophic level occupied by specimen L. (1 mark)
- b. i. Place 5cm³ of solution C into a boiling tube. Using a drinking straw, blow gently in to the solution and record your observations. (2 marks)
- Explain the observations in b (i) above. (1 mark)
- c. Place 5cm³ of solution C into each of the two remaining boiling tubes. Suspend specimen L into one of the boiling tubes as shown below.



Wrap the boiling tubes with aluminium foil and leave the set up for at least 40 minutes. Remove the aluminium foil and observe after 40 minutes.

- Record your observations. (2 marks)
 - Account for the observations in c(i) above. (3 marks)
2. You are provided with the following specimens P and Q. Study and observe them keenly and use them to answer the questions that follow.
- What types of fruits are specimens (2 marks)
 - Make a transverse section through specimen P. Draw the transverse section of the specimen and label any three parts. (4 marks)
 - Squeeze the juice from Specimen P in a small beaker. Using the reagents provided i.e. X - (Benedicts Solution) and Y (DCPIP), test the food substances, procedures, observations and conclusions in the table below. (8 marks)
 - Name the type of placentation in Specimen Q. (1 mark)
 - With a reason, name the class to which Specimen Q belongs. (2 marks)
 - State the method of seed dispersal in specimen Q. (1 mark)

3. The diagram below shows a pair of mammalian organs with their blood supply. One of the organs has been sectioned longitudinally. Examine them keenly.



- Identify the pair of organs. (1 mark)
- State the two main functions of the organs. (2 marks)
- Name the blood vessel labeled ; M & Q (2 marks)
- Which part of the nephron is found in region S & T (2 marks)
- State the function of the structure labeled W & R (2 marks)
- If the actual longitudinal length (X - Z) of the unsectioned organ is 9 Cm, calculate the magnification of the drawing. (2 marks)
- Give a reason why blood vessel P carries a higher concentration of urea than vessel Q. (1 mark)

**BIOLOGY
PRACTICAL
CONFIDENTIAL**

Each candidate will require:

- In addition to the fitting and apparatus in the school laboratory, each student should be provided with the following:

- Solution C
- Specimen L
- Drinking straw
- Three boiling tubes with boiling tube corks / stoppers.
- Two empty 250ml plastic beaker.
- Two pieces of aluminum foil enough to wrap the boiling tubes completely.
- Specimen P - Ripe orange (Medium sized with seeds)
- Specimen Q - Mature bean pod.
- Solution X - Benedicts Solution.
- Solution Y- DCPIP
- Scalpel
- Hand lens.
- Piece of cotton thread 20 cm long.
- Stop watch.

NB

- Solution C is prepared by measuring 50 Cm³ of Bromothymol blue and dissolve it in 1000 Cm³ of distilled water to make 5% of solution.
- Specimen L is a twig of Cassia SP freshly obtained with 2.3 leaves

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SECTION B (40 MARKS)

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

6. In an ecological study, a grass hopper population and that of crows was estimated in a certain grassland area over a period of one year. The results are as shown in the table below.

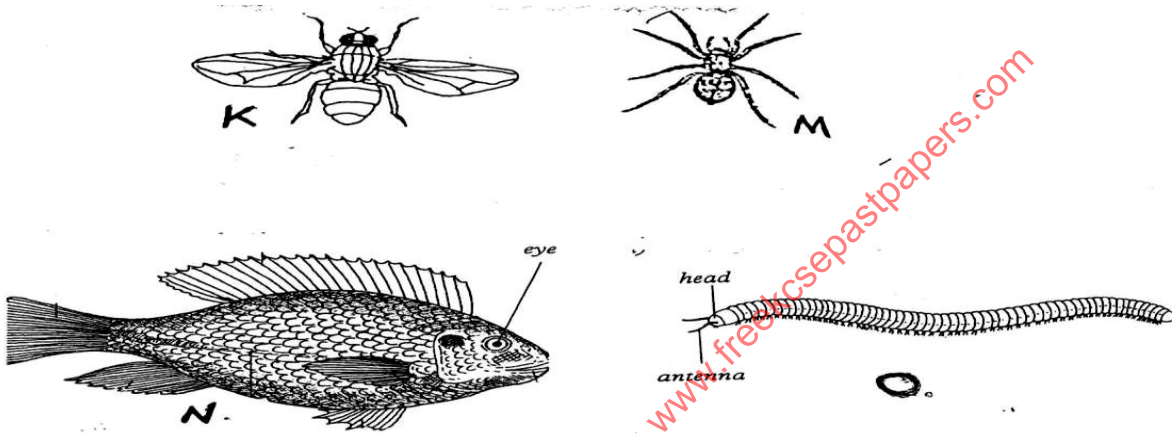
Month	J	F	M	A	M	J	J	A	S	O	N	D
Number of adult grasshopper $\times 10^2$	90	20	11	25	2500	1652	120	15	10	35	192	456
Number of crows	4	2	0	1	8	22	7	2	1	1	5	15
Amount of rainfall	20	0	55	350	520	350	12	10	25	190	256	350

- (i) What is the relationship between the rainfall and grasshopper population? 1mark
- (ii)
- (a) Account for the relationship stated in (i) above. 3marks
- (b) Explain the relationship between the grasshopper population and that of crows 3marks
- (c) If the data was used in the construction of pyramid of numbers, what would be the trophic level of;
- i. Grass hopper
- ii. Crows
- iii. The grass in the study area
- (d) If the area studied was one square kilometer, state;
- i. One method that could have been used to estimate the crow population. 1mark
- ii. One method that could have been used to estimate the grasshopper population. 1mark
- (e) Suggest what would happen if a predator for grasshoppers entered the study area. 2marks
- (f) What is meant by the term carrying capacity? 1mark
- (g) Why would the carrying capacity of wild animals in woodland grassland be higher than that of cattle? 2 marks
- (h) What is an ecosystem? 3marks
7. Describe how mammalian heart is adapted to its function. 20marks
8. (a) Describe how urea is formed in the liver cells from excess amino acid. 5marks
- (b) Discuss economic importance of five plant excretory products. 10marks
- (c) Explain how plants remove waste products from their body. 5 marks

231/3
BIOLOGY
PAPER 3
(PRACTICAL)

Answer all questions in this section in the spaces provided.

- You are provided with a food sample labelled D in solution form. Using the reagents provided, carry out tests to identify the food substances in the food sample. (12mks)
- You are provided with the specimen labelled E. Examine it carefully and answer the questions that follow.
 - Name the class of the plant from which the specimen E was obtained. (1mk)
 - Using observable features only, name **three** reasons for your answer in (i) above. (3mks)
 - Name the agent of pollination for the flowers of specimen E. (1mk)
 - State **four** observations on the specimen E that support the answer in (iii) above. (4mks)
 - Draw and label the pistil of specimen E. (4mks)
- The photographs below represent different types of animals. Study them carefully and answer the questions that follow.



- State **two** observable differences between K and M. (2mks)
- Classify specimen M into the following taxa giving reasons for each case.
 - Phylum (1mk)
Reasons (3mks)
 - Class (1mk)
Reasons (3mks)
- Name the type of skeleton found in the specimen O. (1mk)
- Name the class to which the specimen N belongs. (1mk)
 - Give **three** reasons for your answer in (d) (i) above. (3mks)

231/3 – BIOLOGY PAPER 3
CONFIDENTIAL

Provide each candidate with:-

- Solution L (Milk)
- Filter Paper
- Funnel
- 100ml Beaker
- 2 Test Tubes
- Bench solutions
- Iodine solution
- Copper (II) Sulphate
- Sodium Hydroxide

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26. Name the blood vessels that supply blood to the liver. (2 marks)
27. How do the following factors affect the rate of transpiration? (2 marks)
- (a) Cuticle
 - (b) Stomata
28. (a) Achieng belongs to blood group O negative and her husband is blood group AB positive. Achieng is expecting her first child. Work out the genotype of the couple's children. (4 marks)
- (b) Achieng's children may likely suffer from Haemolytic disease of the new born. How can they be protected?

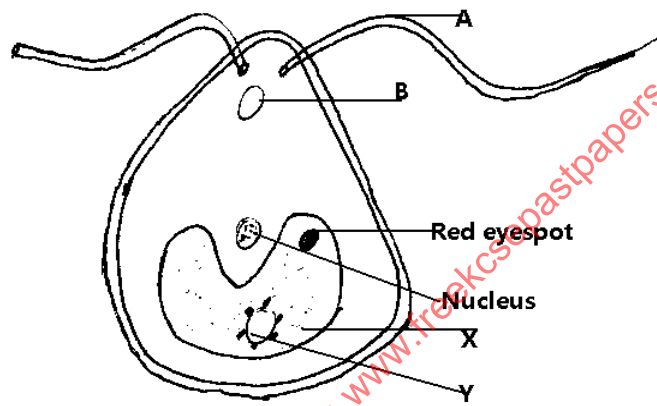
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231/2
BIOLOGY
PAPER 2

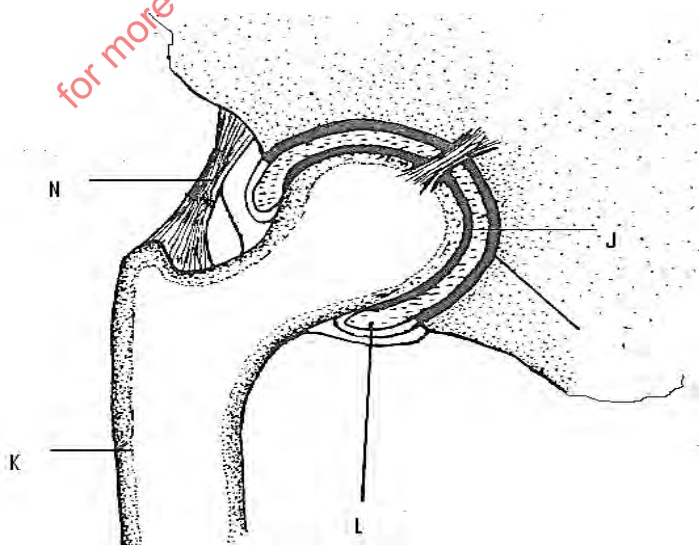
SECTION A (40 Marks)

Answer all questions in this section in the spaces provided.

1. In human beings, a **downward pointed frontal hairline** (“windows peak”) is a heritable trait. A person with windows peak always has at least one parent who has this trait; whereas persons with **frontal hairline** may occur in families in which one or even both parents have windows peak. Using **W** and **w** to symbolize genes for this trait
 - (a) Determine the F1 generation if a homozygous windows peak male parent is married to a homozygous frontal hairlined female parent (4marks)
 - (b) State two causes of variations (1mark)
 - (c) Name two sex linked genetic disorders affecting human females and males (2marks)
 - (d) What is genome
2. The diagram below shows an organism obtained from an aquatic ecosystem



- (a) **State** the kingdom in which the organism belongs. (1mark)
 - (b) **Name** the parts labeled (2marks)
 - (c) **State** the functions of the following parts **A, X & Z** (3marks)
 - (d) Explain briefly why the organism is described as eukaryotic (2mark)
3. a) The diagram below shows some of the features of a synovial joint. Study the diagram carefully and answer the questions that follow.



- (a) Name the type of synovial joint. (1 mark)

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SECTION B (40 Marks)

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

6. The menstrual cycle is a sequence of events repeated monthly in the female production system. The table below shows the concentration of oestrogen and progesterone hormones and body temperatures of female against time.

Time in days	Oestrogen mg/100cm ³ of blood	Progesterone mg/100cm ³ of blood	Temperature in 0°c
1	20	0	36.4
2	20.5	0	36.6
3	25	0	36.7
4	27.5	0	36.8
5	30	0	36.7
6	32.5	0	36.6
7	35	0	36.8
8	40	0	36.7
9	48	0	36.6
10	56	0	36.8
11	64	0	36.7
12	72	0	36.6
13	80	0	36.4
14	170	20	36.3
15	140	50	36.6
16	80	80	37.0
17	70	130	37.2
18	65	170	37.0
19	60	160	37.1
20	65	150	37.15
21	130	130	37.2
22	140	110	37.1
23	130	90	37.0
24	100	70	37.1
25	80	50	37.2
26	60	20	37.0
27	20	0	36.4

- a). Using the same axis draw graphs of oestrogen and progesterone against time/days (8mks)
- b) State the possible event taking place in the uterus during the first week? (1 mark)
- c) State the events taking place in the ovary between day 1 and day 13. (2 marks)
- d) Account for the sudden increase in the progesterone concentration between day 14 and day 18. (2 marks)
- e) Account for the change in temperature between day 14 and 17. (1 mark)
- f) Account for the change of the curve of progesterone between day 19 and 27. (2marks)
- a) State the function of the following.
- (i) Ovary (1mark)
- (ii) Progesterone (1 mark)
- (iii) Oestrogen (1 mark)
- 7 a) Describe how the following evidences support the theory of organic evolution: geographical distribution, fossil records and comparative anatomy (10marks)
- b) Explain tropic responses in plants and their survival values (10marks)
- 8 a) Describe the structural adaptations of mammalian heart to its Functions (10marks)
- b) Explain the role of osmosis in organisms (10marks)

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231/3

BIOLOGY

PAPER 3

(PRACTICAL)

CONFIDENTIAL INSTRUCTIONS**Each candidate will require the following:**

- 50ml distilled water labelled Q1.
- One ripe tomato labelled specimen J.
- 2 pieces of sewing machine cotton thread (9 15cm long each)
- Benedict's solution
- One mature pod from leguminous plant labelled specimen K.
- Iodine solution,
- One mature (dry) fruit of *Bidens pilosa* (Black jack)
- Labelled specimen L.
- 10cm long piece of visking tubing (wet) and preferably of 3cm width.
- 100 ml solution (made of 2% starch and 20% glucose) labelled Q2.
- Means of heating /Flame (candle or Bunsen burner)
- 100ml beaker
- A measuring cylinder – upto 10ml
- Distilled water.
- 6 test tubes
- Tap water / water in a wash bottle
- Test tube rack
- Test tube holder
- A sharp razor blade / scalped

NoteGuide lines for the preparation of solution Q2

To prepare 1 litre of solution Q2, dissolve 20g starch in about 500ml distilled water, dissolve 200g glucose in the solution.

Make up the total volume of the mixture 1 litre by adding distilled water.

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SECTION B-(40 MARKS)

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

6. In an investigation, two persons **A** and **B** drank the same amount of glucose solution. Their blood sugar levels were determined immediately and thereafter at intervals of one hour for the next six hours. The results were as shown in the following table:-

Time (hrs)	Blood glucose (Mg/100ml)	
	Person A	Person B
0	90	120
1	220	360
2	160	370
3	100	380
4	90	240
5	90	200
6	90	160

- a) Draw a graph of blood sugar levels of persons **A** and **B** against time on the same axis. (7marks)
- b) Explain each of the following observation:-
 i) Blood sugar level increased in person **A** between 0 and 1hr. (2mark)
 ii) The blood sugar level dropped in person **A** between 1 and 4 hours. (2marks)
- c) From the graph, what is the normal blood glucose sugar level for human beings? (1mark)
- d) Suggest a reason for the high sugar level in person **B**. (2marks)
- e) How can high blood sugar level in person **B** controlled? (1mark)
- f) What is the biological significance of maintaining a relatively constant sugar level in a Human being? (3marks)
- g) Account for the decrease in the blood glucose level of person **B** after 4hours. (2marks)
7. a) How is the structure of mammalian gaseous exchange system adapted to its functions. (10marks)
- b) Describe the mechanism of opening and closing of the stomata using the photosynthetic theory. (10marks)
8. a) What is meant by the term natural selection. (2marks)
- b) Describe how natural selection brings about the adaptations of a species to its environment. (8marks)
- c) Distinguish between convergent and divergent evolution (2marks)
- d) Discuss four evidences to show that evolution has taken place. (8marks)

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231/3
BIOLOGY
PAPER 3
PRACTICAL
REQUIREMENTS

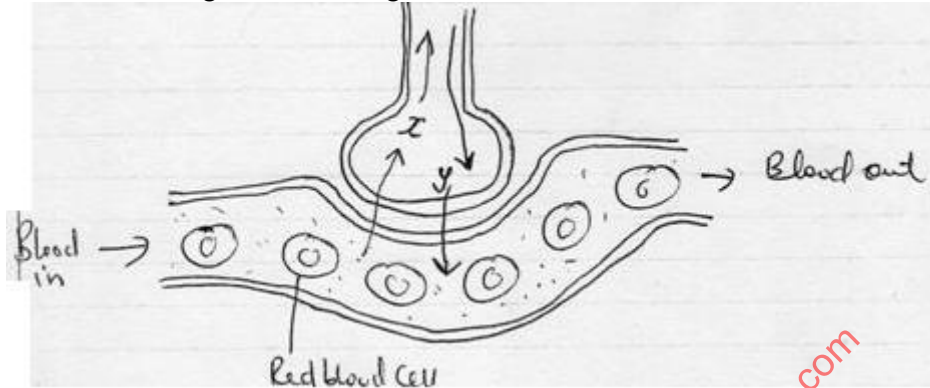
Each candidate will require the following:

- 5 test - tubes
- 5ml of solution L₁ – starch solution 0.5%
- 5ml of solution L₂ – diastase solution 10%
- 2ml of solution L₃ – Boiled diastase solution 10%
NB: boiled for 10 minutes
- Means of labeling – 3 labels
- Water bath
- Thermometer
- Iodine solution
- 3 Droppers
- A White tile
- Means of timing

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**CEKENA PRE-MOCK
BIOLOGY
231/1
FORM IV**

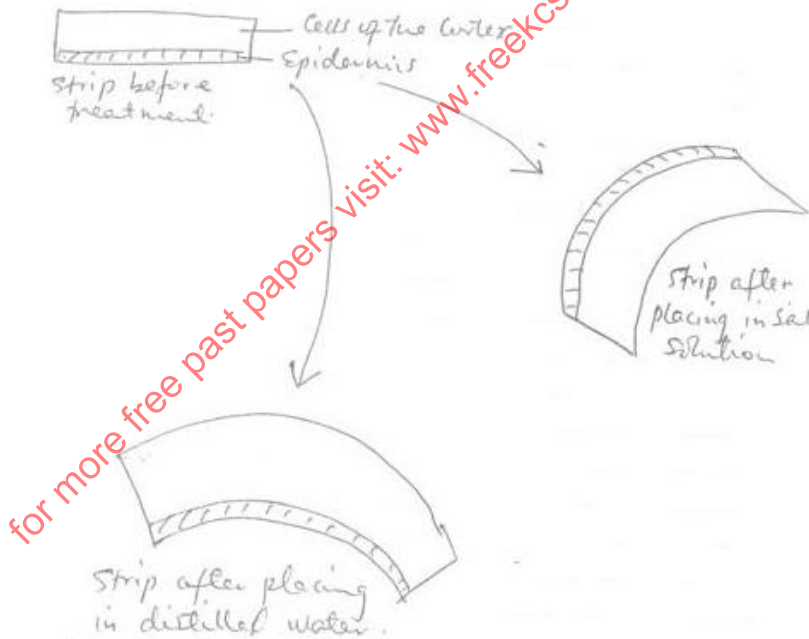
1. a) Name two classes in phylum Arthropoda that have their head fused with the thorax (2mks)
 b) Explain why the member of the Phylum Arthropoda have intermillent growth. (2mks)
2. a) Name two structures for gaseous exchange in aquatic plants (2mks)
 b) The diagram below shows gaseous exchange in the alveolus



Name gases; X & Y

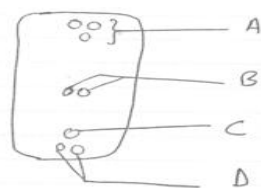
(2mks)

3. Strips were cut off lengthwise from the main stems of a herbaceous plant, then placed in different liquids as shown below.

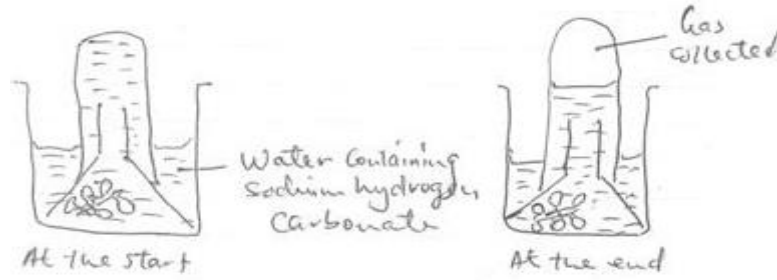


- a) Account for the results obtained when the strips were put in distilled water. (2mks)
- b) The concentration of mineral A in water is 0.001m while its concentration in the cell sap of a plant is 0.5m. Name the process through which A is absorbed by the plant. (1mk)

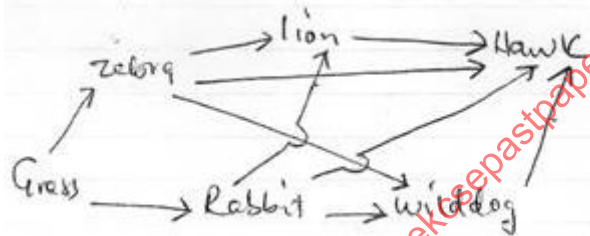
4. The diagram below shows a mature embryos of a flowering plant



- a) Name the parts labeled A and B (2mks)
 b) What is the role played by the parts B & C (2mks)
5. The set-up below is an experience to investigate photosynthesis.

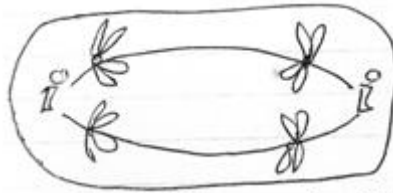


- a) Which gas was collected in the test tube? (1mk)
 b) What was the role of sodium hydrogen carbonate in the experiment? (1mk)
 c) Name two raw materials for the dark stage process of photosynthesis. (2mks)
6. State the function of the following organelles
- i) Golgi bodies (1mk)
 ii) Nucleolus (1mk)
7. Study the food web below and answer the questions that follow

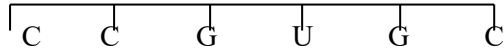


- a) Name the organism occupying the highest tropic level. (1mk)
 b) Construct two food chains with wild dogs as secondary consumers. (2mks)
 c) What do you understand by the term —Ecologically balanced”? (1mk)
8. a) Name three properties of proteins. (3mks)
 b) Name a disease caused by lack of each of the following in a human diet.
- i) Vitamin D (1mk)
 ii) Iodine (1mk)
9. a) What is the importance of heart beat in blood circulation? (1mk)
 b) If the nerve supply the heart of a mammal is severed, the rhythmic heart movement will still go on and the heart continues to beat. Explain. (2mks)
 c) State the functions of the following in the heart
- i) Sino atrio node (1mk)
 ii) Interventricular septum (1mk)
10. a) 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 Oxide
- a) Name the process (1mk)
 b) State the economic importance of the process named in a) above. (1mk)
 c) i) A dog weighing 15.2kg requires 216KJ per day. Explain. (2mks)
 ii) What is the end product of respiration in animals when there is insufficient oxygen supply. (1mk)
11. a) Give two reasons why plants lack well developed excretory system. (2mks)
 b) Name two excretory products in plants. (2mks)
12. a) Name the kingdom into which the prokaryotes are placed. (1mk)
 b) State two characteristics used to classify Arthropods in their class. (2mks)
 c) A certain plant had the following characteristics
- Presence of roots, stem and leaves
 - Found with sori on the under surface of the mature leaf
 - Life cycle is sporophyte and gametophyte generations
 - Sporophyte generation is dominant.
- Name the division to which the plant belongs. (1mk)

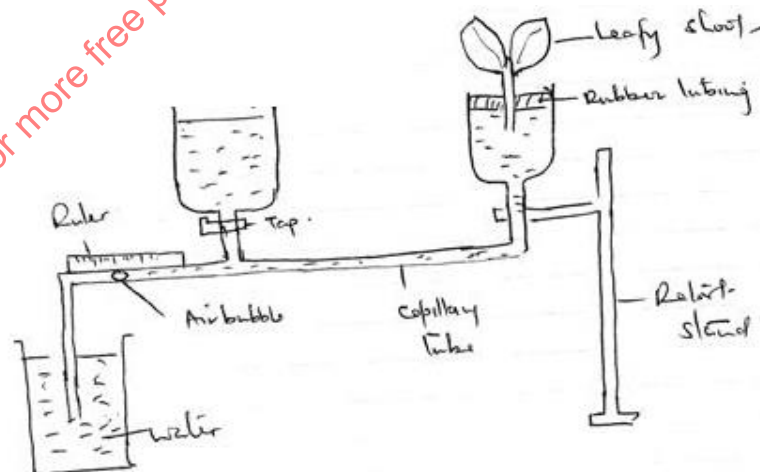
13. The diagram below represents a stage of cell division.



- a) Name the stage of cell division shown. (1mk)
 - b) Give two reasons for your answer in a) above. (2mks)
 - c) State the significance of this stage division in living organisms. (1mk)
14. a) A portion of a nucleic acid molecule is shown below.



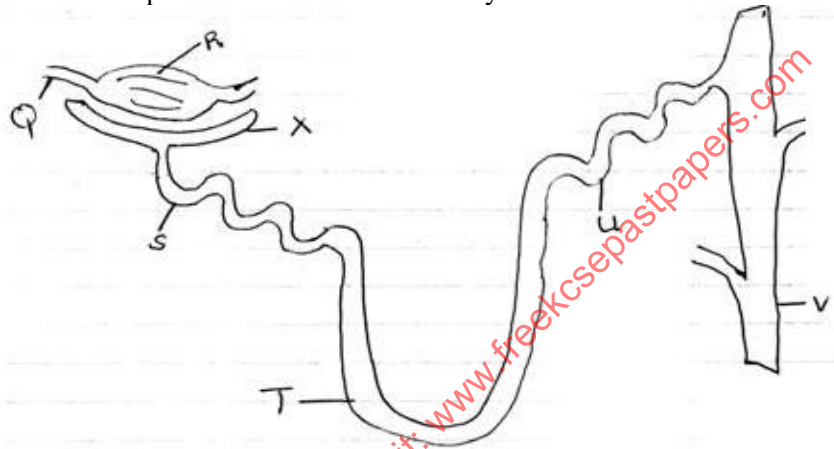
- a) Name the nucleic acid molecule to which the portion belongs. Give a reason. (2mks)
 - b) Write down the sequence of bases of a complementary strand to the one above. (1mk)
15. a) Give a reason why glucose does not appear in the urine even after being filtered in the glomerulus. (1mk)
- b) Name two hormones involved in osmoregulation. (2mks)
16. Name the cell organelles which would be abundant in
- a) Sperm cell (1mk)
 - b) Pancreas (1mk)
17. State the importance of osmosis in plants. (3mks)
18. a) Name the respiratory surface for gaseous exchange in insects. (1mk)
- b) State two adaptations of the respiratory surface named in a) above. (2mks)
19. State two ways in which lactic acid formed in the muscles is removed. (2mks)
20. Explain why several axillary buds sprout when a terminal bud in a young tree is removed (3mks)
21. Give one example of each of the following;
- a) Continuous variation (1mk)
 - b) Discontinuous variation (1mk)
22. Name the causative agent for the following disease; Typhoid (1mk)
23. a) Name two forms of non-disjunction. (2mks)
- b) Give two disorders caused by gene mutations. (2mks)
24. Study the diagram shown



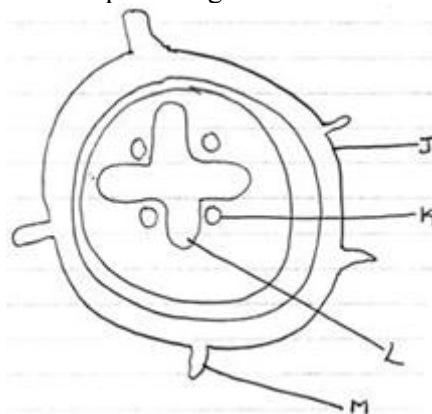
- a) What process was being investigated? (1mk)
- b) Giving a reason state one precaution that should be taken when setting up the experiment (1mk)
- c) How would changes in temperature affect the rate of movement of the air bubble (1mk)

BIOLOGY
231/2
FORM IV
2 HOURS

1. a) What is meant by the term sex linked genes? (1mk)
- b) In humans hairy ears are controlled by a gene on the Y-chromosome.
 - i) Using letter Y^H to represent the chromosome carrying the gene for hairy ears, work out the cross between the hairy earned man and his wife. (4mks)
 - ii) What is the probability of the girls having hairy ears? (1mk)
- c) Name two other disorders in humans that are determined by sex-linked traits. (2mks)
2. a) Distinguish between homologous and analogous structures and give an example of each. (4mks)
- b) i) What are vestigial structures? (1mk)
- ii) Give two examples of vestigial structures in man. (2mks)
- c) In what way does Lamarck's theory fail to agree with the modern scientific evidence (1mk)
3. The diagram below shows a nephron of a mammalian kidney



- a) Name the parts labelled Q, R & U (3mks)
- b) State 3 ways through which part labeled S is adapted to perform its function. (3mks)
- c) Explain why protein are absent in part X (1mk)
- d) Give one structural difference between part labeled T of fresh water and marine organism. (1mk)
4. The diagram below is a transverse section of a plants organ.



- a) From which plant organ was the section obtained? (1mk)
- b) Give two reasons for your answer in a) above. (2mks)
- c) Name the parts labelled J, K &L (3mks)
- d) State two functions of the part labeled M (2mks)

5. When testing a variegated leaf for starch, the following procedure is important
- The leaf is boiled in water
 - The leaf is then boiled in methylated spirit
 - The leaf is taken back to the hot water.
 - The leaf is spread on a white tile and irrigated with iodine solution.
 - Why is the leaf boiled in water? (1mk)
 - Why is the leaf boiled in methylated spirit? (1mk)
 - Explain why the leaf is dipped in hot water. (1mk)
 - Explain the observation made when the leaf is irrigated with iodine solution (2mks)
 - What is a variegated leaf (1mk)
 - What is to destarch the leaf (2mks)

SECTION B (40 MARKS)

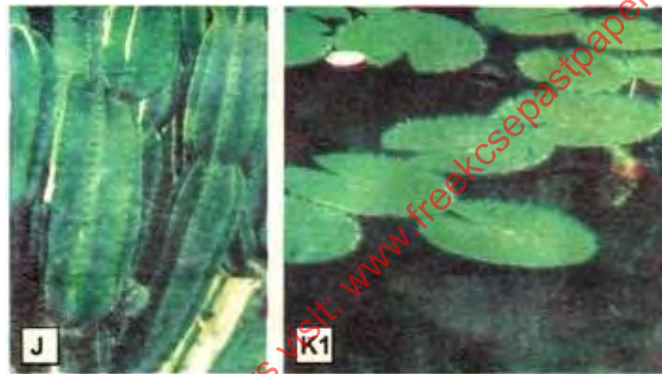
6. The mean dry weight in milligram of germinating barley grains was worked out for whole grains endosperm and the embryo. The means were determined at 2 day interval for 12 days. Results were as shown below.

Time in days	Dry weight of whole grain (in mg)	Dry weight of endosperm (mg)	Dry weight of embryo (mg)
0	49	45	6
2	46	42	6
4	44	35	9
6	42	24	17
8	40	12	25
10	41	8	32
12	45	8	40

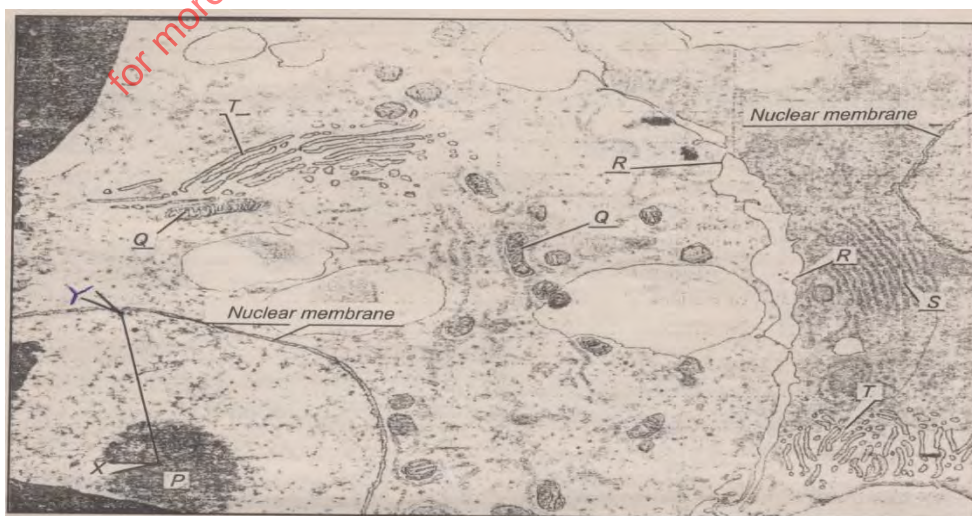
- Using the same axes draw graphs for dry weight of whole grain, endosperm and embryo against time (7mks)
 - What was the average dry weight of the embryo on day 9? (1mk)
 - Account for the day weight of
 - Endosperm from day 0 to 12 (3mks)
 - Whole grain from day 0 to 12 (3mks)
 - Other than water which other factors are necessary for germination? (2mks)
 - Explain the importance of the following in seed germination.
 - Water (2mks)
 - Temperature (2mks)
7. a) Explain how food as a factor regulates the population in an ecosystem (8mks)
 b) Describe the flow of energy from the sun through the different trophic levels in an ecosystem (12mks)
8. How is human male reproductive system adapted to its function? (20mks)

BIOLOGY
231/3
FORM IV
1 ¾ HOURS
(PRACTICAL)

1. You are provided with specimen K. Use it to answer the following questions.
 - a) Carefully observe the specimen using a hand lens. Using observable features identify the class to which the specimen belongs
 - i) Class _____ (1mk)
 - ii) Observable features _____ (3mks)
 - b) Using the scapel, cut two of the specimens into small pieces. Using the boiling tube provided, boil the pieces in 20ml of water while stirring for five minutes. Decant the 'soup' into another boiling tube. Using the reagents provided carry out various food test. Record your information in the table below. (10mks)
2. You are provided with specimens Q, P, N and J use them to answer the question which follows.
 - a) Using observable features only identify the agent of dispersal for specimens Q, P, and N and explain how each is adapted for dispersal. (9mks)
 - b) Name the larger classification of fruits P, N and J _____ (1mk)
 - c) To which smaller classification does each of the specimen belong? (3mks)
 - d) Give a reason why specimen J is classified as a fruit. (1mk)
3. a) The photographs below shows plants obtained from different habitats. Study them and answer the questions that follows.



- i) Identify the habitats of the plants
 - ii) Using observable features only, state one way in which plant J and K1 are adapted to their habitat.
- b) Below is a part of an animal cell as seen under an electron microscope. Study the micrograph and answer the questions that follows



- i) Name the organelles labeled P and T (2mks)
- ii) How is the structure labeled Q adapted to its function. (2mks)

BIOLOGY PAPER 3
CONFIDENTIAL

- Each student to be provided with the following specimens:
 - Q – a Jacaranda seed
 - P – a pea pod
 - N – Black jack (*Biden pilosa*)
 - J – A maize grain
 - K – 3 Omena

- A scapel
- 3 test tubes
- 2 boiling tubes
- 3 droppers
- A hand lens
- A 50 ml measuring cylinder
- A stirring rod
- A test tube holder
- A test tube rack

Access to:

Means of heating
NaOH solution
Benedict's solution
Copper II sulphate solution

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BIOLOGY

231/1

MARKING SCHEME

1. a) Name two classes in phylum Arthropoda that have their head fused with the thorax (2mks)
Arachnida and Crustacea (Reject if small a and c for Arachnida and Crustacea)
- b) Explain why the member of the Phylum Arthropoda have intermillent growth. (2mks)
Have hard exoskeleton, rigid and has to be shed off periodically to allow growth
2. a) Name two structures for gaseous exchange in aquatic plants (2mks)
i) Stomata
ii) Aerenchyma
iii) Pneumatophores
- b) The diagram below shows gaseous exchange in the alveolus (2mks)
Name gases;
Y - Oxygen
X Carbon (IV) Oxide
3. Strips were cut off lengthwise from the main stems of a herbaceous plant, then placed in different liquids as shown below.
- a) Account for the results obtained when the strips were put in distilled water. (2mks)
Distilled water was hypotonic to the cell sap; Carter cells absorbed water by osmosis and became turgid
- b) The concentration of mineral A in water is 0.001m while its concentration in the cell sap of a plant is 0.5m. Name the process through which A is absorbed by the plant. (1mk)
Active transport
4. The diagram below shows a mature embryos of a flowering plant
- a) Name the parts labeled A and B (2mks)
A Antipodals
B Polar nuclei
- b) What is the role played by the parts (2mks)
i) B - Fuses with one male to form a triploid endosperm
ii) C – Fuses with the other male nuclei to form a diploid zygote
5. The set-up below is an experience to investigate photosynthesis.
- a) Which gas was collected in the test tube? (1mk)
Oxygen gas
- b) What was the role of sodium hydrogen carbonate in the experiment? (1mk)
Dissociates in water to provide Carbon (IV) Oxide ink
- c) Name two raw materials for the dark stage process of photosynthesis. (2mks)
i) Carbon (IV) oxide ii) Hydrogen ions/atoms
6. State the function of the following organelles
- i) Golgi bodies (1mk)
Secretion of materials from the cells to the outside
- ii) Nucleolus (1mk)
Synthesis of ribosomes
7. Study the food web below and answer the questions that follow
- a) Name the organism occupying the highest trophic level. (1mk)
Hawk
- b) Construct two food chains with wild dogs as secondary consumers. (2mks)
i) Grass – Zebra – Wild dog
ii) Grass – Rabbit – Wild dog
- c) What do you understand by the term —Ecologically balanced”? (1mk)
Both consumers and producers are at equilibrium
Number of organisms in the trophic level can support one another

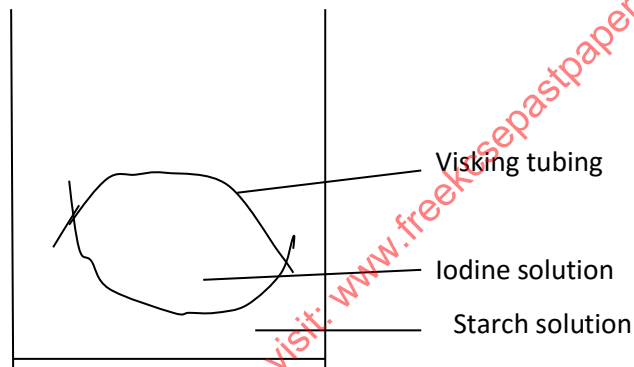
8. a) Name three properties of proteins. (3mks) i) F
 rom colloidal suspension in water
 ii) Denatured by temperatures above 40⁰c
 iii) Are amphoteric / have both acidic and basic propertier
- b) Name a disease caused by lack of each of the following in a human diet. (1mk)
 i) Vitamin D
 Richet
 ii) Iodine (1mk) Goitre
9. a) What is the importance of heart beat in blood circulation? (1mk)
 Ensure sufficient supply in nutrients and oxygen to cells
 Ensure removal of waste products of metabolism from the cells
 Distribution of blood to all body parts
- b) If the nerve supply the heart of a mammal is severed, the rhythmic heart movement will still go on and the heart continues to beat. Explain. (2mks)
 Rhythmic contraction of the heart arises from the special cordiac muscules, which are myogenic
- c) State the functions of the following in the heart
 i) Sino atrio node (1mk)
 Regulate the heart beat/initiating and maintaining contraction of the heart
 ii) Interventricular septum (1mk)
 Prevents mixing of oxygenated and deoxygenated blood
10. a) 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 Oxide
- a) Name the process (1mk)
 Anaerobic respiration/fermentation
- b) State the economic importance of the process named in a) above. (1mk) Brewing
 Baking
- c) i) A dog weighing 15.2kg requires 216KJ per day. Explain. (2mks)
 Mouse has a larger surface area to volume ratio than dog, hence losses more energy.
 ii) What is the end product of respiration in animals when there is insufficient oxygen supply. (1mk) Lactic acid
11. a) Give two reasons why plants lack well developed excretory system. (2mks) Excrete less
 toxic wastes
 Reuse some of their wastes/nitrogenous wastes
 Respire glucose that produces less toxic wastes
- b) Name two excretory products in plants. (2mks)
 Carbon IV Oxide
 Water
 Caffin
 Cumi
 Rubber
12. a) Name the kingdom into which the prokaryotes are placed. (1mk)
 Monera – (Reject wrong spelling and small etter (m) for Monera)
- b) State two characteristics used to classify Arthropods in their class. (2mks) -
 – Number of limbs
 – Presence and number of antennae
 – Number of body parts
 – Types of eye
- c) A certain plant had the following characteristics
 – Presence of roots, stem and leaves
 – Found with sori on the under surface of the mature leaf
 – Life cycle is sporophyte and gametophyte generations
 – Sporophyte generation is dominant.
- Name the division to which the plant belongs. (1mk)
 Pleridophyta (Reject small 'p')

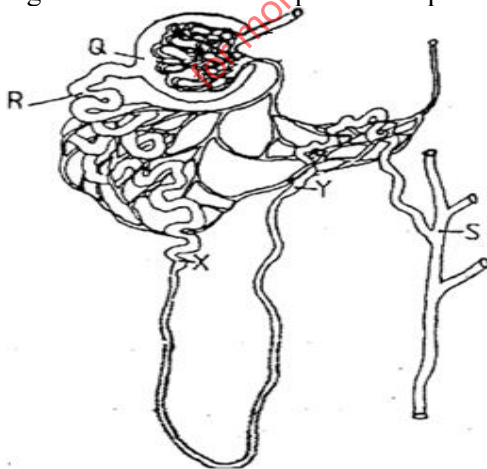
13. The diagram below represents a stage of cell division.
- Name the stage of cell division shown. (1mk)
Anaphase
 - Give two reasons for your answer in a) above. (2mks)
Homologous Chromosomes separate at the equator sister chromatids attached at the centromere
 - State the significance of this stage division in living organisms. (1mk) Result to formation of gametes
14. a) A portion of a nucleic acid molecule is shown below.
- Name the nucleic acid molecule to which the portion belongs. Give a reason. (2mks)
Ribonucleic acid
Has uracil base
 - Write down the sequence of bases of a complementary strand to the one above. (1mk) G – G – C –
A – C – G
15. a) Give a reason why glucose does not appear in the urine even after being filtered in the glomerulus. (1mk)
It is selectively reabsorbed in the proximal convoluted tubule
- Name two hormones involved in osmoregulation. (2mks)
Antidiuretic hormone/ADH/vasopressin
Aldosterone
16. Name the cell organelles which would be abundant in
- Sperm cell (1mk)
Mitochondria
 - Pancreas (1mk)
Golgi – bodies
17. State the importance of osmosis in plants. (3mks) -
Absorption of water from the soil by root hair cells
- Provides support in seedlings, leaves, herbaceous plants
 - Opening and closing of stomata
 - Distribution of water from cell to cell.
 - Feeding in insectivorous plants
18. a) Name the respiratory surface for gaseous exchange in insects. (1mk)
Tracheole – (Reject Tracheoles)
- State two adaptations of the respiratory surface named in a) above. (2mks)
 - Has thin epithelial lining to reduce distance of the diffusing gases
 - Moist to dissolve the gases
 - Numerous fine tubules to increase the surface area for gaseous exchange
19. State two ways in which lactic acid formed in the muscles is removed. (2mks)
- Increasing the supply of oxygen to oxidize accumulated lactic acid to carbon dioxide and energy
 - Transporting the lactic acid to the liver where it is converted to glycogen.
20. Explain why several axillary buds sprout when a terminal bud in a young tree is removed (3mks)
IAA/auxins produced by the terminal bud; inhibits growth of lateral buds hence cause apical dominance, when cut the suppression ceases making axillary buds to sprout.
21. Give one example of each of the following;
- Continuous variation (1mk)
 - height
 - weight
 - skin colour
 - Discontinuous variation (1mk) -
 - ABU system
 - Tongue rolling
 - Finger prints
 - male/female/sex

GATUNDU SOUTH
231/1
BIOLOGY
(Theory)

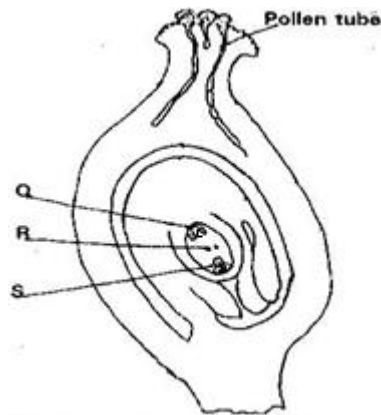
1. Name the kingdom to which the following organisms belong: (2mks).
 - (a). Algae
 - (b). bacteria
2. State three precautions observed when collecting biological specimens. (3mks).
3. Explain how the following factors hinder self pollination in plants:
 - (i) Protogyny (1mk)
 - (ii) Dioecism (1mk)
4. Name the causative agents of the following diseases in humans. (2mks)
 - (a). Amoebic dysentery.
 - (b). Candidiasis.
5.
 - a) Define the term immunity. (1mk)
 - b) Distinguish between natural immunity and acquired immunity. (1mk)
 - c) Identify one immunizable disease in Kenya. (1mk)
6. Study the diagram below and answer the questions that follow.



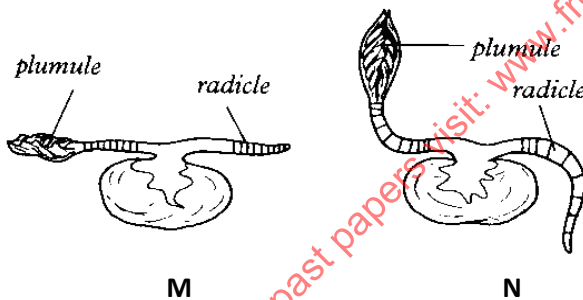
- (a). Name the physiological process being investigated. (1mk).
- (b) State the expected results at the end of the experiment. (2mks).
- (c). Explain your answer in (b) above. (2mks).
7. What happens to glucose synthesized during photosynthesis. (2mks).
8. Give two advantages of polyploidy in plants. (2mks).
9. The diagram below illustrates part of a nephron from a mammalian kidney.



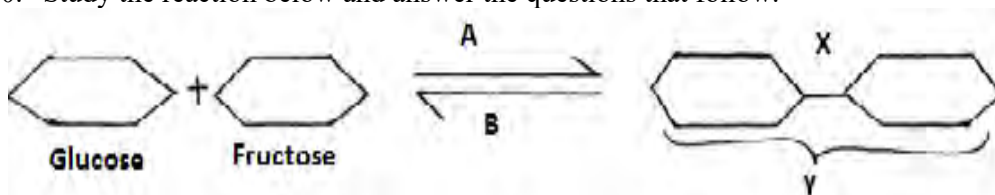
- a) Name the fluid found in the part labeled Q. (1mk)
 - b) Identify the process responsible for the formation of the fluid named in (a) above. (1mk)
 - c) Which two hormones exert their effect in the nephron? (2mk)
10. State three structural differences between Crustacea and Arachnida. (3mks).
11. State three ways in which a respiratory surface is adapted to its function. (3mks).
12. The diagram below shows a stage during fertilization in flowering plant.



- a) Name the parts labeled Q, R, and S. (3 mk)
 - b) State the function of the pollen tube. (1 mk)
13. (a) Where does glycolysis takes place in a cell. (1mk)/
 (b). Name the compound formed during glycolysis. (1mk).
14. An experiment was set to investigate a certain aspect of response. A seedling was put on a horizontal position as shown in figure M below. After 24 hours, the set up was as shown in figure N.



- a) Name the response exhibited. (1mk)
 - b) Explain the curvature of the shoot upwards. (3mk)
15. The paddles of whales and the fins of fish adapt these organisms to aquatic habitats.
- a) Name the evolutionary process that may have given rise to these structures. (1mk)
 - b) What is the name given to such structures? (1mk)
16. a) Name a protein and vitamin involved in blood clotting.
- i) Protein. (1mk)
 - ii) Vitamin (1mk)
- (b). Explain why blood from a donor whose blood group is A cannot be transfused into the recipient whose blood group is B. (2mk)
17. (a). State two effects of Gibberellins on shoots of plants. (2mks)
- (b). Account for loss in dry weight of cotyledons in a germinating bean seed. (1mk).
18. (a) Explain the importance of transport in plants. (1mk)
- (b) What is the role of root hairs in plants? (1mk)
19. Explain why a pregnant woman excretes less urea compared to a woman who is non- pregnant. (2mk)
20. Study the reaction below and answer the questions that follow.



- a) What biological processes are represented by A and B? (2mk)
- b) Identify the product Y. (1mk)
- c) State the bond represented by X. (1mk)
- 21 Explain what happens during the light stage of photosynthesis. (3mk)
22. Explain what happens in humans when the concentration of glucose in the blood rises above the normal level. (3mk)
23. State two characteristics of aerenchyma tissue. (2mks).
24. (a). Name the substance that accumulates in muscles when respiration occurs with insufficient oxygen. (1mk).
- (b). Give the end products of anaerobic respiration in plants. (2mks).
25. What is the importance of carrying out the following procedures when preparing temporary slides in the laboratory? (3mks).
- (a). Adding water to the specimen.
- (b). Staining the specimen.
- (c). Using a sharp blade to make sections.
26. Name the disorder of the mammalian circulatory system that specifically affect: (2Mks).
- (a). Arteries
- (b). Veins.
27. The table below shows the percentage composition by volume of inhaled and exhaled air.

Gas	Inhaled air %	Exhaled air %
Oxygen	21	16
Carbon (IV) oxide	0.04	4.0
Nitrogen	79	79

- (a). By what percentage is carbon (IV) oxide concentration in exhaled air higher than inhaled air. (2mks).
- (b). Explain the difference in the composition of the gases between inhaled and exhaled air. (3mks).

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GATUNDU SUBCOUNTY JOINT EXAMS
BIOLOGY PAPER 2 231/2

SECTION A(40 MARKS)

1. In human beings, the phenotypes and genotypes with respect to the condition of sickle cell anaemia are as follows.

	GENOTYPE
Unaffected	HbSHbS
Sickle cell trait	HbSHbs
Sickle cell anaemia	HbsHbs

- a) Using a punnet square, predict the outcome of a cross between a man and a woman with sickle cell trait. (4 marks).
- b) What are the phenotypic and genotypic ratios? (2 mks)
- c) Name possible sets of chromosomes that can be found in a normal cell. (2 mks)
2. The following is a diagram of an organism

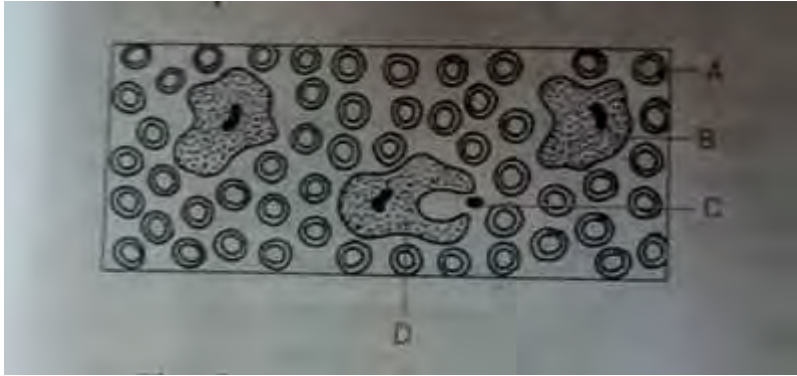


- a). With a reason identify the Kingdom to which the organism belongs (2 mks)
- Kingdom
 - Reason
- b) Identify the part labelled Z and give its function (2 mks)
- c) How does the organism reproduce?(1mk)
- d) State **two** advantages of sexual reproduction. (2 mks)
- e) Define the term prokaryote (1mk).
3. The cells of a certain herbaceous plant were found to have a diameter of 25 μ m. The cells were placed in varying concentrations of sugar solution. The average diameter of the cells in each solution was determined and the results obtained were as shown in the table below.

Concentration of sugar solution	Diameter of cells (μ m)
1%	50
5%	40
10%	30
15%	20

- a.) From these results, determine the concentration of the cell sap. (1 mk)
- b). What term is used to describe the sugar solution whose concentration is equal to that of the cell sap? (1mk)

- c) Give an explanation for the average diameter of the cells placed in 1 % sugar solution. (2mks)
- d) Explain why a plant cell when placed in distilled water will not burst while an animal cell will burst. (2 mks)
- e). Distinguish between diffusion and osmosis (2 mks).
- 4. a) Name **two** digestive enzymes secreted in inactive forms. (2mk)
- b). State **five** adaptations of ileum to its functions. (5 mks)
- c). Describe the meaning of conjugated proteins. (1 mk)
- 5. The diagram below shows a smear of blood on a microscope slide



- a). Identify the structures labelled A, B and C. (3mk)
- b). State the importance of the large numbers of structure A in the blood smear. (1 mk)
- c). Name the process by which structure D would engulf C and state its importance (2 mks)
- d). State **two** adaptations of the structure labelled A to its functions. (2 mk).

SECTION B (40 MARKS)

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

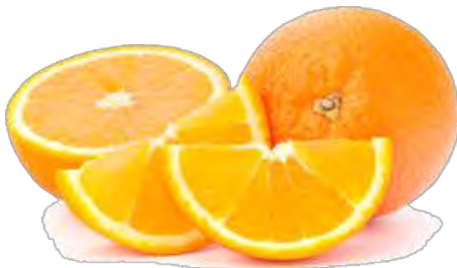
- 6. The table below shows how the quantities of urine and sweat vary with external temperature

External temperature(°C)	Urine (cm ³ /hr)	Sweat (cm ³ /hr)
0	100	5
5	90	6
10	80	10
15	70	20
20	60	30
25	50	60
30	40	120
35	30	200

- a). On the grid provided, plot the quantities of urine and sweat produced against external temperature (7marks)
- b) At what temperature are the amount of sweat and urine produced equal? (1 mk)
- c) What happens to the amount of sweat produced as the temperature rises? Explain your observation (3mks)
- d). Explain the observation made on the amount of urine produced (3mks).
- e) How is the skin adapted for temperature regulation? (6 mks).
- 7. Using a relevant example in each case. describe simple and conditioned reflex actions (20 marks)
- 8. Describe the various causes and effects of air pollution (20 marks)

GATUNDU SOUTH JOINT EVALUATION EXAM
231/3
BIOLOGY
PAPER 3
(PRACTICALS)

1. Study the photograph labeled **Z** of some animals in a certain ecosystem and answer the questions that follow.
 - (a) State the type of biotic relationship shown in the photograph. (1 mark)
 - (b) Identify which of the two animals **M** and **N** will have the least biomass . (1 mark)
 - (c) Give **two** reasons for your answer in (b) above. (2 marks)
 - (d) Explain the concept of “survival for the fittest” in relation to the organisms in photograph **Z** (3 marks)
 - (e) Explain three visible survival adaptive features for the organisms. (6 marks)
 2. You are provided with a food sample labeled solution **Q**. Using the reagents provided; carry out tests to identify the food substance present in the sample [12mks]
 3. (a) In the table below name the mode of dispersal and the features that adapt the specimen(s) to that mode of dispersal. (12 marks)
 - (b) (i) State the type of placentation in specimen **A** (1 mark)
 - (ii) Name the structure labeled **K** in specimen **E** (1 mark)
- Below are photographs of specimens obtained from plants. Examine the photographs.



SPECIMEN A



SPECIMEN B



SPECIMEN C



SPECIMEN D



SPECIMEN E



SPECIMEN F

K

FOR QUESTION ONE



2.

PHOTOGRAPH Z

Confidential

Every candidate will require;

- i) Benedict's solution labeled D
- ii) Dilute hydrochloric acid labeled C
- iii) Sodium hydrogen carbonate solution F
- iv) Copper (ii) sulphate solution E
- v) Access to means of heating

I. PHOTOGRAPH MUST BE COLOURED**PREPARAYION OF SOLUTION Q**

To make 500mls of Q mix 1gram egg albumen concentrate/two eggs with 50 grams sucrose

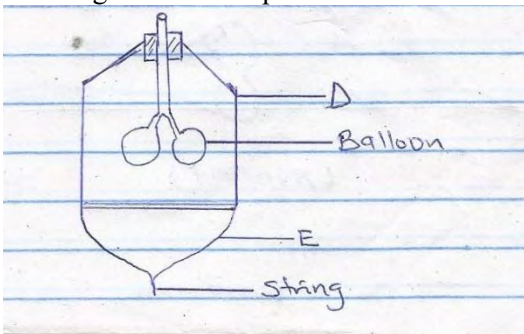
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BIOLOGY
PAPER 1

- State the functions of the following parts of a microscope.
 - Objective lens. (1mk)
 - Diaphragm. (1mk)
- State one use for each of the following apparatus in the study of living organisms.
 - Pooter (1mk)
 - Pitfall trap. (1mk)
- Below is the dental formula of a mammal.

$$\begin{array}{cccc} i & 0, & c & 0, & pm & 3, & m & 2 \\ 4 & & 0 & & 3 & & 3 & \end{array}$$
 - What is the total number of teeth? (1mk)
 - What is the mode of feeding in the mammal? (1mk)
 - Give one reasons for your answer above. (1mk)

- The diagram below represents a model used to demonstrate breathing in mammals.

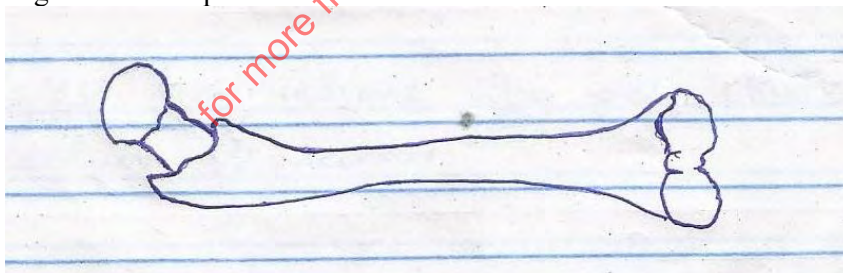


- Name the mammalian structure represented by the parts labeled D and E. (2mk)
 - State the observation made when the string is pulled downwards. (1mk)
 - Explain the observation in (b) above. (1mk)
- $$5C_{51}H_{98}O_6 + 145CO_2 \rightarrow 102CO_2 + 98H_2O + ENERGY$$

The above equation shows an oxidation reaction of food substances.

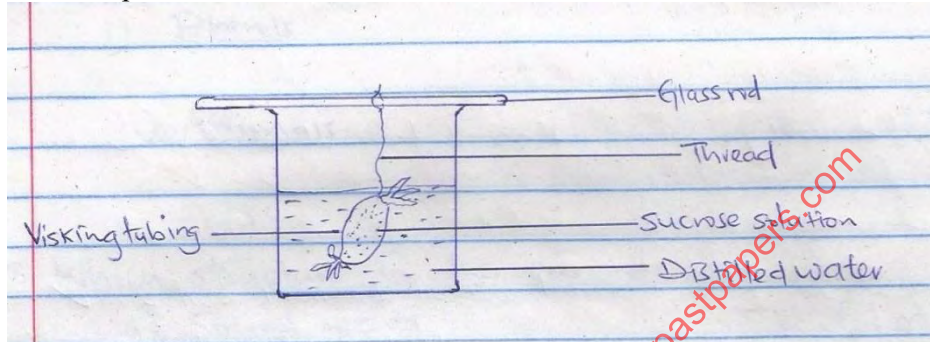
 - Determine respiration quotient of the oxidation of food substances. (2mks)
 - Identify the food substances. (1mk)

- The diagram below represents a mammalian bone.



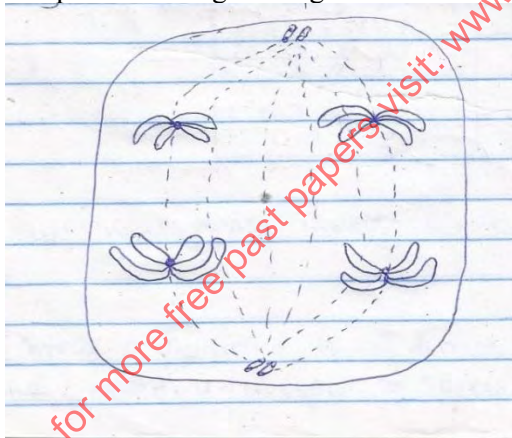
- Name the bone. (1mk)
 - Name the type of the joint formed by the bone at its interior end with adjacent bone. (1mk)
- When are two organisms considered to belong to the same species? (2mks)
 - A shoot of seedling exposed to light one side bends towards the sources of light as it grows.
 - Name the response exhibited by the shoot of the seedling. (1mk)
 - Explain how the bending towards the sources of light occurs. (2mks)
 - State two structural differences between DNA and RNA. (2mks)
 - State two fuctions of DNA molecules. (2mks)
- Suggest two reasons why green plants are included in a fish aquarium. (2mks)

11. a) i) What is meant by the term vestigial structures? (1mk)
 ii) Give examples of a vestigial structure in human. (1mk)
- b) Name the type of evolution illustrated by :
 i) Hind limbs of birds. (1mk)
 ii) Wings of birds and insects. (1mk)
12. Name two process in the human body in which homeostasis is involved. (2mks)
13. a) Explain the absence of the following components in urine of a healthy person.
 i) Glucose (1mk)
 ii) Plasma protein (1mk)
- b) What is the name of the hormone responsible for regulating the level of sodium ions in blood of a mammal. (1mk)
14. a) State two primary functions of the root to plant. (2mks)
 c) Explain the significance of transpiration in plants. (2mks)
15. An experiment was set up as shown below.



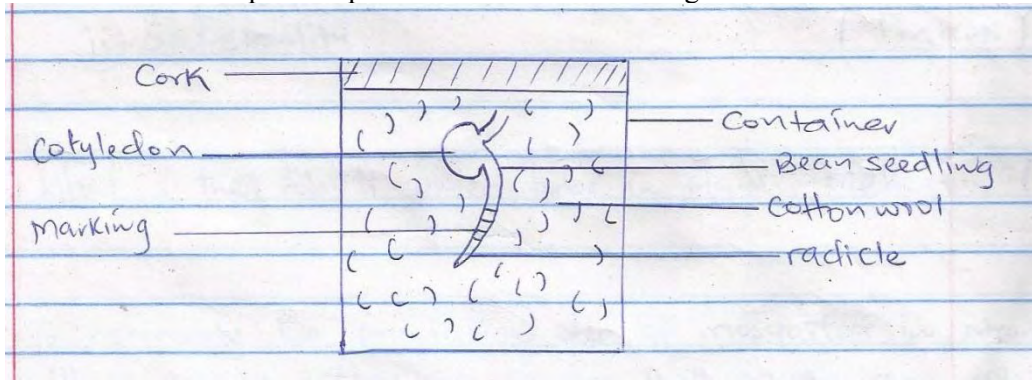
The set up was left for 30minutes.

- a) State the expected results. (1mk)
 b) Explain your answer in (a) above. (3mks)
16. The diagram below represents a stage during cell division.

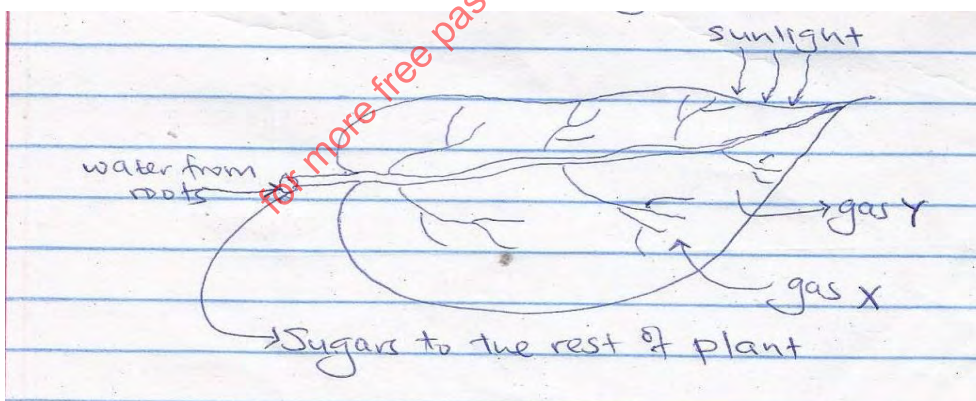


- a) i) Identify the stage of cell division. (1mk)
 ii) Give two reasons for your answer in (a) (i) above. (2mks)
17. Give two reasons in each case why support is necessary in:
 i) Plants (2mks)
 ii) Animals (2mks)
18. Which structure in the ear detects.
 a) Sound waves. (1mk)
 b) Change in position. (1mk)

19. A students set up and experiment as shown in the diagram below.



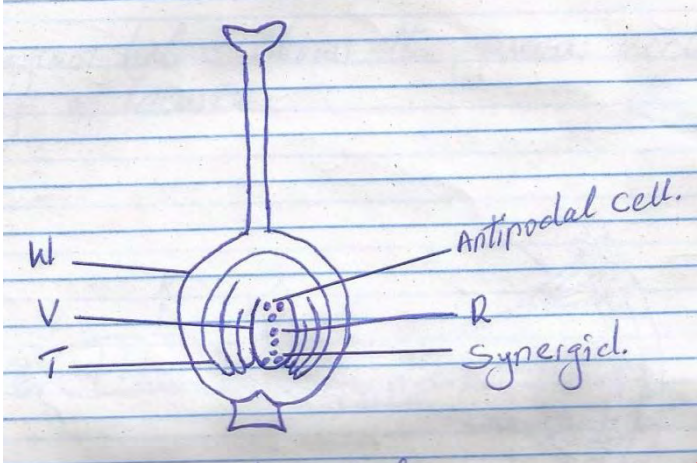
- a) i) What was being investigated in the experiment? (1mk)
 ii) Draw a diagram to indicate the expected results of the experiment after seven days. (1mk)
 iii) Why was it necessary to have wet cotton wool in the container. (1mk)
- b) What is the role of cotyledons in a germinating seed? (1mk)
20. An individual is of blood group B positive. (2mks)
 a) Name the antigens in the individuals' blood. (2mks)
 b) Give the reason why the individual cannot receive blood from blood group A donor. (1mk)
21. a) Explain how the following prevents self-pollination. (1mk)
 i) Dioecism. (1mk)
 ii) Self-sterility (1mk)
 b) What is the role of pollen tube in the plant fertilization? (1mk)
22. To estimate the population size of mosquitoes in Nyansionga village, visiting researchers caught 400 mosquitoes which they marked and released. After 24 hours 200 mosquitoes were caught out of which 80 had the marks. (1mk)
 a) What is the name given to this method of estimating the population size. (2mks)
 b) Estimate the population size of the mosquitoes in the village. (1mk)
 c) State one assumptions that was made during the investigations. (2mks)
23. Name the tissue in plants responsible for. (1mk)
 a) i) Transport of water and mineral salts. (1mk)
 ii) Primary growth. (1mk)
 b) State two ways in which the root hair is adapted to its functions (2mks)
24. The following diagram of a leaf shows what happens in a plant leaf during photosynthesis.



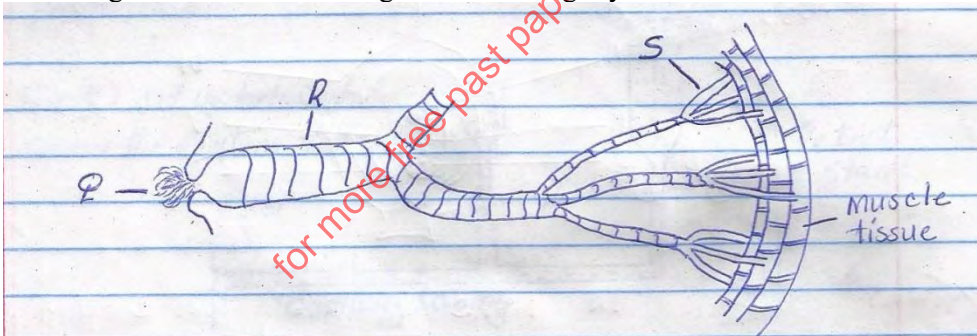
- a) State one way in which leaves are adapted to absorb light. (1mk)
 b) Name the gases labeled X and Y. (2mks)
25. State the functions of the following cell organelles. (2mks)
 a) Golgi apparatus. (1mk)
 b) Ribosomes (1mk)
26. Explain why it is an advantage for plant to store carbohydrates in form starch rather than as glucose. (2mks)

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BIOLOGY
PAPER 2

1. In a certain plant species which is normally green, a recessive gene for colour (n) causes the plant to be white in colour. Such plants die at an early stage. In the heterozygous state, the plants are pale green in colour but grow to maturity.
 - a) Give a reason for the early death of the plant with homozygous recessive gene. (2mks)
 - b) If a normal green plant was crossed with the pale green plant, what would be the genotype of the first filial generation (F₁ generation) ? show your working? (4mk)
 - c) If heterozygous plants were self-pollinated and the resulting seed planted, work out the proportion of their offspring that would grow to maturity. (2mks)
2. The diagram below illustrates the structure of the female parts of a flower.

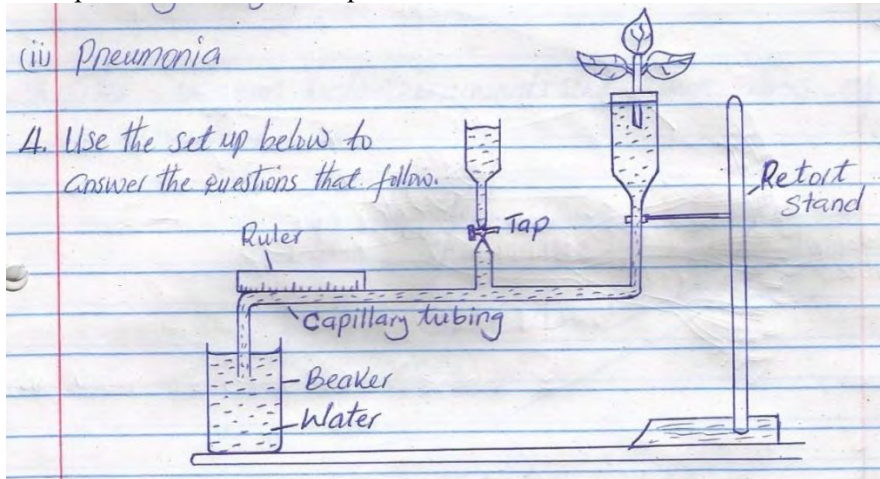


- a) Name the part labeled W. (1mk)
 - b) Describe what happens when the pollens tube enters the structures labeled V. (4mks)
 - c) What do the structures labeled R and T develop into after fertilization? (2mks)
 - d) Name the flower part that produces the male gametes. (1mk)
3. The diagram below shows the gaseous exchange system of a locust.



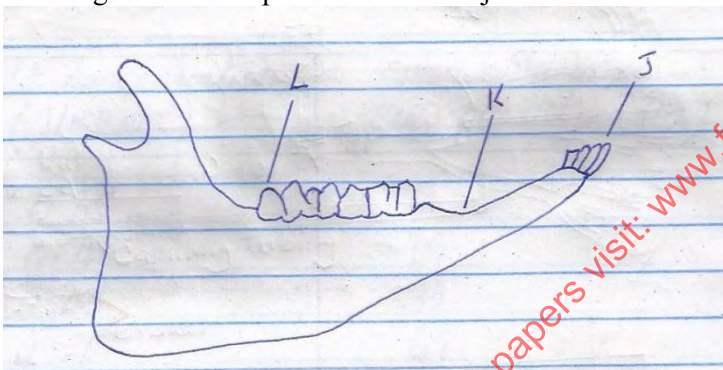
- a) Name the structure labeled Q. (1mk)
- b) State the function of the part labeled R. (1mk)
- c) How is the part labeled S structurally adapted to its function? (2mks)
- d) Identify the structure that perform the same function as one illustrated above in . (2mks)
 - i) Amoeba
 - ii) Fish
- e) Name the causative agents for the following respiratory. Diseases (2mks)
 - i) Whooping Cough.
 - ii) Pneumonia.

4. Use the set up below to answer the questions that follow.



- a) What process was being investigated? (1mk)
- b) i) State one precaution that should be taken when setting up the experiment. (1mk)
- ii) Give a reason for the precaution stated in b(i) above. (1mk)
- c) State three environmental factors that influence the process under investigation. (3mks)
- d) Give two importance of the process named in (a) above (2mks)

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



- a) Name the mode of nutrition of the mammal whose jaw is shown. (1mk)
- b) State one structural and one functional differences between the teeth labeled J and L. (2mks)
- c) i) Name the toothless gap labeled K. (1mk)
- ii) State the function of the gap. (1mk)
- d) Name the substance that is responsible for hardening of teeth. (1mk)
- e) Distinguish between the terms homodont and heterodont. (2mks)

SECTION B: 40MKS

6. An experiment was carried out to investigate plasmolysis in onion epidermal cells. The epidermal cells were placed in different concentrations of sodium chloride solution. The percentage of plasmolysis cells was determined after 30 minutes. The results were as shown in the table below.

Salt concentration (g/100cm ³)	Onion epidermal cells plasmolysis(%)
0.35	0
0.40	15
0.45	30
0.50	69
0.55	82
0.60	91
0.65	100

On the grid provided plot a graph of:

- i) Plasmolysis epidermal cells against salt concentration. (6mks)

- ii) At what concentration of salt solution was the proportion of plasmolysis cells equal to non-plasmolysis cells. (1mk)
- iii) State the salt concentration at which 45% of the cells are plasmolysed. (1mk)
- b) Account for the results obtained at:
- i) 0.35% salt concentration. (3mks)
- ii) 0.65% salt concentration. (3mks)
- c) i) What does the term plasmolysis mean? (1mk)
- ii) Name the process by which plasmolysis is reversed. (1mk)
- d) Does plasmolysis occur in animal cells. Explain (2mks)
- e) What is the relationship between molar concentration of the salt solution and the percentage of plasmolysis cells. (2mks)
7. a) i) Distinguish between epigeal and hypogeal germination. (1mk)
- ii) Why is oxygen necessary in the germination of seeds. (2mks)
- b) State two factors that cause seed dormancy. (2mks)
- c) Describe the role of hormones in the growth and development of plants. (15mks)
8. How is the human eye adapted to its function . (20mks)

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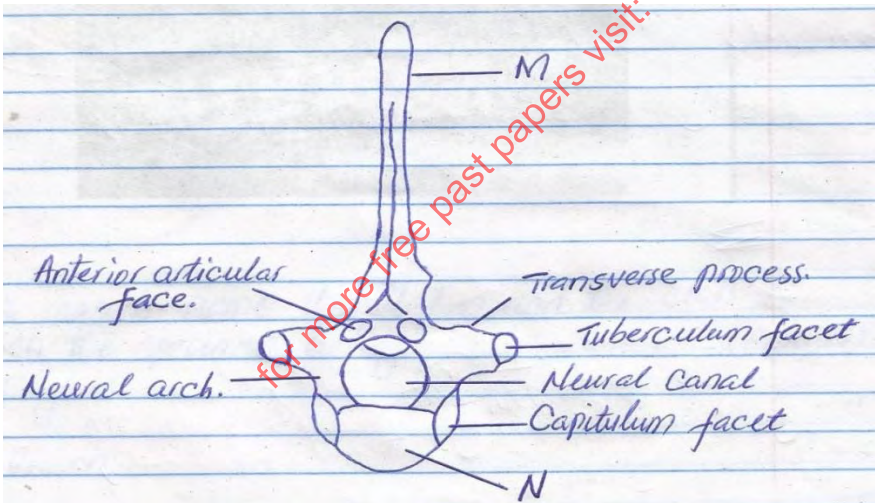
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231/3/
BIOLOGY
PAPER 3
(PRACTICAL)

1. You are provided with specimen labeled **K** make transverse section of the specimen using the scalpel provided.
 - a) Draw a well labeled diagram of the section. (3mks)
 - b) i) What type of placentation is displayed by the above specimen. (1mk)
 - ii) Identify the method of dispersal of the above specimen. (1mk)
 - iii) Give a reasons for your answer in b(ii) above. (1mk)
 - c) Squeeze the juice out of the specimen provided and carryout food test using the reagent provided. (12mks)
2. You are provided with specimens **Q** and **S**.
 - a) With reasons state the class to which each at the specimen belong.

Q	
Class	(1mk)
Reason	(1mk)
S	(1mk)
Class	(1mk)
Reason	(1mk)
 - b) State the type of germination exhibited by specimen. (2mks)

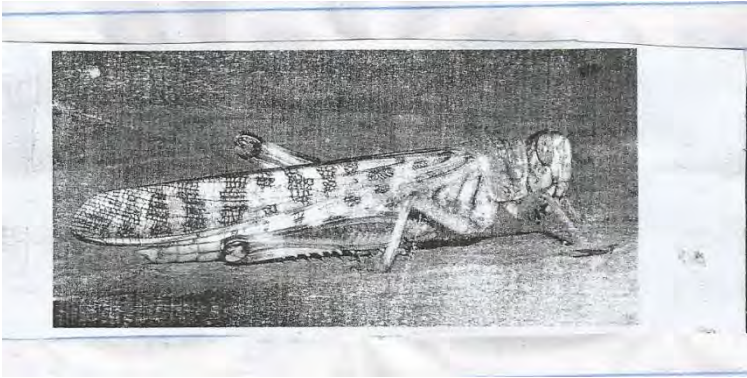
Q	
S	
 - c) Cut a transverse section of the stem of specimen **Q**. Using a hand lens draw a plan diagram of the section. (4mks)
 - d) i) Which of the seedlings may form swellings on the roots later in their life? (1mk)
 - ii) Name the organism that are found in the swelling and give their roles. (2mks)

Organism	
Role	
3. i) The diagram below shows a mammalian vertebra.



- a. Name the parts labelled : (2mks)
- b. State one function of the neural canal. (1mk)
- c. Name the region of the body from which the bone was obtain. (1mk)
- d. Which bone articulates (is fused) at the capitulum and tuberculum facets. (1mk)

ii) Below is a photograph of specimen L.



With reasons name the phylum and the class to which the specimen belongs. (4mks)

Phylum

Reason

Class

Reason

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BIOLOGY

PAPER 3

JULY/AUGUST 2018

CONFIDENTIAL INSTRUCTIONS TO ALL SCHOOLS.

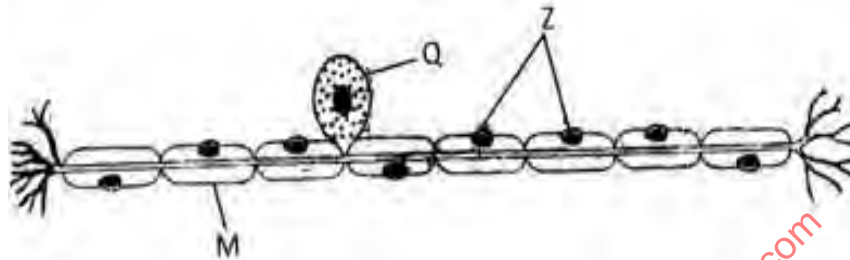
Each student will be required to have the following.

- A mature orange labeled specimen. **K**
- A scaped /razor blade.
- A 100 ml beaker.
- Iodine solution with a dropper.
- Sodium hydroxide (10% NaOH) with a dropper.
- 1% copper(ii) sulphate with a dropper.
- Benedicts solution with a dropper.
- DCIPIP solution with a dropper.
- Four test tubes.
- Test tube rack.
- Test tube holder.
- Means of heating.
- A ruler.
- A bean seedling labeled **Q**.
- A maize seedling labeled **S**.

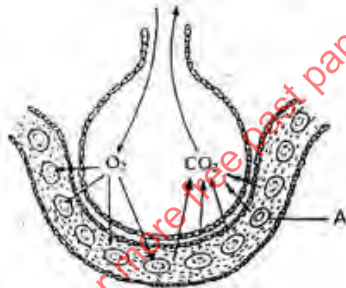
❖ **NB: The seedlings should be planted three or two weeks before the day of the practical.**

**CEKENA
BIOLOGY
231/1**

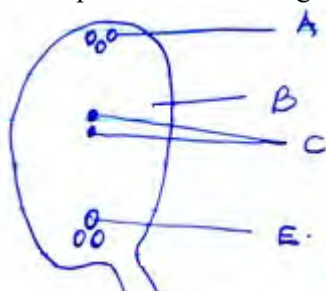
1. a) Name the causative agent of cholera. (1mk)
- b) Name the kingdom into which prokaryotes are placed. (1mk)
- c) State two characteristics used to classify arthropods in their classes. (2mks)
2. i) Name the main product of the dark stage of photosynthesis. (1mk)
- ii) State the importance of chlorophyll in photosynthesis. (1mk)
3. Describe the path taken by Carbon (IV) Oxide molecule from an actively respiring tissue in an insect to the atmosphere. (3mks)
4. The diagram below represents a cell.



- a) Identify with a reason the type of neuron above (1mk)
- b) Name the parts labeled (2mk)
5. a) What is fertilization? (1mk)
- b) Explain how double fertilization takes place in plants. (3mks)
6. Name the cell organelle which would be abundant in: (2mks)
- i) Sperm cell: _____
- ii) Pancrease: _____
7. a) State the reason for the following adaptations of the xylem vessels. (2mks)
- i) Narrow lumen
- ii) Lack of cross walls
- b) State two distinguishing features of the phloem sieve tubes. (2mks)
8. The diagram below shows the exchange of gases in alveolus



- a) State how the alveoli are adapted to their function (3mks)
- b) Name the cell labeled (1mk)
9. Name two hormones involved in osmoregulation (2mks)
10. Define the following terms as used in ecology (3mks)
- i) Ecological niche
- ii) Biosphere
- iii) Population
11. The diagram below shows a pollen tube entering the ovule of a flowering plant.



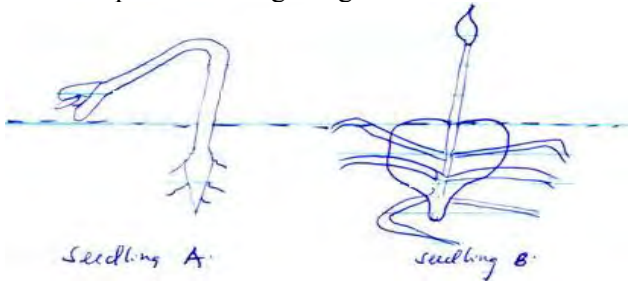
State what happens to B, C and E after fertilization. (3mks)

12. During oxidation of certain food substances, the respiratory quotient was found to be 0.718

i) Name the type of food substance being oxidized (1mk)

ii) State two advantages of using the food substances named. (2mks)

13. The diagram below represents a stage of growth in two different seeds.



a) Identify the type of germination exhibited by seedling A and B. (2mks)

b) State role of oxygen in germination (1mk)

14. a) Define sex-linkage (1mk)

b) Name two traits linked to Y chromosome in human being. (2mks)

15. a) Distinguish between homologous and analogous structure. (2mks)

b) Explain the term continental drift as used in evolution. (2mks)

16. State three features of a vertebra. (3mks)

17. Give reason why each of the steps is followed when preparing a cross section of a leaf for examination under a microscope (4mks)

a) Cutting very thin sections

b) Using sharp razor blade when cutting

c) Pacing section in water

d) Staining section before observing under microscope

18. State three importance of osmosis in plants (3mks)

19. State two reasons why the pressure of blood is greater in arteries than in veins. (2mks)

20. Name a disease caused by lack of each of the following in human diet (2mks)

i) Vitamin B2

ii) Iodine

21. Sugar appears in the urine of a diabetic person. Explain (3mks)

22. State on adaptation of the following parts of mammalian eye (3mks)

i) Forea Centralis

ii) Sclera

iii) Ciliary body

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

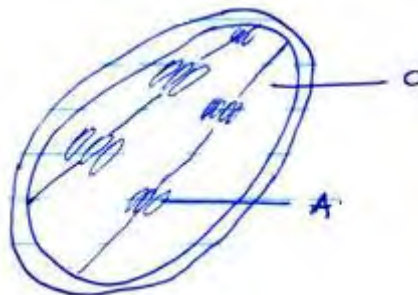
24. State the importance of the following plant excretory products. (3mks)

a) Rubber

b) Papain

c) Quinine

25. The diagram below represents a chloroplast. Study it and answer questions that follow.



a) Name the part labeled c (1mk)

b) List down the process that takes place in structure A (1mk)

c) List two structural differences between the above organelle and mitochondria (2mks)

26. State two functions of muscles found in alimentary canal of a mammal (2mks)

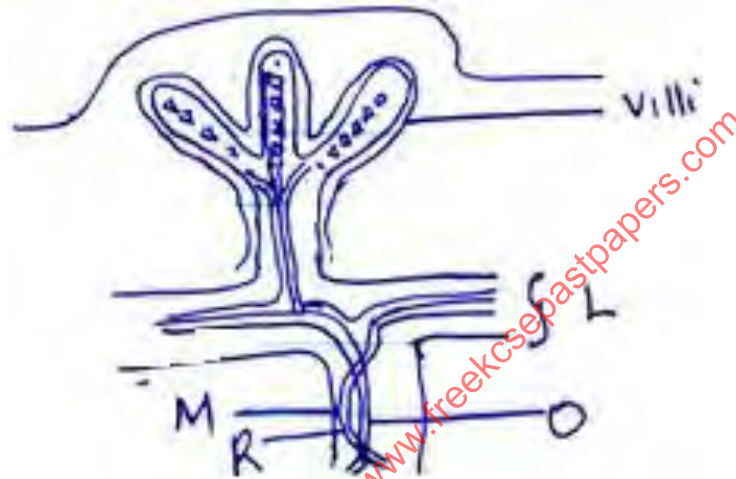
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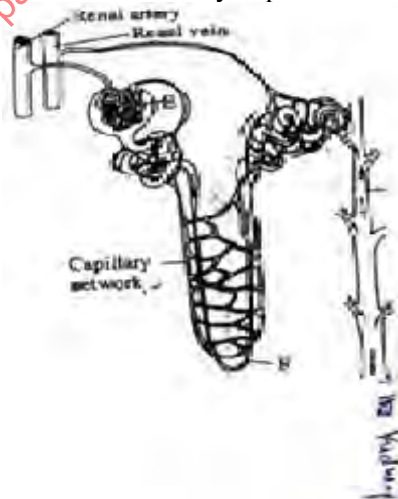
231/2

SECTION A

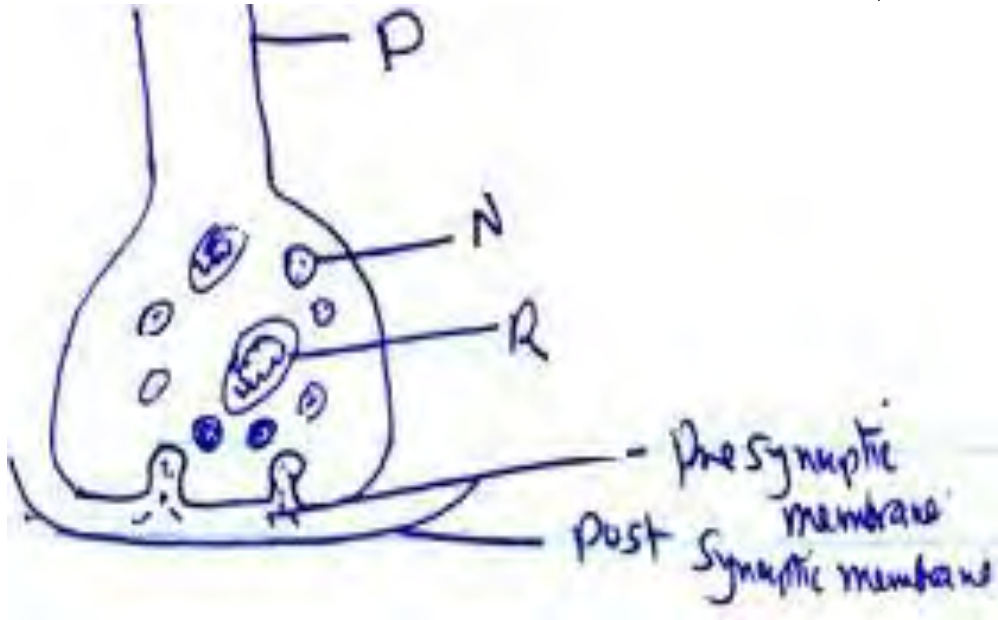
1. When pure breeding black guinea pigs were crossed with pure breeding white guinea pigs the offspring had a coat with black and white patches
 - a) Using letter G to represent the gene for black coat colour and letter H for the white colour, work out the genotypic ratio of F₂ (5mks)
 - b) State the phenotypic ratio of F₂ generation (1mk)
 - c) Name the term used when two alleles in heterozygous state are fully expressed phenotypically in an organism. (1mk)
 - d) Give an example of a trait in human beings where the condition whose term is named in (c) (i) above expresses itself.
2. The diagram below illustrates the structure of a placenta



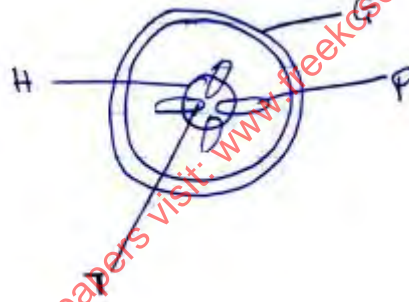
- a) Name the part labeled L and M (1mk)
 - b) Explain two functions of the above structure (2mks)
 - c) Name one substance that is not allowed to pass through the placenta to the uterus (1mk)
 - d) State and explain what may happen if the ovaries of a human are removed before and after the first four months of her pregnancy. (3mks)
3. The diagram below illustrates the structure of the kidney nephron



- a) Name the part labeled E (1mk)
 - b) How is part labeled F adapted to its function (4mks)
 - c) State three physiological mechanism of controlling the human body temperature during cold day (3mks)
4. a) Name one type of neurone (1m)
- b) The diagram shown is a structure of a synapse



- Name the parts labeled R and N (2mks)
 - Give the function of the structure labeled R (2mks)
 - Explain what happens immediately an impulse reaches a synaptic knob (3mks)
 - What is a reflex action (1mk)
5. Below is a cross section through a plant organ. Use it to answer question that follows



- Giving a reason identify the figure shown above (2mks)
- State three characteristics of the tissue labeled H (3mks)
- Name one substance transported by part labeled P (1mk)
- State the function of part G (1mk)
- Name the substance used to strengthen part labeled T (1mk)

SECTION B

Question 6 is compulsory and either 7 or 8 in the space provided

6. The data below was obtained by measuring the length of a playing mantis after birth until it was mature

Time in days	0	6	7	14	17	22	25	30	35
Length in mm	3	5	17	18	29	31	52	55	65

- Draw a curve of length of the insect against time. (6mks)
- Identify the type of curve drawn (1mk)
- Explain what happened on day 7 and 15
 - Day 7 (4mks)
 - Day 15 (3mks)
 - Name the structure responsible for type of growth indicated by the shape of the curve (1mk)
 - State one function of the structure you named in (c) (iv) above (1mk)
- Name the stage demonstrate between day 7 and 17 (1mk)
 - Give the name of the hormone responsible for the stage named above (1mk)
- How many of such cycles does the organism above undergo before reaching maturity (1mk)
- Name the phylum of the organism having such growth curve. (1mk)

7. a) State four characteristics of gaseous exchange surfaces (4mks)
b) . Describe the mechanism of gaseous exchange of a mammal. (16 mks)
8. Describe various evidences which show that evolution has taken place. (20mks)

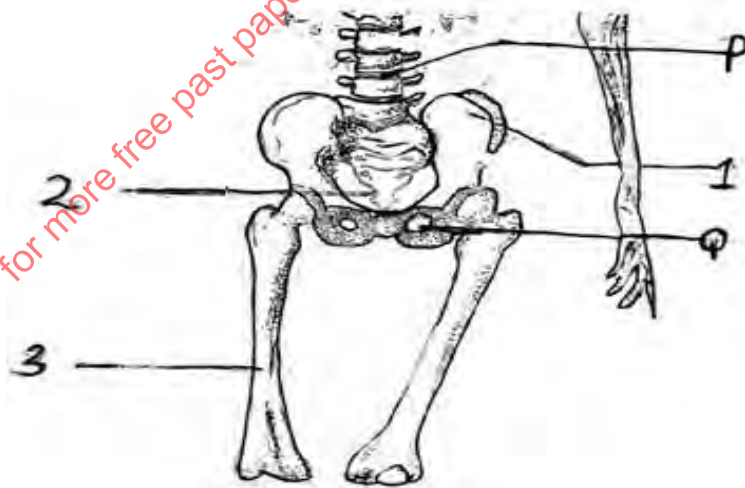
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BIOLOGY

231/3

BIOLOGY PAPER 3

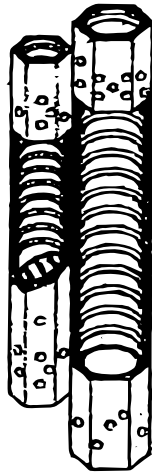
1. You are provided with a chart marked Q which is a representation of a variety of organisms in different habitats and a transparent square paper. Use them to answer the questions which follow.
- From the chart, identify two classes of organisms which belong to the same phylum as insecta (2mks)
 - Work out the area of the transparent paper provided in centimeters (2mks)
 - Place the transparent paper at each of the four corners of the chart labeled A_D, each time counting the number of members of class insecta enclosed. Record your counts in the table below. (4mks)
 - Use the counts above to estimate the population size of members of class insect in the chart. (4mks)
 - Name the method used above to estimate the population of insects (1mk)
 - Suggest the possible habitats from which the organisms in the chart were obtained (2mks)
 - Name a suitable instrument which would be useful to an entomologist to capture the members of class insect in the chart provided. (1mk)
2. a) You are provided with specimen T (Irish potato) peel it and cut it into two equal halves and label them C₁ and C₂. Crush C₁ using mortar and pestle, add 10ml of water, decant the solution in a beaker and divide it into two as Sol₁ and Sol₂ in two test tubes.
- Describe the procedure for starch test. (3mks)
 - Test for starch in Solution 1, give your observation and conclusion (2mks)
- b) i) Describe the procedure for testing reducing sugars (2mks)
- Test for reducing sugars in solution 2, give your observation and conclusion (2mks)
- c) i) Cut C₂ into two cubes measuring 1cm by 1cm. Label them K₁ and K₂. In a 20ml measuring cylinder put 5ml of hydrogen peroxide and put K₁. Record the volume of foam produced after 2 minutes (1mk)
- Volume
- Empty the measuring cylinder and clean it. Cut K₂ into tinny pieces and put them in a measuring cylinder with 5ml of hydrogen peroxide. Record the volume of foam produced in K₂ (1mk)
- Volume
- Account for the different in volume produced by K₁ and K₂ (2mks)
3. Below is a photograph obtained from the pelvic region of a human being and showing some bones of the vertebral column. Examine it carefully and answer the questions that follow.



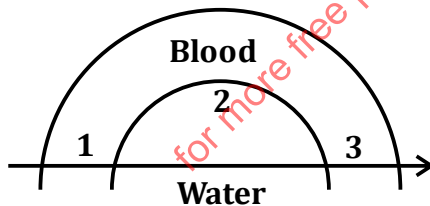
- Identify the bones labeled 1, 2 and 3 (3mks)
- Name the type of joint formed at the proximal end of bone 3 as it articulates with the adjacent bone. (1mk)
 - Give an observable feature on bone 3 for your answer in (b) (i) above (1mk)
- Identify the part labeled P (1mk)
 - Give two functions of the part identified in (c) (i) above (2mks)
- Using observable features only, state how bone 1 is adapted to its functions. (2mks)
- Identify the part labeled Q (1mk)
 - Give the function of the part labeled Q (1mk)

GRAPHICS
231/1
BIOLOGY
 (Theory)

1. Name two cells which line the trachea, bronchus and bronchioles of a mammal and play a role during gaseous exchange . (2 mark)
2. a) The bryophytes are normally small plants with a maximum height of 2 - 3 cm. Suggest why they never grow bigger. (2 marks)
- b) In terms of alternation of generation, how does the moss plant differ from the ferns. (1 mark)
3. In mammals haemoglobin is confined to red blood cells. Give two advantages of this . (2 marks)
4. A man was involved in an accident and got a head injury. When he reached the hospital he was not able to breath properly.
 - a) Which part of the brain has been damaged. (1 marks)
 - b) State two other functions of the part of brain named in (a) above. (2 marks)
5. The cells shown below are adapted for transport in flowering plants.

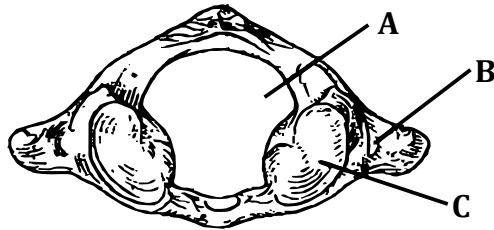


- a) Name the tissue in which these cells are found. (1 mark)
 - b) Identify and explain two observable features of these cells that adapt them to their function in transport. (2 marks)
6. The figure below shows parallel flow across a gill plate of a bony fish.

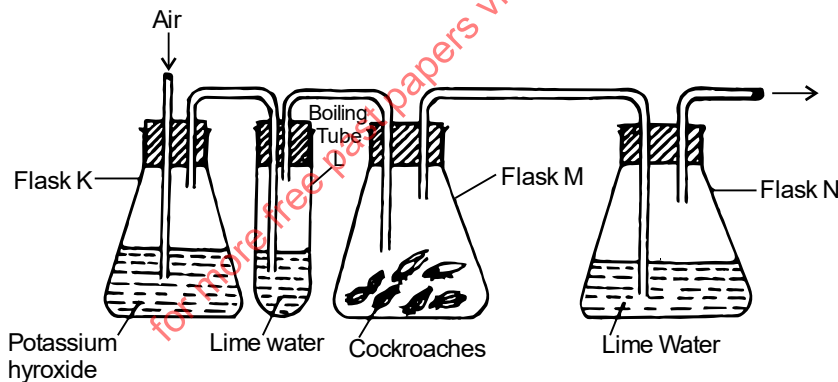


- a) At which point is the
 - i) highest diffusion of oxygen. (1 mark)
 - ii) Most oxygenated blood. (1 mark)
 - b) State the reason why counter current flow in a bony fish achieves the highest concentration of gases exchanged. (1 mark)
7. Name the part of the eye that secretes the aqueous humour. (1 mark)
- b) State two functions of aqueous humour. (2 marks)
 - c) Give one difference between the fovea and the blind spot. (1 mark)
8. a) Name the cells that are protected by the root cap against mechanical damage by soil particles. (1 mark)
- b) State two characteristics of the cells mentioned in (a) above. (2 marks)

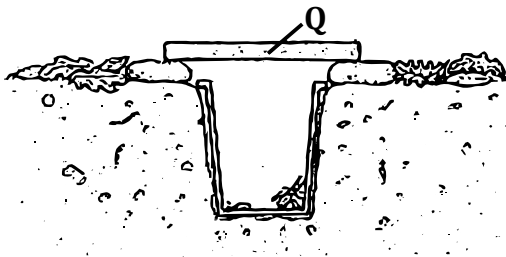
9. The diagram below shows a mammalian bone.



- a) With a reason, identify the bone. (2 marks)
 Identify
 Reason
- b) Identify each of the parts labelled A and B. (2 marks)
- c) State the function of the part labelled C. (1 mark)
10. From potato whose cell sap was 30% sugar were obtained two potato cylinders labelled A and B. A was placed in a solution of 10% sugar concentration while B was placed in 50% sugar concentration.
- a) What change was expected in cylinder B. (1 mark)
- b) Account for the change expected in potato cylinder A. (3 marks)
11. a) State two internal conditions necessary for germination of a seed. (2 marks)
- b) State one way in which viability of seeds is lost. (1 mark)
12. Give the structure of the cell that perform the following functions.
- a) Synthesis of ribosome. (1 mark)
- b) Regulate exchange of substances in and out of the nucleus. (1 mark)
13. State the functions of the following hormones in human male reproductive system.
- a) Follicle stimulating hormone. (1 mark)
- b) Luteinising hormone. (1 mark)
14. a) The diagram below represents a set-up that students used in an investigation.

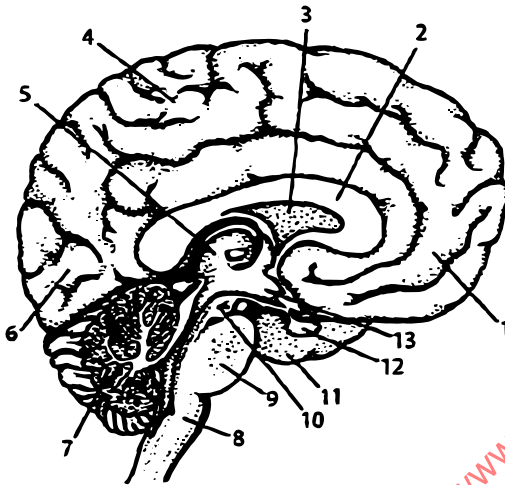


- a) Name the physiological process that was being investigated. (1 mark)
- b) i) What observation would be made in boiling tube L. (1 mark)
- ii) Give reason for your answer in b(i) above (1 mark)
15. a) The diagram below represents the apparatus used by a biologist.



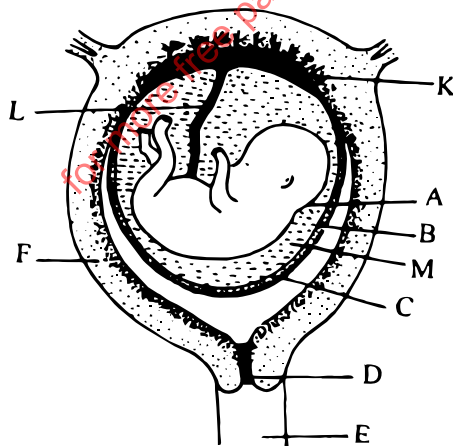
- a) Identify the apparatus. (1 mark)

- b) What is the role of the part labelled Q. (1 mark)
16. Explain each of the following
- a) variegated plants accumulate less food than non-variegated plants under similar conditions. (2 marks)
- b) A leaf cannot be tested for starch by adding iodine solution directly. (2 marks)
17. Explain the role of the salivary gland in the digestion of food in a mammal. (3 marks)
18. A student came across a piece of food substance and he suspected that it contains lipids. He took it to Biology laboratory and asked the teacher to provide him with an apparatus to investigate whether the food substance contained lipid. The teacher provided him with a filter paper and source of heat. Describe an experiment that he would do using the apparatus to confirm the presence of lipids in the food substance. (4 marks)
19. State the biological significance of each of the following in the digestive system.
- i) Emulsification of lipids. (1 mark)
- ii) Presence of calcium in herbivores. (1 mark)
- iii) Thin epithelium of the ileum. (1 mark)
20. The diagram below shows part of the human brain.



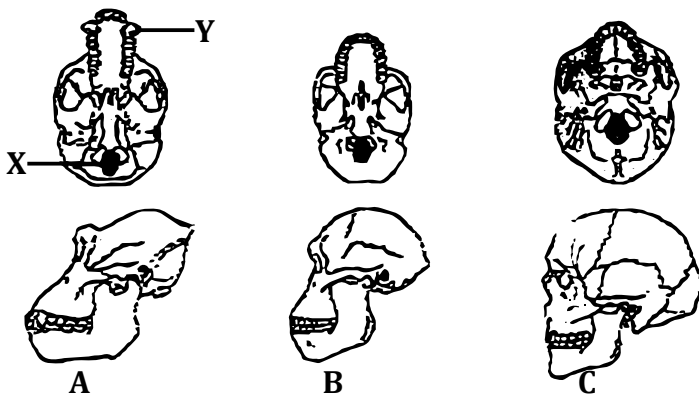
Which of the numbers represent structures responsible for

- i) control of the heart rate. (1 mark)
- ii) regulation of the blood pressure. (1 mark)
21. The diagram below illustrates the relationship between developing foetus and the maternal tissues.

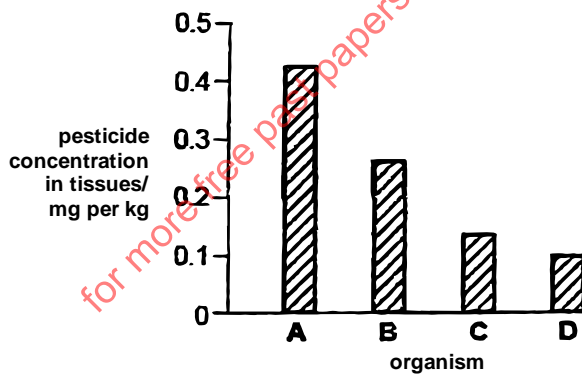


- a) Name the part labelled C. (1 mark)
- b) State the function of the part labelled L. (2 marks)

22. The diagram below represents the fossilised skulls of three different species of primates. They were either bipedal or quadrapedal.



- a) What do you understand by the term quadrapedal animal? (1 mark)
- b) Which of the skull (A, B or C) belong to a quadrapedal primate? (1 mark)
- c) Explain how the change in the skull from B to C could indicate a change in intelligence. (1 mark)
23. Distinguish between dioecious and monoecious plants. (1 mark)
- b) What are disadvantages of self-pollination in plants. (3 marks)
24. a) What is the importance of a test cross? (1 mark)
- b) What would be expected results from a test cross. (2 marks)
25. This is a food chain extracted from a certain ecosystem.
Mango tree → caterpillars → sparrow → hawk.
- a) Draw a pyramid of numbers for this feeding relationship. (1 mark)
- b) The concentration of pesticides in the tissues of the organism in the food chain was measured and the results plotted as shown in the bar graph below.



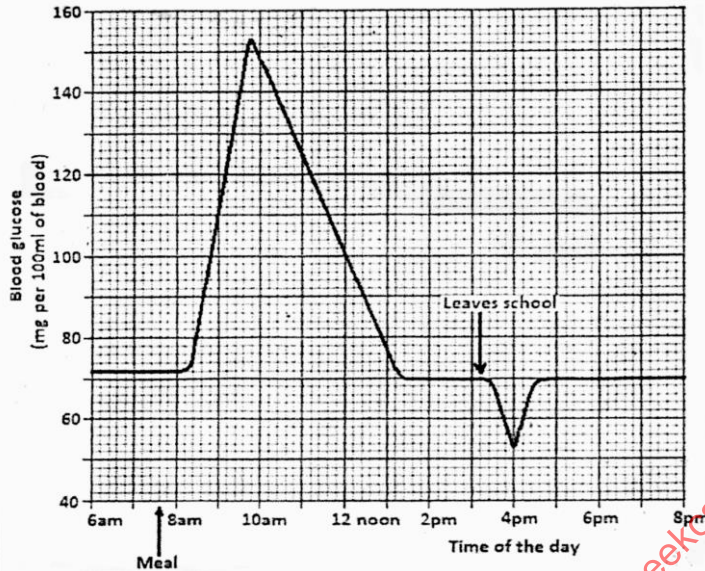
- i) Which organism in the bar chart is sparrow? (1 mark)
- ii) Give reason for your answer. (2 marks)
26. Name the material (s) that strengthen the following supporting tissues in woody plants
- i) Collenchyma (2 marks)
- ii) Sclerenchyma (1 mark)

GRAPGICS
231/2
BIOLOGY
Paper 2
(Theory)

SECTION A : (40 marks)

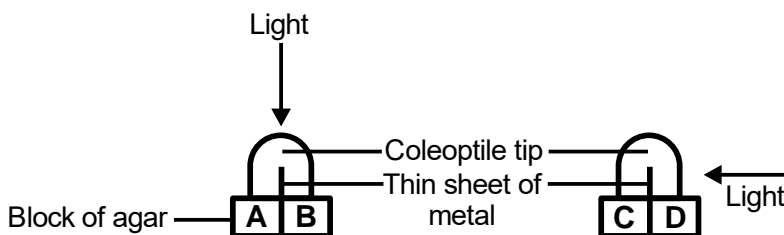
Answer ALL the questions in this section in the spaces provided.

1. The graph below shows the blood glucose concentration of a boy over 14 hours.

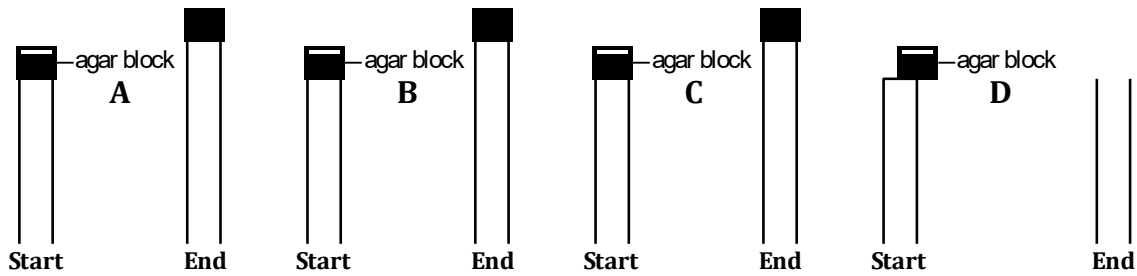


- a) The boy had a meal at about 7:45 am
 - i) What was the boy's blood glucose concentration before this meal. (1 mark)
 - ii) What was the boy's maximum blood glucose concentration after this meal. (1 mark)
 - b) After the meal the boy's pancreas secreted a hormone that helped to remove excess glucose from the blood and store it.
 - i) On the graph mark with letter G when the pancreas started to secrete the hormone. (1 mark)
 - ii) State the form in which glucose is stored in the body. (1 mark)
 - iii) State one organ in the body where this storage occurs (1 mark)
 - c) On the way home from school the boy was involved in a fight.
 - i) State what happened to the boy's glucose concentration at the start of the fight. (1 mark)
 - ii) During the fight the boy's body produced another hormone which prepared him for the fight. Name the hormone. (1 mark)
 - iii) State one effect this hormone had on the boy's body. (1 mark)
2. a) What is Taxis response. (1 mark)
- b) Give an example of : (1 mark)
- i) Aerotaxis (1 mark)
 - ii) Rheotaxis. (1 mark)
- c) An oat seedling has a protective sheath (the coleoptile) which is frequently used as convenient plant material for experiments on phototropism.

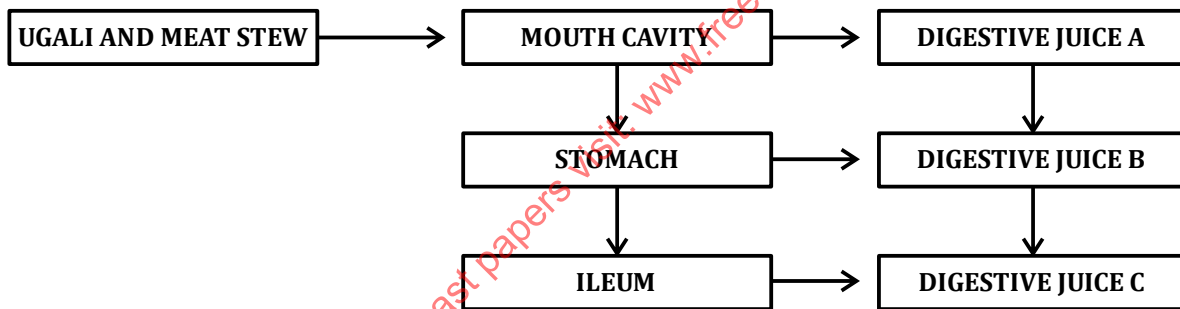
An experiment was carried out in which the tips of oat coleoptiles were removed and placed on blocks of agar. The agar blocks underneath each coleoptile were divided by thin sheets of metal. The tips of the coleoptiles were either illuminated evenly from above or from the right during this initial treatment period. The experiment set-up is shown in the diagram below.



After the treatment outline above the agar blocks then were paced on decapitated coleoptiles. The diagram below shows the height of the coleoptiles, initially (just after placement of the agar blocks) and finally (after 48 hours)



- i) Complete the diagram above by drawing a result for the agar block D. (1 mark)
 - ii) Account for your answer in c(i) above. (3 marks)
 - iii) Explain the reason for the inclusion of blocks A and B in the experiment (1 mark)
3. In 4 O'clock plant, a white flowered plant was crossed with a red flowered plant. When the F1 plants were crossed 204 white, 418 pink and 196 red were obtained .
- a) i) What is the phenotype (s) of the F1 plants. (1 mark)
 - ii) Using letter R to represent the gene for red colour and letter W to represent the gene for white colour, work out the genotypes of F2 plants. (4 marks)
- b) i) Name the disorder in humans that is due to non-disjunction. (1 mark)
- ii) Give the scientific name of the garden pea plant. (1 mark)
4. The diagram below represents passage of a meal through the human digestive system. Study it and answer the questions that follow.



- a) Name the physical process that will occur in mouth cavity. (1 mark)
 - b) Name the digestive juices B and C (2 marks)
 - c) Explain two ways in which the digestive system is protected from corrosive effects of digestive juice. (2 marks)
 - d) Name the hormone that stimulates secretion of juice B. (1 mark)
 - e) Identify the contents of digestive juice A. (2 marks)
5. The table gives information about the distributions of lichens in and around a city. Atmospheric sulphur (IV) oxide (SO₂) levels and the pH of rainwater were also recorded.

Distance from city centre (km)	Number of lichen species per km ²	Atmospheric SO ₂ concentration (Ng/m ³)	pH of rainwater
0 - 1.5	0	240	4.6
1.6 - 3.0	1	220	4.8
3.1 - 4.5	7	185	5.0
4.6 - 6.0	13	120	5.5

- a) Describe the relationship between each of the following:
- i) Distance from the city centre and the number of lichen species per km² (2 marks)
 - ii) Distance from the city centre and atmospheric sulphur (IV) oxide concentration. (2 marks)
 - iii) Atmospheric sulphur (IV) oxide concentration and rain water pH. (2 marks)
- b) Calculate the average decrease in atmospheric sulphur (IV) oxide concentration per kilometre over the 6km from the city centre. (2 marks)

SECTION B (40 marks)

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

6. The data shows the effect of age on basal metabolic rate (BMR) in males and females.

Age (years)	Basal Metabolic Rates (kJm ⁻² hr ⁻¹)	
	Males	Females
Birth (0)	225.0	225.0
10	237.5	237.0
20	212.5	200.0
30	200.0	187.5
40	175.0	162.5
50	162.5	150.0
60	155.0	145.0
70	150.0	140.0
80	145.0	135.0

- a) Plot a graph of basal metabolic rate against age (years). (8 marks)
- b) Under what conditions should BMR be measured. (1 mark)
- c) Suggest an explanation for each of the following:
- i) The high BMR between the ages of 0 and 5 years. (1 mark)
 - ii) The difference in BMR between males and females above the age of 5 years. (2 marks)
 - iii) The change in BMR after the age of 45 years. (2 marks)
- d) Aerobic respiration is known to be a more efficient type of respiration with minimal negative effects. Give reasons for this observation. (3 marks)
- e) i) State the product (s) of the first phase of Aerobic respiration. (1 mark)
- ii) State the sites for the following processes. (2 marks)
- Glycolysis
- Kreb's cycle

Answer any ONE of the Questions 7 or 8.

7. Describe how the cervical, lumbar and thoracic vertebrae are suited to their functions. (20 marks)
8. Describe the mechanism of transport of carbon (IV) oxide in mammalian blood. (20 marks)

GRAPHICS
BIOLOGY
Paper 3
(Practical)

1. You are provided with olive oil, liquids labelled L₁ and L₂ and Irish potato. Label two test tubes A and B. Place 2cm³ of water into each test tube. Add 8 drops of olive oil into each test tube. To test tube labelled A, add 8 drops of liquid L₁. Shake both test tubes. Allow to stand for 2 minutes.
- a) i) Record your observations.
- | | |
|--------------|----------|
| Test tube A | (1 mark) |
| Test tube B. | (1 mark) |
- ii) Name the process that has taken place in test tube A. (1 mark)
- iii) State the significance of the process named (a)(ii) above. (1 mark)
- iv) Name the:
 digestive juice in humans that has the same effect on oil as liquid L₁. (1 mark)
 region of alimentary canal into which the juice is secreted. (1 mark)
- 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. | (1 mark) |
| ii) Suggest the identity of L ₂ .
From the Irish potato provided, cut out a cube whose sides are 1cm. Crush the cube to obtain a paste.
Place the paste into a test tube labelled C. Leave the setup for at least 30 minutes. | (1 mark) |
| iii) Record your observations.(1 mark) | |
| iv) Account for the results in (b) (iii) above. | (3 marks) |
2. You are provided with a microscope, onion bulb, microscope slide, cover slip, pair of forceps, ruler and mounting pin. Adjust the mirror slowly and carefully to ensure you see the field of view using the low power objective lens. Take a ruler and place it on the stage to see the millimetre markings.
- | | |
|--|-----------|
| a) Determine the size of the field of view. | (1 mark) |
| b) Using the result obtained above, calculate the diameter of field of view in micrometres | (2 marks) |
| c) Remove one fleshy leaf from the onion portion. Carefully peel a piece of the epidermis and place it on a drop of water on a slide.
Place a cover slip on the epidermis gently.
Place a drop of iodine at one edge of a cover slip. Using a blotting paper, drain off excess iodine solution and water observe the epidermis under low power then medium power. Draw and label any two neighbouring cells. | (3 marks) |
| d) State the magnification of your drawing. | (1 mark) |
| e) Why was staining of the epidermis necessary. | (1 mark) |
| f) Count the number of cells across the diameter of the field of view hence determine the size of one cell. | (3 marks) |
| g) What assumptions can be drawn from your working. | (2 marks) |
3. You are provided with specimens label J, K₁ and K₂ which were obtained from the same mammal.
- | | |
|--|----------|
| a) Identify specimen J. | (1 mark) |
| b) Name the part of the body from which specimen J was obtained. | |
| c) i) Name the bones that articulate with specimen J. (2 marks) | |
| ii) Which ones of the bones named in (c)(i) above controls or limits movement. (1 mark) | |
| d) Draw and label specimen J. (4 marks) | |
| e) Examine specimen K ₁ and K ₂ . K ₁ and K ₂ are the same except that K ₂ was placed in hydrochloric acid overnight. | |
| i) Describe the texture of K ₁ and K ₂ (2 marks) | |
| ii) Name the inorganic compound that was removed by addition of hydrochloric acid to the bone. (1 mark) | |
| iii) What is the significance of the presence of the substance in e (ii) above (1 mark) | |
| iv) Name the structures that join bone to bone. (1 mark) | |
| v) State the name given to joints which allow limited movement of one bone over another. (1 mark) | |

BIOLOGY

Paper 3

CONFIDENTIAL INSTRUCT

Sodium hydrogen carbonate
Starch solution
Olive oil
Iodine solution served with a dropper
Irish potato
Scapel
Portion of onion bulb
Microscope
Microscope slide
Cover slip
Distilled water served with a dropper
Blotting paper
Ruler
Forceps
Mounting needle
Specimen J - a scapula bone
K1 - rib
K2 - rib dipped in 2M hydrochloric acid overnight

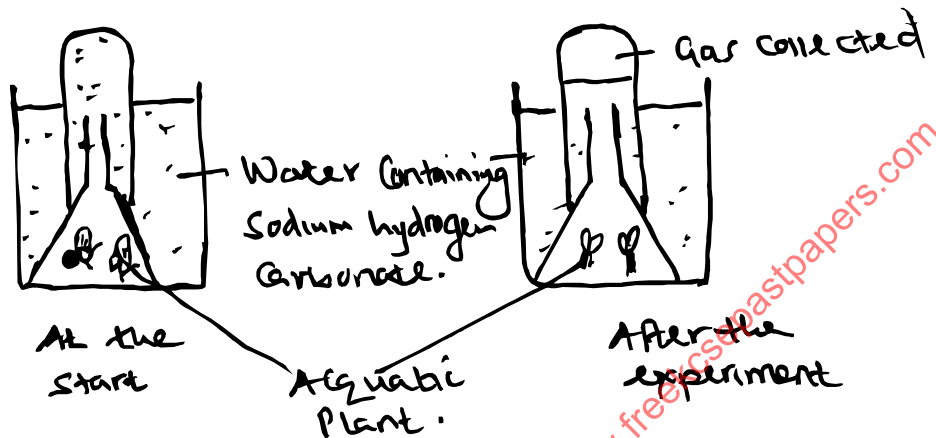
NOTE:

All the bones must be obtained from the same animal

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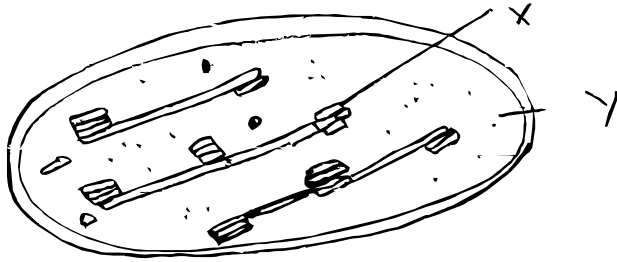
KANGEMA
231/1
BIOLOGY
PAPER 1
(THEORY)

1. Give the structure of the cell that perform the following functions.
 - a. Synthesis of ribosomes (1 mark)
 - b. Regulate exchange of substances in and out of the nucleus. (1 mark)
 - c. Breakdown large molecules, destroy worn out organelles. (1 mark)
2. State the name given to the study of :
 - a. Insect (1 mark)
 - b. The cell (1 mark)
3. a. Name two raw materials for the dark stage process of photosynthesis. (2 marks)
- b. The set up shows an experiment to investigate photosynthesis.



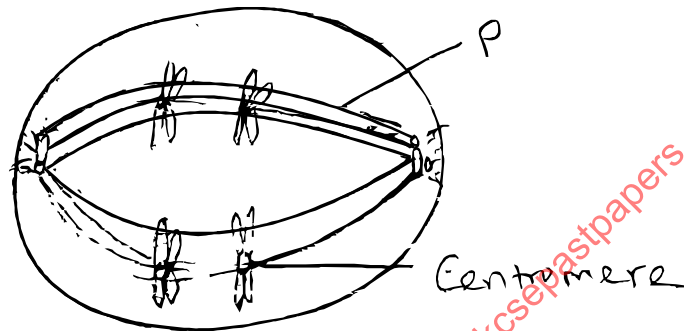
- What gas was collected in the test tube? (1 mark)
4. Give three structural features that reduce water loss from a leaf. (3 marks)
 5. a. Name the process that is involved in the uptake of mineral salts from the soil by the plants. (1 mark)
 - b. Explain what you understand by the term diffusion gradient. (1 mark)
 6. a. Define the term enzyme. (1 mark)
 - b. Give one factor that affect the rate of enzyme activity. (1 mark)
 7. a. Name one defect of circulatory system in humans. (1 mark)
 - b. State three functions of blood other than transport. (3 marks)
 8. State two ways in which floating leaves of aquatic plant are adapted for gaseous exchange. (2 marks)
 9. List the changes that takes place during inhalation in the breathing cycle of mammal in the following.
 - a. Rib cage (2 marks)
 - b. Diaphragm (1 mark)
 10. Study the word equation below :
 Glucose \rightarrow Ethanol + Carbon (iv) Oxide
 - a. Name the process shown in the equation above. (1 mark)
 - b. Suggest the organism (s) in which it takes place. (1 mark)
 - c. Give one application of the process in industry. (1 mark)
 11. Name the substances that do not undergo digestion but are absorbed directly from the alimentary canal to the blood stream. (2 marks)
 12. State one use of each of the following plants excretory products.
 - a. Tannis (1 mark)
 - b. Colchicines (1 mark)
 - c. Quinine (1 mark)

13. The diagram below represent a cell organelle.



- i. Name the part labeled Y. (1 mark)
- ii. State the function of the part labeled X. (1 mark)

14. The diagram below represent a stage during cell division.



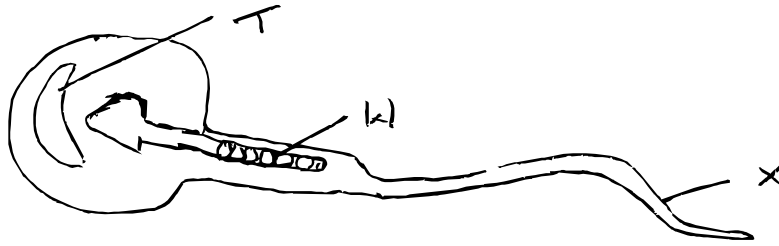
- a. Identify the stage of cell division. (1 mark)
 - b. Give two reasons for your answer in (a) above. (2 marks)
 - c. Name the structure labeled P. (1 mark)
15. State the importance of each of the following features of mammalian ileum.
- a. Highly coiled. (1 mark)
 - b. Long. (1 mark)

16. The figure below illustrates a part of a kidney nephron.

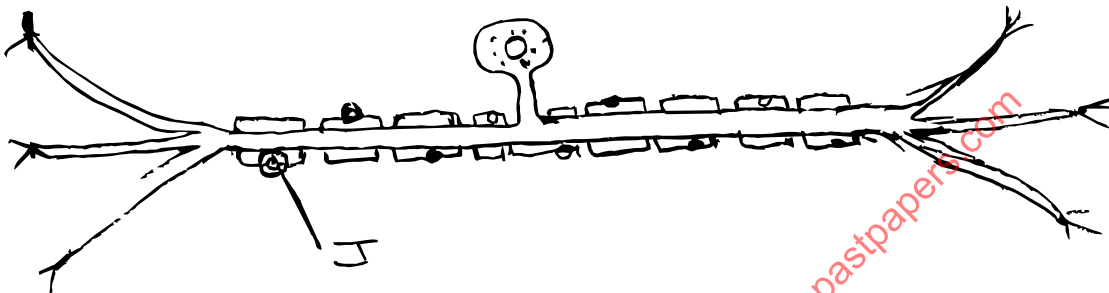


- a. Name the parts labeled A and D. (2 marks)
 - b. State one observable difference between part A and B. (1 mark)
 - c. Name two components found in A but absent in part D. (2 marks)
17. The paddles of whales and the fins of fish adapt these organisms to aquatic habitats.
- a. Name the evolutionary process that may have given rise to these structures. (1 mark)
 - b. What is the name given to such structures. (1 mark)
 - c. Give two examples of vestigial organs in man. (2 marks)
18. a. State three characteristics of monera that are not found in other kingdoms. (3 marks)

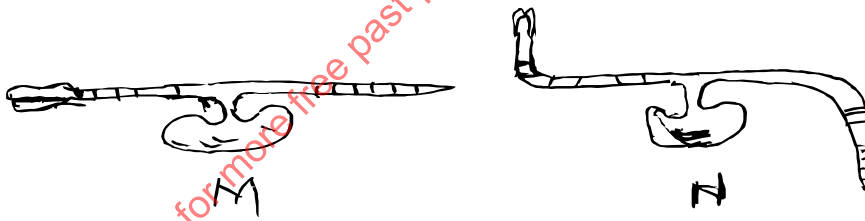
- b. Name the class to which a termite belong. (1 mark)
19. The diagram below represent a spermatozoa.



- a. Name the structures labeled T and X. (2 marks)
- b. State two adaptions of the spermatozoa for its function. (2 marks)
20. The diagram below illustrate a nerve cell.



- a. (i) Identify the type of cell illustrated. (1 mark)
- (ii) Give a reason for your answer in a (i) above. (1 mark)
- b. i. Identify the part labeled J. (1 mark)
- ii. State the function of the part in b (i) above. (1 mark)
21. a. What is metamorphosis? (1 mark)
- b. What is the biological importance of the larval stage during metamorphosis? (2 marks)
22. An experiment was set to investigate a certain aspect of a response. A seedling was put on a horizontal position as shown in figure M below. After 24 hours the set up was as shown in figure N.



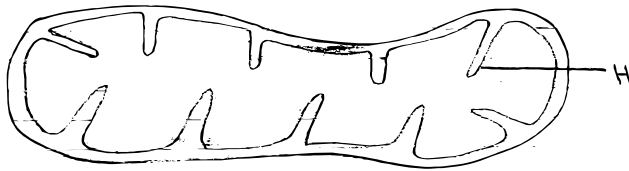
- a. Name the response exhibited. (1 mark)
- b. Explain the curvature of the shoot upward. (3 marks)
23. a. A student visiting a game park observed an adult elephant flapping its ears twice as much as its calf in order to cool its body when it is hot. Explain. (2 marks)
- b. Explain why some desert animas excrete uric acid rather than ammonia. (2 marks)
24. a. What is seed dormancy? (1 mark)
- b. Name a growth inhibitor in seed. (1 mark)
- c. Differentiate between hypogeal and epigeal germination in seeds. (2 marks)
25. Name the causative agent of the following diseases in man.
- a. Candidiasis (1 mark)
- b. Syphilis (1 mark)
26. To estimate the population of tilapia using the capture recapture method, 60 fish were captured and released. In the second capture out of 72 fish, 10 had been marked. Calculate the estimated population of tilapia. (show your working) (2 marks)

**KANGEMA
BIOLOGY
Paper 2
(Theory)**

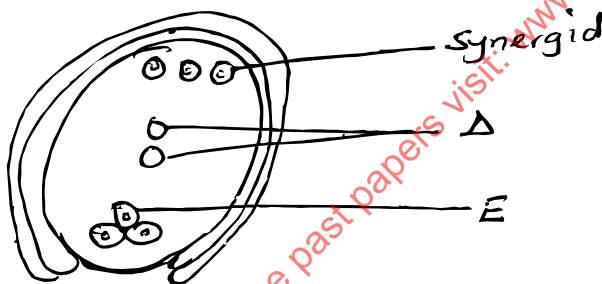
SECTION A : (40 marks)

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

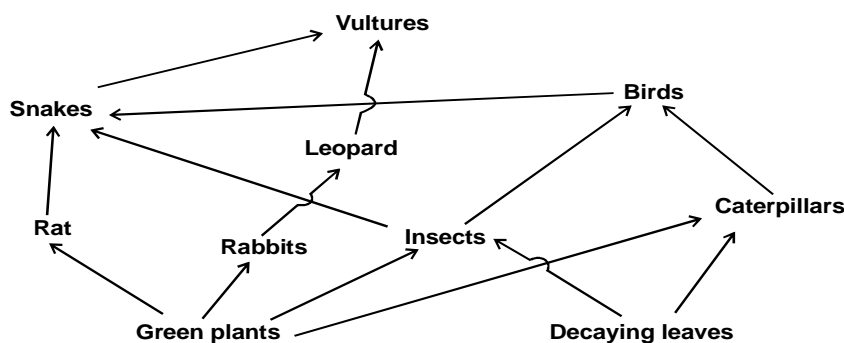
1. The diagram below shows an organelle that is found in most cells. Study it and answer the questions that follow.



- a.
 - i. Name the organelle. (1 mark)
 - ii. State the function of the organelle in a (i) above. (1 mark)
 - b.
 - i. Give the full name of the major chemical compound that is found in the organelle. (1 mark)
 - ii. Identify the gas that is required in order to form the compound you have stated in b (i) above. (1 mark)
 - c. Give the name of the structure labeled H and state its function. (2 marks)
Function.....
 - d.
 - i. In which cells between spermatozoa or ova would you expect to find a high number of the organelles named in a (i) above? (1 mark)
 - ii. Give a reason for your answer in d (i) above. (1 mark)
2. The diagram below shows an embryo sac.



- a. Name the structures labeled D and E. (2 marks)
 - b. On the diagram label the integuments. (1 mark)
 - c. On the diagram, mark using letter X the point at which the pollen tube enters embryo sac. (1 mark)
 - d. What is the function of the pollen tube? (2 marks)
 - e. State two factors that hinders self pollination in flowering plants. (2 marks)
3. Study illustration below.



- a. Identify the ecosystem. (1 mark)

- b. i. Which organism have the least biomass in the food web? (1 mark)
 ii. Explain your answer in b (i) above. (1 mark)
- c. Name the trophic level occupied by the following organisms.
 i. Insects (1 mark)
 ii. Leopards. (1 mark)
- d. Construct a food chain in which the vulture is a quaternary consumer. (1 mark)
- e. i. Name one group of organisms not shown in the food web but play an important role in the ecosystem. (1 mark)
 ii. What is the role of the organisms you named in d (i) above? (1 mark)
4. During a biology practical lesson, the teacher provided students with the following apparatus:
 – A pooter
 – A scalpel
 – Specimen bottle
 – A pair of forceps
 – Sweep net
 – Chloroform
- a. Give the precautions the biology teacher gave to students before the practical when collection of specimens begun. (3 marks)
- b. What was the function of the following apparatus?
 i. Pooter (1 mark)
 ii. Sweep net (1 mark)
 iii. Chloroform. (1 mark)
- c. Other than observation, name other two scientific skills developed by studying biology. (2 marks)
5. Hemophilia or bleeders disease is a condition in which blood takes a longer time than usual to clot. This is due to lack of certain blood protein. The gene for hemophilia is recessive to the gene for normal clotting factor and is found on the X - Chromosome.
- a. Explain why there are only female carries for hemophilia and no male carries for traits. (2 marks)
- b. A carrier female for hemophilia trait married a normal male. Work out the possible genotypes of the children. Let letter H represent the normal gene and letter h represent the gene for hemophilia. (4 marks)
- c. Name two other sex linked trait in human. (2 marks)

SECTION B. (40 marks)

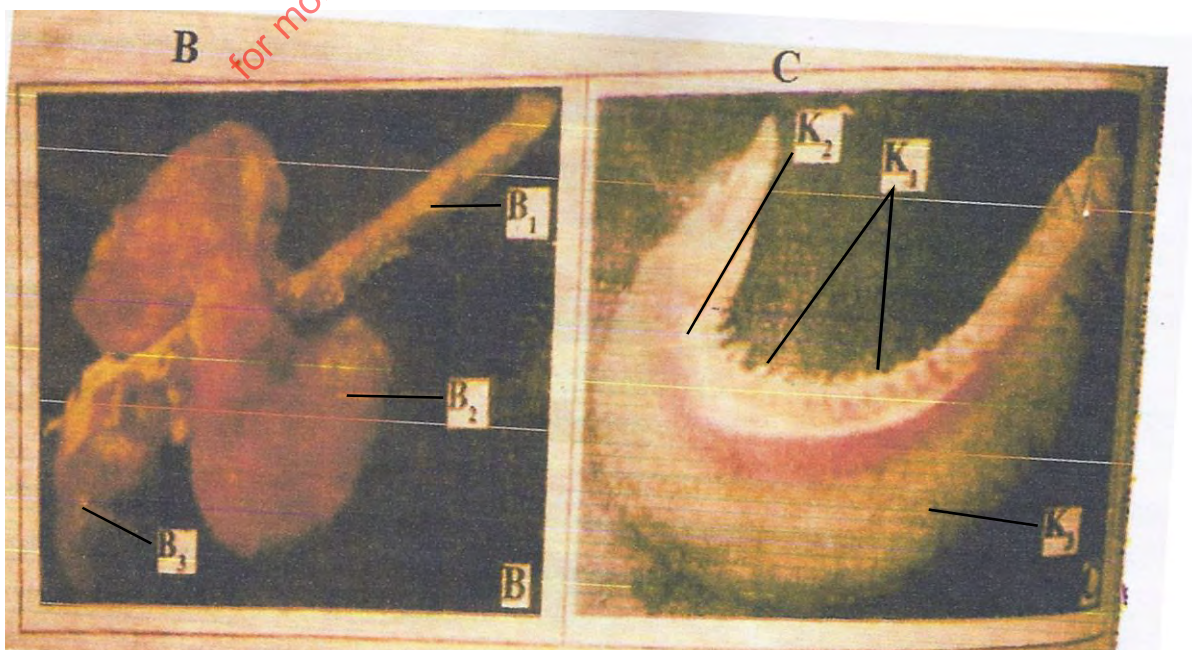
6. The amount of water particles that moved across cell membrane was determined at various temperature. The data collected is as in the table below.

Temperature (°C)	0	5	10	15	20	25	30	35	40	45	50	55	60
Water particles that moved across a cell membrane	0	2	5	13	20	50	80	95	93	73	45	20	0

- a. Draw a line graph to represent the amount of water particles that moved across the cell membrane against temperature. (6 marks)
- b. Account for the shape of the curve between;
 i. 200 - 350 C (2 marks)
 ii. 400 - 600 C. (3 marks)
- c. i. Name and define the process by which water particles moved across the cell membrane. (2 marks)
 ii. Other than the temperature, state and explain another factor that affect the rate of the process you named in c (i) above. (2 marks)
- d. i. If the water molecules were moving across the cell membrane in to a plant cell, name the state at which the cell would be if it was at 350 - 400 for 20 minutes. (1 mark)
 ii. State two forces that would be involved in the plant cell to result in the state of cells you named in d (i) above. (2 marks)
- e. i. State what would be expected if animal cells were used in d (i) above in stead of plant cells. (1 mark)
 ii. Explain why plant cells behave differently from animal cells. (1 mark)
7. a. How are xerophytes adapted to their habitat? (10 marks)
 b. Explain how the mammalian skin is adapted to thermoregulation. (10 marks)
8. Discuss the various evidences which show that evolution has taken place. (20 marks)

KANGEMA
231/3
BIOLOGY
(Practical

1. You are provided with specimen labeled K and L. Examine them and answer the following questions.
 - a. Using external features only:
 - i. Name the sub division to which both specimen belong. (1 mark)
 - ii. Give a reason for your answer in a (i) above. (1 mark)
 - b. i. Name the class to which each specimen belongs. (2 marks)
 - ii. Give a reason for your answers in b (i) above. (2 marks)
 - c. i. Suggest the agent of pollination for the specimen L . (1 mark)
 - ii. Give a reason for your answer in c (i) above. (1 mark)
 - d. List three external observable differences between the leaves of specimen K and L. (3 marks)
2. You are provided with a piece of potato labeled R. Cut 4 equal pieces of the potato about 1cm^3 .
 - Place one piece in a test tube and label it A.
 - Place a second piece in to a pestle and crush it in to a paste using a mortar. Put it in to a second test tube and label it B.
 - To each of the two test tubes add 2cm^3 of hydrogen peroxide.
 - a. Record your observations.
 - Test tube A (1 mark)
 - Test tube B (1 mark)
 - b. Put a third piece of potato on to the pestle and crush it in to a paste. Put it in to a third test tube and label it C. Add some little water to the paste and boil it for about 10 minutes. Let it cool. Add 2cm^3 hydrogen peroxide. Record your observations. (1 mark)
 - c. Explain the results in (a) and (b) above. (3 marks)
 - d. i. Crush the fourth piece of potato and put it in to a test tube, add 2cm^3 hydrogen peroxide to it. Test for gas produced and record your observations. (1 mark)
 - ii. Give the identity of the gas produced in d (i) above. (1 mark)
 - e. i. Write a word equation for the reaction that takes place in d (i) above. (1 mark)
 - ii. What is the importance of the reaction in d (i) above in the body? (1 mark)
 - f. Crush the rest of the specimen in to paste and using the reagents provided test for the food substances present. (6 marks)
3. Below are photographs labeled B and C of organs obtained from different animals. The organ performs similar functions. Examine them and answer the questions that follow.



- a.
- b.
- c.
- d.

BIOLOGY
PRACTICAL
CONFIDENTIAL

Each candidate will require:

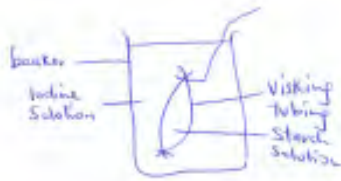
1.
 - Zebrina / Tradescantia with flower labelled K.
 - Hibiscus twig with flowers labelled L.
2.
 - Large potato tuber
 - Hydrogen peroxide.
 - 6 - test tubes
 - Mortar and pestle
 - Distilled water in wash bottles
 - Iodine solution.
 - Benedict solution.
 - 2 boiling tubes.
 - 4 means of heating / Bunsen burner.
 - A pair of forceps.
 - Test tube pasas
 - White bile.
 - 3-droppers.
 - 10ml measuring cylinder.
3. Photograph B and C

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KIGUMO
231/1
BIOLOGY PAPER 1
PAPER 1

Answer all questions in the spaces provided.

1. State the two major characteristics of members of the kingdom plantae. (2 mks)
2. Blocking of pancreatic duct has no effect on blood sugar regulation. Explain. (2 mks)
3. List three characteristics of member of phylum Arthropoda. (3 msk)
4. When a plant is covered with an opaque material with a hole on one side, it grows out through the hole. Explain. (3 mks)
5. Explain cause and correction of short sightedness. (2 mks)
6. A step up was done as shown below.

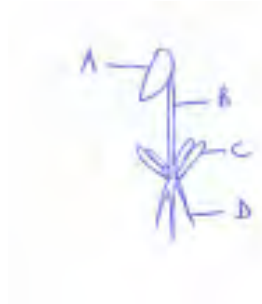


- a) What was the observation in beaker and visking tubing? (2 mks)
- b) What was the aim of the experiment? (1 mk)
- c) What physiological process was being investigated? (1 mk)
7. A variegated leaf was tested for starch.
 - (i) Name the reagent used. (1 mk)
 - (ii) State the expected results. (1 mk)
 - (iii) What was the aim of the experiment? (1 mk)
8. State two characteristics of anemophilous flowers. (2 mks)
9. Study the cell organelle drawn below.

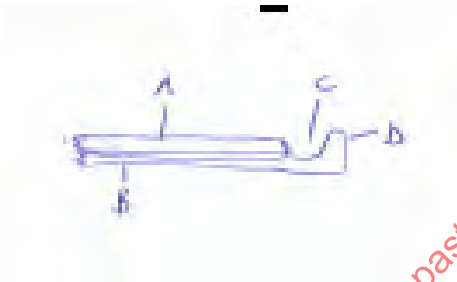


- (i) Name the organelle (1 mk)
- (ii) State two adaptations of the organelle to its function. (2 mks)
10.
 - a) State three differences between aerobic and anaerobic respiration. (3 mks)
 - b) Name two uses of anaerobic respiration in industry. (2 mks)
11. Name the gaseous exchange site in :
 - (i) Man (1 mk)
 - (ii) Fish (1 mk)
 - (iii) Insect (1 mk)

12. Study the diagram below.



- (i) Name the kingdom and division the organism belongs. (2 mks)
 (ii) Name the parts A – C. (3 mks)
 (iii) State two functions of the part labelled D. (2 mks)
13. Study the diagram below.

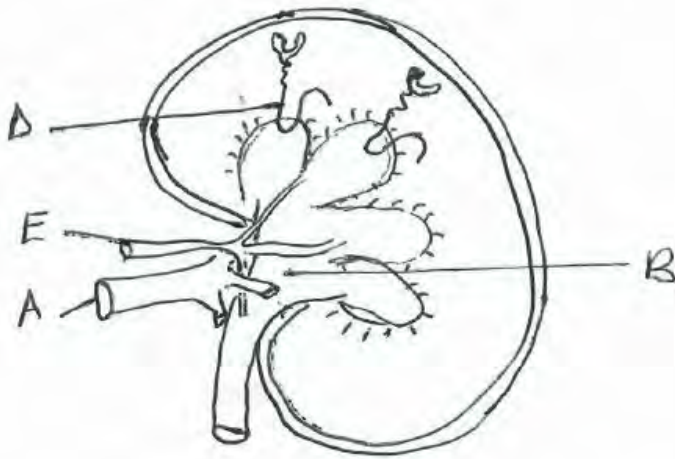


- (i) Name the parts A – D (4 mks)
 (ii) Name the bone articulating at part labelled C. (1 mk)
 (iii) Name two functions of the part labelled D. (2 mks)
- 14.
- (i) Write the dental formula of an adult human being. (1 mk)
 (ii) What is the importance of mastication? (2 mks)
 (iii) State the two types of dentition. (2 mks)
15. State the function of
- (i) Nucleolus (1 mk)
 (ii) Centriole (1 mk)
 (iii) Chloroplast (1 mk)
16. In rats, black colour is dominant over white
- a) Using appropriate letter symbols, make a cross of two heterozygous black rats. (4 mks)
 b) Indicate the genotypic and phenotypic ratios of their off springs. (2 mks)
- 17.
- a) Define convergent evolution. (1 mk)
 b) Explain two evidences in support of organic evolution theory. (4 mks)
18. Explain double fertilization in flowering plants. (4 mks)
19. Explain three adaptations of the root hair cell to perform its functions. (3 mks)
20. State the function of the following parts of a light microscope.
- (i) Lens (1 mk)
 (ii) Diaphragm (1 mk)
 (iii) Eye piece (1 mk)
- 21.
- a) Describe three homeostatic functions of the mammalian skin. (3 mks)
 b) Why do desert animals excrete nitrogenous wastes in form of uric acid? (2 mks)

KIGUMO
231/2
BIOLOGY PAPER TWO

SECTION A: (Answer All the Questions)

Q.1 The figure below represents a Mammalian organ.



- (a) State the name of the part labelled
- (i) A..... (1mk)
- (ii) B..... (1 mk)
- (b) State how the part labelled D would vary in a desert rat and fresh water fish (2 marks)
- (c) State two differences in composition of blood between vessels A and E (2 Marks)
- (d) State two functions of the above organ (2 Marks)

Q.2 (a) Below is a section of a nucleic acid strand with a series of organic bases



- (i) Is this a Deoxyribonucleic Acid or an Ribonucleic Acid molecule? (1 Mark)
- (ii) Explain your answer in a(i) above (1 mark)
- (iii) Draw the complementary Deoxyribonucleic Acid strand of the above strand. (2 marks)
- (b). State two differences between Deoxyribonucleic Acid and Ribonucleic Acid (2 Marks)
- (c) Name two types of gene mutations (2 marks)
- (d) State one advantage of polyploidy in Agriculture (1 mark)

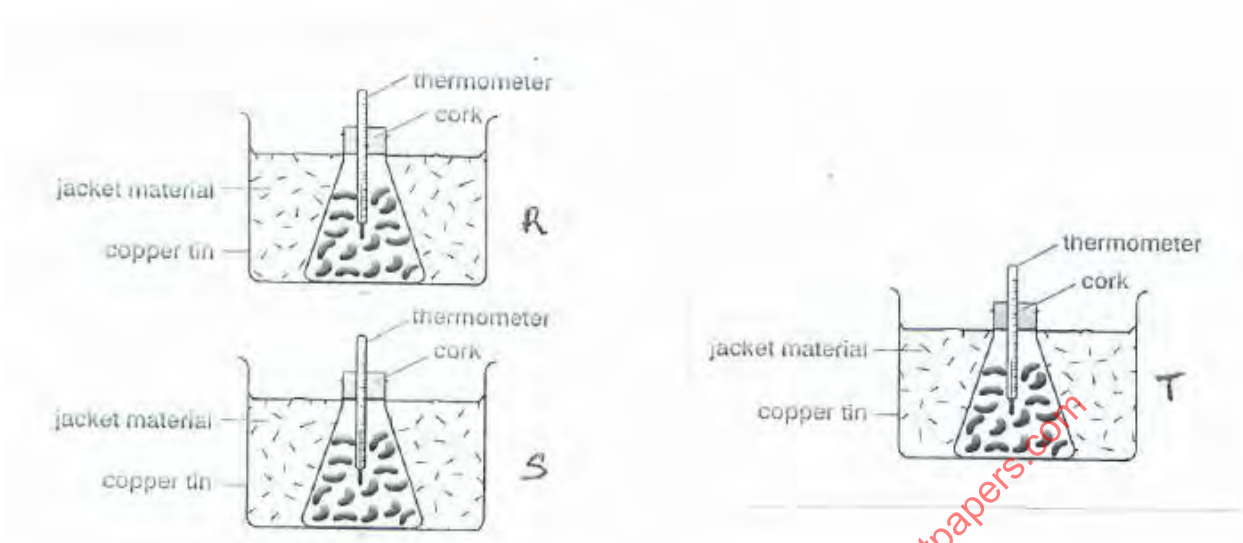
Q3. (a) Differentiate between the following terms

- (i) Protogyny and Protandry (2marks)
- (ii) Asexual & sexual reproduction (2 marks)
- (b) State two disadvantages of sexual reproduction (2 marks)
- (c) Name two Accessory glands associated with the male reproductive system (2 marks)

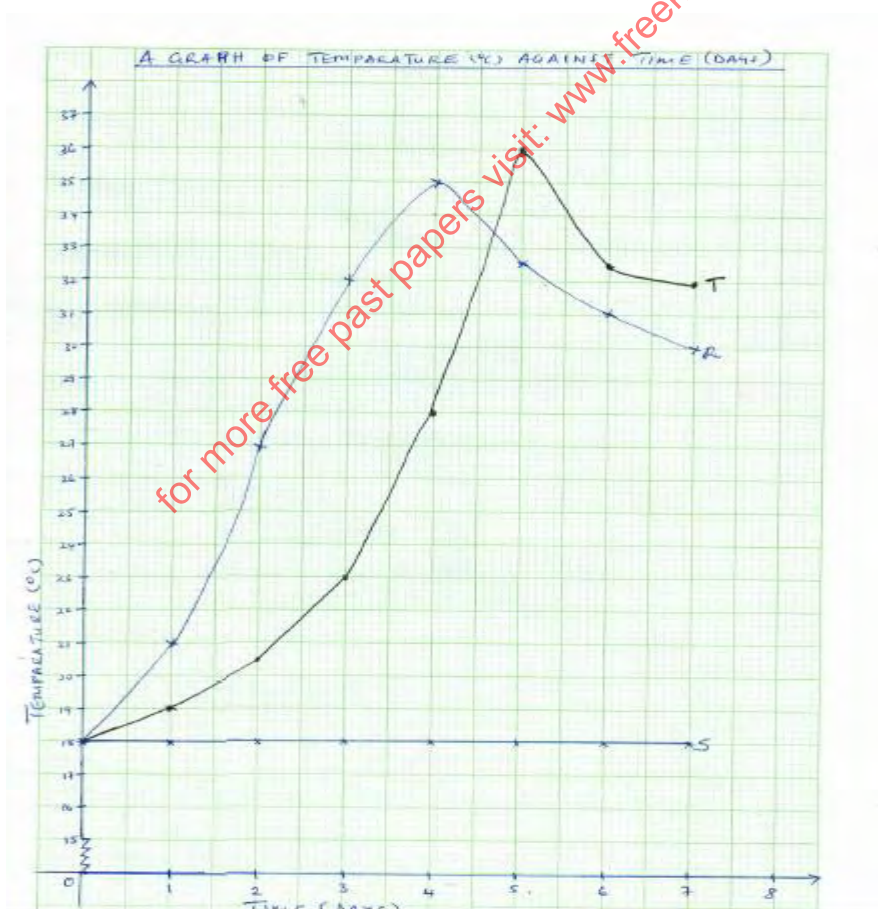
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SECTION B: (Answer Question 6 which is COMPULSORY and choose between 7 and 8 and answer it on the space provided below question 8)

Q6. A student set up the apparatus shown below to investigate a certain physiological process. In R, **beans soaked in water** were introduced. **Boiled beans sprinkled with antiseptic** and **just boiled beans** were introduced in S and T respectively.



The temperature in each set of apparatus was recorded for one week and the results obtained represented in the graph shown below.



- (a) Using the information on the graph and the set of apparatus shown above, state the aim of the experiment. (1 mark)
- (b) At what temperature did the setups R and T have the same rate of respiration (1 mark)
- (c) Account for the differences in the change in temperature in apparatus R and T:
- (i) From days zero to 2 (5 marks)
- (ii) After 5 days (5 marks)
- (d) Explain why there was no temperature change in S for the whole week. (3 marks)
- (e) (i) Suggest one way the set-up above could be improved for more accurate results. Give a reason for your answer. (2 marks)
- (ii) Why was the setup S included in the experiment? (1 mark)
- (f) Explain the biological principle applied to make food in a refrigerator remain unspoil for a longer period than in ordinary conditions. (2 marks)
- Q7. (a) State the **four** main characteristics of gaseous exchange surfaces. (4 marks)
- (b) Name two gaseous exchange structures in terrestrial plants. (2 marks)
- (c) Describe the various adaptations of an insect's tracheole system to its function (14 marks)
- Q8. (a) Explain the survival advantage of the following tropic responses; (2 marks)
- (i) Phototropism
- (ii) Hydrotropism
- (b) State three differences between endocrine and nervous system. (3 marks)
- (c) Discuss the functions of the various parts of human brain. (15 marks)

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KIGUMO**231/3****BIOLOGY PRACTICAL**

1. Examine Specimen E provided.
 - a) Identify the type of the fruit. (1 mark)
 - b) Give a reason for your answer in 1(a) above. (1 mark)
 - c) Cut a transverse section through specimen E and make a well labeled diagram. (4 marks)
 - d) State the type of placentation of E. (1 mark)
 - e) i) Name the agent of dispersal for E. (1 mark)
ii) State how E is adapted to its mode of dispersal identified in e (i) above. (2 mark)
 - f) Squeeze out the juice from specimen E into test tubes and fill in the table below. (4 marks)

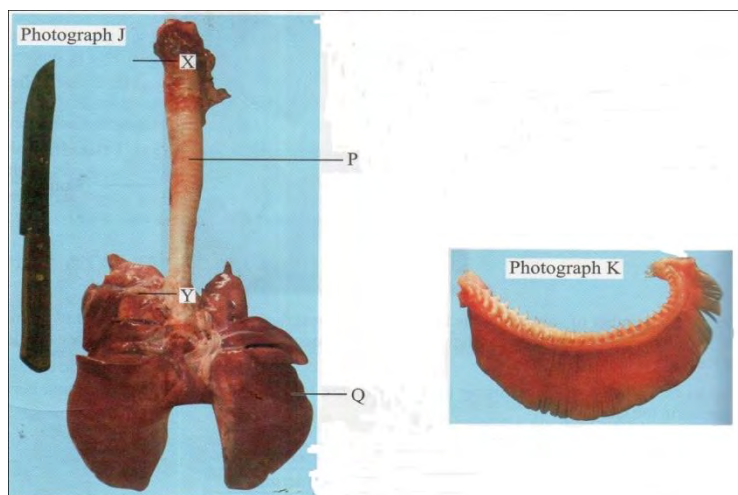
Food substance	Procedure	Observation	Conclusion

- g) i) Suggest the expected result if the juice of E was boiled for 10 minutes, cooled and then retested again. (1 mark)
ii) Explain your answer in g(i) above. (1 mark)
2. The photographs below show three bean seedlings that are of the same age but grown under different environmental conditions. Examine them.



- a) Based on external appearance of the seedling, suggest the conditions under which seedling R and S were grown. (2 mark)
- b) State 3 observable differences between seedling R and S. (3 marks)
- c) i) Name the term used to describe the phenomenon exhibited by specimen S. (1 mark)
ii) State the significance of the above named phenomenon in c(i) above. (1 marks)
- d) Account for the difference in the length of the stems of specimen R and S. (2 marks)
- e) Name the response exhibited by seedling Q. (1 mark)
- f) State the type of germination that occurs in the three seedlings. (1 mark)
 - i) Give a reason for your answer in f(i) above. (1 mark)

3. Examine photographs J and K below and answer the questions that follow.



- a) Identify the organ labeled Q in photograph J and the organ in photograph K.
- i) Q (1 mark)
ii) K (1 mark)
- b) State the class of organisms from which organ in photograph K was obtained. (1 mark)
- c) State the common function performed by the organs shown in the photographs. (1 mark)
- d) Highlight two adaptations that are common to organ Q and the organ in photograph K. (2 marks)
- e) i) Name the part labeled P, in the photograph J. (1 mark)
ii) Using observable features only, state how the structure you named in e (i) above is adapted to its function. (1 mark)
- f) Name the part of the body from where the structure labeled Q on photograph J is found. (1 mark)
- g) Using observable features only, state three adaptations of specimen K to its functions. (3 marks)

BIOLOGY CONFIDENTIAL

REQUIREMENTS

Each Candidate Requires

- Ripe Orange fruit – Labeled E
- Scalpel
- 4 test tubes in a rack
- Test tube holder
- DCPIP solution
- Source of heat/Hot water bath
- Benedict's solution
- Distilled water

MURANGA SOUTH

231/1

BIOLOGY

PAPER 1

1. Write down two characteristics displayed by plants but are absent in animals. (2mks)
2. Define binomial nomenclature (1mk)
3. a) Explain the term cell specialization. (1mk)
- b.) state how the following cells are specialized to perform their function.
 - i). red blood cell (1mks)
 - ii. root hair cell (1mk)
4. Explain how an increase in temperature affects the rate of active transport (2mks)
5. Describe how turgor pressure builds up. (2mks)
6. A solution of sugarcane was boiled with hydrochloric acid, sodium hydrogen carbonate was added to the solution which was then heated with Benedicts solution. An orange precipitate was formed.
 - a) Why was the solution boiled with hydrochloric acid. (1mk)
 - b) To which class of carbohydrates does sugar in sugarcane belong. (1mk)
 - c.) state the form in which carbohydrates are stored in
 - i. Plants. (2mks)
 - ii. Animals.
7. Name **three** functions of saliva in the mouth (3mks)
8. Explain how the following plant adaptations minimize the rate of transpiration.
 - a) Sunken stomata. (1mks)
 - b) Leaf folding. (1mk)
9. Explain how the following forces contributes to the movement of water up the xylem vessels. (2mks)
 - a) Cohesion.
 - b) Adhesion.
10. The table below shows the transportation of substances in the human body. (3mks)

substances	Transported by the blood	
	from	to
Oxygen	M	Whole body
N	Liver	Kidney
P	Intestines	Whole body

Give the identity of M,N and P.

11. How are lenticels adapted for gaseous exchange? (2mks)
12. a) In what form is energy stored in muscles (1mk)
- b) State one economic importance of anaerobic respiration. (1mks)
13. State the importance of the following processes that take place in the nephrons of a human kidney
 - (a) Ultra filtration (1mk)
 - (b) Selective reabsorption (1mk)
14. Give 2 functions of each of the following structures in the human reproductive system.
 - (a) Epididymis. (2 marks)
 - (b) Oviduct (2 marks)
15. a) Explain why the carrying capacity for wild herbivorous animals is higher than that for cattle in a given piece of land. (2marks)
- b) Name the bacteria found in root nodules of leguminous plants (1mark)
- c) What is the role of the bacteria named in (b) above (1mark)
16. State **two** functions of luteinizing hormone in reproduction. (2mks)
17. Give the meaning of the following terms. (2mks)
 - i) Protandry
 - ii) Self-sterility

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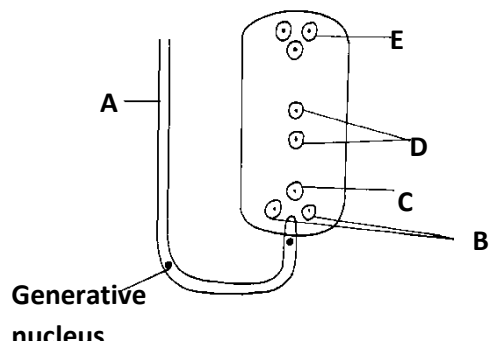
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MURANGA SOUTH
231/2
BIOLOGY
PAPER 2

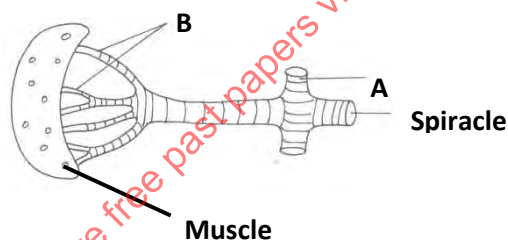
SECTION A

Answer all questions in section A

1. The figure below shows the embryo-sac before fertilization.



- (a) Identify the structures labelled **A** and **B**. (2mrks)
- (b) Identify the structures labeled in the diagram that will develop into the following after fertilization.
- Embryo (1mrk)
 - Endosperm (1mrk)
- (c) State the chromosomal constitution of each of the following nuclei after fertilization.
- C** (1mrk)
 - D** (1mrk)
- (d) Briefly outline the process of “double” fertilization in flowering plants. (2mrks)
2. The diagram below shows part of gaseous exchange system in an insect. Study it and answer the questions that follow.

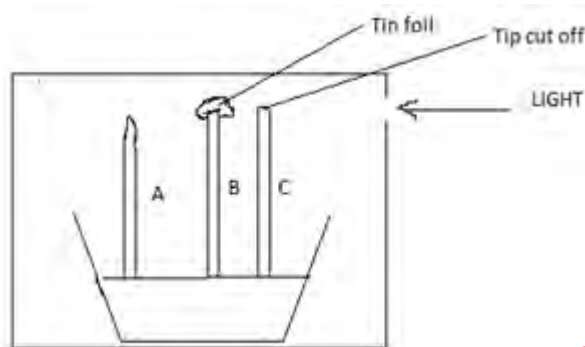


- a) What are the structural adaptations of the parts labelled **A** and **B** to their functions? (2mks)
- b) Name the parts of the following animals that carry out the same function as part **B** above. (2mks)
- Man
 - Tilapia fish
- c) Name the structures used for gaseous exchange in plants growing in waterlogged soils. (1mk)
- d) i) Give **two** reasons why accumulation of lactic acid during vigorous exercise leads to an increase in heartbeat. (2mks)
- ii) In what form is oxygen transported from lungs to the tissues? (1mk)
3. a) State any two (2) classes of the sub division Gymnospermaphyta. (2marks)
- b) Give one structural difference between a monocotyledonous and a dicotyledonous leaf. (1 mark)
- c) While walking through the school playground, a student came across an organism with the following descriptions:-
- A pair of antennae
 - Two pairs of wings
 - Segmented abdomen
 - Three pair of legs
- i) Give the phylum and the class that the organisms belong. (2 marks)

Phylum:

Class:

- ii) Name the three body parts in the organism. (3 marks)
4. In an experiment, a variety of garden peas having a smooth seed coat was crossed with a variety with a wrinkled seed coat. All the seeds obtained in the F1 had a smooth seed coat. The F1 generation was selfed. The total number of F2 generation was 7324.
- (a) Using letter R to represent smooth seed coat, work out the genotype of the F1 generation. (4 marks)
- (b) From the information above, **work out** the following for the F2 generation
- i) Genotypic ratio (2 marks)
- ii) Phenotypic ratio (1 mark)
- iii) Number of Wrinkled seeds (1 mark)
5. The diagram below represents growing seedlings, which were subjected to unilateral light at the beginning of the experiment.



- a) What was the aim of the experiment? (1mk)
- b) Why were the seedlings labeled B and C included in this experiment. (1mk)
- c) i) State the results of A after five days. (1mks)
- ii) Account for the results in c(i) above (3mks)
- d) State what would be observed after five days if the tin foil was removed. (1mk)
- e) State the biological phenomenon shown by the seedlings grown in the dark (1mk)

SECTION B (40 marks)**Answer question 6(compulsory) and any other one question from this section.**

6. 1cm³ of catalase solution was added to equal volumes of hydrogen peroxide solutions at different pH values. The time taken to collect 10cm³ of oxygen was measured. The results were as follows.

pH of solution	Time taken to collect gas(cm ³)
5.5	30
6.0	20
6.5	12
7.0	8
7.5	5
8.0	9
8.5	15
9.0	25

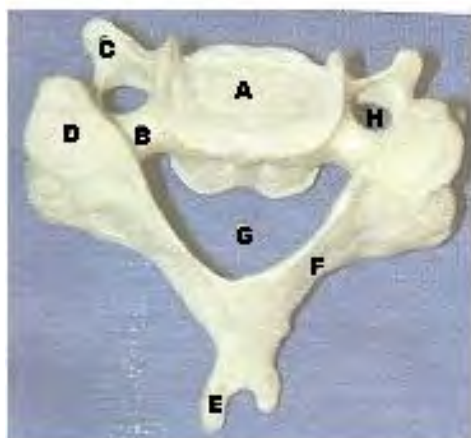
- a) Plot a graph of time against pH of solution (6mk)
- b) Account for the rate of reaction at:
- i) pH. 7.5 (2mk)
- ii) pH 5.5 (2mks)
- iii) pH 9.0 (2mks)
- c) Write a word equation for the reaction above. (1mk)
- d) What is the importance of the reaction you have given in c above (2mks)
- e.) name an organ in the human body where the above reaction takes place. (1mk)
- f) Other than the factor being investigated above name four other factors that affect the rate of enzyme controlled reaction. (4mks)

7. a) Define pollution. (2 marks)
- b) Describe water pollution under the following.
- i) Causes. (6 marks)
 - ii) Effects of pollutants on plants and animals. (6 marks)
 - iii) Methods of controlling pollution (6 marks)
8. a) Define the following terms
- i.) cell (1mk)
 - ii.) Tissue (1mk)
 - iii) Organ. (1mk)
 - iv) Organelle (1mk)
- v.) Name one specialized tissue in animals; (1mk)
- b. Describe how various cell organelles are adapted to their functions. (15 marks)

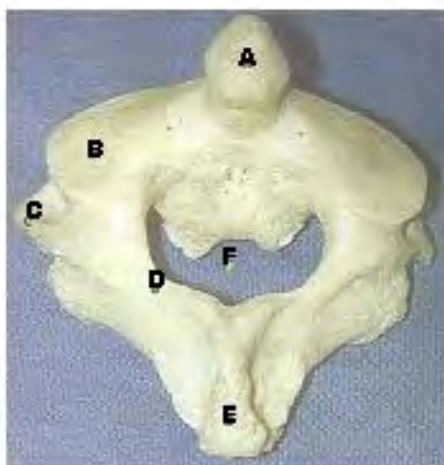
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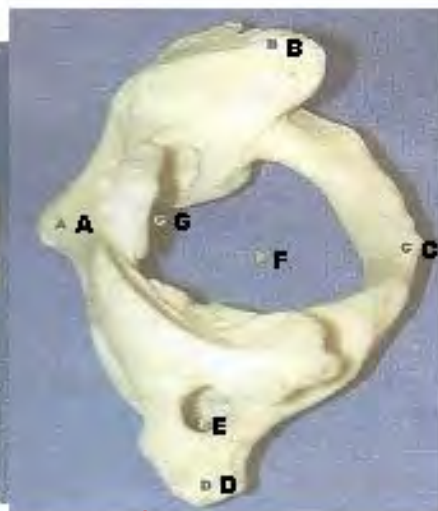
2. The photographs below are bones from the same mammal. Examine the bones and answer the questions that follow.



Photograph 3.03



Photograph 3.02



Photograph 3.01

- (a) Name the body region from which the bones were obtained. (1mk)
- (b) Name the bones in terms of 3.01, 3.02 and 3.03 in the correct order from anterior to posterior. (1mk)
- (c) Name and the part labeled as
- F in photograph 3.02 (1mks)
 - H in photograph 3.03 (1mks)
 - A in photograph 3.02 (1mks)
- (d) Identify the bones in photograph
- 3.01 -**
- 3.02 -**
- (e) What is the function of part H in photograph 3.03 (1mk)
- (f) Name the bones that articulate with bone in photograph 3.03 in the distal and end (2mks)
- 3 (a) Place 2ml of bicarbonate indicator in a clean test tube. Add dilute hydrochloric acid drop by drop and shake after each drop till there is a permanent colour change.
- State the resulting colour. (1 mark)
 - To the mixture obtained above, now add sodium hydroxide solution drop by drop until there is a colour change. Record your observation. (1 mark)
 - From your observations in (a)(i) and (a)(ii) above what is the nature of bicarbonate indicator. (1 mark)
- (b) Place 10ml of fresh bicarbonate indicator in a boiling tube. Using the drinking straw, bubble air through the bicarbonate indicator until there is colour change.
- Record your observation. (1 mark)
 - What does the colour obtained in (b)(i) above suggest about the nature of the gas breathed out? (1 mark)
- (c) Rinse the measuring cylinder and use it to place 2ml of lime water solution in a clean test tube. Rinse the drinking straw used in (b) above and use it to bubble air through lime water solution.
- Record your observation. (1 mark)
 - Suggest the identity of the gas that gave rise to the observation above. (1 mark)
- (d) (i) Name the physiological process in cells that leads to formation of the gas named in c(ii) above. (1 mark)
- Write down a word equation for the process named in d (i) above. (1 mark)
 - What is the importance of the identified process in cells of living organisms? (1 mark)

CONFIDENTIAL

1. You are provided with the following:

- 25ml bicarbonate indicator.
- Lime water
- A drinking straw.
- 2 test tubes.
- 10ml measuring cylinder.
- A boiling tube.
- Dilute hydrochloric acid.

Dilute sodium hydroxide

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KURIA EAST

231/1

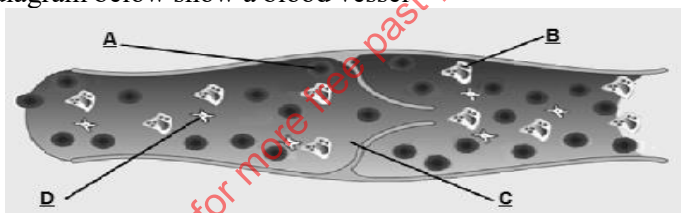
BIOLOGY

Paper 1

1. Define each of the following terminologies as used in biology : (2 marks)
 - a). Ecology
 - b). Anatomy
2. State the role of the DNA in a cell. (2 marks)
3. Name two processes that are involved in the translocation of manufactured food materials. (2 marks)
4. State two ways by which lactic acid formed in the muscles of an athlete is removed. (2 marks)
5. Explain why sexual reproduction is important in an organism. (2 marks)
6. State two aspects that distinguish Lamarckian hypothesis and Darwinian theory of evolution. (2 marks)
7. The diagram below shows the teeth of a certain animal. Use it to answer the questions that follow.

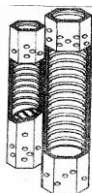


- a). Identify the mode of feeding exhibited the animal shown above. (1 mark)
Give a reason for your answer in (a) above. (1 mark)
8. Explain what would happen if the nucleus of an animal cell is removed. (2 marks)
9. Enzymes are important in various physiological processes in living things
 - a). Differentiate between an enzyme and a hormone. (2 marks)
 - b). Name the property of an enzyme exhibited by the Lock and Key Hypothesis. (1 mark)
10. Outline three roles of active transport in human beings. (3 marks)
11. State the role of each of the following features found in the human gaseous exchange system : (2 marks)
 - a). Goblet cells
 - b). Rings of cartilage
12. The diagram below show a blood vessel



- a) Giving a reason, identify the blood vessel shown above. (2 marks)
- b) Name the enzymes present in A and D. (2 marks)
13. Give three disorders caused by non-disjunction (3 marks)
14. Oil is one of the pollutants of water in major water bodies
 - a). In what ways is oil as a pollutant affect the following organisms:
 - i. Fish (1 mark)
 - ii. Mosquito larvae (1 mark)
 - iii. Aquatic birds (1 mark)
15. Name two sites for gaseous exchange in floating aquatic plants:- (2 marks)
16. State three qualities that a plant breeder looks at in artificial selection in breeding programmes. (3 marks)
17. Explain what happens to a tadpole when there is insufficient iodine. (2 marks)
18. Name the diseases caused by the following organisms.
 - a). Wucheraria bancrofti (1 mark)
 - b). Treponema pallidum (1 mark)
19. Explain why carbohydrates are stored in their polysaccharide forms in both plants and animals. (1 mark)

20. Define the following terms:
- Chelicerae (1 mark)
 - Prothallus (1 mark)
 - Alteration of generation. (1 mark)
21. Distinguish between the growth pattern exhibited by human beings and fish. (2 marks)
22. The cells shown below are adapted for transport in flowering plants.



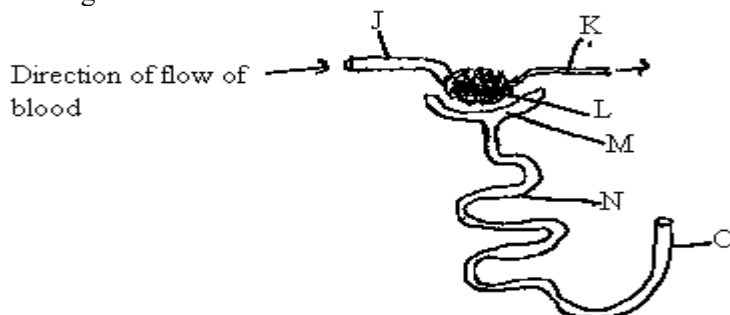
- Name the tissue in which these cells are found. (1 mark)
 - Identify and explain two observable features of these cells that adapt them to their role in transport (2 marks)
23. A student smeared Vaseline jelly on the lower epidermis of a leaf of a potted green plant which had been kept in the dark for 24 hours. She then transferred the plant to the light for six hours. Starch test on the leaf of the plants were negative. Account for the observation. (3 marks)
24. Outline two structural differences between an egg and a sperm in humans. (2 marks)
25. (a) State the advantage of desert animals excreting their nitrogenous waste in form of urea and not ammonia. (2 marks)
- State two modifications on the kidney nephron of desert mammals. (2 marks)
26. State two functions of gibberellins. (2marks)
27. Differentiate between facultative and obligate anaerobes (2 marks)
28. Name the bacteria involved in the conversion of ammonium compounds to nitrites. (1 mark)
29. Differentiate between divergent evolution and convergent evolution. (2 marks)
30. A group of students carried out an ecological investigation on an ecosystem. They recorded the findings in the table below.

Organism	Number of individuals	Biomass (kg)
P	4000	9.8
Q	2500	2.1
R	570	0.42
S	90	0.03
T	1300	1.1

- Write down a food chain for the ecosystem. (1 mark)
 - Name the organism which;
 - Which organism is the producer in the ecosystem? (1 mark)
 - What would be the last to be affected if the ecosystem experienced a prolonged drought. (1 mark)
 - Which organism recycles nutrients in ecosystem? (1 mark)
31. After fertilization in flowering plants has taken place, name three structures that wither off. (3 marks)
32. Give two structural adaptations of the chloroplast to its function. (2 marks)
33. Define the term balanced diet. (2 marks)
34. Explain why the ecosystem is said to be a self- sustaining natural unit. (1 mark)
35. State the role of the Hypocotyl in epigeal germination. (1 mark)

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- d) Explain what happens to a red blood cell when placed in distilled water. (3 marks)
- 4 a) Name any two disorders in human caused by gene mutation. (2marks)
- b) Describe the following chromosomal mutations. (2 marks)
- a) Inversion
- b) Translocation.
- c) In mice the allele for black fur is dominant to the allele for brown fur. What percentage of offspring would have brown fur from across between heterozygous black mice? Show your working. Use letter B to represent the allele for black colour. (4 marks)
- 5 The diagram below shows a section of the functional unit of a mammalian kidney.



- a) Identify the structure drawn. (1 mark)
- b) Name the parts labelled J and M (2mark)
- c) What causes the process that occurs in structure L? (1 mark)
- d) Name **one** differences in the composition of fluids in structure K and O? (1 mark)
- e) State one adaptations of part N to its function. (1 mark)
- f) State two adaptations that desert animals have to reduce water loss through urine. (2 marks)

SECTION B (40 MARKS)

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

6. The data below was obtained from an experiment designed to measure the velocity of flow of water during the course of a single day in the xylem of two trees of the same species.

Time of day/hr		0300	0600	0900	1200	1500	1800	2100	2400	0300	0600
velocity of flow/cmhr ⁻¹	Eucalyptus	0	45	125	140	135	85	45	25	5	0
	Species										
	Acacia species	-	5	105	135	110	45	30	25	10	0

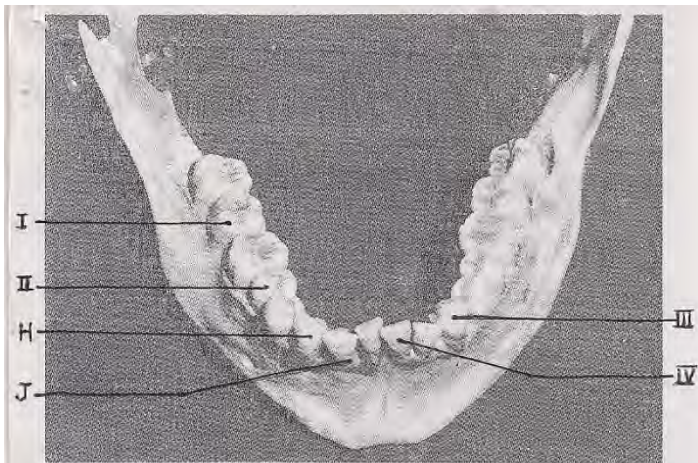
- a) Using the same axes, draw graphs to show the velocity of flow against time. (7 marks)
- b) At what time of the day was the velocity of flow same for the species? (1 mark)
- c) Account for the shape of the graph of eucalyptus. (4 marks)
- d) What forces move the water through the plant? (4 marks)
- e) Determine the rate of flow at 1900 hours in. (2 marks)
- i) Acacia
- ii) Eucalyptus
- f) Suggest two features of Acacia that lead to the differences in the velocity flow. (2marks)
7. Describe the role of the following hormones in the growth and development of plants. (20 marks)
- a) Auxins
- b) Gibberellins
- c) Cytokinins
- d) Ethylene
8. Discuss the various evidences which show that evolution has taken place. (20 marks)

**PAPER 3
(PRACTICAL)**

SECTION A (40 MARKS)

Answer all questions in this section in the spaces provided.

1. Below is a photograph of an adult human jaw with teeth. Study the diagram and answer the questions that follow.



- i) State the mode of nutrition in man. (1mk)
 - ii) Name the type of teeth labeled I and III. (2mks)
 - iii) Name the parts of teeth labeled H and J. (2mks)
 - iv) Identify **one** distinguishing feature between teeth labeled II and IV. (1mk)
 - v) State **one** function of tooth IV. (1mk)
 - vi) Write the dental formula from the jaw shown in the photograph. (1mk)
 - vii) Explain why tooth I would be more prone to dental carries than tooth III, (2mks)
2. Use the hand lens provided to observe specimen K and answer the questions that follow.
- i) (i) In the space below draw a fully labeled diagram of representative part of the specimen. (5mks)
 - (ii) Calculate the magnification of your drawing. (2mks)
- Identify:
- a. The Kingdom (1mk)
 - b. The Division, to which the specimen belongs. (1mk)
 - c. Give a reason for your answer in b (ii) above. (1mk)
- i) State the functions of any **two** parts labeled in your diagram. (2mks)
 - ii) What is the mode of reproduction in the specimen? (1mk)
 - iii) Explain the significance of colour observed in the specimen K. (2mks)

3. You are provided with a food substance in a powder form labeled R. Place all of it into a boiling tube, add 10cc of water and stir using a glass rod to obtain a mixture. Using the reagents provided, carry out food tests on the mixture and record your observation in the table below. (15mks)

Food Tested	Procedure	Observation	Conclusion

231/3 – BIOLOGY

CONFIDENTIAL

Preparation of R

Each candidate: $\frac{1}{2}$ spatula end full of starch; $\frac{1}{2}$ spatula end full of glucose; $\frac{1}{2}$ spatula end full of Ascorbic acid powder: mixed well.

- Iodine solution
- Benedict's solution
- DCPIP
- NaOH
- CuSO₄
- Filter paper
- Boiling tube
- Five test tubes
- Means of heating

Moss plant labeled K in a watch glass / peri-dish.

Showing (Rhizoids, leaves, seta, capsule).

Hand lens

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