

# K.C.S.E YEAR 2010

## PAPER 1

1. State the name give to the study of: *FOR ANSWERS SMS OR WHATSAPP 0723981225*
- a) The cell (1 mark)
  - b) Micro--organism. (1 mark)
2. The diagram below shows a transverse section of a plant organ.
- a) Name the plant organ from which the section was obtained. (1 mark)
  - b) i) name the class to which the plant organ was obtained (1 mark)  
ii) Give a reason for your answer in (b) (i) above (1 mark)
  - c) Name the part labeled X. (1 mark)
3. State the function of:
- a) Ribosomes (1 mark)
  - b) Lysosomes (1 marks)
4. The diagram below shows a specialized plant cell.
- a) i) Name the cell (1 mark)  
ii) Name the parts labeled **D** and **E**. (2 marks)
  - b) state the function of the part labeled **C**. (1 mark)
5. state three ways in which a respiratory surface is adapted to its function. (3 marks)
6. State one function for each of the following:
- a) Cerebellum (1 mark)
  - b) Medulla oblongata (1 mark)
7. Distinguish between haemolysis and plasmolysis. (2 marks)
8. State three external differences between chilopoda and diplopoda. (3 marks)
9. State **two** ways in which chiroplasts are adapted to their functiuons. (2 marks)
10. State two advantages of hybrid vigour. (2 marks)
11. The diagram below shows a transverse section of leaf.
- a) Name the habitat of the plant from which the leaf was obtained. (1 mark)
  - b) Give one reason for your answer in (a) above. (2 marks)
12. The diagram below illustrates the structure of bread mould.
- a) Name the part labeled **J** (1 mark)
  - b) State the function of the structure labeled **K** (2 marks)
13. What is meant by the following term?
- a) Habitat; (1 mark)
  - b) Ecosystem (1 mark)
14. Explain why is not advisable to be in a poorly ventilated room with a burning charcoal. (3 marks)
15. A potted plant was kept in the dark for 48 hours. Two leaves **X** and **Y** were treated as shown in the diagram below.

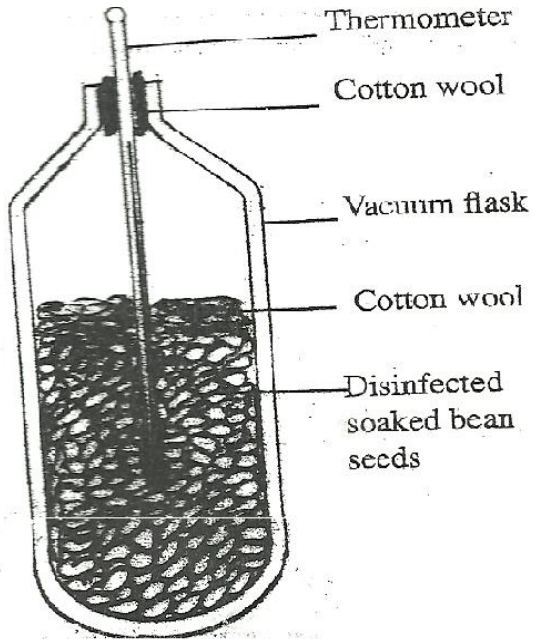
- The experimental set-up was kept in sunlight for 6 hours after which a starch test was carried out on the two leaves.
- a) What were the results of the starch test on leaves **X** and **Y**? (2 marks)
- b) Give reasons for your answers in (a) above. (2 marks)
16. What is the role of bile salts in humans? (2 marks)
17. The following is the dental formula of a certain mammal:
- i  $\frac{0}{3} \frac{c}{0/1} \frac{pm}{3/3} \frac{m}{3/3}$
- a) State the likely mode of feeding for the mammal. (1 mark)
- b) Give a reason for your answer in (a) above. (1 mark)
18. Give **two** reasons why animals have specialized organ for excretion as compared to plants (2 marks)
19. State the changes that occur in arterioles in the human skin during thermoregulation. (2 marks)
20. State **two** advantages of internal fertilization in humans. (2 marks)
21. The diagram below represents part of the human skeleton.
- a) Name the part labeled **P** (1 mark)
- b) i) Name the bone the articulates with the part labeled **Q**. (1 mark)
- ii) What type of joint is formed between the part labeled **Q** and the bone named in (b) (i) above?(1mk)
22. What is the function of the following structure in the human reproductive organ?
- a) Fallopian tubes. (1 mark)
- b) Epididymis. (1 mark)
- c) Scrotl sac (1 mark)
23. Explain **three** ways in which red blood cells are adapted to their function. (3 marks)
24. .
- a) State **two** ideas proposed by Lamark in his theory of evolution. (2 marks)
- b) Why is Larmark's theory not acceptable? (1 mark)
25. State **three** factors that contribute to the deceleration phase in the population curve of an organism (1 mark)
26. State **one** survival value for each of the following in plants:
- a) Thigmotropism in stems; (1 mark)
- b) Geotropism in roots. (1 mark)
27. .
- a) What is meant by the term non-disjunction? (1 mark)
- b) Give an example of a genetic disorder caused by:
- i) Non-disjunction; (1 mark)
- ii) Gene mutation (1 mark)
28. State **three** structural differences between arteries and veins. (3 marks)
29. The diagram below represents a female cone.
- a) Name the subdivision of the plant from which the cone was obtained. (1 mark)
- b) Other than the presence of cone, name **two** other external features that identify plants in the subdivision named in (a) above. (2 marks)
20. What is meant by the apical dominance? (3 marks)

# PAPER 2

## SECTION A (40 MARKS)

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

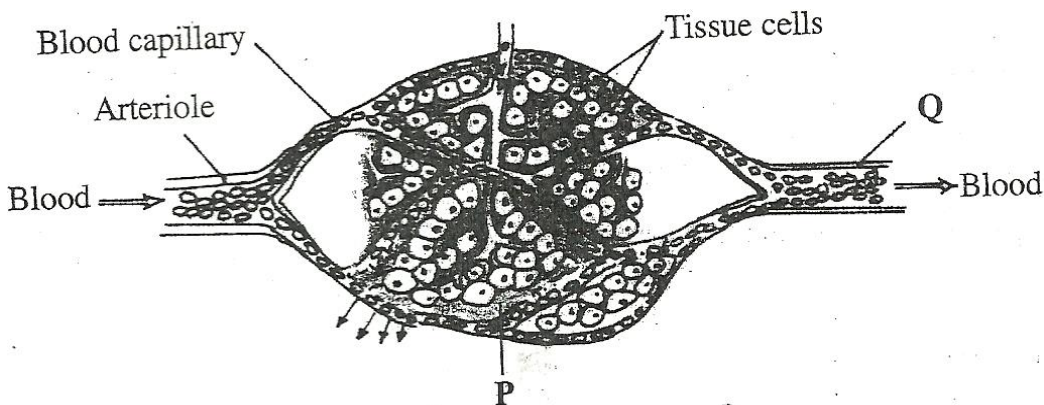
1. In an experiment, disinfection soaked bean seeds were put in a vacuum flask which was then fitted with a thermometer as shown in the diagram below.



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

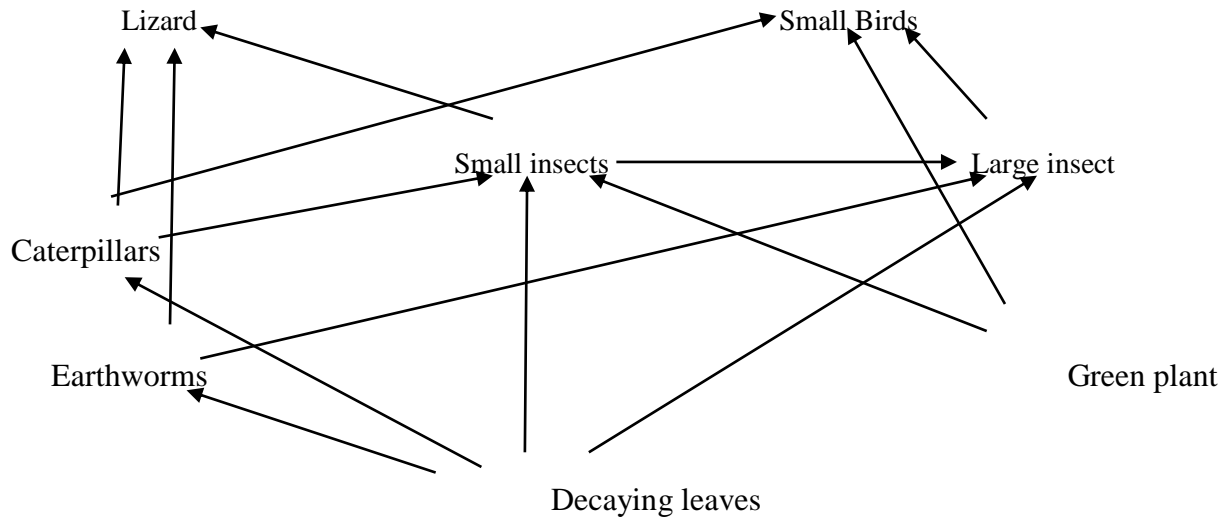
- Which process was being investigated? (1 mark)
- i) what were the expected results? (1 mark)  
ii) account for the answer in (b) (i) above? (2 marks)
- Why were the seeds disinfected? (2 marks)
- Why was a vacuum flask used in the set-up? (1 mark)
- How would a control for this experiment be set? (1 mark)

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

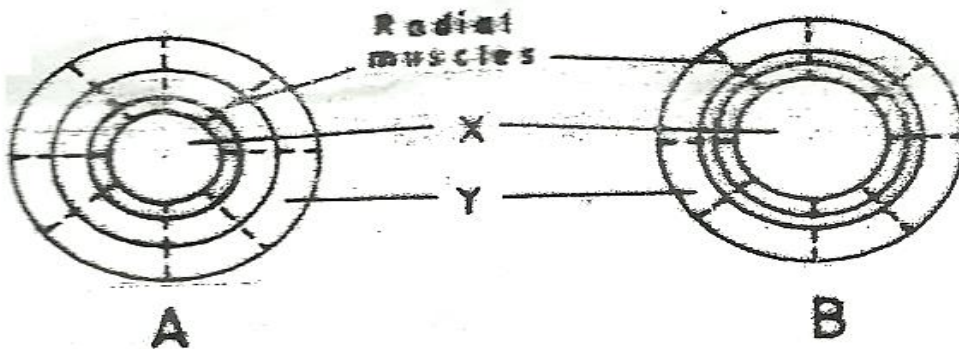


- Name the part labeled **P** and **Q** (2 marks)
  - Name the substance that are:
    - Required for respiration that move out of capillaries; (2 marks)
    - Remove from tissue cells as a result of respiration (2 marks)
  - Explain how substances move from blood capillaries into the tissue cells. (2 marks)
  - Name **one** component of the blood that is not found in the part labeled **P** (1 mark)
3. The diagram below represents a food web in certain ecosystem





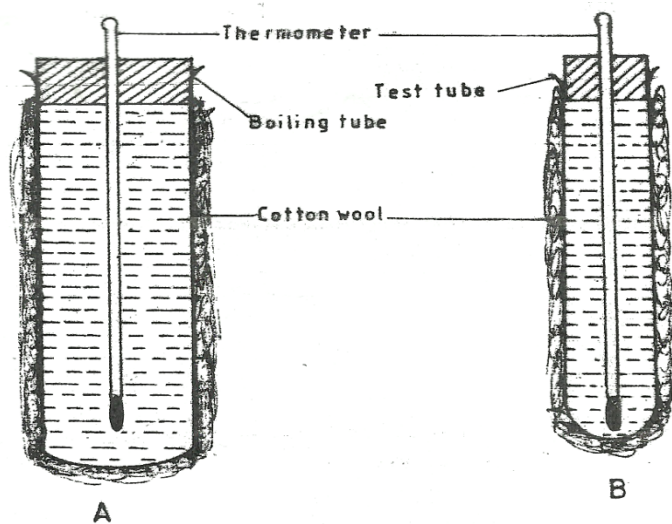
- a) Name the trophic level occupied by each of the following:
- Caterpillars (1 mark)
  - Small insect. (1 mark)
- b) From the food web, construct **two** food chains which end with lizards as a tertiary consumer. (2 marks)
- c) i) Which organisms have the least biomass in this ecosystem? (1 mark)
- ii) Explain the answer in (c)(i) above. (3 marks)
4. The diagram below shows how the iris and pupil of a human eye appear under different conditions.



- a) Name the structures labeled **X** and **Y** (2 marks)
- b) i) State the condition that leads to the change in appearance shown in the diagram labeled **B** (2 marks)
- ii) Describe the change that lead to the appearance of the iris and pupil as shown in the diagram labeled **B**. (4 marks)
- iii) What is the significance of the change described in (b) (ii) above? (1 mark)
5. 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 white coat colour, work out the genotypic ratio of  $F_2$ . (1 mark)
- b) State the phenotypic ratio of  $F_2$ . (1 mark)
- c) i) Name the term used when two alleles in heterozygous state are fully expressed phenotypically in an organism. (1 mark)
- ii) Give an example of a trait in human beings where the condition whose term is named in (c) (i) above expresses itself. (1 mark)

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

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



The temperatures reading were taken at the start and after every two minutes for twenty minutes. The results were as shown in the table below.

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

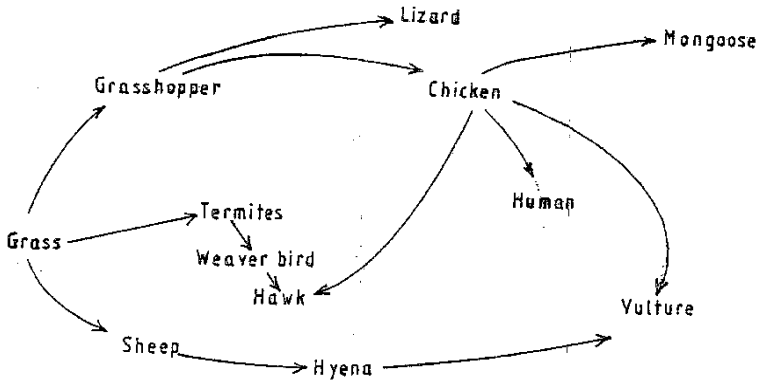
- a) Using the same axes, draw graphs of temperature against time. (6 marks)
- b) i) Work out the rate of heat in the boiling tube labeled **A** and test tube labeled **B** between the 5<sup>th</sup> and 15<sup>th</sup> minutes.  
 ii) Account for the answers in (b) (i) above. (2 marks)  
 iii) How does the explanation in (b) (ii) above apply to an elephant and a rat? (2 marks)
- c) i) State the role of the cotton wool in this experiment. (1 mark)  
 ii) Name **two** structures in mammals that play the role stated in (c) (i) above (2 marks)
- d) State **three** advantage of having constant body temperature in mammals. (3 marks)
7. Describe the process of fertilization in flowering plants. (20 marks)
8. Describe how a finned fish such as Tilapia moves in water. (20 marks)



# BIOLOGY

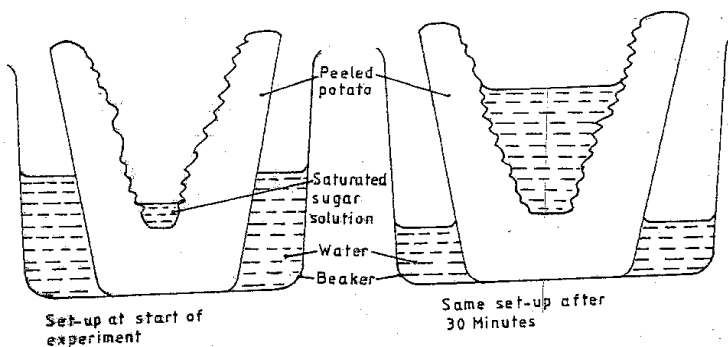
## PAPER 1

1. Name two kidney diseases.
2. (a) Write the dental formula of an adult human.
3. Give three reasons for classifying organisms.
4. State one use for each of the following apparatus in the study of living organisms.
  - (a) Pooter
  - (b) Pitfall trap
5. The figure below illustrates a food web in a certain ecosystem.



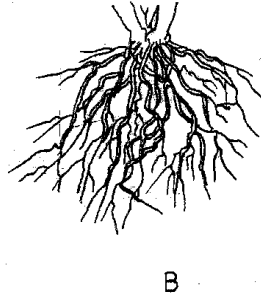
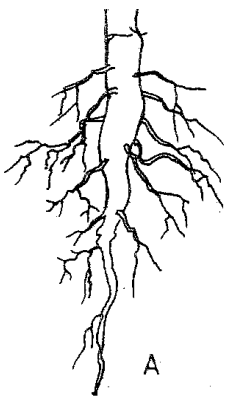
From the food web:

- (a) Draw the shortest food chain;
  - (b) identify the organisms with the highest
    - (i) Number of predators
    - (ii) Biomass
6. What is meant by the following terms?
    - (a) Ecology
    - (b) Carrying capacity
  7. The diagrams below show an experiment set up to investigate a certain process in a plant tissue.



Explain the results obtained after 30 min.

8. State three characteristics of the class crustacean.
9. The diagrams below illustrate the organs of some flowering plants.



State the classes of plants to which each belong.

A

B

10. (a) give two differences in the products of anaerobic respiration between plants and animals.

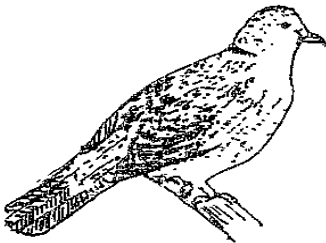
(b) Name the site of anaerobic respiration in a cell.

11. State two functions of the following parts of a light microscope.

Fine adjustment knob

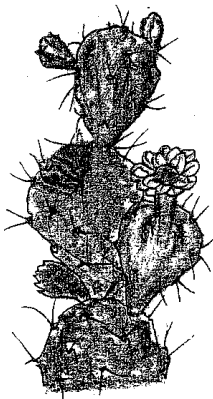
Stage

12. The diagram below represents a certain organism.



State the phylum and class of carbohydrates in the human body.

14. The diagram below represents a certain plant.



(a) What is the likely habitat of the plant?

(b) Give two reasons for your answer in (a) above.

15. Give reasons for carrying out the following procedures when preparing temporary wet mounts of plant tissues.

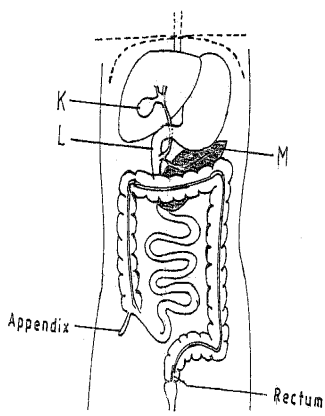
(a) Making thin plant sections

(b) Adding water on the plant section.

16. (a) describe the condition known as varicose veins.

(b) What is the role of blood platelets in the clotting process?

17. The diagram represents part of the human digestive system.



(a) Name the organs labeled L and M.

L

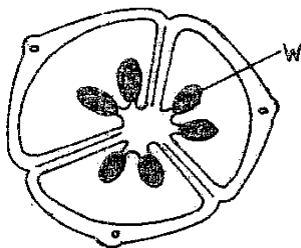
M

(b) (i) Name the substance named in b (i) above.

19. (a) Apart from the lungs, name two gaseous exchange surfaces in a frog.  
 (b) Write an equation that summarizes the process of aerobic respiration.
20. The number of stomata on the lower and upper surface of two leaves from plant X and Y were counted under the field of view of a light microscope. The results were as shown in the table below.

Leaf	Number of stomata	
	Upper surface	Lower surface
X	4	12
Y	20	23

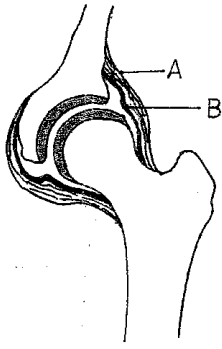
- (a) Which of the leaves would be expected to have a lower rate of transpiration?  
 (b) Given a reason for your answer in (a) above
21. (a) what is meant by convergent evolution?  
 (b) State **two** limitations of fossils as an evidence of evolution.
22. State the difference in content of oxygen and carbon (IV) oxide in the air that enters and leaves the human lung.
23. The diagram below represents a transverse section of an ovary from a certain flower.



- (a) (i) name the structure labeled W  
 (ii) name the type of plantation illustrated in this diagram.
24. (a) Difference between the following terms:  
 (i) dominant gene and recessive gene;  
 (ii) continuous variation and discontinuous variation  
 (b) What would be the expected results from a test cross?
25. State one economic importance of each of the following plant excretory products.  
 (a) Tannin  
 (b) Quinine  
 (c) Caffeine

26. Name the gamete cells that are produced by the ovaries.

27. The diagram below represents features of a joint mammal.



(a) Name the part labeled A

(b) State the function of the part labeled B

28. (a) What is a tropic response?

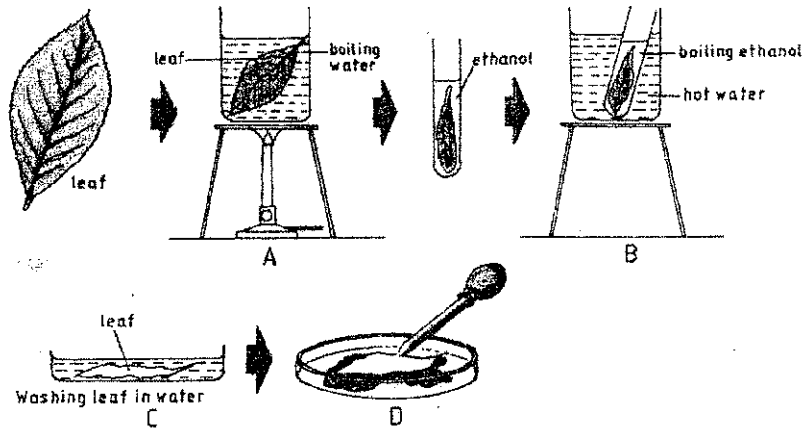
(b) State **two** ways by which auxins regulate growth in seedlings

29. State **four** reasons why water is significant in seed germination

## BIOLOGY PAPER 2

### QUESTIONS

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



been growing in sunlight.

(i) What was the purpose of the above procedure ?

1 (mark)

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

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

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

2.

In humans, hairy ears is controlled by a gene on the Y Chromosomes .

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

(4 marks)

(i) What is the probability of the girls having hairy ears? (1 mark)

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

) Name two disorders in humans that are determined by sex linked genes (2marks)

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

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

(2marks)

(i) whooping cough.

(ii) Pneumonia

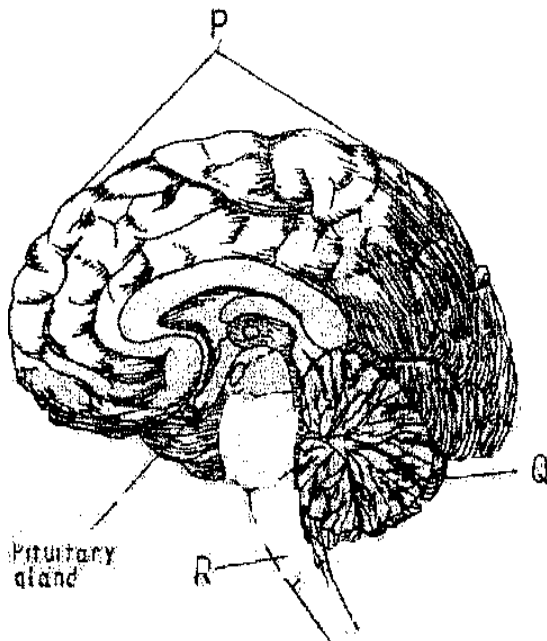
(b) Describe how oxygen in the alveolus reaches the red blood cells .

(4marks)

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

(2marks)

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



(i) Name the structure labeled Pand R.

(ii) State two functions of the part labeled Q

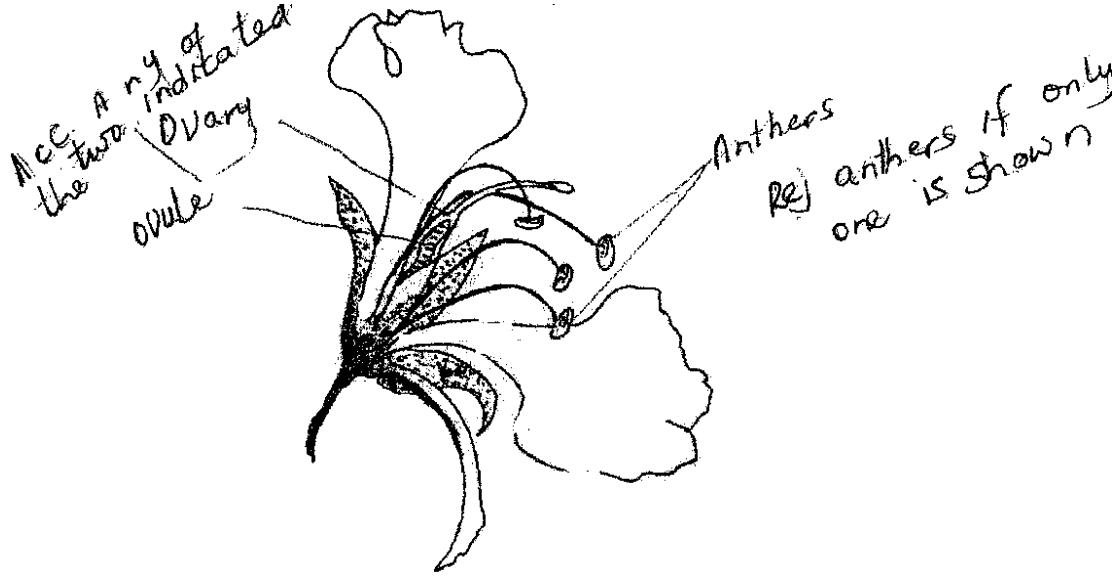
(b) (i) Name two reproductive hormones secreted by the pituitary gland in women.

(2marks)

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

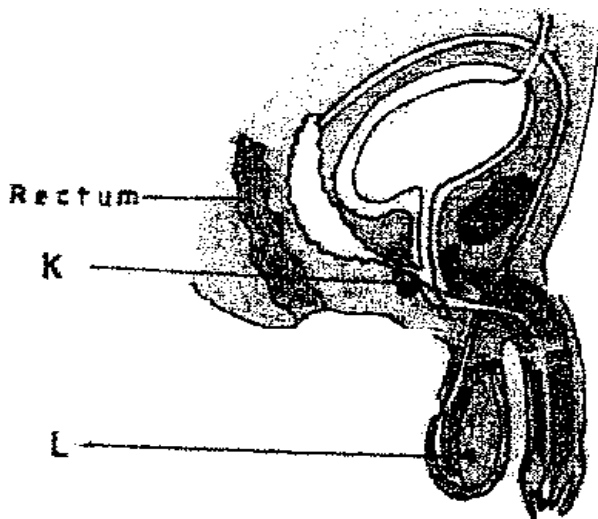
(2marks)

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



- (i) On the diagram, name two structures where meiosis occurs. (2 marks)
- .....
- .....
- (ii) How is the flower adapted to prevent self-pollination?

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



- (i) Explain two adaptations of the structure labeled L to its functions (2 marks)
- Explain the role of gland labeled K

**SECTION B (40 MARKS)**

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

(a) An experiment was carried out to investigate the population of a certain micro-organism. Two petri-dishes were used. Into the petri-dish labeled M, 60cm<sup>3</sup> of a culture medium was placed while 30cm<sup>3</sup> of the same culture medium was placed in petri-dish labeled N. Equal numbers of the micro-organisms were introduced in

both petri-dishes . The set-ups were then incubated at 35<sup>o</sup>c. The number of micro-organisms in each petri-dish was determined at irregular intervals for a period of 60 hours . The results were as shown in the table below

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

(i) On the

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

( 7 marks)

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

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

(iii)

(iv) With a reason state the effect on the population of micro-organisms in petri-dish M if the temperature Was raised to 60<sup>o</sup>c after 20 hours . (2marks)

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

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

When the osmotic pressure of the blood increases beyond the normal level ( osmoreceptors)hypothalamus detects this and stimulates the pituitary gland to /secretes / release more ADH vasopressins which make kidney tubules more permeable to water ; and more water is reabsorbed into the blood ; reducing the osmotic pressure to the normal level ; Acc reverse  
When osmotic presser falls below the nomal level the (osmoreptors) in the hypothalamus detect this the pituitary gland is less stimulated Non /little /less permeable to water hence less water is absorbed into the blood ; increasing the osmotic level

when op is high

when there is too much Na<sup>+</sup><sub>(aq)</sub> – the blood adrenal cortex responds by secreting less aldosterone; which causes less Na<sup>+</sup><sub>(aq)</sub> to be absorbed from the kidney tubules into the blood; lowering the sodium ions level

when op is low

when there is too low Na<sup>+</sup> ions /or Na<sup>+</sup><sub>(aq)</sub> in the blood adrenal cortex responds by secreting more adolsterone which causes more Na<sup>+</sup> to be reabsorbed from the kidney tubules into the blood ; raising the Na<sup>+</sup> level

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

Explain how the human skin brings about cooling of the body on a hot day . (7marks)

Describe the exoskeleton and its functions in insects . (13marks )

escribe how accommodation in the human eye is brought about when focusing on a near object . (7marks)



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Name ..... Index Number .....

231/1  
BIOLOGY  
Paper 1  
(THEORY)  
Oct./Nov. 2012  
2 hours

Candidate's Signature .....

Date .....



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**

**Kenya Certificate of Secondary Education**

**BIOLOGY**

**Paper 1  
(THEORY)  
2 hours**

<b>231/1</b>	<b>Biology P1</b>
Thursday	8.00 am - 10.00 am
15/11/2012	(1 <sup>st</sup> Session)

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer **ALL** the questions in the spaces provided.
- (d) **This paper consists of 11 printed pages.**
- (e) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

**For Examiner's use only**

Question	Maximum Score	Candidate's Score
1 - 30	80	



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Kenya Certificate of Secondary Education, 2012  
BIOLOGY  
Paper 1

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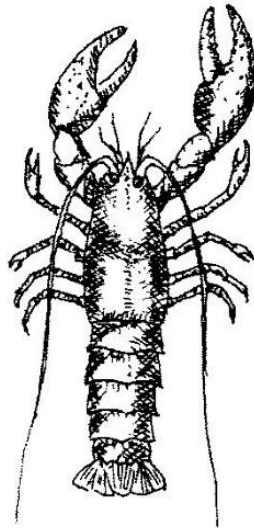
220020001

Turn over

1 How does nutrition as a characteristic of living organisms differ in plants and animals? (2 marks)

.....  
.....

2 The diagram below represents a certain organism collected by a student at the sea shore.



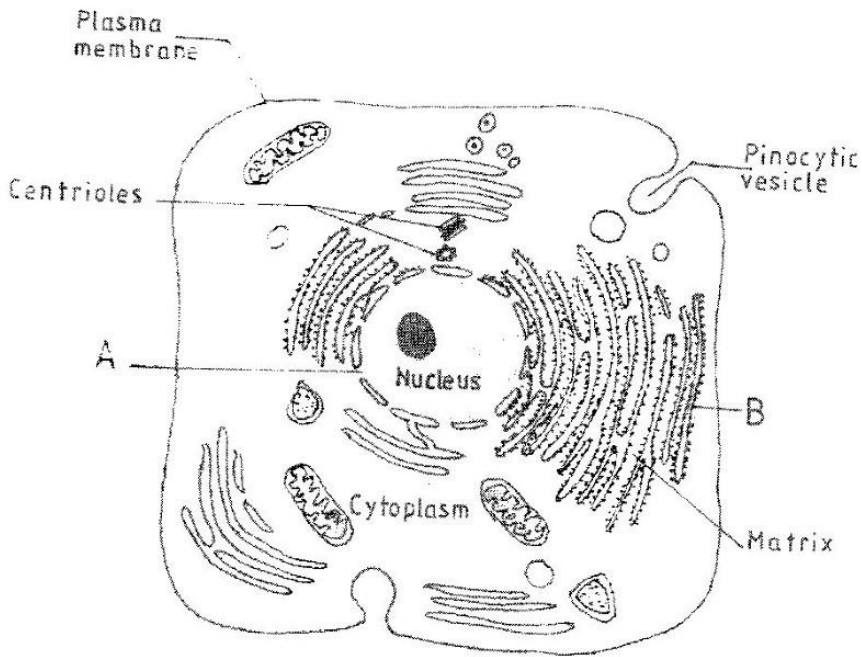
(a) Name the class to which the organism belongs. (1 mark)

.....

(b) Give **three** reasons for your answer in (a) above. (3 marks)

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

3 The figure below is a fine structure of a generalised animal cell as seen under an electron microscope.



(a) Name the parts labelled **A** and **B**. (2 marks)

**A** .....

**B** .....

(b) How is the structure labelled **B** adapted to its function? (2 marks)

.....  
.....

- 4 In an investigation, a student extracted three pieces of paw paw cylinders using a cork borer. The cylinders were cut back to 50 mm length and placed in a beaker containing a solution. The results after 40 minutes were as shown in the table below.

Feature	Result
Average length of cylinders (mm)	56 mm
Stiffness of cylinders	stiff

- (a) Account for the results in the table above. (3 marks)

.....

.....

.....

- (b) What would be a suitable control set-up for the investigation? (2 marks)

.....

.....

- 5 The table below shows results of a study of three plants C, D and E growing in different habitats.

Feature	Plant C	Plant D	Plant E
Number of stomata on upper surface of leaf per square area	4	20	6
Number of stomata on lower surface of leaf per square area	6	0	8
Thickness of leaf cuticle (mm)	0.4	0.1	0.2
Surface area of roots (cm <sup>2</sup> )	2000	1000	1200

- (a) Which one of the plants C, D and E grows in an area of relatively low water availability? (1 mark)

.....

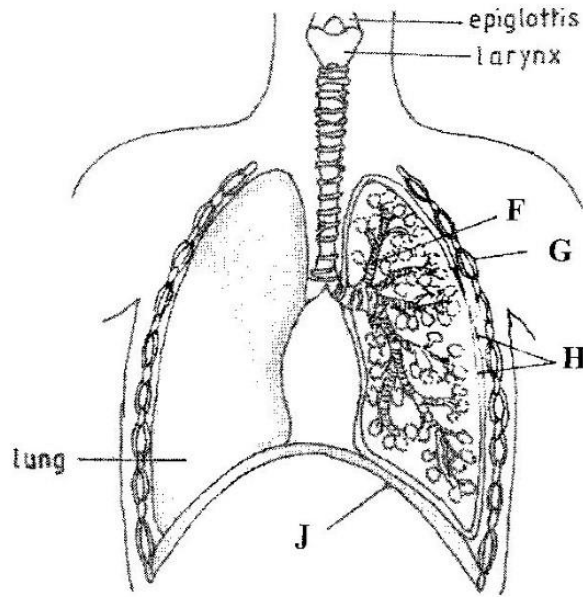
- (b) Explain your answer in (i) above. (3 marks)

.....

.....

.....

- 6 The diagram below represents part of the gaseous exchange system in human.



- (a) Name the parts labelled F and G. (2 marks)

F .....

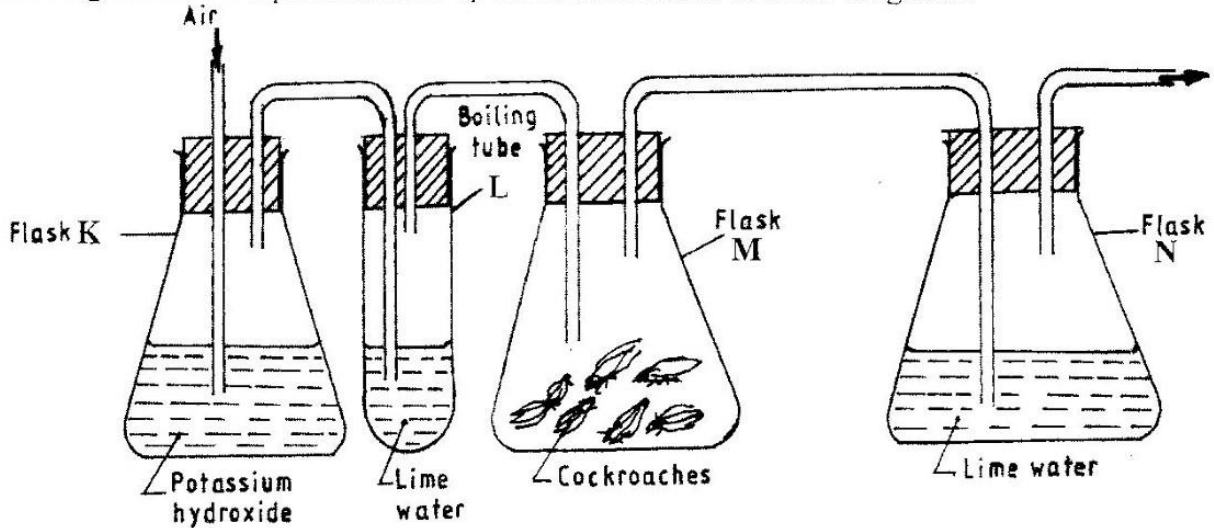
G .....

- (b) State **one** function of each of the parts labelled H and J. (2 marks)

H .....

J .....

7 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) State the role of potassium hydroxide in flask K. (1 mark)

.....

(c) Account for the observation in boiling tube L and flask N. (2 marks)

L .....

.....

N .....

.....

8 What is the probability of a couple with blood group AB getting a child with blood group AB? Show your working. (4 marks)

.....

.....

.....

.....

9 State the importance of negative phototaxis to termites. (1 mark)

.....  
.....

10 What is meant by the term irritability? (1 mark)

.....  
.....

11 (a) State two ways in which heart muscles are special. (2 marks)

.....  
.....

(b) Name the muscles found in the following organs: (2 marks)

stomach: .....

bone: .....

12 (a) Name the part of a light microscope used to bring an image of a specimen into sharp focus. (1 mark)

.....

(b) Why is it recommended to keep the stage of the microscope dry? (1 mark)

.....

13 State three factors that affect the rate of diffusion. (3 marks)

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

14 (a) Name the type of respiration that is most efficient. (1 mark)

.....

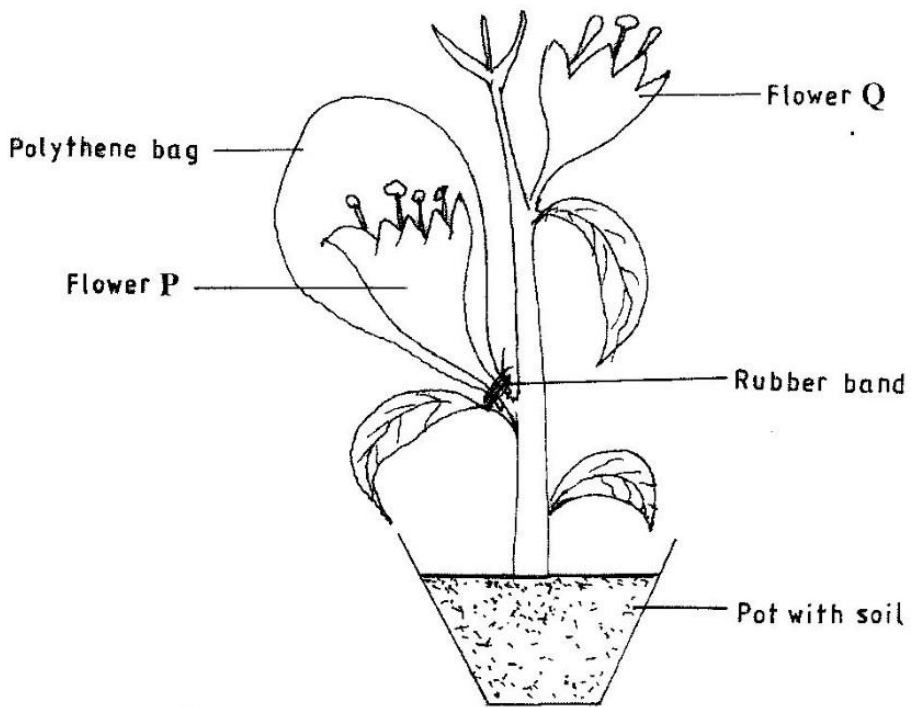
(b) Give a reason for your answer in (a) above (1 mark)

.....

15 What name is given to a group of hormones that controls the development of secondary sexual characteristics in a human male? (1 mark)

.....

16 The diagram below represents an experimental set-up used by students to investigate a certain process.



Flower Q produced seeds while P did not. Account for the results. (3 marks)

.....

.....

.....

17 Name **two** substances that leave the foetal blood through the placenta. (2 marks)

.....  
.....

18 Why are plants able to accumulate most of their waste products for long? (1 mark)

.....

19 List **four** symptoms of diabetes mellitus. (4 marks)

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

20 State **three** aspects that can be used to estimate growth in seedlings. (3 marks)

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

21 Name the process through which free atmospheric nitrogen is converted into nitrates. (1 mark)

.....

22 State the importance of divergent evolution to organisms. (2 marks)

.....  
.....

23 Name the strengthening materials found in the following support tissues: (2 marks)

- (a) collenchyma; .....
- (b) xylem. ....

24 State **four** characteristics of apical meristem cells. (4 marks)

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

25 State the role of the following hormones in the life cycle of insects: (2 marks)

ecdysone hormone; .....

juvenile hormone. ....

26 (a) State the theories of evolution proposed by the following scientists. (2 marks)

Charles Darwin .....

Jean-Baptiste de Lamarck .....

(b) State the evidence of evolution based on (2 marks)

(i) cell organelles .....

(ii) fossils. ....

27 What is the function of contractile vacuoles in amoeba? (1 mark)

.....

28 State **two** differences between open and closed circulatory systems. (2 marks)

.....  
.....

29 Name **two** nutrients that are absorbed without being digested by enzymes in humans. (2 marks)

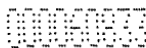
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30 Name the organelle that is involved in each of the following: (2 marks)

(a) manufacture of lipids .....

(b) formation of lysosomes.....

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Name ..... Index Number ..... / .....

231/2  
BIOLOGY  
Paper 2  
(THEORY)  
Oct./Nov. 2012  
2 hours

Candidate's Signature .....

Date.....



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**  
**Kenya Certificate of Secondary Education**

**BIOLOGY**  
**(THEORY)**  
**2 hours**

**231/2 – Biology Paper 2**  
Monday 8.00 am – 10.00 am  
19/11/2012 (1st Session)

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) This paper consists of **two** sections; **A** and **B**.
- (d) Answer **all** the questions in section **A** in the spaces provided.
- (e) In section **B** answer question **6 (compulsory)** and either question **7** or **8** in the spaces provided after question **8**.
- (f) **This paper consists of 12 printed pages.**
- (g) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

**For Examiner's Use Only**

Section	Questions	Maximum Score	Candidate's Score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
	7	20	
	8	20	
<b>Total Score</b>		<b>80</b>	

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Kenya Certificate of Secondary Education, 2012  
BIOLOGY  
Paper 2



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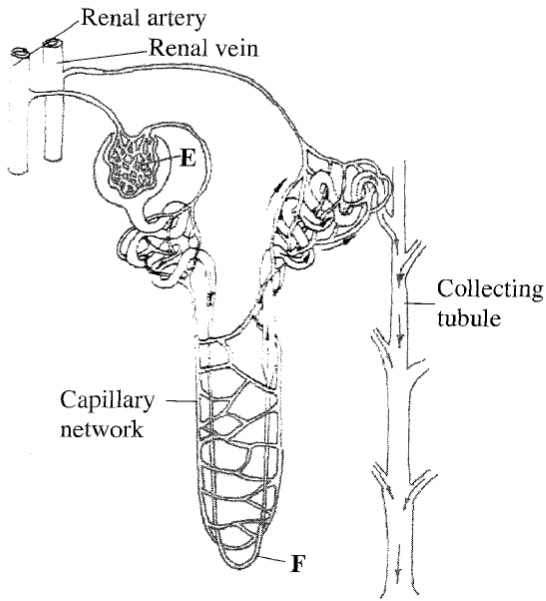
THE END

**SECTION A** (40 marks)

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

- 1 In a certain plant species which is normally green, a recessive gene for colour ( $n$ ) causes the plants to be white in colour. Such plants die at an early age. In the heterozygous state, the plants are pale green in colour but grow to maturity.
- (a) Give a reason for the early death of the plants with the homozygous recessive gene. (2 marks)
- .....
- .....
- (b) If a normal green plant was crossed with the pale green plant, what would be the genotype of the first filial generation ( $F_1$  generation)? Show your working. (4 marks)
- (c) If heterozygous plants were self-pollinated and the resulting seeds planted, work out the proportion of their offspring that would grow to maturity. (2 marks)

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



(a) Name the part labelled E. (1 mark)

.....

(b) How is the part labelled F adapted to its function? (4 marks)

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

(c) State **three** physiological mechanisms of controlling the human body temperature during a cold day. (3 marks)

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

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

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

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

.....

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

.....

- (iii) Account for the results in test tubes **H** and **J**. (2 marks)

.....

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

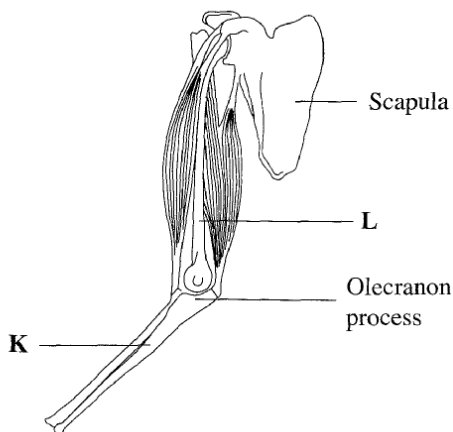
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4 (a) The diagram below illustrates the arrangement of bones and muscles in the human arm.



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

**K** .....

**L** .....

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

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

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

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

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

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

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**SECTION B** (40 marks)

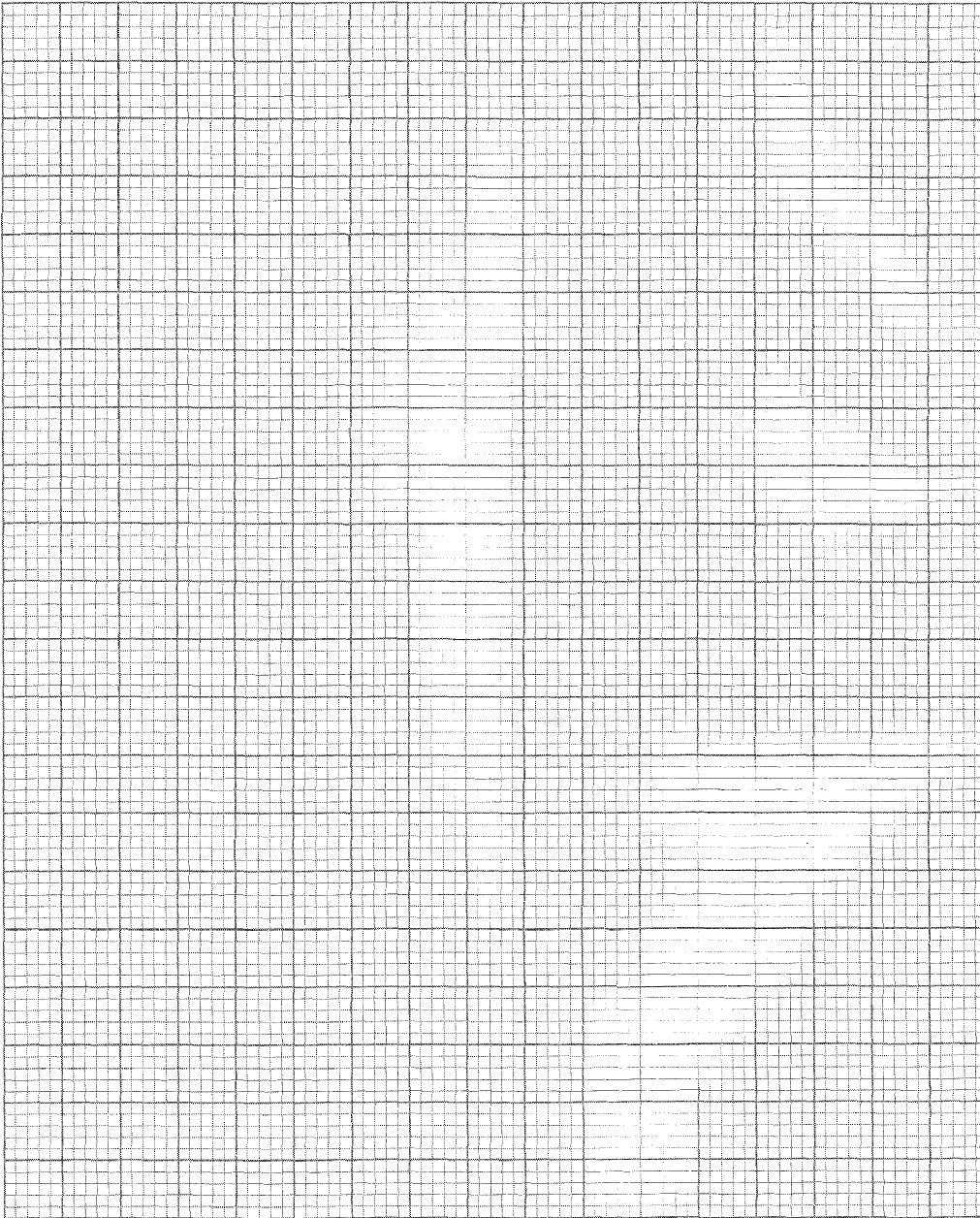
Answer question 6 (compulsory) and either question 7 or 8 in the spaces provided after question 8.

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

TIME IN YEARS	POPULATION IN RELATIVE NUMBERS	
	POPULATION OF P	POPULATION OF Q
5	24500	17000
10	30000	20500
15	33500	26000
20	33500	30000
25	31000	33000
30	27000	32000
35	25000	30000
40	29000	27500
45	32500	28000
50	34000	28500

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





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

.....

.....

.....

.....

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

.....

.....

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.....

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

.....

.....

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

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.....

.....



00063519

Name ..... Index Number ..... / .....

231/3  
BIOLOGY  
Paper 3  
(PRACTICAL)  
Oct./Nov. 2012  
1¼ hours

Candidate's Signature .....

Date.....



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
Kenya Certificate of Secondary Education  
BIOLOGY  
Paper 3  
(PRACTICAL)  
1¼ hours

**231/3 – Biology Paper 3 (Practical)**  
Tuesday 8.00 am – 9.45 am  
23/10/2012 (1st Session)

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer **all** the questions in the spaces provided.
- (d) You are required to spend the first 15 minutes of the 1¼ hours allowed for this paper reading the whole paper carefully before commencing your work.
- (e) Additional pages must **not** be inserted.
- (f) **This paper consists of 7 printed pages.**
- (g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

**For Examiner's use only**

Question	Maximum Score	Candidate's Score
1	12	
2	14	
3	14	
<b>Total Score</b>	<b>40</b>	

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BIOLOGY  
Paper 3

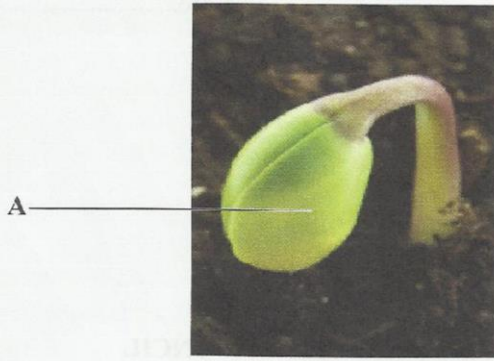


912035

220020008

Turn over

1 Below is a photograph showing a seedling during germination.



- (a) With a reason, name the type of germination shown in the photograph.
- (i) Type of germination ..... (1 mark)
- (ii) Reason .....  
 ..... (2 marks)

(b) State **three** functions of the part labelled A in the germination of a seedling up to the appearance of the first foliage leaves. (3 marks)

.....

.....

.....

(c) Account for the change in shape the seedling will undergo to straighten. (6 marks)

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2 (a) You are provided with a specimen labelled **D** which has been grown on a substrate.

(i) Name the specimen (1 mark)

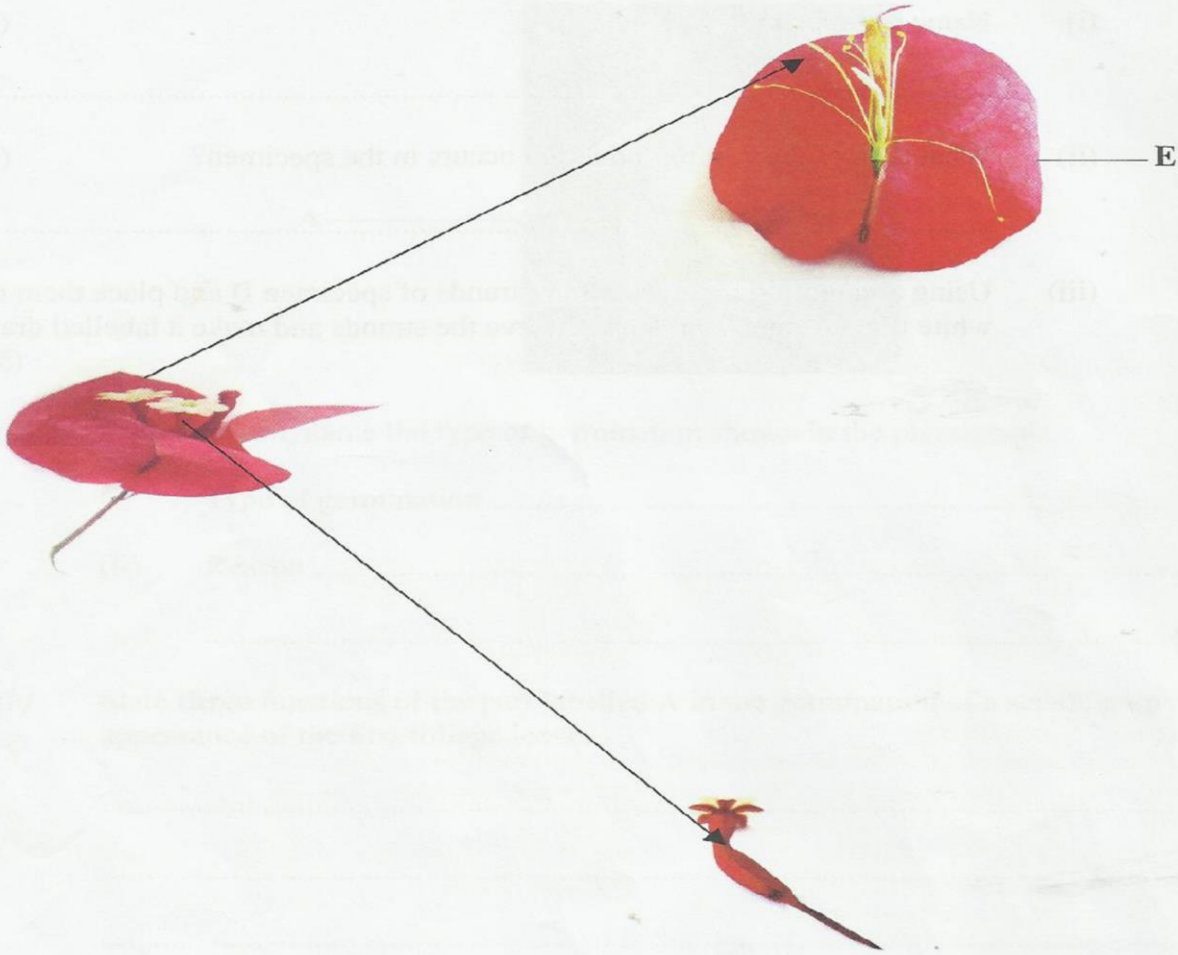
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(ii) What type of asexual reproduction occurs in the specimen? (1 mark)

.....

(iii) Using a mounting pin, pick a few strands of specimen **D** and place them on the white tile. Using a hand lens, observe the strands and make a labelled drawing. (3 marks)

(b) The photograph below shows different parts of a flower.



(i) Name the class of the plant from which the photograph was taken. (1 mark)

.....

(ii) Using observable features on the photograph, give **three** reasons for your answer in (b) (i) above. (3 marks)

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

(iii) Name the agent of pollination for the flower in the photograph. (1 mark)

.....

(iv) State **three** observations on the photograph that support the answer in (b) (iii) above. (3 marks)

.....

.....

.....

(v) Name the part labelled **E** on the photograph. (1 mark)

.....

3 You are provided with a potato, a 10 ml measuring cylinder, dilute hydrogen peroxide solution and substances **F** (pH 4), **G** (pH 7) and **H** (pH 9). Cut the potato and remove a piece measuring 1 cm<sup>3</sup> from it.

Cut the 1 cm<sup>3</sup> piece into tiny pieces and crush (macerate) them on a clean white tile using a glass rod.

Divide the macerated potato into **three** equal portions for use in the procedure that follows:

- I. Put 2 cm<sup>3</sup> of substance **F** (pH 4) into the 10 ml measuring cylinder.  
Add **one** portion of the macerated potato into the measuring cylinder.  
Read and record the volume of the mixture in the table provided below.  
Add one drop of washing-up solution.  
Add 1 cm<sup>3</sup> of dilute hydrogen peroxide solution to the mixture and immediately start a stop clock or watch. At the end of **two minutes**, read the mark to which the foam rises.  
Record the reading in the table provided.  
Clean and rinse the measuring cylinder with distilled water.
- II. Put 2 cm<sup>3</sup> of substance **G** (pH 7) into the measuring cylinder.  
Add the **second** portion of the macerated potato.  
Read and record the volume of the mixture in the table.  
Add one drop of washing-up solution.  
Add 1 cm<sup>3</sup> of dilute hydrogen peroxide solution to the mixture and immediately start a stop clock or watch. At the end of **two minutes**, read the mark to which the foam rises.  
Record the reading in the table.  
Clean and rinse the measuring cylinder with distilled water.

- III. Put 2 cm<sup>3</sup> of substance **H** (pH 9) into the measuring cylinder.  
 Add the **third** portion of the macerated potato.  
 Read and record the volume of the mixture in the table.  
 Add one drop of washing-up solution.  
 Add 1 cm<sup>3</sup> of dilute hydrogen peroxide solution to the mixture and immediately start a stop clock or watch. At the end of **two minutes**, read the mark to which the foam rises.  
 Record the reading in the table.

	F (pH 4)	G (pH 7)	H (pH 9)
<b>Volume of solution + portion of potato</b>			
<b>Volume of solution + portion of potato + foam</b>			
<b>Volume of foam</b>			

(9 marks)

- (a) Using the data obtained in the table, calculate the volume of the foam produced in each of the pH 4, pH 7, and pH 9 substances. Record the volumes in the table.

(b) Account for

(i) the observation made when hydrogen peroxide was added to the potato mixture (3 marks)

.....

.....

.....

(ii) the difference in the volume of foam produced in pH 4 and pH 9 substances. (2 marks)

.....

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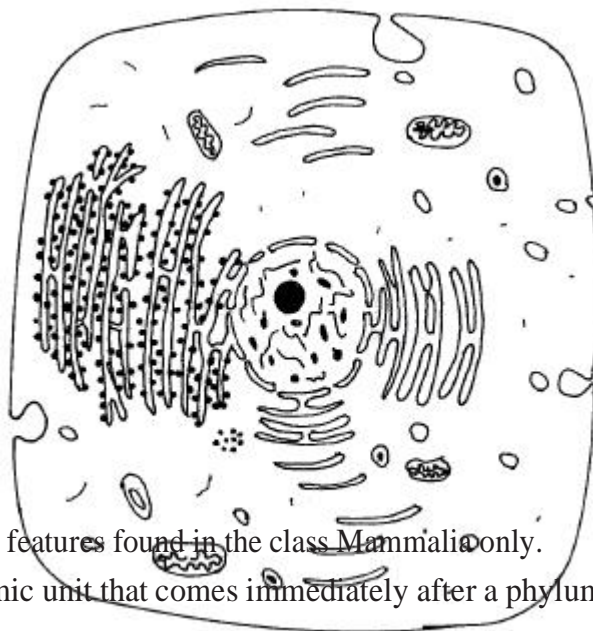
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Kenya Certificate of Secondary Education, 2012  
BIOLOGY  
Paper 3

**220020008**

912035

3.4.1 Biology Paper 1 (231/1)

- 1 (a) What is meant by the term wilting? (1 mark)
- (b) Explain how an increase in temperature affects the rate of active transport. (2 marks)
- (a) Based on the diagram, state whether it represents an animal cell or a plant cell.
- (b) Give **two** reasons for your answer in 2(a) above. (2 marks)
- (c) Why is the palisade layer a tissue? (1 mark)



- 3 (a) State **two** external features found in the class Mammalia only. (2 marks)
- (b) Name the taxonomic unit that comes immediately after a phylum in classification. (1 mark)
- 4 (a) State **two** roles of mucus in the stomach. (2 marks)
- (b) Explain how age determines a person's energy requirements. (2 marks)

- 5 Describe how turgor pressure builds up. (3 marks)

6.  $6000\mu\text{m}$ . Calculate the average length of the cells. Show your working. (2 marks)

vessels: (2 marks)

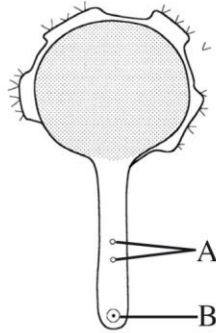
**7** Explain how the following forces contribute to the movement of water up the xylem

A) cohesion

(b) adhesion.

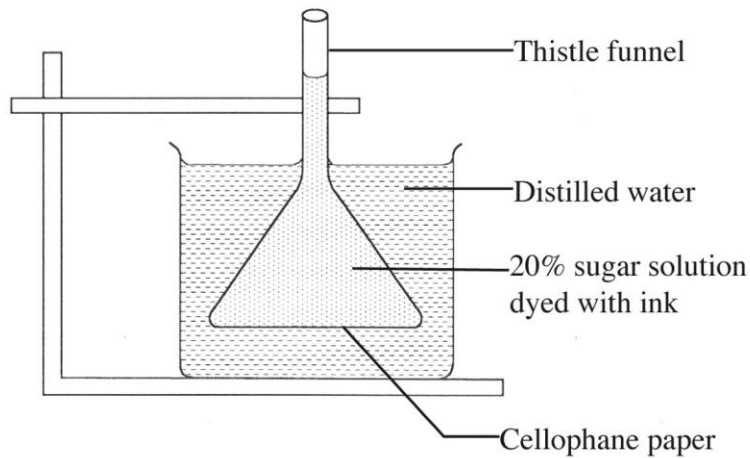
Answer *all* the questions.

- 1 State the importance of each of the following in living organisms:
- (a) nutrition (1 mark)
  - (b) excretion. (1 mark)
- 2 (a) What is meant by the term seed dormancy? (1 mark)
- (b) State **three** causes of seed dormancy. (3 marks)
- 3 State **two** functions of the placenta in mammals. (2 marks)
- 4 The diagram below illustrates a growing pollen tube.



- (a) Name the part labelled **B**. (1 mark)
- (b) Explain the role of the parts labelled **A** . (2 marks)

5 The diagram below shows a set up for an experiment to demonstrate a certain physiological process.



- (a) What nature of solution is represented by 20% sugar solution? (1 mark)
- (b) Explain the observation made on the set up after one hour. (2 marks)

6 State **three** roles of auxins in a plant stem. (3 marks)

7 A student drew a 6cm long diagram of a plant flower. If the actual length of the flower was 12cm, calculate the magnification of the drawing made by the student. Show your working. (2 marks)

8 Differentiate between phenotype and genotype as used in genetics. (1 mark)

9 State **two** functions of intervertebral discs in the mammalian skeleton. (2 marks)

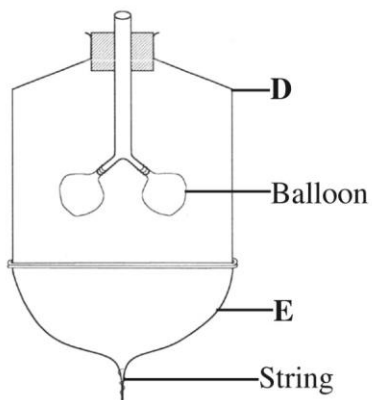
10 (a) Explain **two** roles of diffusion in human beings. (4 marks)

- (b) What is meant by each of the following terms?
  - (i) Crenated cell. (1 mark)
  - (ii) Flaccid cell. (1 mark)

11 State **three** differences between tactic and tropic responses. (3 marks)

Tactic Responses	Tropic Responses

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



- (a) Name the mammalian structure represented by the parts labelled **D** and **E**.
- (i) **D** .....
- (ii) **E** .....
- (b) State the observation made when the string is pulled downwards.
- (c) Explain the observation in (b) above.

13 State **one** function of each of the following parts of a mammalian eye:

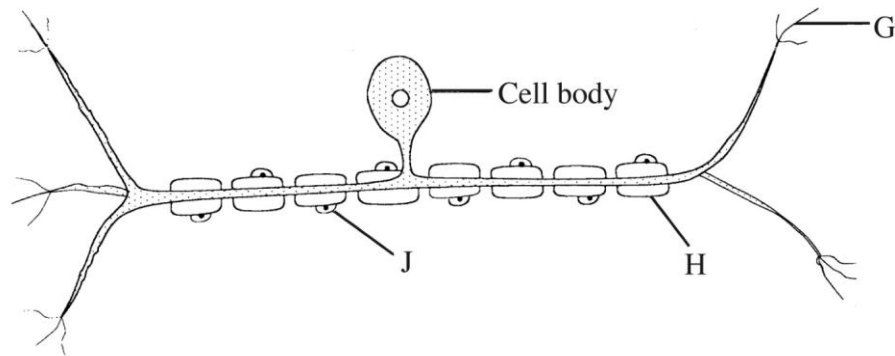
- (a) eye lashes
- (b) lachrymal glands.

14 State **three** structural differences between DNA and RNA.

DNA	RNA

- 15 (a) Which type of mammalian muscles is voluntary?
- (b) Distinguish between a tendon and a ligament.

16 The diagram below illustrates a nerve cell.



- (a) Name the type of nerve cell illustrated. (1 mark)
- (b) Give a reason for your answer in (a) above (1 mark)
- (c) Identify the part labelled **J** (1 mark)
- (d) State **one** function of each of the parts labelled **G** and **H**.
  - (i) **G** ..... (1 mark)
  - (ii) **H** ..... (1 mark)

17 Give a reason why the image is not formed when light is focused on the blind spot.

18 Explain why

- (a) mammalian testes are located to hang outside the body (2 marks)
- (b) four months after fertilisation, ovaries can be removed from a human female, without terminating pregnancy. (2 marks)

19 Why is a burning charcoal stove in a poorly ventilated room likely to cause death of the inhabitants? (3 marks)

20 State **one** function of each of the following cell organelles:

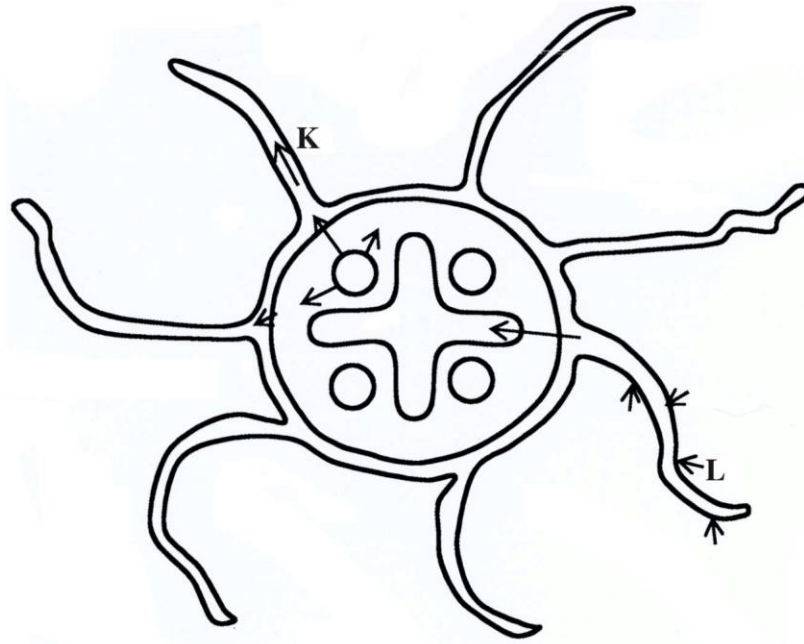
- (a) golgi bodies (1 mark)
- (b) lysosomes. (1 mark)

21 Name the type of skeleton that makes up each of the following animals:

- (a) locust (1 mark)
- (b) bird. (1 mark)

- 22 (a) Name **two** vestigial structures in human beings. (2 marks)
- (b) Why are some bacteria able to resist the effect of antibiotics? (2 marks)

23 Below is an illustration of a cross section of a plant root showing the transportation of substances in the plant.



- (a) Name the substances transported along the paths labelled **K** and **L**.
- K** ..... (1 mark)
- L** ..... (1 mark)
- (b) Give a reason for your answer in **L** above. (1 mark)

24 The table provided shows the transportation of substances in the human body.

Substance	Transported by blood	
	From	To
Oxygen	<b>M</b>	Whole body
<b>N</b>	Liver	Kidneys
<b>P</b>	Intestine	Whole body

Name the substances represented by

**M** ..... (1 mark)

**N** ..... (1 mark)

**P** ..... (1 mark)

25 State **two** roles of luteinising hormone in human reproduction. (2 marks)

26 The table provided shows the concentration of sodium and iodine in sea water and cell sap of a plant.

	Sodium ion concentration	Iodide ion concentration
Sea water	250	35
Cell sap	100	550

(a) (i) Name the process through which the plant cells take up sodium ions. (1 mark)

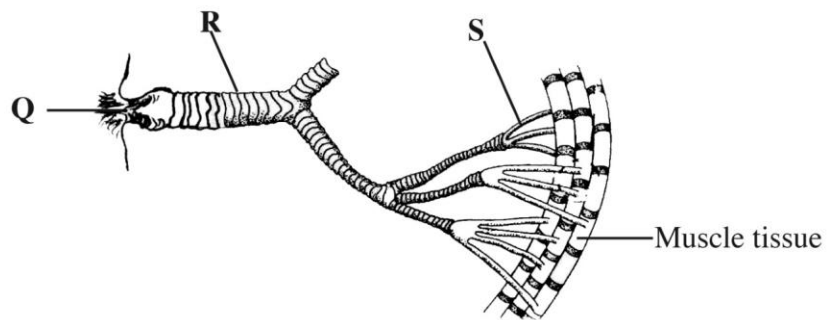
(ii) Give a reason for your answer in (a) (i) above. (1 mark)

(b) If the plant was sprayed with a chemical that inhibits respiration:

(i) which of the two ions uptake will be affected? (1 mark)

(ii) give a reason for your answer in (b) (i) above. (1 mark)

27 The diagram below shows the gaseous exchange system of a locust.



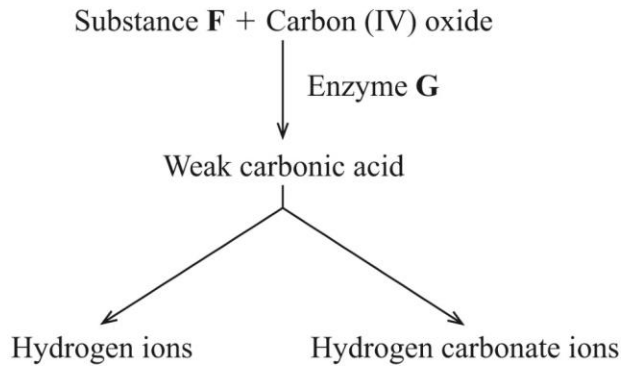
- (a) Name the structure labelled **Q**. (1 mark)
- (b) State the function of the part labelled **R**. (1 mark)
- (c) How is the part labelled **S** structurally adapted to its function? (2 marks)

**SECTION A (40 marks)**

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

- 1 (a) State **four** characteristics of fruits dispersed by animals. (4 marks)
- (b) State **two** roles of each of the following hormones in menstruation:
- (i) luteinising hormone; (2 marks)
  - (ii) oestrogen. (2 marks)

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



- (a) Other than the carbon (IV) oxide transportation in the red blood cells, name the other form of carbon (IV) oxide transportation in humans. (1 mark)
- (b) (i) Name substance **F** ..... (1 mark)
- (ii) Name the enzyme marked **G** and state its role in the reaction. (2 marks)
- Enzyme .....
- Role.....
- (c) Explain why transportation of carbon (IV) oxide in red blood cells is advantageous. (2 marks)
- (d) Explain the role of calcium ions in blood clotting. (2 marks)



- 3 (a) Describe the mechanism of gaseous exchange in plants through the lenticels. (3 marks)
- (b) Explain each of the following:
- (i) the tracheoles lack spiral bands of chitin; (3 marks)
- (ii) the floor of the mouth is lowered during inhalation in a bony fish. (2 marks)
- 4 (a) How is sex determined in man? (4 marks)
- (b) (i) Differentiate between sickle cell anaemia and sickle cell trait. (2 marks)
- (ii) Explain why people with sickle cell trait have an adaptive survival advantage over normal individuals in malaria endemic regions. (2 marks)

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



- (a) Name the part labelled **H**. (1 mark)
- (b) State **two** functions of the fluid found in the part labelled **J**. (2 marks)
- (c) Give a reason for the colour of white matter. (1 mark)
- (d) Name and give the function of the enzyme found at the part labelled **K**.  
 Name ..... (1 mark)  
 Function .....  
 ..... (2 marks)
- (e) On the diagram, use an arrow to show the direction of impulse transmission along the neurone labelled **1**. (1 mark)

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

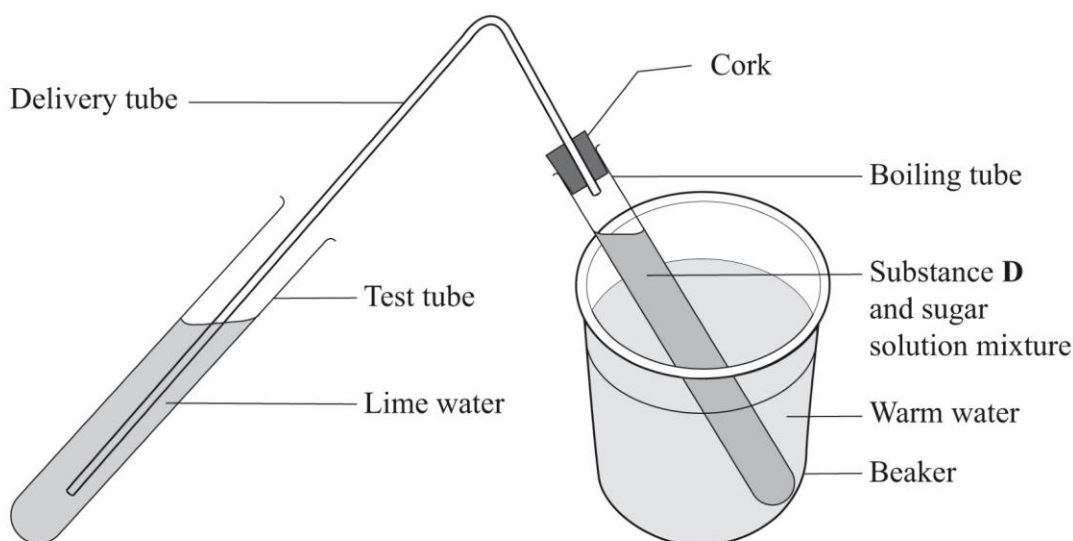
The amount of nitrogen in each seedling was measured in milligrams at intervals of ten days. The table below shows the results obtained.

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

- (a) Using the same axis draw line graphs of nitrogen uptake by the two (**M** and **N**) sets of broad bean seedlings against time. (8 marks)
- (b) Determine the rate of uptake of nitrogen in Set **M** between 65 and 85 days. (2 marks)
- (c) (i) What is the relationship between carbon (IV) oxide concentration in the air and nitrogen uptake? (1 mark)
- (ii) Account for the relationship in (c)(i) above. (3 marks)
- (d) (i) What would happen to the concentration of nitrogen in the seedlings in set **M**, if after 75 days the seedlings are transferred to a normal atmosphere. (1 mark)
- (ii) Explain your answer in (d)(i) above. (2 marks)
- (e) State **three** ways in which nitrogen fixation occurs. (3 marks)
- 7** (a) Explain how each of the following factors affects the rate of photosynthesis:
- (i) temperature; (2 marks)
- (ii) chlorophyll concentration. (2 marks)
- (b) Describe the process of carbohydrate digestion in human beings. (16 marks)
- 8** (a) How does excretion take place in plants? (4 marks)
- (b) Describe the role of the human skin in homeostasis. (16 marks)

- 1 (a) You are provided with solutions labelled **Q** and **R**, a substance labelled **D** and a delivery tube fitted with a rubber bung/cork.

- I Label solution **Q** as **lime water**.
- II Label solution **R** as **10% sugar solution**.
- III Add substance **D** to the 10% sugar solution.
- IV Tightly close/plug the boiling tube with the rubber bung/cork fitted with a delivery tube.
- V Dip the other end of the delivery tube in the test tube containing lime water.
- VI Put the boiling tube in the warm water bath at 40°C and allow the set up to stand as shown in the diagram below.
- VII Observe the set up for about 15 minutes.



- (i) State the observations made in the lime water. (2 marks)
  - (ii) Explain the observations made in the lime water. (2 marks)
  - (iii) Name the physiological process that was being investigated. (1 mark)
  - (iv) Write a word equation for the physiological process investigated. (1 mark)
  - (v) Why was the warm water bath used in the experiment? (2 marks)
- (b) Put a drop of the contents in the boiling tube on a microscope slide. Stain with a drop of methylene blue and cover with a cover slip. Observe it under a light microscope using low, medium and high power objective lenses.
- (i) Draw and label one of the structures observed under the high power objective lens. (3 marks)
  - (ii) State the magnification of your drawing. (1 mark)
  - (iii) State the identity of substance **D**. (1 mark)

2 You are provided with specimens labelled **E** and **F**.

(a) (i) Name the sub-division to which the specimens belong. (1 mark)

(ii) Using observable features on the specimens, give **two** reasons for your answer in (a)(i) above. (2 marks)

(b) State the differences between the

(i) Leaves of specimens **E** and **F**. (5 marks)

LEAF **E**

LEAF **F**

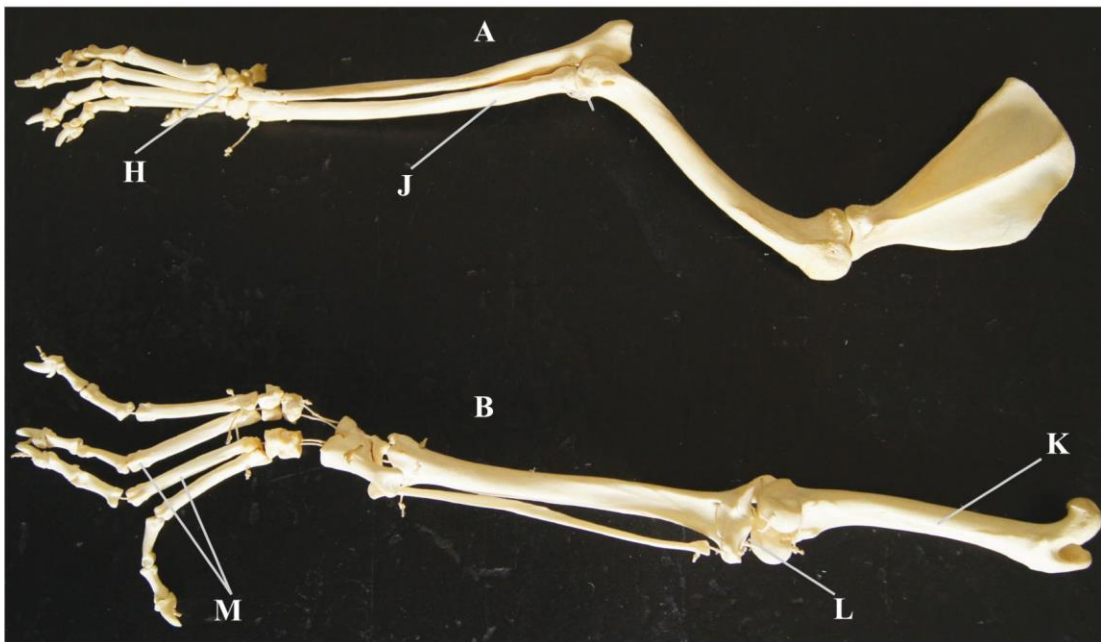
(ii) Stems of specimens **E** and **F**. (2 marks)

STEM **E**

STEM **F**

(c) Using observable features on the specimen, state the adaptation of the stem of specimen **E** to its habitat. (4 marks)

3 The photograph below shows two (**A** and **B**) skeletal limbs of a certain mammal.



(a) (i) Which of the two (**A** and **B**) skeletons represents a forelimb? (1 mark)

(ii) State **two** features observable on the skeleton to confirm your answer in (a)(i) above. (2 marks)

- (b) Name the bones labelled **J**, **K** and **M**.
- J** ..... (1 mark)
- K** ..... (1 mark)
- M** ..... (1 mark)
- (c) Which bone forms the second joint with the bone labelled **K**? (1 mark)
- (d) Name the type of joint formed at the part labelled **H** and **L**.
- H** ..... (1 mark)
- L** ..... (1 mark)
- (e) Apart from the bones, state the function of any **two** other components of a joint. (4 marks)

**Component**

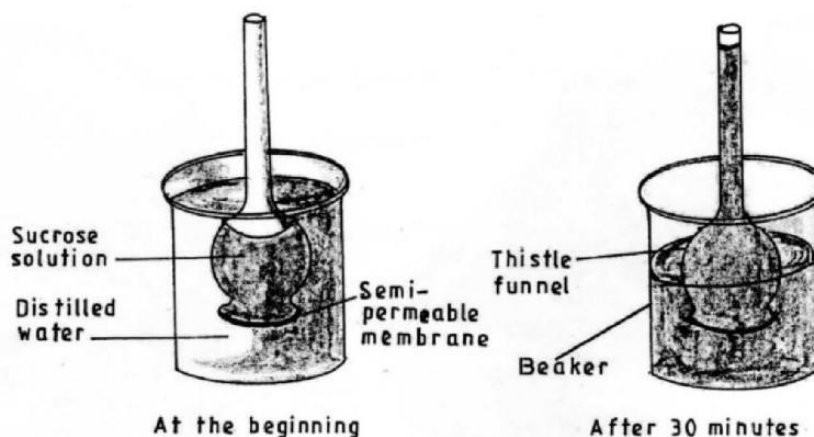
**Function**

### 3.5 BIOLOGY (231)

#### 3.5.1 Biology Paper 1 (231/1)

Answer *all* the questions in the spaces provided.

- 1 (a) What is meant by the term binomial nomenclature? (1 mark)
- (b) State **two** guidelines that should be followed when typing scientific names. (2 marks)
- 2 During a lesson, students observed the structure of bat, cat and human forelimbs to determine their evolutionary relationship.
- (a) State the name given to the structure of the limbs observed by the students. (1 mark)
- (b) Name the type of evolution illustrated by the structure of the limbs observed. (1 mark)
- (c) What evidence of evolution is illustrated by the limbs? (1 mark)
- (d) State the significance of the type of evolution illustrated by the limbs. (1 mark)
- 3 An individual is of blood group **B** positive.
- (a) Name the antigens in the individual's blood. (2 marks)
- (b) Give the reason why the individual **cannot** receive blood from a blood group **A** donor. (2 marks)
- 4 Colour blindness is a sex linked trait controlled by a recessive gene **b**. If a mother is a carrier and the father is normal, what is the chance that their son will be colour blind? Show your working. (4 marks)
- 5 (a) State **two** advantages of using a coverslip when preparing a specimen for observation under a light microscope. (2 marks)
- (b) How is the low power objective lens manipulated to focus a specimen for observation under a light microscope? (2 marks)
- 6 Students set up an experiment as illustrated below.



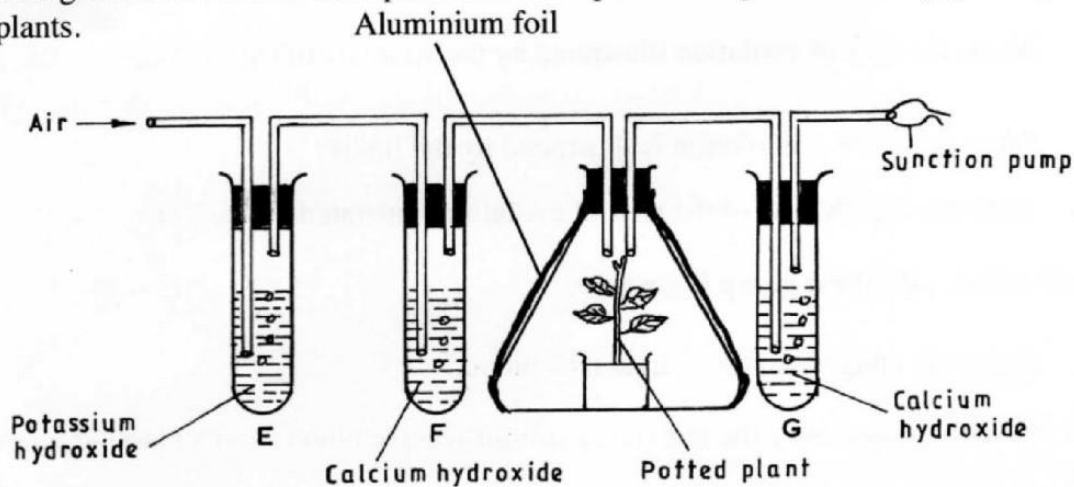
- (a) Name the physiological process that resulted in the observations made after 30 minutes. (1 mark)

- (b) State the importance of the physiological process investigated in plants. (1 mark)
- (c) Explain the observations made after 30 minutes. (2 marks)

7 How is a guard cell structurally adapted for gaseous exchange? (4 marks)

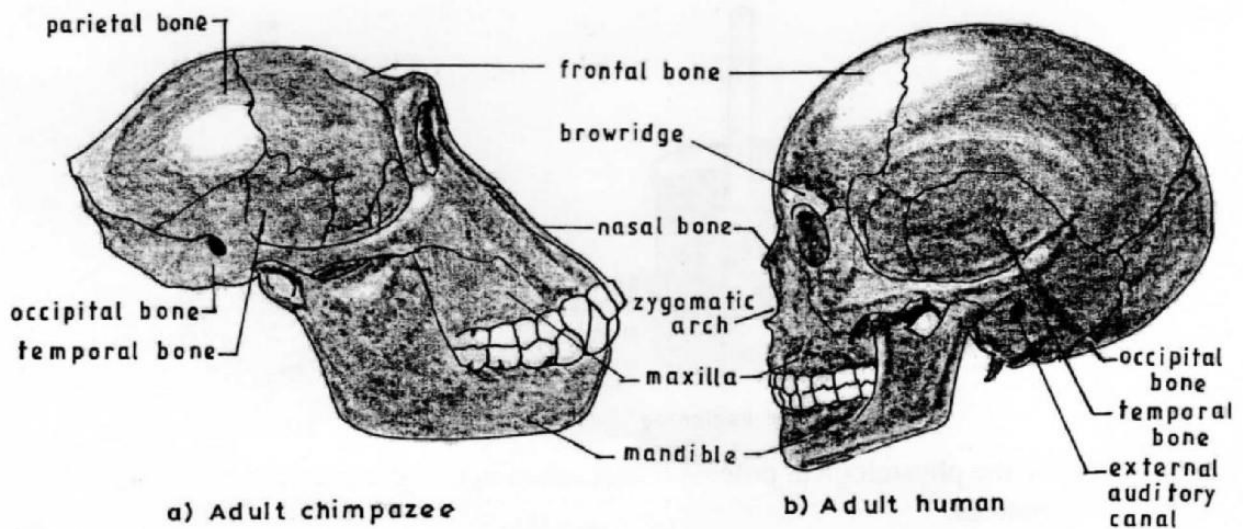
- 8 (a) Name the organism that:
- (i) causes malaria; (1 mark)
- (ii) transmits malaria. (1 mark)
- (b) State **two** control measures for malaria. (2 marks)

9 The diagram below shows an experimental set up to investigate a certain physiological process in plants.



- (a) State the aim of the experiment. (1 mark)
- (b) State the role of the following in the experiment:
- (i) potassium hydroxide; (1 mark)
- (ii) aluminium foil. (1 mark)
- (c) Account for the expected colour change in tube F. (2 marks)

10 The diagram below illustrates the skulls of adult human and chimpanzee.



(a) State **one** difference between the two skulls in the following structures:

(3 marks)

	Structure	Chimpanzee Skull	Human Skull
(i)	Parietal bones		
(ii)	Mandible		
(iii)	Browridge		

(b) State the significance of the evolution observed on the parietal bone in the chimpanzee and human skulls. (1 mark)

11 Name **two** structures used for gaseous exchange in plants. (2 marks)

12 (a) What is meant by each of the following:

(i) pyramid of biomass? (1 mark)

(ii) pyramid of numbers? (1 mark)

(b) During an ecological visit to the Savanna Grassland, students were able to see lions, antelopes, vultures and pastoralists grazing their cattle. Construct a food chain with four consumer levels to illustrate the energy flow in the ecosystem. (2 marks)

13 State **three** differences between the end products of mitosis and meiosis. (3 marks)

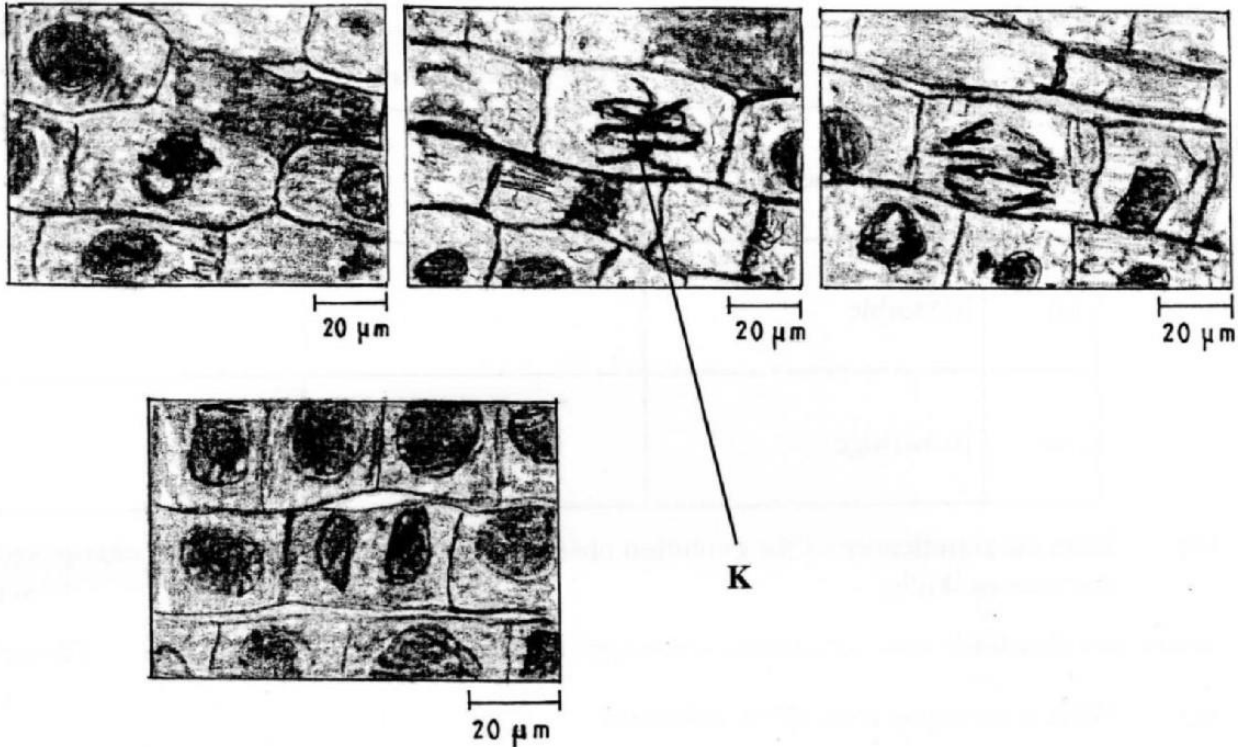
**Mitosis**

**Meiosis**

14 (a) Name **two** types of involuntary muscles in mammals. (2 marks)

(b) State the location of each of the muscles named in (a) above. (2 marks)

15 The photomicrographs below show the various stages of cell division in a certain plant.



- (a) (i) Name the type of cell division illustrated. (1 mark)  
 (ii) Give a reason for your answer in (a) (i) above. (1 mark)
- (b) (i) Name the stage of cell division labelled **K**. (1 mark)  
 (ii) Give a reason for your answer in (b) (i) above. (1 mark)

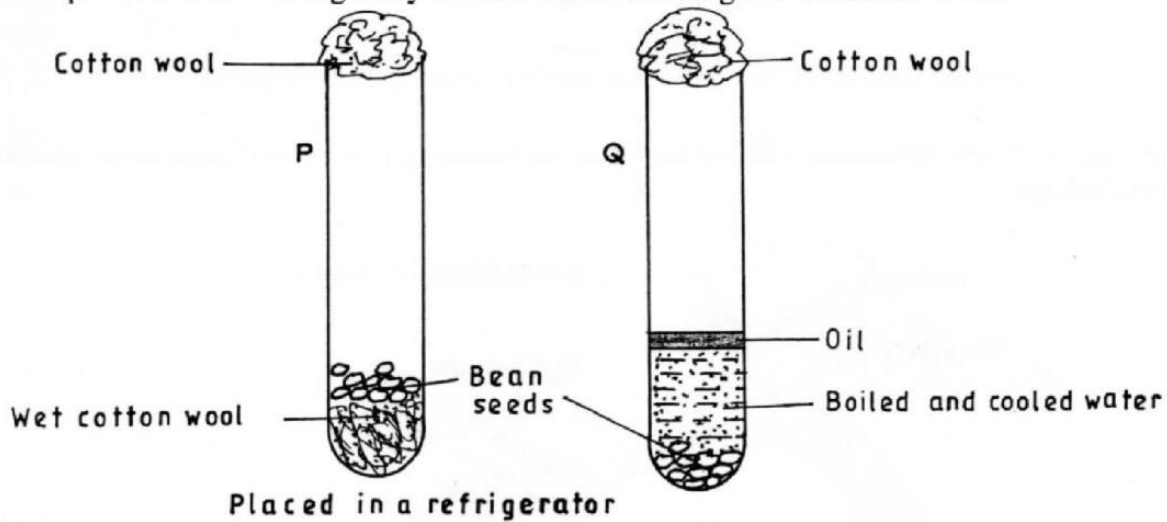
16 State **four** structural differences between millipedes and centipedes. (4 marks)

**Millipedes**

**Centipedes**

- 17 (a) How is a human stomach adapted to
- (i) protein digestion? (2 marks)  
 (ii) churning? (2 marks)
- (b) What happens to the glucose synthesized during photosynthesis? (2 marks)

- 18 The diagram below shows an experimental set-up to investigate the conditions necessary for germination. Test tube **P** was placed in a refrigerator while **Q** was left at room temperature. The set-ups were observed regularly for two weeks but no germination occurred.

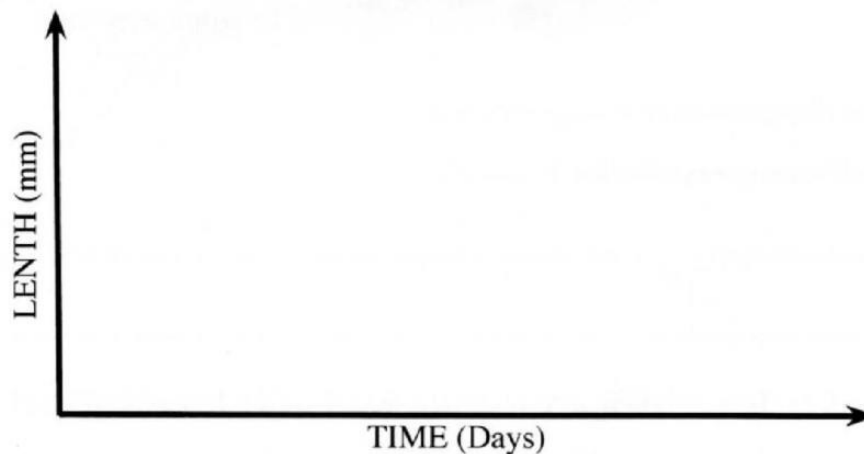


Explain the observations in **P** and **Q**.

**P** (2 marks)

**Q** (3 marks)

- 19 (a) Using the axes provided below, sketch a curve to illustrate the growth pattern observed in the phylum arthropoda. (2 marks)



(b) Explain the growth pattern observed observed in arthropods. (3marks)

- 20 Below are components of a simple reflex pathway:

- interneurone;
- muscle;
- motor neurone;
- sensory neurone;
- pain receptor;
- central nervous system.

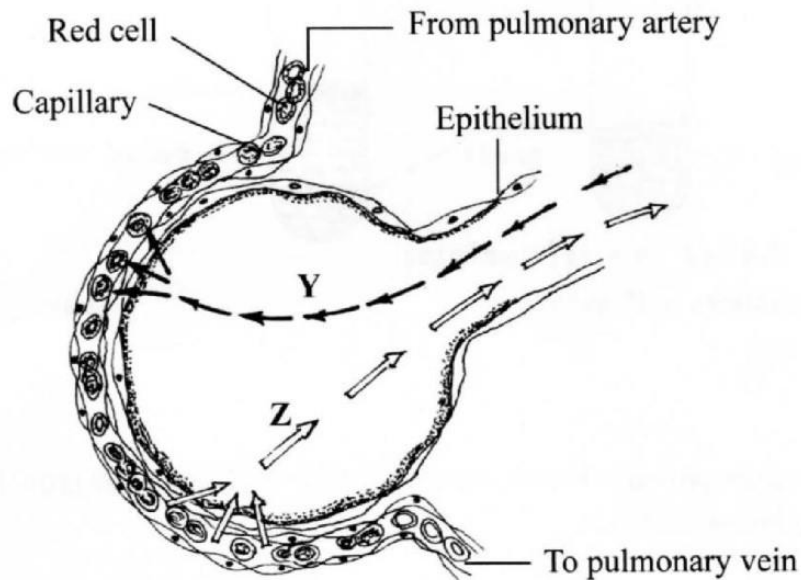
List the components in their proper sequence during the transmission of a nerve impulse.

(3 marks)

SECTION A (40 marks)

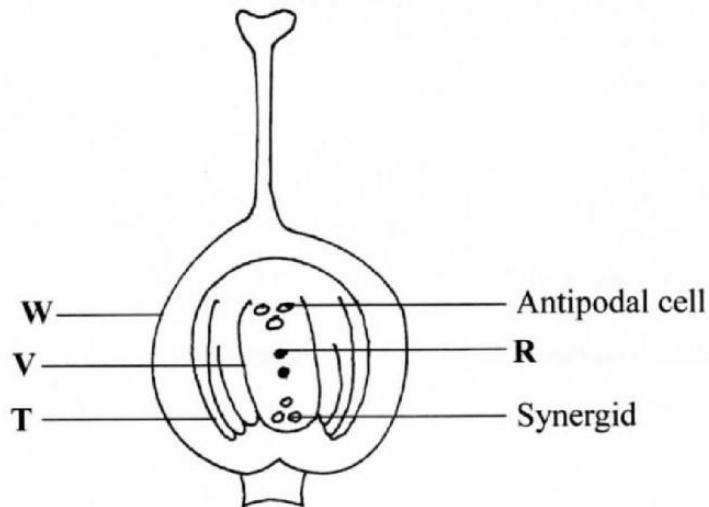
Answer **all** the questions in this section in the spaces provided.

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



- (a) Name the gaseous exchange structure. (1 mark)
- (b) Identify the gases labelled Y and Z.
- Y ..... (1 mark)
- Z ..... (1 mark)
- (c) How does the gas labelled Y reach the inside of the blood capillary? (3 marks)
- (d) How does cigarette smoking lead to lung cancer? (2 marks)

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



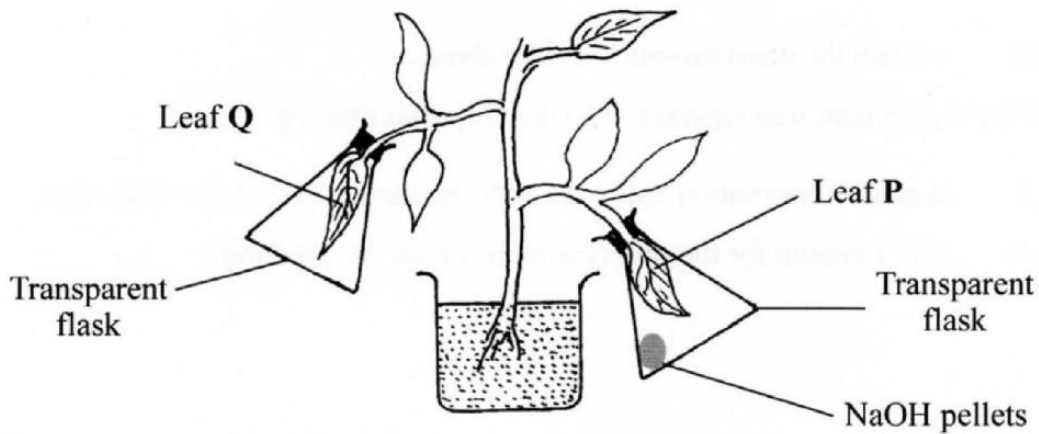
- (a) Name the part labelled **W**. (1 mark)
- (b) Describe what happens when the pollen tube enters the structure labelled **V**. (5 marks)
- (c) What do the structures labelled **R** and **T** develop into after fertilization?

**R** ..... (1 mark)

**T** ..... (1 mark)

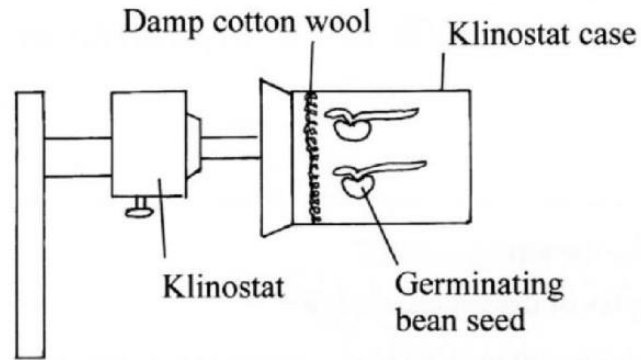
- 3 (a) What is meant by the term genetics? (1 mark)
- (b) State two examples of discontinuous variation. (2 marks)
- (c) A female with sickle cell trait marries a normal man. The allele for sickle cell is  $Hb^s$  and the normal allele is  $Hb^A$ . Determine the probability that their first born will have the sickle cell trait. Show your working. (5 marks)

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



- (a) Why was the potted plant kept in the dark overnight? (1 mark)
- (b) Which factor was being investigated in the experiment? (1 mark)
- (c) (i) Which test did the students perform to confirm photosynthesis in the leaves labelled **P** and **Q**? (1 mark)
- (ii) State the results obtained in the leaves labelled **P** and **Q**.
  - P** ..... (1 mark)
  - Q** ..... (1 mark)
- (iii) Explain the results obtained in the leaves labelled **P** and **Q**.
  - P** ..... (1 mark)
  - Q** ..... (1 mark)
- (d) What was the purpose of leaf **Q** in the experiment? (1 mark)

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

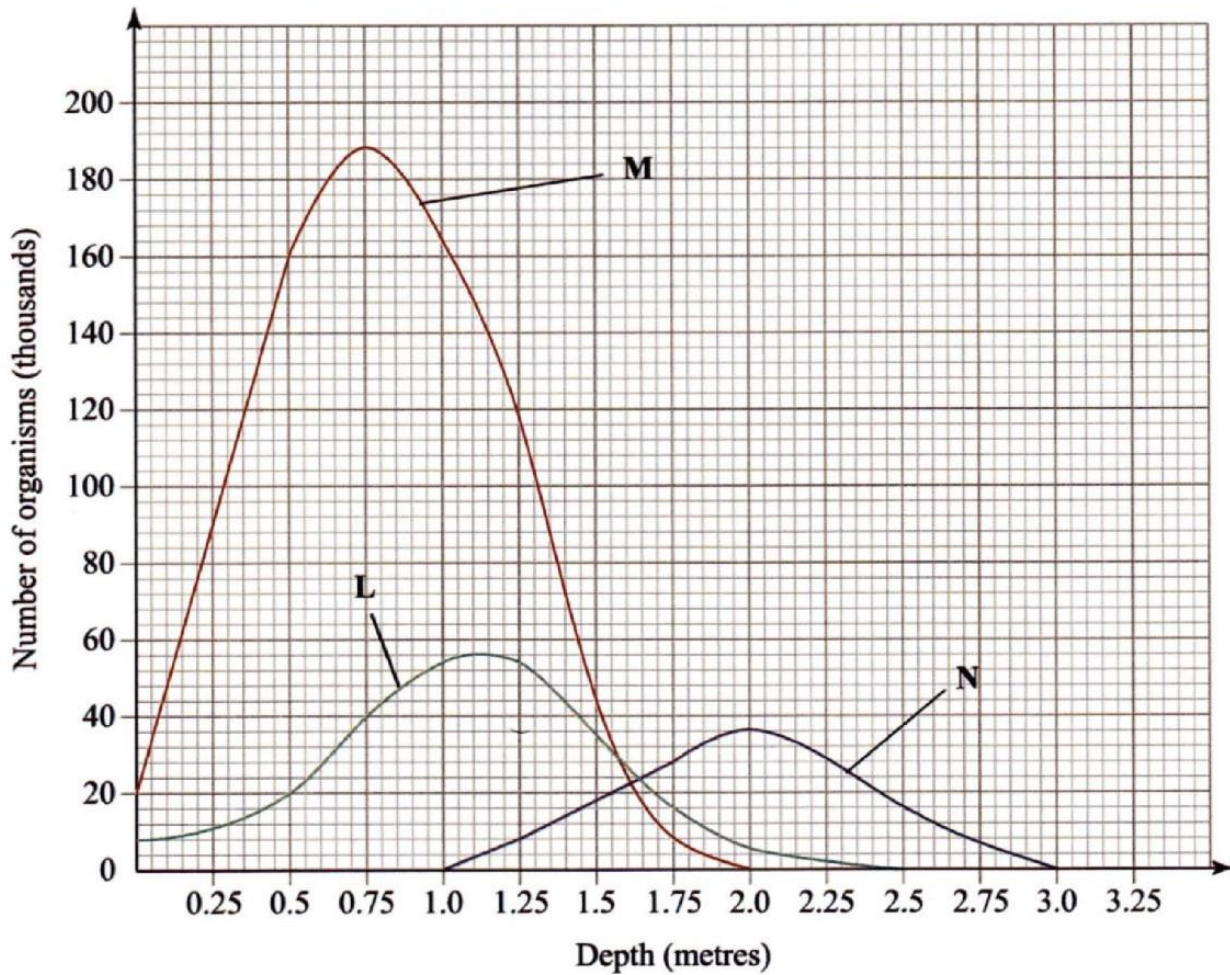


- (a) Name the type of response that was being investigated. (1 mark)
- (b) If the Klinostat was **not** rotating:
- (i) state the observations that would be made on the seedlings after three days; (2 marks)
- (ii) explain the observations in (b) (i) above. (3 marks)
- (c) If the experiment was repeated with the Klinostat rotating:
- (i) state the observation that was made on the seedlings after three days; (1 mark)
- (ii) give a reason for the observation made on the seedlings. (1 mark)

**SECTION B (40 marks)**

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

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



- (a) Giving a reason for your answer, which of the species is a
- (i) producer? ..... (1 mark)  
Reason ..... (1 mark)
  - (ii) secondary consumer? ..... (1 mark)  
Reason ..... (1 mark)
- (b) State the depths at which each of the populations labelled L, M and N is at its optimum.
- L ..... (1 mark)
  - M ..... (1 mark)
  - N ..... (1 mark)

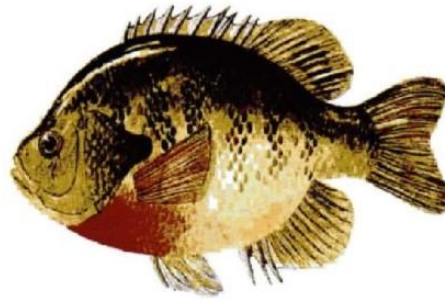
- (c) (i) Which method may have been used to determine the population of organisms labelled N in the pond? (1 mark)
- (ii) Give a reason for your answer in (c) (i) above. (1 mark)
- (iii) State the assumptions made when using the method in (c) (i) above. (4 marks)
- (d) State **two** reasons why primary productivity in the pond decreases with depth. (2 marks)
- (e) Explain the ecological importance of fungi to plants. (2 marks)
- (f) Why is flooding likely to lead to a cholera outbreak? (3 marks)
- 7 Explain the various ways in which seeds and fruits are adapted to dispersal. (20 marks)
- 8 How is a mammalian heart structurally adapted to its function? (20 marks)

3.5.3 Biology Paper 3 (231/3)

1 Using the pictures of animals provided below, complete the construction of the dichotomous key by filling the blank spaces. (13 marks)



Eagle



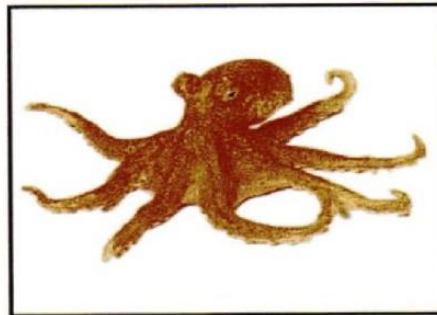
Fish



Earthworm



Tortoise



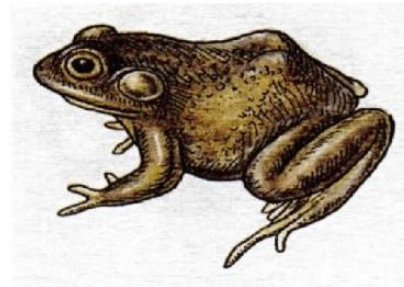
Octopus



Starfish



Spider

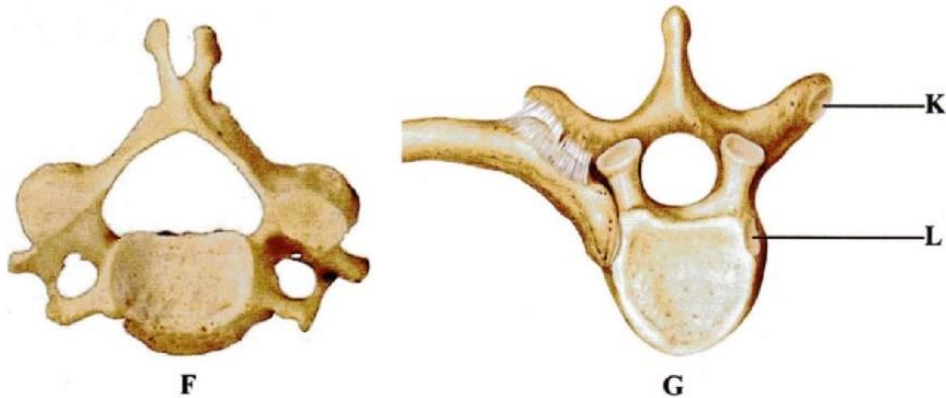


Frog

- |    |     |  |                |
|----|-----|--|----------------|
| 1. | (a) | Animals with a backbone .....                  | <b>go to 2</b> |
|    | (b) | Animals without a backbone .....               | _____          |
| 2. | (a) | Animals with wings .....                       | _____          |
|    | (b) | Animals without wings .....                    | _____          |
| 3. | (a) | Animals which live in water all the time ..... | _____          |
|    | (b) | Animals which live in water some time .....    | _____          |
| 4. | (a) | Animals with scales .....                      | _____          |
|    | (b) | Animals without scales .....                   | _____          |

5. (a) Animals with legs ..... \_\_\_\_\_  
 (b) Animals without legs ..... **go to 7**
6. (a) Animals with six legs ..... **Butterfly**  
 (b) Animals with eight legs ..... \_\_\_\_\_
7. (a) Animals with a shell ..... **Snail**  
 (b) Animals without a shell ..... \_\_\_\_\_
8. (a) Animals with a jelly-like body ..... \_\_\_\_\_  
 (b) Animals without a jelly-like body ..... \_\_\_\_\_
9. (a) Animals with a segmented body ..... \_\_\_\_\_  
 (b) Animals without a segmented body ..... **Octopus**

2 Below are pictures of three mammalian vertebrae.



H

- (a) Identify the type of vertebra labelled
- F** ..... (1 mark)
- G** ..... (1 mark)
- H** ..... (1 mark)
- (b) Label **five** parts of the vertebra labelled **H**. (5 marks)
- (c) Name the articular facets labelled **K** and **L**.
- K** ..... (1 mark)
- L** ..... (1 mark)
- (d) How does each of the parts of a vertebra enable a mammalian skeleton to carry out its functions? (4 marks)

**3** You are provided with a 250 ml beaker, four test tubes, solutions labelled **D** and **E**, iodine and Benedict's solutions.

Half fill the beaker with the hot water provided to create a hot water bath.

- (I) Label the four test tubes as follows:
- (i) test tube 1, **D+Iodine**
- (ii) test tube 2, **D+E+Iodine**
- (iii) test tube 3, **D+Benedict's solution**
- (iv) test tube 4, **D+E+Benedict's solution**
- (II) Put 1 cm<sup>3</sup> of solution **D** in each of the four test tubes.
- (III) To the **D+Iodine** test tube, add one drop of iodine solution and shake to mix.
- (IV) To the **D+E+Iodine** test tube, add 1 cm<sup>3</sup> of solution **E** and two drops of iodine solution. Shake to mix.
- (V) To the **D+Benedict's solution** test tube, add 1 cm<sup>3</sup> of Benedict's solution and shake to mix.
- (VI) To the **D+E+Benedict's solution** test tube, add 1 cm<sup>3</sup> of solution **E** and 1 cm<sup>3</sup> of Benedict's solution. Shake to mix.
- (VII) Observe the changes in each of the four test tubes.
- (VIII) Put all the four test tubes in the hot water bath and observe carefully for about five minutes.

- (a) Record the observations and conclusion for each of the four test tubes in the table below. (8 marks)

NO	TEST TUBE	OBSERVATION	CONCLUSION
1	D+Iodine		
2	D+E+Iodine		
3	D+Benedict's solution		
4	D+E+Benedict's solution		

- (b) What was the role of each of the following in the experiment?
- (i) solution E (1 mark)
  - (ii) hot water bath. (1 mark)
- (c) Give the identity of E in human beings. (1 mark)
- (d) Explain the observations made on the reagents tested with Benedict's solution. (2 marks)

Name ..... Index Number .....

231/1  
**BIOLOGY**  
**Paper 1**  
Nov. 2016  
2 hours

Candidate's Signature .....

Date .....



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**  
**Kenya Certificate of Secondary Education**  
**BIOLOGY**  
**Paper 1**  
2 hours

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of the examination in the spaces provided above.
- (c) Answer all the questions in this question paper.
- (d) All answers must be written in the spaces provided.
- (e) This paper consists of 11 printed pages.
- (f) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- (g) Candidates should answer the questions in English.

**For Examiner's Use Only**

Question	Maximum Score	Candidate's Score
1-20	80	



*Answer all the questions in the spaces provided.*

1. (a) State **two** ways in which the muscles of the mammalian heart are special. (2 marks)

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

- (b) Name the type of muscles found in the following organs. (2 marks)

Stomach .....

Bone .....

2. Why are plants able to accumulate most of their waste products for long? (2 marks)

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

3. State the importance of tactic responses among members of Kingdom Protista. (2 marks)

.....  
.....

4. (a) Name **one** defect of the circulatory system in humans. (1 mark)

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.....

- (b) State **three** functions of blood other than transport. (3 marks)

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5. State the economic importance of anaerobic respiration in plants. (1 mark)

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.....

6. Explain continental drift as evidence of evolution. (3 marks)

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7. Explain how the following prevent self pollination. (1 mark)

(i) Protandry

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.....  
.....

(ii) Self-sterility (1 mark)

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

8. State **three** functions of Golgi apparatus. (3 marks)

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9. (a) Name **two** structures of gaseous exchange in aquatic plants. (2 marks)

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.....

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

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.....

10. (a) State **two** disadvantages of sexual reproduction in animals. (2 marks)

.....  
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.....

(b) State **two** functions of a placenta. (2 marks)

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.....

11. Name **two** benefits that a parasite derives from its host. (2 marks)

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12. Other than using a quadrat give **two** methods that can be used to estimate the population of grass. (2 marks)

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13. (a) State **two** factors that affect enzymatic activities. (2 marks)

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.....  
.....

(b) Explain how **one** of the factors stated in (a) above affects enzymatic activities. (1 mark)

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14. Give **three** factors that determine the amount of energy a human being requires in a day. (3 marks)

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.....  
.....



15. (a) What is seed dormancy? (1 mark)

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.....  
.....

(b) Name a growth inhibitor in seeds. (1 mark)

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.....

16. State **one** use of each of the following excretory products of plants. (2 marks)

(i) Colchicine

.....  
.....

(ii) Papain

.....  
.....

17. State the name given to the study of:-

(i) The cell (1 mark)

.....

(ii) Micro-organisms (1 mark)

.....

18. Distinguish between haemolysis and plasmolysis. (2 marks)

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19. Explain why it is not advisable to be in a poorly ventilated room with a burning charcoal stove. (3 marks)

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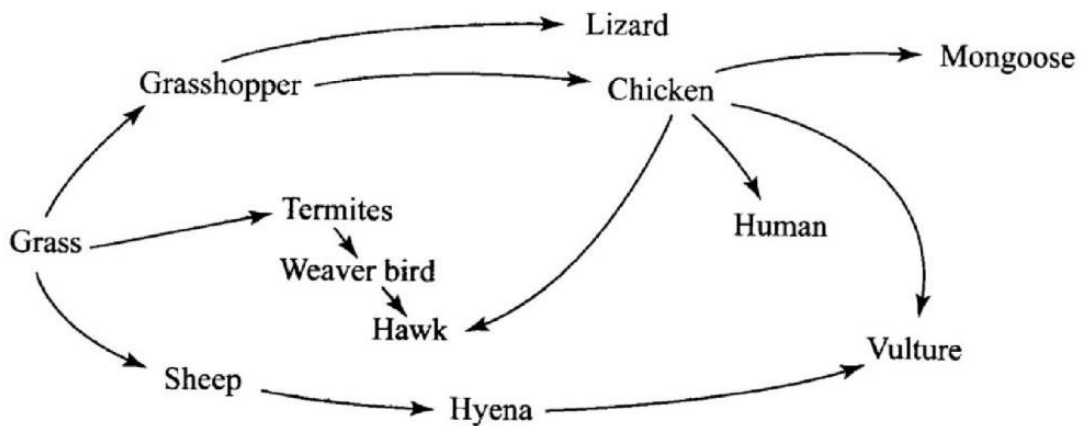
20. State **three** factors that contribute to the deceleration phase in the population curve of an organism. (3 marks)

.....

.....

.....

21. The figure below illustrates a food web in a certain ecosystem.



From the food web:

- (a) Draw the shortest food chain (1 mark)

- (b) Identify the organism with the highest:

- (i) number of predators (1 mark)

.....

- (ii) biomass (1 mark)

.....

22. State **three** characteristics of the class Crustacea. (3 marks)

.....  
.....

23. (a) Name **one** salivary gland in humans. (1 mark)

.....  
.....

(b) State **two** functions of saliva. (2 marks)

.....  
.....

24. How does nutrition as a characteristic of living organisms differ in plants and animals. (2 marks)

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.....

25. Distinguish between diffusion and osmosis. (2 marks)

.....  
.....

26. State the functions of the following parts of a microscope. (2 marks)

(a) Objective Lens

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

(b) Diaphragm

.....  
.....

27. (a) What is single circulatory system? (1 mark)

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

(b) Name an organism which has a single circulatory system. (1 mark)

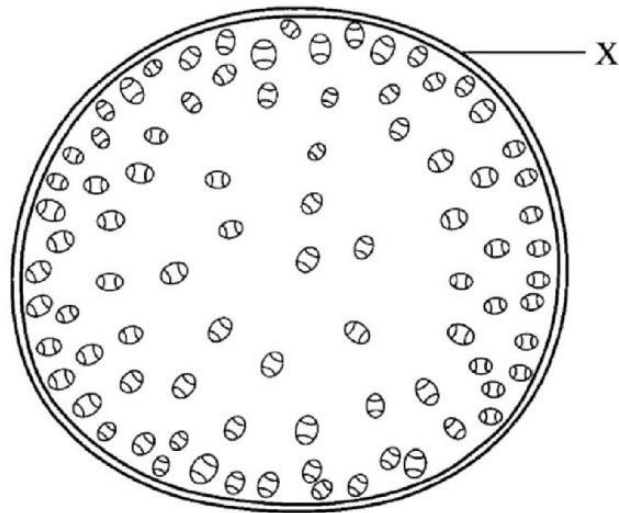
.....  
.....

(c) Name the opening to the chamber of the heart of an insect. (1 mark)

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



28. The diagram below shows a transverse section of a plant organ.



- (a) Name the plant organ from which the section was obtained. (1 mark)

.....

- (b) (i) Name the class to which the organism from which section was obtained belongs. (1 mark)

.....

- (ii) Give a reason for your answer in b (i) above. (1 mark)

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.....

29. (a) State a characteristic that is common to all cervical vertebrae. (1 mark)

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.....  
.....

(b) Name **two** tissues in plants that provide mechanical support. (2 marks)

.....  
.....

30. State **two** advantages of hybrid vigour. (2 marks)

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**THIS IS THE LAST PRINTED PAGE.**

Name ..... Index Number .....

231/2  
BIOLOGY  
Paper 2 (THEORY)  
Nov. 2016  
2 hours

Candidate's Signature .....

Date .....



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
Kenya Certificate of Secondary Education  
BIOLOGY  
Paper 2 (THEORY)  
2 hours

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of the examination in the spaces provided above.
- (c) This paper consists of **two** sections; **A** and **B**.
- (d) Answer **all** the questions in section **A** in the spaces provided.
- (e) In section **B** answer question 6 (**compulsory**) and either question 7 or 8 in the spaces provided after question 8.
- (f) **This paper consists of 12 printed pages.**
- (g) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (h) **Candidates should answer the questions in English.**

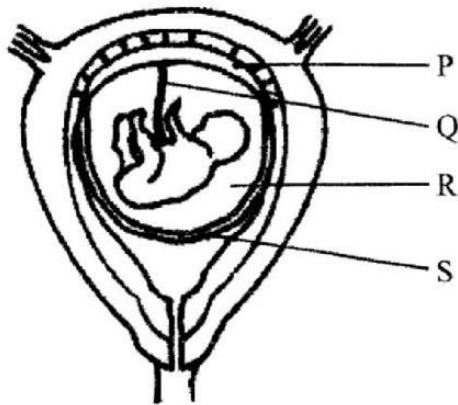
**For Examiner's Use Only**

Section	Question	Maximum Score	Candidate's Score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
	7	20	
	8	20	
Total Score		80	

## SECTION A (40 marks)

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

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



- (a) Name the part labeled S. (1 mark)

.....

.....

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

.....

.....

.....

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

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.....

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

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

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

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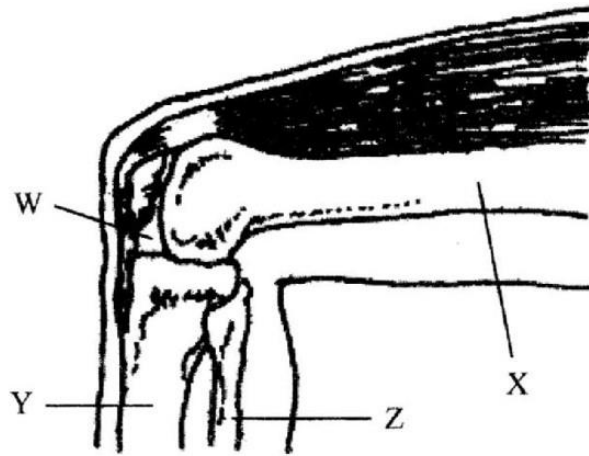
(b) (i) Differentiate between sickle cell anaemia and sickle cell trait. (2 marks)

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

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



(a) Name the bones labeled X, Y and Z (3 marks)

X: .....

Y: .....

Z: .....

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

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

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

.....  
 .....

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

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

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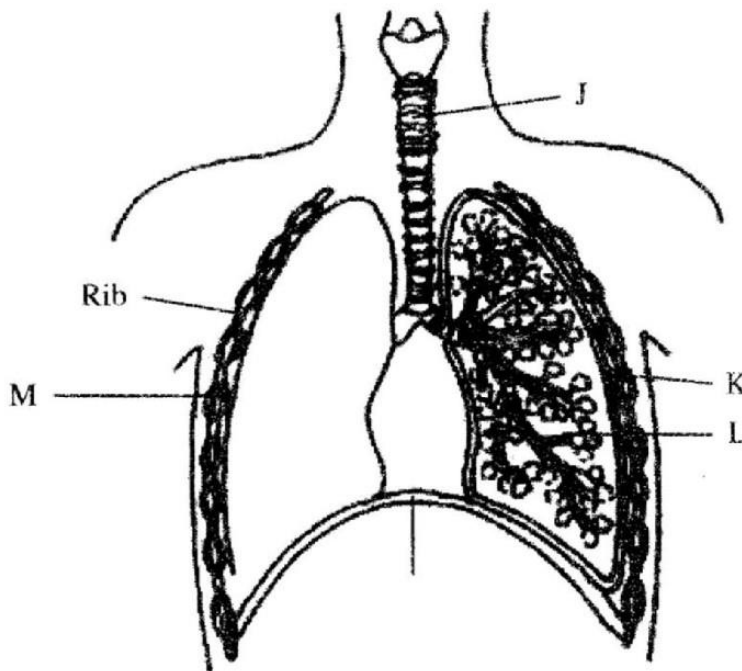
- (e) Name the structure at the elbow that performs the same function as the patella. (1 mark)

.....

.....

.....

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



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

.....

.....

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.....

.....

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

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.....

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

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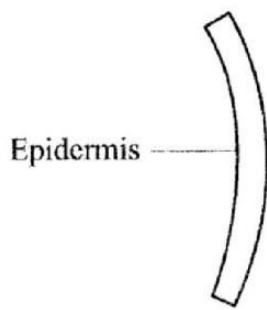
- (d) Give the scientific name of the organism that causes tuberculosis in humans. (1 mark)

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.....

5. A freshly obtained dandelion stem measuring 5cm long was split lengthwise to obtain two similar pieces.

The pieces were placed in two different solutions of different concentrations in petri dishes ( $L_1$  and  $L_2$ ) for 20 minutes. The appearance after 20 minutes is as shown.



Piece in  $L_1$



Piece in  $L_2$

- (a) Account for the appearance of the pieces in solutions  $L_1$  and  $L_2$ . (6 marks)

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- (b) State the significance of the biological process involved in the experiment. (2 marks)

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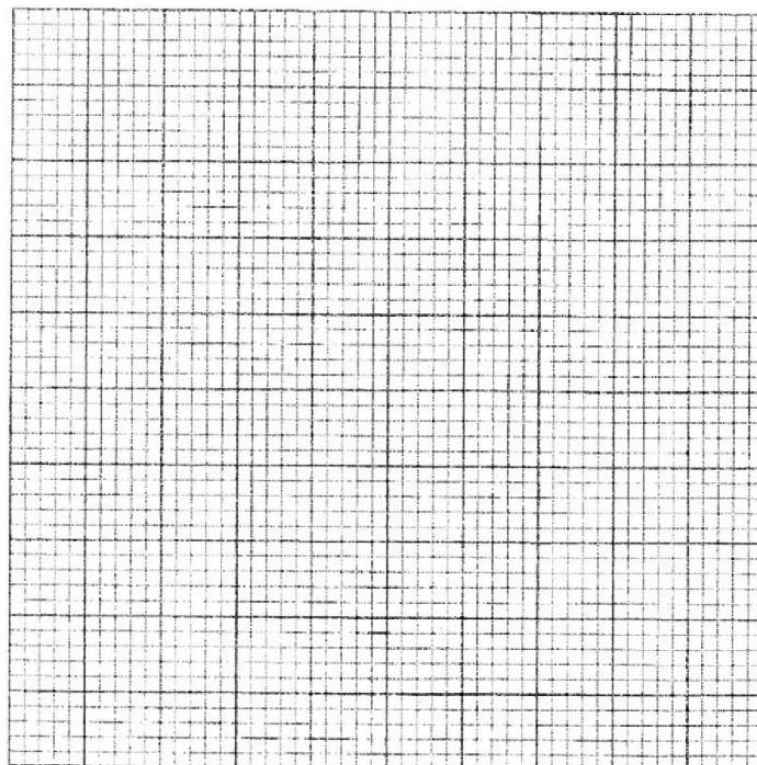
**SECTION B (40 marks)**

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

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

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

- (a) On the grid provided plot the rate of reaction against temperature. (6 marks)



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

.....  
.....

(c) Account for the shape of the graph between:

(i) 5°C and 40°C (2 marks)

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

(ii) 45°C and 60°C (3 marks)



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

(d) Other than temperature name **two** ways in which the rate of reaction between 5°C and 40°C could be increased. (2 marks)

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

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

.....  
.....

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

.....  
.....



Name ..... Index Number .....

231/3  
BIOLOGY  
Paper 3  
(PRACTICAL)  
Nov. 2016  
1¼ hours

Candidate's Signature .....

Date .....



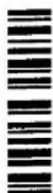
**THE KENYA NATIONAL EXAMINATIONS COUNCIL**  
**Kenya Certificate of Secondary Education**  
**BIOLOGY**  
**Paper 3**  
**(PRACTICAL)**  
1¼ hours

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer **all** the questions in the spaces provided.
- (d) You are required to spend the first 15 minutes of the 1¼ hours allowed for this paper reading the whole paper carefully before commencing your work.
- (e) Additional pages must **not** be inserted.
- (f) **This paper consists of 6 printed pages.**
- (g) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (h) **Candidates should answer all the questions in English.**

**For Examiner's Use Only**

Question	Maximum Score	Candidate's Score
1	14	
2	13	
3	13	
<b>Total Score</b>	40	



1. You are provided with specimen G.

- (a) (i) Cut off the petiole, about 1.5 cm from the end where the leaf attaches to the stem.
- (ii) Carefully make several thin cross sections through the piece obtained in (a)(i) above, using a sharp razor blade or scalpel.
- (iii) Put the sections obtained in water on a Petri dish.
- (iv) Mount the thinnest section(s) on a glass slide, add a drop of iodine solution provided.
- (v) Observe the section(s) using a hand lens, then draw a labelled diagram of the section observed. (3 marks)

(b) Account for the following features of specimen G.

(i) Extensive network of veins (1 mark)

.....

(ii) Tough leaf blade (1 mark)

.....

(iii) Strong and extended petiole (1 mark)

.....

(c) State with reasons, the class of plants from which the specimen was obtained.

Class ..... (1 mark)

Reasons: .....

.....

..... (3 marks)

(d) Explain why the following procedures were necessary during the preparation of the sections for observation.

(i) Putting the sections in water on a Petri dish. (1 mark)

.....

(ii) Using a sharp scapel/razor blade. (1 mark)

.....

(iii) Adding iodine solution to the section. (1 mark)

.....

(iv) Cutting very thin sections. (1 mark)

.....

2. Study the photograph below of some animals in a certain ecosystem and answer the questions that follow.



(a) State the type of biotic relationship exhibited by the animals shown in the photograph. (1 mark)

.....

(b) (i) Identify which of the two animals, E and F, will have the least biomass? (1 mark)

.....

(ii) Give a reason for your answer in (b)(i) above. (2 marks)

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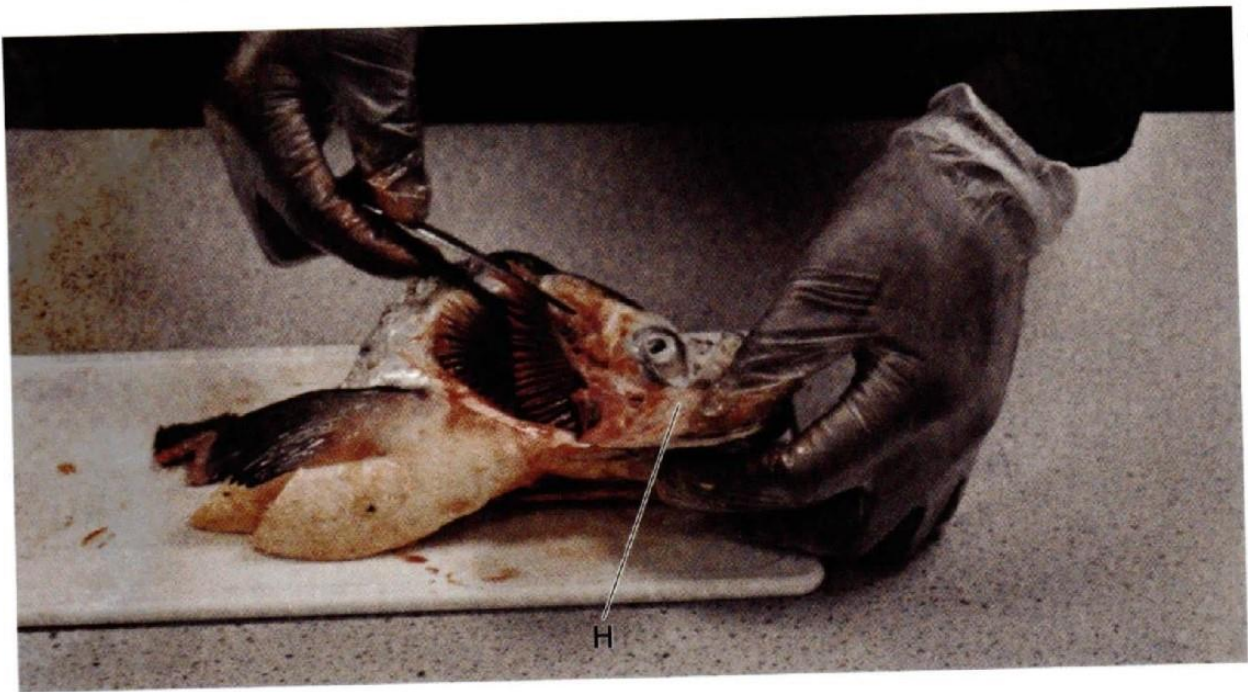
(c) Explain the concept of "Survival for the fittest" in relation to the organisms illustrated in the photograph. (3 marks)

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

(d) Explain **three** visible survival adaptive features for the organisms illustrated in the photograph. (6 marks)

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

3. The photograph below illustrates a procedure carried out to study gaseous exchange structures in a certain organism.



- (a) Identify **two** dissecting tools being used in the procedure illustrated. (2 marks)

.....  
.....

- (b) (i) Name the class of the animal in use. (1 mark)

.....

- (ii) State any **two** visible characteristics from the photograph to support your answer in (b)(i) above. (2 marks)

.....  
.....

- (c) Name the part of the organism labelled H and state its function. (1 mark)

Name: ..... (1 mark)

Function: ..... (1 mark)

(d) (i) Draw the gaseous exchange structure under study and on it, label the site for gaseous exchange. (3 marks)

(ii) How is the part labelled in (d)(i) adapted to efficient gaseous exchange? (3 marks)

.....

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231/1 –

**BIOLOGY**

– Paper 1

**Nov. 2017 – 2 hours**

Name ..... Index Number .....

Candidate's Signature ..... Date .....

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer **all** the questions in this question paper.
- (d) All answers must be written in the spaces provided.
- (e) **This paper consists of 12 printed pages.**
- (f) **Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**
- (g) **Candidates should answer the questions in English.**

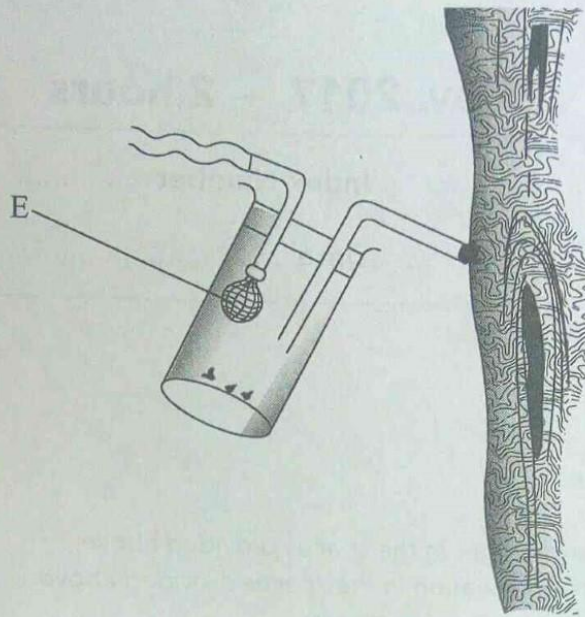
**For Examiner's Use Only**

Question Number	Maximum Score	Candidate's Score
1–23	80	



Answer **all** the questions in the spaces provided.

1. Below is an illustration of a piece of apparatus strategically positioned to trap some organisms.



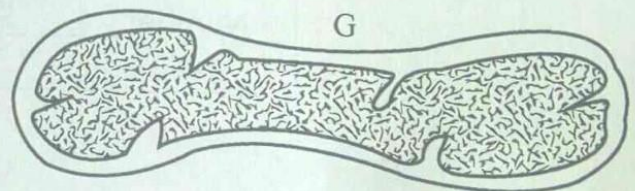
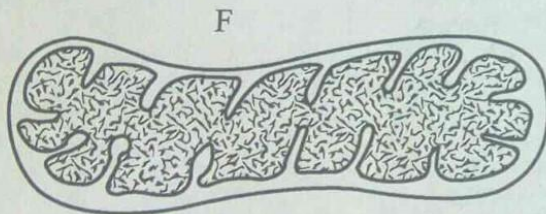
- (a) Name the apparatus. (1 mark)

.....

- (b) State the function of the part labelled E. (1 mark)

.....

2. Below are diagrams of a cell organelle obtained from different organs of an animal.



- (a) (i) For each organelle state an organ in the urinary system where it is likely to be found. (2 marks)

F .....

G .....

- (ii) Give a reason for your answers in (a) (i) on page 2. (2 marks)

.....  
 .....

- (b) Name the part of the chloroplast where the following reactions occur:

- (i) Carbon(IV) oxide fixation (1 mark)

.....

- (ii) Photolysis (1 mark)

.....

3. During a practical investigation on food tests, students were provided with the following reagents.

Benedict's solution

Sodium hydrogen carbonate

Dilute hydrochloric acid.

- (a) Identify the food substance the students were to test. (1 mark)

.....

- (b) State the role of dilute hydrochloric acid and sodium hydrogen carbonate during the experiment.

- (i) Dilute hydrochloric acid (1 mark)

.....

- (ii) Sodium hydrogen carbonate (1 mark)

.....

4. In an experiment on respiration, a mouse was observed to have inhaled  $200\text{ cm}^3$  of oxygen and exhaled  $199.75\text{ cm}^3$  of carbon(IV) oxide in ten minutes.

(a) Calculate the respiratory quotient for the activity in the experiment. (2 marks)

.....  
 .....

(b) Identify the possible food substance consumed by the mouse. (1 mark)

.....

(c) State the fate of the excess food named in (b) above in the human body. (2 marks)

.....  
 .....

5. The photograph illustrates a housefly at various stages of its development.



(a) (i) On the photograph, name the stages of the life cycle. (1 mark)

(ii) Using arrows, link the stages of the life cycle in the correct order. (1 mark)

.....

(b) (i) State **two** differences between the life cycles of a housefly and that of a cockroach. (2 marks)

.....  
 .....

(ii) State **one** advantage of the life cycle of a cockroach to itself. (1 mark)

.....

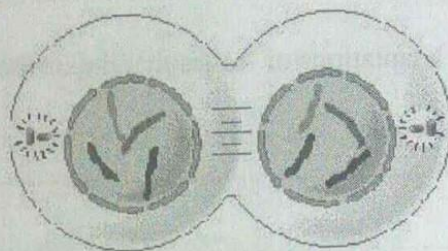


6. Name **two** enzymes in the human digestive system which are secreted in an inactive form. (2 marks)

.....

.....

7. The diagram below represents a stage in the division of a cell.



With a reason, identify the organism from which the cell was obtained. (2 marks)

.....

.....

8. Explain why short distance runners breathe quickly and deeply at the end of a race. (2 marks)

.....

.....

9. (a) State the function of a mirror in a light microscope. (1 mark)

.....

(b) Give **one** reason why the coarse adjustment knob should **not** be used to lower the high power objective. (1 mark)

.....



10. (a) State the effect of movement of the diaphragm muscles during inhalation in mammals. (3 marks)

.....

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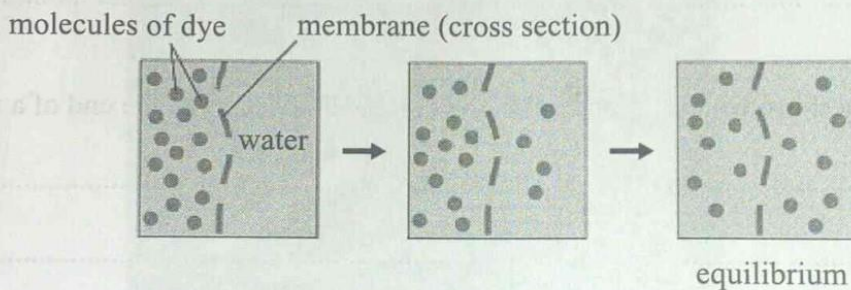
(b) State **two** structural adaptations of leaves that maximise efficiency in gaseous exchange. (2 marks)

.....

.....

.....

11. The set up below illustrates a certain physiological process.



(a) (i) Name the physiological process. (1 mark)

.....

(ii) Give **two** examples of the process named in (a) (i) above in plants. (2 marks)

.....

.....

(b) State **two** ways by which the movement of dye molecules in the set up would be slowed down. (2 marks)

.....

.....

12. Explain the survival values of the following tropic responses to plants.

(a) Geotropism (2 marks)

.....

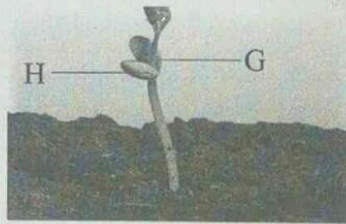
(b) Phototropism. (1 mark)

.....

13. Name the causative agent for Tuberculosis. (1 mark)

.....

14. The photograph below illustrates a germinating seedling.



(a) Name the type of germination illustrated in the photograph. (1 mark)

.....

(b) Explain the function of each of the parts labelled G and H.

G ..... (1 mark)

H ..... (1 mark)

15. Explain the physiological process responsible for keeping young seedlings upright. (3 marks)

.....

.....

.....

.....

16. The following are text messages on a cellphone that represent gene mutation.

	Intended message	Actual message
I	I hate meat	I ate meat
II	This is my team	This is my mate

- (a) Identify the type of gene mutation represented in each case

I

(1 mark)

.....

II

(1 mark)

.....

- (b) State Mendel's First Law.

(1 mark)

.....

.....

- (c) State **two** disadvantages of genetically modified plant products.

(2 marks)

.....

.....

17. How is the surface area increased in the mammalian small intestines?

(2 marks)

.....

.....



18. Below are diagrams representing developmental stages of three different vertebrates.



(a) State the evidence of evolution illustrated by the vertebrates in the diagram. (1 mark)

.....

(b) Suggest why the structure labelled J has been retained throughout the evolution of fish. (2 marks)

.....  
 .....

(c) State **two** major advantages evolution has given humans over most of the other animals. (2 marks)

.....  
 .....



19. The table below shows the percentage concentration of certain substances in blood plasma, glomerular filtrate and urine in a human being at a particular time.

Percentage Concentration			
Substance	Blood Plasma	Glomerular filtrate	Urine
Glucose	0.023	0.02	0.0
Water	92.70	92.70	96.08
Protein	5.69	0.0	0.0
Urea	0.087	0.098	2.6

- (a) Explain the likely impact on the composition of urine in case of the following:
- (i) Vigorous physical exercises (2 marks)

.....

.....

- (ii) a meal rich in proteins (2 marks)

.....

.....

- (b) Name the processes responsible for:

- (i) Presence of glucose in the glomerular filtrate (1 mark)

.....

- (ii) absence of glucose in urine (1 mark)

.....

20. State **three** methods of fossil formation. (3 marks)

.....

.....

.....

21. The photograph below represents a leaf obtained from a certain plant.



Account for the observations made if the leaf was tested for starch.

(3 marks)

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.....

.....

22. State **two** ways by which plants manage their solid wastes.

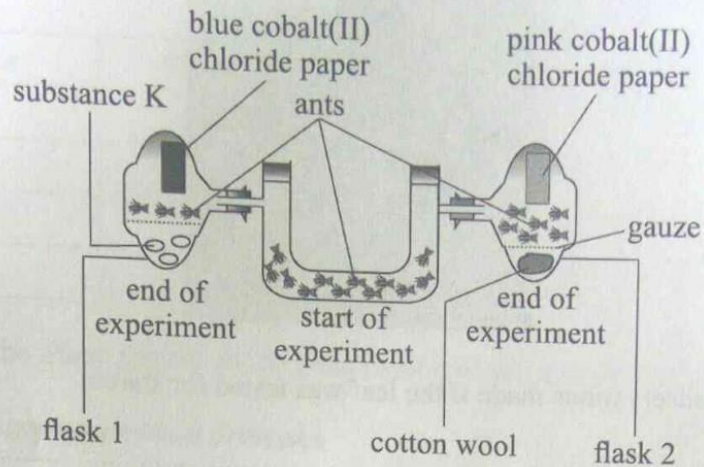
(2 marks)

.....

.....

23. The diagram below represents a set up during an experiment.

Experiment



- (a) (i) What was, the experiment investigating? (1 mark)

.....

- (ii) State the likely identity for substance K (1 mark)

.....

- (iii) Explain your answer in (a) (ii) above (1 mark)

.....

.....

- (b) Account for the observations made in flask 2. (2 marks)

.....

.....

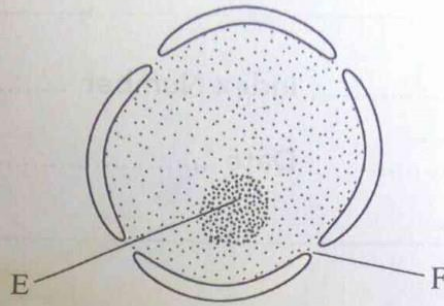
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**SECTION A (40 marks)**

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

1. The diagram below represents a nucleus.



(a) Name the structures labelled E and F. (2 marks)

(i) E.....

F.....

(ii) State the function of F. (1 mark)

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

(iii) With reference to the nucleus, state **one** difference between an animal and a bacterial cell. (1 mark)

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

(b) Name the plant cell organelle:

(i) that stores chlorophyll (1 mark)

.....  
 .....

(ii) responsible for intracellular digestion. (1 mark)

.....

(c) State **two** main functions of the vacuole in the amoeba. (2 marks)

.....  
 .....

The table below shows variations in the form carbon (IV) oxide is transported in the blood at rest and during physical exercise.

Carbon (IV) oxide transport in blood plasma at rest and during exercise		
Form of transport	Rest (Mol/l)	Exercise (Mol/l)
Dissolved carbon (IV) oxide	0.52	0.97
Bicarbonate ion	12.34	13.68
Carbon (IV) oxide bound to protein	0.26	0.16
Total carbon (IV) oxide in plasma	13.12	14.81
pH of blood	7.42	7.09

(a) Explain why more carbon (IV) oxide is transported in the form of bicarbonate ion. (2 marks)

.....  
 .....

(b) Account for the high total plasma content of carbon (IV) oxide during exercises. (3 marks)

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

(c) State how one's involvement in the exercises affects blood pH. (2 marks)

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

(d) Name the protein responsible for the transport of carbon (IV) oxide in the blood. (1 mark)

.....

3. The diagram below illustrates the appearance of a plant cell after it had been put in a certain solution.



(a) Explain the appearance of the cell at the end of the treatment. (3 marks)

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.....



(b) Explain the results obtained if a red blood cell is subjected to the same treatment. (3 marks)

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(c) Explain why transfusion with distilled water is **not** recommended for a dehydrated patient. (2 marks)

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.....

4. (a) Explain how the sex of a male child is determined in human beings. (2 marks)

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

(b) (i) Define the term diploidy. (1 mark)

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.....  
.....

(ii) Name the type of cell division that gives rise to diploid cells. (1 mark)

.....

(iii) Name the type of cells in which the process named in (b) (ii) above occurs. (1 mark)

.....



## 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 potted plants G and H belonging to the same species were exposed to increasing light intensities at different temperatures, 30°C and 20°C respectively. The rate of photosynthesis was measured for each plant and results recorded as shown in the table below:

Light intensity (in arbitrary units)	1	2	3	4	5	6	7	8
Rate of photosynthesis for plant G at 30°C	0	84	148	196	232	260	284	296
Rate of photosynthesis for plant H at 20°C	0	72	115	148	170	186	204	216

- (a) On the same axis, plot graphs of rate of photosynthesis against light intensity for plants G and H. (8 marks)

(b) State the aim of the investigation. (1 mark)

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

(c) Account for the difference in the rate of photosynthesis in the two plants. (3 marks)

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

(d) Account for the difference in the rate of photosynthesis in the two plants between the following light intensities:

(i) 1–4 units (2 marks)

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

(ii) 4–8 units. (2 marks)

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

(e) (i) Predict the rate of photosynthesis at light intensity of 16 units. (1 mark)

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

(ii) Give a reason for your answer in (e) (i) above. (1 mark)

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1. You are provided with the following materials and reagents.

A straight portion of raw banana, labelled D

Two petri dishes

A scalpel sharp razor blade

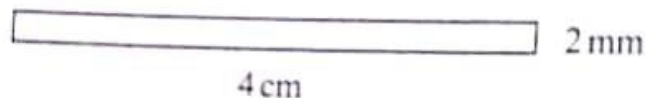
Two beakers containing liquids, E and F

A measuring cylinder

A stopwatch/access to a wall clock

Means of labelling.

- (i) Label the two petri dishes, E and F
- (ii) Place 30 cm<sup>3</sup> of liquid E into petri dish E and 30 cm<sup>3</sup> of liquid F into petri dish F
- (iii) Using the scalpel, prepare four thin, straight, flat strips from the raw banana peel
- (iv) Each strip should measure about 4 cm by 2 mm as illustrated below.



**Note:** To get a straight, flat, thin strip, remove all the banana flesh, leaving only the peel.

- (v) Immerse two strips in petri dish E and the other two in petri dish F and leave the set ups undisturbed for 10 minutes.
- (a) (i) State your observations in petri dishes E and F after 10 minutes.

Petri dish E

(1 mark)

Petri dish F

(1 mark)

(ii) Account for the observations made in (a) (i) on page 2.

Petri dish E

(3 marks)

.....

.....

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.....

Petri dish F

(2 marks)

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.....

.....

(b) Describe the nature of liquids E and F in relation to the sap in the banana peel used in the experiment.

E

(1 mark)

.....

.....

F

(1 mark)

.....

.....

(c) With reference to the observations made, compare the nature of the outer and inner surfaces of the banana peel.

(1 mark)

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.....

.....

- (d) (i) Name the cell structure responsible for the observations made in this experiment. (1 mark)

.....

- (ii) Explain how the cell structure named in (d) (i) above works to bring about the observations made. (2 marks)

.....

.....

.....

2. You are provided with the following materials and reagents.

Three test tubes on a rack

Dilute egg albumen

(Access to) dilute hydrochloric acid with a dropper

(Access to) Sodium hydroxide solution with a dropper

Solution P

Two droppers

Three 10 ml measuring cylinders

A stop watch/access to a wall clock

Access to a water bath maintained at 50°C to 60°C

- (i) Label the test tubes A, B, and C
- (ii) Put 2 cm<sup>3</sup> of egg albumen into each of the test tubes A, B and C
- (iii) Add 1cm<sup>3</sup> of solution P in each of the test tubes
- (iv) Into test tube A, add two drops of sodium hydroxide
- (v) Into test tube B, add two drops of hydrochloric acid
- (vi) Into test tube C, add 2 drops of water
- (vii) Place all the three test tubes in the water bath for 10 minutes.

- (a) (i) State the observations made in test tubes A and B.

Test tube A

(1 mark)

.....

.....

Test tube B

(1 mark)

.....

.....



(ii) Account for the observations made in a (i) above.

Test tube A

(3 marks)

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

Test tube B

(3 marks)

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

(b) Explain why the investigation was carried out at the specified temperature range.

(1 mark)

.....  
.....

(d) State the purpose of test tube C.

(1 mark)

.....  
.....

(e) (i) With a reason, identify solution P.

(2 marks)

.....  
.....

(ii) Name the likely part of the human alimentary canal where the process in this experiment occurs.

(1 mark)

.....

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

(1 mark)

.....  
.....



3. You are provided with specimens labelled H and K. Specimen H is a complete plant while J is a portion of a different plant. Observe the specimens and answer the questions that follow.

(a) State **three** observable differences between the leaves of specimens H and K. (3 marks)

.....

.....

.....

.....

(b) (i) Explain **three** ways in which the stem of specimen H adapts the plant for maximum photosynthesis. (3 marks)

.....

.....

.....

.....

(ii) Explain **three** ways in which the plant from which specimen K was obtained is adapted for survival in its habitat. (3 marks)

.....

.....

.....

.....

(c) Explain the consequence of adding liquid F used in question 1 to the soil in which specimen H is growing. (2 marks)

.....

.....

.....

(d) State **two** ecological importance of specimen K in an ecosystem. (2 marks)

.....

.....

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231/2 -

**BIOLOGY**  
**(THEORY)**

- Paper 2

**Nov. 2018 - 2 hours**

Name ..... Index Number .....

Candidate's Signature ..... Date .....

**Instructions to candidates**

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- This paper consists of **two** sections; **A** and **B**.
- Answer **all** the questions in section **A** in the spaces provided.
- In section **B** answer question **6** (**compulsory**) and either question **7** or **8** in the spaces provided after question **8**.
- This paper consists of **12** printed pages.
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- Candidates should answer all the questions in **English**.

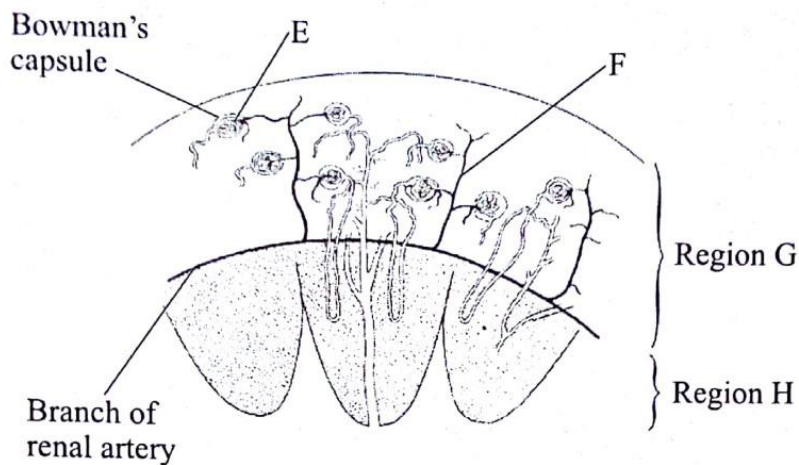
**For Examiner's Use Only**

Section	Question	Maximum Score	Candidate's Score
A	1	8	
	2	8	
	3	8	
	4	8	
	5	8	
B	6	20	
		20	
Total Score			

**SECTION A (40 marks)**

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

1. The diagram below illustrates a section of the mammalian kidney.



- (a) Name the structures labelled E and F.

E ..... (1 mark)

F ..... (1 mark)

- (b) Explain the processes that take place in the regions labelled G and H.

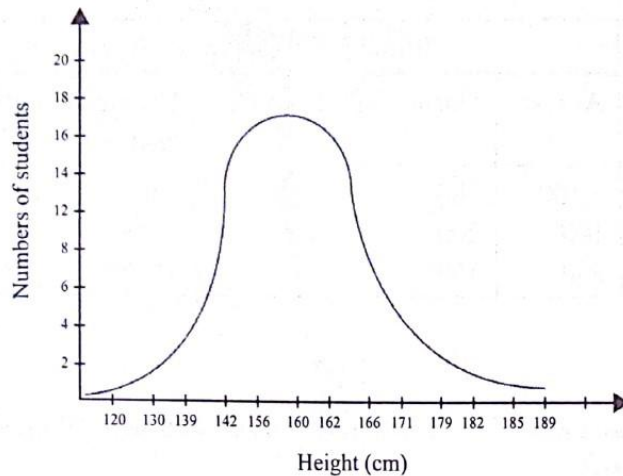
Region G (3 marks)

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

Region H (3 marks)

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

2. Below is a graphical representation of students' height in a classroom.



(a) Name the type of curve illustrated. (1 mark)

.....

(b) (i) State the type of variation represented by the curve. (1 mark)

.....

(ii) State **two** meiotic processes that lead to variation among organisms. (2 marks)

.....

.....

(iii) Explain the role of variation in organisms. (2 marks)

.....

.....

(c) Explain the need for genetic counselling in present day health facilities. (2 mark)

.....

.....

3. The amount of blood flowing through certain parts in the mammalian body at different activity levels was measured and results tabulated as shown in the table below.

Parts of the body	Blood flow (cm <sup>3</sup> /minute)		
	At rest	During light exercises	During strenuous exercise
Alimentary canal	1,100	780	350
Cardiac muscles	100	200	1,300
Skeletal muscles	900	4600	15,000

(a) Account for:

(i) the high blood-flow through the cardiac and skeletal muscles during strenuous exercises. (4 marks)

.....

.....

.....

(ii) the results obtained for the alimentary canal at rest. (2 marks)

.....

.....

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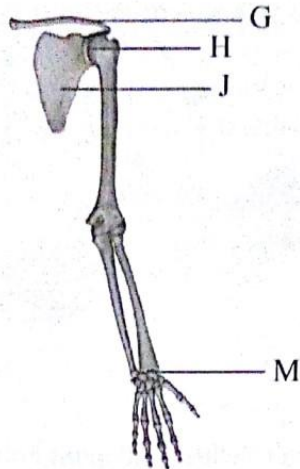
(b) Name **two** waste materials excreted by both the skin and the kidneys. (2 marks)

.....

.....



4. The diagram below illustrates the arrangement of bones in a human arm.



(a) Name:

(i) the type of joints formed at points H and M.

H ..... (1 mark)

M ..... (1 mark)

(ii) bone G ..... (1 mark)

(b) Name bone J and state how it is adapted to its functions.

Name: ..... (1 mark)

Adaptation ..... (3 marks)

.....

.....

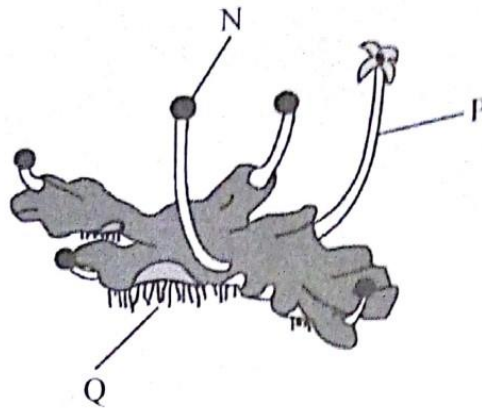
.....

(c) State **one** functional difference between a tendon and a ligament. (1 mark)

.....



5. The photograph below represents a plant in a certain Division.



(a) (i) Name the Division to which the plant belongs. (1 mark)

.....

(ii) With reference to the photograph, state **three** observable features of the Division named in a(i) above. (3 marks)

.....

.....

.....

(b) Name the parts labelled N and P.

N ..... (1 mark)

P ..... (1 mark)

(c) Explain how the part labelled Q is adapted to its functions. (2 marks)

.....

.....

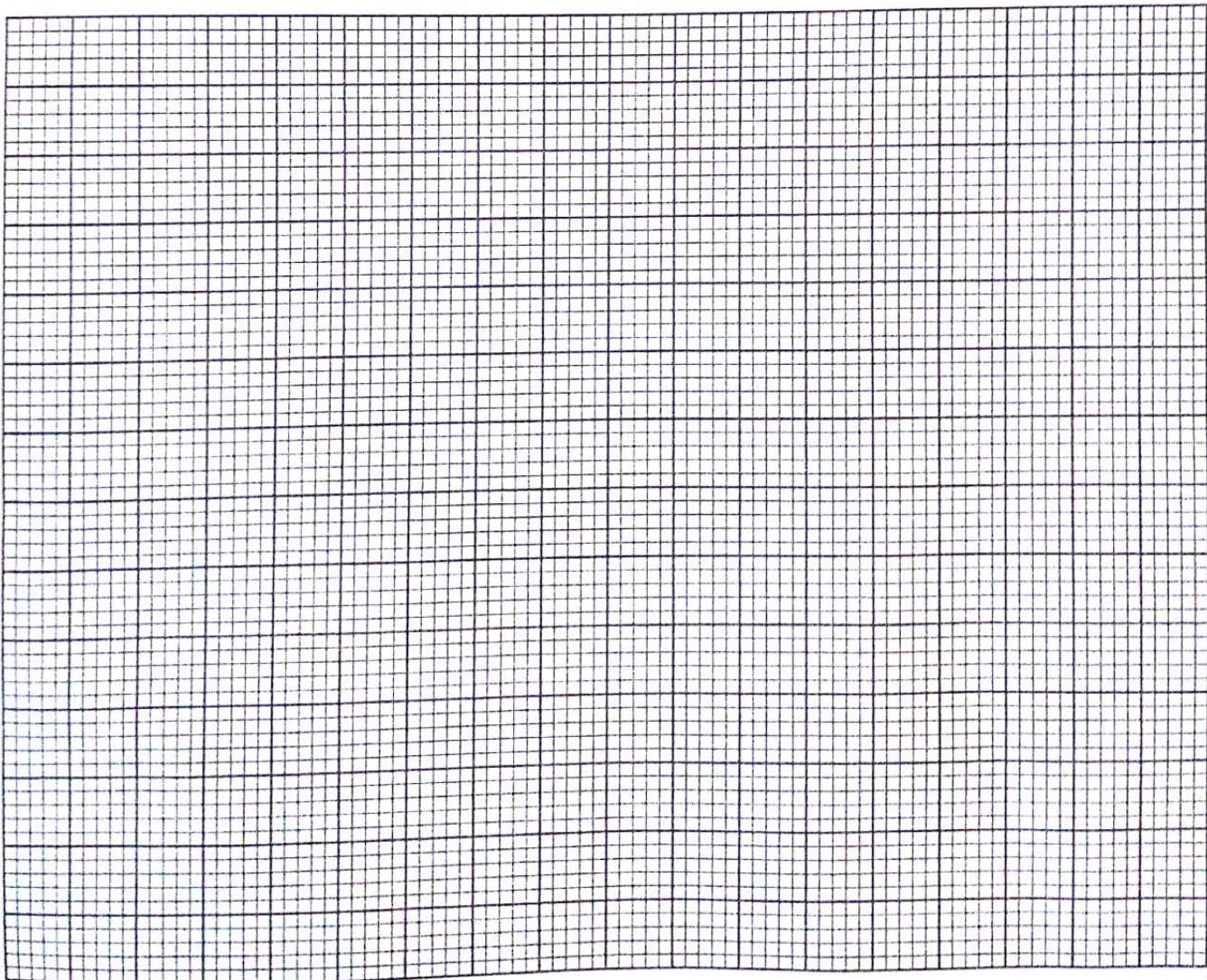
## SECTION B (40 marks)

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

6. The effect of auxin concentration on growth response of two parts of a plant, X and Y was investigated over a period of time. The results were tabulated as shown in the table below.

Concentration of Auxin (in parts per million)	$10^{-6}$	$10^{-5}$	$10^{-4}$	$10^{-3}$	$10^{-2}$	$10^{-1}$	1	$10^1$	$10^2$
Percentage inhibition /stimulation on part X	0	40	55	40	0	-45	-90	0	0
Percentage inhibition /stimulation on part Y	0	0	0	25	65	155	210	125	-25

- (a) On the same axis, draw line graphs of the effect on growth of the two parts, X and Y (percentage inhibition or stimulation) against the concentration. (8 marks)



- (b) With reasons, name the two parts of the plant, X and Y. (1 mark)
- X ..... (1 mark)
- Reason ..... (1 mark)
- Y ..... (1 mark)
- Reason ..... (1 mark)

- (c) From the graph identify:
- (i) the point at which the percentage stimulation was the same for both X and Y. (1 mark)
- .....
- (ii) the optimum concentration of auxins required for part Y (1 mark)
- .....

- (d) State **three** ways in which the effects of auxins on plants is applied in flower farming. (3 marks)
- .....
- .....
- .....

- (e) Distinguish between simple and conditioned reflex action (3 marks)
- .....
- .....
- .....

7. (a) Describe the mode of reproduction in a named fungus. (5 marks)
- (b) Describe the role of hormones in the human menstrual cycle. (15 marks)





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Handwriting practice lines consisting of 20 horizontal dotted lines.

0134

0136



231/3 =

**BIOLOGY**  
**(PRACTICAL)**  
**Nov. 2018 - 1¾ hours**

**- Paper 3**

Name ..... Index Number .....

Candidate's Signature ..... Date .....

**Instructions to candidates**

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of examination in the spaces provided above.
- (c) Answer all the questions in the spaces provided.
- (d) You are required to spend the first 15 minutes of the 1¾ hours allowed for this paper reading the whole paper carefully before commencing your work.
- (e) Additional pages must not be inserted.
- (f) This paper consists of 7 printed pages.
- (g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- (h) Candidates should answer all the questions in English.



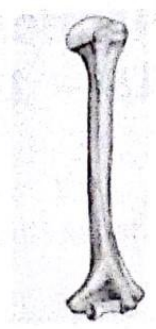
**For Examiner's Use Only**

Question	Maximum Score	Candidate's Score
1	14	
2	12	
3	14	
<b>Total Score</b>	<b>40</b>	

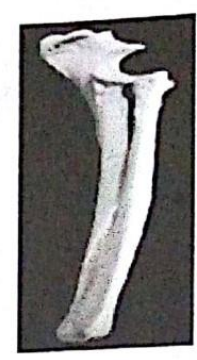
1. The photographs below represent three mammalian bones, labelled E, F and G.



E



F



G

(a) With reasons, identify the bones.

Bone	Identity	Reason(s)
E	.....	.....
	.....	.....
	.....	.....
		(3 marks)
F	.....	.....
	.....	.....
	.....	.....
		(2 marks)
G	.....	.....
	.....	.....
	.....	.....
		(2 marks)

(b) Name the joints formed at the anterior and posterior ends of F.

Anterior end ..... (1 mark)

Posterior end ..... (1 mark)

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A102



(c) State the types of movement facilitated by the joint at the anterior end of specimen labelled F. (1 mark)

.....  
.....

(d) (i) Name the substance found inside the living tissue of the specimen represented in photograph F. (1 mark)

.....  
.....

(ii) State the function of the substance named in (d) (i) above. (1 mark)

.....  
.....

(e) (i) Name the muscle bundle usually attached onto the front of the specimen represented in photograph F. (1 mark)

.....

(ii) State the function of the muscle bundle named in (e) (i) above. (1 mark)

.....

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A102



(iii) State the mode of dispersal for seeds of specimen **H**. (1 mark)

.....  
.....

(iv) Explain how seeds of specimen **H** are dispersed through the mode stated in (b) (iii) above. (3 marks)

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A102

