INSTRUCTIONS TO CANDIDATES:

1. Write your Name, Index Number and School in the spaces provided above.
2. Sign and write the date of examination in the spaces provided above.
3. Answer all the questions in the spaces provided.
4. Answers must be written in the spaces provided in the question paper.
5. Additional pages must not be inserted.

FOR EXAMINER’S USE ONLY:

<table>
<thead>
<tr>
<th>Question</th>
<th>Maximum Score</th>
<th>Candidate’s Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 26</td>
<td>80</td>
<td></td>
</tr>
</tbody>
</table>
1. Name the organelles that are abundant in:
   (a) Goblet cells ________________________________ (1 mark)
   (b) Liver cells ________________________________ (1 mark)

2. Give a reason why it is difficult to calculate Respiratory Quotient (RQ) in plants. (2 marks)

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

3. List three advantages of asexual reproduction in plants. (3 marks)

   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

4. The diagram below represents a stage during cell division.

   (a) (i) Identify the stage of cell division. (1 mark)

   __________________________________________________________

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

   __________________________________________________________
Biology Paper 1

2

Kirinyaga Central

(b) Name the structures labelled M. (1 mark)

5. Explain why there is increased heart beat during vigorous exercise in man. (2 marks)

6. (a) State two characteristic features of members of division pteridophyta. (2 marks)

(b) Give one way in which pteridophyta differ from spermatophyta. (1 mark)

7. (a) Explain the role of antidiuretic hormone when there is excess water in the human body. (3 marks)

(b) State the kidney disorder characterized by production of large volume dilute urine. (1 mark)
Biology Paper 1

8. (a) State one role of each following hormones in the menstrual cycle.
   (i) Follicle stimulating hormone. (1 mark)
   
   
   
   (ii) Luteinising hormone. (1 mark)
   
   
   
   
   (b) Explain why hormone testosterone still exerts it’s influence even when vas deferens have been cut. (2 marks)
   
   
   
   

9. The graph below represents growth pattern in a certain group of animals. Study it and answer the questions that follow.
(a) Name the type of growth curve.  

(b) Name the animal phylum that shows this type of growth pattern.  

(c) Name the process that occurs in part M.  

10. (a) Name the bacteria found in ceacum of herbivores.  

(b) State the association of the bacteria named in (a) above with herbivores.  

11. During germination and early growth, the dry weight of endosperm decreases while that of the embryo increases. Explain.  

12. The figure below shows an alveolus in which gaseous exchange take place.
(a) Define the term diffusion. (1 mark)

_________________________________________________________________

_________________________________________________________________

(ii) What causes oxygen to diffuse into the blood from the alveoli? (1 mark)

_________________________________________________________________

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(iii) List two features of gaseous exchange surfaces in animals, such as humans that are evident in the diagram above. (2 marks)

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13. State two characteristics that researchers use/select in breeding programmes. (2 marks)

_________________________________________________________________

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14. (a) Which component of the blood gives the body immunity? (1 mark)

_________________________________________________________________

(b) Distinguish between natural and acquired immunity. (2 marks)

_________________________________________________________________
Biology Paper 1

15. (a) Define ‘osmosis’.

(b) State the importance of osmosis in plants.

16. (a) Give two evidences that support the theory of organic evolution.

(b) Why is Lamarck’s theory of evolution not accepted by biologists today?
17. The number and distribution of stomata on three different leaves are shown in the table below.

<table>
<thead>
<tr>
<th>Leaf</th>
<th>Number of stomata</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper epidermis</td>
<td>Lower epidermis</td>
</tr>
<tr>
<td>A</td>
<td>300</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>150</td>
<td>200</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>13</td>
</tr>
</tbody>
</table>

**Biology Paper 1**

(a) Suggest the possible habitat of the plant from which the leaves were obtained. (3 marks)

<table>
<thead>
<tr>
<th>Leaf</th>
<th>Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>____________________________</td>
</tr>
<tr>
<td>B</td>
<td>____________________________</td>
</tr>
<tr>
<td>C</td>
<td>____________________________</td>
</tr>
</tbody>
</table>

(b) State **one** modification found in the stomata of leaf (C). (1 mark)

____________________________________________________________________

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18. (a) State **one** way through which herbaceous plants achieve support. (1 mark)

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(b) Name **three** supporting tissues in plants. (3 marks)

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19. (a) One of circulatory systems in animals is open circulatory system. Give the name of the other type of circulatory system found in animals. (1 mark)
(b) State two advantages of the circulatory system you have named in (a) above. (2 marks)

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Biology Paper 1

20. State two advantages of metamorphosis to the life of insects. (2 marks)

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21. There are at least 205 known sex-linked recessive disorders.
   (a) What is meant by term sex-linkage? (2 marks)

____________________________________________________________________

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____________________________________________________________________

(b) Name two sex-linked traits in humans. (2 marks)

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____________________________________________________________________

22. The diagram below shows the position of an image formed in a defective eye.
(a) Name the defect.  
_____________________________________________________________  

(b) Explain how the defect named in (c) above can be corrected.  
______________________________________________________________________  
______________________________________________________________________  
______________________________________________________________________  

23. (a) State the importance of the following processes that take place in the nephron of a human kidney.  
(i) Ultrafiltration.  
______________________________________________________________________  
______________________________________________________________________  
______________________________________________________________________  

(ii) Selective reabsorption.  
______________________________________________________________________  
______________________________________________________________________  
______________________________________________________________________  

(b) In which part of the nephron does ultrafiltration take place?  
______________________________________________________________________  

24. A biological washing detergent contains enzymes which remove stains like mucus
and oils from clothes which are soaked in water with the detergent.

(a) Name the two groups of enzymes that are present in the detergent. (2 marks)

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

(b) Why would the stains be removed faster with the detergent in water at 35°C rather than at 15°C? (2 marks)

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

25. Explain why it is important to go for Voluntary Counselling and Testing (VCT) on HIV/AIDS. (2 marks)

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______________________________________________________________________

26. In an experiment young potted seedlings were placed in a dark box with unilateral light source as shown below.
(a) What was the aim of the experiment? (1 mark)

_________________________________________________________________

_________________________________________________________________

(b) State the observation made on the seedling after 3 days. (2 marks)

_________________________________________________________________

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_________________________________________________________________
INSTRUCTIONS TO CANDIDATES:

- Write your **name, 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 space provided after question **8**.
- Check to ascertain that all pages are printed and that no questions are missing.

<table>
<thead>
<tr>
<th>FOR EXAMINER’S USE ONLY:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section</strong></td>
</tr>
<tr>
<td>A</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>B</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Total Score</td>
</tr>
</tbody>
</table>
SECTION A: (40 MARKS)

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

1. Study the diagram shown below of the anterior view of a lumbar vertebra of a mammal.

(a) Name the parts labelled: (3 marks)

A ________________________________________________________________

B ________________________________________________________________

C ________________________________________________________________

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

______________________________________________________________

______________________________________________________________

______________________________________________________________

(c) State three roles of skeletons in organisms. (3 marks)

______________________________________________________________

______________________________________________________________

______________________________________________________________

(d) State how the part labelled D is adapted for the function stated in (b) above. (1 mark)

______________________________________________________________

______________________________________________________________

______________________________________________________________
2. The graph below shows rates of photosynthesis in a plant at different temperatures.

(a) Account for the decrease in the rate of product formation at 41°C from 5 to 20 minutes.  
(2 marks)
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

(b) Explain the results obtained at
(i) 25°C.  
(2 marks)
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

(ii) 36°C.  
(2 marks)
________________________________________________________________________
________________________________________________________________________
Biology Paper 2
(c) (i) Other than temperature, state **one** external factor that affect the rate of photosynthesis. (1 mark)

(ii) Suggest the product which could have been used in the experiment. (1 mark)

3. The diagram below shows a model of the nephron of a mammalian kidney.

(a) Which parts of the nephron are represented by the:
   (i) Syringe? (1 mark)

   (ii) Perforated rubber tubing? (1 mark)

   (iii) Free rubber tubing? (1 mark)

(b) Name the type of filtration taking place within the perforated rubber tubing. (1 mark)

(c) What would happen to the contents of the syringe if its handle was slowly pushed forward? Explain. (4 marks)
The table below shows the number of Leopards and Impala in a grassland park over a period of six years.

<table>
<thead>
<tr>
<th>Time in years</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Impala</td>
<td>360</td>
<td>498</td>
<td>546</td>
<td>216</td>
<td>120</td>
<td>72</td>
</tr>
<tr>
<td>Number of Leopard</td>
<td>11</td>
<td>17</td>
<td>25</td>
<td>7</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

(a) (i) What is the average number of Impala in the park during the six years. (2 marks)

(ii) Account for the decrease in the number of leopards between the 4th and 6th year? (3 marks)

(b) Identify the trophic level occupied by
   (i) Leopards (1 mark)

(ii) Tick feeding on the leopard. (1 mark)

(c) The two pyramids shown were obtained in the park.

   (i) Identify each type of pyramid. (2 marks)

I: 

II:
5. A pea plant with smooth seeds was crossed with one with wrinkled seeds. The gene for smooth seeds is dominant over that for wrinkled seeds. Use letter R to represent the dominant.

(a) State the genotype of the parents if the plant with smooth seeds was heterozygous. (2 marks)

(b) State the gametes produced by the smooth seeds and wrinkled seeds parents. (2 marks)

(c) State the genotype and phenotype of F1 generation. Show your working. (4 marks)

SECTION B: (40 MARKS)

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

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

<table>
<thead>
<tr>
<th>Salt concentration (g/dm³)</th>
<th>% of RBC destroyed By haemolysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>2.5</td>
<td>100</td>
</tr>
<tr>
<td>3.0</td>
<td>100</td>
</tr>
<tr>
<td>3.5</td>
<td>96</td>
</tr>
<tr>
<td>3.7</td>
<td>80</td>
</tr>
</tbody>
</table>
(a) Draw a graph of percentage of red blood cells haemolysed against salt concentration.

(6 marks)

<table>
<thead>
<tr>
<th>Salt Concentration</th>
<th>Percentage of Red Blood Cells Haemolysed</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>60</td>
</tr>
<tr>
<td>4.5</td>
<td>16</td>
</tr>
<tr>
<td>4.7</td>
<td>0</td>
</tr>
<tr>
<td>5.0</td>
<td>0</td>
</tr>
<tr>
<td>6.0</td>
<td>0</td>
</tr>
</tbody>
</table>
(b) Explain haemolysis of red blood cells. (3 marks)

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

(c) From the graph, state:

(i) the salt concentration at which 50% red blood cells were haemolysed. (1 mark)

______________________________________________________________________

(ii) the highest salt concentration when the largest number of red blood cells were haemolysed. (1 mark)

______________________________________________________________________

(d) (i) Suggest the normal salt concentration in the blood of the mammal from which the red blood cells were obtained. (2 marks)

______________________________________________________________________

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

______________________________________________________________________

(iii) What term is used to describe the solution with equal solute concentration as that of the cells? (1 mark)

______________________________________________________________________
(e) Name the process in the human body that ensures that haemolysis of red blood cells is prevented. (1 mark)

(f) State the role of osmosis in organisms. (4 marks)

7. How are respiratory gases, oxygen and carbon (IV) oxide transported to and from tissues in mammals? (20 marks)

8. State and explain how the mammalian small intestines are adapted to perform their function. (20 marks)
1. You are provided with a specimen labelled H which is a piece of a mammalian intestine. Squeeze the contents in the lumen into a test tube. Add 3ml of water and shake the contents. Reserve the piece of intestine for question (b).

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

<table>
<thead>
<tr>
<th>Food substance</th>
<th>Procedure</th>
<th>Observations</th>
<th>Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proteins</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reducing sugars</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) Account for the results obtained in (a)(i) above. (9 marks)

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

(i) Feel the inner and outer surfaces of the specimen. Record your observations. (2 marks)

(ii) Account for our observations of the inner surface. (3 marks)
2. (a) The figure below shows feet of various birds. Study the diagram and answer the questions that follow.

(i) Name the type of evolution represented by the diagrams.  
(1 mark)

(ii) Using Darwin’s theory of evolution, explain how the feet of bird E would have evolved.  
(3 marks)

(iii) Explain how Larmack could have explained the evolution of feet of bird C.  
(3 marks)

(b) Figure 1 represents a bat wing, Figure 2 a whale paddle and Figure 3 an insect wing. Study the diagrams and answer the questions that follow.
(i) Name parts labelled E and F. (2 marks)

(ii) State **one** difference between the wings in Figure 1 and 3. (1 mark)

(iii) Name the type of joint found at proximal end of bone marked H. (1 mark)

3. (a) You are provided with a specimen labelled R. Using observable features only, identify the class to which the specimen belongs.

   Class ______________________________________________________________________ (1 mark)

   List the observable features used to identify the class which the specimen belongs. (3 marks)

   (i) __________________________________________________________________________

   (ii) __________________________________________________________________________

   (iii) __________________________________________________________________________

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

   (i) Record your observation. (2 marks)

   (ii) Observe the arrangement of the scales. Record your observations. (1 mark)

   (iii) State the significance of the arrangement of the scales. (1 mark)

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

   (i) forward movement. (1 mark)

   (ii) Balancing. (1 mark)

   (iii) Staying upright. (1 mark)

   (iv) Fast movement. (1 mark)