EXAMINATION NO.: _____

THE MALAWI NATIONAL EXAMINATIONS BOARD

2004 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

BIOLOGY

Subject Number: M022/I

Tuesday, 12 October

Time Allowed: 2 h 30 mins
8:30 – 11:00 am

PAPER I
(100 marks)

THEORY

Instructions

1. **This paper contains 12 pages. Please check.**

2. Before beginning **fill** in your **Examination Number** at the top of the question paper and on **all** other sheets.

3. This paper contains Sections **A, B** and **C**. Answer **all** questions in **all** the sections.

4. Write your answers on the question paper in the spaces provided. The maximum number of marks for each answer is indicated against each question.

Section A (20 marks)

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

1. a. Define the following terms:

(i) "ecosystem" _____

_____

(1 mark)

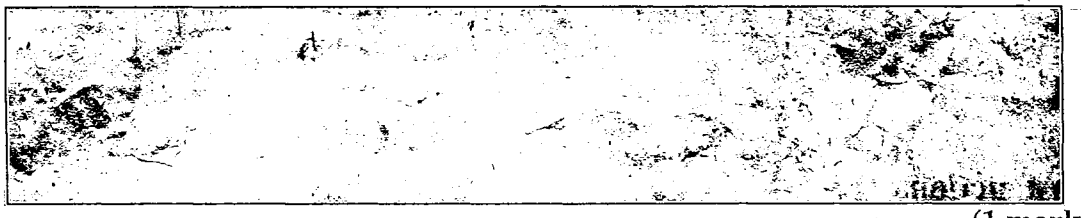
(ii) "community" _____

_____

(1 mark)

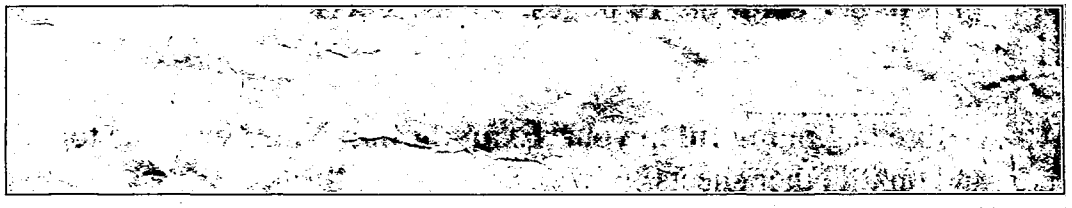
b. Suppose a particular ecosystem has 2 shrubs, 100 caterpillars and 3 birds, construct a pyramid of:

(i) numbers



(1 mark)

(ii) biomass



(1 mark)

2. a. Name **one** locomotory structure in

(i) bird _____

(1 mark)

(ii) fish _____

(1 mark)

b. State **two** adaptations for locomotion common to both birds and fish.

_____

_____

(2 marks)

3. a. (i) Why would a plant fail to carry out photosynthesis if it lacked magnesium?

_____

_____

(1 mark)

(ii) By what process does a nitrate ion move into a root hair cell when its concentration is higher in the root hair cell than in the soil?

_____

(1 mark)

Continued/.

3. (Continued)

b. In what way is diffusion similar to osmosis?

_____

_____

(1 mark)

4. **Figure 1** is a diagram showing a transverse section of the spinal cord. Use it to answer the questions that follow.

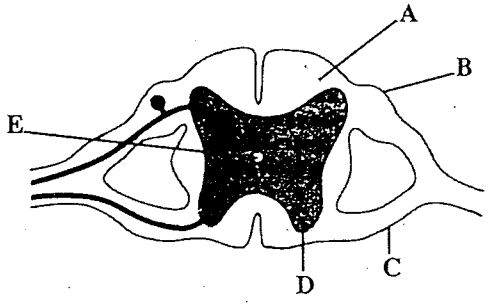


Figure 1

a. Name the parts labelled **B** and **C**.

B _____ C _____

(2 marks)

b. State the **structural** difference between parts labelled **A** and **D**.

_____

_____

(1 mark)

c. What is the function of the substance found in the part labelled **E**?

_____

(1 mark)

5. **Figure 2** is a diagram showing a lymph node which has a tumour beginning to develop. Use it to answer the questions that follow:

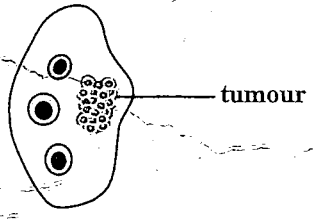


Figure 2

a. Name the type of disease shown in **Figure 2**.

_____

(1 mark)

b. State **two** ways in which the cells of the tumour might affect cells surrounding it.

_____

_____

(2 marks)

Continued/...

5. (Continued)

c. Suggest any **two** factors that would increase the risk of developing the disease named in **5a**.

_____

_____

(2 marks)

Section B (50 marks)

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

6. a. State **two** factors which must be considered before a blood transfusion is done.

_____

_____

(2 marks)

b. Describe how an individual could acquire natural active immunity.

_____

_____

_____

(3 marks)

7. **Figure 3** is a diagram showing recycling of materials in an ecosystem. Use it to answer the questions that follow.

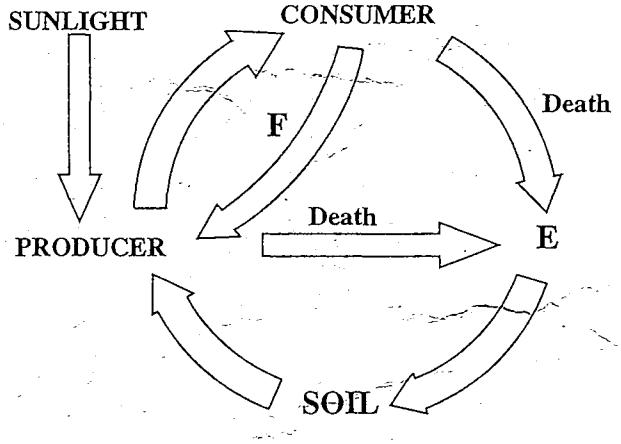


Figure 3

a. What do the letters **E** and **F** represent?

E _____

F _____ (2 marks)

b. Explain how the consumer would be affected if **E** was absent in the cycle.

_____

_____

_____

(3 marks)

7. **(Continued)**

c. How would a worm using the soil as a habitat benefit the producer?

_____

_____

_____

_____

(3 marks)

8. **Figure 4** is a diagram showing the wing of a bat labelled **A** and the front leg of a rabbit labelled **B**. Use it to answer the questions that follow.

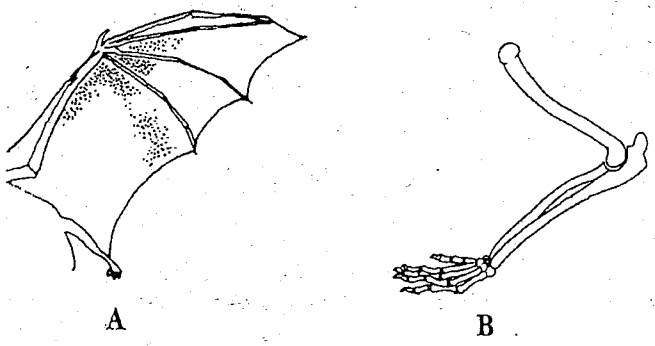


Figure 4

a. Give **two** structural differences between wing **A** and leg **B**.

_____

_____

(2 marks)

b. (i) What type of evidence of evolution is shown in **Figure 4**?

_____

(1 mark)

(ii) Give a reason for your answer to 8b(i).

_____

_____

(2 marks)

9. **Figure 5** is a photograph of plant known as cactus. Use it to answer the questions that follow.

Figure 5

a. (i) Suggest a possible environment where the plant in **Figure 5** would grow.

_____

(1 mark)

Continued/...

9. a. **(Continued)**

(ii) State **one** adaptation shown in the photograph which would assist the plant to survive in its habitat.

_____

_____

(1 mark)

(iii) Explain how the adaptation in **9a(ii)** would help the plant to survive in its habitat.

_____

_____

(1 mark)

10. A scientist crossed a red flowered plant with a white flowered plant, all the **F1** generation had pink flowers.

a. Explain how the **F1** plants had produced pink flowers.

_____

_____

(1 mark)

b. Using **R** to represent gene for red colour and **r** to represent gene for white colour, write down genotype of

(i) red flowered plants _____

(1 mark)

(ii) **F1** plants _____

(1 mark)

c. State **one** advantage of cross pollination in plants.

_____

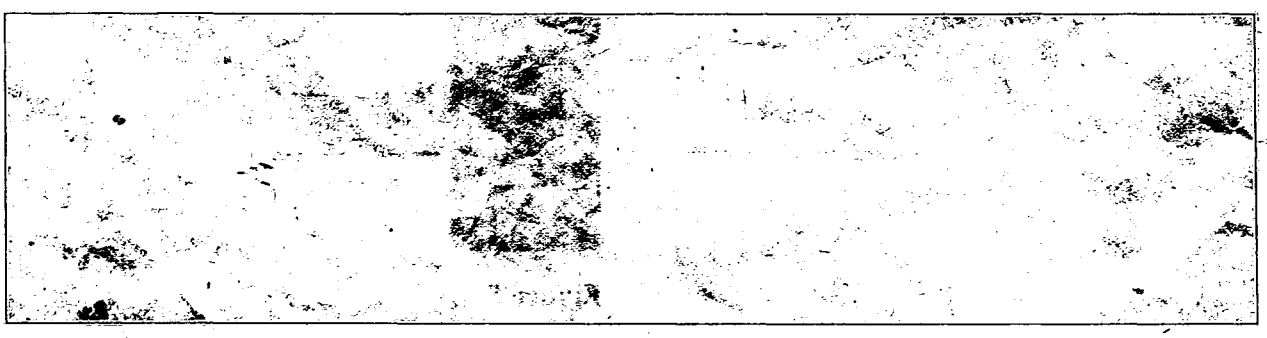
_____

(1 mark)

11. Dwarfism is a human characteristic in which a person is abnormally short. Gene **T** for tallness is dominant over gene **t** for shortness. If a man and a woman who are both heterozygous for this trait marry

a. (i) draw a cross diagram to show how this family would produce a dwarf.

(ii) indicate genotype of parents, gametes and offspring.



(3 marks)

Continued/...

11. (Continued)

b. Write down the ratio of the genotype and the phenotype of the offspring.

(i) genotypic ratio _____ **(1 mark)**

(ii) phenotypic ratio _____ **(1 mark)**

12. **Figure 6** shows cross-sections through stems **6A** and **6B** of two plant species. Use it to answer the questions that follow.

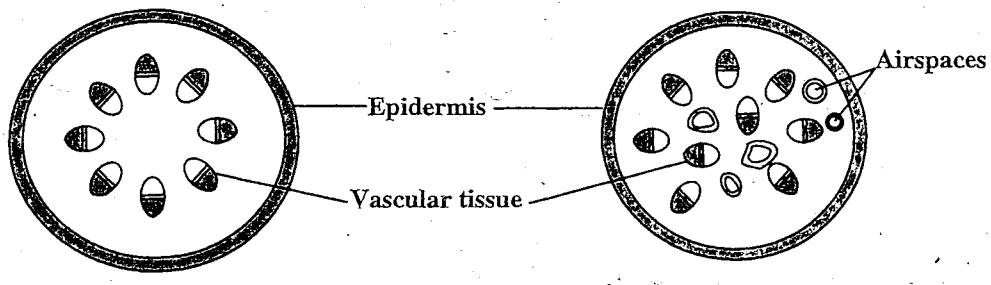


Figure 6A **Figure 6B**

a. State **two** structural differences between **Figures 6A** and **6B**.

_____

_____

(2 marks)

b. (i) Which cross-section belongs to an aquatic plant?

_____

(1 mark)

(ii) Explain your answer to **12b(i)**.

_____

_____

_____

_____

(2 marks)

13. **Figure 7** is a diagram showing an experiment on osmosis. Use it to answer the questions that follow.

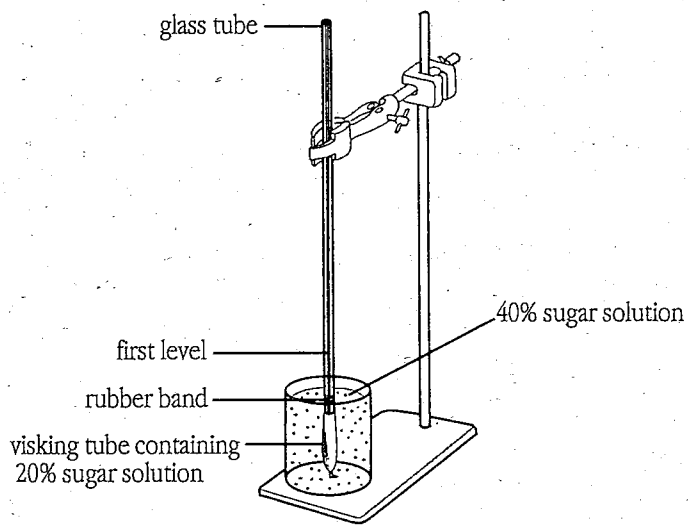


Figure 7

a. (i) What change would occur to the level of sugar solution in the glass tubing after some time?

_____

(1 mark)

(ii) Explain your answer to **13a(i)**.

_____

_____

_____

_____

(2 marks)

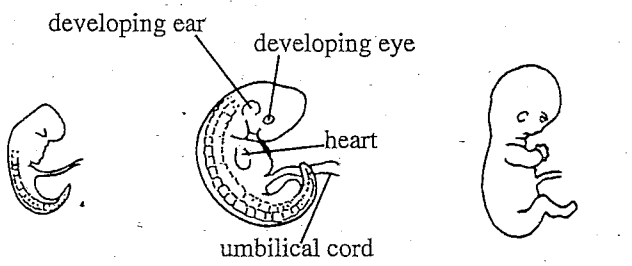
b. What type of membrane is the visking tubing?

_____

(1 mark)

Continued/...

14. **Figure 8** is a diagram showing a human embryo at different stages of development. Use it to answer the questions that follow.



(a) AFTER 2 WEEKS (b) ABOUT 5 WEEKS (c) 8 WEEKS

Figure 8

a. How old is the embryo by the time a circulatory system develops?

_____

(1 mark)

b. (i) Apart from the head and tail, name the structure which is present in all the three stages shown in **Figure 8**.

_____

(1 mark)

(ii) Explain **two** ways in which the structure named in **14b(i)** is important to the embryo.

_____

_____

_____

(2 marks)

c. What type of cell division contributes to the increase in size of the embryo?

_____

(1 mark)

15. A dialysis machine is an artificial kidney which is used when a person has kidney failure.

a. How is the loss of glucose and other important substances from the blood prevented when a patient is on the dialysis machine?

_____

_____

(2 marks)

b. State **one** similarity between the dialysis tube and the tubule of the nephron.

_____

_____

(2 marks)

c. Name **two** substances which diffuse out of the dialysis tube when it is in operation.

(i) _____

(ii) _____

(2 marks)

Continued/...

Section C (30 marks)

Essay questions

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

16. Explain **five** ways in which glucose is used by the plant after photosynthesis.

(10 marks)

Continued/...

17. Explain the mechanism of breathing in fish.

(10 marks)

Continued/...

18. Describe an experiment that you would use to find out the effect of unequal distribution of light on a growing shoot. In your answer include method, expected results and conclusion.

(10 marks)

END OF QUESTION PAPER

B: This paper contains 12 pages.