CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®

EXAMINATION

BIOLOGY

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in two sections. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Where appropriate, answers should be illustrated by diagrams.
5. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
6. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

SECTION A

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) Figure 1 shows two plant organs.

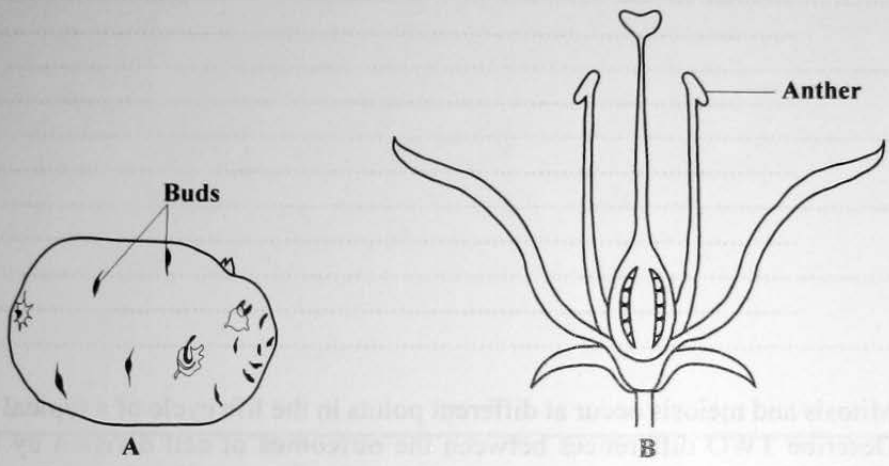

Figure 1. Plant organs

(i) Identify the type of reproduction carried out by EACH of the plant organs shown in Figure 1.

A: .....

B: .....

(2 marks)

(ii) Outline the sequence of events that would take place from pollination to the formation of the seed/fruit from the organ shown in Figure 1B.

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(3 marks)

(b) Mitosis and meiosis occur at different points in the life cycle of a typical flowering plant. Describe TWO differences between the **outcomes** of cell division by mitosis and cell division by meiosis.

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(4 marks)

(c) The plant from which the flower shown in Figure 1B comes, exists in two varieties: one produces blue flowers while the other produces white flowers. A cross between two blue-flowered plants produces 100 seeds. Seventy-four of the plants that develop from these 100 seeds have blue flowers while 26 have white flowers.

Deduce the **genotypes** of the parent plants. Explain your answer with the aid of a genetic diagram.

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Space for diagram for (c)

(3 marks)

(d) Figure 2 shows the growth of a seedling over eight days.

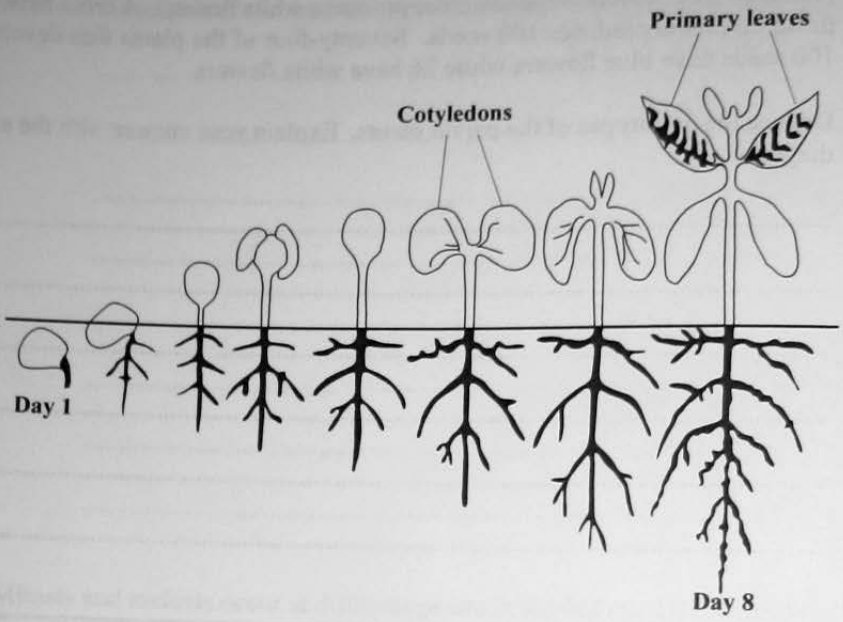


Figure 2. Diagram showing growth of a seedling over eight days

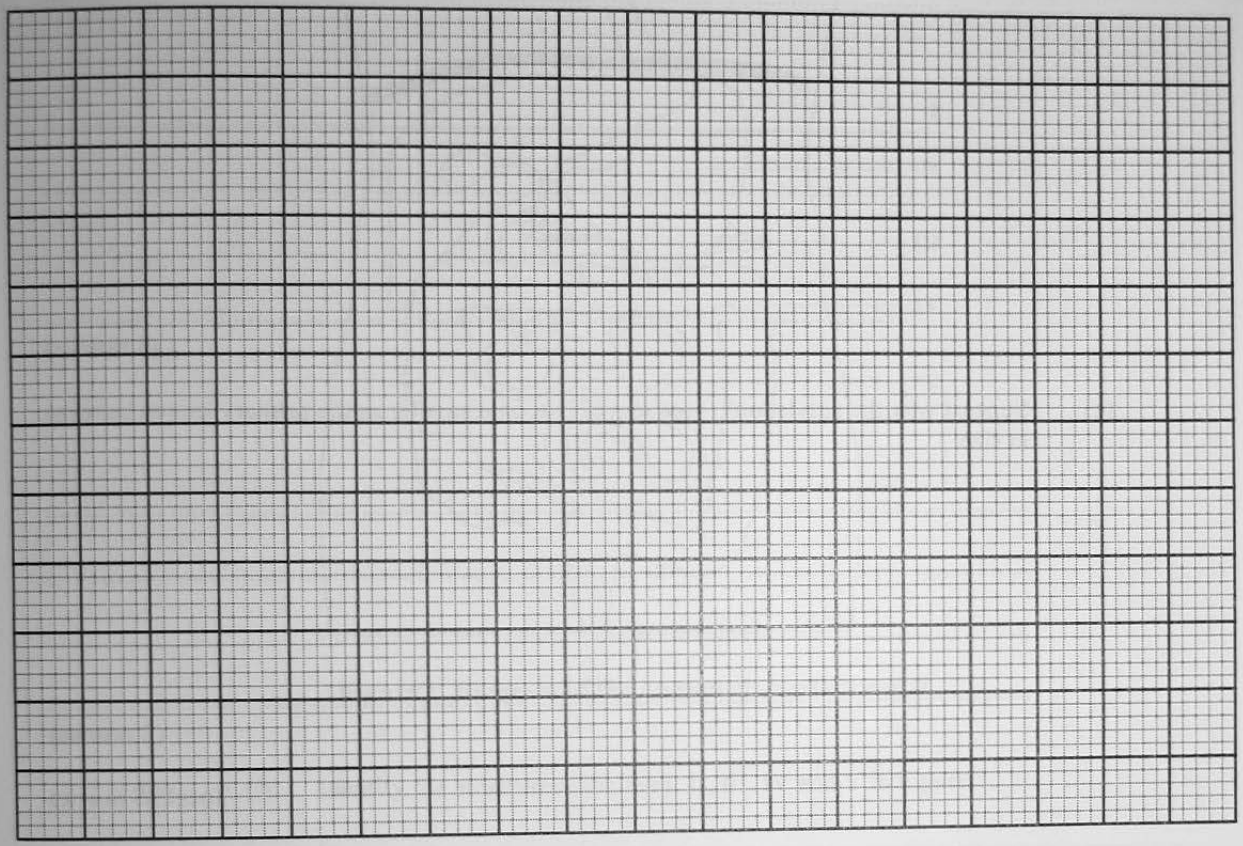
(i) Measure the length of the **radicle** of the seedling on EACH day and record your measurements in Table 1.

TABLE 1: LENGTH OF RADICLE AFTER GERMINATION

Days After Germination	Length of Radicle (cm)
1	
2	
3	
4	
5	
6	
7	
8	

(1 mark)

(ii) Plot the data in Table 1 on the graph paper below. Put days on the horizontal (x) axis.



(4 marks)

(iii) State TWO factors, other than water, that are required for the germination of the seed shown in Figure 2.

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(2 marks)

(iv) Describe an investigation to test the hypothesis, 'Water is needed for the germination of seeds'.

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(4 marks)

(e) Suggest why the cotyledons (seed leaves) become smaller as the primary leaves increase in size.

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(2 marks)

Total 25 marks

2. Figure 3 is a diagram of the human alimentary canal.

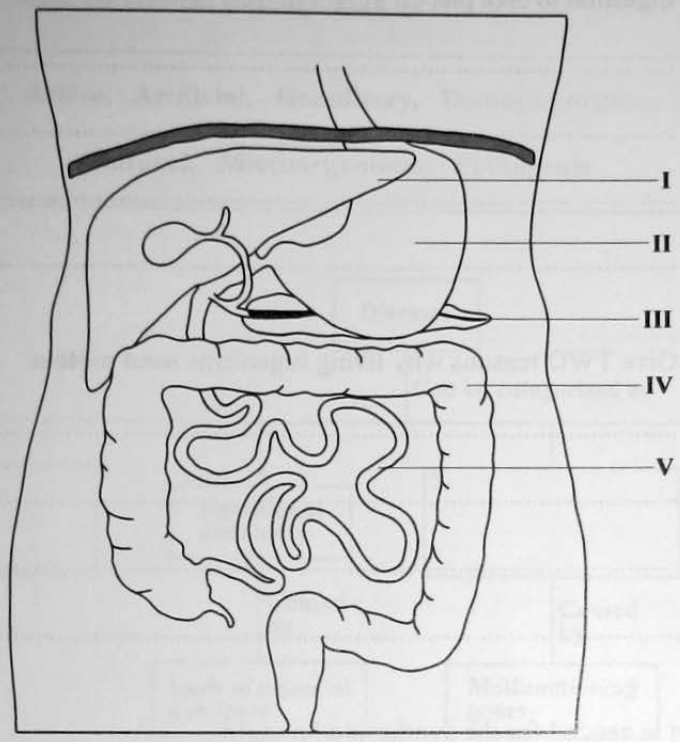

Figure 3. Diagram of the human alimentary canal

(a) (i) Identify the structures labelled I, II, III, IV and V in Figure 3.

I: .....

II: .....

III: .....

IV: .....

V: .....

(5 marks)

(ii) Using the symbol, **X**, indicate **on** Figure 3, TWO places where protein digestion takes place. **(2 marks)**

(iii) Suggest TWO reasons why the locations indicated in (a) (ii) are suitable for protein digestion to take place.

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(2 marks)

(iv) Give TWO reasons why living organisms need protein.

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(2 marks)

(b) Nitrogen is needed for the synthesis of proteins.

(i) In the liver, excess protein is converted to urea which is excreted by some animals. Briefly describe ONE route by which the nitrogen excreted from animals (in the form of urea) is made available to plants.

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(2 marks)

(ii) Suggest TWO signs of nitrogen deficiency in plants.

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(2 marks)

Total 15 marks

3. (a) Figure 4 is a concept map on diseases. Choose the correct term from the following list and complete the concept map in Figure 4.

Active, Artificial, Hereditary, Damaged organs, Natural, Microorganisms, Pathogenic

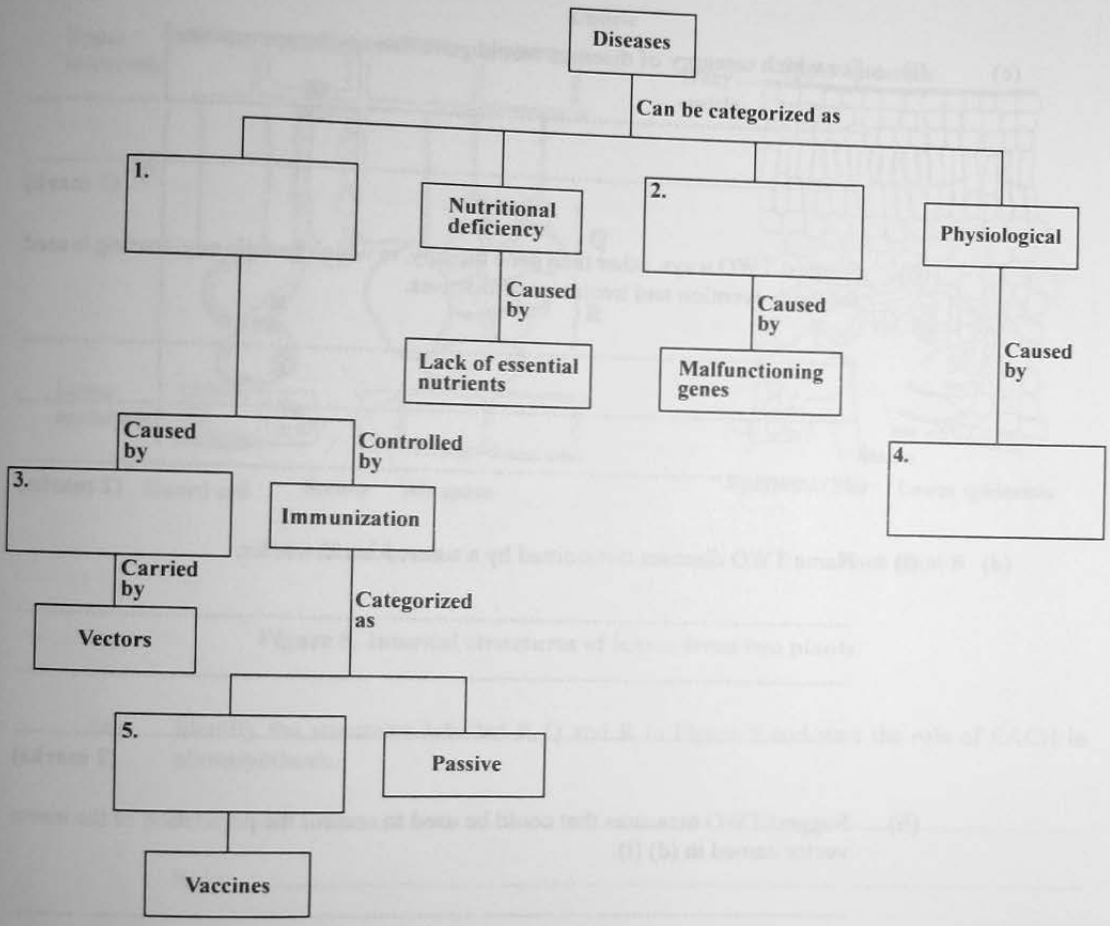

Figure 4. Concept map on diseases

(5 marks)

(b) Suggest THREE ways in which physiological diseases may be managed.

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(3 marks)

(c) (i) For which category of diseases would gene therapy be appropriate?

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(1 mark)

(ii) Suggest TWO ways, other than gene therapy, in which genetic engineering is used for the prevention and treatment of diseases.

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(2 marks)

(d) (i) Name TWO diseases transmitted by a **named** insect vector.

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(2 marks)

(ii) Suggest TWO measures that could be used to control the population of the insect vector named in (d) (i).

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(2 marks)

Total 15 marks

SECTION B

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

4. Figure 5 shows the internal structures of two leaves from plants growing in different environmental conditions.

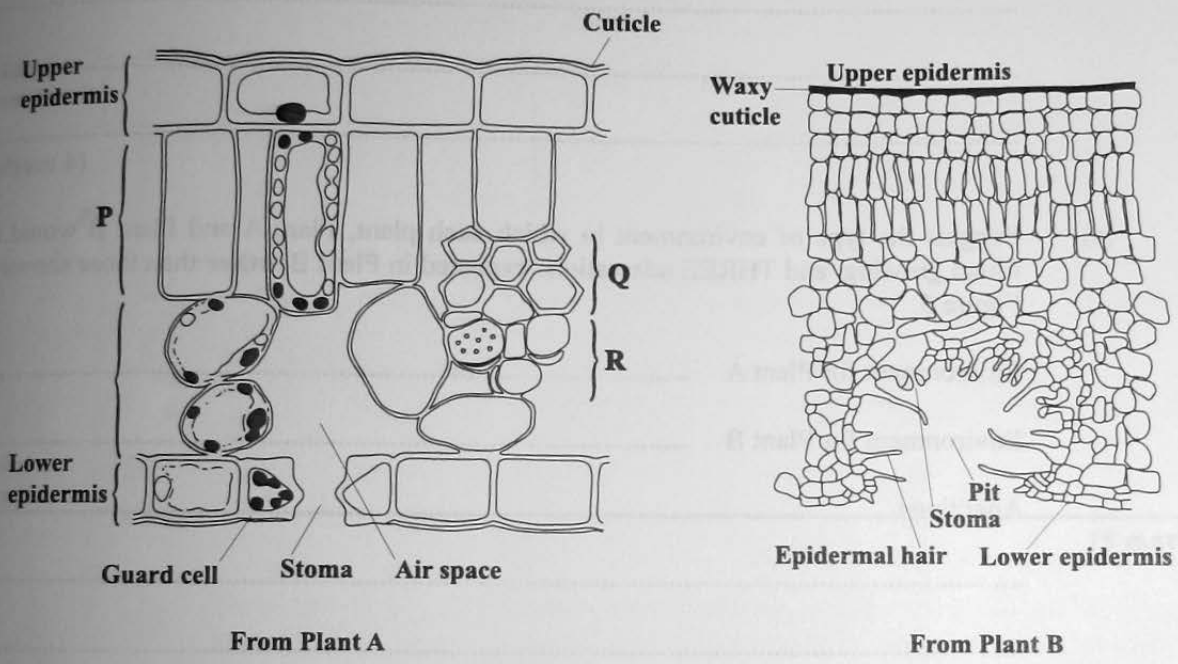

Figure 5. Internal structures of leaves from two plants

(a) Identify the structures labelled P, Q and R in Figure 5 and state the role of EACH in photosynthesis.

P .....

Role .....

Q .....

Role .....

R .....

Role .....

(6 marks)

(b) Describe ONE difference in the cuticles and ONE difference in the lower epidermis of the two plants, A and B, and explain the significance of these differences.

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(4 marks)

(c) Suggest the type of environment in which each plant, Plant A and Plant B would be found growing, and THREE adaptations expected in Plant B, **other** than those shown in Figure 5.

Environment for Plant A .....

Environment for Plant B .....

Adaptions .....

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(5 marks)

Total 15 marks

5. (a) Draw a clearly labelled diagram to show the internal structure of human skin.

Space for diagram for (a)

(5 marks)

(b) A biologist travels to the Sahara desert to study its organisms. Daytime temperatures in the desert are very high and night-time temperatures are very low.

(i) Explain how the biologist's skin allowed him to maintain a relatively normal body temperature during his first **day** and **night** in the desert. In your answer, state the term used to describe the maintenance of a constant body temperature.

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(7 marks)

(ii) Suggest TWO ways the biologist could modify his behavior during the day, and ONE way during the night, to help regulate his body temperature in the desert.

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(3 marks)

Total 15 marks

6. (a) Table 2 is an incomplete table showing organisms and their natural habitat.

(i) Complete Table 2 to match EACH organism with its natural habitat.

TABLE 2: ORGANISMS AND THEIR NATURAL HABITAT

Organism	Natural Habitat
Cactus	
Mora	Forest
King fish	
	Pond
Red mangrove	

(4 marks)

(ii) Describe briefly a technique for sampling organisms in the pond.

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(2 marks)

(b) Harry plants tomato seedlings 10 cm apart and Karen plants the same variety 30 cm apart. The plots of land are identical in size and are located next to each other. The plants in both plots receive the same amount of water and fertilizer. At harvest, Karen reaps many more tomatoes, which are larger and healthier than Harry's tomatoes.

Explain THREE factors that may have caused a lower yield of tomatoes in Harry's plot.

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(6 marks)

(c) Suggest THREE ways by which human activity could adversely affect an oyster population living in a mangrove swamp.

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(3 marks)

Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.