

FORM TP 2017155



TEST CODE 02207020

MAY/JUNE 2017

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

BIOLOGY

UNIT 2 – Paper 02

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. You may use a silent, non-programmable calculator to answer questions.
5. You are advised to take some time to read through the paper and plan your answers.
6. 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.**
7. **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.**

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.**

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SECTION A

Answer ALL questions.

Write your answers in the spaces provided in this booklet.

1. (a) A simplified summary of the stages in glycolysis is given in Figure 1.

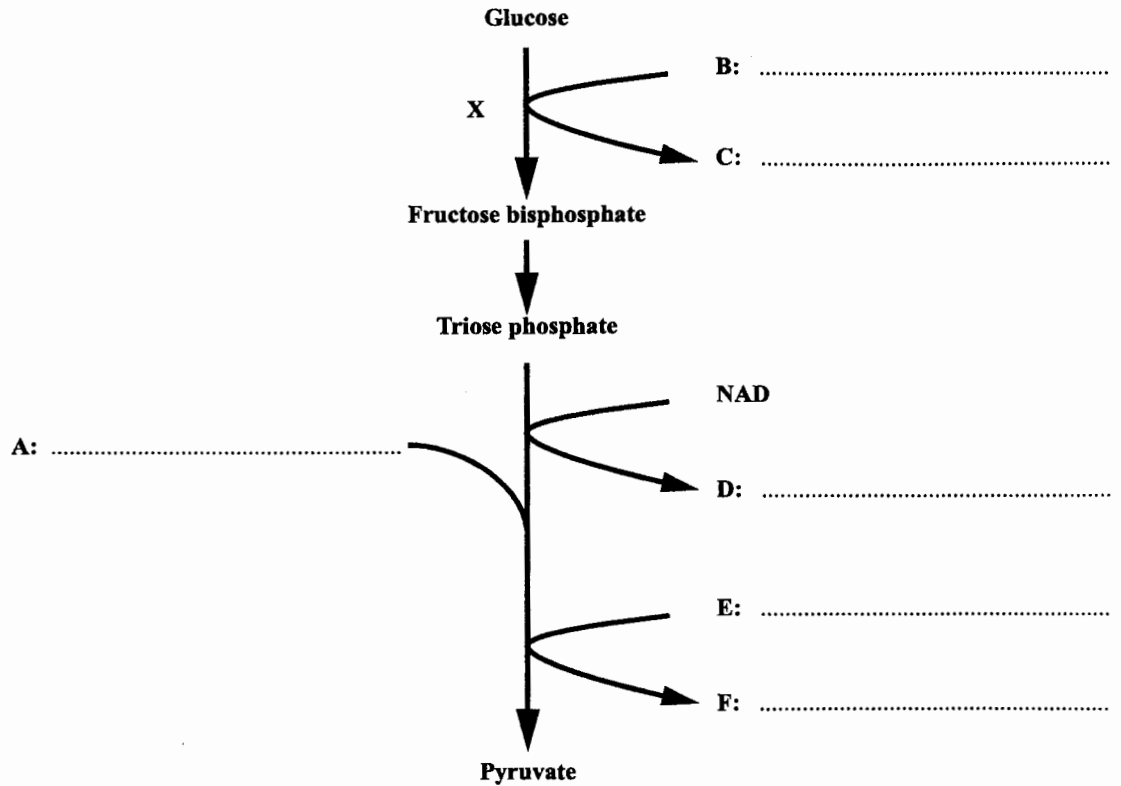


Figure 1. Summary of key stages in glycolysis

- (i) Identify the reactants or products labelled A, B, C, D, E and F in Figure 1. Write your answers in the relevant spaces in Figure 1. [4 marks]



(ii) Explain the significance of the process labelled X in Figure 1.

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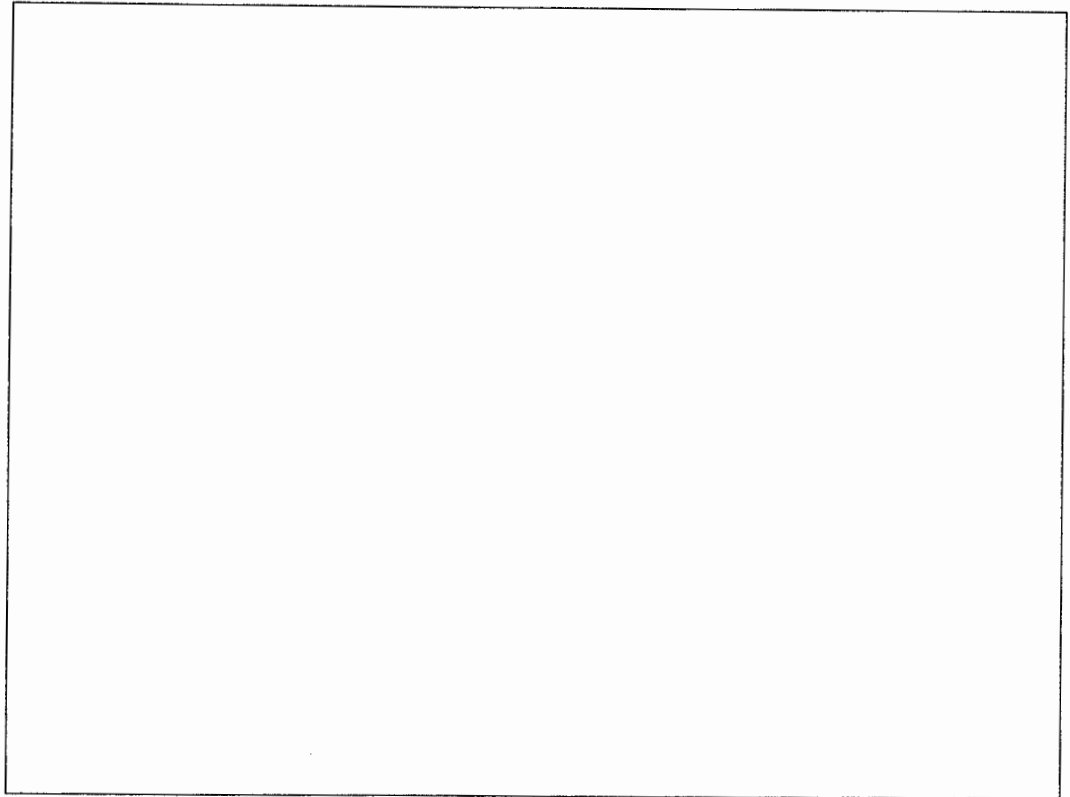
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[3 marks]

(b) Mitochondria play an important role in cellular respiration.

(i) **In the box below**, draw a labelled diagram to show the detailed structure of a mitochondrion. **NOTE: No title is required.**



[3 marks]

(ii) **On your diagram**, use labelled arrows to identify FOUR key substances of cellular respiration that move out of the mitochondrion. [2 marks]

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- (c) Ecosystems are dynamic in nature. Figure 2 illustrates the changes in population sizes of an agricultural pest and its predator over time, following the introduction of the predator species.

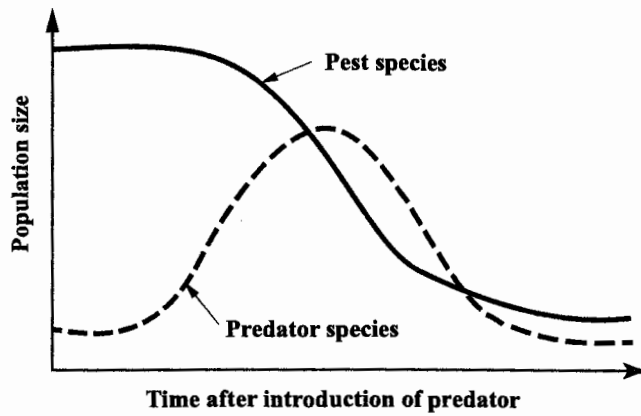


Figure 2. Changes in population sizes over time for a pest and its predator

Describe the changes in the two populations during the period.

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[3 marks]

Total 15 marks

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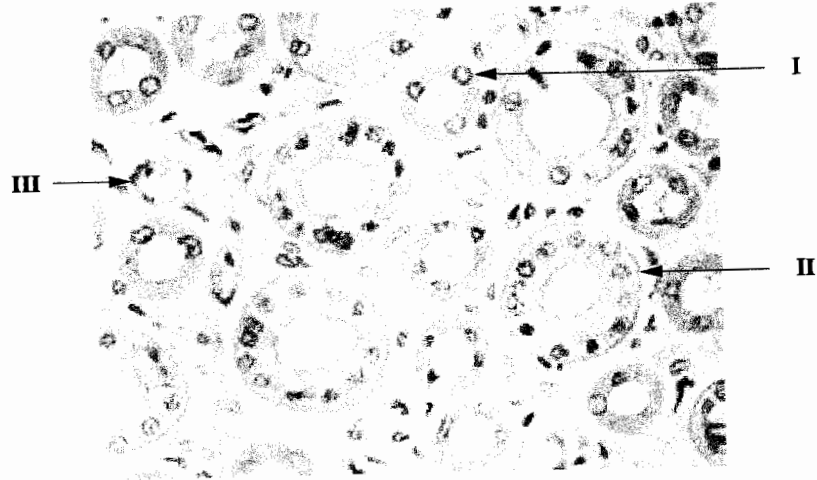


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2. (a) Figure 3 is a stained section through the medulla of the kidney showing cross sections through some functional regions of the nephron and associated ducts.



**Figure 3. Section through the medulla of the kidney**

Source: <http://apbrwww5.apsu.edu/thompsonj/Anatomy%20&%20Physiology/2020/2020%20Exam%20Reviews/Exam%204/collecting%20duct02.bmp>

- (i) Identify the cross sections labelled **I** and **II** and for EACH, state ONE observable feature which justifies the given identification.

I: .....

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II: .....

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[4 marks]

- (ii) Comment on the main function of the region labelled **III**.

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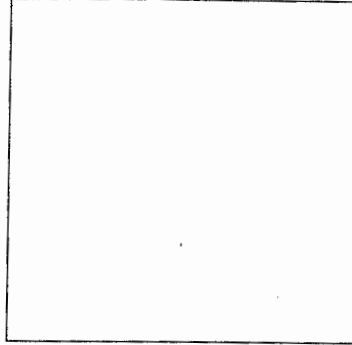
[1 mark]

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- (iii) In **BOX II**, make a detailed drawing of the cross section labelled **II**.  
**NOTE: No title or magnification is required.**

**BOX II**



**[3 marks]**

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- (b) Figure 4 shows the results of some experiments in which the effect of the closure of stomata on transpiration rate in a plant is studied. Two series of experiments are conducted, one in still air and the other under windy conditions.

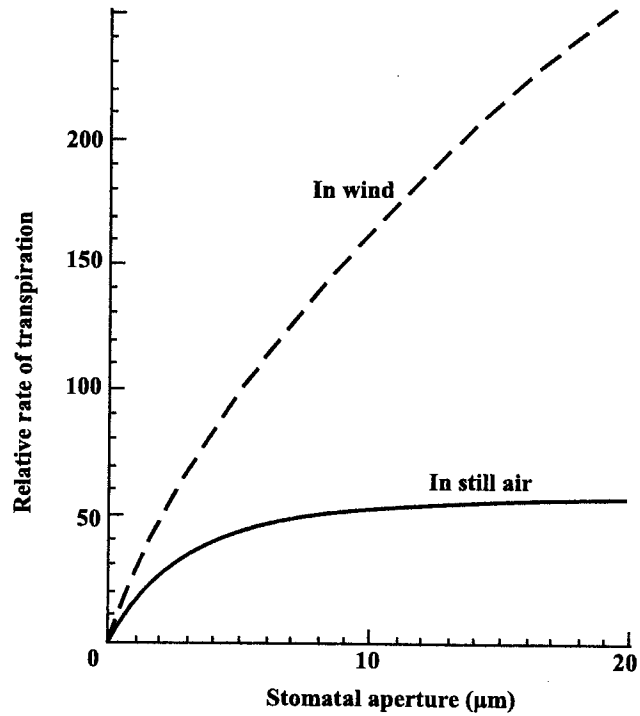


Figure 4. Rate of transpiration relative to stomatal aperture

- (i) With reference to the structure of stomata, explain the nature of the relationship between stomata and transpiration.

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[3 marks]



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3. (a) The percentages of the total deaths in 2012 that were attributable to alcohol consumption for different age groups in two regions are provided in Table 1.

**TABLE 1: DEATHS ATTRIBUTABLE TO ALCOHOL CONSUMPTION IN TWO REGIONS**

Age Group (years)	Death due to Alcohol Consumption (as a % of Total Deaths)	
	Americas	Europe
15–19	17.0	20.0
20–29	17.5	25.0
30–39	15.0	25.5
40–49	12.5	23.0
50–59	9.0	19.0
60–69	5.0	14.0
70–79	2.5	12.5
80+	1.5	10.0

Source: World Health Organization: Global status report on alcohol and health, 2014

- (i) On the grid provided on page 13, plot a bar chart of the data in Table 1. [4 marks]

- (ii) State TWO conclusions that can be made based on the data provided in Table 1.

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[2 marks]

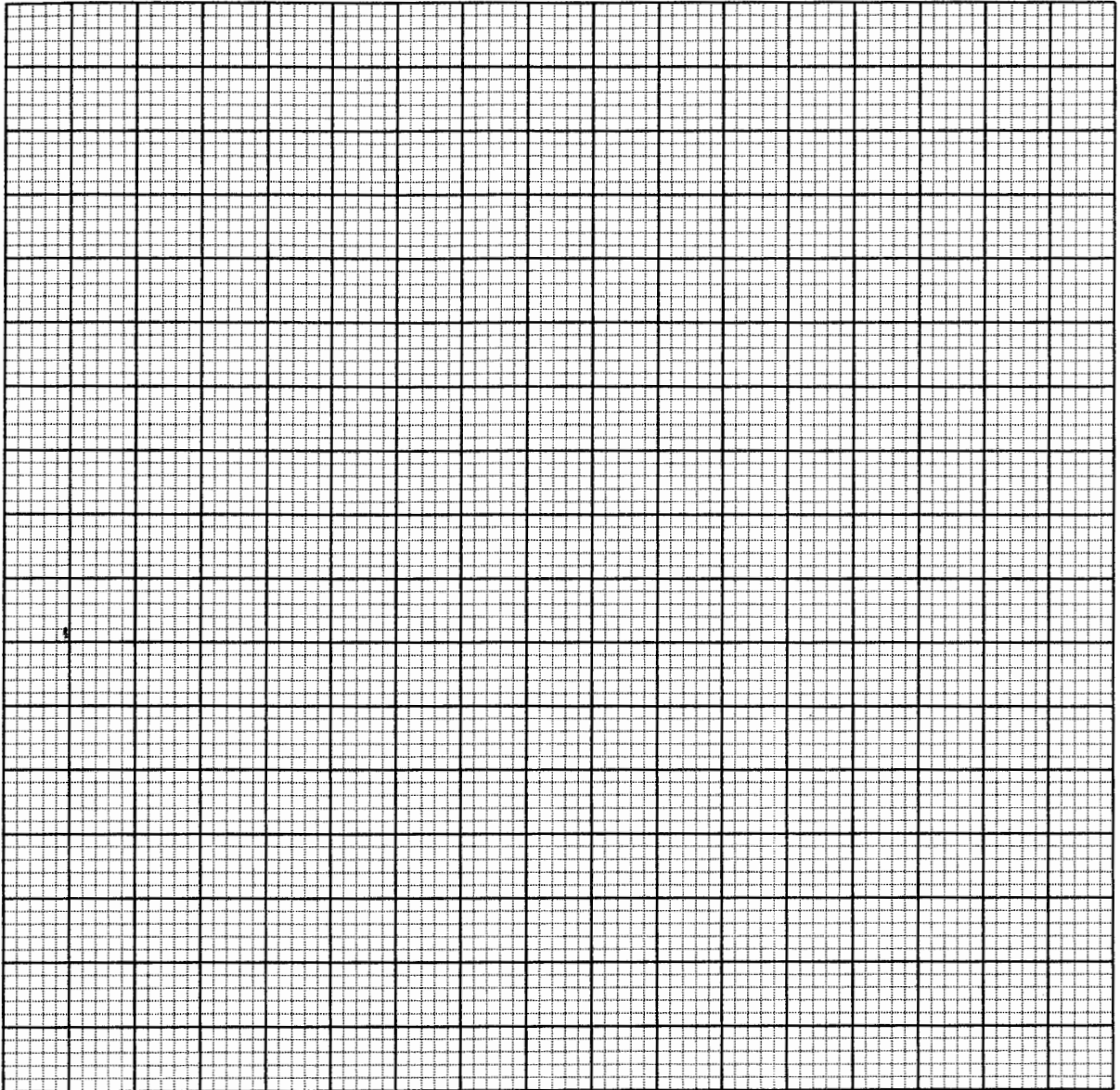


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(b) Discuss TWO social consequences of excessive alcohol consumption.

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[4 marks]

(c) Describe FIVE risk factors that promote the onset of Type 2 diabetes.

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[5 marks]

**Total 15 marks**

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**SECTION B**

**Answer ALL questions.**

**Write your answers in the spaces provided in this booklet.**

4. (a) Light intensity and carbon dioxide concentration are two factors that can limit the rate of photosynthesis.

- (i) Discuss the concept of a limiting factor in photosynthesis.

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(ii) Using your knowledge of the light-dependent and light-independent stages of photosynthesis, explain how light intensity and carbon dioxide act as limiting factors.

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(b) Microorganisms are primarily responsible for most of the cycling of nitrogen in the biosphere. With reference to the main processes in the nitrogen cycle, outline FOUR key roles of microorganisms in the nitrogen cycle.

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Total 15 marks

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5. (a) Explain the mechanisms by which a nerve cell membrane is able to conduct an action potential and give an analysis of TWO factors that affect the rate of conduction.

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[8 marks]

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6. (a) Vaccination is regarded as a form of active, artificial immunity.

(i) Distinguish between the terms 'active immunity' and 'artificial immunity'.

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[3 marks]





(b) Despite a decline in new HIV infections in the Caribbean, the region still has a higher HIV prevalence than any other region in the world, except for sub-Saharan Africa.

Discuss **THREE** factors which may account for the continued spread of HIV in the Caribbean.

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**[6 marks]**  
**Total 15 marks**

**END OF TEST**

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

