

FORM TP 2015150



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MAY/JUNE 2015

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) Figure 1 provides the rate of photosynthesis in the leaves of a plant species measured in response to light intensity.

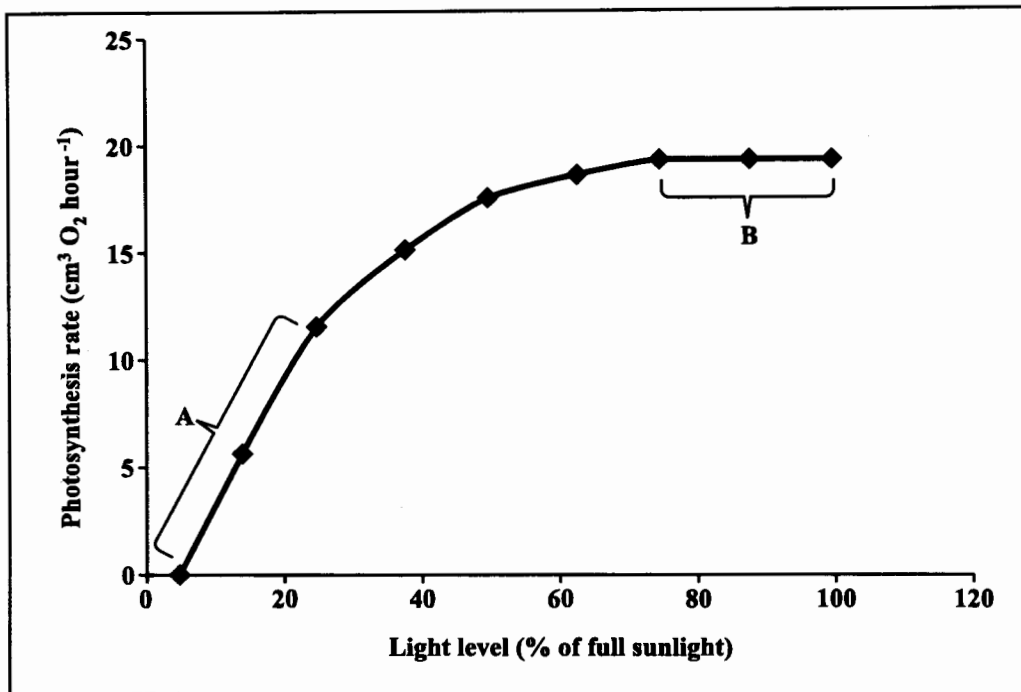


Figure 1. Rate of photosynthesis in response to light intensity

- (i) Describe the observed effects of light intensity on the rate of photosynthesis of this species in the regions labelled A and B.

A: .....

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B: .....

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[2 marks]



(ii) Outline the process by which  $O_2$  is produced during photosynthesis.

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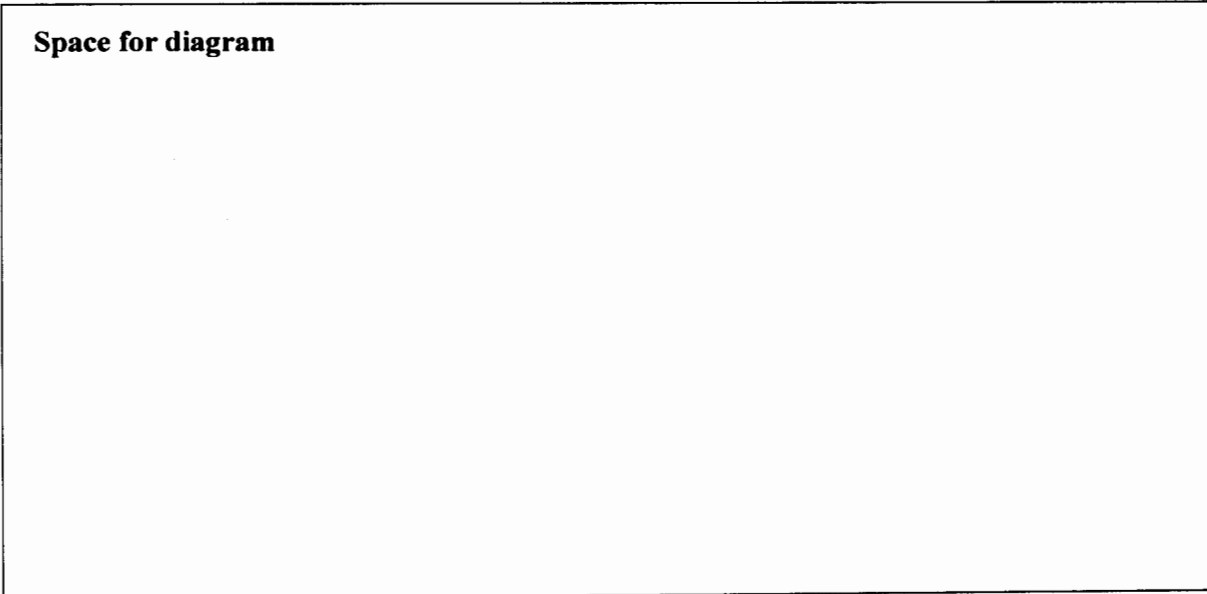
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[2 marks]

(b) (i) Using an annotated diagram of a simple respirometer (constructed using a plastic syringe and capillary tube), outline the procedure for measuring respiration in germinating seeds.

**Space for diagram**



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[6 marks]

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- (ii) Suggest FIVE precautions to be taken to ensure the accuracy and reliability of the results, when conducting an experiment using a simple respirometer.

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**[5 marks]**

**Total 15 marks**



2. (a) Figure 2 is a diagram of a simple potometer which is used to investigate the rate of transpiration of leafy shoots.

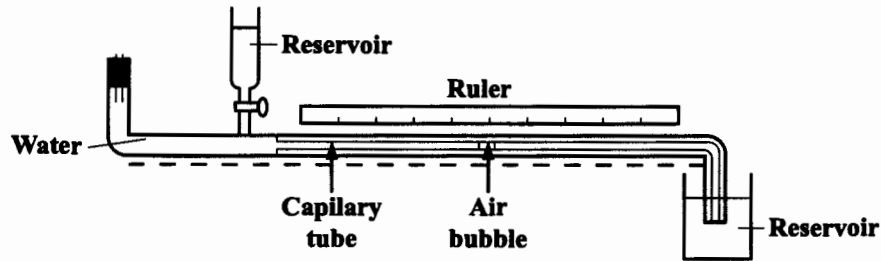


Figure 2. A simple potometer

- (i) On Figure 2, use an arrow labelled X to indicate the position at which a leafy shoot is placed in the potometer. [1 mark]
- (ii) Outline the key steps for determining the rate of transpiration using the potometer shown in Figure 2.

**Note: Details of setting up the apparatus are not required.**

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[3 marks]

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- (b) With reference to FOUR structural features, explain how xylem tissue is designed to facilitate water transport.

**Note: Definition of transpiration and explanation of the mechanism of water transport are NOT required.**

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**[4 marks]**



- (c) Figure 3 is a student's plan drawing of a cross section of a major mammalian artery showing the distribution of the tissue layers.

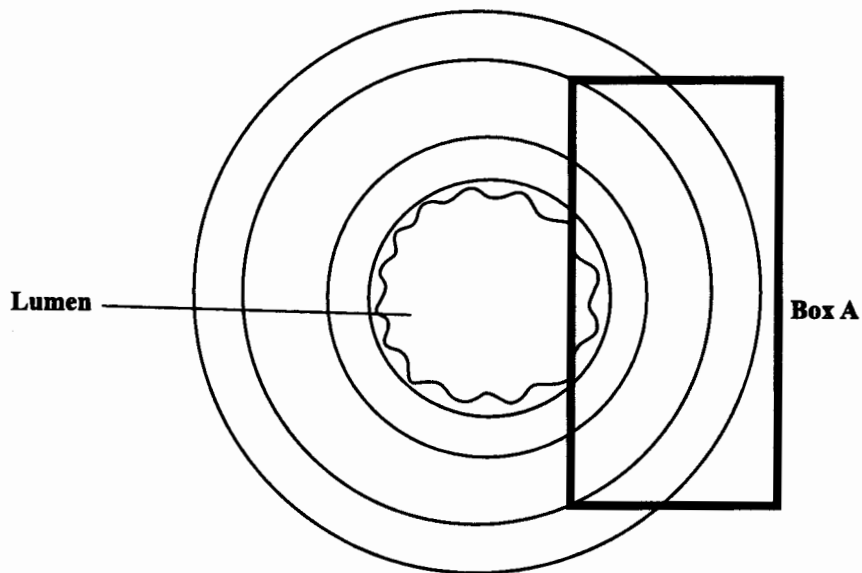


Figure 3. Plan drawing of a cross section of a mammalian artery

Source: *msjensen.cehd.umn.edu*

- (i) In the region highlighted by the box labelled A on Figure 3, draw cellular details of the tissue layers. **[4 marks]**
- (ii) With reference to the structural features observed in Figure 3, explain how an artery is able to endure the high pressure of blood as it is pumped from the heart.
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- .....
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- [2 marks]**
- (iii) State ONE major difference that would be observed if the student did a plan drawing of a cross section of a vein.
- .....

**[1 mark]**

**Total 15 marks**

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3. (a) Table 1 shows the percentage of young people in a population who were categorized as being obese over the period 1971 to 2006.

**TABLE 1: OBESITY LEVELS (%) OF YOUNG PEOPLE  
IN A POPULATION, 1971–2006**

Time Period	Age Group (years)		
	2 – 5	6 – 11	12 – 19
1971–1974	5.0	4.0	6.0
1976–1980	5.0	6.5	5.0
1988–1994	7.5	11.0	10.5
2003–2006	12.5	17.0	17.5

- (i) On the grid provided on page 9, plot a bar graph of the data in Table 1. Use the x-axis for the time period. **[5 marks]**

- (ii) Describe the changes in obesity levels among the age groups over time.

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**[2 marks]**

- (iii) Suggest THREE possible reasons which may account for the trends described in (a) (ii) above.

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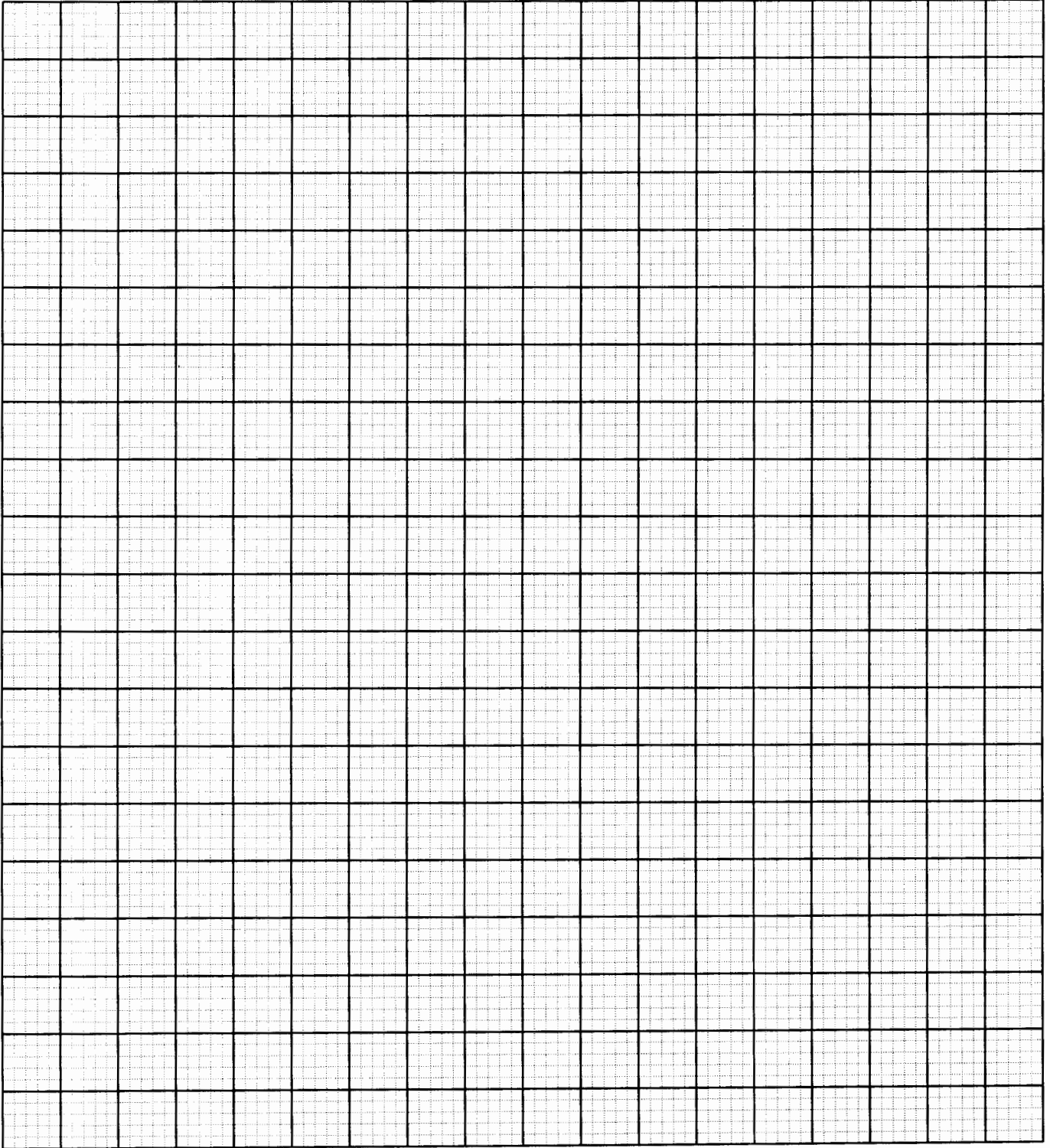
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**[3 marks]**





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- (b) Figure 4 shows the concentration of antibodies in the blood of an individual during the first few weeks after an infection.

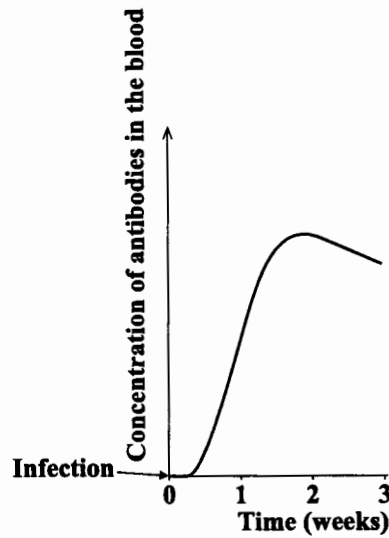


Figure 4. Blood antibody levels in response to an infection

- (i) Describe the response shown in Figure 4.

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[2 marks]

- (ii) Explain whether this response is likely to be a primary or secondary response to the infection.

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[1 mark]

- (c) Distinguish between active and passive immunity.

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[2 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) Feeding relationships and the transfer of energy through the biotic component of ecosystems have traditionally been summarized in pyramid diagrams.

(i) Explain why energy transfer between trophic levels is considered to be relatively inefficient. In your answer, provide a brief definition of the term 'trophic level' and include THREE reasons for this inefficiency. **[6 marks]**

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- (ii) Briefly describe the THREE types of biological pyramids and comment on which type is the most useful for representing the productivity of EACH trophic level. [5 marks]

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- (b) There is a continuing debate as to the nature of the relationship between biological diversity and ecosystem stability. Outline the current view of the nature of this relationship and briefly discuss evidence in support of the stated viewpoint. **[4 marks]**

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5. (a) Explain the mechanism for selective reabsorption of glucose from the glomerular filtrate in the kidney, including the role of sodium ions ( $\text{Na}^+$ ). Discuss the clinical significance of the presence of glucose in the urine. **[5 marks]**

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- (b) Starting with atrial systole, describe the mammalian cardiac cycle. Your answer must include cycle initiation and mechanisms that prevent reverse blood flow. [4 marks]

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- (c) Explain the regulatory effects of blood carbon dioxide levels and the hormone, adrenaline, on heart action. **[6 marks]**

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6. (a) The World Health Organization defines health as being ‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’.
- (i) Define the term ‘disease’ and discuss THREE different types of factors that may influence a person’s health. **[6 marks]**

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- (ii) State TWO main categories of human disease, giving a brief description of EACH category. With the aid of an example, comment on the problem of classifying a disease into one particular category. **[4 marks]**

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- (b) Sandra and Wayne are both drug abusers. Sandra, who is 40 years old, uses about \$100 worth of heroin per day, in two to four injections, four to twelve hours apart. When she goes for longer than twelve hours without the drug, she feels sick in the stomach, becomes restless and anxious, and has very strong cravings for the drug. In comparison, Wayne, who is 16 years old, sniffs petrol with his friends. He often goes without sniffing for a few days, with no ill effects. However, when he has not sniffed for a week or more, he can feel a strong urge to sniff, despite knowing the dangers of petrol sniffing. The urge to sniff is very strong when he feels depressed or bored.

Identify the type of addiction demonstrated by Sandra and Wayne. Justify your answers by reference to case information given and include a brief explanation of the term 'drug abuse'. **[5 marks]**

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**Total 15 marks**

**END OF TEST**

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

