



Biology

Standard level

Paper 1B — Mock Examination

Mock Exam 2

Calculator required

Time allowed: **40 minutes**

Maximum mark: **25 marks**

Candidate information

Candidate name:

Session number:

Date:

Topic emphasis: the structure and function of blood vessels, factors affecting the rate of photosynthesis, classification and the construction of dichotomous keys, and the measurement of cell respiration. Data processing, experimental design and the evaluation of method are assessed throughout.

Instructions to candidates

- Write your session number in the box on the cover.
- Do not open this examination paper until you are told to do so.
- Answer **all** questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[25 marks]**.

The mark allocation is shown in square brackets at the end of each question or part question. Where a numerical answer is required, show all of your working. Unless otherwise stated, all measurements were made at 293 K and 100 kPa.

Mark allocation

Question 1 (blood vessels and circulation)	[6 marks]
Question 2 (photosynthesis)	[7 marks]
Question 3 (classification and keys)	[6 marks]
Question 4 (cell respiration)	[6 marks]
Total	[25 marks]

Answer **all** questions. Answers must be written within the answer boxes provided.

1. The table shows measurements taken from five types of blood vessel in the human circulatory system. The mean blood pressure is the pressure of the blood within each vessel.

Blood vessel	Internal diameter / mm	Thickness of wall / mm	Mean blood pressure / kPa
Aorta	25.0	2.00	12.6
Artery	4.0	1.00	12.0
Arteriole	0.03	0.02	8.0
Capillary	0.008	0.001	4.0
Vein	5.0	0.50	1.3

- (a) Calculate the ratio of wall thickness to internal diameter for the artery and for the vein. **[2]**

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- (b) Explain, using the data, the difference in wall thickness between the artery and the vein. **[2]**

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(Question 1 continued)

- (c) Outline **one** adaptation of capillaries for the exchange of materials with the tissues. [1]

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- (d) State **one** structural feature found in veins but not in arteries. [1]

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2. A student investigated the rate of photosynthesis in the aquatic plant *Elodea canadensis*. A piece of the plant was placed in a test tube of water containing sodium hydrogencarbonate solution, and the number of gas bubbles released from the cut stem in one minute was counted. The lamp was moved to different distances from the tube to change the light intensity. The investigation was then repeated using a higher concentration of sodium hydrogencarbonate. The temperature of the water was kept at 25°C throughout.

Light intensity / arbitrary units	Mean number of bubbles per minute	
	0.04 % carbon dioxide	0.15 % carbon dioxide
1	5	6
2	12	15
4	22	30
6	27	42
8	28	50
10	28	52

- (a) Outline the reason for adding sodium hydrogencarbonate solution to the water. [1]

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(Question 2 continued)

- (b) Calculate the percentage increase in the number of bubbles per minute when the light intensity is increased from 2 to 6 arbitrary units at 0.15 % carbon dioxide. **[2]**

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- (c) Deduce, with a reason, the factor that is limiting the rate of photosynthesis at a light intensity of 10 arbitrary units in the 0.04 % carbon dioxide solution. **[2]**

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- (d) Suggest **two** reasons why counting bubbles may not give a reliable measure of the rate of photosynthesis. **[2]**

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3. Four species of insect were collected from a meadow. The table shows some of their external features.

Species	Number of pairs of wings	Antennae	Body length / mm
<i>Apis mellifera</i>	2	shorter than the head	15
<i>Bombus terrestris</i>	2	shorter than the head	22
<i>Chorthippus brunneus</i>	2	longer than the head	20
<i>Musca domestica</i>	1	shorter than the head	7

- (a) In the name *Apis mellifera*, state which part is the genus. [1]

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- (b) Construct a dichotomous key that could be used to identify the four species in the table. [3]

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(Question 3 continued)

- (c) Suggest **one** limitation of using external features alone to classify organisms into groups. **[2]**

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4. A respirometer was used to measure the rate of cell respiration in germinating pea seeds. A known mass of seeds was placed in a sealed tube containing soda lime, which absorbs carbon dioxide. The tube was connected to a capillary tube containing a drop of coloured liquid, and the distance moved by the drop in ten minutes was used to calculate the volume of oxygen consumed. The apparatus was placed in water baths at different temperatures. The results are shown in the table.

Temperature / °C	Oxygen consumed / cm ³ g ⁻¹ h ⁻¹
10	0.4
20	0.9
30	1.8
40	2.6
50	1.1

- (a) State the reason for including soda lime in the sealed tube. **[1]**

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- (b) Calculate the percentage increase in the rate of oxygen consumption between 20 °C and 40 °C. **[1]**

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(Question 4 continued)

(c) Explain the change in the rate of oxygen consumption between 40 °C and 50 °C. **[2]**

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(d) Describe a suitable control for this investigation, and state the reason for using it. **[2]**

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End of examination.

Total: 25 marks