



Biology

Standard Level

Paper 2 — Mock Examination

Mock Exam 2

Calculator required

Time allowed: **1 hour 30 minutes**

Maximum mark: **50 marks**

Candidate information

Candidate name:

Session number:

Date:

Topic emphasis: form and function (the circulatory system, membranes and transport, xylem and water movement), unity and diversity (water, DNA structure and replication), interaction and interdependence (the cell cycle, immunity, energy flow and the carbon cycle) and continuity and change (cell division, biotechnology, climate change).

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.
- Section A: answer **all** questions.
- Section B: answer **one** question.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is **[50 marks]**.

The mark allocation is shown in square brackets at the end of each question or part question. Where a numerical answer is required, working must be shown; marks are available for a correct method even when the final answer is incorrect. Answers should be given to an appropriate number of significant figures and units must be included where relevant.

In Section B, **one additional mark** is available for the construction of your answer. This mark is awarded when your answer is clear enough to be understood without re-reading and is written succinctly, with little or no repetition or irrelevant material.

Mark allocation**Section A**

Question 1	[12 marks]
Question 2	[7 marks]
Question 3	[6 marks]
Question 4	[5 marks]
Question 5	[4 marks]

Section B

Question 6 or Question 7	[16 marks]
Total	[50 marks]

Section A

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

1. During exercise the heart delivers more oxygenated blood to the muscles. Cardiac output is the volume of blood pumped out of the left ventricle each minute and is calculated as

$$\text{cardiac output} = \text{heart rate} \times \text{stroke volume}$$

Twelve endurance-trained adults and twelve untrained adults of the same age and body mass exercised on a cycle ergometer. The workload was increased in steps and the heart rate of each participant was recorded at each workload. The mean values are shown in the table.

Workload / W	Mean heart rate / beats min ⁻¹	
	Untrained	Trained
0 (at rest)	76	52
50	105	80
100	130	105
150	155	130
200	180	160

- (a) State the mean heart rate of the untrained group at a workload of 100 W. [1]

.....

.....

- (b) Compare **and** contrast the heart rates of the two groups as the workload increases. [2]

.....

.....

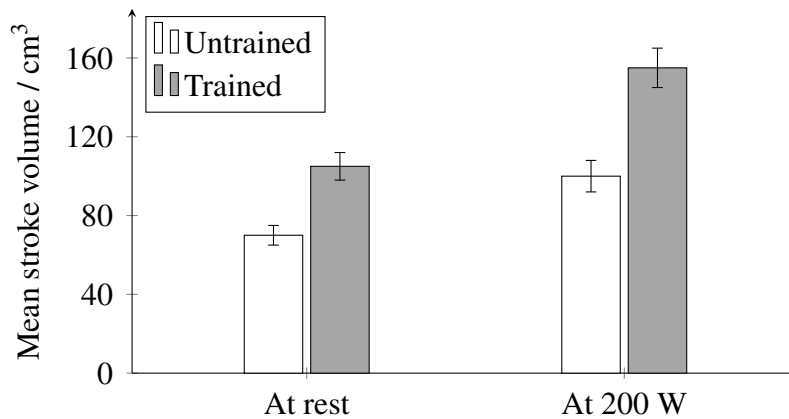
.....

.....

(This question continues on the following page)

(Question 1 continued)

The stroke volume of each participant was also measured, at rest and at a workload of 200 W. The bars show the mean values and the error bars show the standard deviation.



Statistical significance of the difference between trained and untrained: at rest $p < 0.01$; at 200 W $p < 0.01$

- (c) Calculate the cardiac output of the trained group at a workload of 200 W. State the units of your answer. [2]

- (d) Suggest reasons for the difference in stroke volume between the two groups at rest. [2]

(This question continues on the following page)

(Question 1 continued)

- (e) Outline what the statistical significance levels indicate about the differences in stroke volume between the two groups. [2]

.....

.....

.....

.....

- (f) Explain how the changes in heart rate and stroke volume during exercise increase the delivery of oxygen to the muscles. [3]

.....

.....

.....

.....

.....

.....

2. Water absorbed by the roots of a plant is carried to the leaves in the xylem.

(a) Outline how water moves from the soil to the leaves of a plant. [3]

.....

.....

.....

.....

.....

.....

(b) Explain how the properties of water molecules make this movement possible. [2]

.....

.....

.....

.....

(c) State **two** structural features of xylem vessels that adapt them for the transport of water. [2]

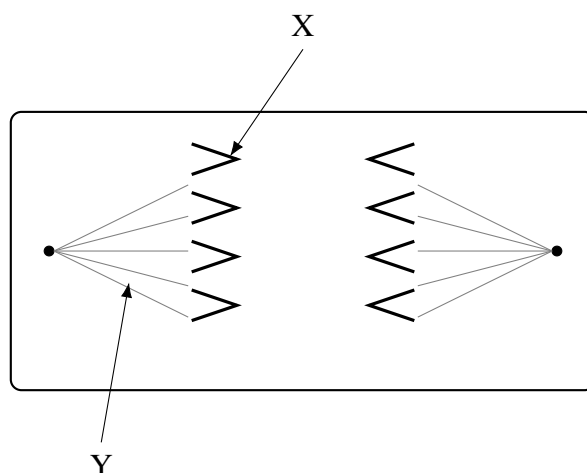
.....

.....

.....

.....

3. The diagram shows a cell from the root tip of an onion during mitosis.



- (a) Identify, giving a reason, the stage of mitosis shown in the diagram. [2]

.....
.....
.....

- (b) Identify the structures labelled X and Y. [2]

.....
.....
.....

- (c) In a stained root tip, 60 of the 400 cells counted were in mitosis. Calculate the mitotic index. [1]

--

- (d) State **one** difference between cytokinesis in a plant cell and in an animal cell. [1]

.....
.....

4. Substances move into and out of cells across the plasma membrane.

(a) Distinguish between simple diffusion and active transport. [2]

.....

.....

.....

.....

(b) Predict, giving a reason, the appearance of a plant cell that has been placed in a concentrated salt solution. [2]

.....

.....

.....

(c) State the function of cholesterol in the membranes of animal cells. [1]

.....

.....

5. The immune system defends the body against pathogens.

(a) Outline how antibodies help to destroy a pathogen. [2]

.....

.....

.....

(b) Explain how vaccinating a high proportion of a population also protects individuals who have not been vaccinated. [2]

.....

.....

.....

Section B

Answer **one** question. One additional mark is available for the construction of your answer. Answers must be written within the answer boxes provided.

6. The structure of DNA allows genetic information to be stored, copied and passed on.
- (a) Outline the structure of a DNA molecule. [4]
 - (b) Explain how DNA is replicated. [7]
 - (c) Describe how the polymerase chain reaction is used to amplify a sample of DNA. [4]
7. Ecosystems depend on a supply of energy and on the recycling of the chemical elements that organisms are made from.
- (a) Distinguish between the flow of energy and the cycling of nutrients in an ecosystem. [4]
 - (b) Describe the processes that move carbon between the atmosphere, living organisms and the oceans. [7]
 - (c) Explain how rising concentrations of atmospheric carbon dioxide affect coral reefs. [4]

IB Demystified | www.ibdemystified.com **Turn over**

[illegible]

[illegible]

[illegible]

End of examination.

Total: 50 marks
