

3 A study investigates the effect of training on athletic performance.

In the study, the number of capillaries in the muscle tissue of a person is measured before and after a six-week period of training.

(a) The table shows the results.

| Mean number of capillaries per mm ² | |
|--|----------------|
| before training | after training |
| 437 | 460 |

- (i) Explain how training may affect the athletic performance of this person.
Use information from the table to support your answer.

(5)

(ii) Give **two** ways in which the design of the study could be improved.

(2)

1

.....

2

.....

(b) The diameter of a capillary is $8.0\text{ }\mu\text{m}$ and the diameter of the aorta is 25.0 mm .

$1000\text{ }\mu\text{m} = 1\text{ mm}$

(i) Calculate the ratio of the diameter of the aorta to the diameter of the capillary.
Show your working.

(2)

ratio =

(ii) Explain why the aorta has a thicker wall than the capillary.

(2)

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(Total for Question 3 = 11 marks)

| Question number | Answer | Mark |
|-----------------|--|----------|
| 3(a)(i) | <p>An explanation that makes reference to the following five points:</p> <ul style="list-style-type: none"> • training improves performance by increasing the number of capillaries (1) • better supply of oxygen/aerobic (1) • better supply of glucose (1) • respiration/energy/ATP (1) • muscle contraction (1) • better removal of lactic acid/carbon dioxide (1) • can run for longer/equivalent (1) | 5 |

| Question number | Answer | Mark |
|-----------------|---|----------|
| 3(a)(ii) | <p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • use more people (1) • extend training period (1) • compare different ages/genders (1) | 2 |