Respiration

Question Paper 1

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Respiration
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 1

Time Allowed: **51 minutes**

Score: **/42**

Percentage: **/100**

1 Sports physiologists study ways in which athletes can improve their performance by recording factors such as oxygen uptake and the concentration of lactic acid in the blood. They can also monitor how these two factors change during training.

Fig. 2.1 shows an athlete running on a treadmill in a physiology laboratory while aspects of his breathing are measured.

Fig. 2.1

The athlete ran on a treadmill at a slow speed for 11 minutes.

His oxygen uptake was measured before, during and after the exercise.

The results are shown in Fig. 2.2.

The arrows indicate the start and end of the period of exercise.

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Fig. 2.2

(a) **(i)** State the oxygen uptake at rest, before the athlete started running.

.....$cm^3\,kg^{-1}\,min^{-1}$ [1]

(ii) Use Fig. 2.2 to describe the changes in oxygen uptake during and after running on the treadmill (from 2 to 25 minutes).

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(iii) Explain the change in oxygen uptake during the run (between 2 and 13 minutes).

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(b) The lactic acid concentration in the blood of the athlete was measured at intervals.
At the end of the slow run the lactic acid concentration had increased by 30%.

After a rest, the athlete ran at a much faster speed on the treadmill. At the beginning of this exercise the lactic acid concentration in his blood was 100 mg dm^{-3}. After 11 minutes running at the faster speed, his lactic acid concentration was 270 mg dm^{-3}.

(i) Calculate the percentage increase in lactic acid concentration at the end of the faster run.

Show your working.

answer ..... %
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(ii) Explain why the percentage increase in lactic acid is much greater when running at the faster speed.

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[Total: 14]

2 Researchers designed an investigation to find the effect of increasing levels of exercise on two groups of people.

The first group of people were trained cyclists and the second group were untrained cyclists.

The researchers asked all the people to cycle at four levels of effort: 30%, 45%, 60% and 75% of their maximum cycle speed.

They cycled for eight minutes at each level of effort.

(a) The researchers predicted that the pulse rate of all the cyclists would increase during exercise.

Explain this prediction.

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Fig. 3.1 shows the average concentration of lactic acid in the blood of the trained cyclists and untrained cyclists in the investigation.

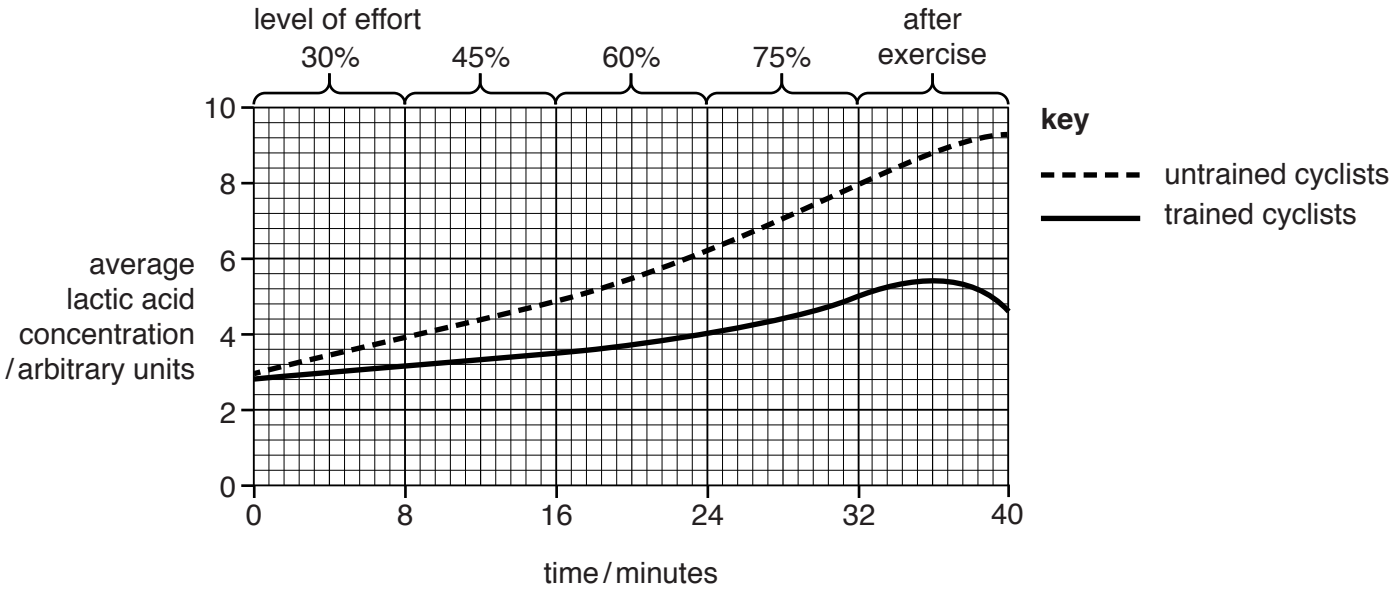

Fig. 3.1

(b) Describe the effect of the increasing levels of effort on the average lactic acid concentration in the blood of the **untrained** cyclists.

You should use data from Fig. 3.1 in your answer.

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(c) Lactic acid is produced in the muscles during anaerobic respiration.

(i) Define the term *anaerobic respiration*.

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(ii) Describe how the lactic acid produced in muscle cells enters the blood.

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(iii) Name the component of the blood that transports lactic acid.

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(d) Explain why the lactic acid concentration in the blood in trained cyclists is different from the untrained cyclists eight minutes **after** the exercise.

You should use data from Fig. 3.1 in your answer.

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[Total: 13]

3 **(a)** Define the term *respiration*.

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(b) A rowing machine is a piece of apparatus that is used in many fitness centres.

Fig. 4.1 shows a man training on a rowing machine. The man in the photograph has his arms extended during the rowing stroke as shown in Fig. 4.2.

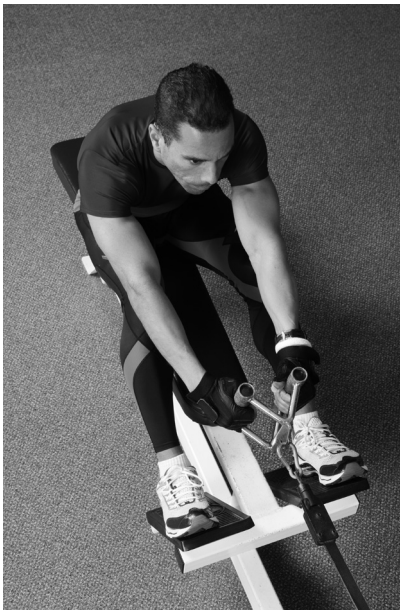

Fig. 4.1

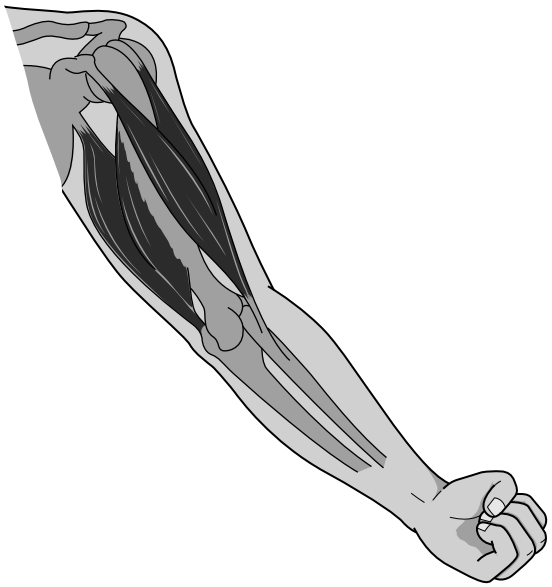

Fig. 4.2

Use Fig. 4.2 to describe how the hand is moved closer to the chest during the rowing stroke.

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(c) The man has an intense workout on the rowing machine.

Fig. 4.3 shows his oxygen uptake before and during the exercise.

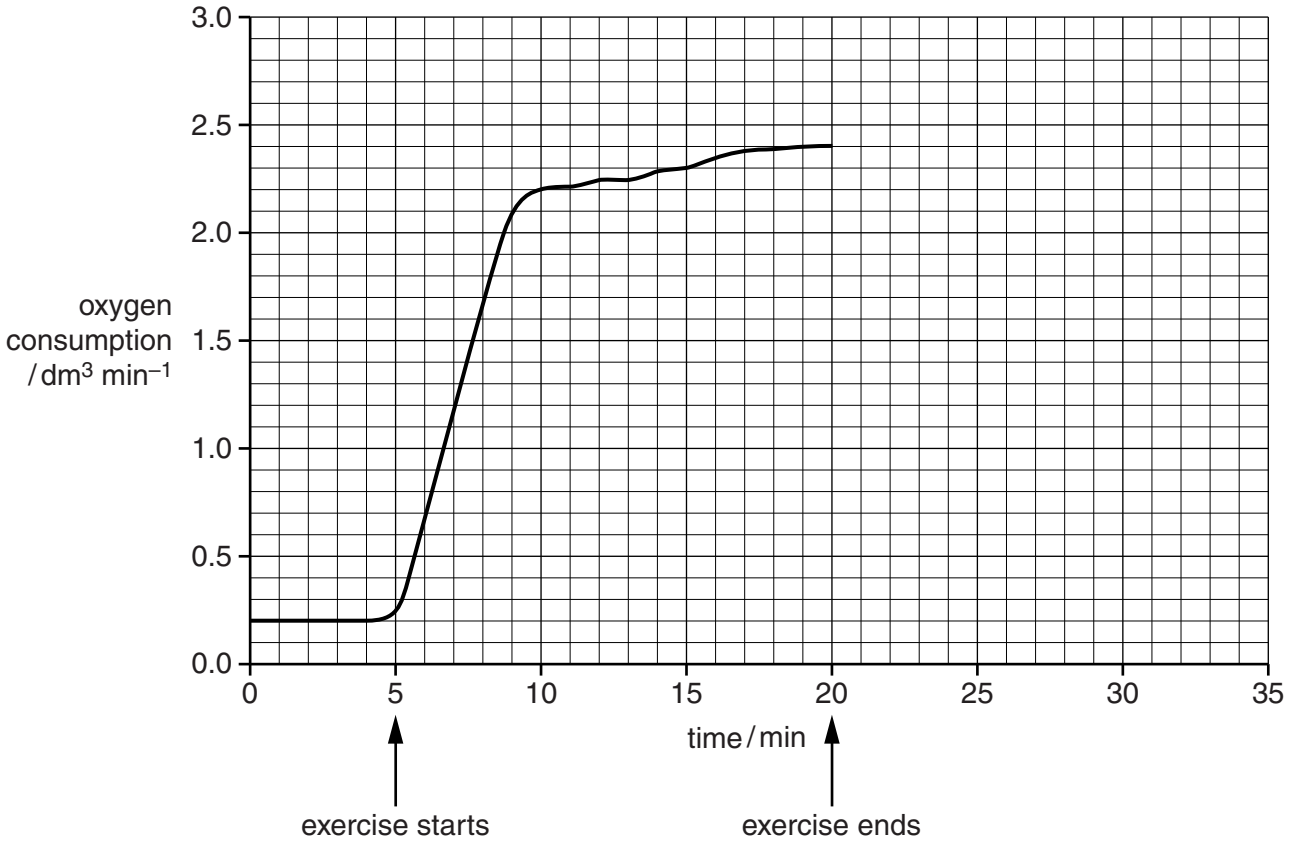

Fig. 4.3

(i) Explain why there is a steep increase in the man's oxygen consumption at the start of the exercise.

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(ii) It took 10 minutes after the man had stopped rowing for his oxygen consumption to decrease to its resting value.

On Fig. 4.3 draw a line between 20 minutes and 35 minutes to show the change in oxygen consumption after exercise has stopped. [2]

(iii) Explain why the man's oxygen consumption did not return to the resting value **immediately** after exercise.

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[Total: 15]