

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Teacher's Use Total ISA mark	
	Mark
Stage 1 Skills	
Stage 2 Skills	
Section A	
Section B	
TOTAL ISA Mark	



General Certificate of Education
Advanced Subsidiary Examination
June 2010

Human Biology

HBI3T/Q10/test

Unit 3T AS Investigative Skills Assignment

Written Test

For submission by 15 May 2010

For this paper you must have:

- the task sheet, your results and your graph
- a ruler with millimetre measurements
- a calculator.

Time allowed

- 1 hour 15 minutes

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 36.
- You will be marked on your ability to:
 - use good English
 - organise information clearly
 - use accurate scientific terminology.

Signature of Teacher marking this ISA Date

Section A

These questions relate to your investigation into the effect of intensity of exercise on breathing rate.

Use your Task Sheet, your results and your graph to answer them.

Answer **all** questions in the spaces provided.

- 1** During your investigation, it was important that you recorded each breathing rate when you were sitting down.
Explain why it is important that you were sitting down.

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(1 mark)

- 2** You rested before starting each new minute of exercise.
Explain what information you used to decide the length of your rest period.

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(2 marks)

- 3 (a)** When carrying out an investigation, it is usually a good idea to do repeats.
Explain the advantage of doing repeats.

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(2 marks)

- 3 (b)** In your investigation, it was not a good idea to do repeats. Explain why.

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(1 mark)

- 4** Two groups of students carried out investigations similar to your's. Group **A** recorded the number of breaths taken in one minute. Group **B** recorded the number of breaths taken in 20 seconds and then calculated the number of breaths per minute. For each group of students, explain why their method could result in an inaccurate figure for the breathing rate.

Group **A**

.....

Group **B**

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(2 marks)

Turn over for the next question

Turn over ►

- 5** A third group of students carried out a similar investigation to your's. Their results are shown in **Table 1**.

Table 1

Rate of standing up / stands min ⁻¹	Mean breathing rate / breaths min ⁻¹
0	14.1
15	16.2
20	18.4
30	22.8

- 5 (a)** Calculate the percentage increase in mean breathing rate of this group of students from when they were not exercising to when they were standing up at their fastest rate. Show your working.

(2 marks)

- 5 (b)** When performing the same length and intensity of exercise under the same conditions, each person in the group showed a different increase in breathing rate. Give **three** factors that could produce these differences in breathing rates.

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(3 marks)

(Extra Space)

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6 (a) What is the advantage of the increase in breathing rate seen during exercise?

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(1 mark)

6 (b) How is this increase in breathing rate controlled?

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(3 marks)

(Extra Space)

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7 In addition to an increase in breathing rate, give **one** other change that you observed in your breathing during exercise.

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(1 mark)

Resource Sheet

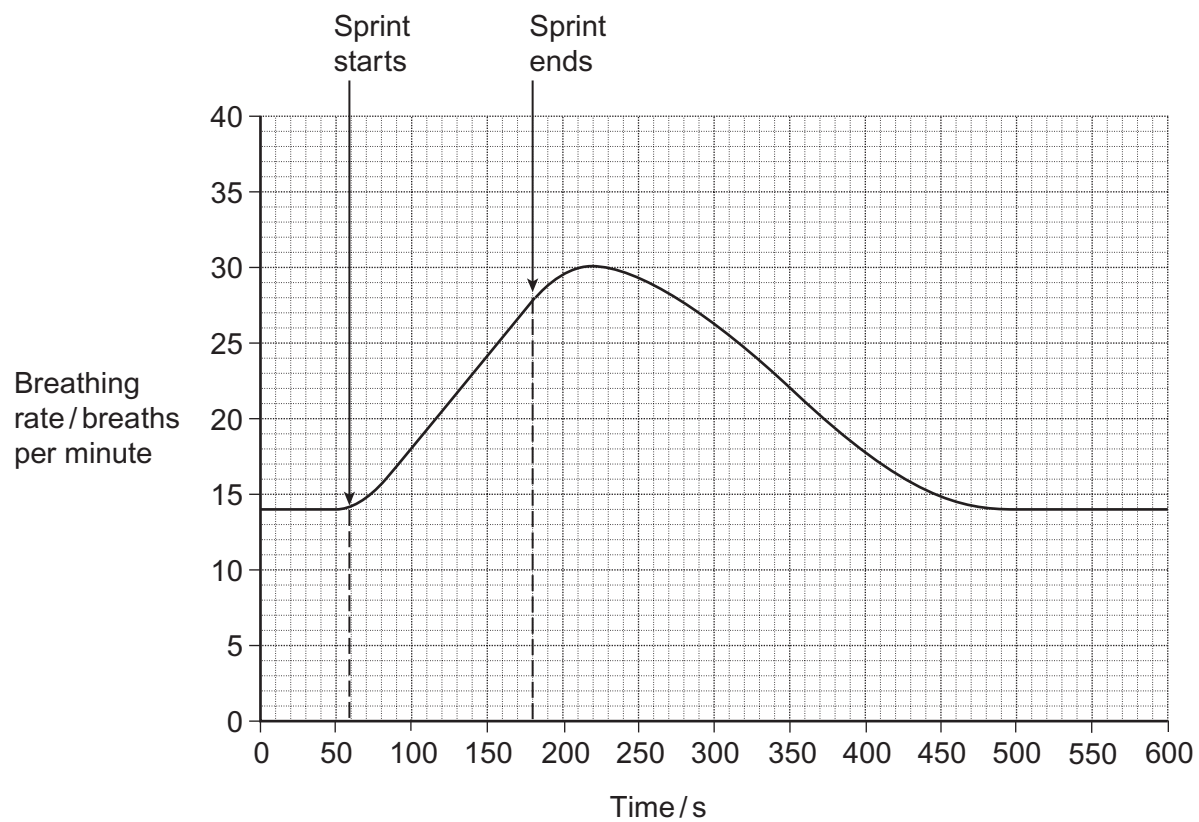
Introduction

The information on this resource sheet is about the effects of different kinds of exercise on breathing rate, blood composition and blood lactate concentration.

Resource A

Sports scientists monitored a cyclist's breathing before, during and after a 2-minute sprint. They used a stethograph. This device gives continuous measurement of breathing rate and provides data in digital form. **Figure 1** shows the results.

Figure 1



Resource B

Two groups of 17-year-old students exercised on a treadmill. The treadmill was set to make them jog at a steady 6 km h^{-1} . After exercising for different lengths of time, the breathing rate of each student was recorded. **Table 2** shows the results.

Table 2

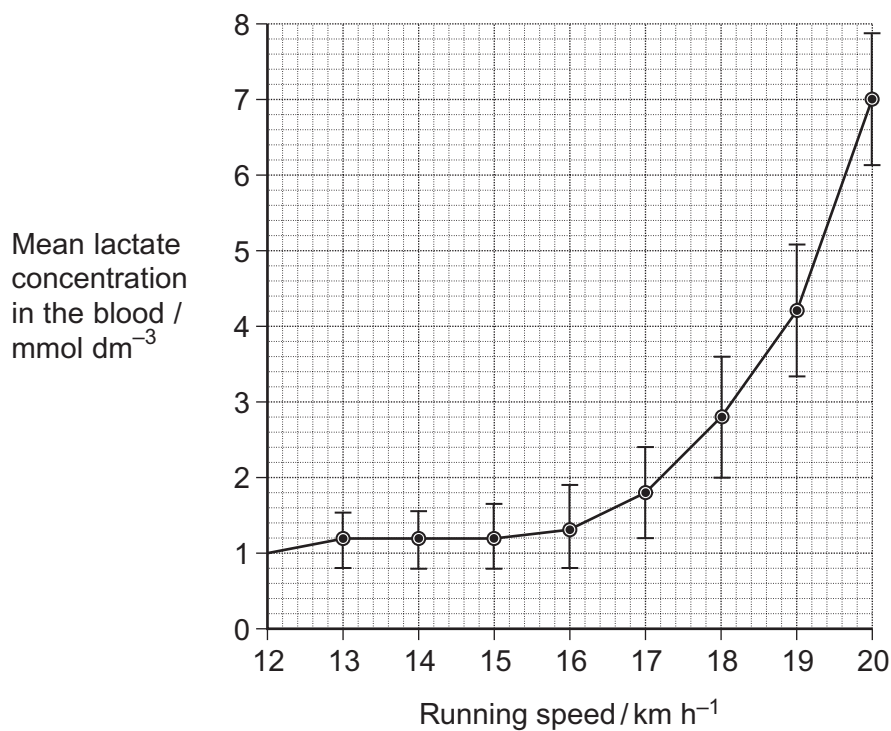
Time on treadmill / minutes	Mean breathing rate / breaths min^{-1} (\pm standard deviation)	
	Group X	Group Y
0	14.1 ± 1.1	13.8 ± 0.9
2	22.5 ± 1.8	18.5 ± 1.1
4	26.4 ± 2.3	19.6 ± 1.3
6	27.5 ± 2.7	20.4 ± 1.2
8	28.4 ± 2.3	20.2 ± 1.2
10	29.1 ± 2.4	20.3 ± 1.1

Turn over ►

Resource C

During exercise, the concentration of lactate in the blood increases. **Figure 2** shows the mean lactate concentration in the blood of a group of athletes after running for 15 minutes at different speeds. The bars on the graph show standard deviations.

Figure 2



Resource D

A cyclist rode her bike for different distances around a cycle track. She rode each distance at a constant 32 km h^{-1} . **Table 3** shows how long it took for her breathing rate to return to its resting level after each ride.

Table 3

Distance cycled / km	Time taken for breathing rate to return to resting level / s
1	110
2	115
4	130
8	245

Section B

Use the information in the **Resource Sheet** to answer the questions.

Answer **all** the questions in the spaces provided.

Use **Resource A** to answer **Questions 8 and 9**.

- 8** Give **two** advantages of using a stethograph rather than counting breaths when measuring breathing rate.

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(2 marks)

- 9 (a)** When the cyclist's breathing was increasing at a steady rate, what was the rate of increase in the number of breaths per minute?

Answer
(2 marks)

- 9 (b)** After the sprint ended, how long did it take for the cyclist's breathing rate to return to the level before exercise?

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(1 mark)

Turn over ►

Use **Resource B** to answer **Question 10**.

- 10 (a)** Give **two** differences between the change in mean breathing rate with increasing exercise in Group **X** and the change in mean breathing rate with increasing exercise in Group **Y**.

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(2 marks)

- 10 (b)** What does a standard deviation tell us about a mean breathing rate?

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(1 mark)

- 10 (c)** One of the groups was a football team. The other group was made up of students who did not take regular exercise. Suggest which group was the football team. Give **one** reason for your answer.

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(1 mark)

- 10 (d)** Sports scientists measured the rate of oxygen uptake by both groups during exercise. They discovered that the oxygen uptake of the two groups was very similar, even though their breathing rates were different. Suggest **two** explanations for the similar oxygen uptake.

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(2 marks)

Use **Resource C** to answer **Question 11**.

11 (a) Describe the changes in blood lactate concentration shown in **Figure 2**.

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(2 marks)

11 (b) Explain the reason for these changes.

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(3 marks)

(Extra Space)

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Use **Resource D** to answer **Question 12**.

12 Explain the pattern of change in recovery times with increasing distance cycled shown in **Table 3**.

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(2 marks)

END OF QUESTIONS