

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

For Teacher's Use Total ISA mark

General Certificate of Education
June 2009
Advanced Subsidiary Examination



HUMAN BIOLOGY
Investigative Skills Assignment (ISA)
Written test

HBI3T/P09/test

For submission by 15 May 2009

<p>For this paper you must have</p> <ul style="list-style-type: none"> the task sheet, your results and your graph a ruler with millimetre measurements. <p>You may use a calculator.</p>
--

For Teacher's Use	
Section	Mark
Stage 1 skills	
Stage 2 skills	
Section A	
Section B	
TOTAL ISA MARK	

Time allowed: 1 hour 15 minutes

Instructions

- Use black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The maximum mark for this test is 34.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in all answers.

Signature of Teacher marking this ISA Date

SECTION A

These questions relate to your investigation into the effect of exercise on pulse rate.
Use your Task Sheet, your results and your graph to answer them.

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

- 1** How did you decide how long to wait between each bout of exercise?

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

(2 marks)

- 2** Was the number of repeats you carried out for each length of time you spent exercising enough to give reliable results? Use your results to justify your answer.

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

(2 marks)

- 3** Explain the difference between monitoring a variable and controlling a variable.

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

(2 marks)

4 In your class, different people may have decided to record their pulse for 10 seconds, 20 seconds or 30 seconds, and then multiply to get the pulse rate per minute. The length of time they chose could affect the accuracy of their results. Explain why.

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

(2 marks)

5 What additional information would you need to calculate your cardiac output? Explain your answer.

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

(2 marks)

6 Explain how your pulse rate during exercise is controlled.

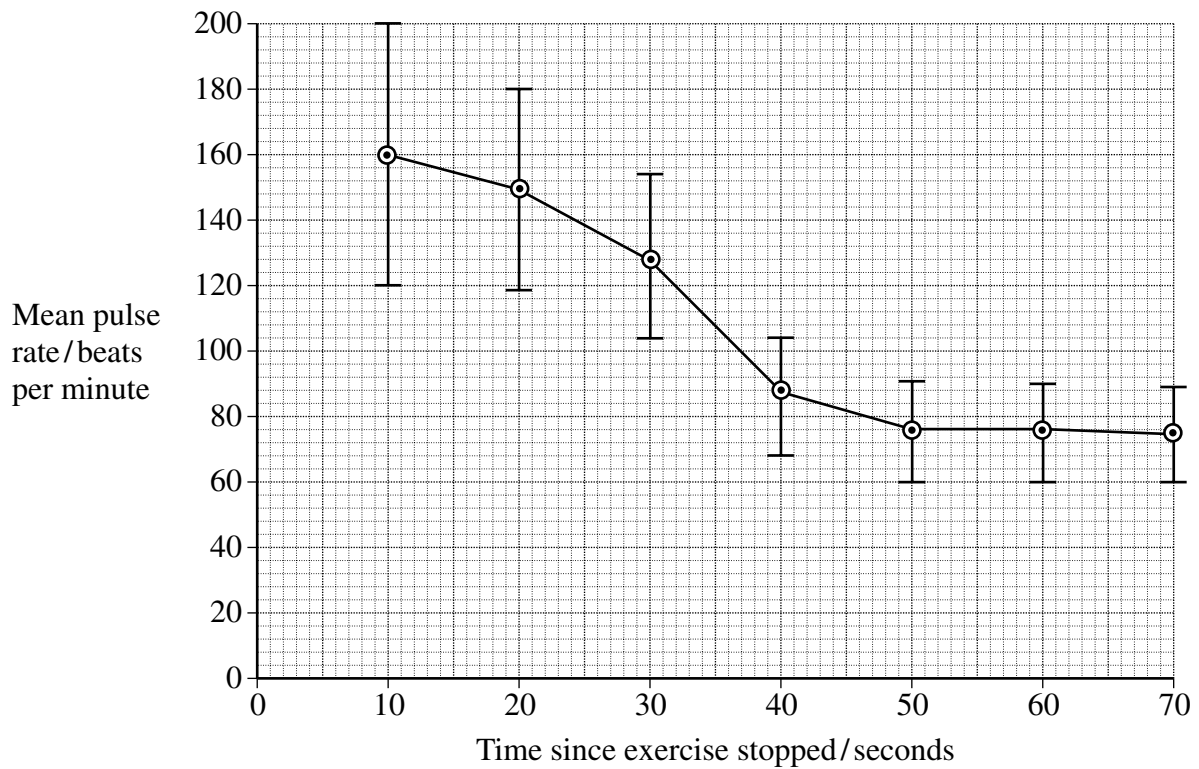
.....
.....
.....
.....

(2 marks)

Turn over ►

A group of students conducted a similar investigation to yours. They calculated the means and the standard deviations of their raw data. Their results are shown on **Figure 1**.

Figure 1



7 Use **Figure 1** to describe how the pulse rate changed.

.....

.....

(1 mark)

8 The standard deviations on the left of the graph are bigger than those on the right. Suggest an explanation for this.

.....

.....

.....

.....

(2 marks)

9 Why was it important to use a large group of students in this investigation?

.....
.....

(1 mark)

10 A heart monitor is a piece of equipment that can be strapped onto someone's chest to record their heart rate. The heart monitor records heart rate continuously and calculates the number of beats per minute. Give **three** advantages of using a heart monitor rather than counting pulse rate.

1

2

3

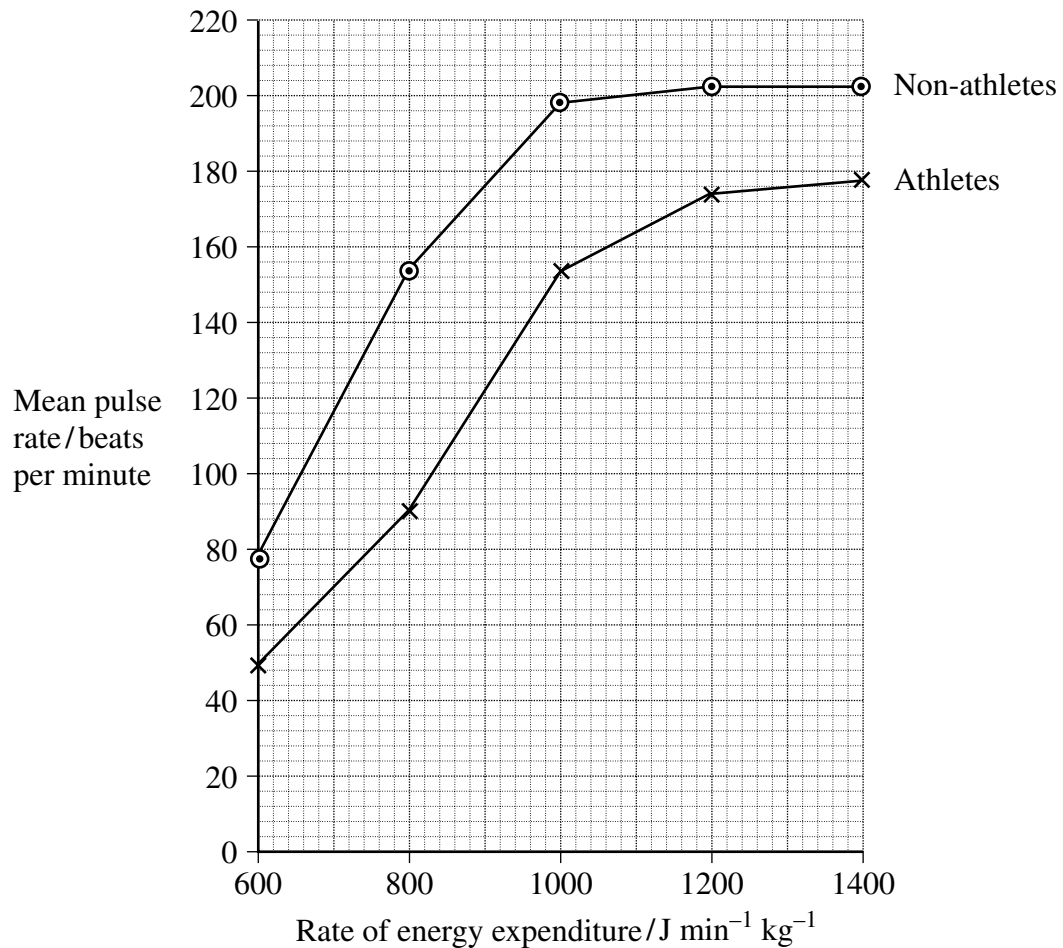
(3 marks)

RESOURCE SHEET**INTRODUCTION**

Sports scientists investigate the response of athletes to exercise. The results of their investigations may help them to advise coaches and athletes on training programmes.

Resource A

The mean pulse rates of athletes and non-athletes were compared at different rates of energy expenditure while using an exercise bicycle. **Figure 2** shows the results.

Figure 2

Resource B

Scientists measured how pulse rate changed during a long-distance run. They measured the pulse rates of athletes and non-athletes. The mean results for athletes, together with the ranges, are shown in **Table 1**. Data on standard deviations are shown below the table.

Table 1

Distance from start of run / km	Mean pulse rate / beats per minute	Range of pulse rate / beats per minute
0	55	51 – 62
1	138	133 – 145
2	140	135 – 149
3	164	137 – 182
4	142	135 – 152
5	149	141 – 157
6	148	142 – 154
7	142	137 – 148

The standard deviation for the athletes at 5 km was ± 7 beats per minute.

Another scientist studied non-athletes in the same run. The mean of their pulse rates at 5 km was 197 beats per minute. The range was 175 – 205 beats per minute. The standard deviation was ± 12 beats per minute.

Resource C

Athletes often train at high altitude before major competitions. Scientists studied the blood of athletes who normally live at low altitude, after training at 4000 metres above sea level. **Table 2** shows their results.

Table 2

	Athletes when training at sea level	Athletes after training at 4000 m above sea level
Mean number of red blood cells per mm^3 of blood	5.1×10^6	6.5×10^6
Mean concentration of haemoglobin / mg mm^{-3} of blood	15.0×10^2	20.0×10^2

Turn over ►

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 11** and **12**.

11 Compare the effect of increased energy expenditure on the heart rate of the athletes and non-athletes.

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

(2 marks)

12 The rate of energy expenditure is measured per kilogram of body mass. Explain why.

.....
.....

(1 mark)

Use **Resource B** to answer **Questions 13** and **14**.

13 Evaluate the usefulness of the range and standard deviation in comparing data from the athletes and non-athletes.

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

(3 marks)

(Extra space)

.....
.....

14 Suggest a reason for the difference in the mean pulse rate of the two groups.

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

(2 marks)

Use **Resource C** to answer **Questions 15** to **17**.

15 Calculate the percentage increase in the mean number of red blood cells in the athletes' blood after training at high altitude. Show your working.

Answer (2 marks)

16 Was it important to have the same number of athletes training at each altitude? Explain your answer.

.....
.....

(1 mark)

Turn over ►

17 Use **Table 2** to explain the advantages to athletes of high-altitude training.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

(Extra space)

.....

.....

.....

15

END OF QUESTIONS