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Section	Mark
PSA	
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Section A	
Section B	
TOTAL (max 50)	



General Certificate of Education
Advanced Level Examination
June 2011

Human Biology

HBI6T/Q11/test

Unit 6T A2 Investigative Skills Assignment

For submission by 15 May 2011

For this paper you must have: - the Task Sheet, your results and your statistical analysis - 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 35. - You will be marked on your ability to: - use good English - organise information clearly - use scientific terminology accurately.
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Section A

These questions relate to your investigation into the effect of use on features of the arm.

Use your Task Sheet, your results and your statistical analysis to answer them.

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

- 1** You told each person to clench the fist before you measured the forearm (step 6). Explain why.

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(1 mark)

- 2** Give **one** factor that may have affected the reliability of your measurements of the forearm and the wrist. In each case explain **one** way in which you tried to overcome this.

- 2 (a)** forearm

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(2 marks)

- 2 (b)** wrist

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(2 marks)

- 3** An error of ± 1 mm would have a bigger effect on the accuracy of measurements of the wrist than of the forearm.
Explain why.

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(2 marks)

- 4** A student carried out the same investigation as you did. His results are shown in **Figure 1**.

Figure 1

Arm	Mean forearm circumference / mm	Mean wrist diameter / mm
Dominant	298	56
Other	284	55

- 4 (a)** Suggest an explanation for these results.

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(2 marks)

- 4 (b)** He thought that one of his sets of data was anomalous. What action would you recommend in this instance?

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(1 mark)

Turn over ►

- 5** A scientist investigated the effect of age on features of arms. Her results are shown in **Figure 2**.

Figure 2

Age group / years	Mean number of times forearm circumference is bigger than wrist diameter in dominant arm
18 to 22	5.32
68 to 72	5.01

- 5 (a)** What do the results in **Figure 2** show about the relative change in size of forearm and wrist diameter?

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 (1 mark)

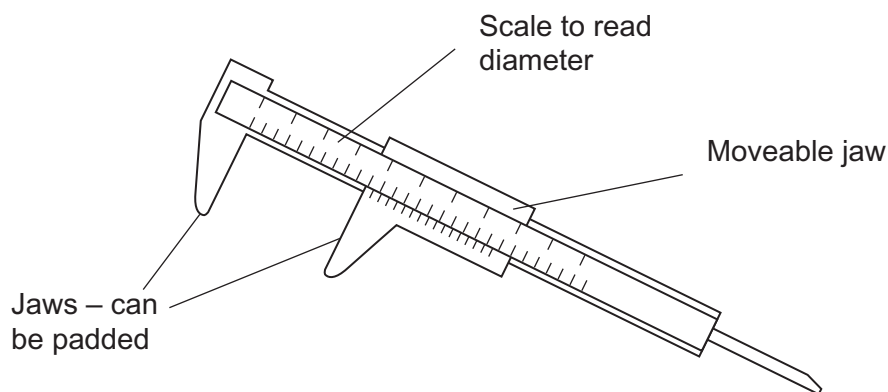
- 5 (b)** Suggest an explanation for the difference between the two age groups.

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 (2 marks)

- 6** A scientist carried out a different investigation. She measured the diameter of the forearms using the callipers shown in **Figure 3**. She repeated her work using a similar pair of callipers with plastic pads attached to the jaws.

Figure 3



- 6 (a)** The scientist decided to calculate standard deviations for each set of data. What information does a standard deviation give?

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 (1 mark)

- 6 (b)** The scientist decided that the data collected using the 'padded' callipers are more reliable. Suggest **one** explanation for this difference in reliability.

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 (2 marks)

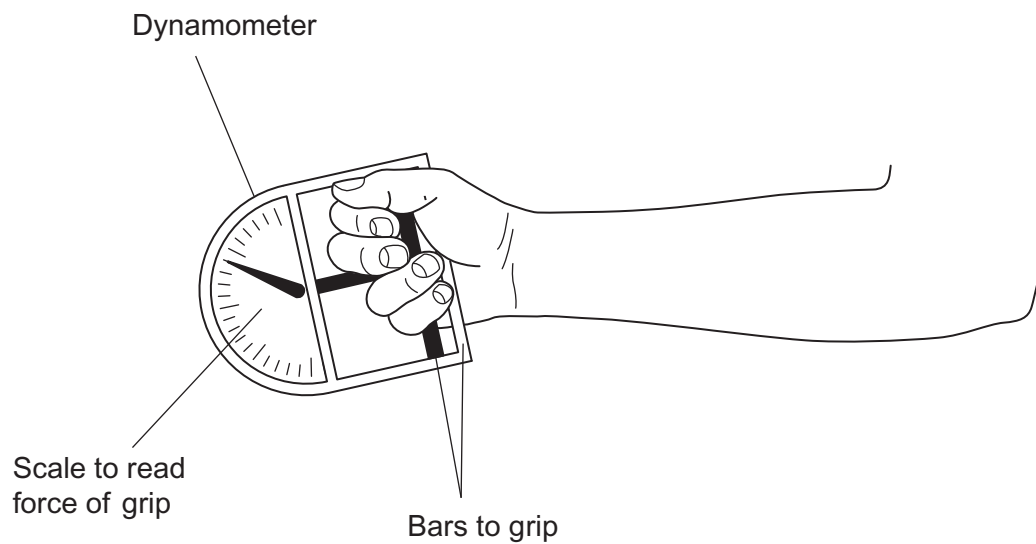
Resource Sheet

Resource A

A scientist investigated differences between the hands of two groups of people. Group **K** regularly played cricket. Group **L** did not play any sport which involved using their arms. All of the people were between 18 and 21 years of age. There were more than 100 people in each group.

For each person, the scientist measured the force of the grip of each hand. He measured this using a hand-held dynamometer as shown in **Figure 4**.

Figure 4



For each trial, the arm holding the dynamometer was held at right angles to the body. The scientist measured the maximum force of the grip three times with a 60-second rest between each trial. He also measured the length of the forearm. He then calculated the means, standard deviations and standard errors for each group. His results are shown in **Figure 5**.

Figure 5

	Group K			Group L		
Characteristic	Mean	Standard deviation	Standard error	Mean	Standard deviation	Standard error
Length of arm from elbow to wrist/mm	265.0	± 16.8	± 1.6	267.0	± 25.2	± 2.7
Maximum force of right hand grip/newton	360.2	± 71.2	± 7.3	322.9	± 79.5	± 7.7
Maximum force of left hand grip/newton	355.3	± 66.3	± 7.1	312.1	± 78.1	± 7.3

Turn over ►

Resource B

A scientist used a dynamometer to investigate age-related changes in the force of the grip of men. None of the men tested had done any strength training.

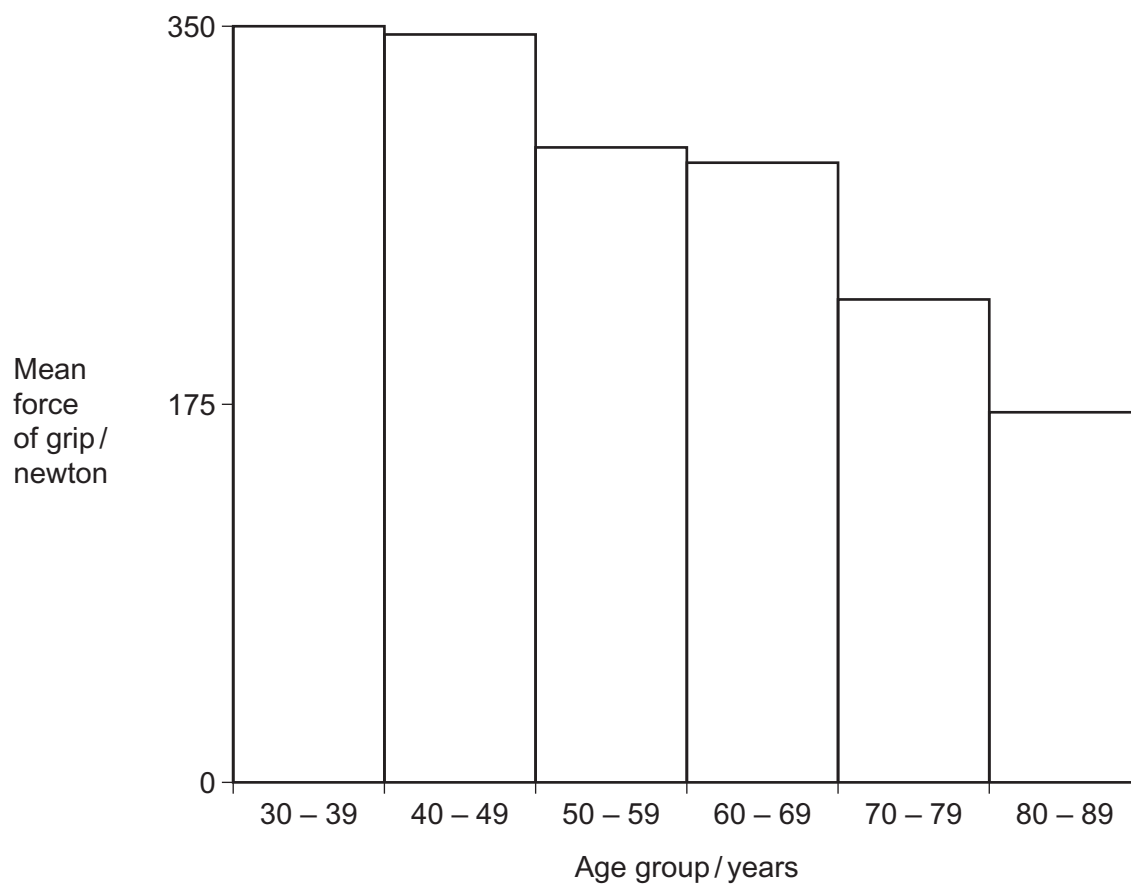
The numbers of men tested in each age group is shown in **Figure 6**.

Figure 6

Age group / years	Number of men
30 to 39	62
40 to 49	69
50 to 59	92
60 to 69	108
70 to 79	63
80 to 89	33

Figure 7 shows the results.

Figure 7



Resource C

Doctors investigated the effects of calcium and vitamin D supplements on the mobility of two groups of elderly people, **F** and **G**. Both groups contained 120 people. Group **F** was given calcium every day. Group **G** was given calcium and vitamin D supplements every day. Both groups were given their supplements for 20 months.

The doctors used the 'timed-up-and-go' test to measure mobility. This test involves timing how long it takes a person to stand up then walk a set distance.

Figure 8 shows their results.

Figure 8

Group	Supplement	Mean time to complete tests / s		
		At the start	After 12 months	After 24 months
F	Calcium	8.5	8.2	8.3
G	Calcium and vitamin D	8.9	7.5	7.1

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 7 and 8**.

- 7 (a)** Which group, **K** or **L**, showed the greater variability in forearm length?
Explain your answer.

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(1 mark)

- 7 (b)** The cricketers appear to have stronger right-hand grips than the other group.
Which statistical test would you use to find out if this difference is significant?

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(1 mark)

- 8** The grip test may cause aching and fatigue in the muscles of the hand. This is due to the build-up of lactate. When people rest after the test, the aching and fatigue gradually disappear. Explain the build-up and disappearance of the lactate.

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(5 marks)

Use **Resource B** to answer **Questions 9** and **10**.

- 9** There were different numbers of men in each age group in this investigation. Did this affect the reliability of the means obtained? Explain your answer.

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(1 mark)

- 10 (a)** Describe the trend shown by the graph in **Figure 7**.

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(1 mark)

- 10 (b)** Do the data in **Figure 7** prove that age affects the strength of the grip of men? Explain your answer.

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(1 mark)

Use **Resource C** to answer **Questions 11** and **12**.

- 11** Describe and suggest explanations for the effects of the two supplements on the mobility of elderly people.

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(4 marks)

Turn over ►

- 12** Before publication, the findings of this investigation were subjected to a review by other scientists who work in the same field.
Suggest **one** reason why this peer review is important.

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(2 marks)

- 13** Explain how the effects of the aging process increase the chance of having a fall.

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(3 marks)

END OF QUESTIONS