AQA

General Certificate of Education
Advanced Level Examination
June 2013

Biology   BIO6T/P13/test

Unit 6T   A2 Investigative Skills Assignment

Written Test

For submission by 15 May 2013

For this paper you must have:	Time allowed
• the task sheet, your results and your calculations • a ruler with millimetre measurements • a calculator.	• 1 hour 15 minutes
Instructions	**Information**

• 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 space 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.
	• The marks for questions are shown in brackets.
	• You are expected to use a calculator where appropriate.
	• The maximum mark for this paper is 36.
	• You will be marked on your ability to:
	  – use good English
	  – organise information clearly
	  – use scientific terminology accurately.

Details of additional assistance (if any). Did the candidate receive any help or information in the production of this work? If you answer yes give the details below or on a separate page.

Yes ☐   No ☐

Teacher Declaration:
I confirm that the candidate's work was conducted under the conditions laid out by the specification. I have authenticated the candidate's work and am satisfied that to the best of my knowledge the work produced is solely that of the candidate.

Signature of teacher .... Date ....

Section A

These questions relate to your investigation of human variation.

Use the Task Sheet and your results to answer the questions.

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

7 You investigated characteristics with phenotypes produced by dominant and recessive alleles. What is meant by *phenotype*?

....

....

....
(1 mark)

8 Other than for age, there was no matching of the subjects in this investigation.

Give **one** reason why it was not necessary to match the subjects in this investigation.

....

....

....
(1 mark)

9 You investigated whether the frequency of certain human characteristics remained the same from one generation to the next.

Suggest **two** reasons why the Hardy-Weinberg principle may **not** apply to human populations.

1 ....

....

2 ....

....
(2 marks)

You measured your own hand spans (steps 1 and 2) and wrist circumferences (steps 3 and 4). Another student, who carried out a similar investigation, measured the hand spans and wrist circumferences of a group of people.
His results are shown in **Figure 1**.

Figure 1

Person	Hand span / mm	Wrist circumference / mm
1	224	171
2	232	192
3	235	195
4	216	168
5	220	170
6	244	193
7	248	199
8	238	194
9	229	180

10   In this investigation, the student did have to match the people.
Give **two** features he should have matched people for when investigating hand span.
For each feature, explain why it should be matched.

Feature 1 ....

Explanation ....

....

....

Feature 2 ....

Explanation ....

....

....
(4 marks)

11   Use his data for **hand span** to identify:

11 (a)   the median ....

11 (b)   the range. ....
(2 marks)

Turn over ▶

12 He concluded that wrist circumference was **not** determined by a single gene.

Use his data to suggest why he came to this conclusion.

....

....

....

....

....
(2 marks)

13 The student wondered whether wrist circumference could be used to predict hand span and plotted the scatter diagram shown in **Figure 2**.

Figure 2
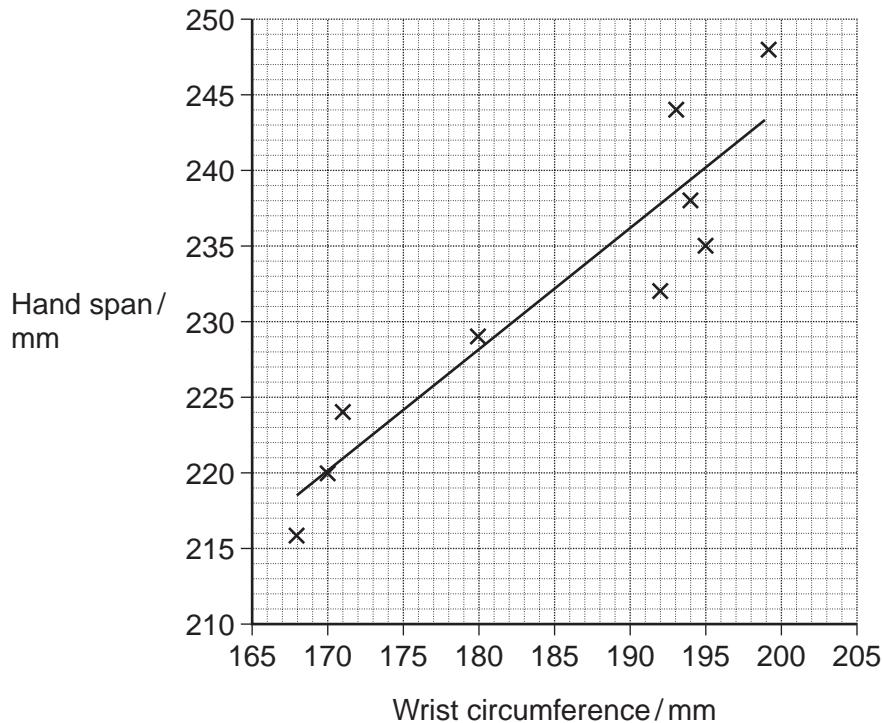
13 (a) Explain why he plotted his data as a scatter diagram.

....

....

....
(1 mark)

13 (b) He concluded that there was a strong positive correlation between wrist circumference and hand span.

Explain why he came to this conclusion.

....

....

....

....

....

(2 marks)

13 (c) Which statistical test should he use to see if the correlation between a person's wrist circumference and their hand span is significant or not?

....

(1 mark)

13 (d) When he carried out the statistical test on his data he obtained a value of P<0.05.

How should he interpret this value?

....

....

....

....

....

(2 marks)

18

Turn over ▶

Resource Sheet

Resource A

Researchers investigated some characteristics of people from different parts of England. In the north of England they selected 200 people and recorded their phenotypes for three different characteristics.

Their results are shown in **Figure 3**.

Figure 3

Phenotype produced by dominant allele	Number of people	Phenotype produced by recessive allele	Number of people
Tongue roller	131	Non-tongue roller	58
Right-handed	182	Left-handed	14
Straight thumb	142	Hitch-hiker thumb	50

Resource B

When most people fold their arms, they either always have their left arm on top, **L**, or always have their right arm on top, **R**. A geneticist investigated this characteristic on five small islands, **A**, **B**, **C**, **D** and **E**.

Her results are shown in **Figure 4**.

Figure 4

Key
- Right arm on top
- Left arm on top
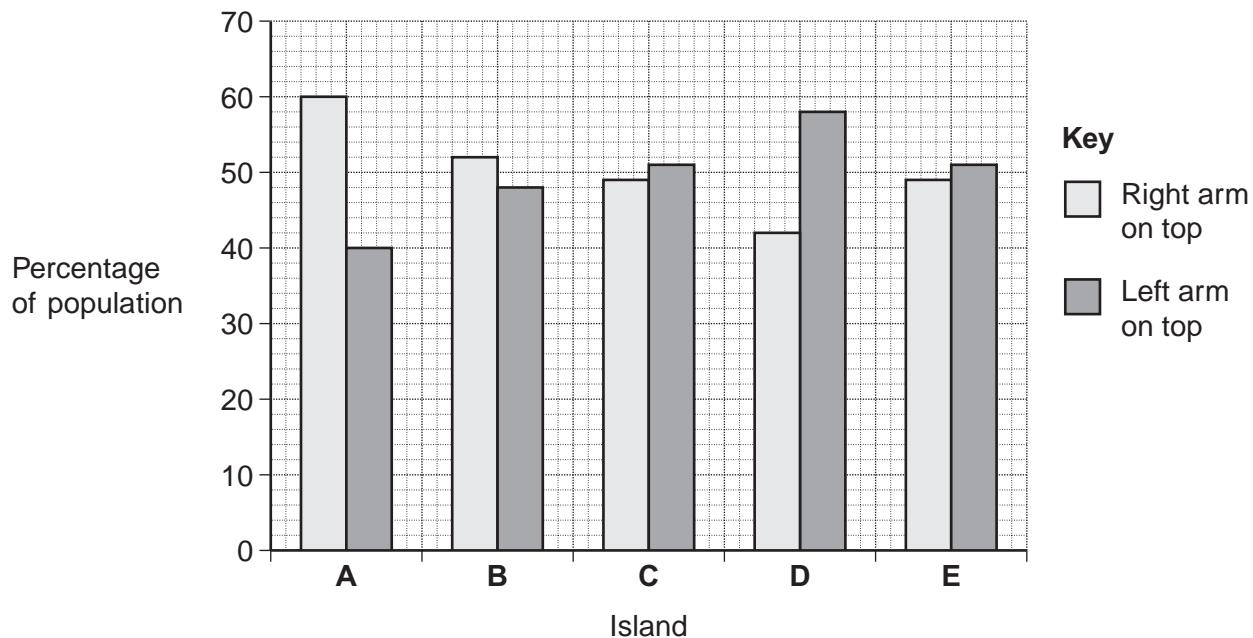
On one of the islands she recorded the arm-folding characteristics of parents and their children.

These results are shown in **Figure 5**.

Figure 5

Arm-folding of parents	Arm-folding of the children / %	
	Right arm on top, R	Left arm on top, L
R and **R**	41	59
R and **L**	45	55
L and **L**	44	56

The geneticist concluded that arm-folding is not determined by a single gene with a dominant allele and a recessive allele.

Turn over ▶

Section B

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

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

Use **Resource A** to answer Questions **14** to **16.**

14   Calculate the ratio of straight thumb to hitch-hiker thumb in this study.

Ratio = ...

(1 mark)

15   The numbers for the tongue rolling and thumb characteristics do not add up to 200.
For each characteristic suggest **one** reason why the numbers do **not** add up to 200.

Tongue rolling ....

....

....

Thumb ....

....

....

(2 marks)

16   One student looked at the researchers' results and concluded that 91% of people in the UK are right-handed.
Do you agree with this conclusion?   Give reasons for your answer.

....

....

....

....

....

(2 marks)

Use **Resource B** to answer Questions **17** to **19**.

17 The geneticist investigated arm-folding on five small islands.

17 (a) Use information from **Figure 4** to describe the results she obtained.

....

....

....

....

....

(2 marks)

17 (b) Suggest advantages of using island populations in this investigation.

....

....

....

....

....

(2 marks)

Turn over for the next question

Turn over ▶

Do not write outside the box

18 The geneticist concluded that arm-folding is **not** determined by a single gene with a dominant allele and a recessive allele.

Use information from **Figure 5** to explain why she reached this conclusion.

....

....

....

....

....

(3 marks)

(Extra space) ....

....

....

19 In another study, the geneticist investigated arm-folding in genetically identical twins. Data from this study supported her conclusion from the island study.

Suggest the evidence she found that supported her conclusion.

....

....

....

(1 mark)

20 The Hardy-Weinberg equation is

$$p^2 + 2pq + q^2 = 1$$

The Hardy-Weinberg equation can be used to estimate the frequency of a recessive allele in a population. Haemochromatosis is a condition caused by a recessive allele. In one country, 1 in every 400 people was found to have haemochromatosis.

Describe how you would use the Hardy-Weinberg equation to calculate the frequency of people who are healthy but carriers (heterozygotes) of the allele for haemochromatosis.

....

....

....

....

....

....

(3 marks)

(Extra space) ....

....

....

21 Health Authorities often make use of estimates of the frequency of harmful alleles.

Suggest and explain **one** advantage to Health Authorities of using these estimates.

....

....

....

....

....

....

....

(2 marks)

END OF QUESTIONS

18

There are no questions on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED