AQA

General Certificate of Education
Advanced Level Examination
June 2014

Biology   BIO6T/Q14/test/v2

Unit 6T   A2 Investigative Skills Assignment

Written Test

For submission by 15 May 2014

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 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.
	• The marks for questions are shown in brackets.
	• The maximum mark for this paper is 37.
	• You are expected to use a calculator where appropriate.
	• 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 populations.

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

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

6 You used leaves of the same plant species.
Give **two** reasons why it was important to use the same plant species.

[2 marks]

1 ....

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2 ....

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7 In investigations such as these, it is considered better to measure the leaves while they are still attached to the plant. Suggest why.

[1 mark]

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8 You used a ruler to press each leaf against a flat surface (step 2). Explain why it was important to press each leaf against a flat surface.

[1 mark]

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Do not write outside the box

9 A student carried out a similar investigation to yours. She plotted length of leaves against width of leaves on a graph. She said her results showed that there was a positive correlation between length and width of the leaves.

9 (a) What type of graph should she have drawn? Explain your answer.

[2 marks]

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9 (b) What is meant by a **positive correlation**?

[1 mark]

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She also investigated whether there is a relationship between the length of a leaf and the mass of a square centimetre of the same leaf. She used only east-facing leaves from plants in the same population.

9 (c) Suggest the null hypothesis for her investigation.

[1 mark]

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Question 9 continues on the next page

Turn over ▶

9 (d) Describe how she could find the mass of a square centimetre of leaf.

[2 marks]

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9 (e) Which statistical test should she use to analyse her results?

[1 mark]

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10 Another student used mark-release-recapture to estimate the size of a woodlouse population in a garden. He sampled one part of the garden and then repeated the procedure in different parts of the garden. His estimated population size was different in each part of the garden. He used all of the estimates to calculate a mean population size and the standard error of the mean.

10 (a) What would the standard error tell the student about the true size of the woodlouse population in the garden?

[2 marks]

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10 (b) The following week, he carried out the same procedure again. The value he calculated for standard error was greater than for the first occasion. How should a difference in standard error values be interpreted?

[1 mark]

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Do not write outside the box

10 (c) He wanted to use mark-release-recapture to estimate the size of the human population of a town. His teacher said that this method was not suitable. Explain why mark-release-recapture may **not** be a suitable method for estimating the size of a human population.

[3 marks]

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[Extra space] ....

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17

Turn over for the Resource Sheet

Turn over ▶

Resource Sheet

Resource A

Ecologists used a method called proportional sampling to estimate the population size of an animal species. This method is based on assumptions. Two of the assumptions are given below.

1. They know the size of the area, **A**, where the animal population lives.
2. The animals are uniformly distributed in this area.

To carry out the method, the ecologists:

- chose a region of known size, **R**, inside area **A**
- counted the number of animals in region **R**. They called this number **S**
- assumed that the number, **S**, would be in proportion to the size of the total population, **P**, in area **A**.

Resource B

Use of population data allows demographic changes to be recognised.

Birth rate is the number of births per 1000 people in a year. In 2007, a researcher compared birth rates in different countries. Some of his data are shown in **Table 2**.

Table 2

Country	Birth rate per 1000 people
China	12
Germany	8
India	24
Kenya	40
United States	14

The researcher also investigated the age structure of the population of a European country. He produced an age population pyramid showing the age distribution of males and females in the population. Males and females can be shown as a number or as a percentage. The age population pyramid he produced is shown in **Figure 1**.

Figure 1
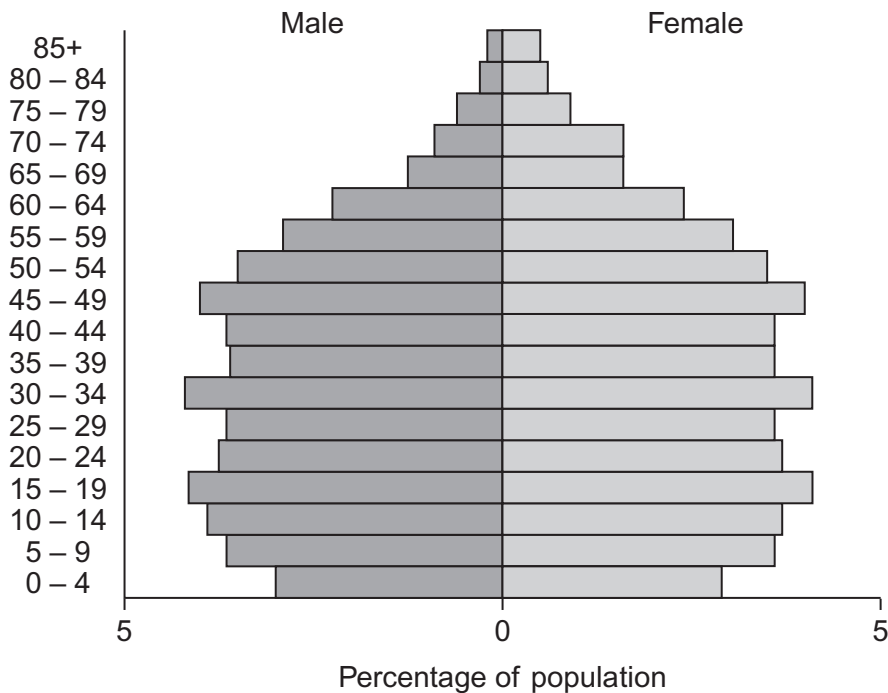
Section B

Use the information in the **Resource Sheet** and your own knowledge to answer the questions.

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

Use **Resource A** to answer **Questions 11** to **13.**

11   Proportional sampling can be used to estimate the population size of a species that is uniformly distributed.

11 (a)   What is a **species**?

[1 mark]

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11 (b)   What is meant by **uniformly distributed**?

[1 mark]

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12   Use the letters **A**, **R** and **S** to write an equation showing how proportional sampling is used to estimate the total size of a population, **P**. Show your working.

[2 marks]

P = ...

13 Population size can be estimated using proportional sampling or mark-release-recapture.

13 (a) How do the assumptions made in proportional sampling differ from those made in mark-release-recapture?

[2 marks]

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13 (b) Give **one** assumption about the animals caught that is made in both methods.

[1 mark]

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Use **Resource B** to answer **Questions 14** to **18.**

14 Birth rates are expressed as the number of births per 1000 people in a year.
Give **two** advantages of expressing birth rates in this way.

[2 marks]

1 ....

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2 ....

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Turn over for the next question

15 Recently, a scientist calculated that, in 2007, the total world population increased by 1.2%. To make this calculation he needed three factors. One was birth rate, what were the other two?

[2 marks]

Factor 1 ....

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Factor 2 ....

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16 Germany had the lowest birth rate of the countries shown in **Table 2**, but the size of its population did not change over the course of the year. Suggest **two** reasons why.

[2 marks]

1 ....

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2 ....

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17 An age population pyramid can show numbers or percentages of males and females of different ages in a population.
Give **one** advantage of showing numbers.

[1 mark]

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18 **Figure 1** shows a country where the population is decreasing in number. Describe the evidence that this country has a contracting population.

[1 mark]

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Use both **Resource A** and **Resource B** to answer **Question 19**.

19 In the UK, the total numbers of people with illnesses such as type II diabetes and Alzheimer's disease are not known.

19 (a) A doctor has records of the people within her practice who have been diagnosed with type II diabetes. The method of proportional sampling can be adapted to use these records to estimate the number of people in the UK with type II diabetes. Explain how.

[2 marks]

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19 (b) Aging is a risk factor for Alzheimer's disease. A worker in a UK care home for patients with Alzheimer's disease saw **Figure 1**. She concluded that the number of people with Alzheimer's disease would increase in the UK in the future.
Do you agree with her conclusion? Explain your answer.

[3 marks]

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[Extra space] ....

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END OF QUESTIONS

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