Centre Number						Candidate Number				
Surname						Other Names				

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For Teacher's Use	
Section	Mark
PSA	
Stage 1 Skills	
Stage 2 Skills	
Section A	
Section B	
TOTAL (max 50)	

General Certificate of Education
Advanced Subsidiary Examination
June 2011

Biology BIO3T/Q11/test

Unit 3T AS Investigative Skills Assignment

For submission by 15 May 2011

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. • The maximum mark for this paper is 32. • 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 on variation.
Use the task sheet and your results to answer the questions.

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

What species did you investigate? .....

What environmental variable did you investigate? .....

1 Suggest how you might measure the environmental variable in your investigation.

.....

.....

(1 mark)

2 Apart from the environmental variable you investigated, suggest **one** other variable that you could measure that might affect leaf size. Explain how this variable might affect leaf size.

Environmental variable .....

Explanation .....

.....

(2 marks)

3 You should have measured a large sample of leaves at each site.
Give **two** reasons why you should have measured a large sample.

1 .....

.....

2 .....

.....

(2 marks)

4 You were told to collect the leaves at random (step 3). Explain why.

.....

.....

(1 mark)

5 You were told to calculate the standard deviation of your sample of leaves. Why is it useful to calculate the standard deviation?

.....

.....

(1 mark)

Turn over for the next question

6 One student investigated the size of ivy leaves on two sides of a wall. One side faced south and the other faced north. He measured size by finding the width of each leaf. He measured the width of each leaf in exactly the same way. The table shows his data. The student then used his measurements to calculate the mean and the standard deviation for each sample.

Width of ivy leaves on south-facing side of wall / mm	Width of ivy leaves on north-facing side of wall / mm
21	33
25	40
26	40
28	42
29	45
31	46
32	48
33	48
33	50
35	51
35	51
36	53
36	53
37	53
37	54
37	56
39	57
40	59
41	62
41	63
45	66
48	73
48	74
51	80
55	

6 (a) Give the mode of the data for the south-facing side of the wall.

.....

(1 mark)

6 (b) The student decided that the measurement of 80 mm for the north-facing side of the wall was an anomaly. Do you agree that this measurement was an anomaly? Give the reason for your answer.

.....

.....

(1 mark)

6 (c) The student did not measure the same number of leaves from each side of the wall. Is it important to have the same sample size for each set of measurements? Explain your answer.

.....

.....

(1 mark)

6 (d) Suggest **one** reason why the width of the leaves may **not** be a reliable measure of leaf size.

.....

.....

(1 mark)

11

Turn over for the next question

Resource Sheet

Cheetah

The photograph shows a cheetah. The body markings of cheetahs vary, in particular the pattern of bands on their tails. Cheetahs are solitary animals but the young stay with their mother until they are between 14 and 18 months old.

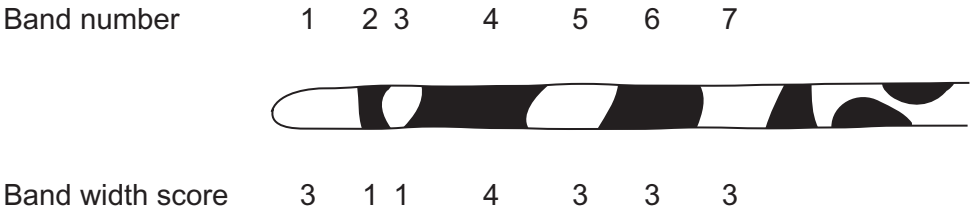
Resource A

Scientists investigated the banding pattern on the tails of cheetahs living in the wild.

- They drove a car alongside a walking cheetah and used binoculars to study the tail pattern.
- They gave each cheetah a banding pattern score based on the width of the dark and light bands on the end of the tail.
- They scored the width of the bands on the right and left side of the tail using a 5 point scale of width.

A typical pattern on the right side of one cheetah's tail is shown in **Figure 1**.

Figure 1



The scientists collected data from each cheetah on four separate occasions.
Figure 2 shows the data for one of the cheetahs.

Figure 2

Side of tail	Mean band width score (± standard deviation)						
	Band 1	**Band 2**	**Band 3**	**Band 4**	**Band 5**	**Band 6**	**Band 7**
Right	3.00 (± 0.82)	1.00 (± 0.00)	1.00 (± 0.00)	3.75 (± 0.50)	2.75 (± 0.50)	3.00 (± 0.00)	3.00 (± 0.00)
Left	3.75 (± 0.50)	3.25 (± 0.50)	2.00 (± 0.50)	3.00 (± 0.00)	2.00 (± 0.00)	2.50 (± 0.50)	3.00 (± 0.50)

Resource B

In the early 1980s, before DNA analysis had been developed, scientists investigated the genetic variation of cheetahs living in captivity. They used skin grafts to do this. They carried out skin grafts on anaesthetised animals by

- removing a small piece of skin from one animal. This animal was the recipient.
- replacing the removed skin by a piece of skin taken from another animal. This animal was the donor.
- attaching the new piece of skin with stitches.

A graft may be accepted by the recipient. It will be rejected if the recipient's immune system recognises the antigens on the skin as foreign.

Scientists carried out skin grafts between cheetahs living in captivity and domestic cats. **Figure 3** shows the data that they obtained.

Figure 3

Recipient of skin graft	Donor of skin graft	Relationship	Time taken for the graft to be rejected / days
Domestic cat 1	Domestic cat 2	Unrelated	13
Cheetah 1	Domestic cat 3	Unrelated	12
Cheetah 1	Cheetah 2	Sisters	No rejection after 52 days
Cheetah 3	Cheetah 4	Unrelated	49
Cheetah 5	Cheetah 6	Unrelated	No rejection after 78 days
Cheetah 7	Cheetah 8	Unrelated	No rejection after 41 days
Cheetah 9	Cheetah 10	Unrelated	No rejection after 24 days
Cheetah 11	Cheetah 12	Unrelated	No rejection after 14 days
Cheetah 13	Cheetah 14	Unrelated	No rejection after 44 days

The scientists also grafted skin from one area to another on the same animal. These grafts were not rejected.

Turn over for the next question

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 **7** to **10**.

7 The scientists only used data from cheetahs which were fully grown. Suggest why.

.....

.....

(1 mark)

8 The scientists estimated the width of the bands on the same cheetah on four separate occasions. They did not always get the same score.

8 (a) Give **two** pieces of evidence from **Figure 2** which show that the scientists sometimes obtained different scores for the same band.

1 .....

.....

2 .....

.....

(2 marks)

8 (b) The method the scientists used resulted in them getting different scores for the same band. Suggest why.

.....

.....

(1 mark)

9 What is the evidence from **Figure 2** that the dark and light bands do **not** form rings of equal width around the tail?

.....

.....

(1 mark)

10 The scientists found the difference in banding pattern between

- offspring in the same family
- cheetahs chosen randomly.

Explain how scientists could use this information to show that some variation in tail banding was genetic.

.....

.....

.....

.....

.....

.....

(3 marks)

(Extra space) .....

.....

.....

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

11 (a) The scientists grafted skin from a domestic cat to a cheetah. Suggest why.

.....

.....

(1 mark)

11 (b) They also grafted skin from one area to another on the same animal. Explain why.

.....

.....

(1 mark)

12 (a) Give **three** conclusions that you can make from the data in **Figure 3** about the time taken for rejection.

1. .....

.....

2. .....

.....

3. .....

.....

(3 marks)

12 (b) Give **one** reason why these conclusions may **not** be reliable.

.....

.....

(1 mark)

12 (c) There are proteins on the skin of cheetahs that act as antigens. What do the data in **Figure 3** suggest about these cheetah antigens?

.....

.....

(1 mark)

12 (d) Antigens are proteins. Explain why a knowledge of antigens can show that animals are genetically similar.

.....

.....

.....

.....

(2 marks)

13 (a) A genetic bottleneck results in genetic similarity. Explain how.

.....

.....

.....

.....

(2 marks)

13 (b) Give **two** possible consequences of a low genetic diversity.

.....

.....

.....

.....

(2 marks)

21

END OF QUESTIONS

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