Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

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General Certificate of Education
June 2007
Advanced Level Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

BIOLOGY (SPECIFICATION B) **BYB678/B**
Unit 6 Section B Applying Biological Principles
Unit 7 Section B Applying Biological Principles
Unit 8 Section B Applying Biological Principles

Friday 22 June 2007 1.30 pm to 3.45 pm

For this paper you must have:
- Section A.
- a ruler with millimetre measurements.

You may use a calculator.

Time allowed: The total time for Section A and Section B of this paper is 2 hours 15 minutes

For Examiner's Use			
Question	Mark	Question	Mark
1			
2			
3			
4			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in **Section B** in the spaces provided.
- **Section A** and **Section B** will be marked by different examiners. You must ensure that any supplementary sheets are fastened to the appropriate question paper answer book.
- Do all rough work in this book. Cross through any work you do not want to be marked.

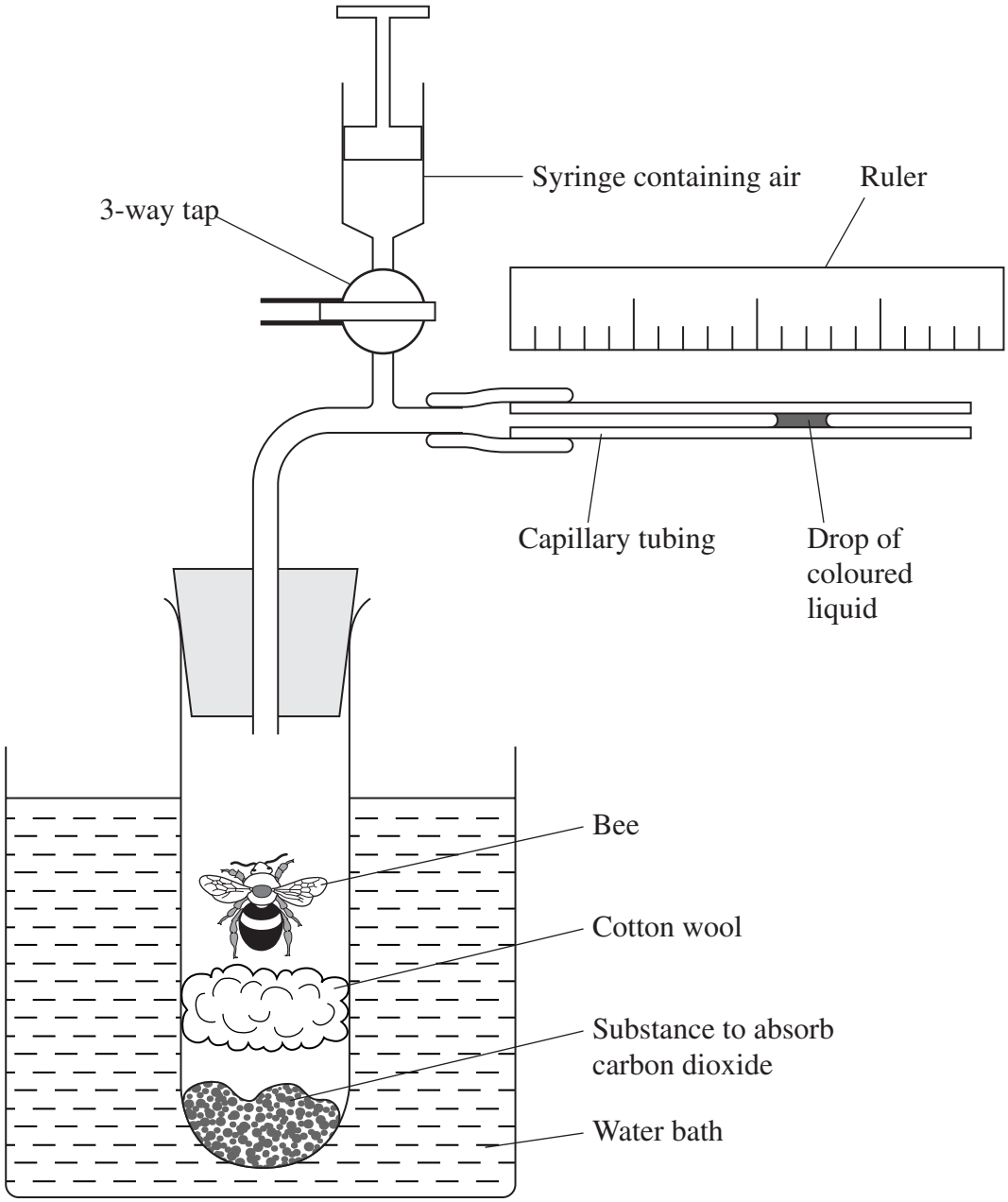
Information

- The maximum mark for **Section B** is 50.
- The marks for questions are shown in brackets.
- You are reminded that all questions in this **Section B** are synoptic (indicated by the letter **S**). You must use your knowledge of different parts of the specification when answering this section.
- You are advised to spend 1 hour 15 minutes on **Section B**.
- Use accurate scientific terminology in all your answers.
- You are reminded of the need for good English and clear presentation in your answers. Question 4 should be answered in continuous prose. Quality of Written Communication will be assessed in your answer.

SECTION B

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

S 1 Scientists measured the rate of aerobic respiration in bees at different environmental temperatures. They measured the rate of oxygen consumption of individual bees using the apparatus shown in the diagram.



(a) (i) The scientists left the tube in the water bath until it reached the required temperature. Then they closed the tap. The drop of coloured liquid started to move steadily.

Which way did the liquid move? Explain your answer.

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(2 marks)

(ii) What measurements would the scientists need to make to compare the rate of oxygen consumption of different bees?

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(3 marks)

(iii) What is the syringe used for?

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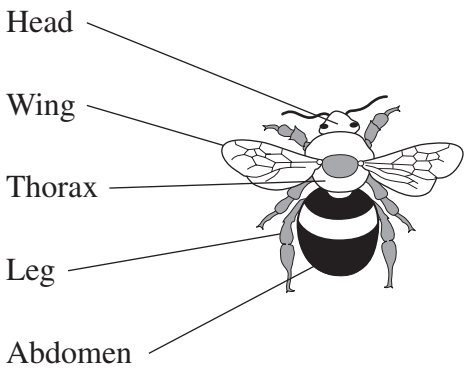
(1 mark)

Question 1 continues on the next page

At low temperatures, some bees respire at a much higher rate than others. The body temperature of these bees is much higher than their surroundings. It is also higher than the body temperature of other bees. These bees are described as endothermic bees. The diagram shows the body structure of a bee.



(b) At low temperatures, endothermic bees vibrate their wings rapidly. By vibrating their wings the bees produce heat. Suggest how.

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(2 marks)

(c) Bees live in colonies consisting of very large numbers of worker bees and a single queen bee. The worker bees are all offspring of the queen bee. Worker bees are unable to reproduce.

In winter, a colony comes together in a cluster. The queen is at the centre of the cluster. Endothermic bees are also found near to the centre of the cluster.

Using the information given, suggest how endothermy evolved in bees.

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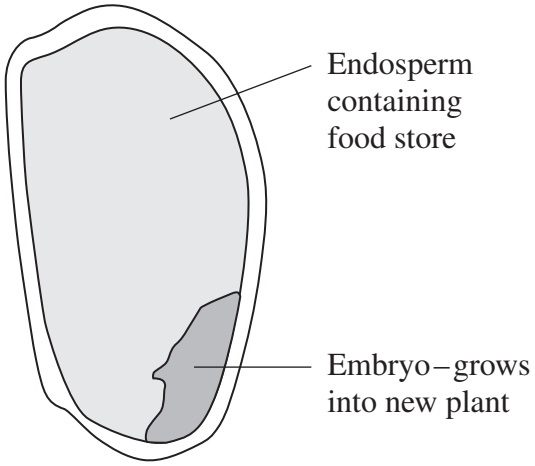
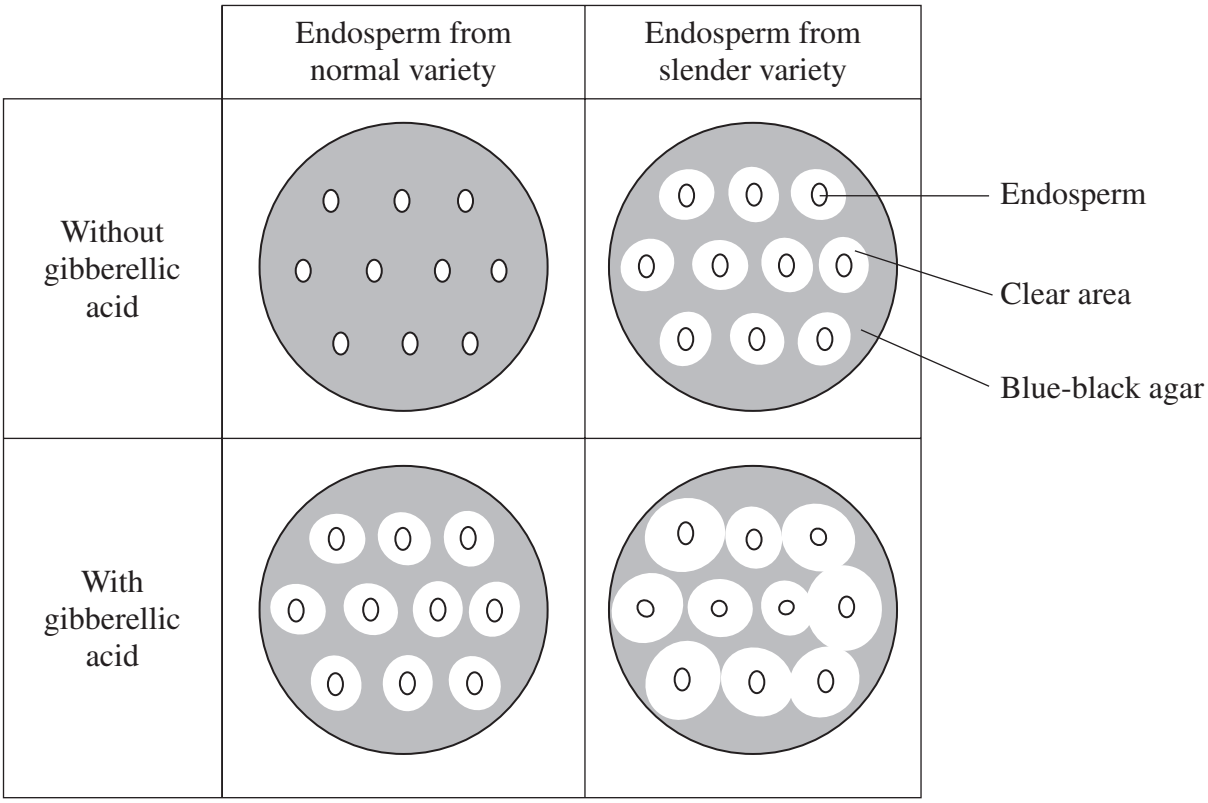
(3 marks)

Turn over for the next question

S 2 The growth of young rice plants from seeds is affected by a plant hormone called gibberellic acid. Rice plants of the variety called 'slender' have very long shoots. The diagram shows the structure of a seed from a rice plant.



Scientists investigated amylase activity in seeds from normal and slender rice plants. They removed endosperm tissue from the seeds of both varieties of plants and placed the samples on agar plates. The agar in all of the plates contained starch and in half of the plates it also contained gibberellic acid. After a few days, the plates were flooded with a solution of iodine in potassium iodide. Four typical plates are shown below.



(a) Give **one** variable that must be controlled when preparing the starch agar plates. Explain why it must be controlled.

Variable .....

Explanation .....

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(2 marks)

(b) There are clear areas around the endosperms on some of the agar plates. Explain why.

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(2 marks)

(c) What do these results show about the seeds of the slender variety, compared to seeds of the normal variety?

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(2 marks)

Question 2 continues on the next page

(d) Slender plants have the genotype **ss**. Crosses were carried out between plants that were heterozygous **Ss**. The offspring were 311 normal and 89 slender plants, giving an observed ratio of 3.49:1. A chi-squared test was carried out, to see if this was significantly different from the expected 3:1 ratio. A value for χ^2 of 1.61 was obtained. The table shows χ^2 values and corresponding probability values for one degree of freedom.

Probability values	0.50	0.20	0.10	0.05	0.01	0.001
χ^2 values	0.46	1.64	2.71	3.84	6.64	10.3

(i) What was the null hypothesis for this test?

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(1 mark)

(ii) Explain what a χ^2 value of 1.61 indicates about the difference between the observed and expected ratios.

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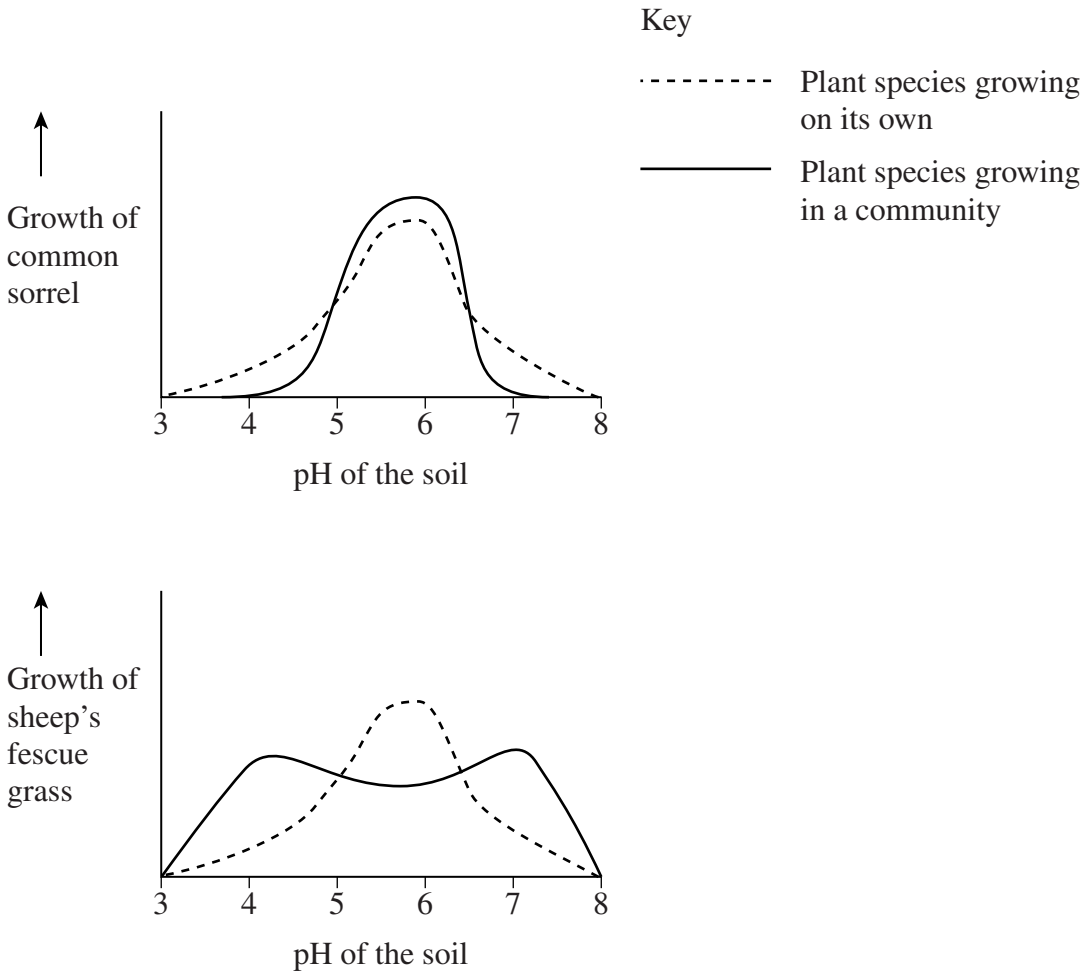
(2 marks)

9

Turn over for the next question

3 The pH of soil affects the growth of plants. Scientists tried to grow two species of plant on large areas of bare soil of different pH. They grew each species on its own.

In a different investigation, the scientists recorded the growth of the same two species in natural communities. They also measured the pH of the soil where each species grew. The graphs show the results of both investigations.



(a) The results are very similar when common sorrel and sheep's fescue were growing on their own. Suggest **one** explanation.

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(2 marks)

(b) The results obtained when these plants were growing in communities are different from when they were growing on their own. Suggest **one** explanation for the difference in the results.

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(3 marks)

5

Turn over for the next question

S 4 Write an essay on **one** of the topics below.

EITHER

(a) Movements inside cells.

OR

(b) Transfers through ecosystems.

In the answer to this question you should bring together relevant principles and concepts from different parts of the specification.
Your essay will be marked not only for its scientific accuracy, but also for the selection of relevant material.
The essay should be written in continuous prose.

The maximum number of marks that can be awarded is:

Scientific content	*16*
Breadth of knowledge	*3*
Relevance	*3*
Quality of Written Communication	*3*

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END OF QUESTIONS

For Examiner's use only

	Mark	Comment
S		
B		
R		
Q		