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Section	Mark
PSA	
Stage 1 Skills	
Stage 2 Skills	
Section A	
Section B	
TOTAL (max 50)	



General Certificate of Education
Advanced Level Examination
June 2011

Human Biology

HBI6T/P11/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 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.	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 temperature on the rate of respiration of microorganisms such as those found in probiotic foods.

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

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

- 1** You were told to stand the test tubes and boiling tubes in a waterbath before mixing the contents (steps 4 and 9). Explain why.

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(1 mark)

- 2** You were told to stir the stock culture before taking your sample (step 6). Suggest why you were told to stir it.

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(1 mark)

- 3 (a)** You heated tube **2** and its contents to about 100 °C before using it in the investigation (step 7). How would heat affect the contents of tube **2**?

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(1 mark)

- 3 (b)** Why were you told to cool test tube **2** before using it in your investigation (step 8)?

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(1 mark)

3 (c) What was the purpose of tube **Y**?

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(2 marks)

4 You did not add methylene blue to tube **Z**. Explain why tube **Z** was included.

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(1 mark)

5 You were told to leave the tubes in the waterbath for a suitable length of time before mixing the contents (step 9). How did you decide that enough time had passed?

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(1 mark)

6 You measured the time taken for a colour change. Suggest **one** factor other than temperature that could affect the time taken for this colour change.

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(1 mark)

7 You carried out a statistical test on your results. Explain why.

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(1 mark)

Turn over ►

- 8** One probiotic food supplement is provided as packets of dried, powdered yeast. It is recommended that this yeast is stirred into a drink.

Two biology students discussed using this supplement as a probiotic food.

- 8 (a)** Shakil said that he would make a hot chocolate drink with boiling water. He would then add the yeast immediately. Would this be sensible? Explain your answer.

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(2 marks)

- 8 (b)** Sapna said she would stir the yeast into a cold milkshake. Her biology teacher told her the yeast would die before it reached the small intestine. Suggest **two** reasons why the yeast might die before it reaches the small intestine.

1

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2

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(2 marks)

Turn over for the next question

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

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Resource Sheet

Introduction

The human intestine is home to vast numbers of live bacteria. Some of these bacteria are beneficial ('good') and some are harmful ('bad').

Manufacturers of probiotic foods claim their products contain large numbers of beneficial microorganisms which improve the ratio of 'good' to 'bad' bacteria.

Resource A

When people take antibiotics, between 5% and 25% of them experience diarrhoea as a side effect. Some develop serious intestinal complications.

A doctor investigated whether taking probiotics could reduce this risk of diarrhoea. The doctor recruited 140 patients who were about to take antibiotics. They were divided into two groups, **S** and **T**.

- Group **S** drank a probiotic yoghurt drink each day.
- Group **T** drank a sterile milkshake each day.

Both groups were given the drinks when they started taking the antibiotics. None of the patients knew what the drink contained.

Figure 1 shows the results of the investigation.

Figure 1

Group of patients	Type of drink	Number of bacteria in drink	Percentage of volunteers who developed diarrhoea	Percentage of volunteers who developed serious intestinal complications
S	Probiotic yoghurt drink	Millions	11	0
T	Sterile milkshake	None	35	10

Resource B

Researchers investigated whether live bacteria from probiotic yoghurt could be detected in the faeces of three groups of healthy volunteers.

- Group **P** ate fresh probiotic yoghurt, containing live bacteria, every day.
- Group **Q** ate the same probiotic yoghurt, after it had been heat treated to 75 °C, every day.
- Group **R** did not eat probiotic yoghurt.

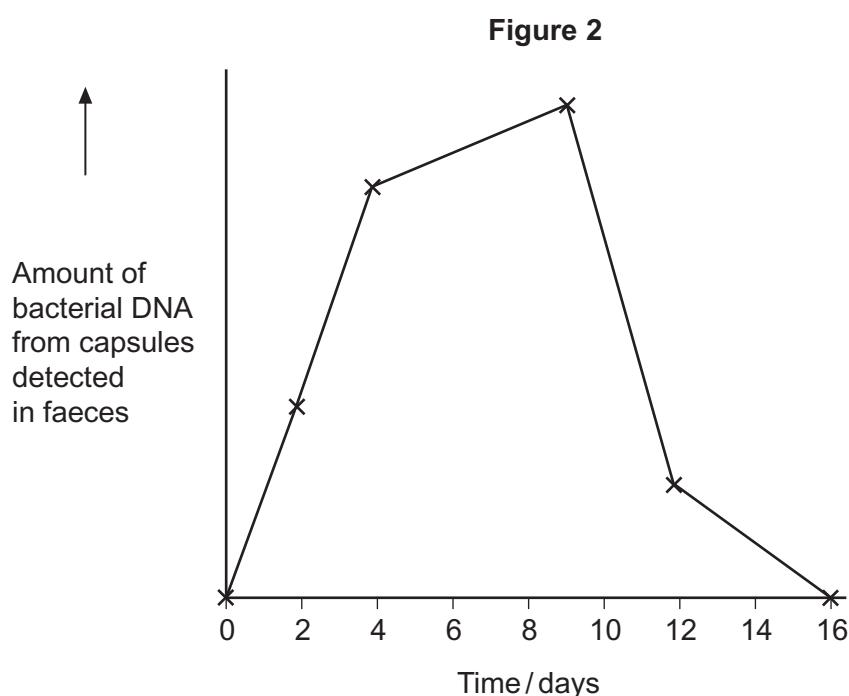
The volunteers continued their normal diet.

Samples of their faeces were collected at regular intervals. Different tests were carried out on the samples. The polymerase chain reaction and DNA analysis were used to try to detect the presence of the bacteria originating from the probiotic yoghurt.

The analysis showed that DNA compatible with the probiotic bacteria supplied in the yoghurt was found in 11% of volunteers in Group **P**.

Resource C

Scientists investigated whether bacteria from a probiotic food supplement could colonise the intestines. They asked volunteers to take capsules containing these bacteria for 9 days. The scientists used a test to detect the DNA of these bacteria in the faeces of the volunteers during the time they were taking the capsules and for 7 days afterwards. **Figure 2** shows their results.



Turn over for the next question

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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 9 and 10**.

- 9** The doctor put the patients into groups **S** and **T** at random. Suggest a method for doing this.

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 (1 mark)

- 10** The company which provided the probiotic yoghurt drink drew **two** conclusions from this research.

Use **Figure 1** to evaluate each of its conclusions.

Conclusion 1. The probiotic drink reduced the risk of diarrhoea and serious intestinal conditions.

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Conclusion 2. The tests proved that the probiotic yoghurt drink helped support the body's natural defences.

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 (5 marks)

Use **Resource B** to answer **Question 11**.

- 11 (a)** Before DNA analysis was carried out, the DNA had to be extracted from the bacterial cells. Samples of the faeces were processed to collect the bacterial cells. These bacterial cells were then placed in water. Why was placing them in water necessary in order to extract the DNA from the bacterial cells?

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(2 marks)

- 11 (b)** Suggest why the polymerase chain reaction was carried out on samples of faeces.

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(2 marks)

- 11 (c)** Describe how the scientists could identify the DNA as belonging to the species of bacteria in the probiotic yoghurt.

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(2 marks)

Turn over ►

12 Use **Resource C** to answer **Question 12**.

- 12 (a)** **Figure 2** shows that the amount of DNA from the experimental bacteria in the faeces increases between day 0 and day 2 after starting to take the capsules. Suggest **one** reason why the amount of DNA increases.

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(1 mark)

- 12 (b)** The amount of DNA detected in the faeces dropped after the volunteers stopped taking the capsules. The bacteria had failed to establish themselves permanently in the gut. Suggest **one** reason why they had failed.

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(1 mark)

- 13** Use all the resources to answer **Questions 13** and **14**.
The different bacteria referred to in resources **A** to **C** are found in many live, fresh yoghurts.

Claire and Harry bought a multipack of live, fresh yoghurt and kept it in a fridge. Claire ate a yoghurt one week before the sell-by date. Harry ate another yoghurt on the sell-by date. Harry said he would get more bacteria as they had had a longer time to multiply. Was he right? Explain your answer.

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(3 marks)

14

A journalist read all three investigations. She wrote “probiotics increase intestinal populations of ‘good’ bacteria”. Evaluate this statement.

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(4 marks)

21

END OF QUESTIONS