

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

For Examiner's Use Total for EMPA

General Certificate of Education
June 2009
Advanced Subsidiary Examination



HUMAN BIOLOGY
Unit 3X Externally Marked Practical Assignment
Written Test

HBI3X

For submission by 15 May 2009

For this paper you must have

- Task Sheet 2, your results and your graph
- a ruler with millimetre measurements.

You may use 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 spaces provided.
- Show all your working.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

- The maximum mark for this test is 30.
- The marks for questions are shown in brackets.
- You are reminded of the need for good English and clear presentation in your answers.
- Use accurate scientific terminology in all answers.

For Examiner's Use	
	Mark
Task 1	
Task 2	
Section A	
Section B	
TOTAL for EMPA	
Initials	

SECTION A

These questions relate to your investigation on the effect of temperature on the relative number of bacteria in a milk sample.

You should use Task Sheet 2, your results and your graph to answer the questions.

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

- 6** When an experiment is repeated, results may not be the same each time.
Use your results table to identify the temperature at which the results obtained showed the largest difference.

Temperature

Give the values of the data you obtained at this temperature.

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What does the difference between these values show?

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(1 mark)

- 7 The number of bacteria in milk affects the colour that resazurin will turn in a certain time after being added to a milk sample. This colour can be used to indicate the quality of milk. The table shows the relationship between the colour that the resazurin in the milk sample turned and the quality of the milk.

Colour obtained with sample	Quality of milk
Blue	Excellent
Mauve	Good
Pink	Fair
Pale pink	Poor
White	Bad

- 7 (a) Use your data to give the temperature or temperatures that produced milk of the worst quality in your investigation. Explain why you chose this temperature or temperatures.

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(2 marks)

- 7 (b) What are the advantages and disadvantages of describing the quality of milk as 'poor'? Explain your answer.

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(3 marks)

(Extra space)

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8 Another group of students carried out a similar investigation with resazurin. They used samples of five different types of milk. The samples were incubated at 10 °C.

8 (a) Describe how you would maintain a water bath at 10 °C.

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(1 mark)

The results of this investigation are shown in **Table 1**.

Table 1

Type of milk used	Colour after two hours
5-day-old pasteurised whole milk	Pale pink
5-day-old pasteurised semi-skimmed milk	Pink
5-day-old pasteurised skimmed milk	Mauve
UHT long life milk (milk that has been heated to 135 °C)	Blue
Sterilised milk (milk that has been heated to 120 °C for 30 minutes)	Blue

8 (b) What type of graph would you use to plot these results? Explain your choice.

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(2 marks)

8 (c) The result for sterilised milk was a blue colour. Explain why.

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(2 marks)

- 8 (d) Complete **Table 2** to show the results you would expect if the same investigation was conducted at 36 °C instead.

Table 2

Type of milk used	Colour after two hours
5-day-old pasteurised whole milk	
5-day-old pasteurised semi-skimmed milk	
5-day-old pasteurised skimmed milk	
UHT long life milk (milk that has been heated to 135 °C)	
Sterilised milk (milk that has been heated to 120 °C for 30 minutes)	

(2 marks)

- 9 How useful is a test using resazurin for estimating the size of a bacterial population in milk? Give **two** reasons to explain your answer.

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(2 marks)

RESOURCE SHEET

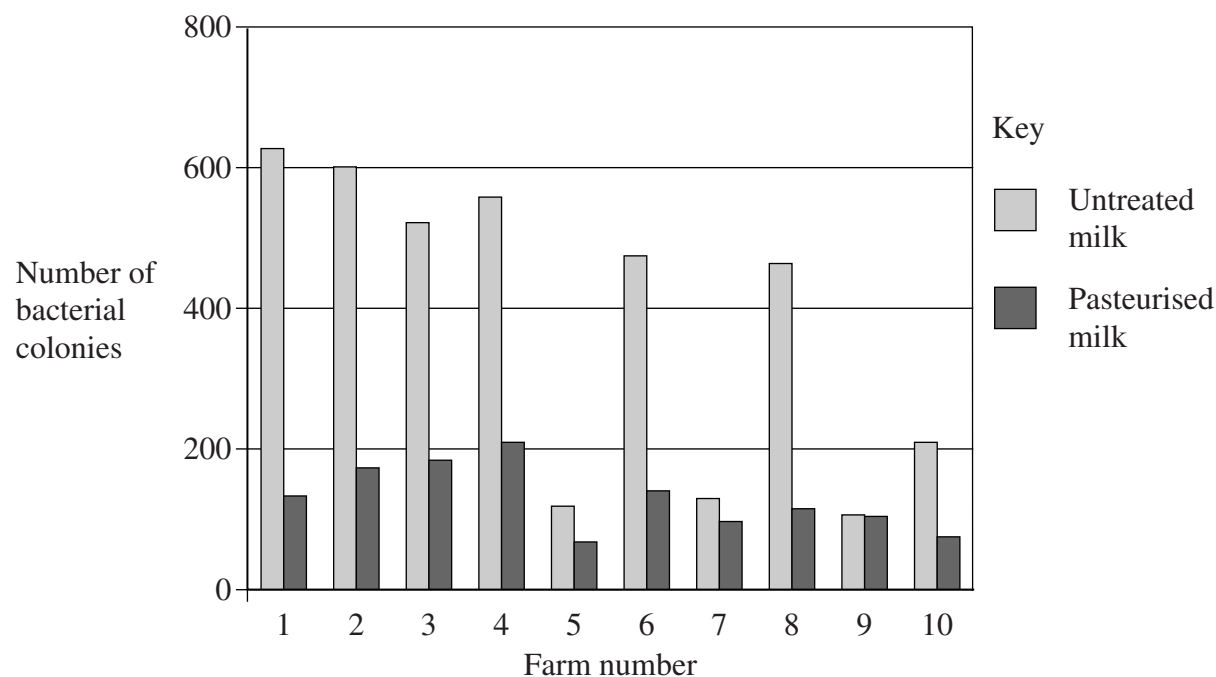
This section of the paper is about the presence of bacteria in milk. Use the information given and your own knowledge to answer the questions.

Resource A

Milk has a high nutritional value and may be an important part of the diet. However, at a suitable temperature, it is also a good growth medium for many bacteria. Pathogens can be introduced into milk if it is not collected and handled with sufficient care. Pasteurisation involves heating untreated milk to 63 °C for 30 minutes and then cooling it. The milk should then be stored below 10 °C.

A scientist wanted to obtain an idea of the number of bacteria in untreated and pasteurised milk. The scientist collected samples of milk from ten farms. He pasteurised half of each sample and left the other half untreated. The scientist then used standard plating techniques and transferred a known volume of each sample of milk to Petri dishes containing nutrient agar. He incubated these plates at 37 °C for 24 hours and counted the number of bacterial colonies. The results are shown in **Figure 1**.

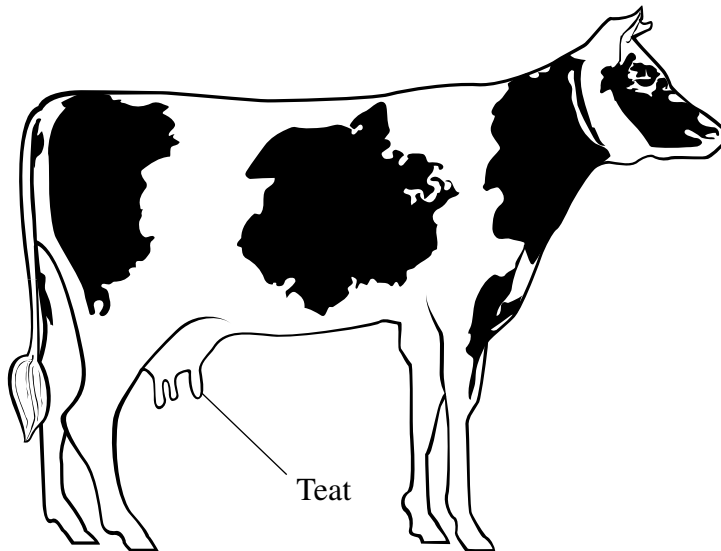
Figure 1



Resource B

In one part of the country, farmers wash the teats of cows before milking (**Figure 2**). They wash the teats in warm water and then dry them with a cloth. A scientist thought that the quality of milk from these cows was affected by how clean the teats were before milking. The scientist investigated whether additional washing of the teats with a disinfectant would reduce the number of bacteria in milk, and, thus improve its quality.

Figure 2



In this experiment, the scientist treated samples of cows in two different ways.

Treatment 1

Cows' teats washed with water, then washed with water again and dried with a cloth.

Treatment 2

Cows' teats washed with disinfectant, then washed with water and dried with a cloth.

The scientist swabbed an area of the cows' teats before and after these treatments. She then used the swabs to find the mean number of bacteria per cm^2 of the cows' teats in each sample. Her results are shown in the table below.

Treatment number	Mean number of bacteria per cm^2	
	before treatment	after treatment
1	592	140
2	456	27

Turn over ►

Resource C

An outline method for determining the size of a bacterial population in a liquid culture.

- Prepare Petri dishes containing nutrient agar
- Take a sample of the culture from a known area
- Produce known dilutions
- Use aseptic techniques
- For each dilution, spread the bacteria across the surface of the agar
- Incubate the Petri dishes
- Count the number of colonies

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 **Question 10**.

- 10** (a) Live bacteria are still present in milk after it has been pasteurised. Explain why.

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(1 mark)

- 10** (b) Some people believe that it is never safe to drink untreated milk. Use the data to explain whether you think this belief is justified or not.

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(2 marks)

- 10** (c) The number of bacteria in a sample was measured by using the *number of colonies*. Explain why.

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(2 marks)

Turn over ►

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

- 11** (a) (i) What conclusion can be drawn from treatment **1**?

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(1 mark)

- 11** (a) (ii) Treatment **1** is the control for this experiment.
Explain how it acts as the control.

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(1 mark)

- 11** (b) Which treatment shows the greater effect on the number of bacteria?
Use a calculation to support your answer.

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(1 mark)

- 11** (c) Give **three** limitations of the method used in the investigation.

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(3 marks)

- 12 Your teacher gives you a 1 cm^3 sample of fresh whole milk and Petri dishes containing 10 cm^3 nutrient agar. Use **Resource C** to describe a method that would enable you to estimate how many live bacteria there were in the milk.

Credit will be given for use of appropriate apparatus, techniques and control of relevant factors which will enable you to collect reliable data.

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(4 marks)

(Extra space)

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END OF QUESTIONS

There are no questions printed on this page

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