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Candidate Signature						Date				

For Examiner's Use Total EMPA mark	
Examiner's Initials	
Section	Mark
Task 1	
Task 2	
Section A	
Section B	
TOTAL EMPA MARK	



General Certificate of Education
Advanced Subsidiary Examination
June 2011

Biology

BIO3X

Unit 3X AS Externally Marked Practical Assignment

For submission by 15 May 2011

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • Task Sheet 2, your results and your calculations • a ruler with millimetre measurements • a calculator. 	<p>Time allowed</p> <ul style="list-style-type: none"> • 1 hour 15 minutes
<p>Instructions:</p> <ul style="list-style-type: none"> • 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. 	<p>Information</p> <ul style="list-style-type: none"> • The marks for questions are shown in brackets. • The maximum mark for this paper is 31. • You will be marked on your ability to: <ul style="list-style-type: none"> – organise information clearly – use scientific terminology accurately.
<p>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.</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>	

Teacher Declaration:

I confirm that the candidate has met the requirements of the practical skills verification (PSV) in accordance with the instructions and criteria in section 3.8 of the specification.

Practical Skills Verification	Yes <input type="checkbox"/>
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Signature of teacher Date

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Section A

These questions relate to your investigation into the effect of substrate concentration on the rate of the reaction catalysed by the enzyme chymosin.

Use your Task Sheet 2 and your results to answer the questions.

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

7 (a) You were told to place the tubes containing the milk in a water bath for at least 5 minutes before adding the chymosin. Explain why you were told to leave them for at least 5 minutes.

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(1 mark)

7 (b) Describe what you did during the investigation to minimise the effect of temperature changes.

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(2 marks)

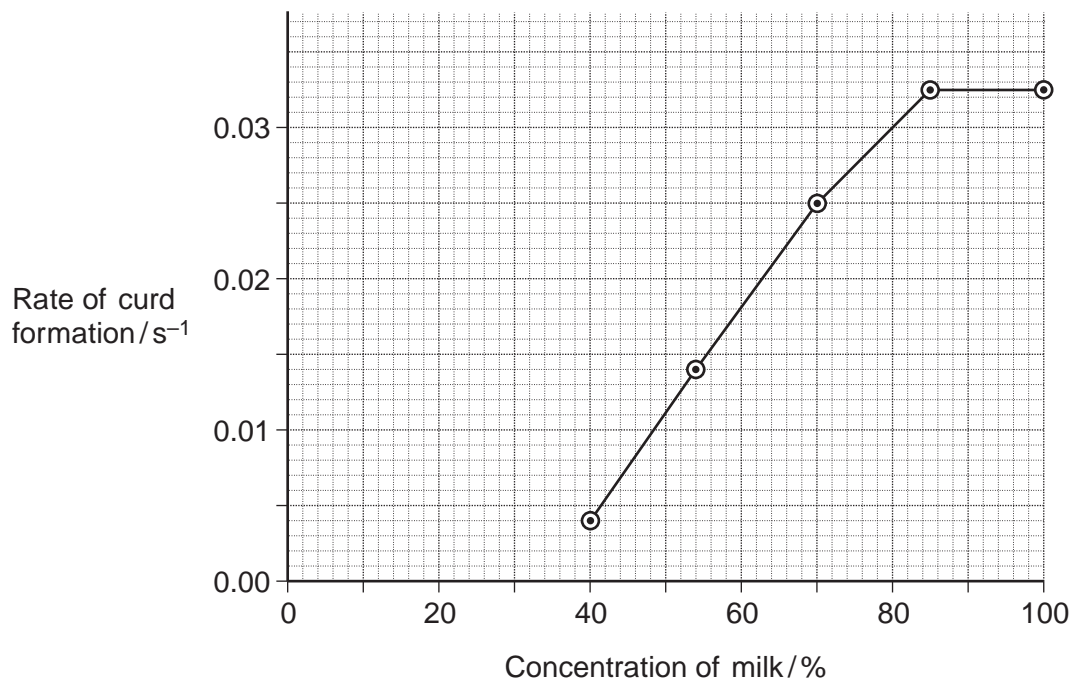
8 Another variable that affects the rate of curd formation is pH. How could you have controlled pH in your investigation?

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(1 mark)

Turn over ►

9 A student carried out a similar investigation. The graph shows her results.



9 (a) (i) Describe the results of this student's investigation.

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(2 marks)

9 (a) (ii) Explain the shape of the curve on the graph.

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(4 marks)

(Extra space)

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9 (b) The student did **not** continue the curve until it met the x-axis. Was she correct to do so? Explain your answer.

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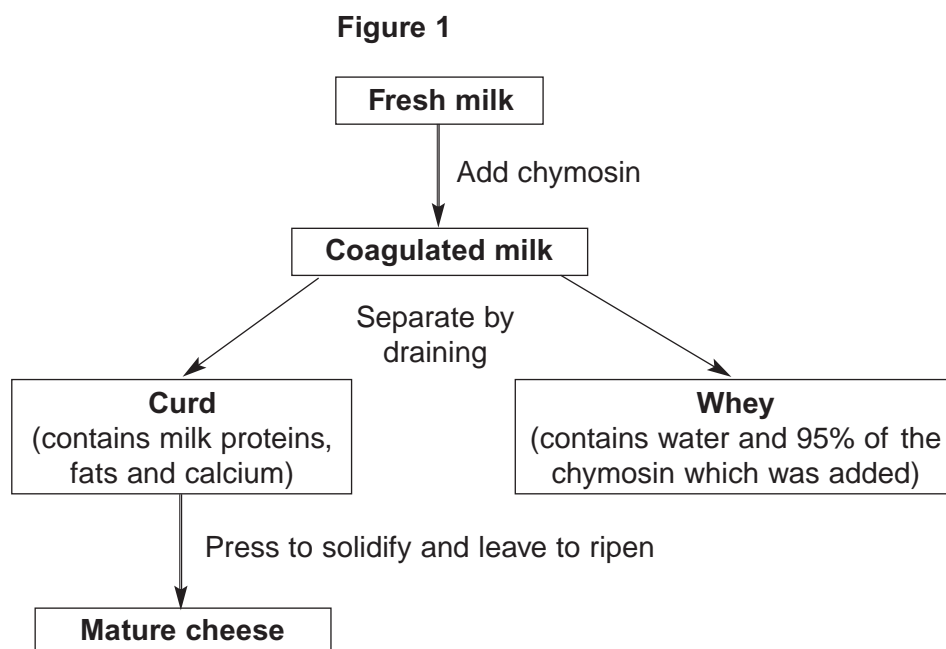
(1 mark)

11

Turn over ►

Resource Sheet**Resource A**

Figure 1 summarises the way in which cheese is made.

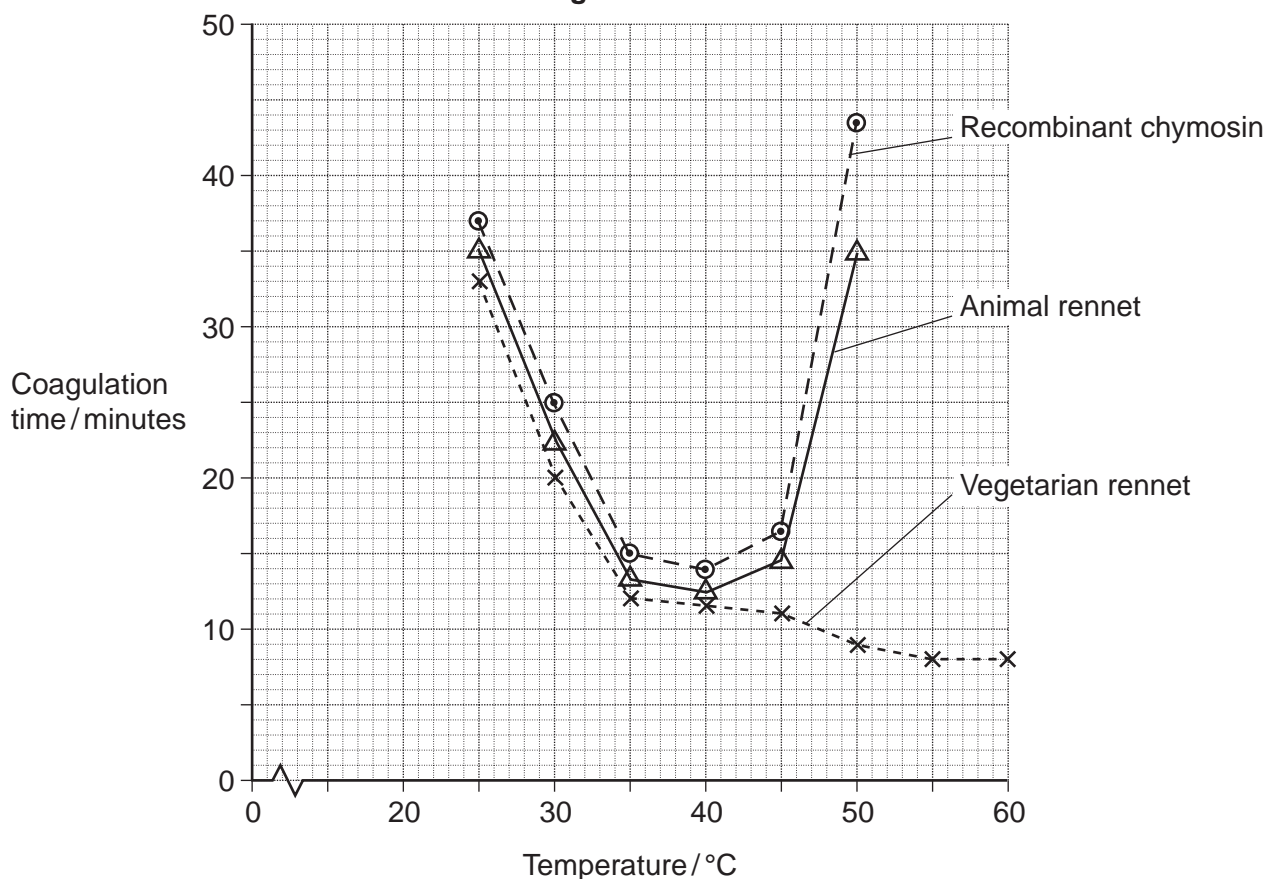
**Resource B**

Different extracts may be added to milk to make cheese. All of these extracts contain chymosin.

- Animal rennet comes from calves and lambs. Rennet from these young animals contains between 80 and 95% chymosin. It also contains between 5 and 20% of another protein-digesting enzyme called pepsin.
- Vegetarian rennet comes from fungi. It contains 100% chymosin.
- Recombinant chymosin comes from bacteria which have had an animal gene for chymosin inserted in them. It contains 100% chymosin.

Scientists investigated the effect of temperature on the time these different extracts took to coagulate milk. Their results are shown in **Figure 2**.

Figure 2



Resource C

Some people are lactose intolerant. The lactose in milk and milk products, such as cheese, causes digestive discomfort in these people.

Scientists gave 159 adult volunteers, who had diagnosed themselves as lactose intolerant, a questionnaire to complete. The volunteers were asked,

- do you eat the food?
- if you eat the food, do you feel discomfort after eating it?

The results are shown in **Figure 3**.

Figure 3

Food	Typical lactose content / g per serving	Percentage of people who			
		A do not eat the food	B feel discomfort after eating the food	C (= A + B) do not eat the food or feel discomfort after eating the food	D feel no discomfort after eating the food
Hard cheese	1.2	11.1	39.9	51.0	49.0
Pizza	3.0	10.4	57.8	68.2	31.8
Soft cheese	3.6	25.1	53.0	78.1	21.9
Ice cream	6.0	14.6	68.2	82.8	17.2
Milk	9.9	27.0	67.1	94.1	5.9

Section B

You should use the information on the **Resource Sheet** and your own knowledge to answer these questions.

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

Use **Resource A** to answer Questions **10** and **11**.

10 A student carried out a biuret test on a sample of whey. The sample turned purple. Use the flowchart to explain why.

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(2 marks)

11 The percentage of protein in mature cheese is greater than the percentage of protein in coagulated milk. Use the flow chart to explain why.

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(1 mark)

Use **Resource B** to answer Questions **12** to **15**.

12 Suggest **two** disadvantages of using animal rennet rather than recombinant chymosin as a source of chymosin for making cheese.

1

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2

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(2 marks)

13 The shape of the curve for recombinant chymosin is similar to the shape of the curve for animal rennet. Suggest why.

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(1 mark)

14 (a) Describe how the coagulation time for vegetarian rennet is different from that for animal rennet.

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(1 mark)

14 (b) Calculate the percentage reduction in coagulation time between 45 °C and 60 °C for vegetarian rennet. Show your working.

Answer%
(2 marks)

15 Explain the shape of the curve for animal rennet above 45 °C.

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(3 marks)

(Extra space)
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Turn over ►

Use **Resource C** to answer Questions **16** to **18**.

16 People who are lactose intolerant suffer discomfort after eating foods containing lactose. Give **two** symptoms of this discomfort.

1

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2

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(2 marks)

17 The scientists investigated the relationship between the lactose content of the food and the amount of digestive discomfort.

17 (a) The figures in columns **A** and **B** were used to produce those in column **C**. The scientists used column **C** rather than column **B** in their analysis. Suggest why.

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(1 mark)

17 (b) Describe the relationship between the lactose content of the food and the data in column **C**.

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(1 mark)

17 (c) The scientists could **not** conclude that the discomfort was caused by the increase in lactose content of the food. Explain why.

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(2 marks)

18 Suggest **two** reasons why the data in this table may be unreliable.

1

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2

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(2 marks)

20

END OF QUESTIONS

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