

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use Total Task 2



General Certificate of Education  
Advanced Subsidiary Examination  
June 2011

## Biology

## BIO3X/PM2

### Unit 3X AS Externally Marked Practical Assignment Task Sheet 2

To be completed before the EMPA Written Test.

For submission by 15 May 2011

**For this paper you must have:**

- a ruler with millimetre measurements
- a calculator.

## Task 2

### The effect of substrate concentration on the rate of the reaction catalysed by the enzyme chymosin

#### Introduction

Casein is a protein found in milk. Chymosin is an enzyme which breaks some of the peptide bonds in casein. The product is an insoluble polypeptide which precipitates to form a solid white curd. When all the protein has been broken down the milk turns solid.

You will now investigate how changing the concentration of casein affects the rate of curd formation by chymosin.

#### Materials

You are provided with

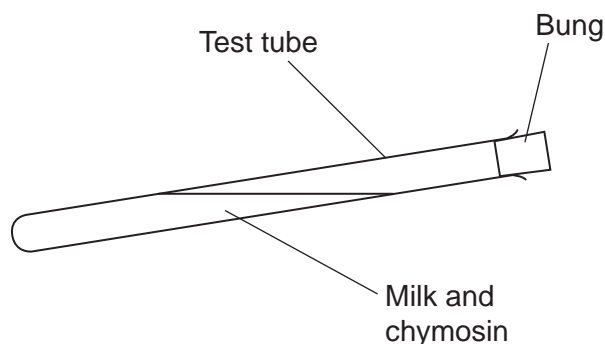
- milk
- distilled water
- chymosin solution
- Pasteur pipette
- test tubes
- bungs for test tubes
- test tube rack
- 100 cm<sup>3</sup> beakers
- 250 cm<sup>3</sup> beaker to be used as water bath
- water at 30 °C to be used in the water bath
- thermometer
- stop watch or timer
- large container to hold the waste
- pipettes or syringes
- marker pen or chinagraph pencil
- access to hot water

You may ask your teacher for any other apparatus you require.

## Outline method

Read these instructions carefully before you start your investigation.

1. Use distilled water and milk to make up  $20\text{ cm}^3$  of five different concentrations of milk in the  $100\text{ cm}^3$  beakers provided. The concentrations should be 40%, 55%, 70%, 85% and 100% (undiluted) milk.  
Complete the table in Question 4 to show the volumes of milk and water you used to make up each concentration.
2. Use the  $250\text{ cm}^3$  beaker to set up a water bath at  $30\text{ }^\circ\text{C}$ .
3. Add  $5\text{ cm}^3$  of each of the five concentrations of milk to separate labelled test tubes.
4. Place all the tubes in the water bath. Leave for at least 5 minutes.
5. Add 10 drops of chymosin solution to the 100% concentration of milk and put a bung in the tube.
6. Hold the tube nearly horizontal as shown in the diagram. Keeping the tube nearly horizontal, gently mix the contents by rotating the tube several times.



7. Rotate the tube every 10 seconds.
8. Record the time taken for the first white curd to appear on the side of the tube in a table in Question 5.
9. Repeat steps 5 to 8 with the other four concentrations of milk.

You should decide for yourself

- how to minimise the effect of temperature changes.

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

- 4 Volumes of milk and water you used to make up 20 cm<sup>3</sup> of milk at each concentration**

	Concentration of milk / %				
	40	55	70	85	100
Volume of milk / cm <sup>3</sup>					20
Volume of water / cm <sup>3</sup>					0

(1 mark)

**Presenting data**

- 5** Record your data in a table in the space below. Hand in this sheet at the end of each practical session. (3 marks)

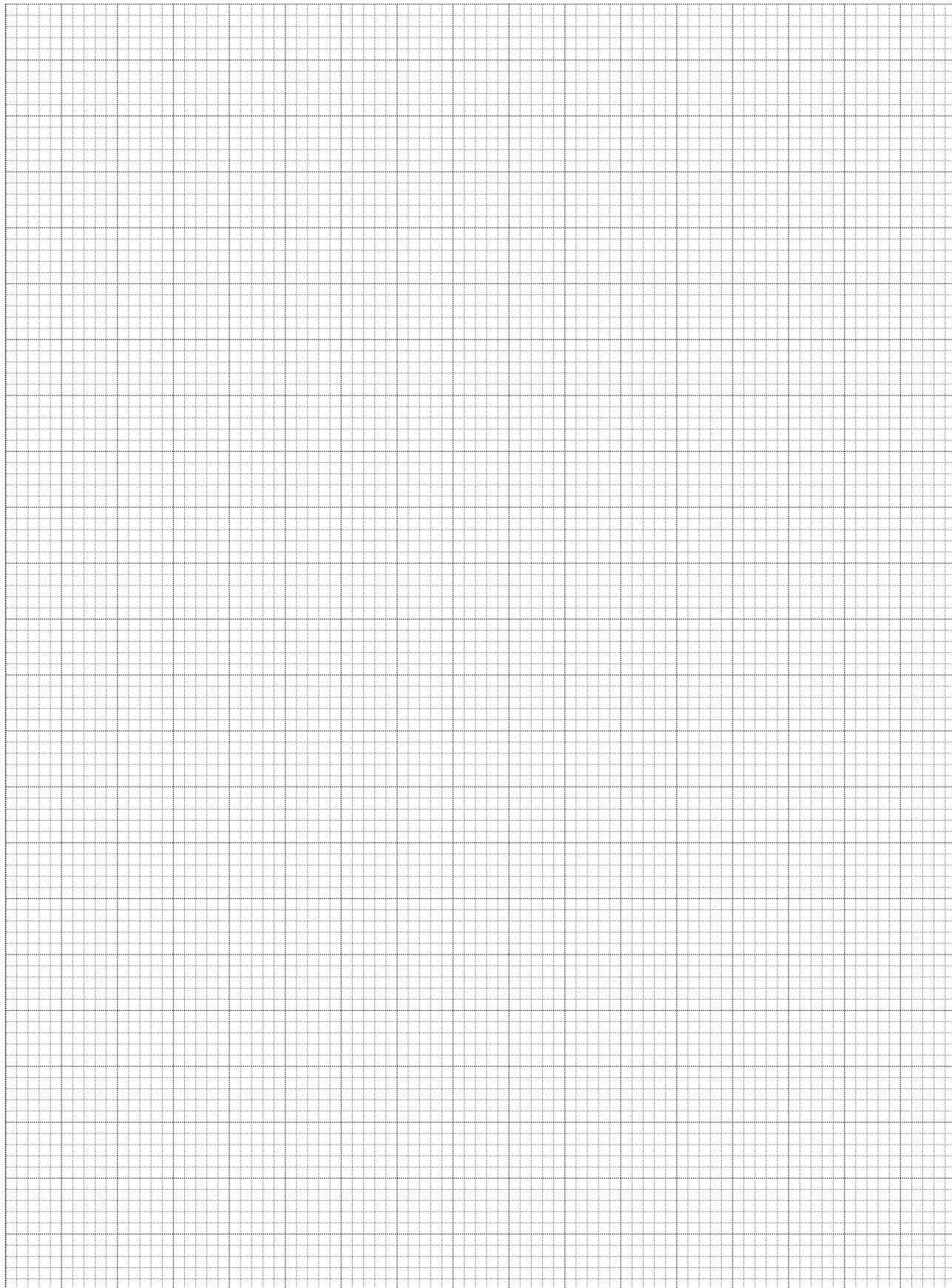
You will be awarded up to 2 marks for the quality of your practical work. (2 marks)

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**6** Use the space below to process your data.

Use the graph paper provided to plot a graph of your processed data.

(6 marks)



**END OF TASK 2**

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