UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| CANDIDATE NAME | | | | | | | | | |
| CENTRE NUMBER | | | | | | CANDIDATE NUMBER | | | |



**BIOLOGY** **9700/36**

Advanced Practical Skills 2 **October/November 2010**

**2 hours**

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black ink.
You may use a pencil for any diagrams, graphs or rough working.
Do **not** use red ink, staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **both** questions.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
| Total | |

This document consists of **9** printed pages and **3** blank pages.

**You are reminded that you have only one hour for each question in the practical exam. You should read carefully through the whole of each question and then plan your us the time to make sure that you finish all of the work that you would like to do.**

**You will gain marks for recording your results according to the instructions.**

**1** Solution **E** contains an enzyme which coagulates (clots) milk.

You are required to investigate the independent variable, temperature, on the progress of this enzyme-catalysed coagulation.

When a mixture of milk and enzyme is gently rotated the coagulation goes through the stages shown in Fig. 1.1. Stage **3** is the end-point of the enzyme-catalysed coagulation.

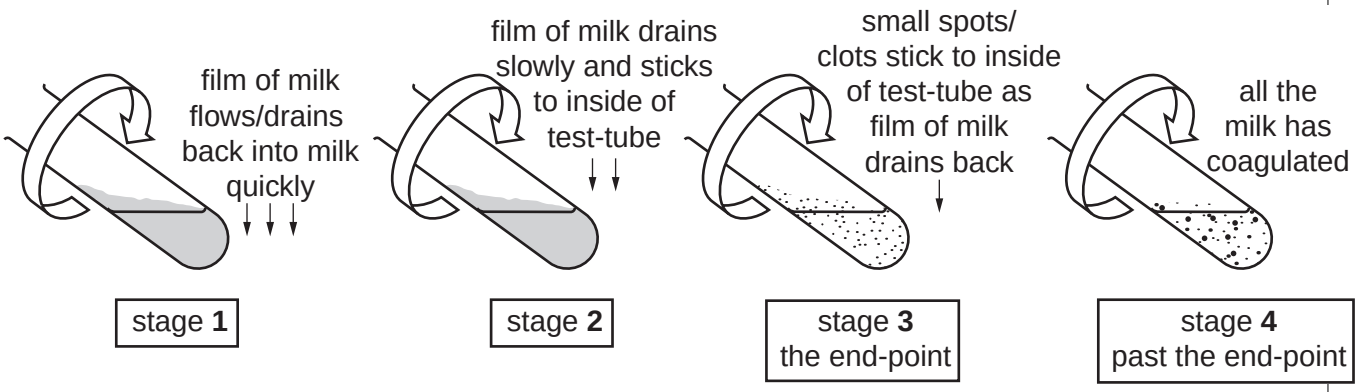



**Fig. 1.1**

You are provided with

| labelled | contents | hazard | volume / $cm^3$ |
|---|---|---|---|
| **E** | rennin solution | irritant | 20 |
| **C** | calcium chloride solution | irritant | 20 |
| **M** | milk | none | 100 |

**(a) (i)** Decide on the temperatures you plan to use in the range (between) 25 °C to 45 °C.

Record the temperatures you have chosen in the space below.

.....

..... [2]

Proceed as follows:

1. Label the test-tubes with the temperatures you have chosen.

2. Put 10 $cm^3$ of **M** into each test-tube.

3. Add 1 $cm^3$ of solution **C** to each test-tube.

4. Gently shake the test-tube to mix **M** and solution **C**.

5. Adjust the temperature of the water-bath you are provided with to your highest chosen temperature.

6. Record the actual temperature of the water-bath.

7. Put the test-tube, labelled with your highest temperature, into the water-bath and leave for three minutes.

8. Remove the test-tube from the water-bath and add 1 $cm^3$ of solution **E**, so that it runs down the side of the test-tube to form a layer on the surface of the milk as shown in Fig. 1.2.

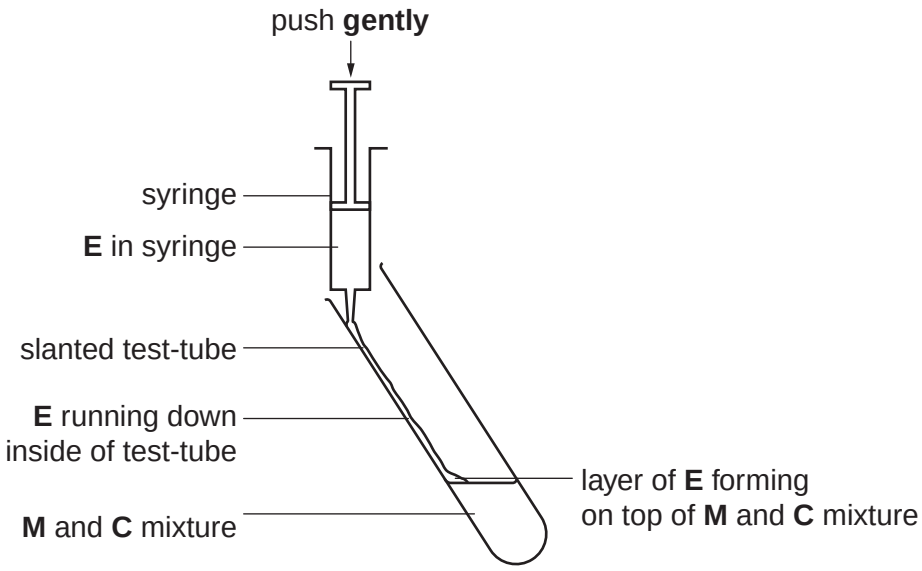



**Fig. 1.2**

9. Mix solution **E** with the milk by gently shaking the test-tube.

10. Start timing and gently rotate the test-tube as shown in Fig. 1.1 to form a film of milk on the inside of the test-tube. Continue to rotate the test-tube and record the time to reach the end-point as shown in stage **3** in Fig. 1.1. Ignore any small bubbles on the inside of the test-tube.

11. Adjust the water-bath to your next highest temperature.

12. Repeat steps 4 to 11.

**(ii)** Prepare the space below and record your results.

[4]

**(iii)** From your results, state the temperature at which the activity of the enzyme was **lowest**.

.....[1]

**(iv)** Identify **two** significant sources of error in this investigation.

.....

.....

.....

.....

.....

..... [2]

**(v)** Describe a suitable control for this investigation.

.....

..... [1]

**(vi)** Suggest how you could make this investigation as reliable as possible.

.....

..... [1]

In a similar investigation a student studied the effect of the independent variable on the coagulation of milk.
The results are shown in Table 1.1.

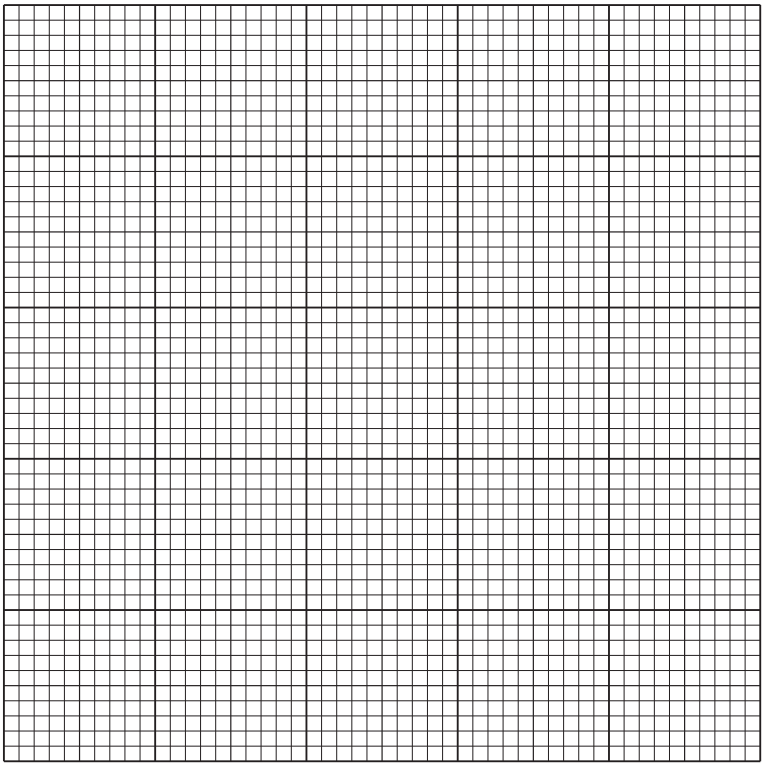
**Table 1.1**

| | activity of milk clotting enzyme / arbitrary units | | | | | |
|---|---|---|---|---|---|---|
| **pH of milk** | **trial 1** | **trial 2** | **trial 3** | **trial 4** | **trial 5** | **mean** |
| 6.02 | 8.8 | 8.7 | 8.9 | 8.2 | 8.7 | |
| 6.22 | 6.8 | 6.8 | 6.8 | 6.7 | 6.9 | 6.8 |
| 6.40 | 4.9 | 4.3 | 4.4 | 4.3 | 4.4 | 4.4 |
| 6.64 | 1.1 | 1.0 | 1.0 | 0.9 | 1.0 | 1.0 |
| 6.70 | 0.7 | 0.6 | 1.1 | 0.5 | 0.7 | 0.6 |

**(b) (i)** Three of the values in Table 1.1 are anomalous. Draw a circle around each of these values. [1]

**(ii)** Complete Table 1.1 by calculating the missing value. [1]

**(iii)** Plot a graph of the data shown in Table 1.1.



[4]

**(iv)** Explain the relationship between pH and the enzyme shown in the data.

.....

.....

.....

.....

.....

..... [3]

[Total: 20]

**2** **N1** is a stained transverse section through part of a tubular organ from an animal.

**(a)** **(i)** Draw a large plan diagram showing the features of the wall of the organ.

Label the position of the lumen.

[4]

**(ii)** Annotate (make notes with label lines) your diagram to show one difference between the outside layers and the inside layers. [1]

**(b) (i)** Fig. 2.1 is a photomicrograph of a stained transverse section through an [illegible] from an animal. The tissue has been stained with special dyes to show the [illegible] and nuclei.

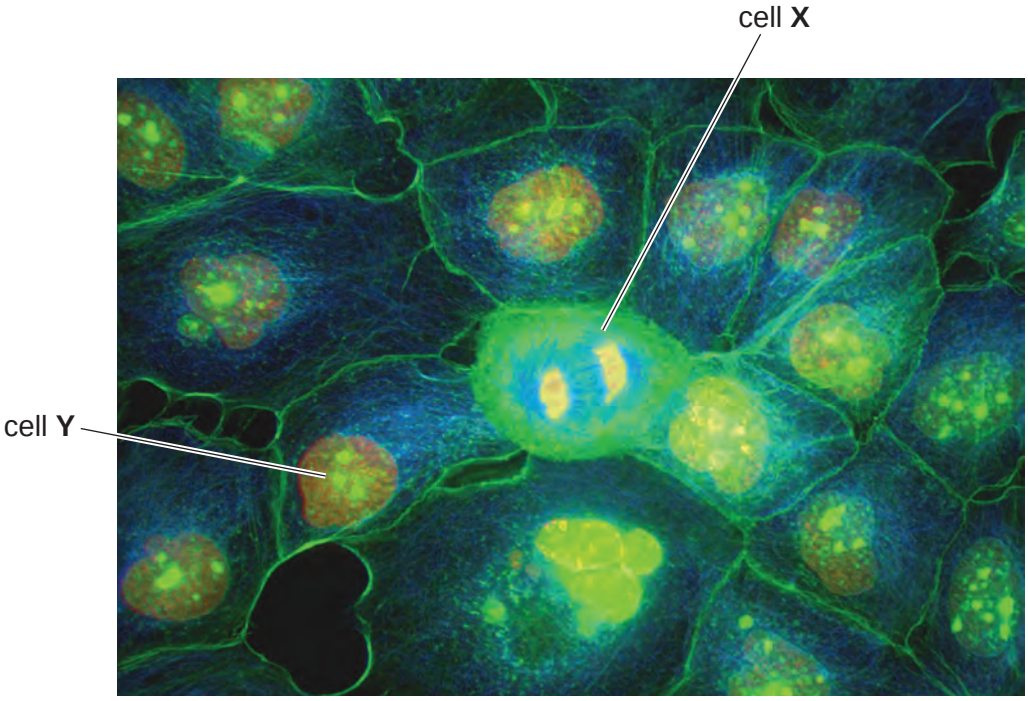



**Fig. 2.1**

The actual diameter of the nucleus in the cell labelled **Y** is 7.8 μm.

Use this information to calculate the actual mean diameter of the three largest nucleoli in cell **Y**.

You may lose marks if you do not show your working or if you do not use appropriate units.

**(ii)** Suggest how you would make the measurement of each nucleolus more ac

.....

..... [1]

**(iii)** Make a large drawing of the cell labelled **X** with three complete cells touching cell **X**.

[5]

**(iv)** Prepare the space below so that it is suitable for you to compare the cells labelled **X** and **Y**.

[5]

[Total: 20]

BLANK PAGE

BLANK PAGE

**BLANK PAGE**