UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

CO-ORDINATED SCIENCES   **0654/52**

Paper 5 Practical Test   **May/June 2012**

                                                               2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in Instructions to Supervisors

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 pen.
You may use a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Chemistry practical notes for this paper are printed on page 12.

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	
3	
Total	

This document consists of **11** printed pages and **1** blank page.

UNIVERSITY *of* **CAMBRIDGE**
International Examinations

[Turn over

1 You are going to investigate the digestion of fat in milk by the combined actions of the enzyme lipase and bile.

(a) • Half fill a $500\,cm^3$ beaker with the hot and cold water provided to make a water bath with a temperature between 35 °C and 40 °C. It may be necessary to add more hot water to maintain this temperature range.

• Using a measuring cylinder, place $7\,cm^3$ of sodium carbonate solution into each of tubes **A**, **B** and **C**.

• Using a measuring cylinder, place $5\,cm^3$ of full fat milk into each of tubes **A**, **B** and **C**.

• Place 5 drops of phenolphthalein indicator solution into each of tubes **A**, **B** and **C**.

• Using a syringe, place $1\,cm^3$ of water into tube **B** only.

• Using a syringe, place $1\,cm^3$ of bile salts into each of tubes **A** and **C**.

• Place all three tubes into the water bath and leave them for 10 minutes, remembering to maintain the temperature range as above.

  During this 10 minutes continue with part (e).

• After 10 minutes, using a syringe, add $1\,cm^3$ **boiled** lipase solution to tube **A** and mix. Immediately, using a syringe, add $1\,cm^3$ of **unboiled** lipase to tubes **B** and **C** and mix. Leave all three tubes in the water bath.

• Start the timer.

• Record in Table 1.1 the time taken, in seconds, for the pink colour of the mixtures to disappear. If no colour change has occurred after 10 minutes, record 'no change'.

Table 1.1

tube	A	B	C
lipase	boiled	unboiled	unboiled
bile salts	present	absent	present
time taken for pink colour to disappear / s			

[4]

(b) Lipase breaks down fat into fatty acids. Sodium carbonate is a weak alkali. Phenolphthalein is an indicator. If the solution has a pH of above 8, it is pink. If the pH is less than 8, it is colourless.

If any of the solutions turned from pink to colourless, suggest and explain why the solution changed colour.

....

....

.... [2]

(c) Using your knowledge of the action of bile during digestion, explain any difference in your recorded time taken between tube **B** and tube **C**.

....

....

....

.... [3]

(d) (i) Suggest **one** source of error in the experiment.

....

.... [1]

(ii) Suggest why the experiment was performed at a temperature between 35 °C and 40 °C.

.... [1]

(e) • Using a measuring cylinder, place $5 \, cm^3$ of fresh full fat milk into each of tubes **D** and **E**.

• Add 5 drops of iodine solution into tube **D** and mix. Record in Table 1.2 the colour of the resulting solution and suggest a reason for the colour.

• Using a measuring cylinder, place $5 \, cm^3$ of biuret reagent into tube **E** and mix. Record in Table 1.2 the colour of the resulting solution and suggest a reason for the colour.

Table 1.2

tube	D	E
colour of solution		
reason for colour		

[4]

2 You are going to find the density of a material used to make plastic pipes. You will use two different methods to find the volume of the piece of pipe.

(a) (i) Use the balance provided to find the mass in grams, **M**, of your piece of plastic pipe.
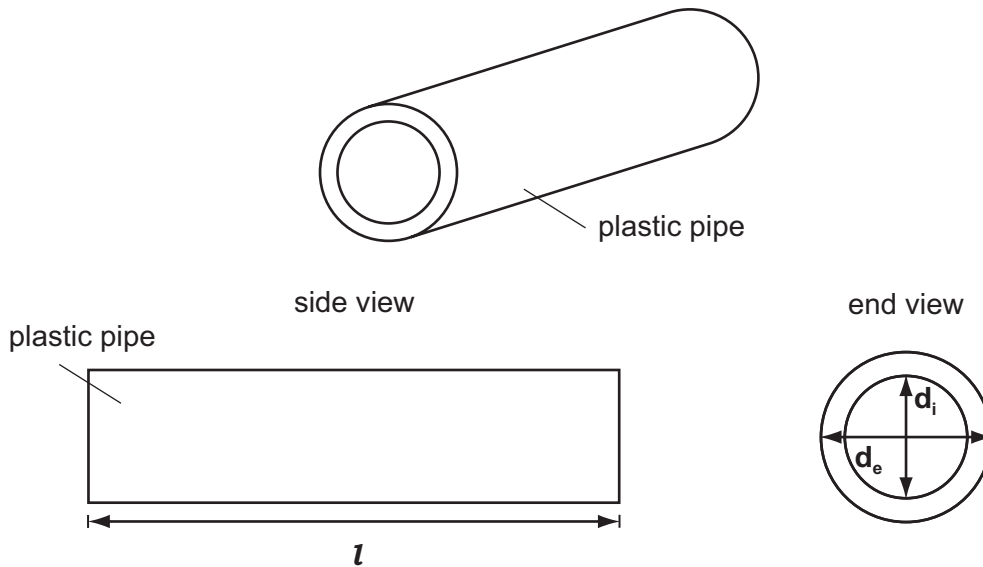
Record your answer to 1 decimal place.

M = ... g [1]

Fig. 2.1

(ii) Method 1

Measure the length, l, the external diameter, d_e, and the internal diameter, d_i, in centimetres as shown in Fig. 2.1, of your piece of plastic pipe.

Record your measurements below.

length, l = ...

external diameter, d_e = ...

internal diameter, d_i = ... [2]

(iii) Use your values of external and internal diameters, in cm, to calculate **k** from the formula below.

$$k = d_e^2 - d_i^2$$

k = ... cm^2 [2]

(iv) Use your values in **(a)(ii)** and **(a)(iii)** to calculate the volume **V**, in cm^3, of the piece of pipe using the formula below.

$$V = \frac{\pi\,k\,l}{4}$$

V = ... cm^3 [1]

(v) Use your values in **(a)(i)** and **(a)(iv)** to calculate the density of the plastic in this piece of pipe.

Show clearly any formula you use.

(method **1**) density of plastic = ... g/cm^3 [2]

(vi) In this method for finding the density of a material, the volume is calculated from its dimensions. When would this method be unsuitable for finding the density of the material of an object?

....

.... [1]

(b) (i) Method 2

Exactly fill the 250 cm^3 measuring cylinder with water up to the 150 cm^3 mark. Attach the thread to the metal weight and lower it into the water until it is fully immersed.

Read the new water level in the measuring cylinder and record the volume reading in Table 2.1. [1]
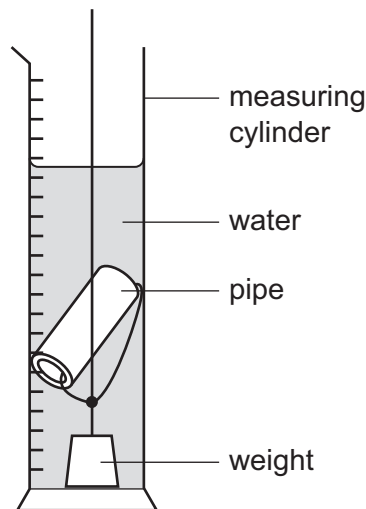
Table 2.1

	volume / cm^3
water and metal weight	
water, metal weight and piece of pipe	

(ii) Remove the metal weight from the water, dry with a paper towel, and attach it to the piece of plastic pipe using the thread. If necessary, adjust the volume of water in the measuring cylinder to read exactly 150 cm^3.

Carefully lower the metal weight and piece of pipe into the water in the measuring cylinder until they are both fully immersed as in Fig. 2.2.

Read the new water level in the measuring cylinder and record the volume reading in Table 2.1.

Fig. 2.2

[1]

(iii) Using the volume readings in Table 2.1, calculate the volume of the material in the piece of pipe.

volume of material in pipe = ... cm³   [1]

(iv) Use your values in **(a)(i)** and **(b)(iii)** to calculate the density of the plastic in this piece of pipe.

(method **2**) density of plastic = ... g/cm³   [1]

(c) (i) Which of the two methods, **1** or **2**, is the more accurate? Explain your answer.

Method .... is more accurate because ....

.... [1]

(ii) The plastic pipe floats in water because it has a density less than that of water which is 1000 kg/m³. Convert your answer in **(b)(iv)** from g/cm³ to kg/m³.

density of plastic = ... kg/m³   [1]

3 You are going to find out how much heat is produced in the reaction between solid **A** and solution **B**.

(a) (i) Using the thermometer measure the temperature of solution **B**. Record the value to the nearest half degree, in Table 3.1 in the appropriate space, for time = 0 min. [1]

Table 3.1

time / min	temperature / °C
0	
0.5	
1.0	
1.5	
2.0	
2.5	
3.0	
3.5	
4.0	
4.5	
5.0	
5.5	
6.0	
6.5	
7.0	

(ii) • Place all of the solid **A** into the plastic cup.

• Using the measuring cylinder measure out 25 cm^3 of solution **B**. Add this quickly to solid **A** in the plastic cup. Start the stopclock.

• Stir the mixture thoroughly.

• Measure the temperature of the mixture every half minute for seven minutes, stirring throughout and recording the values to the nearest half degree in Table 3.1. [3]

(iii) Record any changes to the appearance of the solid and to the solution in Table 3.2.
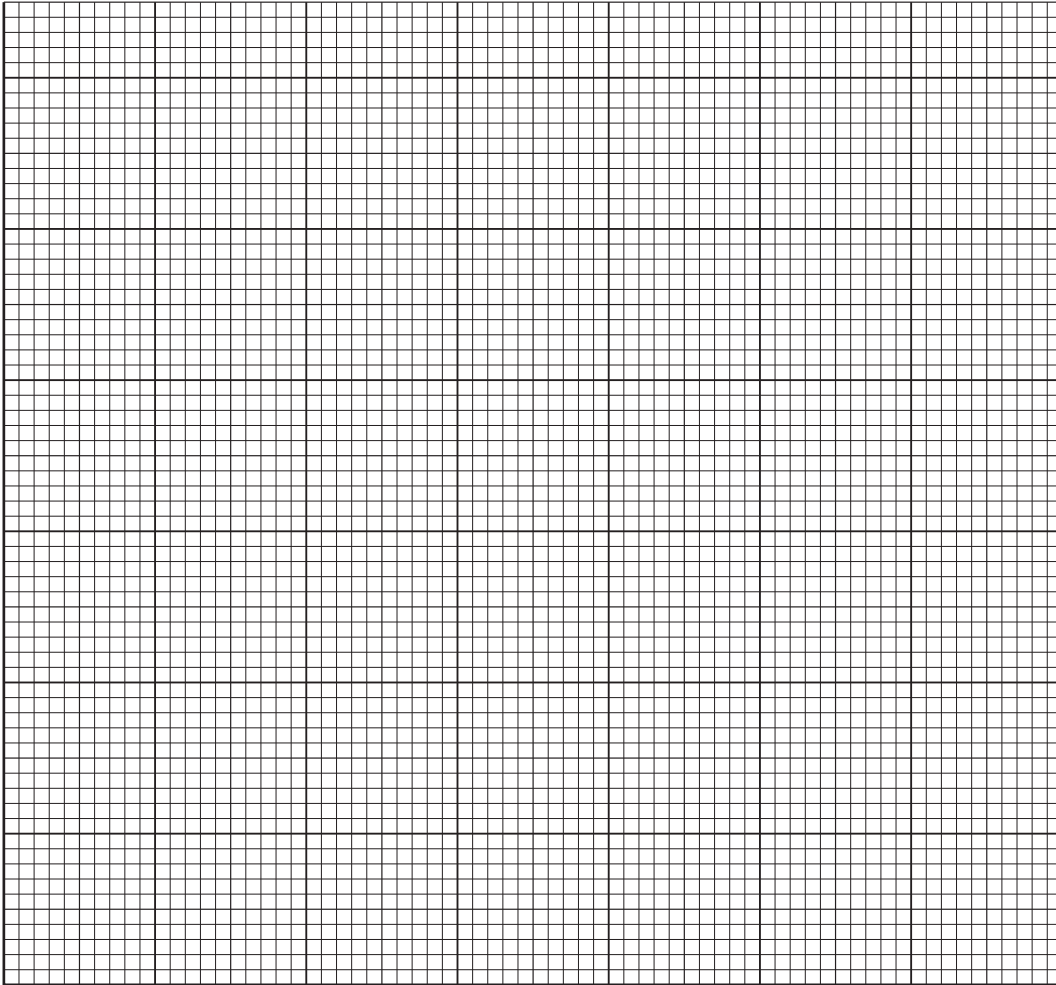
Table 3.2

observations	solid A	solution B
before the reaction	grey	blue
after the reaction		

[2]

(b) (i) Using the data in Table 3.1, plot a graph of temperature (vertical axis) against time on the grid provided. Draw a smooth curve through the points.

[4]

(ii) Use your graph to find the maximum temperature rise, Δ**T**, in this reaction.

Δ**T** = ... °C   [1]

(iii) Calculate **E**, the energy given out by the reaction using the formula below.

E = volume of solution **B** $\times$ 4.2 $\times$ Δ**T**

E = ... J   [2]

(c) (i) Suggest a modification to the apparatus (not the chemicals) that will mean that less heat is lost to the surroundings during the experiment.

....

.... [1]

(ii) Complete the following sentence.

In this reaction .... energy has been transformed

into .... energy. [1]

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CHEMISTRY PRACTICAL NOTES

Test for anions

anion	test	test result
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify then add aqueous barium chloride *or* aqueous barium nitrate	white ppt.

Test for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
ammonium (NH_4^+)	ammonia produced on warming	-
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

Test for gases

gas	test and test results
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	"pops" with a lighted splint
oxygen (O_2)	relights a glowing splint