UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

1444211402

CO-ORDINATED SCIENCES **0654/52**

Paper 5 Practical Test **May/June 2011**

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 (a) You are going to investigate the energy content of bread.

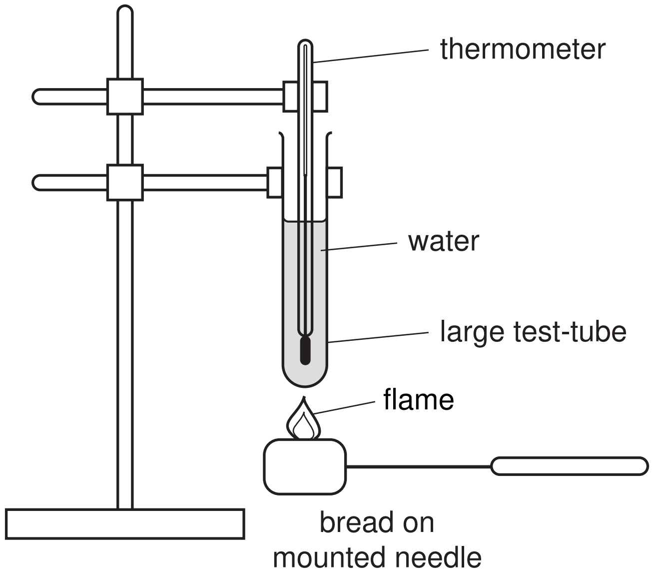


Fig. 1.1

- Clamp a large test-tube as shown in Fig. 1.1.
- Measure 20 cm^3 of water. Put this into the large test-tube.
- Clamp the thermometer in the large test-tube as shown in Fig. 1.1. Ensure the thermometer is in the water.
- Read the temperature of the water, $\mathbf{t_s}$, and record it in Table 1.1.
- Record the mass of the bread, $\mathbf{m_b}$, in Table 1.1.
- Using a mounted needle pick up the piece of bread ($\mathbf{m_b}$). Ignite the bread by placing it into a flame.
- Quickly place the burning bread under the test-tube so that it heats the water.
- If the bread stops burning, re-ignite it by placing it back into the flame.
- Record the maximum temperature, $\mathbf{t_m}$, of the water.

Table 1.1

starting temperature t_s / °C	**maximum temperature t_m / °C**	**temperature rise T / °C**	**mass of bread m_b / g**	**mass of water m_w / g**
				20

[3]

(i) Calculate **T**, the temperature rise of the water, using the formula $\mathbf{T} = (\mathbf{t_m} - \mathbf{t_s})$ and record it in Table 1.1.

T = ... °C [1]

For Examiner's

(ii) The energy content of the bread can be determined by the following formula.

$$E = \frac{0.084 \times \mathbf{T}}{\mathbf{m_b}}$$

Calculate the energy content of the bread using the formula.

Show your working.

energy content of the bread .... kJ/g [2]

(iii) Is the energy content that you calculated likely to be accurate and close to the true energy content?

Explain your answer.

....

....

....

.... [2]

(iv) Suggest **one** way in which the accuracy of the experiment could be improved.

....

.... [1]

(b)
- Label three hard glass test-tubes **A**, **B**, and **C** and put into the test-tube rack.
- Place a piece of fresh bread into each test-tube.
- Add about 5 cm^3 of water and gently break the bread up using a glass rod.
- Add four drops of iodine solution to **tube A**. Record the colour change of the solution, if any, in Table 1.2.
- Add about 5 cm^3 of Benedict's solution to **tube B** and place in a hot water bath for 5 min. Record the colour change of the solution, if any, in Table 1.2.
- Add about 5 cm^3 of biuret solution to **tube C**. Record the colour change of the solution, if any, in Table 1.2.

Table 1.2

	iodine (tube A)	**Benedict's (tube B)**	**biuret (tube C)**
colour change	from .... to	from .... to	from .... to ....
conclusion	....	....	....

Use the information you have recorded in Table 1.2 to draw conclusions about the chemical composition of bread. [6]

2 You are going to find the mass of a metre rule using the principle of moments.

- Push the pin into the cork.
- Clamp the cork so that the pin protrudes horizontally as shown in Fig. 2.1.
- Suspend the rule from the pin at the 100 mm mark as shown in Fig. 2.2. Ensure the rule is free to pivot about the pin.
- Attach the other end of the rule to the newton meter, at the 900 mm mark, as shown in Fig. 2.2.
- Suspend the newton meter from the clamp and stand as shown in Fig. 2.2.
- Attach the 500 g mass at the 200 mm mark on the rule.
- Make the rule horizontal by adjusting the height of the clamp holding the newton meter.

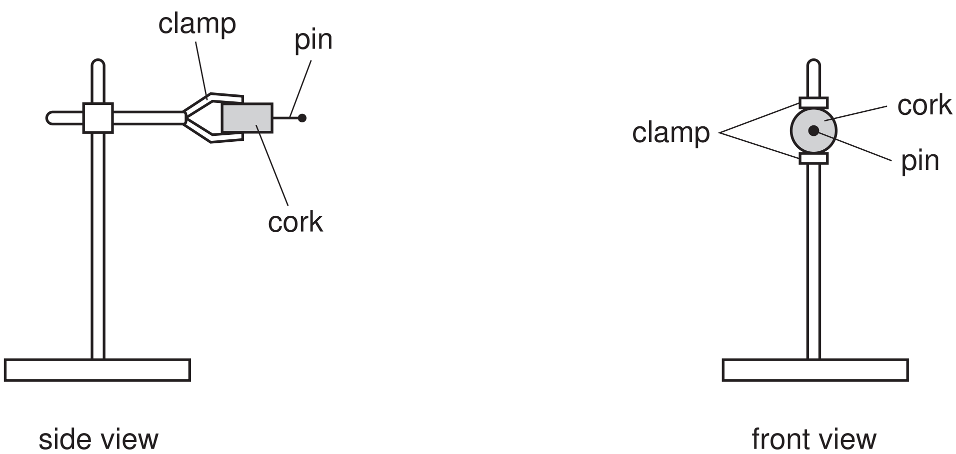


Fig. 2.1

Fig. 2.2 shows the apparatus when set up.

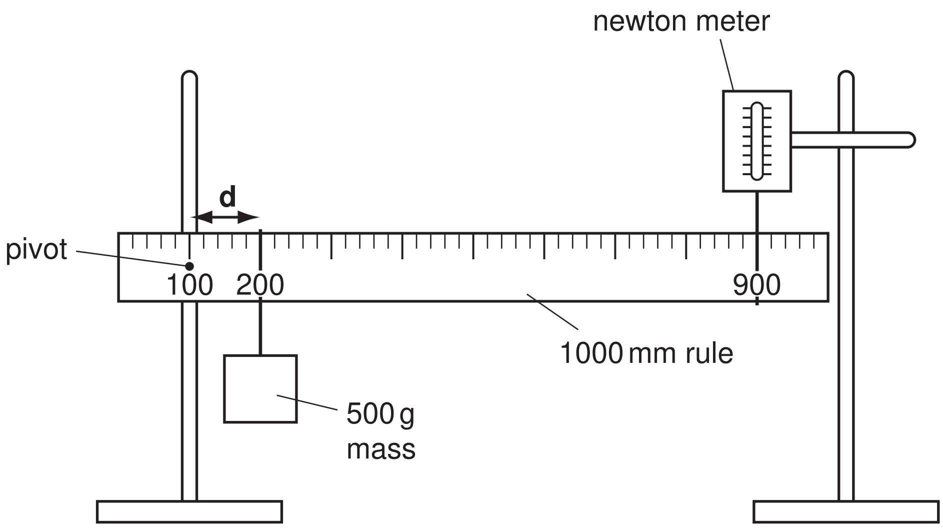


Fig. 2.2

(a) (i) Record the distance **d**, from the pivot to the mass, as shown in Fig. [obscured] Table 2.1.

(ii) Read the force shown on the scale of the newton meter.

Record this value in Table 2.1.

(b) (i) Move the 500 g mass to the 250 mm mark on the rule. Read the newton meter again.

Record the value of **d** and the force in Table 2.1.

(ii) Repeat **three** more times, moving the mass 50 mm nearer the centre of the rule each time.

Table 2.1

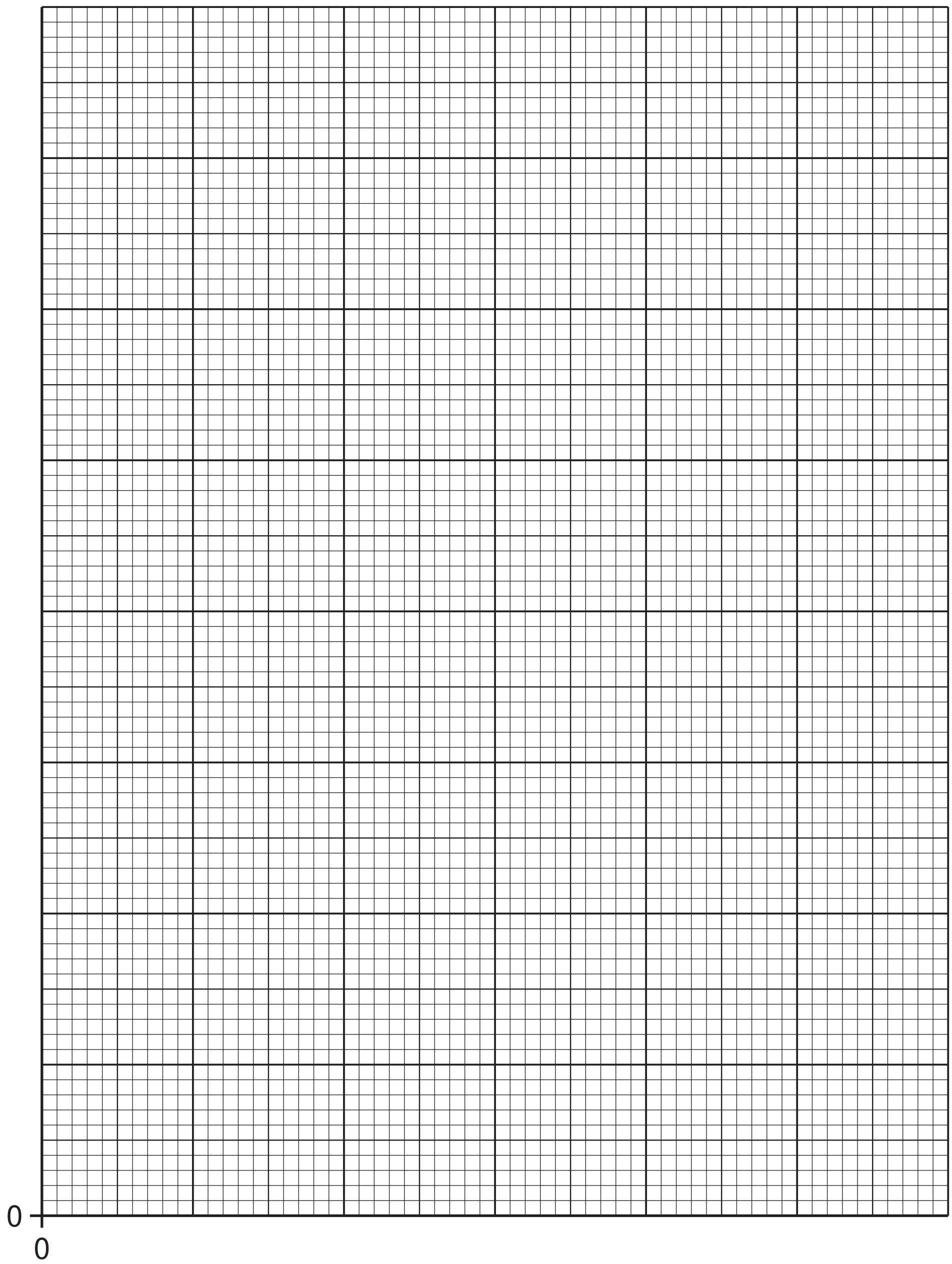
d / mm	force / N

[4]

For Examiner's

(c) (i) Plot a graph of force (vertical axis) against distance.

Draw the best straight line through your points. The line will **not** pass through the point (0,0). [4]



(ii) Extend the line so that it cuts the vertical axis. [1]

(d) (i) Read off the value of the force when the distance **d** = 0.

value of force = ... N [1]

(ii) Convert the force into a mass, **m**, in grams. Remember that the force of gravity on 100 g is 1.0 N.

mass **m** = ... g [1]

(iii) The mass of the rule is equal to 2 **m**.

Using your value from **(d)(ii)**, calculate the mass of the rule.

mass of the rule = ... g [2]

(e) The accuracy could be improved by making sure the rule is exactly horizontal before taking readings.

Suggest **one** way by which you could make sure the rule is horizontal.

....

....

.... [2]

3 **X** is a mixture of two compounds each containing different ions. Carry out the following tests to identify all the ions in the compounds.

(a) What is the colour of solid **X**? .... [1]

(i) Place about 10 cm^3 of water into the large test-tube. Add all of the solid **X** and stopper the tube. Shake the contents for about a minute. Filter the contents of the test-tube.

Keep the filtrate for testing in part **(b)**. Keep the residue in the filter paper in the funnel for testing in part **(c)**.

(ii) What is the colour of the

residue on the filter paper, ...

filtrate? .... [2]

(b) Carry out the following tests on the filtrate from **(a)**, recording all your observations.

(i) Place about 1 cm^3 of the filtrate into a clean test-tube. Gradually add aqueous sodium hydroxide until there is no further change.

observation .... [2]

(ii) Place another 1 cm^3 portion of the filtrate into a clean test-tube. Add aqueous ammonia, a little at a time until there is no further change.

observations ....

....

.... [3]

(iii) To another 1 cm^3 portion of the filtrate, add a few drops of dilute hydrochloric acid followed by aqueous barium chloride.

observation .... [1]

(iv) Name the **two** ions in the filtrate.

cation ....

anion .... [2]

(c) Add about 2 cm^3 of dilute hydrochloric acid to the residue in the filter paper fr[...] collecting the filtrate for use in test **(d)**.

Record any observations and name the anion in the residue.

observations .... [1]

name of anion .... [1]

(d) **(i)** Slowly add aqueous sodium hydroxide to the filtrate from **(c)**, to make the solution alkaline.

Record your observation.

observation .... [1]

(ii) Suggest the name of the cation in the filtrate.

name of cation .... [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