UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

6825597462

COMBINED SCIENCE **0653/52**

Paper 5 Practical Test **October/November 2010**

1 hour 30 minutes

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 **10** printed pages and **2** blank pages.

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UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

For Examiner's Use

1 (a) (i) Some fruit juices contain protease enzymes.

You will be investigating fruit juices to find if they digest proteins. You will find out if a sample of protein loses mass after immersion in the juice.

- Label four pieces of paper towel **1**, **2**, **3** and **4**.
- Put four large test-tubes into a test-tube rack or beaker. Label them **1**, **2**, **3** and **4**.
- Divide the solid protein into four pieces, each about the same size.
- Weigh the first piece of protein and record the mass in Table 1.1.
- Cut this piece of protein into approximately 10 pieces. Put the pieces into the tube **1**.
- Treat the remaining three pieces of protein in the same way for tubes **2**, **3** and **4**.

Table 1.1

test-tube number	**1**	**2**	**3**	**4**
mass of protein / g				
type of juice				

- Measure 20 cm^3 of **juice 1** and add this to tube **1**. Record the type of fruit juice in Table 1.1.
- Add 20 cm^3 of **juice 2** to tube **2**, recording the type of fruit juice in Table 1.1.
- Repeat this with the remaining two fruit juices, **juice 3** and **juice 4**. [2]

(ii) Using the hot water provided make a water bath with a temperature of 50 ºC in a large beaker. Stand all four tubes in this for 10 minutes. Monitor the temperature during this time. If the temperature falls below 40 ºC add more hot water to keep the temperature between 40 ºC and 50 ºC.

During this time create a table for the results of the four tubes. This should include the **type of juice**, the **mass of protein at the start**, the **mass of protein at the end**, and the **change in mass**.

[2]

(b) After 10 minutes do the following.

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- Carefully pour off and discard the fruit juice from tube **1** into a beaker. Place all the pieces of protein on towel no. **1** and blot the protein dry.
- Weigh all the pieces of protein together and record the mass in the table you have made.
- Repeat this with the protein in tubes **2**, **3** and **4**.

Calculate the change in mass for the protein from each tube and enter in your table. [4]

(c) Which fruit juice showed the greatest protease activity?

Explain your answer.

fruit juice ....

explanation ....

.... [2]

For Examiner's Use

2 You are going to measure the refractive index of a semi-circular block by two different methods.

(a) (i) Place the semi-circular block on the grid, Fig. 2.3, with its curved edge downwards as shown in Fig. 2.1.

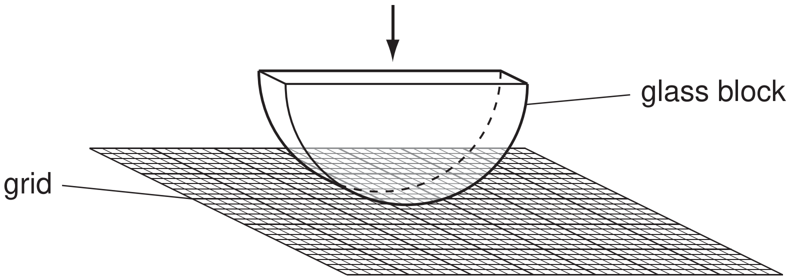

Fig. 2.1

Look through the flat side of the block at the grid (see Fig. 2.2). Place a ruler alongside the top edge of the grid and measure the length of the clear image of the grid, $\mathbf{d_1}$, that you can see in the block. Do **not** count the number of grid marks.

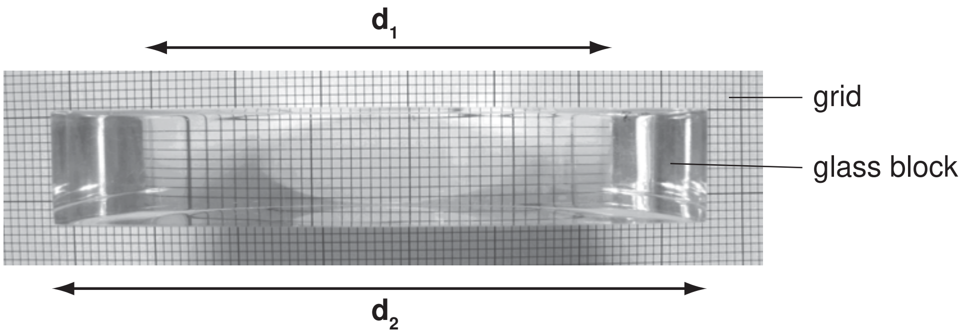

Fig. 2.2

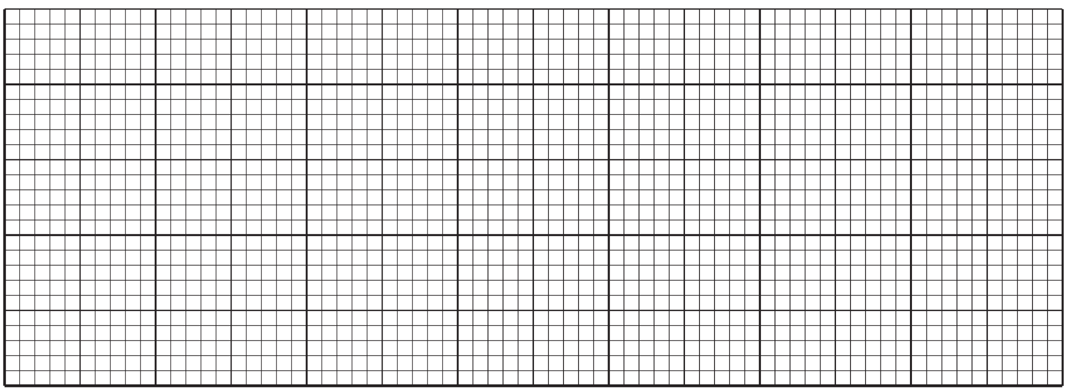

Fig. 2.3

Record the length $\mathbf{d_1}$. $\mathbf{d_1}$ = ... mm [1]

(ii) Measure and record the length of the flat side of the block which you have looked through, d_2, as shown in Fig. 2.2.

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d_2 = ... mm [1]

(iii) Calculate the value of $\frac{d_2}{d_1}$. This is the refractive index of the block.

$\frac{d_2}{d_1}$ = ... [1]

(b) (i) Now place the semi-circular block flat on a piece of plain paper and draw round it.

Remove the block; mark the centre point of the flat side.

Draw a normal at this point and construct incident rays with incident angles, ***i***, of 0°, 20°, 30° and 40° as shown in Fig. 2.4.

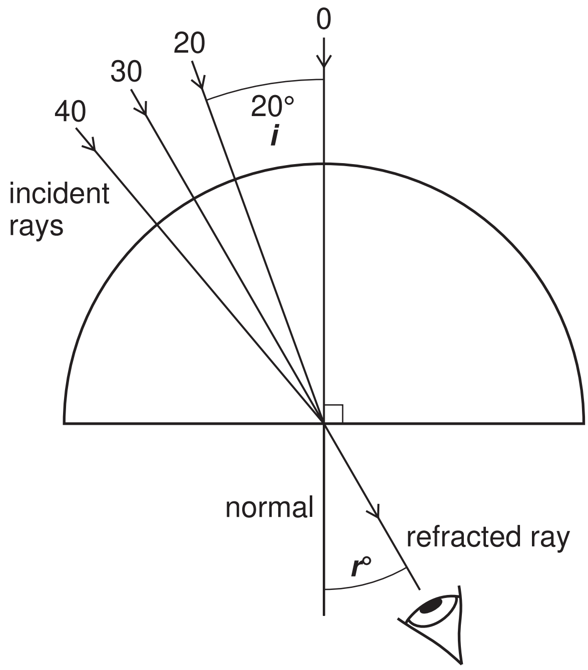


Fig. 2.4

- Replace the block on the paper.
- Place 2 pins about 4 cm apart on the incident ray you have drawn with an angle, ***i*** = 20°.
- Look through the block from the other side and place 2 more pins (on the refracted ray) in line with the pins on the incident ray.
- Remove the block, draw the refracted ray and measure the angle of refraction, ***r°***. Record the value of ***r°*** in Table 2.1.
- Repeat the procedure with the incident rays with ***i*** = 30° and 40° to find the other angles of refraction.

For Examiner's Use

Table 2.1

i°	sine *i*	*r*°	sine *r*
0	0.00	0	0.00
20	0.34		
30	0.50		
40	0.64		

[3]

(ii) Using the Table 2.2 below, or using a calculator, find the sine value for each angle of refraction, ***r*°**, and record each sine ***r*** value next to its angle in Table 2.1.
The sine values for the angles of incidence, ***i***, have been entered in the table for you already.

Table 2.2

angle / °	sine
0	0.00
10	0.17
11	0.19
12	0.21
13	0.22
14	0.24
15	0.26
16	0.28
17	0.29
18	0.31
19	0.33
20	0.34

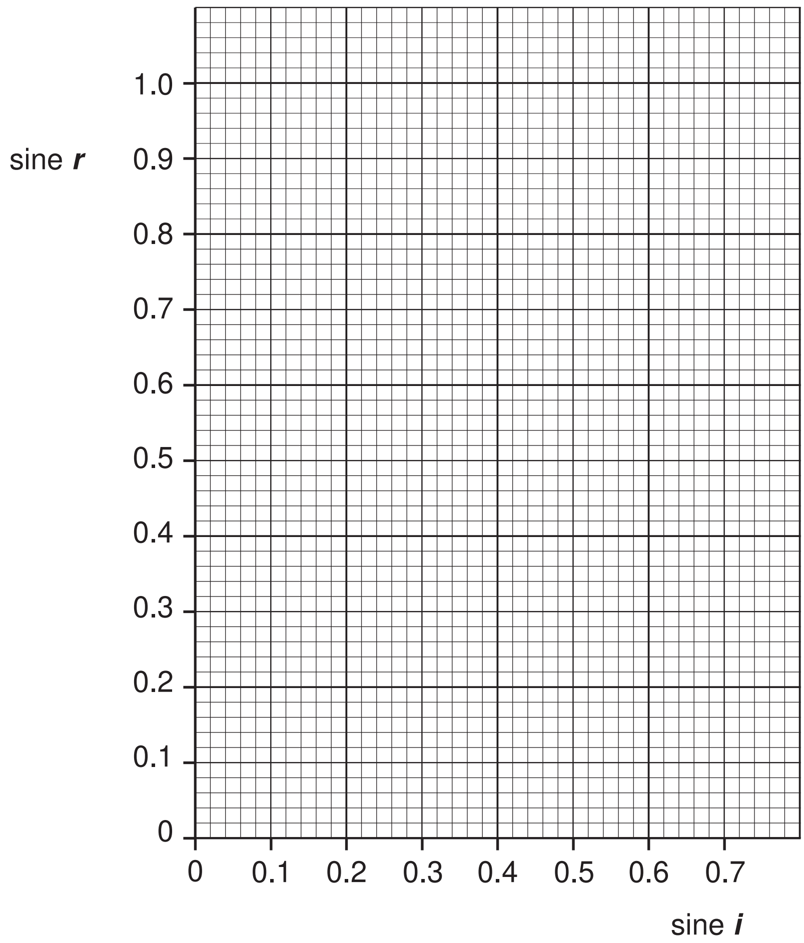
angle / °	sine
30	0.50
31	0.52
32	0.53
33	0.54
34	0.56
35	0.57
36	0.59
40	0.64
45	0.71
46	0.72
47	0.73
48	0.74

angle / °	sine
49	0.75
50	0.77
51	0.78
52	0.79
70	0.94
71	0.95
72	0.95
73	0.96
74	0.96
75	0.97
76	0.97

[1]

For Examiner's Use

(c) **(i)** Plot a graph on the grid below of sine ***r*** (vertical axis) against sine ***i*** (horizontal axis) using the values in Table 2.1. Draw the best straight line through the points.



[2]

(ii) Suggest why the value of the refractive index found using the gradient of the graph will be more accurate than your result from **(a)(iii)**.

....

....

.... [1]

3 You are provided with three solutions labelled **A**, **B**, and **C**. The three solutions are:

hydrochloric acid, HCl

nitric acid, HNO_3

potassium nitrate, KNO_3

You will carry out two tests on each solution to find out which is which.

(a) Test 1

- To about 1 cm^3 of solution **A** in a test-tube add a spatula full of sodium carbonate solid, Na_2CO_3. Record your observations in Table 3.1.
- Repeat the test using solutions **B**, and **C**, using a fresh test-tube for each solution.
- Complete Table 3.1 to show your conclusion for each test and the possible identities for each solution.

Table 3.1

solution	observations on adding sodium carbonate	conclusion of test	possible identities of the solution
A			.... or ....
B			....
C			.... or ....

[5]

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(b) Test 2

- To about 1 cm^3 of a fresh sample of solution **A** add an equal volume of silver nitrate solution, $AgNO_3$. Record your observations in Table 3.2.
- Repeat the test using solutions **B** and **C**, using a fresh test-tube for each solution.
- Complete Table 3.2 to show your conclusion for each experiment and the identity of each solution.
- **To establish the identity of each solution you will have to consider the results and conclusions of tests 1 and 2.**

Table 3.2

solution	observations on adding silver nitrate solution	conclusion of test	identity of the solution
A			....
B			....
C			....

[3]

(c) Describe how you would show the presence of the nitrate ion in a sample of potassium nitrate solution.
You do not need to carry out this experiment.

....

....

....

....

.... [2]

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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