UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

9932384090

CO-ORDINATED SCIENCES **0654/51**

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 **12** printed pages.

1 You are going to compare the composition of inhaled and exhaled air.

For Examiner's Use

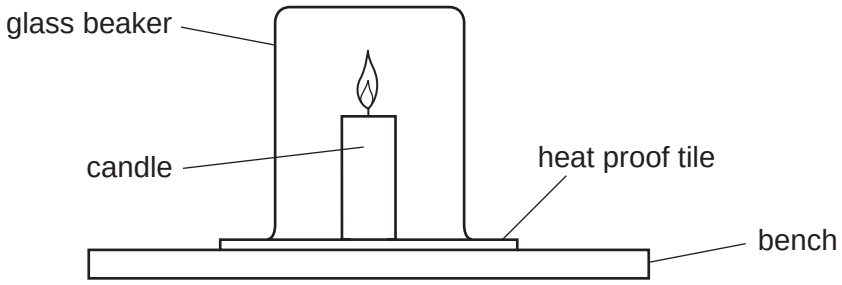

Fig. 1.1

(a) Analysis of **inhaled air**.

- Take a 500 cm^3 glass beaker (or glass jar).
- Light a candle (or night light) and place it onto a heatproof tile.
- Set the clock to zero.
- Place the glass beaker over the candle and start the clock (see Fig. 1.1).
- Record in Table 1.1 the time taken in seconds for the flame to go out. Remove the glass beaker from the candle, leave open to the air for one minute.
- Repeat the experiment and again record the time for the flame to go out in Table 1.1.

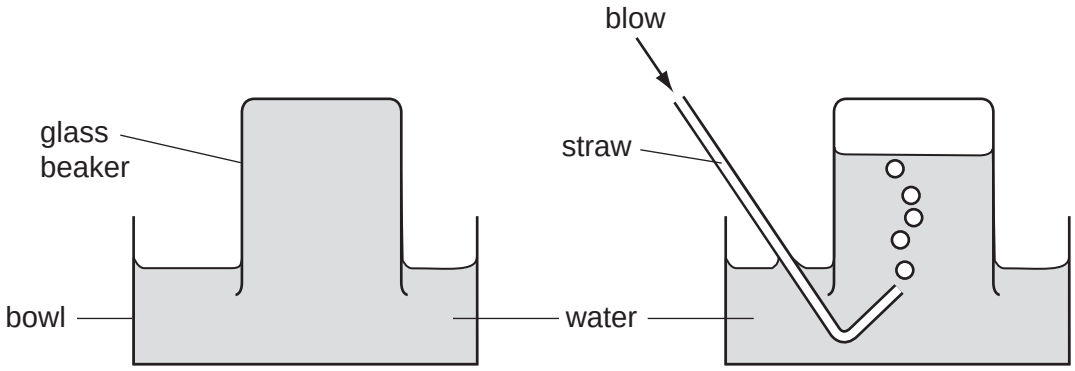

Fig. 1.2

(b) Analysis of **exhaled air**.

- Fill the glass beaker (or glass jar) with water and place into a bowl of water, inverted (see Fig. 1.2).
- Using the straw or tube blow into the glass beaker, until it is full of exhaled air.
- Light the candle.
- Using your hand to prevent the loss of air from the glass beaker, transfer the beaker from the bowl and place it over the lit candle. Immediately start the clock.
- Record in Table 1.1 the time taken in seconds for the flame to go out.
- Repeat the experiment for exhaled air and again record the time taken for the flame to go out in Table 1.1.

Table 1.1

	inhaled air		exhaled air	
experiment number	1	2	3	4
time taken / s				

[2]

For Examiner's Use

(c) (i) Calculate the average times for the flame to go out in inhaled air and exhaled air.

Show all working.

average time taken for flame to go out in inhaled air = ... s

average time taken for flame to go out in exhaled air = ... s

[3]

(ii) Describe and explain the difference between the results for inhaled and exhaled air.

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..... [2]

For Examiner's Use

(iii)
- Take two large test-tubes and label them **A** and **B**.
- Place about 10 cm^3 of limewater into each tube.
- Place a bung over tube **A** and gently shake it for 30 seconds. This will allow atmospheric air to bubble through the lime water.
- Using a straw or tube, blow into tube **B** for 30 seconds. This will allow exhaled air to bubble through the limewater.

Describe and explain the results observed in tube **A** and tube **B**.

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..... [3]

(d) Describe an experiment to investigate the effect of exercise on breathing rate. Ensure that it is controlled, reliable and that you explain the need for all equipment.

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..... [5]

2 You are to investigate how an elastic band stretches when acted on by an increasing force.

For Examiner's Use

(a) Measure and record the width of the elastic band.

width of band = ... mm [1]

Push the pin into the cork leaving just enough showing to enable the elastic band to be hung from it. Clamp the cork firmly and adjust its position to give about 500 mm or more clearance from the bench top as shown in Fig. 2.1.

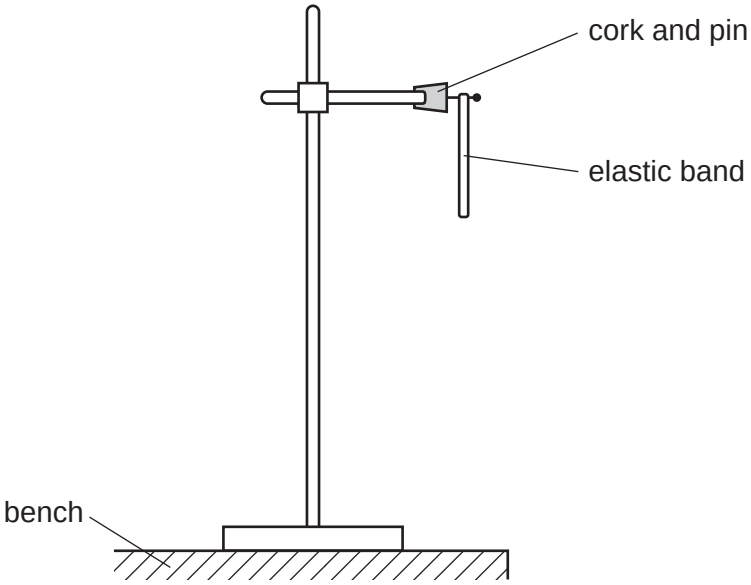


Fig. 2.1

(b) Hang the elastic band from the pin in such a way that masses can be attached, causing the band to stretch.

If you have a carrier for the masses, this should be attached before the initial length of the elastic band is taken. If no carrier is available, you will need to tie various masses together using thread and tie these to the band.

(i) Measure the length of the elastic band without any masses attached. Record this length in Table 2.1.

(ii) Attach a mass of 100 g to the band. Measure and record its new length in Table 2.1.

(iii) Continue to add masses of 100 g until you have a total of 500 g hanging from the band. Measure the length of the band after each addition and record the values in Table 2.1.

(iv) Complete Table 2.1 by converting each mass into a force and also calculating the total increase in length of the band.

For Examiner's Use

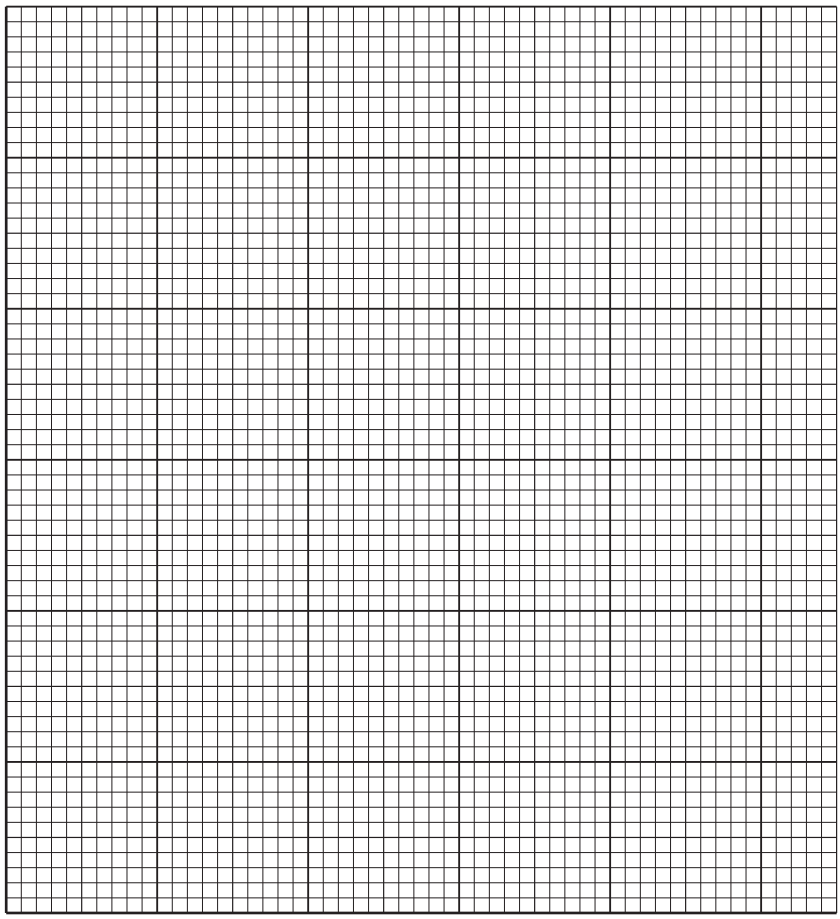
Table 2.1

total mass / g	force / N	length of band / mm	total increase in length / mm
0	0		0
100	1.0		
200			
300			
400			
500			

[4]

(c) Plot a graph of total increase in length (vertical axis) against force (horizontal axis).

Before drawing a line, answer question **(d)**.



[3]

For Examiner's Use

(d) Do you expect the line to pass through the origin?

Explain your answer.

.....

..... [1]

(e) Draw a suitable best fit line using the points plotted, taking into account your answer in **(d)**. [1]

(f) Use your graph to find the total increase in length produced by a mass of 250 g.

total increase in length = ... mm [1]

(g) Use your graph to describe the relationship between the force applied and the total increase in length.

.....

..... [1]

(h) A student suggested that the band may have stretched and would not return to its original form when the force is removed.

Describe how you could test this suggestion.

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..... [2]

(i) If masses were added beyond 500 g, the elastic band would eventually break. On the axes below, sketch the shape of the graph that would be obtained.

For Examiner's Use

[1]

For Examiner's Use

3 You are provided with a salt **Z** which contains two cations and one anion. Carry out the following tests.

(a) Record the appearance of solid **Z**.

appearance ..... [1]

(b) Place about one quarter of solid **Z** in a hard glass test-tube. Heat strongly. Test any gas given off with litmus paper.

Record all your observations.

action on litmus paper .....

observations .....

.....

..... [2]

(c) (i) Determine how to make a solution of **Z**. Make sure you keep some of the solid for test **(d)**.

Place about half of the solid **Z** into a fresh test-tube.

Try to dissolve **Z** in cold water and if it does not dissolve, try cold dilute sulfuric acid and then hot dilute sulfuric acid. **Stop** as soon as you have found a way of dissolving **Z**.

Note the colour of the solution.

Keep the solution for further tests. You will need about 10 cm^3 of solution.

Z dissolves in .....

colour of solution ..... [2]

(ii) Place about 2 cm^3 of the solution from **(c)(i)** into a large test-tube. Add dilute sodium hydroxide until alkaline. Use litmus paper to check that you have added enough.

Record your observation.

observation ..... [1]

Now carefully bring the mixture to the boil and test any gas given off with litmus paper.

Record your observation.

observation ..... [1]

For Examiner's Use

(iii) Place a second 2 cm^3 portion of the solution from **(c)(i)** in a fresh test-tube. Add ammonia solution until in excess.

Record your observation.

observation ..... [1]

(d) Place a small amount of solid **Z** in a fresh test-tube. Dissolve in about 5 cm^3 of dilute nitric acid. Use this solution to test for the chloride anion and the sulfate anion.

Divide the solution into **two** portions **before** carrying out any tests.

Describe how you carried out each test and record the result.

test for the chloride anion

.....

.....

.....

result ..... [2]

test for the sulfate anion

.....

.....

.....

result ..... [2]

(e) State the three ions in solid **Z**, giving a reason for each one.

For Examiner's Use

ion 1 .....

reason .....

.....

.....

ion 2 .....

reason .....

.....

.....

ion 3 .....

reason .....

.....

..... [3]

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