



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

CANDIDATE  
NAME

CENTRE  
NUMBER

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**CHEMISTRY**

**0620/06**

Paper 6 Alternative to Practical

**October/November 2008**

**1 hour**

Candidates answer on the Question Paper.

No additional materials are required.

**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.

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.

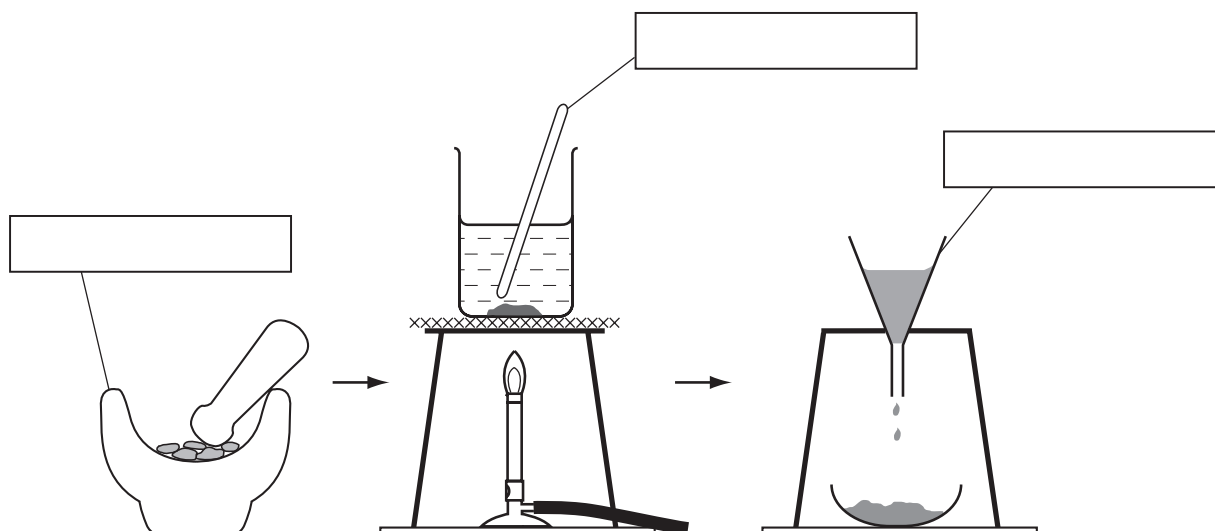
| For Examiner's Use |  |
|--------------------|--|
| <b>1</b>           |  |
| <b>2</b>           |  |
| <b>3</b>           |  |
| <b>4</b>           |  |
| <b>5</b>           |  |
| <b>6</b>           |  |
| <b>7</b>           |  |
| <b>Total</b>       |  |

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



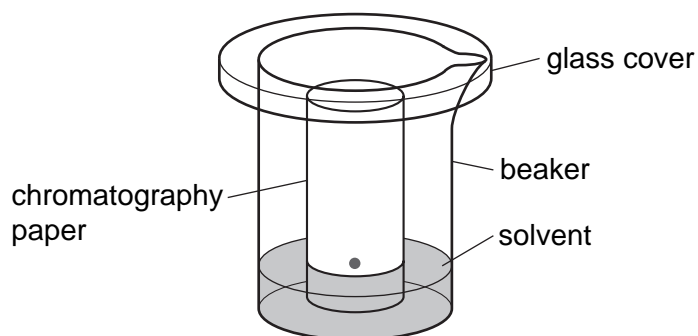
- 1 The colours present in some blackcurrant sweets can be separated by chromatography. The colours are water-soluble dyes. The diagrams show how the colours can be extracted from the sweets.

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- (a) Complete the empty boxes to name the pieces of apparatus. [3]

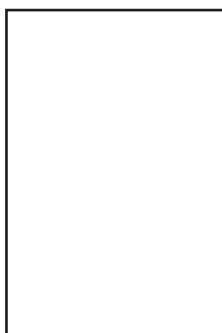
The apparatus below was used to carry out the chromatography.



- (b) (i) Name the solvent used. [1]
- .....

- (ii) Label, with an arrow, the origin on the diagram. [1]

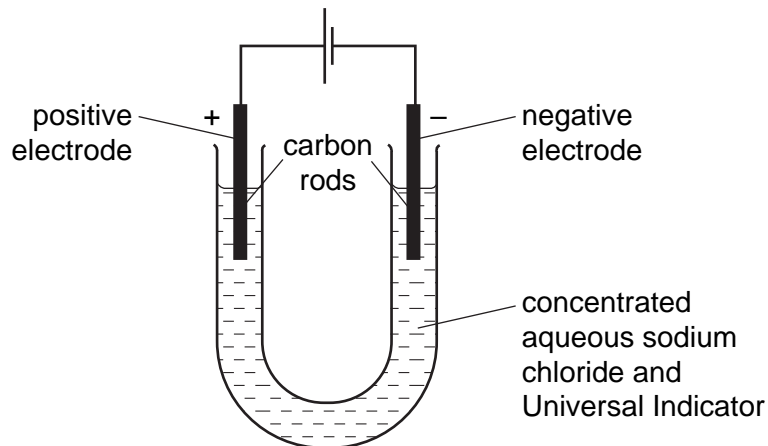
- (c) Sketch, in the box, the chromatogram you would expect if two different colours were present in the sweets.



[1]  
[Total: 6]

- 2 Electricity was passed through a concentrated solution of sodium chloride containing Universal Indicator.

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- (a) Suggest a suitable material for the electrodes.

..... [1]

Three observations were noted:

- 1 Bubbles of gas seen immediately at the negative electrode.
- 2 Bubbles of gas formed after some time at the positive electrode.
- 3 The solution turned blue around the negative electrode and colourless near the positive electrode.

- (b) Give a test to show that the gas observed in 1 is hydrogen.

test .....

result ..... [2]

- (c) Suggest why bubbles of gas were not seen immediately in 2.

.....  
..... [1]

- (d) What causes the colour change in 3 at

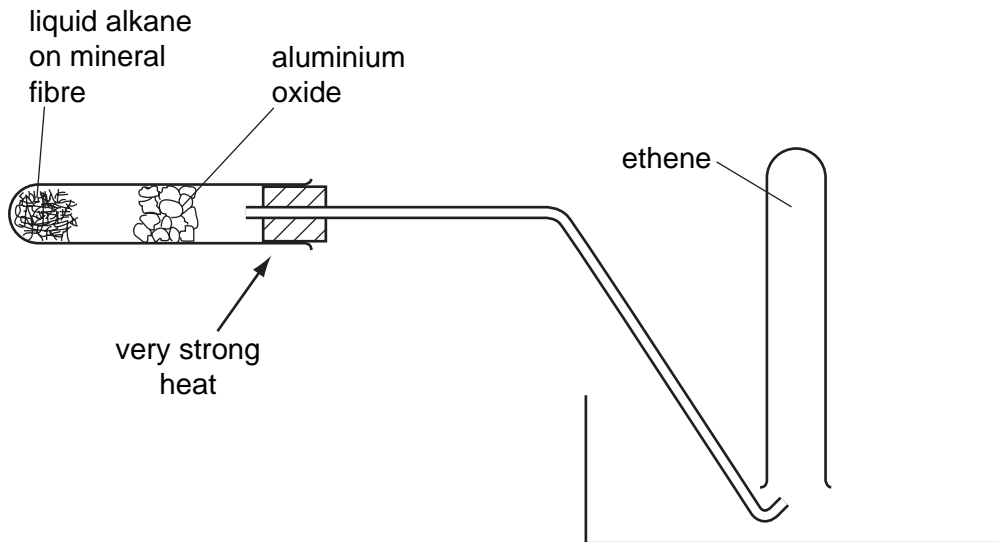
the negative electrode, .....

the positive electrode? ..... [2]

[Total: 6]

- 3 Ethene gas was formed by the cracking of a liquid alkane. The diagram shows the apparatus used.

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- (a) Identify two mistakes in the diagram.

1 .....

..... [1]

2 .....

..... [1]

- (b) Describe a test to show the presence of ethene.

test .....

result ..... [2]

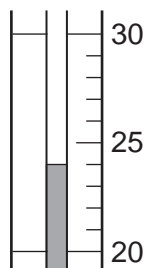
[Total: 4]

- 4 A student investigated the addition of four different solids, **A**, **B**, **C** and **D**, to water.

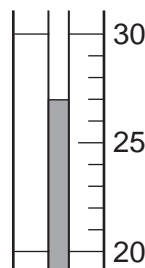
Five experiments were carried out.

*Experiment 1*

By using a measuring cylinder, 30 cm<sup>3</sup> of distilled water was poured into a polystyrene cup and the initial temperature of the water was measured. 4 g of solid **A** was added to the cup and the mixture stirred with a thermometer. The temperature of the solution was measured after 2 minutes.



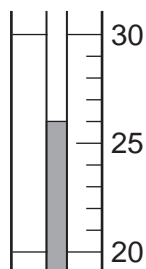
initial temperature



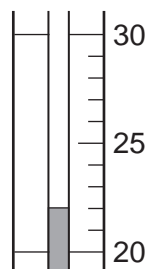
final temperature

*Experiment 2*

Experiment 1 was repeated using 4 g of solid **B**.



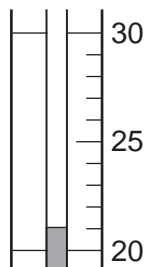
initial temperature



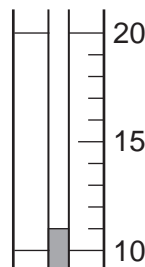
final temperature

*Experiment 3*

Experiment 1 was repeated using 4 g of solid **C**.



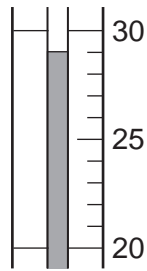
initial temperature



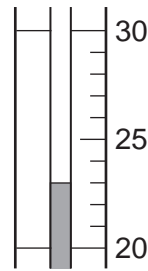
final temperature

*Experiment 4*

Experiment 1 was repeated using 4 g of solid **D**.



initial temperature



final temperature

*Experiment 5*

A little of the solution from Experiment 4 was added to a little of the solution from Experiment 2 in a test-tube. The observations were recorded.

**observations**                      *A fast reaction. Vigorous effervescence and bubbles produced.*

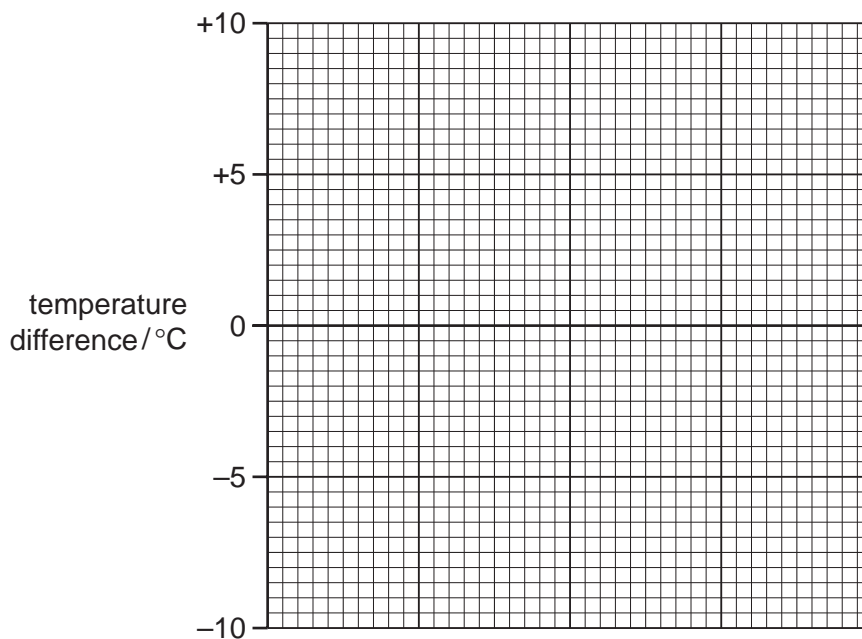
- (a) Use the thermometer diagrams for Experiments 1-4 to record the initial and final temperatures in Table 4.1.  
Calculate and record the temperature difference in Table 4.1.

**Table 4.1**

| experiment | initial temperature / °C | final temperature / °C | difference / °C |
|------------|--------------------------|------------------------|-----------------|
| 1          |                          |                        |                 |
| 2          |                          |                        |                 |
| 3          |                          |                        |                 |
| 4          |                          |                        |                 |

[4]

(b) Draw a labelled bar chart of the results to Experiments 1, 2, 3 and 4 on the grid below.



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[4]

Use the results and observations from Experiments 1-5 to answer the following questions.

(c) (i) Which solid dissolves in water to produce an exothermic reaction?

..... [1]

(ii) Give a reason why you chose this solid.

..... [1]

(d) Which Experiment produced the largest temperature change?

..... [1]

(e) Predict the temperature change that would happen if

(i) 8 g of solid **B** were used in Experiment 2,

..... [1]

(ii) 60 cm<sup>3</sup> of water was used in Experiment 4.

..... [1]

(iii) Explain your answer to (e)(ii).

.....  
..... [2]

(f) Suggest an explanation for the observations in Experiment 5.

.....  
..... [2]

[Total: 17]

- 5 Two salt solutions **K** and **L** were analysed. Each contained the same chloride anion but different metal cations. **K** was a copper(II) salt. The tests on the solutions and some of the observations are in the following table. Complete the observations in the table.

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| tests                                                                                                                                                                                                                                                                                                                                                                                                      | observations                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <p>(a) Appearance of the solutions.</p> <p>solution <b>K</b></p> <p>solution <b>L</b></p>                                                                                                                                                                                                                                                                                                                  | <p>.....[1]</p> <p>yellow</p>                                                       |
| <p>(b) The pH of each solution was tested.</p> <p>solution <b>K</b></p> <p>solution <b>L</b></p>                                                                                                                                                                                                                                                                                                           | <p>pH 3</p> <p>pH 2</p>                                                             |
| <p><u>tests on solution <b>K</b></u></p>                                                                                                                                                                                                                                                                                                                                                                   |                                                                                     |
| <p>(c) (i) Drops of aqueous sodium hydroxide were added to solution <b>K</b>. Excess aqueous sodium hydroxide was then added to the test-tube.</p> <p>(ii) Experiment (c)(i) was repeated using aqueous ammonia instead of aqueous sodium hydroxide.</p> <p>(iii) A few drops of hydrochloric acid and about 1 cm<sup>3</sup> of barium chloride solution were added to a little of solution <b>K</b>.</p> | <p>.....[2]</p> <p>.....[1]</p> <p>excess .....</p> <p>.....[2]</p> <p>.....[1]</p> |



| tests                                                                                                                        | observations            |
|------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| (iv) A few drops of nitric acid and about 1 cm <sup>3</sup> of silver nitrate solution were added to a little of solution K. | ..... [1]               |
| <u>tests on solution L</u>                                                                                                   |                         |
| (d) (i) Experiment (c)(i) was repeated using solution L.                                                                     | red - brown precipitate |
| (ii) Experiment (c)(ii) was repeated using solution L.                                                                       | red – brown precipitate |
| (iii) Experiment (c)(iii) was repeated using solution L.                                                                     | ..... [1]               |
| (iv) Experiment (c)(iv) was repeated using solution L.                                                                       | ..... [1]               |

(e) What does test (b) indicate?

..... [1]

(f) Identify the metal cation present in solution L.

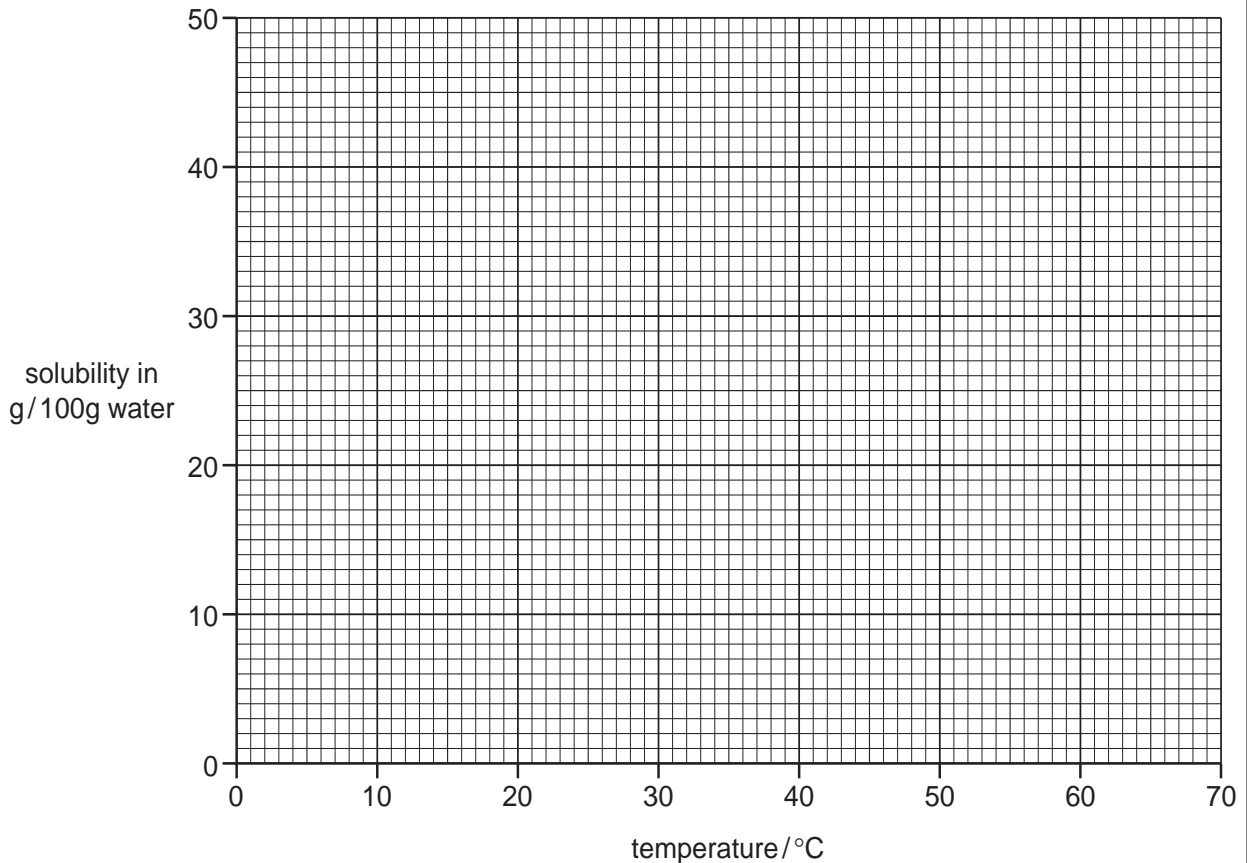
..... [2]

[Total: 13]

- 6 An experiment was carried out to determine the solubility of potassium chlorate at different temperatures. The solubility is the mass of potassium chlorate that dissolves in 100 g of water.  
The results obtained are shown in the table below.

|                                      |    |    |    |    |    |    |    |
|--------------------------------------|----|----|----|----|----|----|----|
| <b>temperature / °C</b>              | 0  | 10 | 20 | 30 | 40 | 50 | 60 |
| <b>solubility in g / 100 g water</b> | 14 | 17 | 20 | 24 | 29 | 34 | 40 |

- (a) On the grid, draw a smooth line graph to show the solubility of potassium chlorate at different temperatures.



[4]

- (b) Use your graph to determine the solubility of potassium chlorate at 70 °C. Show clearly on the graph how you obtained your answer.

..... [2]

- (c) What would be the effect of cooling a saturated solution of potassium chlorate from 60 °C to 20 °C?

.....  
 .....  
 ..... [2]

[Total: 8]

7 A solution of magnesium sulphate can be made by reacting magnesium oxide with warm sulphuric acid.

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(a) Describe how you could make a solution of magnesium sulphate starting with magnesium oxide powder and dilute sulphuric acid.

.....  
.....  
.....  
.....  
.....  
..... [3]

(b) Describe how you would obtain pure dry crystals of hydrated magnesium sulphate,  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ , from the solution of magnesium sulphate in (a).

.....  
.....  
.....  
.....  
.....  
..... [3]

[Total: 6]

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