

For Examiner's use only

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# London Examinations GCSE

Monday 21 June 1999 – Afternoon  
Science: Chemistry

Paper 4H  
**HIGHER TIER**

Time: 1 hour

## Instructions to Candidates

In the boxes above, write your centre number, candidate number, the Paper reference, your surname, other names and signature.

The Paper reference is shown in the top left-hand corner. If more than one Paper reference is shown, you should write the one for which you have been entered.

Answer ALL questions in the spaces provided in this book.

Show all stages in any calculations and state the units. Calculators may be used.

Include diagrams in your answers where these are helpful.

Additional Answer Sheets may be used.

## Information for Candidates

The marks for the various parts of questions are shown in round brackets: e.g. (2).

This paper has 5 questions. There are no blank pages.

Question numbers	Leave blank
1	
2	
3	
4	
5	
Total	

Centre Number							
Candidate Number							
Paper reference							
Surname							
Other Names							
Candidate signature							



1. The list below gives the names of four calcium compounds.

- calcium carbonate
- calcium hydrogencarbonate
- calcium hydroxide
- calcium sulphate

(a) Use this list to name the compound which is present in the following.

Each name may be used once, more than once or not at all.

(i) chalk

..... (1)

(ii) gypsum

..... (1)

(iii) temporary hard water

..... (1)

(iv) scale

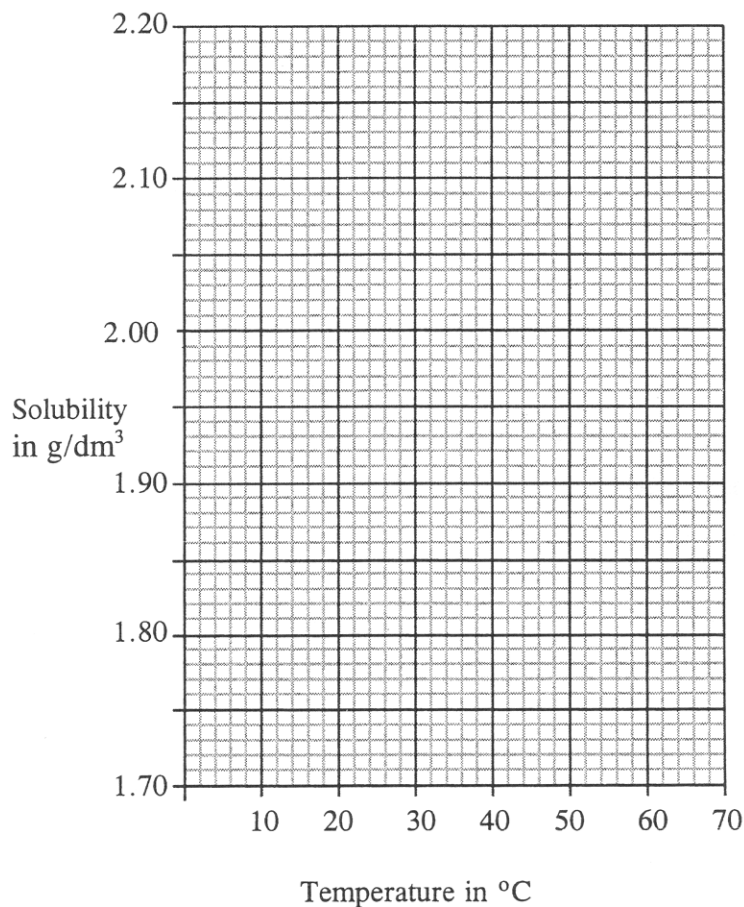
..... (1)

**QUESTION 1 CONTINUES ON NEXT PAGE**

- (b) The solubility of calcium sulphate in water at different temperatures is shown in the table.

Temperature (°C)	10	20	30	40	50	60	70
Solubility (g/dm <sup>3</sup> )	1.92	2.05	2.10	2.11	2.07	2.00	1.93

- (i) Draw a graph to show how solubility varies with temperature.



(3)

- (ii) Describe how the solubility of calcium sulphate changes as the temperature rises from 10 °C to 70 °C.

.....

.....

.....

.....

(2)

(c) Some calcium sulphate powder was shaken with 1 dm<sup>3</sup> water at 25 °C until there was no further change.

(i) Use your graph in part (b) to find the mass of calcium sulphate which will dissolve in 1 dm<sup>3</sup> water at 25 °C.

.....  
(1)

(ii) Calculate the mass of calcium sulphate dissolved in 500 cm<sup>3</sup> of this solution at this temperature.

.....  
(1)

(iii) Describe the mixture formed when 6.00 g of calcium sulphate are shaken with 500 cm<sup>3</sup> water at 25 °C.

.....  
.....  
.....  
(2)

**(Total 13 marks)**

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**TURN OVER FOR QUESTION 2**

2. (a) Write the formula for:

(i) a sodium ion; ..... (1)

(ii) a chloride ion; ..... (1)

(iii) a copper(II) ion. .... (1)

(b) Complete the following tables which show the tests for some ions.

(i) Flame tests

Name of ion	Colour of flame
potassium	lilac
.....	yellow
calcium	.....

(2)

(ii) Tests for ions in solution

Name of ion in solution	Reagent added to the solution	Positive result
copper(II)	.....	light blue precipitate
.....	dilute nitric acid + silver nitrate solution	white precipitate
sulphate	..... + .....	.....

(5)

(c) Describe a test to show the presence of ammonium ions in ammonium chloride.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

(4)

**(Total 14 marks)**

---

**TURN OVER FOR QUESTION 3**

3. The balanced equation for the fermentation of glucose is:



(a) 9.0 g of glucose are fermented completely.

(i) Calculate the mass of ethanol formed.

(Relative atomic masses: H = 1.0; C = 12; O = 16)

.....  
.....  
.....  
.....  
.....

(3)

(ii) Calculate the volume of carbon dioxide, measured at room temperature and pressure, evolved.

(1 mol of any gas occupies 24 000 cm<sup>3</sup> at room temperature and pressure.)

.....  
.....  
.....  
.....

(2)

(b) Name the process used to obtain a concentrated solution of ethanol from the fermentation mixture.

.....

(2)



(c) Glucose burns in excess oxygen to form carbon dioxide and water.

(i) Write the balanced equation for this reaction.

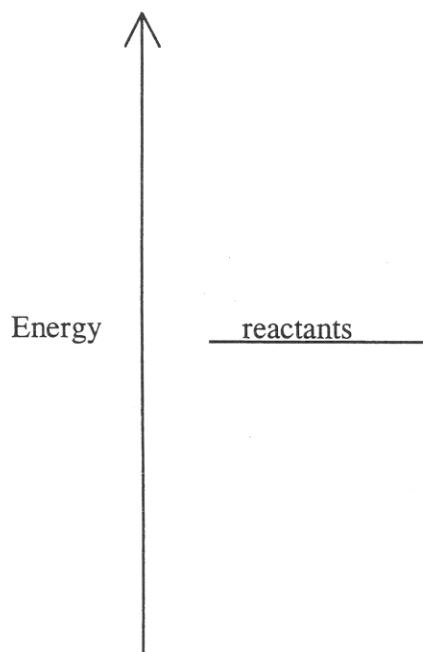
.....  
(2)

(ii) How does the volume of oxygen used compare with the volume of carbon dioxide produced? Both volumes are measured at room temperature and pressure.

.....  
.....  
(1)

(iii) The total energy of the reactants, glucose and oxygen, is shown on the diagram.

Draw a line on the diagram to show the total energy of the products.



(1)

(Total 11marks)

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**TURN OVER FOR QUESTION 4**

4. Anhydrous sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) was used to find the concentration of a dilute solution of hydrochloric acid.

- (a) Calculate the mass of sodium carbonate which must be dissolved to make  $250 \text{ cm}^3$  of solution with a concentration of  $0.100 \text{ mol dm}^{-3}$ .  
(Relative atomic masses: C = 12; O = 16; Na = 23)

.....  
 .....  
 .....  
 ..... (3)

- (b) The balanced equation for the reaction of sodium carbonate solution with hydrochloric acid is:



- (i) Write the ionic equation for this reaction.

..... (2)

- (ii) In a titration  $25.0 \text{ cm}^3$  of sodium carbonate solution, with a concentration of  $0.100 \text{ mol dm}^{-3}$ , reacted with  $20.0 \text{ cm}^3$  of hydrochloric acid. Calculate the concentration of hydrochloric acid in  $\text{mol dm}^{-3}$ .

.....  
 .....  
 .....  
 .....  
 ..... (3)

(iii) The neutral solution formed at the end of the titration was gently evaporated to dryness. What mass of sodium chloride remained?  
(Relative atomic masses: Na = 23; Cl = 35.5)

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.....

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.....

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.....

(3)

**(Total 11 marks)**

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**TURN OVER FOR QUESTION 5**

5. (a) Describe and explain the three main stages in the Contact Process for the manufacture of 98% sulphuric acid (concentrated sulphuric acid).

For each stage give the equation for the reaction and details of the reaction conditions.

Stage 1 - production of sulphur dioxide

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.....  
.....  
.....

Stage 2 - conversion of sulphur dioxide to sulphur trioxide

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.....  
.....  
.....

Stage 3 - conversion of sulphur trioxide to 98% sulphuric acid

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(8)

(b) The quantity of sulphuric acid manufactured each year is said to be a good indicator of the success of the industrial economy of the United Kingdom. Explain, with examples, why the amount of sulphuric acid being manufactured is a good measure of the industrial performance of a nation.

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.....  
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(3)

(Total 11 marks)

**TOTAL MARKS 60**

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**END**