

Candidate Name	Centre Number	Candidate Number
		2



GCE AS/A level

333/01

CHEMISTRY CH3 α

P.M. MONDAY, 11 May 2009

45 minutes

FOR EXAMINER'S USE ONLY	
Question	Mark
1	
2	
3	
4	
TOTAL MARK	

ADDITIONAL MATERIALS

In addition to this examination paper, you will need a:

- calculator;
- copy of the **Periodic Table** supplied by WJEC. Refer to it for any **relative atomic masses** you require.

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions in the spaces provided.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

The maximum mark for this paper is 30.

Your answers must be relevant and must make full use of the information given to be awarded full marks for a question.

You are reminded that marking will take into account the Quality of Written Communication used in all written answers.

Page 9 may be used for rough work.

Candidates are advised that answers to all questions should be brief and concise; lengthy extended responses are not required.

1. A student measured the rate of the reaction of 1-bromobutane with sodium hydroxide.

The equation for the reaction is



The experiment was carried out by measuring the decrease in concentration of the NaOH as outlined below.

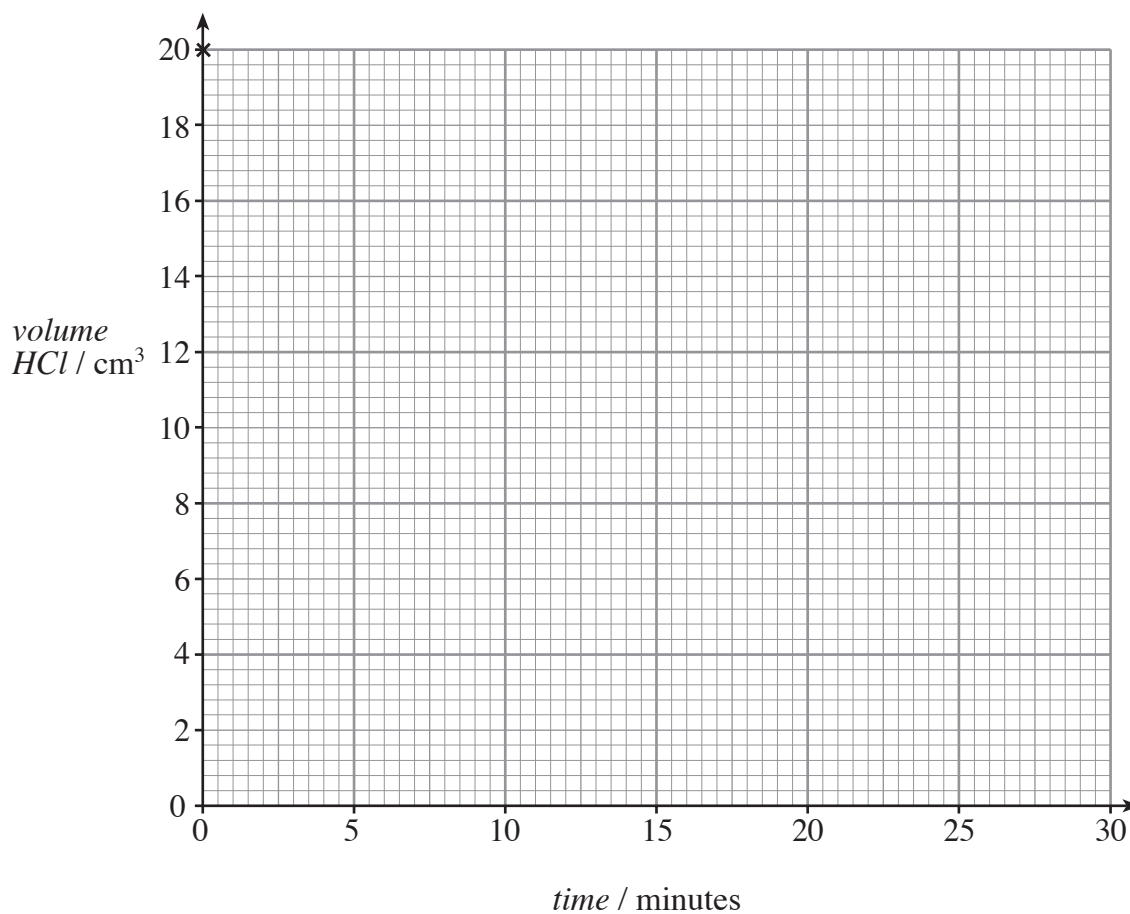
- Equal volumes of 1-bromobutane and sodium hydroxide of the same concentration were placed in separate flasks in a water bath at 25 °C and allowed to reach the bath temperature.
- The two solutions were rapidly mixed as a stopwatch was started.
- After exactly five minutes, a 10 cm³ sample of the mixture was removed by pipette, rapidly transferred to a flask containing 50 cm³ of iced water and the remaining unreacted NaOH titrated with standard HCl from a burette to an endpoint using phenolphthalein indicator.
- Step 3 was repeated at several further five minute intervals and the results obtained are tabulated below.

<i>Time / minutes</i>	0	5	10	15	20	25	30
<i>Volume HCl / cm³</i>	20.0	17.0	14.0	11.5	9.5	8.0	7.0

- (a) (i) Plot the results above on the graph grid provided opposite and draw the curve. (The first point is already plotted.) [3]
- (ii) Use your plot to calculate the initial rate of reaction. [2]

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(b) Answer the following questions about the procedure used in the experiment.

(i) Suggest why the pipetted samples were added rapidly to **excess iced** water. [1]

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(ii) Explain why the rate decreases as the reaction proceeds. [1]

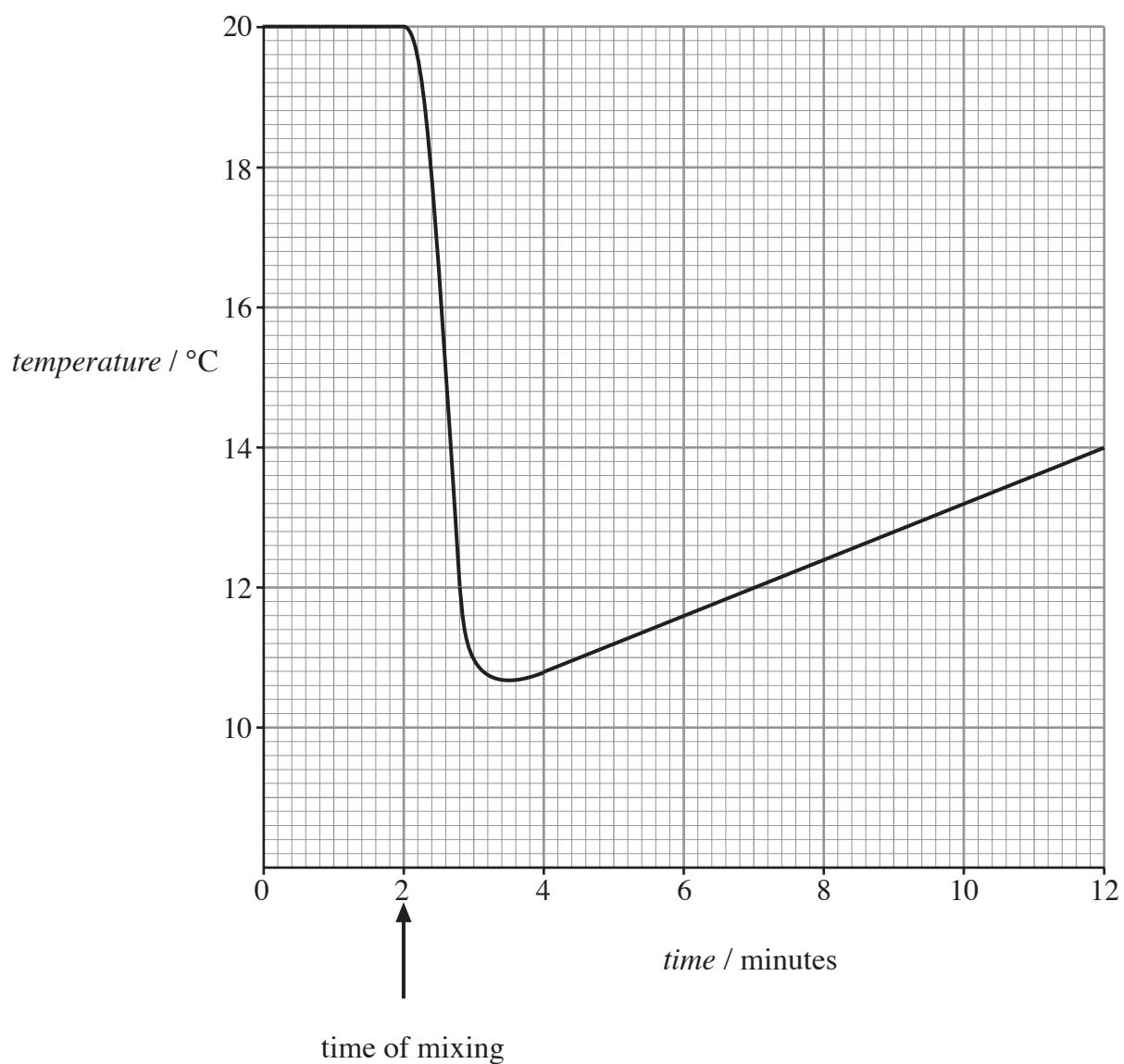
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(iii) Suggest **one** method of measuring the rate of a reaction which does not require samples to be taken at timed intervals. [1]

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Total [8]

2. The graph below was obtained from a student experiment to determine the enthalpy change (ΔH) of solution of solid ammonium nitrate in water which used 50.0 g of water and 0.100 mol of ammonium nitrate.



- (a) (i) Use the graph to estimate the maximum temperature **change** (ΔT). [2]

- (ii) Then calculate ΔH , using the equation

$$\Delta H = \frac{-4.18m\Delta T}{n} \text{ Jmol}^{-1},$$

where m is the mass of water in grams and n is the number of moles of ammonium nitrate. [2]

- (b) State **two** common sources of error in this experimental procedure to determine enthalpy changes (ΔH) in solution. [2]

Total [6]

3. A student determined the concentration of a solution of sulphuric acid by titrating it against a standard solution made by dissolving 10.6 g of sodium carbonate ($M_r = 106$) in distilled water to give 1 dm³ of solution.

A burette was rinsed twice with small volumes of acid and filled to above the zero mark using a small funnel.

The funnel was removed and the acid level brought **exactly** to the 0.00 cm³ mark.

25.00 cm³ of the sodium carbonate solution was placed in a conical flask with a suitable indicator and the acid added while swirling the flask contents.

When the indicator gave signs of change, the titration was halted, the flask walls washed with water and the titration continued, drop by drop, to the end-point.

Three titrations gave readings of 20.75, 20.00 and 20.20 cm³, respectively.

(a) Answer the following questions on the procedure used.

- (i) State why the burette was rinsed with the acid before filling. [1]

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.....

- (ii) State why the funnel was removed. [1]

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.....

- (iii) State and explain whether there was any need for the acid level to be set exactly on zero. [1]

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.....

- (iv) State why the flask contents were swirled during the titration. [1]

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- (b) (i) State, giving a reason, whether you would include the reading of 20.75 cm³ in calculating the mean titration. [1]

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- (ii) The equation for the acid/carbonate reaction is given below.



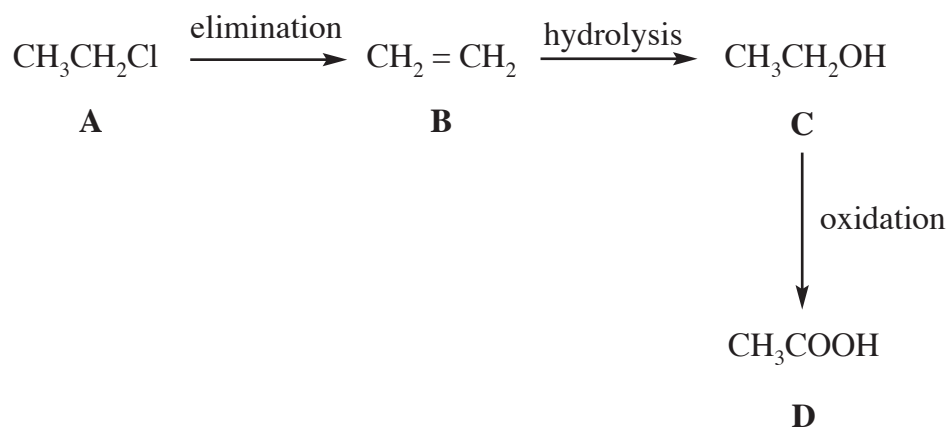
Use the data and results above to calculate the concentration of the acid solution. [3]

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Total [8]

Turn over for question 4

4. A sequence of organic reactions is shown below.



Each of these organic compounds may be identified by **one** of the tests in the table below. Complete the table by inserting the letter for the correct compound and stating what is observed. [8]

<i>Test</i>	<i>Compound</i>	<i>Observation</i>
Heat with NaOH(aq), acidify with HNO ₃ and then add AgNO ₃ (aq)		
Add NaHCO ₃ (aq) and test the product		
Add bromine water		
Warm with acidified dichromate(VI) solution		

Total [8]

[30]

Rough Work

A series of horizontal dotted lines for writing.