Centre No.					Pape	er Refer	ence			Surname	Initial(s)
Candidate No.			6	2	5	4	/	0	1	Signature	

Paper Reference(s)

6254/01

## **Edexcel GCE**

# **Chemistry (Nuffield)**

### Advanced

Unit Test 4

Monday 19 June 2006 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	Items included with question paper
Nil	Nil

#### **Instructions to Candidates**

In the boxes above, write your centre number, candidate number, your surname, initial(s) and your

Answer ALL the questions. Write your answers in the spaces provided in this question paper. Final answers to calculations should be given to an appropriate number of significant figures.

#### **Information for Candidates**

A Periodic Table is printed on the back cover of this question paper.

The marks for the various parts of questions are shown in round brackets: e.g. (2). The total mark for this paper is 60. There are 16 pages in this paper. All blank pages are indicated. Calculators may be used.

#### **Advice to Candidates**

You are advised to show all steps in any calculations.

You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking into account your use of grammar, punctuation and spelling.

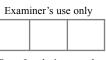
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Question Number 2 3

Total Turn over

(1)

### Answer ALL the questions. Write your answers in the spaces provided.

1	Thin		ia alaasst	the reaction	14	00100000		d l	منسمليات مسامين	
I .	I nis c	mesnon	is anoili	The reaction	nerween	catciiim	carnonale	ana ny	varocnioria	: acid
	11110 0	acoulon	is accur	tile leaction	OCC III CCII	carciani	caroonate	ullu II	, and connecting	, acia.

$$CaCO_3(s) \ + \ 2HCl(aq) \ \rightarrow \ CaCl_2(aq) \ + \ CO_2(g) \ + \ H_2O(l)$$

One method of studying the kinetics of this reaction is to measure the volume of carbon dioxide given off at various timed intervals when using an excess of calcium carbonate.

(a)	Suggest TWO other methods for following this reaction. Explain your choices.
	(2)
(b)	Suggest why the volume of carbon dioxide given off in the first few seconds of the reaction is an unreliable measure of the initial rate of the reaction.

2

(c) In an experiment, the following results were obtained.

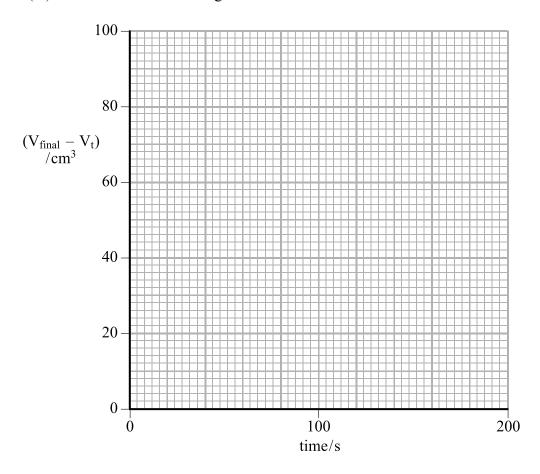
(i) What was the final volume,  $V_{\text{final}}$ ?

Time /s	$\begin{array}{c} \text{Volume of CO}_2 \\ \text{V}_t/\text{cm}^3 \end{array}$	$(V_{final} - V_t) / cm^3$
5	3	85
35	42	46
65	62	26
95	72	
125	79	
155	84	
185	87	

		(1)
(iii)	To what is $(V_{\text{final}} - V_t)$ proportional?	
(11)	Complete the table.	(1)
(ii)	Complete the table.	(1)
		(1)

Leave blank

(iv) Plot these results on the grid below.



(v) On your graph measure and record THREE successive half-lives. Deduce the order of the reaction. Justify your answer.


(3)

(vi) Give the rate equation for this reaction.

(1)

**(2)** 

(vii)What are the units of the rate constant?

.....

(1)

What would you expect the signs of $\Delta S_{\text{system}}$ and $\Delta S_{\text{total}}$ to be for the reaction between calcium carbonate and hydrochloric acid? Justify your answers.
$\Delta S_{ m system}$
$\Delta S_{ ext{total}}$
(4)
(Total 17 marks)

•	T 1 C 41	following reactions.	_ : 41	- C - 11 - C 41	
7.	For each of the	tollowing reactions	give the names	or all or the	arganic nradiicts
	1 of cucii of the	TOTTO WITING TOUCHOIDS.	Sive the mannes	or an or me	or game products.

Also give the **type** or **mechanism** as indicated for each reaction.

(a) 
$$CH_3CO_2H + NaOH \longrightarrow CH_3CO_2Na + H_2O$$

Name of organic product

Type of reaction

(b) O— $CH_3$  O— $CH_3$  + ICl  $\longrightarrow$  + HC

Name of organic product .....

Type of reaction Substitution

Mechanism (2)

(c)  $CH_3COC1 + 2NH_3 \longrightarrow CH_3CONH_2 + NH_4C1$ 

Name of organic product

Type of reaction substitution

Mechanism (2)

(d) 
$$CH_2$$
— $O$ — $CO(CH_2)_8CH_3$   $CH_2OH$   $CH_2OH$ 

Names of products

.....

Type of reaction

(Total 9 marks)

**(3)** 

Q2

(a)	For	each of the following pieces of information, state what can be deduced about	out the
(a)		cture of $\mathbf{A}$ .	out the
	(i)	<b>A</b> burns with a very sooty flame.	
			(1)
	(ii)	A reacts with Brady's Reagent (2,4-dinitrophenylhydrazine) to give an opecipitate.	orange
			(1)
	(iii)	When <b>A</b> is heated with Benedict's solution, a red precipitate forms.	
			(1)
	(iv)	A decolorises bromine water.	
			(1)
	(v)	A is the cis isomer.	
			(1)
	(vi)	Use all of the above information to draw the displayed formula of <b>A</b> .	

(i)	The precipitate can be purified by recrystallisation, using water as the solvent. Describe how you would carry out this recrystallisation, explaining the reason for each step in your method.
<i>(</i> ::)	(5)
(11)	How would you check that the purification had been successful?
	(1)

blank	) (i) Write the equation for the reaction which occurs when solid benzoic acid is added to sodium carbonate solution. Include state symbols in your equation.	
	(ii) Benzoic acid is slightly soluble in water. Write the equation for the dissociation of benzoic acid and hence the expression for the acid dissociation constant, $K_a$ .	
	(iii) Calculate the pH of a $0.00100$ mol dm $^{-3}$ solution of benzoic acid. [K $_a$ for benzoic acid is $6.30\times10^{-5}$ mol dm $^{-3}$ .]	
	(3)  Give the name or formula of an organic compound which, when mixed with a solution of benzoic acid, forms a buffer solution.	
Q3	(1) (Total 21 marks)	

	$CHCl2CO2H(l) + C5H10(l) \rightleftharpoons CHCl2CO2C5H11(l)$					
Give the name of the product of this reaction and also the name for the new functional group it contains.						
	(2)					
acio thro	In experiment to determine the equilibrium constant, 1.00 mol of dichloroethanoic di was mixed with 2.30 mol of pent-1-ene. The total volume remained at 300 cm <sup>3</sup> bughout. When equilibrium had been reached, it was found that 0.40 mol of alloroethanoic acid was left.					
(i)	List the steps in the experiment you would carry out to determine the concentration of dichloroethanoic acid present at equilibrium.					
	(4)					
(ii)	Give the expression for the equilibrium constant, $K_c$ , for this reaction.					

Leave blank

(iii) Complete the table for the number of moles and concentrations at equilibrium.

Substance	Number of moles at start	Number of moles at equilibrium	Concentration at equilibrium /mol dm <sup>-3</sup>		
CHCl₂COOH	1.00	0.40	1.33		
C <sub>5</sub> H <sub>10</sub>	2.30				
CHCl₂COOC₅H <sub>11</sub>	0				

**(3)** 

(iv) Calculate the value of  $K_{\text{c}}$ , and give its units.

(3) Q4

(Total 13 marks)

**TOTAL FOR PAPER: 60 MARKS** 

**END** 



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			23 V Vanadium 51	Niobium 83	μ2	Unp Unil- Pentium (282)	59 Praseo- dymium 141	91 Pa Protactinium (231)
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