UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

Specimen for 2007

GCE A LEVEL

MARK SCHEME
MAXIMUM MARK: 30
SYLLABUS/COMPONENT: 9701/05 CHEMISTRY PRACTICAL

UNIVERSITY of CAMBRIDGE
International Examinations

Skill	*Total marks*	*Approximate breakdown of marks*		*Question 1*	*Question 2*
Planning	15 marks	Defining the problem	4 marks	4	0
		Methods	11 marks	11	0
Analysis, conclusions and evaluation	15 marks	Dealing with data	8 marks	0	8
		Evaluation	4 marks	0	4
		Conclusion	3 marks	0	3

PLAN = Planning
Problem = Defining the problem
Methods
ACE = Analysis, conclusions and evaluation
Data = Dealing with data
Evaluation
Conclusions

Question		Sections	Learning outcomes	Indicative material	mark
1	**(a) (i)**	PLAN Problem	• identify the independent variable in the experiment or investigation	temperature and size of marble chips	**2**
	(ii)		• identify the dependent variable in the experiment or investigation	volume or mass of CO_2	**1**
	(b)	PLAN Problem	• express the aim in terms of a prediction or hypothesis, and express this in words or in the form of a predicted graph	suitable hypothesis proposed e.g. rate of production of CO_2 increases with increasing concentration of hydrochloric acid.	**1**

	(c)	PLAN Methods	• describe how the dependent variable is to be measured	appropriate apparatus to measure volume or mass of CO_2;	**1**
			• describe the arrangement of apparatus and the steps in the procedure to be followed	diagram showing appropriate apparatus and stepwise description including time measurement	**1** **1**
			• describe the method to be used to vary the independent variable, and the means to ensure that they its value is measured accurately	appropriate volumes of acid and water; use of appropriate apparatus in measuring volumes of acid and water;	**1** **1**
			• describe how each of the other key variables is to be controlled	control of temp and constant number and size of marble chips (e.g. same mass and number of chips)	**1**
			• describe precautions that should be taken to keep risks to a minimum	care when making up HC*l* from conc. HC*l*	**1**
			• suggest appropriate volumes and concentrations of reagents	moles/mass of $CaCO_3$ calculated; initial [HC*l*] calculated	**1** **1** **9 max 8**
	(d)	PLAN Methods	• draw up tables for data that they might wish to record	columns for mass/ concentration/time units correct	**1** **1** **1**
			• describe how the data might be used in order to reach a conclusion	calculation of CO_2 evolved, appropriate statement relating to hypothesis in **(b)**	
1 Total					**15**

2	**(a)**	ACE Data	• identify the calculations that are necessary to be able to draw conclusions from provided data •	calculates mass of X_2CO_3 used and mass of CO_2 evolved;	**2**
	(b)	ACE Data	• use graphs to draw attention to the key points in quantitative data, including the variability of data	plots mass of CO_2 on y-axis, mass of X_2CO_3 on x-axis with appropriate labels and units; suitable scales – points plotted over more than half of each axis; correct plotting of at least 10 points; appropriate best-fit line drawn	**1** **1** **1** **1**
	(c)	ACE Evaluation	• identify anomalous values in provided data and suggest appropriate means of dealing with such anomalies • within familiar contexts, suggest possible explanations for anomalous readings	identifies one point where too much CO_2 produced – (cotton wool plug not weighed at end); identifies one point where too little CO_2 produced – (solution not saturated with CO_2 at start, or not left for 10 mins for CO_2 to diffuse)	**1** **1**
	(d)	ACE Evaluation	• identify the extent to which provided readings have been adequately replicated, and describe the adequacy of the range of data provided	identifies less reliability with lower masses of X_2CO_3	**1**
	(e)	ACE Data	• use calculations to enable simplification or explanation of data	values read from graph. NOT table values; calculates M_r	**1** **1**

	(f)	ACE Conclusions ACE Evaluation	• draw conclusions from an investigation, providing a detailed description of the key features of the data and analyses, and considering whether experimental data supports a given hypothesis • make informed judgements on the confidence with which conclusions may be drawn	makes appropriate comment on whether prediction is supported by data i.e. straight line graph makes appropriate comment on whether procedure is suitable for determination of M_r	**1** **1**
	(g)	ACE Conclusions	• make further predictions, ask informed and relevant questions and suggest improvements	suggests appropriate modification to experimental procedure such as more points in range where accuracy is greatest	**1**
	(h)	ACE Conclusions	• make detailed scientific explanations of the data, analysis and conclusions that they have described • make further predictions, ask informed and relevant questions and suggest improvements	uses knowledge of acid/base chemistry to describe a more appropriate way of determining M_r such as titration.	**1**
2 Total					**15**