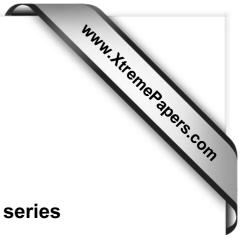**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

GCE Advanced Level

MARK SCHEME for the October/November 2012 series

9701 CHEMISTRY

9701/52   Paper 5 (Planning, Analysis and Evaluation),
maximum raw mark 30

CAMBRIDGE
International Examinations

Question	Sections	Indicative material	Mark
1 (a)	PLAN Problem	PbO 1:1, Pb_3O_4 1:1.33, PbO_2 1:2 All three correct two marks. Two correct one mark.	[2]
(b)	PLAN Problem	Correctly labelled axes and three straight lines drawn converging at the origin. Correct order of the lines. If 'O' is on the *y*-axis, order on axes is PbO_2 (steepest gradient), Pb_3O_4, PbO. Allow 'Pb' on *y*-axis, order reversed.	[2]
(c)	PLAN Problem	**(i)** lead (allow lead oxide or oxide) **AND** **(ii)** oxygen (allow O_2 **OR** lead)	[1]
(d)	PLAN Method	Diagram shows a heated piece of apparatus containing some lead oxide with hydrogen passing over it with inlet and outlet shown. **Diagram** shows apparatus to generate hydrogen using Mg/A*l*/Zn/Fe **AND** any dilute acid (labelled) **OR** group 1 metal/alcohol **OR** Ca with water or dilute acid. Shows excess hydrogen being burned **OR** led away from apparatus/collected.	[1] [1] [1]
(e)	PLAN Method	Chooses mass (M) of lead oxide between 1 g and 25 g.	[1]
		Re-heats to constant mass.	[1]
		Calculates a volume of hydrogen sufficient to reduce the oxide. (mark is for the method, units are required.)	[1]
		Suggests calculating the moles of Pb and O/mole ratio of Pb to O.	[1]
(f)	Plan Method	Hydrogen is explosive in air, so expel air from the apparatus before lighting flame to burn hydrogen **OR** lead/lead oxide is harmful/toxic, so wear a mask/use a fume cupboard to prevent **inhalation** of hydrogen/lead/lead oxide **OR** acids are corrosive/irritant, use chemically resistant gloves **OR** reduction tube is hot, allow to cool before handling/use heat resistant gloves/tongs.	[1]
(g)	PLAN Method	Columns are: mass/weight of the oxide; mass/weight of lead; mass/weight of oxygen; (mass units needed for these three) moles of lead; moles of oxygen; (no units). If five/four are fully correct, 2 marks, if only three/two are correct, 1 mark.	[2]
	Total		**[15]**

2	(a)	ACE Data	Correct log column heading as log C/log(a-x)/log(1-B).	[1]
			Calculations for the **log column** in the table below are correct and given to 3 sig figs. (Allow 1 error without penalty.)	[1]

A	B	C	D
		$1 - B$ /mol dm^{-3}	log C
0	0.000	1	0
30	0.101	0.899	-0.0462
60	0.193	0.807	-0.0931
100	0.259	0.741	-0.130
130	0.370	0.630	-0.201
180	0.469	0.531	-0.275
210	0.551	0.449	-0.348
240	0.573	0.427	-0.370
270	0.617	0.383	-0.417
300	0.655	0.345	-0.462

	(b)	ACE Data	Both axes scaled from zero with x-axis labelled as 'time /min' and y-axis as log C. Plotted points must cover at least half the grid in both directions.	[1]
			All nine points plotted correctly. (Allow tolerance of ± of ½ small square.)	[1]
			Appropriate straight line drawn through the origin. (If all points do not lie on the line then the net deviation of the non-anomalous points on each side of the best fit line must be approximately the same.)	[1]

	(c)	ACE Evaluation	2 anomalous points circled at time 100 min and 210 min.	[1]
			t = 100 min – sample taken out too early **OR** recorded time is later than sample withdrawn. t = 210 min – sample taken out too late **OR** recorded time is earlier than sample withdrawn.	[2]

	(d)	ACE Evaluation	Most of the points are on the line **OR** only a few points are not on the line **OR** there are only a few anomalies.	[1]

	(e)	ACE data	Appropriately drawn lines on the graph.	[1]
			Correctly read values from the graph. (If no construction lines shown, allow values from the table if graph drawn does actually go through point(s) used.)	[1]
			Correctly calculated value of the slope given to 3 sig figs with correct unit (min^{-1}) using the candidate's figures.	[1]

	(f)	ACE Conclusion	Statement that the relationship is justified since a straight line is produced.	[1]

(g)	ACE Conclusion	Draws a straight line from the origin with a different gradient.	[1]
		Shows shorter elapsed times. (Steeper gradient)	[1]
	Total		**[15]**