OCR
Oxford Cambridge and RSA

GCE

Chemistry B

Unit **H433A/03:** Practical skills in chemistry

Advanced GCE

Mark Scheme for June 2017

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
( )	Words which are not essential to gain credit
__	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

Subject-specific Marking Instructions

INTRODUCTION

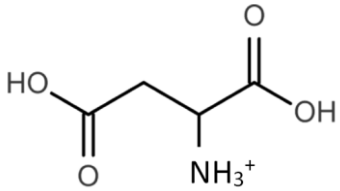
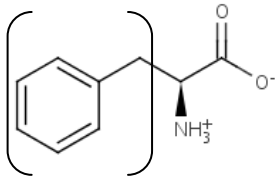
Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

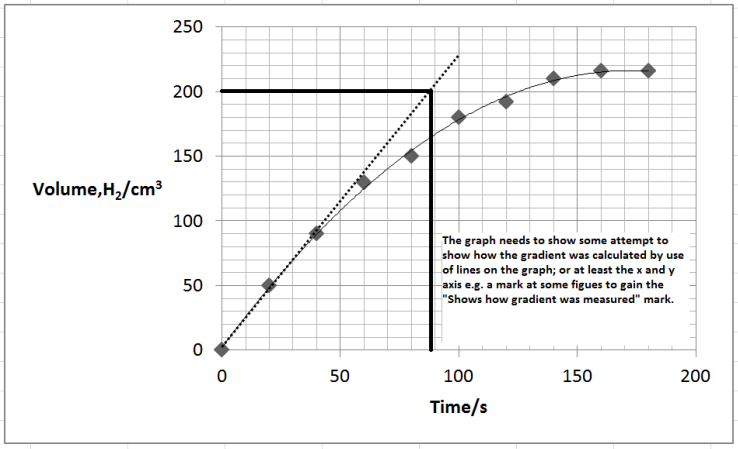
You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

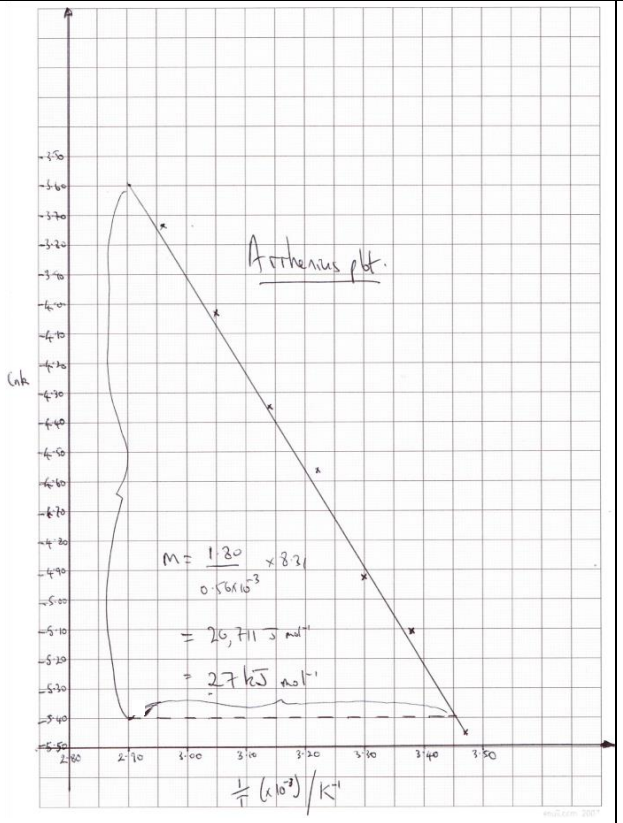
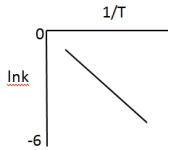
Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

Question			Answer	Marks	Guidance
1	(a)		To allow the liquid to boil more gently/AW✓	1	**ALLOW** no sudden boiling/controls boiling/stops it boiling over/reduce the bubbling **IGNORE** *references which imply catalytic activity* ***IGNORE*** *references to air* ***IGNORE*** *'spitting'*
	(b)	(i)	1 carboxylic acid 2(secondary) amide 3 ester } all three needed ✓	1	**DO NOT ALLOW** polyamide or polyester or amine **IGNORE** *references to peptide link* Spelling must be correct for ester
		(ii)	 ✓ NH_3^+ ✓rest of molecule	2	**ALLOW** full and condensed (eg COOH) formulae **ALLOW** ambiguous attachment to NH **ALLOW** charge on H or N **IGNORE** spurious bond attachment e.g. to H atom Don't forget second mark for 'rest of structure'
		(iii)	 'Structure' of zwitterion ✓ Zwitterion formed from internal acid/ base reaction ✓	2	**ALLOW** COO^- or CO_2^- **IGNORE** ambiguous attachments from ring (see brackets) **ALLOW** answer in terms of proton transfer e.g. NH_2 gains proton/H^+, OH loses proton

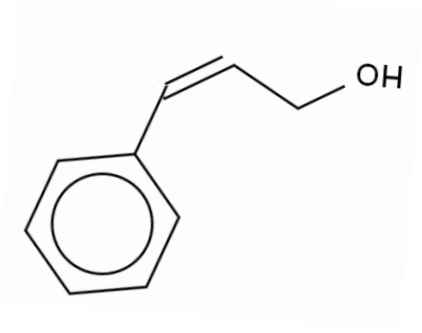
Question			Answer	Marks	Guidance
	(c)		*Please refer to the marking instructions on page 5 of this mark scheme for guidance on how to mark this question.* **Level 3 (5 – 6 marks)** Full treatment using majority of 'set-up' points **AND both** expected observations and interpretation *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3 – 4 marks)** Most of key 'set-up' points described AND expected observations **OR** interpretation *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1 – 2 marks)** A limited treatment using some of set-up points **OR** expected observations **OR** interpretation *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*	**6**	**indicative scientific points may include:** **NB: A labelled diagram may illustrate some of set-up points and/or observations.** **Develop practical techniques and procedures** ***set-up*** • samples of solutions of hydrolysis mixture, pure amino acids/salts and aspartame • water/ solvent in beaker • <u>pencil</u> line on chromatography paper • above level of water/solvent in beaker • samples spotted onto line, evenly spread • paper supported in beaker with lid/film • remove when solvent near top • locating agent used (ninhydrin/iodine/UV source) ***expected observations*** • two spots from hydrolysed sample **ALLOW** three spots (aspartame) • one spot at different heights for each pure aa **ALLOW** observations on a diagram **interpretation** • (two spots from hydrolysed sample show) <u>two aas present</u> • level with samples **OR** compare Rf values show the two suspected aas present.

Question			Answer	Marks	Guidance
	(d)		(phosphoric) acid <u>catalyst</u> for hydrolysis (of aspartame)✓ Lower concentration/amount in regular therefore reaction (hydrolysis) <u>slower</u>✓ **ORA**	**2**	**IGNORE** answers linked to le Chatelier using *acid as reactant rather than catalyst* **DO NOT ALLOW** 'gets hydrolysed less'
			Total	**14**	

Question			Answer	Marks	Guidance
2	(a)	(i)	Any one of: ✓ • amount/mass of Mg remains constant • only changes in acid concentration affect rate • surface area of magnesium is constant	1	**ALLOW** Because it is the limiting reactant **DO NOT ALLOW** 'fair test'/*to keep the variables the same*
		(ii)	**FIRST CHECK ANSWER LINE** If answer = 0.06(075) (g) award 3 marks Moles acid at lowest concentration = 0.05x0.1=0.005 ✓ moles Mg wiil be half above= 0.0025 ✓ mass 0.0025 x 24.3 = 0.06(075) (g) ✓	3	**any** sig figs **ALLOW ecf's** from MP1 – typically the use of 0.5 as the acid concentration (gives a value of 0.3(…); award two marks)
		(iii)	Length = m/d 0.06/1.3 x 10^{-2} = 4.6/4.67/4.7 (cm) ✓	1	**ecf** on ii (the above 0.3 value gives 23(…..)here
	(b)		Rate = k[acid]^2 ✓	1	**ALLOW** H^+ or hydrochloric acid or HCl(aq) for 'acid' Presence of Mg in eqn is a **CON unless** $[Mg]^0$
	(c)		Draws a tangent to curve ✓ tanget line runs through zero✓ Shows how gradient measured eg 230/100(see graph below)✓  ✓ 2.30 (+/- 0.5) cm^3s^{-1} ✓	5	Without the curve drawn first mark cannot be scored Expect to see <u>lines on graph</u> for this mark (often tricky – scanning) **DO NOT ALLOW** "tangents" which cut the curve **ecf's** on gradient **DO NOT ALLOW** Conversion to moles (dm^{-3}) for either of last two marks

Question			Answer	Marks	Guidance
	(d)		Axes correct (lnk and 1/T and unit for 1/T)✓ Scales sensible ✓ Straight line plot ✓ $-E_a/R$ or Gradient x R $= E_a$ ✓ ***Evaluation**:* ***Sign*** *+ or no sign* ✓ ***Numerical Value*** *27 +/- 3 when rounded to two sf kJmol^{-1})* ✓ 	6	• As in answer! • Scales should take up at least half graticule and be evenly distributed • Data points should cluster around/on line (graph does **DO NOT ALLOW** need to be extrapolated to show intercept or start at zero) • Mark for correct relationship i.e Gradient = *$-E_a/R$ or Gradient x R (or shown with the numbers* eg grad x 8.31*)* • Correct evaluation and conversion to kJ (**NO ecf** from gradient mark) The graph opposite is plotted in the same fashion as Fig 7 in the CI 4 in the text book, it could also of course be plotted as in Fig 8 in the text book i.e.  **Award 4 marks for correct answer on answer line** + MP's 1 and 2 if scored Correct answer with negative sign scores 3 (+ MP's 1 and 2)
			Total	**17**	

Question			Answer	Marks	Guidance
3	(a)		Orange colour goes green ✓ Primary alcohols reduce/react/are oxidised by dichromate; tertiary do/are not✓	2	Look for a comparison. **ALLOW** recognition of description of primary/secondary alcohol based on H attached to C and etc..
	(b)		Technique used: distillation ✓ Homologous series of product: aldehyde ✓ Technique used: reflux ✓ Homologous series of product: carboxylic acid ✓	4	**DO NOT ALLOW** condensation **DO NOT ALLOW** structures for homologous series e.g. C=O or COOH **DO NOT ALLOW** oxidation
	(c)		use equal vols/same amount of ocimenol and cinnamyl alcohol✓ add bromine dropwise/from a burette ✓ bromine decolourised ✓ more drops/volume/greatest titre decolorised for ocimenol/more unsaturated molecule ✓	4	**ORA** on first two marks **ALLOW** answer can be in terms of colorimetry and absorption of final solution **ALLOW** answers in terms of add bromine solution until first permanent brown/yellow ***IGNORE*** references to time/rate of decolourisation
	(d)		E/Z ✓	3	**ALLOW** cis/trans **ALLOW** geometric

Question			Answer	Marks	Guidance
			 ✓ Because of restricted/no rotation around double bond **AND** two different groups on each C in the C=C, two forms are different/isomers ✓		**IGNORE** extra C's in chain between double bond and OH
	e		134 ✓	**1**	
			Total	**14**	

Question			Answer	Marks	Guidance
4	(a)	(i)	(25cm3)Volumetric pipette	1	**DO NOT ALLOW** Bulb/graduated pipette
		(ii)	Calculates titre values and Uses average of titre 2, 3, 4= 22.60 (cm^3) ✓	1	
		(iii)	**FIRST CHECK ANSWER LINE** If answer = 80.6 (%) award 4 marks Moles of thiuosulfate = 0.200 x 0.02260 = 4.52×10^{-3} ✓ Moles of Cu in original 250cm^3 = 4.52×10^{-2} ✓ Mass of Cu = (4.52×10^{-2}) x 63.5 = 2.8702g ✓ % = 2.87655/3.56 = 80.624 (%) 80.6 sf mark ✓	4	No working but answer of 81 scores 3 marks (loses sf) 3sf
		(iv)	Burette error = 0.10/22.60 x 100 = 0.44% Electric balance = 0.005/3.56 x 100 = 0.14% (biggest error burette)	2	Mark for calculations **DO NOT ALLOW** decision on which apparatus gives biggest error
		(v)	Colourimetry/gravimetric/cell emf's	1	**ALLOW** an actual method e.g. *react with sodium hydroxide – weigh.* **ALLOW** gravimetric type detail such as precipitate and find mass produced. ***DO NOT ALLOW*** *pH change* **DO NOT ALLOW** Calorimetry
	(b)		*Please refer to the marking instructions on page 5 of this mark scheme for guidance on how to mark this question.* **Level 3 (5 – 6 marks)** Describes main points of the technique **and** most of fine detail under all three headings *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Level 2 (3 – 4 marks)** Describes the main points of the technique and some of	6	**indicative scientific points may include:** *Main points* • weigh the (approximate) mass of the solute/thiosulfate required to make up a known volume of standard solution • dissolve in water in a beaker • Transfer the solution to a clean, rinsed *volumetric/graduated* flask,make up to mark Fine detail *General* • weighed out on an minimum 2dp balance

Question			Answer	Marks	Guidance
			the fine details under all three headings **OR** most of fine detail under two of headings *There is a line of reasoning presented with some structure. The information presented is relevant and supported by some evidence.* **Level 1 (1 – 2 marks)** A limited treatment using main points + some fine detail under any of the headings *There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.* **0 marks** *No response or no response worthy of credit.*		• deionized/distilled water used *Solid transfer* • mass of solute is the <u>difference</u> between the mass of the weighing bottle and solute and the weighing bottle once emptied • stir the mixture in the beaker to dissolve the solute. • using a (filter) funnel to transfer to volumetric flask • Rinse the beaker and stirring rod well with deionised water, making sure that all the washings go into the volumetric flask. *Technique to make up solution.* • Add deionised water to the solution, swirling at intervals to mix the contents, and use a dropping pipette, near mark until • *<u>bottom of the meniscus</u>* is level with the mark on the neck of the flask – when you are looking at it at eye level. • Insert the stopper in the flask and invert it several times to thoroughly mix the contents.
			Total	**15**	

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