

Mark Scheme (Results)

June 2010

GCE

GCE Chemistry (6CH08/01)

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Publications Code UA023646

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Question Number	Acceptable Answers	Reject	Mark
1 (a)	Compound contains a transition metal (ion) / Compound contains chromate(VI) / CrO_4^{2-} Allow any yellow salt (name or correct formula) Allow 'transition element / metal (present)' Ignore d block Ignore any cation included	Dichromate oxides Cr^{6+}	1

Question Number	Acceptable Answers	Reject	Mark
1 (b)	Sodium (ions) present / Na^+	Na Anion	1

Question Number	Acceptable Answers	Reject	Mark
1 (c)	dichromate(VI) / dichromate / $\text{Cr}_2\text{O}_7^{2-}$ / $2\text{CrO}_4^{2-} + 2\text{H}^+ \rightarrow \text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{O}$ Ignore references to the other ions present (Na^+ , 2H^+ , SO_4^{2-}) No TE	Cr(VI) Cr^{6+}	1

Question Number	Acceptable Answers	Reject	Mark
1 (d)	$\text{Cr}_2\text{O}_7^{2-}$ / dichromate(VI)(allow Cr(VI)) is reduced (by the ethanol) / the ethanol is oxidized (by $\text{Cr}_2\text{O}_7^{2-}$ (allow Cr(VI))) / the ethanol forms ethanal / ethanoic acid (1) Cr^{3+} / chromium(III) / Cr(III) formed (1) Allow fully balanced ionic half-equation (2) No TE	Cr^{6+}	2

Question Number	Acceptable Answers	Reject	Mark
1 (e)	Precipitate chromium(III) hydroxide / Cr(OH)_3 / $\text{Cr(OH)}_3(\text{H}_2\text{O})_3$ (1) Solution chromate(III) / tetrahydroxochromate(III) / hexahydroxochromate(III) / Cr(OH)_4^- / Cr(OH)_6^{3-} (1) Allow hydrated forms / CrO_2^- / CrO_3^{3-} Allow chromium hydroxide if Cr^{3+} Allow Cr(OH)_5^{2-} Ignore number of water ligands	Cr_2O_3 Cr^{3+} $\text{Cr}^{3+}(\text{aq})$	2

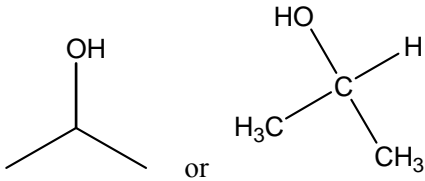
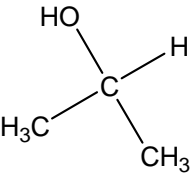
Question Number	Acceptable Answers	Reject	Mark
1 (f)	<p>Pale blue ions $\text{Cr}^{2+} / \text{Cr}(\text{H}_2\text{O})_n^{2+}$ chromium(II) / Cr(II) (1)</p> <p>Role of zinc Reducing agent / Reduces / Reduction / providing electrons (1)</p>	Cu^{2+}	2

Question Number	Acceptable Answers	Reject	Mark
1 (g)	<p>Green ions $\text{Cr}^{3+} / \text{chromium(III)} / \text{Cr(III)}$ (1)</p> <p>Explanation The $\text{Cr}^{2+} / \text{chromium(II)} / \text{Cr(II)}$ (allow 'blue species') is oxidized by (oxygen in) the air (1)</p> <p>Ignore water ligands Allow oxidized by oxygen</p>		2

Question Number	Acceptable Answers	Reject	Mark
2 (a)(i)	OH / hydroxyl group present OR Compound could be an alcohol / OH or a carboxylic acid / COOH	Hydroxide / OH ⁻ alcohol / carboxylic acid alone	1

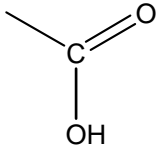
Question Number	Acceptable Answers	Reject	Mark
2 (a)(ii)	P is (an alcohol) not a carboxylic acid Allow P is an alcohol if in (a)(i) P is described as "an alcohol or a carboxylic acid" Ignore primary and/or secondary	Alcohol without three carbons	1

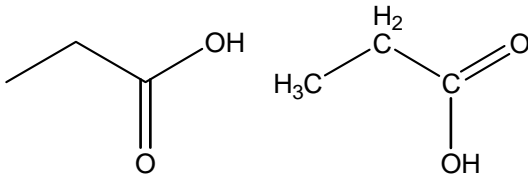
Question Number	Acceptable Answers	Reject	Mark
2 (a)(iii)	P contains the group CH ₃ CH(OH)- / P is a 2-ol Allow P is propan-2-ol / secondary alcohol	P is a methylketone / ethanol / methyl alcohol	1

Question Number	Acceptable Answers	Reject	Mark
2 (a)(iv)	P is propan-2-ol / CH ₃ CH(OH)CH ₃  or  No TE on earlier incorrect answer	Molecular formula only	1

Question Number	Acceptable Answers	Reject	Mark
2 (a)(v)	Peak is caused by (CH ₃ CHOH) ⁺ / C ₂ H ₅ O ⁺ / CH ₂ CH ₂ OH ⁺ (1) stand alone (molecular ion (of propan-2-ol) will fragment by) loss of one CH ₃ group / CH ₃ [•] / CH ₃ radical (1) Second mark can be awarded only if ion has relative mass of 45 Allow the molecule fragments (instead of molecular ion) Allow equations with charge not balanced	Formula without positive charge Breaking C-C bond on its own CH ₃ ⁺	2

Question Number	Acceptable Answers	Reject	Mark
2 (b)(i)	Hydrogen chloride / HCl Allow hydrochloric acid / HCl(aq)	HCl and POCl ₃	1

Question Number	Acceptable Answers	Reject	Mark
2 (b)(ii)	Q is a carboxylic acid / COOH /  Allow CO ₂ H / propanoic acid / carboxylic alone	Carboxylate	1

Question Number	Acceptable Answers	Reject	Mark
2 (b)(iii)	Q is propanoic acid / CH ₃ CH ₂ COOH / CH ₃ CH ₂ CO ₂ H / C ₂ H ₅ COOH 		1

Question Number	Acceptable Answers	Reject	Mark
3 (a)	$\text{Fe} + 2\text{H}^+ \rightarrow \text{Fe}^{2+} + \text{H}_2$ $\text{Fe} + 2\text{H}_3\text{O}^+ \rightarrow \text{Fe}^{2+} + \text{H}_2 + \text{H}_2\text{O}$ Ignore state symbols and correct sulfate formulae	Non ionic equation	1

Question Number	Acceptable Answers	Reject	Mark
3 (b)	Effervescence / fizzing stopped/no more bubbles of gas given off Allow no more gas given off	All iron dissolved Steamy fumes (for gas)	1

Question Number	Acceptable Answers	Mark														
3 (c)(i)	<table border="1"> <tbody> <tr> <td>Titre / cm³</td> <td>23.35</td> <td>23.05</td> <td>22.70</td> <td>23.00</td> <td>22.95</td> <td>(1)</td> </tr> <tr> <td>Titres used (✓ or ×)</td> <td>×</td> <td>✓</td> <td>×</td> <td>✓</td> <td>✓</td> <td>(1)</td> </tr> </tbody> </table> Ignore omission of trailing zeros	Titre / cm ³	23.35	23.05	22.70	23.00	22.95	(1)	Titres used (✓ or ×)	×	✓	×	✓	✓	(1)	2
Titre / cm ³	23.35	23.05	22.70	23.00	22.95	(1)										
Titres used (✓ or ×)	×	✓	×	✓	✓	(1)										

Question Number	Acceptable Answers	Reject	Mark
3 (c)(ii)	$((23.05 + 23.00 + 22.95) \div 3) = 23.00 \text{ (cm}^3\text{)}$ Allow 23 / 23.0 TE from (c)(i)		1

Question Number	Acceptable Answers	Reject	Mark
3 (c)(iii)	<p>(A) Moles MnO_4^- (in titre) = $23.00 \times 10^{-3} \times .022$ = 5.06×10^{-4} (1)</p> <p>(B) Moles Fe^{2+} in 250 cm^3 = $10 \times 5 \times$ Answer in (A) (= 0.0253) (1)</p> <p>(C) Mass of Fe = Answer in B $\times 55.8$ (= $0.0253 \times 55.8 = 1.41$ (g)) (1)</p> <p>(D) % iron = $100 \times$ answer in C $\div 1.48$ (= 95.4 %) (1)</p> <p>Ignore SF except 1 SF Ignore correct intermediate rounding of calculated values Allow 56 for A_r of iron (95.7 %) Allow TE from (c)(i) and (ii) Correct answers with no working score full marks</p>	% > 100 %	4

Question Number	Acceptable Answers	Reject	Mark
3 (d)	<p>Iron(II) ions: Pipette and sulfuric acid: measuring cylinder (1) both needed for the mark</p> <p>An exact volume of iron(II) ion solution is needed but only an approximate volume of /excess sulfuric acid (1) The second mark may be awarded if a burette and measuring cylinder are given</p> <p>Allow any recognisable spelling of pipette, eg pipet</p>	Just pipette more accurate than measuring cylinder	2

Question Number	Acceptable Answers	Reject	Mark
3 (e)	To ensure that the manganate(VII) ions were fully reduced (to manganese(II)) Or To ensure MnO ₂ is not precipitated Allow Large number of H ⁺ ions required in (titration) equation 8 moles H ⁺ ions required (per mol Fe ²⁺ in titration) To prevent oxidation of Fe ²⁺ by (oxygen in) air or by water To prevent hydrolysis	To ensure complete reaction	1

Question Number	Acceptable Answers	Reject	Mark
3 (f)	First permanent pink colour Allow (colourless) solution turns pink	Purple to pink Turns purple	1

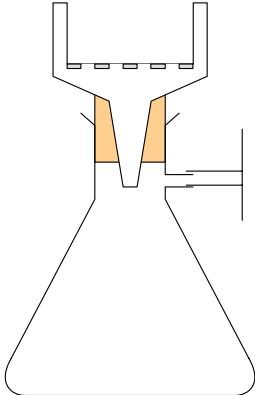
Question Number	Acceptable Answers	Reject	Mark
3 (g)	HCl / Cl ⁻ will be oxidized (to chlorine) by the manganate(VII) OR HCl / Cl ⁻ will react with manganate(VII) to form chlorine (1) So the reaction of the iron(II) ions with manganate(VII) will not be quantitative/titre will be too high (1) Allow permanganate / manganate (for manganate(VII)) Ignore references to toxicity of chlorine	HCl / Cl ⁻ strong reducing agent / oxidised by Fe ²⁺ Just chlorine formed Titration values inaccurate	2

Question Number	Acceptable Answers	Reject	Mark
4 (a)	<p>Amount of phenylamine = $9/93 / 0.0968$ (mol) (1) = amount of ethanoic anhydride</p> <p>Mass ethanoic anhydride = $102 \times 9/93 = 9.87$ (g) (1)</p> <p>Ignore SF except 1 SF Correct answer with no working scores full marks Mr values reversed scores max 1 only if a mole calculation is clearly shown</p>		2

Question Number	Acceptable Answers	Reject	Mark
4 (b)(i)	To ensure that all the phenylamine reacts	<p>So ethanoic anhydride is in excess</p> <p>To ensure complete reaction</p>	1

Question Number	Acceptable Answers	Reject	Mark
4 (b)(ii)	<p>Reaction is exothermic / produces heat</p> <p>Allow reaction is vigorous so that the temperature does not increase (too much) Ignore references to the reaction being violent, dangerous, explosive etc</p>		1

Question Number	Acceptable Answers	Reject	Mark
4 (b)(iii)	<p>Mistake: The condenser water flow is wrong way round so air may be trapped/jacket will not be full of water (1) Allow cooling not so effective / flammable liquid might escape Correction Reverse the flow of water (1)</p> <p>Mistake: Flammable liquids are being heated with a Bunsen/naked flame (1) Correction so the Bunsen burner should be replaced by a hot plate (allow water bath) (1) OR Mistake: Heating with a Bunsen too strong (so glass may crack) (1) Correction Use micro-burner/gauze (1)</p>		4

Question Number	Acceptable Answers	Reject	Mark
4 (b)(iv)	 <p>Funnel (conical allowed) with grid / line / horizontal filter paper (1) Side-arm conical flask (with valve or connection to a pump) (1)</p> <p>Reduced pressure achieved by: Flow of water through the pump/valve/can be shown in diagram (reduces pressure in the flask) (1)</p> <p>Allow using a (vacuum / suction) pump connected to side-arm (connection may be shown in diagram)(1)</p>		3

Question Number	Acceptable Answers	Reject	Mark
4 (c)	<p>Mass of N-phenylethanamide if 100% yield = $135 \times 9/93$ (1) = 13.06 g</p> <p>Yield = $100 \times 7.49/13.06$ = 57.3 % (1)</p> <p>Alternatively Moles phenylamine = $9/93$ = 0.0968 Moles N-phenylethanamide = $7.49/135$ = 0.0555 (1) Yield = $100 \times .0555/.0968$ = 57.3 % (1)</p> <p>Correct answer with no working scores (2)</p> <p>Ignore sf except 1 sf Yields greater than 100 % score zero</p>	<p>$100 \times 7.49/9$ = 83.2 % (0)</p>	2

Question Number	Acceptable Answers	Reject	Mark
4 (d)	Some of the <i>N</i> -phenylethanamide will remain on the filter paper/will be deposited on the sides of the glassware/in solution (and will not be recovered by filtration)		1

Question Number	Acceptable Answers	Reject	Mark
4 (e)	The product was not dry / was damp / water (still) present Ignore reference to impurities present		1

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