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Mark Scheme (Results)
June 2010

GCE

GCE Chemistry (6CH08/01)

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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 / $Cr_2O_7^{2-}$ / $2CrO_4^{2-} + 2H^+ \rightarrow Cr_2O_7^{2-} + H_2O$ 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)	$Cr_2O_7^{2-}$ / dichromate((VI))(allow Cr(VI)) is reduced (by the ethanol) / the ethanol is oxidized (by $Cr_2O_7^{2-}$ (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 / $Cr(OH)_3$ / $Cr(OH)_3(H_2O)_3$ **(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+} $Cr^{3+}(aq)$	**2**

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Question Number	Acceptable Answers	Reject	Mark
1 (f)	**Pale blue ions** Cr^{2+} / $Cr(H_2O)_n^{2+}$ chromium(II) / Cr(II) **(1)** **Role of zinc** Reducing agent / Reduces / Reduction / providing electrons **(1)**	Cu^{2+}	**2**

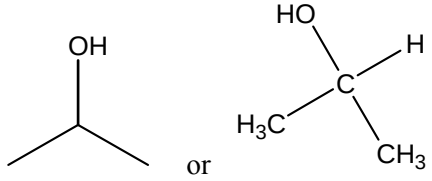
Question Number	Acceptable Answers	Reject	Mark
1 (g)	**Green ions** Cr^{3+}/ chromium(III) / Cr(III) **(1)** **Explanation** The Cr^{2+} / chromium(II) / Cr(II) (allow 'blue species') is oxidized by (oxygen in) the air **(1)** Ignore water ligands Allow oxidized by oxygen		**2**

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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**

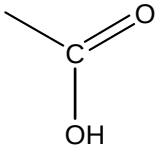
Question Number	Acceptable Answers	Reject	Mark
2 (a)(iii)	**P** contains the group $CH_3CH(OH)-$ / P is a 2-ol Allow **P** is propan-2-ol / secondary alcohol	**P** is a methylketone / ethanol / methyl alcohol	**1**

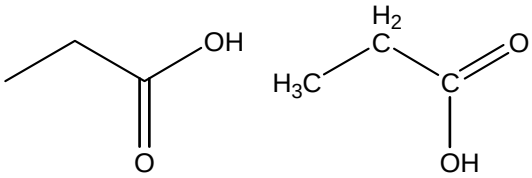
Question Number	Acceptable Answers	Reject	Mark
2 (a)(iv)	**P** is propan-2-ol / $CH_3CH(OH)CH_3$  No TE on earlier incorrect answer	Molecular formula only	**1**

Question Number	Acceptable Answers	Reject	Mark
2 (a)(v)	Peak is caused by $(CH_3CHOH)^+$ / $C_2H_5O^+$ / $CH_2CH_2OH^+$ **(1)** stand alone (molecular ion (of propan-2-ol) will fragment by) loss of one CH_3 group / $CH_3^\bullet$ / 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**

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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_2H / propanoic acid / carboxylic alone	Carboxylate	**1**

Question Number	Acceptable Answers	Reject	Mark
2 (b)(iii)	**Q** is propanoic acid / CH_3CH_2COOH / $CH_3CH_2CO_2H$ / C_2H_5COOH  		**1**

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Question Number	Acceptable Answers	Reject	Mark
3 (a)	$Fe + 2H^+ \rightarrow Fe^{2+} + H_2$ $Fe + 2H_3O^+ \rightarrow Fe^{2+} + H_2 + H_2O$ 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><tr><td>**Titre / cm^3**</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></table> Ignore omission of trailing zeros	**2**

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

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Question Number	Acceptable Answers	Reject	Mark
3 (c)(iii)	(A) Moles MnO_4^- (in titre) = 23.00 x10^{-3} x .022 = 5.06 x 10^{-4} **(1)** (B) Moles Fe^{2+} in 250 cm^3 = 10 x 5 x Answer in (A) (= 0.0253) **(1)** (C) Mass of Fe = Answer in B x 55.8 (= 0.0253 x 55.8 =1.41 (g)) **(1)** (D) % iron =100 x answer in C ÷ 1.48 (= 95.4 %) **(1)** 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	% > 100 %	**4**

Question Number	Acceptable Answers	Reject	Mark
3 (d)	**Iron(II) ions:** Pipette and **sulfuric acid**: measuring cylinder **(1)** both needed for the mark 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 Allow any recognisable spelling of pipette, eg pipet	Just pipette more accurate than measuring cylinder	**2**

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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**

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Question Number	Acceptable Answers	Reject	Mark
4 (a)	Amount of phenylamine = 9/93 / 0.0968 (mol) **(1)** = amount of ethanoic anhydride Mass ethanoic anhydride =102 x 9/93 = 9.87 (g) **(1)** 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		**2**

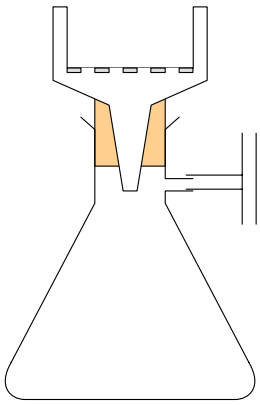
Question Number	Acceptable Answers	Reject	Mark
4 (b)(i)	To ensure that all the **phenylamine** reacts	So ethanoic anhydride is in excess To ensure complete reaction	**1**

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

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Question Number	Acceptable Answers	Reject	Mark
4 (b)(iii)	**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)** **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)**		**4**

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

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

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Question Number	Acceptable Answers	Reject	Mark
4 (d)	Some of the *N*-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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