edexcel
advancing learning, changing lives

Mark Scheme (Results)
June 2010

GCE

GCE Chemistry (6CH08/01)

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: One90 High Holborn, London WC1V 7BH

A PEARSON COMPANY

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers.

Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

For further information, please call our GCE line on 0844 576 0025, our GCSE team on 0844 576 0027, or visit our website at www.edexcel.com.

If you have any subject specific questions about the content of this Mark Scheme that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

Ask The Expert can be accessed online at the following link:

http://www.edexcel.com/Aboutus/contact-us/

Alternatively, you can speak directly to a subject specialist at Edexcel on our dedicated Science telephone line: 0844 576 0037

Summer 2010

Publications Code UA023646

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**

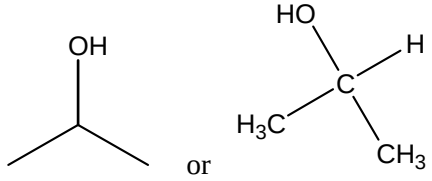
Question Number	Acceptable Answers	Reject	Mark
1 (f)	**Pale blue ions** Cr^{2+} / $Cr(H_2O)_n^{2+}$ chromium(II) / Cr(II) **(1)** **Role of zinc** Reducing agent / Reduces / Reduction / providing electrons **(1)**	Cu^{2+}	**2**

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**

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**

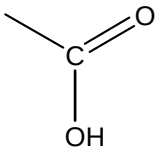
Question Number	Acceptable Answers	Reject	Mark
2 (a)(ii)	**P** is (an alcohol) not a carboxylic acid Allow **P** is an alcohol if in (a)(i) **P** is described as "an alcohol or a carboxylic acid" Ignore primary and/or secondary	Alcohol without three carbons	**1**

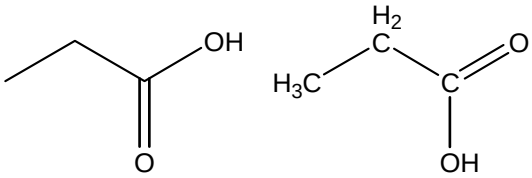
Question Number	Acceptable Answers	Reject	Mark
2 (a)(iii)	**P** contains the group $CH_3CH(OH)-$ / P is a 2-ol Allow **P** is propan-2-ol / secondary alcohol	**P** is a methylketone / ethanol / methyl alcohol	**1**

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**

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**

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**

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**

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**

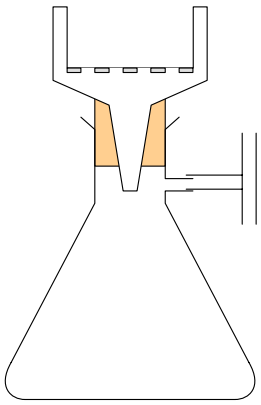
Question Number	Acceptable Answers	Reject	Mark
3 (g)	HCl / Cl^- will be oxidized (to chlorine) by the manganate(VII) **OR** HCl / Cl^- will react with manganate(VII) to form chlorine **(1)** So the reaction of the iron(II) ions with manganate(VII) will not be quantitative/titre will be too high **(1)** 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)	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**

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**

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**

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**

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481

Email publications@linneydirect.com

Order Code UA023646 Summer 2010

For more information on Edexcel qualifications, please visit www.edexcel.com/quals

Edexcel Limited. Registered in England and Wales no.4496750
Registered Office: One90 High Holborn, London, WC1V 7BH