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Mark Scheme (Results)
January 2011

GCE

GCE Chemistry (6CH08/01)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear

  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter

  iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

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Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:
- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.
( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.
Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.
ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication
Questions which involve the writing of continuous prose will expect candidates to:
- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.
Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

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Question Number	Acceptable Answers	Reject	Mark
1 (a)	Transition metal compound / transition metal ion ALLOW *d*-block compound / d-block ion	Any specific ion; transition **metal;** transition **element;** d-block **element.**	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (b)	Lilac ALLOW mauve or pale purple or violet		**1**

Question Number	Acceptable Answers	Reject	Mark
1 (c) (i)	$BaSO_4$ Ignore any state symbols		**1**

Question Number	Acceptable Answers	Reject	Mark
1 (c) (ii)	$Cr(OH)_3$ OR $[Cr(OH)_3(H_2O)_3]$ OR $[Cr(H_2O)_3\ (OH)_3]$ **(1)** $Cr(OH)_6^{3-}$ **(1)**	 $Cr(OH)_4^-$; CrO_3^{3-}	**2**

Question Number	Acceptable Answers	Reject	Mark
1 (c) (iii)	CrO_4^{2-}		**1**

Question Number	Acceptable Answers	Reject	Mark
1 (c) (iv)	$Cr_2O_7^{2-}$	Cr^{3+}	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (c) (v)	$[Cr(H_2O)_6]^{3+}$ OR Cr^{3+} **Max 3 if names given instead of formulae for all parts of (c)**		**1**

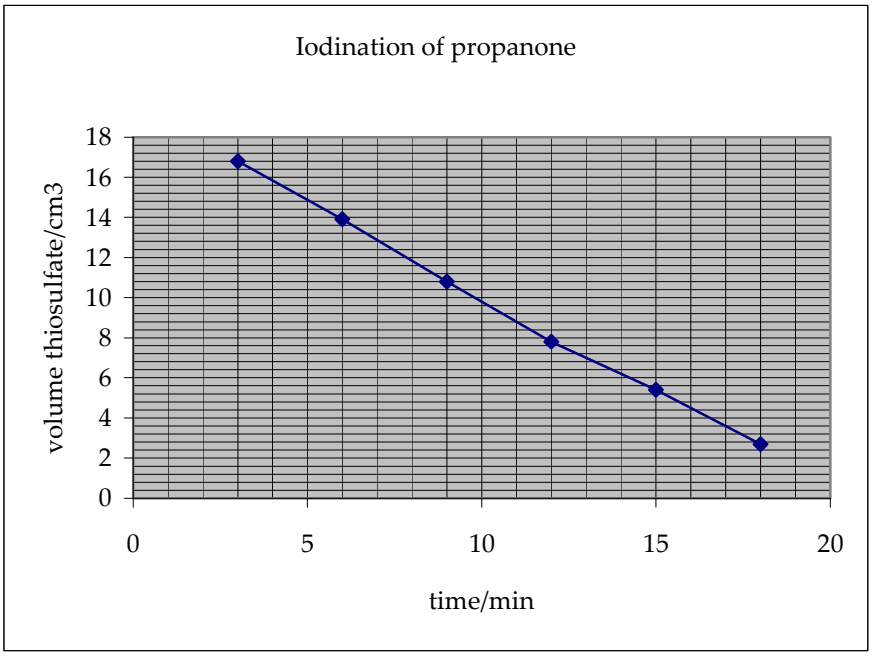
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Question Number	Acceptable Answers	Reject	Mark
1 (d)	$K_2SO_4.Cr_2(SO_4)_3.zH_2O$ (ALLOW z = 24) OR $KCr(SO_4)_2.zH_2O$ (ALLOW z = 12) OR $K_2Cr_2(SO_4)_4.zH_2O$ (ALLOW z = 24)	P for K $KCrS_2O_8$	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (e) (i)	Yellow / orange / orange-red **precipitate** ALLOW yellow / orange **solid**	red	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (e) (ii)	Silver (mirror OR precipitate OR solid) OR black precipitate/solid		**1**

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Question Number	Acceptable Answers	Reject	Mark
2 (a) (i)	 labelled axes **(1)** units do not have to be shown sensible graduations **(1)** points correctly plotted **(1)** suitable best-fit straight line **(1)** not a curve or point-to-point. Ignore any extrapolation beyond the end two points.		**4**

Question Number	Acceptable Answers	Reject	Mark
2 (a) (ii)	The concentration of iodine is proportional to the titre		**1**

Question Number	Acceptable Answers	Reject	Mark
2 (a) (iii)	Propanone and hydrogen ion concentrations are approximately constant during the reaction **(1)** the order (observed is therefore) that of the iodine alone **(1)**		**2**

Question Number	Acceptable Answers	Reject	Mark
2 (a) (iv)	(Straight line shows) rate is independent of concentration OR rate is constant OR gradient is constant **(1)** zero order **(1)** stand-alone		**2**

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Question Number	Acceptable Answers	Reject	Mark
2 (b) (i)	Starch (solution) **(1)** blue OR black OR blue-black solution turns colourless **(1)** colour **change needed**		**2**

Question Number	Acceptable Answers	Reject	Mark
2 (b) (ii)	When the solution is pale yellow / straw coloured **(1)** starch not added initially because it forms an **insoluble** complex / compound / substance **(1)**	near OR at endpoint	**2**

Question Number	Acceptable Answers	Reject	Mark
2 (c)	Titres are small **so** the relative / percentage error is high(er)	Points are not on the line	**1**

Question Number	Acceptable Answers	Reject	Mark
2 (d)	One OR first order **(1)** stand alone (because) doubling its (constant) concentration in the rate equation also doubles the rate **(1)**		**2**

Question Number	Acceptable Answers	Reject	Mark
2 (e)		Dilatometry	**2**

Technique **(1)**	Reason **(1)**
Colorimetry	Iodine is coloured
Conductivity	Increase in concentration of ions
ALLOW	
pH	Increase in concentration of hydrogen ions
Acid base titration	Increase in concentration of hydrogen ions
Silver nitrate titration	Increase in concentration of Iodide ions

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Question Number	Acceptable Answers	Reject	Mark
3 (a) (i)	To avoid the temperature rising too much OR the reaction is exothermic **(1)** as the sulphuric acid is diluted by the water in nitric acid **(1)**		**2**

Question Number	Acceptable Answers	Reject	Mark
3 (a) (ii)	Prevents escape of benzene / volatile liquids **(1)** reactants are **immiscible/do not mix/form separate layers** (so they need to be stirred to make reaction rate acceptable) **(1)**	Escape of non-volatile liquid; escape of H_2SO_4	**2**

Question Number	Acceptable Answers	Reject	Mark
3 (a) (iii)	EITHER benzene is toxic **(1)** so use fume cupboard **(1)** OR benzene is harmful by skin absorption **(1)** so wear gloves **(1)** OR acids corrosive **(1)** so wear gloves **(1)** OR Benzene / nitrobenzene is flammable **(1)** so use heating mantle / water bath **(1)** The method and the reason must be linked for both marks.	Lab coats / goggles	**2**

Question Number	Acceptable Answers	Reject	Mark
3 (a) (iv)	Sodium carbonate removes / neutralizes (residual) acid		**1**

Question Number	Acceptable Answers	Reject	Mark
3 (a) (v)	(anhydrous) sodium sulphate / magnesium sulphate OR (anhydrous) calcium chloride OR silica gel	(Anhydrous) Copper sulphate; cobalt chloride; conc H_2SO_4.	**1**

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Question Number	Acceptable Answers	Reject	Mark
3 (a) (vi)	Distillation flask + heat (the word, or sand- or oil-bath, or mantle) **(1)** thermometer + still-head **(1)** thermometer should be in approximately the correct place air condenser / water condenser (ignore direction of water flow) **(1)** receiver **(1)** Allow correct fractional distillation apparatus. apparatus badly drawn **- 1** apparatus closed **- 1** Reflux apparatus correctly drawn scores **(1)** only.	Water bath Thermometer on the liquid	**4**

Question Number	Acceptable Answers	Reject	Mark
3 (b) (i)	Unstable / decomposes (easily) **(1)** At room temperature / cannot be stored / transported (from supplier) **(1)**		**2**

Question Number	Acceptable Answers	Reject	Mark
3 (b) (ii)	< 0 °C reaction is too slow **(1)** ALLOW mixture freezes > 10 °C diazonium compound decomposes / hydrolyses **(1)**	low yield evaporates	**2**

Question Number	Acceptable Answers	Reject	Mark
3 (c) (i)	To prevent (much of the) azo dye remaining in solution on cooling OR Gives a saturated solution	maximize yield	**1**

Question Number	Acceptable Answers	Reject	Mark
3 (c) (ii)	Removes **insoluble** impurities **(1)** to prevent crystallization (of the azo dye) **(1)**		**2**

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Question Number	Acceptable Answers	Reject	Mark
3 (c) (iii)	Removes **soluble** impurities (from crystal surface)		**1**

Question Number	Acceptable Answers	Reject	Mark
3 (c) (iv)	Decomposition could occur if the compound were to be heated OR compound might melt		**1**

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