



RECOGNISING ACHIEVEMENT

CONFIDENTIAL

January 2006

ADVANCED GCE UNIT

MARK SCHEME

FINAL

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MAXIMUM MARK: 120

**Syllabus / Component: 2854/01**

**Chemistry (Salters): Chemistry by Design**

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Paper Set Date: 25/01/06

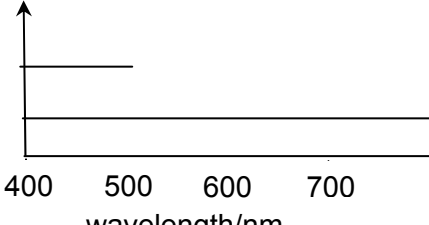
SUBJECT OFFICER: Steven Evans

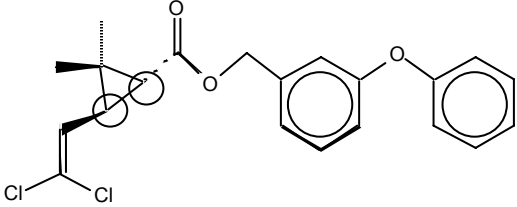
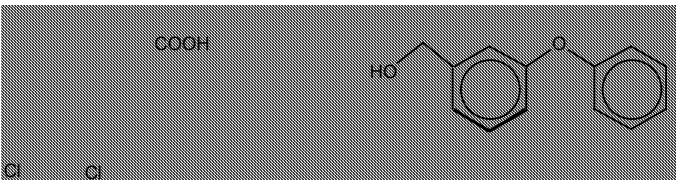
CHECKED BY	APPROVED (Tick or initials or signature)	DATE

## ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.  
You are advised to destroy all draft versions.
2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks (½) should never be used.
3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme. Remember that scripts may be returned to Centres.
  - x = incorrect response (errors may also be underlined)
  - ^ = omission mark
  - bod = benefit of the doubt (where professional judgement has been used)
  - ecf = error carried forward (in consequential marking)
  - con = contradiction (in cases where candidates contradict themselves in the same response)
  - sf = error in the number of significant figures
4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.
5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.
6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)
7. Strike through all blank spaces and/or pages in order to give a clear indication that the whole of the script has been considered.
8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader/Principal Examiner for guidance.

<b>Abbreviations, annotations and conventions used in the Mark Scheme</b>	/ ; NOT ( ) _____ ecf AW ora = alternative and acceptable answers for the same marking point = separates marking points = answers which are not worthy of credit = words which are not essential to gain credit = (underlining) key words which <b>must</b> be used to gain credit = error carried forward = alternative wording = or reverse argument
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<b>Mark Scheme</b> Page 1 of 5	<b>Unit Code</b> 2854	<b>Session</b> Jan	<b>Year</b> 2006	<b>Version</b> Final	
<b>Question</b>	<b>Expected Answers</b>				<b>Marks</b>
1 a	idea of <u>contrast</u> , eg “lettering/it absorbs more light”; “white stands out better”				1
1 b i	NiSO <sub>4</sub> /NiCl <sub>2</sub> /Ni(NO <sub>3</sub> ) <sub>2</sub> NaH <sub>2</sub> PO <sub>2</sub> or potassium salt but NOT acid				2
1 b ii	pH goes down (1); H <sup>+</sup> formed (1)				2
1 b iii	H <sub>3</sub> PO <sub>3</sub>				1
1 c i	0 (1); +1 (1); +3(1); one mark for second two if signs follow numbers				3
1 c ii	Redox – oxidation states change (unless refers to element other than P) / P/H <sub>2</sub> PO <sub>2</sub> <sup>-</sup> is both oxidised and reduced /exchange of electrons/ no proton exchange NOT just reference to oxidation and/or reduction.				1
1 d i	nitrogen dioxide/nitrogen(IV) (di)oxide IGNORE gaps				1
1 d ii	Ni + 2HNO <sub>3</sub> → NiO + 2NO <sub>2</sub> + H <sub>2</sub> O (2) Balanced equation with water molecules and/or hydrogen ions not cancelled(1)				2
1 e	Reacts with acids (to neutralise them)/ accepts protons (1) <i>IGNORE references to alkali/solubility</i> reactants correct for NiO + HCl/HNO <sub>3</sub> /H <sub>2</sub> SO <sub>4</sub> /H <sup>+</sup> (1) correct equation (1)				3
1 f i	complete reaction (with water)/ fully dissociated/ almost fully dissociated/ Ka > 1 (1) <i>IGNORE references to ability to donate protons</i> HNO <sub>3</sub> (ignore “+aq”) $\longrightarrow$ $\rightleftharpoons$ H <sup>+</sup> + NO <sub>3</sub> <sup>-</sup> or reaction with H <sub>2</sub> O to give H <sub>3</sub> O <sup>+</sup> (1) <i>ALLOW equation for other strong acids. Accept “general” acid such as HA, provided there is an arrow rather than an equilibrium sign.</i>				2
1 f ii	pH = 2 (1)				1
1 g	 <p>line starting and continuing parallel across to 700 at least (1); super black line more than half-way below black paint (1)</p>				2
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<b>Mark Scheme</b> Page 2 of 5	<b>Unit Code</b> 2854	<b>Session</b> Jan	<b>Year</b> 2006	<b>Version</b> Final
2 a i	$C_{21}H_{20}O_3Cl_2$ (2) completely correct (order immaterial) (1) one error;			2
2 a ii	two from: ether, alkene, chloro(alkene)/halo/halogeno NOT cycloalkane			2
2 a iii	 (1) each			2
2 a iv	2 (chlorine) atoms/same groups (ora) on one carbon (of double bond)			1
2 b i	$CH_3-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-OH$ Allow more structured (1) NOT C-H-O			1
2 b ii	four from: <b>A</b> large $K_{ow}$ means more in fat/octan-1-ol/non-polar solvents <b>B</b> octan-1-ol "resembles" fat/ is non-polar; <b>C</b> pesticides must be more soluble in fat than water/ easily absorbed in fat/organic; <b>D</b> they can pass from spraying solution (into insect)/ not leached off/ insoluble in water/ high concentrations not needed;. <b>E</b> in the fatty tissues of insect they do damage			4
2 c	 or shown skeletally (1) (1) Allow sodium salt of acid.			2
2 d	<i>two from</i> higher $K_{ow}$ ; smaller quantities have the same effect; break down quicker/ more completely/ in water more specific on certain pests (AW) inactive when outside insects			2
2 e i	radical <i>ignore substitution</i> (1) (uv) light (1);			2
2 e ii	Br , H (1) in either order.			1
2 e iii	$CN^-/KCN/HCN$			1
				20





<b>Mark Scheme</b> Page 5 of 5	<b>Unit Code</b> 2854	<b>Session</b> Jan	<b>Year</b> 2006	<b>Version</b> Final
5 a i	They make black together/ they can make any colour/ they are (sub) primaries			1
5 a ii	Decompose at 400°C			1
5 b i	azo			1
5 b ii	<i>four from:</i> delocalised electrons; ring; above and below ring of carbons/plane of atoms; six electrons/ one electron from each carbon is not involved in other bonding; not attached to particular carbons/spread out over <u>all carbons</u> /benzene ring			4
5 c i	solubility (in water)/ acidity			1
5 c ii	<u>conc.</u> sulphuric acid (1); reflux <i>if sulphuric acid mentioned</i> (1)			2
5 c iii	hydrogen on ring is replaced (by -SO <sub>3</sub> H) (1)			1
5 c iv	positive ion/molecule with partial positive charge (1); attracted to area of negative charge/high electron density (1); accept pair of electrons to form a bond (1)			3
5d	excitation of electrons/ movement from lower to higher energy level (1); absorbs in visible (1); transmits the complementary colour (1); ( $\Delta$ )E=hv/ energy difference related to frequency (1),  <i>2 maximum if emission is described</i>			4
				18