

Chemistry (Salters)

Advanced GCE **2854**

Chemistry by Design

Mark Scheme for June 2010

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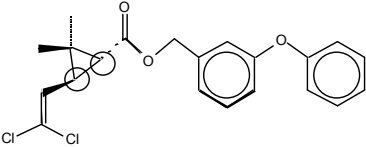
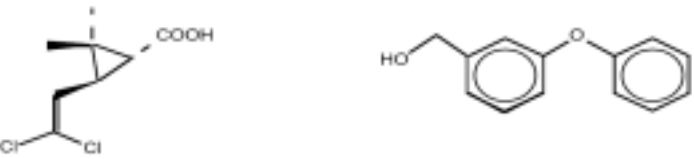
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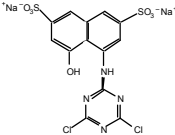
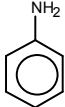
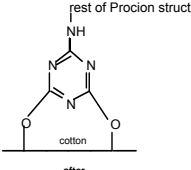
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Mark Scheme Page 2 of 5		Unit Code 2854	Session Jun	Year 2010	Version Final
1 a	2NO + O ₂ → 2NO ₂ allow halved or doubled IGNORE state symbols				1
1 b	car/vehicle OR lightning OR power stations OR bacterial decay OR burning of fossil fuels				1
1 c	+2 +2(allow +1) +4 (1) each. <i>Max 2 if plus signs after numbers</i>				3
1 d i	amount NO ₂ = 1(000)/46(= 0.0217); mass HNO ₃ = 0.0217 x 63 = 1.4 kg or $\frac{63}{46} \times 1(000) = 1.4$ kg (1) for <i>M_r</i> values (46, 63) (1) for calc and evaluation ecf from incorrect Mr values 2 sig figs <i>mark separately if some working shown</i> (1)				3
1 d ii	Advantage: N fertilizer / increases N content / plants need N / N makes plants grow (1). <i>must mention nitrogen / nitric acid / nitrate to score</i> Disadvantage: changes acidity / pH of soil ALLOW 'it is acidic' OR eutrophication (not just 'run-off') AW(1)				2
1 e	<i>two pairs from:</i> high melting point / boiling point (1); strong forces between ions / strong electrostatic forces / ionic bonds (1); ALLOW 'attractions' for 'forces' IGNORE 'inter-molecular forces'. soluble in <u>water</u> (1); strong forces between ions and water molecules / ions are hydrated AW (1); conducts in solution / molten (1); ions can move / carry charge (1); <i>mark separately</i>				4
1 f i	negative AND fewer molecules on right				1
1 f ii	<i>Any three from four:</i> Δ <i>S</i> _{surr} is positive (since Δ <i>H</i> negative) (1); Δ <i>S</i> _{surr} more positive / greater at lower temps (1); 'more positive' also scores 1 st mpt Δ <i>S</i> _{tot} is more positive / becomes positive / larger at lower temperatures (1) idea of Δ <i>S</i> _{surr} overcoming –ve Δ <i>S</i> _{sys} (at lower temps) (1)				3
1 g i	larger (AW)				1
1 g ii	rate constant larger / more collisions are successful (1); but [N ₂ O ₂] lower / less N ₂ O ₂ (AW) at higher <i>T</i> / smaller frequency of collision (1); second effect outweighs first (AW) (1)				3
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Mark Scheme Page 2 of 5	Unit Code 2854	Session Jun	Year 2010	Version Final
2 a i	C ₂₁ H ₂₀ O ₃ Cl ₂ (2) completely correct (order immaterial) (1) one error;			2
2 a ii	two from: ether, alkene, chloro(alkene) / halo / halogeno NOT cycloalkane extra wrong groups are CON to correct answers			2
2 a iii	 (1) each			2
2 a iv	2 (chlorine) atoms / same groups (ora) on one carbon (of double bond) IGNORE 'side 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 / skeletal (1) NOT C-H-O			1
2 b ii	four from: A large K _{ow} means more soluble in octan-1-ol / non-polar solvents B octan-1-ol 'resembles' fat / is non-polar; C pesticides must be more soluble in fat (than water) / easily absorbed in fat / organic; D they can pass from spraying solution/water (into insect) / not leached off / insoluble in water E high concentrations not needed / small concentrations/amounts have same effect / less is needed; F in the fatty tissues of insect they do damage / are effective			4
2 c	 or shown skeletally or displayed (1) each ALLOW sodium salt of acid.			2
2 d	<i>two from</i> higher K _{ow} ; smaller dose/quantities have the same effect; break down quicker / more completely / in water more specific on certain pests (AW) biodegradable inactive when outside insects all must be comparison except last two			2
2 e i	radical <i>ignore substitution</i> (1); (uv) light / sunlight (1);			2
2 e ii	Br (1) IGNORE 'bromine' ALLOW 'bromine atom'			1
2 e iii	CN ⁻ / KCN / HCN			1
				20

[illegible]

Mark Scheme Page 4 of 5	Unit Code 2854	Session Jun	Year 2010	Version Final
4 a	Circle round –OH group on structure. ALLOW circle including the ring bearing the –OH			1
4 b	–SO ₃ [–] (Na ⁺) / sulphonate. <i>NOT</i> –OH			1
4 c i	 <p>lack of any group at coupling position (<i>provided some other correct detail added</i>); (1) rest of structure correct (2 sulphonates (<i>allow</i> Na⁺ <i>missing</i>) and phenol/ phenate added)(1)</p>			2
4 c ii	Alkali / named alkali; (1) below 5 °C / cold / ice bath (1) <i>Mark separately. extra reagents CON reagent mark</i>			2
4 d i	benzene <i>NOT</i> benzene ring			1
4 d ii	conc (+ <i>one correct acid</i>) (1); nitric and sulphuric acids (or formulae) (1); temp below 55 °C IGNORE reflux(1) <i>Mark separately; extra reagents CON acid mark</i>			3
4 d iii	 <p>(1); Sn, conc HCl, reflux (1) mark separately</p>			2
4 e i	Aromatic / arenes ALLOW benzene(s) / benzene rings			1
4 e ii	Electrons / charge are not associated with particular bonds / atoms (<i>NOT atom</i>) / spread out over several atoms / over compound / molecule / structure / carbons			1
4 f i	Condensation / <u>nucleophilic</u> substitution			1
4 f ii	 <p>correct points connected(1); by O atoms and covalent bonds (1) <i>second mark depends on first</i></p>			2
4 g i	hydrogen bonding; (1) appropriate H atom specified(1); bonded to appropriate atom on other structure. (1) mention of OH on cotton and OH/NH/C=O (on dye) scores one of last two. <i>OR ion-dipole(1); ion (sulphonate) stated (1); dipole in O–H stated (1)</i>			3
4 g ii	Direct Red would wash out more easily / more red colour in Direct Red beaker / cotton gets paler in Direct red beaker; ora (1) hydrogen bonds / imf are broken by water / heating / dye hydrogen bonds to water; (1) <u>covalent</u> bonds are strong / not broken (under these conditions)(1) ALLOW (1) of last (2) for “procion bonds with cotton are stronger” (AW) OR “Direct Red imfs with cotton are weaker” (AW)			3
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