

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Level

MARK SCHEME for the October/November 2015 series

9701 CHEMISTRY

9701/41

Paper 4 (A2 Structured Questions), maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	41

Question	Marking point	Marks
1 (a)	Ca $3s^2 3p^6 4s^2$ and Ca ²⁺ $3s^2 3p^6$	1
(b)	Ca(OH) ₂ + 2HNO ₃ → Ca(NO ₃) ₂ + 2H ₂ O or CaO + 2HNO ₃ → Ca(NO ₃) ₂ + H ₂ O	1
(c) (i)	CaO and brown gas	1
(ii)	the (cat)ion size / radii increases decreasing its ability to polarise the nitrate ion / N-O bond	2
(d) (i)	(energy change when) 1 mole of ions gaseous (ions) dissolve in water (to form an infinitely dilute solution) or gaseous (ions) form an aqueous solution	2
(ii)	$\Delta H_{\text{latt}}^{\ominus} \text{Ca(NO}_3)_2 + \Delta H_{\text{sol}}^{\ominus} \text{Ca(NO}_3)_2 = \Delta H_{\text{hyd}}^{\ominus} \text{Ca}^{2+} + 2\Delta H_{\text{hyd}}^{\ominus} \text{NO}_3^-$ $\Delta H_{\text{latt}}^{\ominus} - 19 = -1650 + (2x - 314)$ $-2259 \text{ kJ mol}^{-1}$	3
1	Ca ⁽²⁺⁾ is a smaller (ion) or Ca ⁽²⁺⁾ has a larger charge density Ca ⁽²⁺⁾ has a stronger attraction / bond to H ₂ O	2
		12

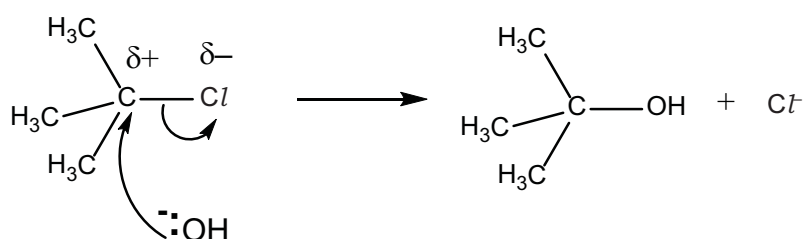
Page 3	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	41

Question	Marking point	Marks																
2 (a)	<table><tr><td>Na</td><td>Mg</td><td>Al</td><td>Si</td><td>P</td><td>S</td><td>Cl</td><td>Ar</td></tr><tr><td>1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>2</td><td>1</td><td>0</td></tr></table>	Na	Mg	Al	Si	P	S	Cl	Ar	1	0	1	2	3	2	1	0	3
	Na	Mg	Al	Si	P	S	Cl	Ar										
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(b) (i)	SiCl ₄ white solid /ppt or misty / white / steamy fumes pH 0–3 PCl ₅ misty / white / steamy fumes pH 0–3	3																
(ii)	SiCl ₄ + 2H ₂ O → SiO ₂ + 4HCl	1																
		<u>7</u>																

Page 4	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks															
3 (a)	forms (one or more) ions with incomplete d orbital(s)/sub-shells/shells	1															
(b) (i)	dative (covalent) or co-ordinate	1															
(ii)	<table border="1"> <tr> <th>species</th><th>can act as a ligand</th><th>cannot act as a ligand</th></tr> <tr> <td>NO_3^-</td><td>✓</td><td></td></tr> <tr> <td>BF_3</td><td></td><td>✓</td></tr> <tr> <td>$\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$</td><td>✓</td><td></td></tr> <tr> <td>NH_4^+</td><td></td><td>✓</td></tr> </table>	species	can act as a ligand	cannot act as a ligand	NO_3^-	✓		BF_3		✓	$\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$	✓		NH_4^+		✓	2
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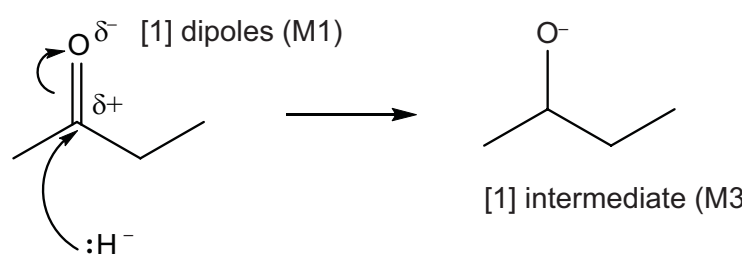
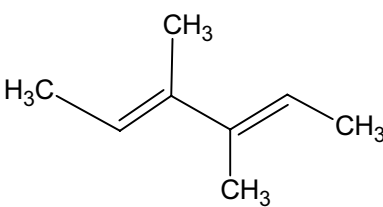
Page 5	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks
4 (a)	M1: dipole on C–Cl bond M2: curly arrow breaking C–Cl bond M3: curly arrow from the oxygen on OH^- (lone pair needs to be shown) to carbon in C–Cl bond and Cl^- (ion) formed in the mechanism 	3
(b) (i)	time taken for the concentration of a reactant(s) to fall to half its original value	1
(ii)	evidence of a pair of construction lines on graph and $t_{1/2} = 49\text{--}53\text{ s}$	1
(iii)	no effect/change	1
(c) (i)	evidence of tangent at 80 s and data used, e.g. $0.42 / 152 = 0.00263$ units $\text{mol dm}^{-3} \text{s}^{-1}$	2
(ii)	correct use of answer to (i)/0.19 and s^{-1}	1
		<u>9</u>

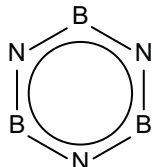
Page 6	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks
5 (a) (i)	M1: salt bridge and voltmeter/ M2: method of H ₂ gas delivery M3: X and Pt electrode labelled M4: solution H ⁺ /HCl(aq)/H ₂ SO ₄ and X ²⁺ labelled	4
(ii)	25 °C/298 K and 1 atm/101 kPa pressure and 1 mol dm ⁻³ (solution)	1
(iii)	solution – ions or H ⁺ and X ²⁺ and wires – electrons/e ⁻	1
(b) (i)	$X + 2Ag^+ \rightarrow 2Ag + X^{2+}$	1
(ii)	moles Ag = 1.30 / 107.9 = 0.0120 1 moles of X react with 2 moles Ag ⁺ moles of X lost = 0.012 × 0.5 = 0.00602 A _r of X = 0.67/0.006 = 111–112 and X = Cd	4
		<u>11</u>

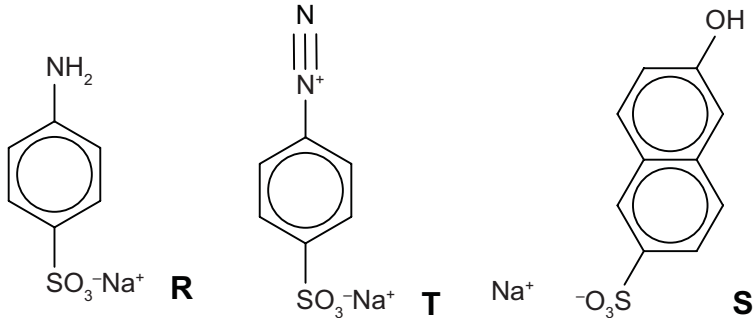
Page 7	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks
6 (a)	$4\text{BF}_3 + 3\text{NaBH}_4 \rightarrow 2\text{B}_2\text{H}_6 + 3\text{NaBF}_4$	1
(b)	 [1] both curly arrows (M2) arrow <u>must</u> come from lone pair	3
(c) (i)	(electrophilic) addition	1
(ii)		1

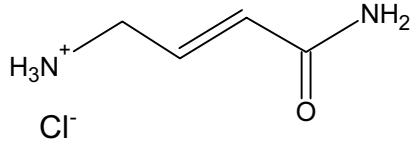
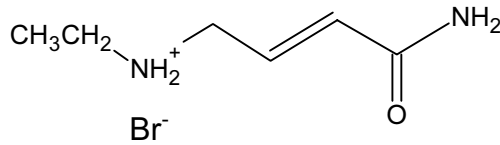
Page 8	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks
(d) (i)	<i>any four of</i> M1: σ-bonds between C–C or C–H M2: π-bonds formed from overlap of p-orbitals M3: (π-bonds/electrons) above and below the ring M4: bonds/electrons are delocalised M5: bond angle 120° M6: intermediate C–C bond length / all C–C same length / strength M7: carbons are sp^2 hybridised	3
(ii)	correct delocalised structure of borazine 	1
		10

Page 9	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks
7 (a) (i)	 <chem>Nc1ccc(S(=O)(=O)[Na])cc1</chem> R <chem>[N+]#Nc1ccc(S(=O)(=O)[Na])cc1</chem> T <chem>[Na+].[O-]S(=O)(=O)c1ccc2cc(O)ccc2cc1</chem> S	3
(ii)	Sn + HCl HNO₂ or NaNO₂ + HCl step 1 (linked to a reduction) reflux/heat/>50 °C or conc/6M (HCl) and step 2 ≤10 °C	3
(iii)	diazonium (group)	1
(b) (i)	σ-bonds = 14 π-bonds = 2	2

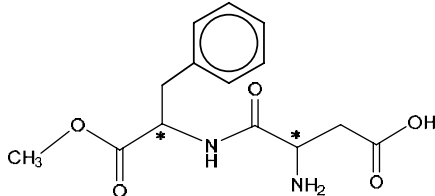
Page 10	Mark Scheme	Syllabus	Paper
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Question	Marking point			Marks
7	reagent	structure of product	type of reaction	3
	HCl		acid-base or neutralisation	
	CH ₃ CH ₂ Br		(nucleophilic) substitution	
				<u>12</u>

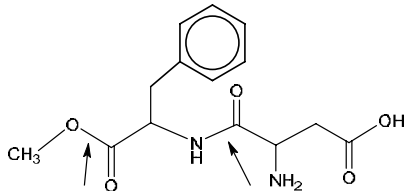
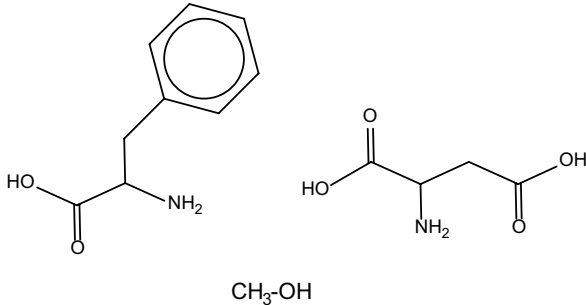
Page 11	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks
8 (a) (i)	A = mRNA B ₁ and B ₂ , etc. = tRNA or tRNA-amino acid complex	2
(ii)	stage 1 = transcription and stage 3= translation	1
(b) (i)	C ₅ H ₅ N ₅	1
(ii)	cytosine, thymine, guanine	1
(iii)	covalent hydrogen bonding	2
(c)	hydrolysis	1
(d) (i)	Phosphorus / P	1
(ii)	H atoms have insufficient electron density or electrons (to show up) or H atoms contain one e ⁻	1
		<u>10</u>

Page 12	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks
9 (a)	iron/Fe (= haemoglobin) sodium/Na or potassium/K (= transmission of nerve impulses) Zn or Cu or Mg or Mn or Mo or Ni or Fe or Co (= enzyme co-factor)	2
(b)	any three of: M1: substrate binds to/fits into the active site of the enzyme M2: Interaction with site causes a specific bond to be weakened, (which breaks) M3: lowers activation energy M4: products released from the enzyme/active site	3
(c) (i)	Tertiary	1
(ii)	$2 -SH \rightarrow -S - S- (+ 2H)$	1
(iii)	oxidation	1
(d) (i)	E = CH and F = CH ₂	1
(ii)	E = triplet and adjacent 2H F = doublet and adjacent 1H	2
		<u>11</u>
10 (a) (i)		1

Page 13	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks
(ii)		2
(iii)		3
(b)	M1: hydrogen bonding M2: between the NH₂ groups and water or CO₂/C=O/-OH groups and water (allow names) or lone pair on N/O with water	2
(c)	allow range 1–200 nm or 1–200 × 10 ⁻⁹ m	1
		<u>9</u>

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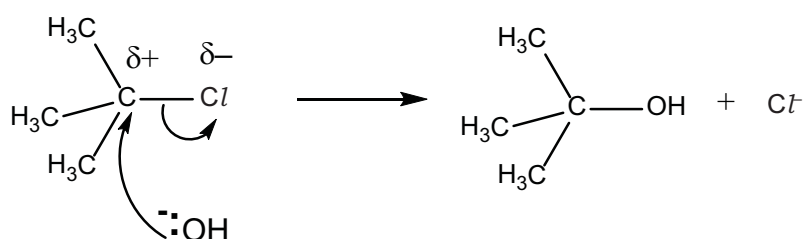
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2 (a)									3
	Na	Mg	Al	Si	P	S	Cl	Ar	
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(b) (i)	SiCl ₄ white solid /ppt or misty /white / steamy fumes pH 0–3 PCl ₅ misty /white / steamy fumes pH 0–3								3
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3 (a)	forms (one or more) ions with incomplete d orbital(s)/sub-shells/shells	1															
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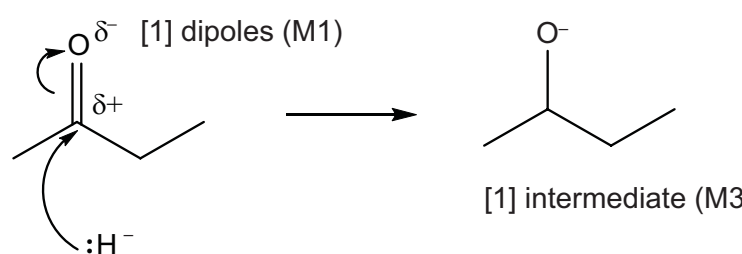
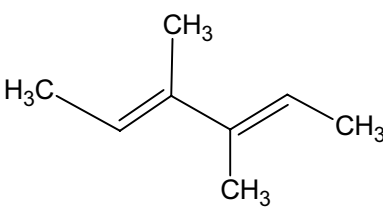
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(iii)	no effect/change	1
(c) (i)	evidence of tangent at 80 s and data used, e.g. $0.42 / 152 = 0.00263$ units $\text{mol dm}^{-3} \text{s}^{-1}$	2
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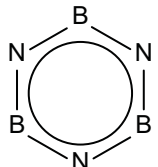
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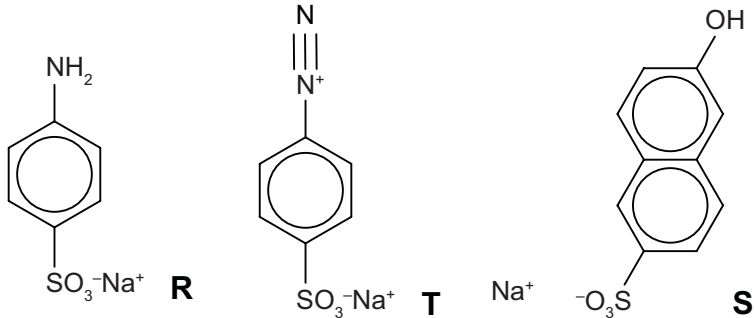
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(b)	 [1] dipoles (M1) [1] intermediate (M3) [1] both curly arrows (M2) arrow <u>must</u> come from lone pair	3
(c) (i)	(electrophilic) addition	1
(ii)		1

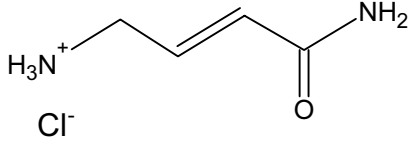
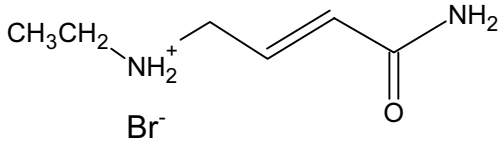
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(ii)	correct delocalised structure of borazine 	1
		<u>10</u>

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	Cambridge International A Level – October/November 2015	9701	42

Question	Marking point	Marks
7 (a) (i)	 <chem>Nc1ccc(S(=O)(=O)[Na])cc1</chem> R <chem>[N+]#Nc1ccc(S(=O)(=O)[Na])cc1</chem> T <chem>[Na+].[O-]S(=O)(=O)c1ccc2cc(O)ccc2cc1</chem> S	3
(ii)	Sn + HCl HNO₂ or NaNO₂ + HCl step 1 (linked to a reduction) reflux/heat/>50 °C or conc/6M (HCl) and step 2 ≤10 °C	3
(iii)	diazonium (group)	1
(b) (i)	σ-bonds = 14 π-bonds = 2	2

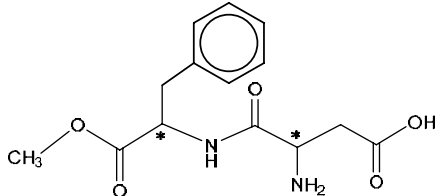
Page 10	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	42

Question	Marking point			Marks
7	reagent	structure of product	type of reaction	3
	HCl		acid-base or neutralisation	
	CH ₃ CH ₂ Br		(nucleophilic) substitution	
				<u>12</u>

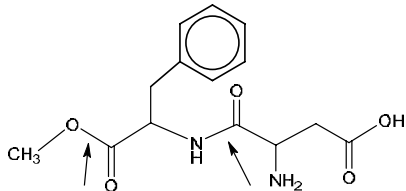
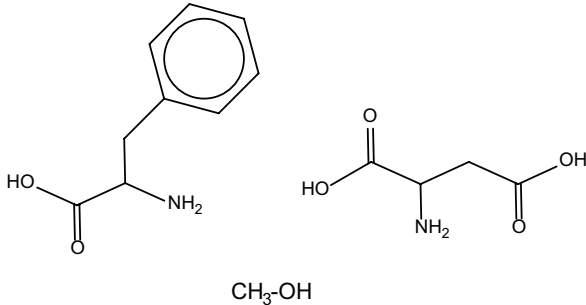
Page 11	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	42

Question	Marking point	Marks
8 (a) (i)	A = mRNA B ₁ and B ₂ , etc. = tRNA or tRNA-amino acid complex	2
(ii)	stage 1 = transcription and stage 3= translation	1
(b) (i)	C ₅ H ₅ N ₅	1
(ii)	cytosine, thymine, guanine	1
(iii)	covalent hydrogen bonding	2
(c)	hydrolysis	1
(d) (i)	Phosphorus / P	1
(ii)	H atoms have insufficient electron density or electrons (to show up) or H atoms contain one e ⁻	1
		<u>10</u>

Page 12	Mark Scheme	Syllabus	Paper
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Question	Marking point	Marks
9 (a)	iron/Fe (= haemoglobin) sodium/Na or potassium/K (= transmission of nerve impulses) Zn or Cu or Mg or Mn or Mo or Ni or Fe or Co (= enzyme co-factor)	2
(b)	any three of: M1: substrate binds to/fits into the active site of the enzyme M2: Interaction with site causes a specific bond to be weakened, (which breaks) M3: lowers activation energy M4: products released from the enzyme/active site	3
(c) (i)	Tertiary	1
(ii)	$2 -SH \rightarrow -S - S- (+ 2H)$	1
(iii)	oxidation	1
(d) (i)	E = CH and F = CH ₂	1
(ii)	E = triplet and adjacent 2H F = doublet and adjacent 1H	2
		<u>11</u>
10 (a) (i)		1

Page 13	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	42

Question	Marking point	Marks
(ii)		2
(iii)		3
(b)	M1: hydrogen bonding M2: between the NH ₂ groups and water or CO ₂ /C=O/-OH groups and water (allow names) or lone pair on N/O with water	2
(c)	allow range 1–200 nm or 1–200 × 10 ⁻⁹ m	1
		<u>9</u>

MARK SCHEME for the October/November 2015 series

9701 CHEMISTRY

9701/43

Paper 4 (A2 Structured Questions),
maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2015 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

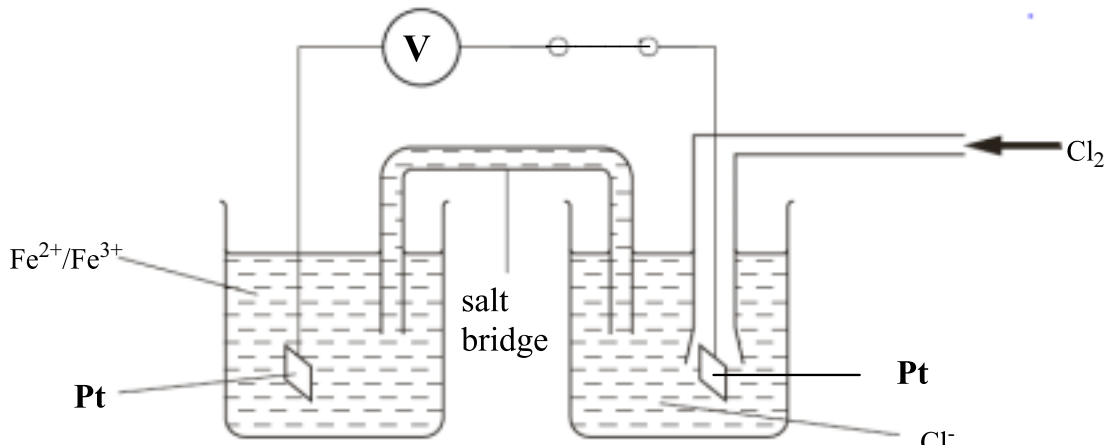
Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	43

Question	Marking Point	Marks	Total Marks
1 (a)	ionic bonds break / bonds between Mg^{2+} and Cl^- break forces / bonds / attractions form between the ions and water	2	
(b) (i)	(the energy change) when 1 mole of a substance dissolves in water / becomes aq	1	
(ii)	$\Delta H^\circ_{\text{latt}} \text{MgCl}_2 + \Delta H^\circ_{\text{sol}} \text{MgCl}_2 = \Delta H^\circ_{\text{hyd}} \text{Mg}^{2+} + 2\Delta H^\circ_{\text{hyd}} \text{Cl}^-$ $-2524 - 155 = -1925 + 2\Delta H^\circ_{\text{hyd}} \text{Cl}^-$ $= -377 \text{ kJ mol}^{-1}$	2	
(iii)	magnesium / Mg is higher charge / sodium / Na is smaller charge magnesium / Mg is smaller / sodium / Na is larger Mg stronger attraction for water / Na weaker attraction for water any two	2	
(c)	- solubility decreases - lattice energy and hydration enthalpy decrease - hydration enthalpy decreases more rapidly / is dominant factor - so (enthalpy change of) solution becomes less exothermic / more endothermic	4	
			[Total: 11]
2 (a)	Co $3s^2 3p^6 3d^7 4s^2$ Co ³⁺ $3s^2 3p^6 3d^6$	[1] [1]	2
(b) (i)	atom or ion, bonded to (one or more), ligands		1
(ii)	any two from: two (or more) oxidation states, catalytic activity, coloured ions or compounds		2

Page 3	Mark Scheme	Syllabus	Paper
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Question	Marking Point	Marks	Total Marks
(c)		5	
(d)	(i) Y 13.4/88.9 or 0.15 Ba 41.2/137 or 0.3 Cu 28.6/63.5 or 0.45 O 16.8/16 or 1	1	
	(ii) = 7/3 or (+) 2.3	1	
	(iii) two Cu are + 2 and one Cu is + 3	1	
			[Total: 13]

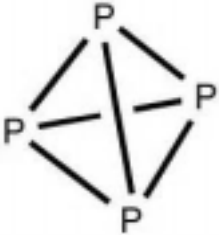
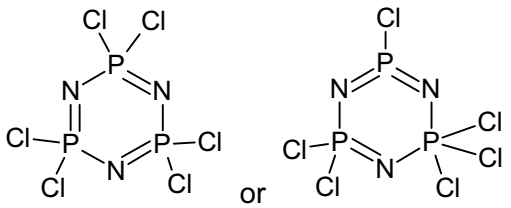
Page 4	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	43

Question	Marking Point	Marks	Total Marks
3 (a) (i)	• Fe^{2+} and Fe^{3+} (or suitable compounds), • salt bridge labelled, • one electrode Pt labelled, • one sol^n 1 mol dm^{-3} • Cl^- (or suitable compound), • voltmeter, labelled or V • Cl_2, • 1 atm or 298K 2 or 3 marking points = [1] 4 or 5 marking points = [2] 6 or 7 marking points = [3] 8 marking points = [4] 	4	
(ii)	$E^\ominus_{\text{cell}} = 1.36 - 0.77 = 0.59 \text{ V}$	1	
(b)	yellow/orange/brown	1	
(c)	cell voltage increases or becomes more positive Cl_2/Cl^- electrode potential increases	2	

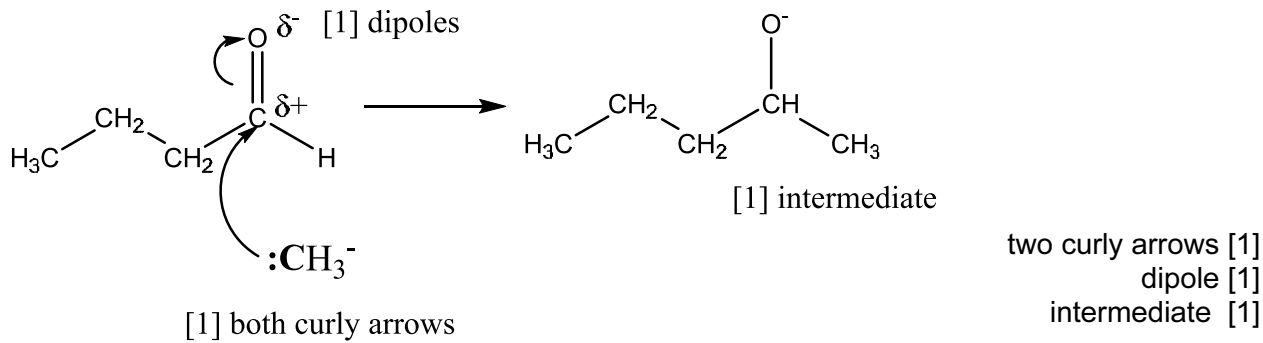
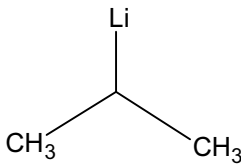
Page 5	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	43

Question	Marking Point	Marks	Total Marks
(d) (i)	$\text{H}_2 + 2\text{OH}^- \rightarrow 2\text{H}_2\text{O} + 2\text{e}^-$ $\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightarrow 4\text{OH}^-$	2	
(ii)	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$	1	
(iii)	rechargeable/refillable/longer time between charges/longer battery life/less pollution because H_2O is the product/ O_2 can be got from the air	1	
			[Total: 12]
4 (a) (i)	sketch graph to show a general decrease in m.p	1	
(ii)	giant covalent (C or Si) to metal/metallic (Sn or Pb)	1	
(b) (i)	can react with an acid or base/alkali or can act as an acid or base or has acidic and basic properties	1	
(ii)	$\text{SnO}_2 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SnO}_3 + \text{H}_2\text{O}$ or $\text{SnO}_2 + 2\text{NaOH} + 2\text{H}_2\text{O} \rightarrow \text{Na}_2\text{Sn}(\text{OH})_6$	1	
(c) (i)	$E^\ominus_{\text{cell}} = +1.18$ or $E^\ominus \text{Cr}_2\text{O}_7^{2-}$ greater/more positive than Sn^{4+} or $E^\ominus (\text{Cr}_2\text{O}_7^{2-}/\text{Cr}^{3+}) + 1.33$ and $E^\ominus (\text{Sn}^{4+}/\text{Sn}^{2+}) + 0.15$	1	
(ii)	$\text{Cr}_2\text{O}_7^{2-} + 3\text{Sn}^{2+} + 14\text{H}^+ \rightarrow 2\text{Cr}^{3+} + 3\text{Sn}^{4+} + 7\text{H}_2\text{O}$ green	2	
(d) (i)	the same substance gets both oxidised and reduced in the reaction or Ge changes oxid. no. +2 to 0 and changes oxid. no. +2 to +4	1	
(ii)	$(\text{CN})_2 + 2\text{NaOH} \rightarrow \text{NaOCN}/\text{NaCNO} + \text{NaCN} + \text{H}_2\text{O}$	1	

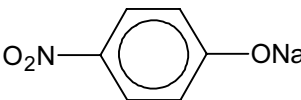
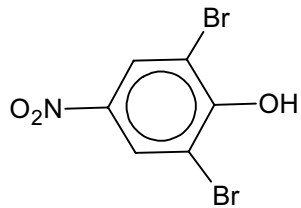
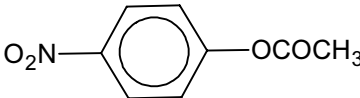
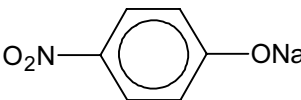
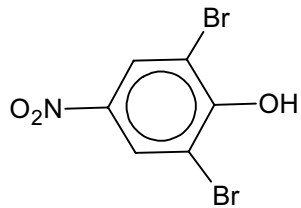
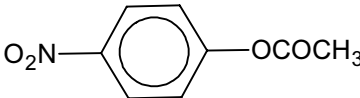
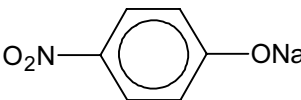
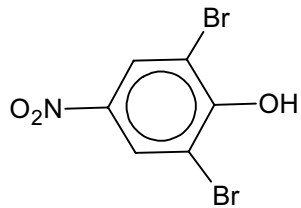
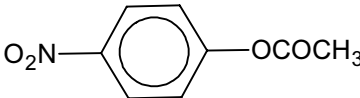
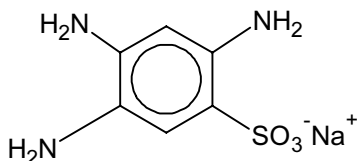
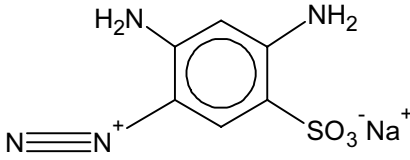
Page 6	Mark Scheme	Syllabus	Paper
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Question	Marking Point	Marks	Total Marks
(iii)	$\begin{array}{c} \text{x} \quad \text{o} \\ \text{x} \text{N} \equiv \text{C} - \text{C} \equiv \text{N} \text{x} \\ \text{x} \quad \text{o} \quad \quad \text{o} \quad \text{x} \\ \text{x} \quad \text{o} \quad \quad \text{o} \quad \text{x} \end{array}$	1	
(e) (i)		1	
(ii)	$2\text{P}_2: 2 \times \text{P} \equiv \text{P} = 2 \times 489 = 978 \text{ kJ mol}^{-1}$ and $\text{P}_4: 6 \times \text{P} - \text{P} = 6 \times -98 = -1188 \text{ kJ mol}^{-1}$ $\Delta H = 978 - 1188 = -210 \text{ kJ mol}^{-1}$	2	
(f) (i)	$3\text{NH}_4\text{Cl} + 3\text{PCl}_5 \rightarrow 12\text{HCl} + \text{P}_3\text{N}_3\text{Cl}_6$	1	
(ii)		1	
			[Total: 15]
5 (a) (i)	L 2,4-DNPH or Brady's reagent or LiAlH ₄ or NaBH ₄ M Fehling's solution or Tollens' reagent or acidified K ₂ Cr ₂ O ₇ or MnO ₄ ⁻ N alkaline I ₂	3	
(ii)	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{Na}$ or $\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2^-\text{Na}^+$ or $\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$	1	

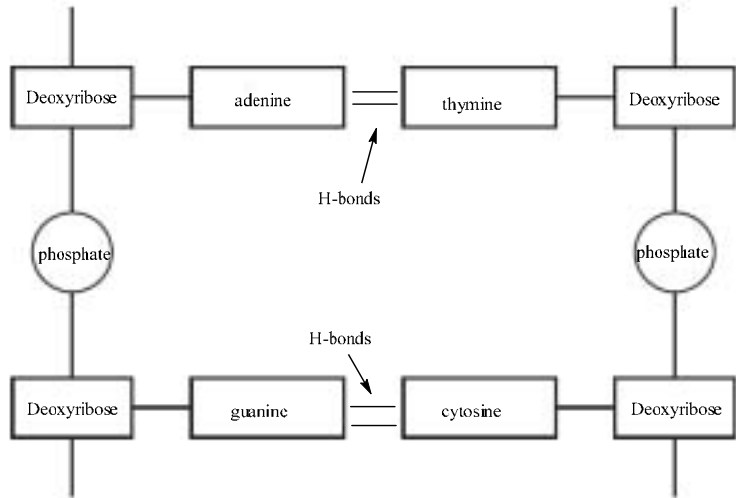
Page 7	Mark Scheme	Syllabus	Paper
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Question	Marking Point	Marks	Total Marks
(iii)	yellow precipitate	1	
(iv)	redox or oxidation	1	
(b) (i)	 [1] both curly arrows [1] intermediate two curly arrows [1] dipole [1] intermediate [1]	3	
(ii)		1	
			[Total: 10]

Page 8	Mark Scheme	Syllabus	Paper
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Question	Marking Point			Marks	Total Marks												
6 (a)	<table><tr><td>reagent</td><td>organic product</td><td>non-organic product</td></tr><tr><td>Na</td><td></td><td>H₂/hydrogen</td></tr><tr><td>Br₂ (aq)</td><td> 2 or 3 Br's any position</td><td>HBr</td></tr><tr><td>CH₃COCl (l)</td><td></td><td>HCl</td></tr></table>			reagent	organic product	non-organic product	Na		H ₂ /hydrogen	Br ₂ (aq)	 2 or 3 Br's any position	HBr	CH ₃ COCl (l)		HCl	4	
	reagent	organic product	non-organic product														
Na		H ₂ /hydrogen															
Br ₂ (aq)	 2 or 3 Br's any position	HBr															
CH ₃ COCl (l)		HCl															
(b) (i)	 E  F			2													

Page 9	Mark Scheme	Syllabus	Paper
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Question	Marking Point	Marks	Total Marks
(b) (ii)	step 1: $\text{NaNO}_2 + \text{HCl}$ or HNO_2 step 1: $T \leq 10^\circ\text{C}$ step 2: alkaline or NaOH(aq) or NaOH solution	3	
			[Total: 9]
7 (a)	- backbone of sugar-phosphate-sugar-phosphate - base bonded to sugar - deoxyribose correct label - two complementary base pairings e.g A–T or C–G - hydrogen bonding/H–bonding between bases, labelled 	5	
(b)	any two of - DNA uncoils or unzips - hydrogen bonds break or weaken - complementary bases join to form a new strand of DNA	2	

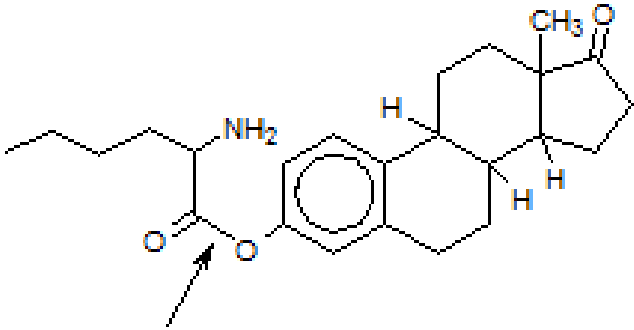
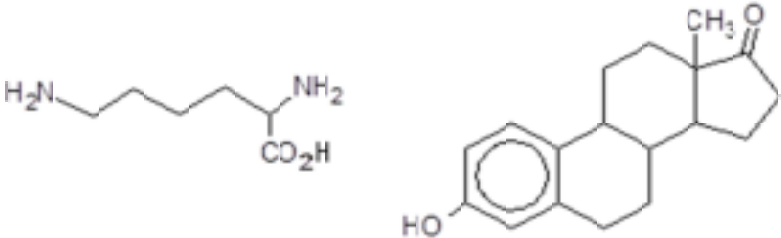
Page 10	Mark Scheme	Syllabus	Paper
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Question	Marking Point	Marks	Total Marks
(c)	(i) restriction enzymes	1	
	(ii) electrophoresis	1	
	(iii) radioactive substance	1	
	(iv) suspect 3	1	
			[Total: 11]
8	(a) (i) time taken for a compound to travel through the column	1	
	(ii) hydrogen or helium or nitrogen	1	
	(iii) it is more soluble in the stationary phase	1	
	(iv) same functional group or same IMF with stationary phase or same polarity	1	
	(v) % X (= $100 \times 22/76$) = 29 (28.9)	1	
	(b) (i) TMS or tetramethylsilane or $\text{Si}(\text{CH}_3)_4$	1	

Page 11	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	43

Question	Marking Point	Marks	Total Marks																
(ii)	<table border="1"> <thead> <tr> <th>chemical shift δ/ppm</th><th>type of proton(s)</th><th>number of protons</th><th>splitting pattern</th></tr> </thead> <tbody> <tr> <td>1.0</td><td>CH₃-R</td><td>3</td><td>triplet</td></tr> <tr> <td>2.3</td><td>CH₂CO</td><td>2</td><td>quartet</td></tr> <tr> <td>3.7</td><td>CH₃O</td><td>3</td><td>singlet</td></tr> </tbody> </table>	chemical shift δ /ppm	type of proton(s)	number of protons	splitting pattern	1.0	CH ₃ -R	3	triplet	2.3	CH ₂ CO	2	quartet	3.7	CH ₃ O	3	singlet	4	
chemical shift δ /ppm	type of proton(s)	number of protons	splitting pattern																
1.0	CH ₃ -R	3	triplet																
2.3	CH ₂ CO	2	quartet																
3.7	CH ₃ O	3	singlet																
(iii)	structure / name of methyl propanoate $\text{H}_3\text{C}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{O}-\text{CH}_3$	1																	
			[Total: 11]																
9 (a)	C ₂₄ (H ₃₄)N ₂ O ₃	1																	
(b)	ketone amine ester	2																	

Page 12	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9701	43

Question	Marking Point	Marks	Total Marks
(c) (i)		1	
(ii)		2	
(d)	hydrogen bonding or ion-dipole forces involving lone pair on N atoms, or lone pair on O atoms, or NH ₂ groups, or CO ₂ groups, or C=O groups, with water	2	[Total: 8]