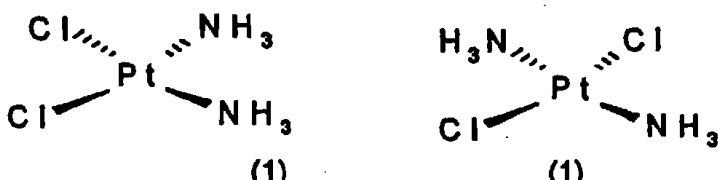
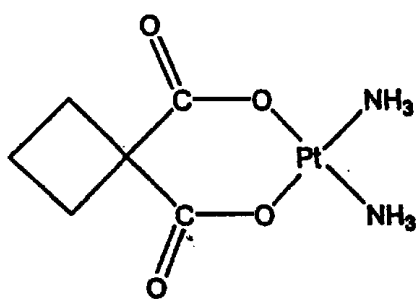


Question	Expected Answers	Marks
2(a)	(central) metal atom/ion; surrounded by/joined to ligand(s)/ a number of (stated or implied) negatively charged ions/ a number of (stated or implied) molecules <u>with lone pairs</u> (of electrons)	2
2(b)(i)	 <p>(1) (1)</p> <p>accept only diagrams with 90 degree bond angles/ ignore Cl₂ or ambiguous attachments</p>	2
2(b)(ii)	geometric/cis-trans isomerism	1
2(b)(iii)	4	1
2(b)(iv)	tetrahedral	1
2(c)	causes the formation of Pt(NH ₃) ₂ Cl ₂ / cisplatin (which is neutral); increased/ high/large <u>concentration of chloride ions/ Cl⁻</u> ; pushes the equilibrium to the LHS;	3
2(d)(i)	lone pair /non bonding pair (of electrons)	1
2(d)(ii)	<p>4 from:</p> <p>DNA consists of two (polynucleotide) chains; in a <i>double helix</i>;</p> <p>*each <u>chain/strand/backbone</u> is made of <i>deoxy ribose/sugar & phosphate</i> groups; (do not accept ribose)</p> <p>*each chain has <u>attached bases</u>;</p> <p>*the <u>bases</u> on each chain are linked by <i>H bonding</i>;</p> <p>specific bases are <i>paired</i> between the two chains ie A-T, C-G;</p> <p>* could be gained from a clearly labelled diagram</p> <p><i>Qwc:</i> Minimum 2 sentences / bullet points; correct use of at least 2 of the <i>italicised terms</i>.</p>	4 + 1

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Mark Scheme

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2(e)	 <p>1 mark for each correct O bond (the second should give the approximately correct angle between the Pt-O bonds) 1 mark for both ammonias bonded correctly in cis conformation</p> <p>No ambiguous attachments/ bonds should be shown</p>	3
2(f)	bidentate ligand (ignore polydentate)	1
		[Total:20]

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Mark Scheme

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Question	Expected Answers	Marks
3(a)	There is little or no air/oxygen present.	1
3(b)(i)	$2\text{Fe} + \text{O}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{Fe}^{2+} + 4\text{OH}^-$ (accept $\text{Fe}(\text{OH})_2$) equations added together (anticlockwise)(no electrons shown) ; balanced (not equilibrium) (consequential on first mark)	2
3(b)(ii)	(+)0.84V must have units	1
3(b)(iii)	$\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$; (accept any value of x) / accept $\text{Fe}(\text{OH})_3$; further oxidation takes place;	2
3(c)(i)	A: $\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$ correct equation chosen ; oxidation ; B: $4\text{e}^- + \text{O}_2 + 2\text{H}_2\text{O} \rightarrow 4\text{OH}^-$ 2 correct half equations wrongly assigned scores 1	3
3(c)(ii)	From A towards the surface <u>In helmet;</u> ecf from (c) (i)	1
3(d)	increases the conductivity of the water/increase flow/number of electrons.	1
3(e)	Magnesium / zinc (1 mark); 3 from choose a metal with a <u>more negative</u> E^\ominus value (than iron); stronger reducing agent (than iron); the metal (not the cation) (stated or implied) supplies electrons; it gets oxidised/reacts/corrodes (in preference)/more reactive; metal can be replaced once it has corroded away;	4
		[Total: 15]

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Mark Scheme

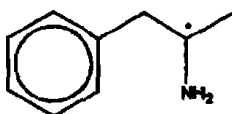
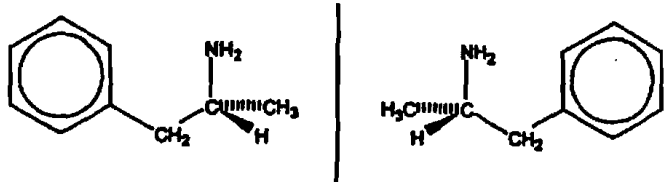
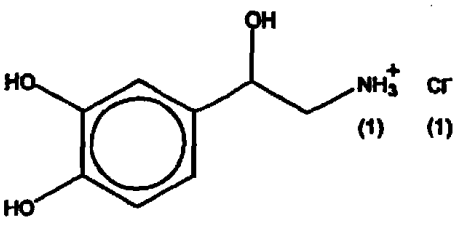
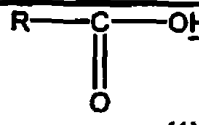
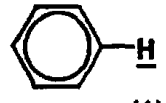
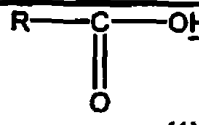
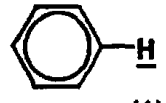
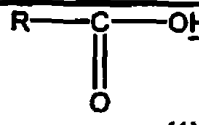
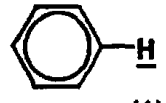
June 2002

Question	Expected Answers	Marks
4(a)	$\frac{6.8 \times 0.10}{1000} \times 5/2 \text{ (1 mark)} = 1.70 \times 10^{-3} \text{ moles (1mark)}$ or calculation by ratios (1 mark) = $1.68 \times 10^{-3} - 1.72 \times 10^{-3}$ moles (1mark) (2/3 sf) (ecf from correct calculation scores 1) (Completely correct answer scores 2)	2
4(b)(i)	correctly plotted data from table (points should be all +/- 1 scale division) (2 marks) 1 incorrect point (1 mark max); curve of best fit through data in the table;	3
4(b)(ii)	Either comment that half lives are almost constant; (at least) 2 half lives correctly shown on graph(1) ; labelled clearly (ie horizontal distance labelled in words/ $t_{1/2}$) or calculated Or As the concentration halves the rate halves; 2 tangents shown on the graph: rate calculated or method shown;	3
4(c)(i)	rate = k [H ₂ O ₂] ^(1 mark) rate and k (1mark) deduct 1 mark for each error	2
4(c)(ii)	$\frac{\text{mol dm}^{-3} \text{s}^{-1}}{\text{mol dm}^{-3}} \quad (1) \quad = \text{s}^{-1} \quad (1)$ Correct answer scores 2 ecf from (c)(i) but not if equilibrium constant shown	2
		[Total:12]

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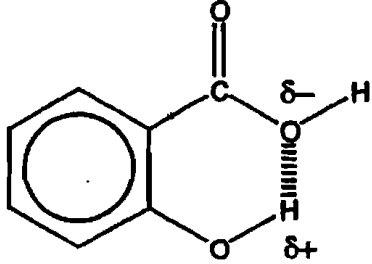
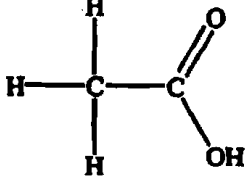
Mark Scheme

June 2002

Question	Expected Answers	Marks												
5(a)		1												
5(b)	<p>Ecf from (a)</p>  <p>(1) correct 3d of chiral carbon representation using wedge - dash - solid line mirror image (1)</p>	2												
5(c)(i)	(1 ^o) amine	1												
5(c)(ii)	 <p>deduct 1 for each substituted OH</p>	2												
5(d)	<table border="1"> <thead> <tr> <th>shift in the region</th> <th>type of proton</th> <th>relative height</th> </tr> </thead> <tbody> <tr> <td>3.7</td> <td>-OCH₃</td> <td>9 (1)</td> </tr> <tr> <td>11.0</td> <td>  </td> <td>1</td> </tr> <tr> <td>7.5</td> <td>  </td> <td>2 (1) consequential on correct type of proton at 7.5</td> </tr> </tbody> </table>	shift in the region	type of proton	relative height	3.7	-OCH ₃	9 (1)	11.0		1	7.5		2 (1) consequential on correct type of proton at 7.5	4
shift in the region	type of proton	relative height												
3.7	-OCH ₃	9 (1)												
11.0		1												
7.5		2 (1) consequential on correct type of proton at 7.5												
		[Total:10]												

Question	Expected Answers	Marks
6(a)	polymer chains are aligned/more crystalline/less amorphous/more closely packed/form a neck; (less branched negates this mark) more opportunities for/greater intermolecular forces between the chains/more points of contact (must have idea of comparison); more difficult for the chains to move <u>past each other</u> ; AW	3
6(b)	FULL STRUCTURAL 4 carbon atoms in a chain with correct number of hydrogens shown; amine group at each end; (allow 1 mark if correct structure shown but not full structural formula)	2
6(c)(i)	More/stronger intermolecular forces in <i>Stanyl</i> ; these are hydrogen bonds; There are more of these per unit length/ unit mass/ <i>Stanyl</i> has a shorter hydrocarbon chain (between amide links) AW; therefore more energy is required to separate the chains/break the intermolecular forces when it melts;	4
6(c)(ii)	M_r of repeating unit =198; $\frac{32000}{198} = 162$; Allow 161 -162 ecf from incorrect M_r of repeating unit	2
6(d)	3 from waterproof/insoluble tough/not brittle/bulletproof; hard/scratch resistant; low density(not light); rigid/inelastic/does not stretch; resistant to abrasion/hard wearing/durable; resistant to chemical attack/ does not corrode; can be made into fibres; high melting point	3
6(e)	<u>plasmid</u> (bacterial host) is cut; 3 from:- gene in spider DNA is cut/removed; (silk/spider) gene required (to make peptide chains) are joined to the plasmid; the modified plasmid is inserted into the bacteria; the cells multiply/reproduce; in the fermenter; this uses enzymes;	4
		[Total:18]

Question	Expected answers	Marks
7(a)	Any 2 points: (these may be general or use a specific example) improve its activity/effect (1); widen its use (1); reduce side-effects (1); improve its properties (1); make it more specific (1). NOT cost.	2

Question	Expected answers	Marks
7 (b)(i)	 <p style="text-align: right;">bond(1); charges(1).</p>	2
7 (ii)	B and C can form (1) ora hydrogen bonds <u>between</u> molecules /stronger intermolecular forces <u>between</u> molecules (1)ora more energy needed/harder to separate molecules ora(1).	3
7 (c)(i)	138 (1).	1
7 (ii)	18 (1).	1
7 (iii)	H ₂ O (1).	1
7 (iv)	H ₂ O molecule is lost from A (1) the groups are close enough in A/can interact/hydrogen bonds in the molecule, ora (1); but not in B and C (1).	3
7 (d)(i)	Ester (1).	1
7 (ii)	Flask + open vertical condenser (1); correct water and heating (1); contents indicated (may be line) and no leaks on reflux apparatus (1).	3
7 (iii)	 <p>correct COOH group (allow -OH group) (1); methyl group correct (1).</p>	2
7 (iv)	Purple/violet colour forms (1).	1
7 (v)	Phenol, (allow hydroxy(l)/enol)(1).	1
7 (e)(i)	(R-COO) ⁻ (1) (- between R & C not essential); Na ⁺ (1).	2
7 (ii)	Add indicator (may be named) (1); colour change (may give correct colour) (1). allow pH meter (1) reasonable observation (1)	2
7 (ii)	Moles = volume x concentration (1) = (27.5/1000 x 0.025); = 6.88 x 10 ⁻⁴ (1).	2
(iv)	6.88 x 10 ⁻⁴ (1) ecf from part (iii).	1
(v)	6.88 x 10 ⁻⁴ x 10 = 6.88 x 10 ⁻³ (1) ecf from part (iv).	1
(vi)	180 g (1).	1
(vii)	Mass in 250 cm ³ sample = 180 x 6.88 x 10 ⁻³ = 1.24 g (1). Ecf from (iv), (v) & (vi).	1
(viii)	% = 1.24 x 100/1.45 = 85-86% (1) ecf from part (vii).	1
Total mark		32