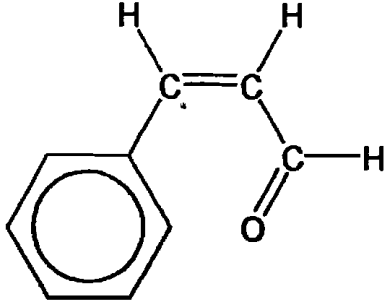
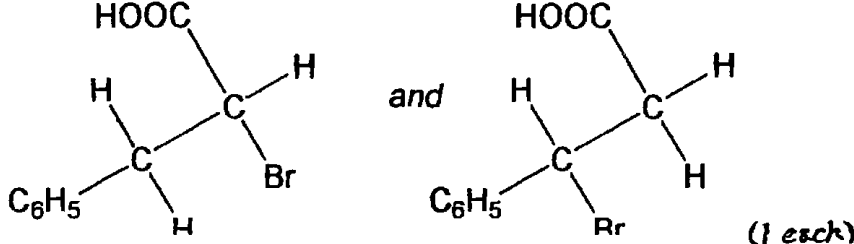



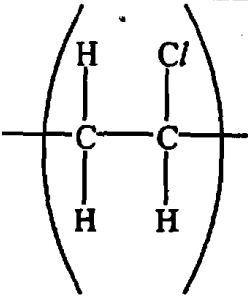
Mark Scheme Page 1 of 7	Unit Code 2851 2848	Session Jun	Year 2001	Final version for examiners
Question	Expected answers			Marks
1 (a) (i)	Water (molecule) (1) <i>do not allow</i> hydroxide ion/ hydroxide group			1
1 (a) (ii)	$\text{Ag}^+(\text{aq}) + \text{Br}^-(\text{aq}) \rightarrow \text{AgBr}(\text{s})$ (1 mark for formulae, allow if balanced with 2s etc., 1 mark for state symbols)			2
1 (a) (iii)	C-Br bond is weaker /broken more easily(1); than either C-F or C-Cl /other bonds, ignore any reference to C-H (1) weakest scores 2			2
1 (b) (i)	ignore name; $\text{C}_2\text{H}_6\text{O}(2)$ or $\text{C}_2\text{H}_5\text{O}(2)$ $\text{C}_2\text{H}_5\text{OH}$ or $\text{C}_2\text{H}_2\text{OH}$ scores (1)			2
1 (b) (ii)	Hydroxide ion (1); attracted more strongly(than a water molecule)/ better nucleophile (1); to a positively charged C (1) Alternative answer if hydroxide ions in a (i) allow more(1) hydroxide ions(1) in NaOH than in water			3
1 (b) (iii)	Enthalpy of products below enthalpy of reactants (1); shape of profile correct for single step, <i>i.e.</i> one 'hump', with lines or names indicating reactants and products (1); (accept energy level) activation enthalpy labelled correctly <i>i.e.</i> enthalpy difference between reactants and top of 'hump' (1)			3
	O/P scores 2			
1 (b) (iv)	Add a catalyst (1)			1
1 (b) (v)	<i>Any 3 points from 4:</i> <u>particles</u> have more energy /move faster (at higher temperatures) (1); in excess of activation enthalpy (energy) or aw(1); more collisions have the activation enthalpy (energy) (1); more collisions result in reaction /more collisions are successful(1)			3
1 (c) (i)	Ultraviolet radiation / light(1)			1
1 (c) (ii)	(Fractional) distillation or glc (1)			1
1 (c) (iii)	<i>Any correct</i> structural formula of polychloroethane, or butane/ HCl (1)			1
Total mark				20

Question	Expected answers	Marks
2 (a)	-CHO group correct (1)	1
2 (b)	<p>Two marks for everything correct, 1 mark only if cis but not all detail of molecule correct</p>  <p>accept C₆H₅- instead of ring</p>	2
2 (c) (i)	Orange/red/brown/yellow colour (1); decolourised only by cinnamic acid (1)	2
2 (c) (ii)	<p>The C=C bond causes(1); Any 3 points: Bromine molecule/Br₂; (1) to be polarised / forms a +ve end and a -ve end <i>may be shown on diagram</i> (1); a C-Br bond is formed (may be shown by a curly arrow); (1) a bromide ion / Br⁻ attacks; (1) positive carbon forming a <u>covalent</u> bond/ C-Br (1)(may be shown by a curly arrow) Ignore nucleophile/electrophile or substitution, whether used correct or wrongly</p>	4
2 (c) (iii)	Carbocation (1) Accept carbonium ion	1
2 (d) (i)	 <p>(1 each)</p>	2
2 (d) (ii)	<p>The 2nd one in 2 (e) (i) because in mechanism given positive bromine attacks C with the COOH group, <i>or</i> H⁺ will attack the same carbon as the positive bromine, <i>or</i> the more stable intermediate is the one with the positive charge next to the benzene ring (1)</p>	1
2 (e)	<p>Any 4 points: Aldehyde has (permanent) dipole-(permanent) dipole forces (1); acid has hydrogen bonding (1); hydrogen bonding is the strongest force, <i>may imply this using the word 'strong'</i> (1) (<i>comparison should be implied</i>); acid has greater intermolecular forces (1); more energy needed to separate molecules in cinnamic acid/ overcome the intermolecular forces (1)</p> <p>1 mark for two sentences / or 2 bullet points including correct use of two of the following phrases: <i>intermolecular forces, (permanent) dipole-(permanent) dipole forces, hydrogen bonding, instantaneous dipole-induced dipole forces</i></p>	5
Total mark		28

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Question	Expected answers			Marks
3 (a)	Copper = +2; sulphur = -2; <i>1 mark each for correct number (2), 1 mark for both signs correct, allow after the number (1)</i>			3
3 (b) (i)	Sulphur dioxide (1), <i>accept</i> sulphur oxide/SO ₂			1
3 (b) (ii)	Acid rain (1); detail of effect <i>or</i> formation (1), <i>or</i> Toxic (1); detail of effect (1) <i>Do not accept</i> greenhouse effect			2
3 (c) (i)	Fe ₂ O ₃ + 3SiO ₂ → Fe ₂ (SiO ₃) ₃ 1 mark for Fe ₂ O ₃ ; 1 mark for rest correct; 1 mark for balanced (1)			3
3 (c) (ii)	Mole ratio (Cu : S) = 79.8/63.5 : 20.2/32 (1); Simplest ratio = 1.26 : 0.63 = 2.00 : 1.00 (1); Formula Cu ₂ S (1) <i>(allow 1 mark for correct molar amount of either copper or sulphur)</i>			3
3 (d)	To increase yield of copper / or reduce wastage of 'white metal' (1) <i>aw</i>			1
3 (e) (i)	Cathode, electrons gained by (copper(II) ions/ copper), <i>or</i> oxidation number of copper decreases (1)			1
3 (e) (ii)	Copper anode dissolves/ forms ions in solution (1); <u>same amount</u> Cu is deposited at cathode as is lost from anode/ or expressed in terms of rate of copper transfer(1) <i>accept if given in terms of equal rates for copper transfer (2)</i>			2
3 (f) (i)	 1s 2s 2p 3s 3p 3d 4s (1) 26 electrons in total (1)			2
3 (f) (ii)	(3)d energy levels (orbitals) / sub shells /shells (1); are <u>partly</u> filled /being filled /unpaired electrons (1)			2
Total mark				20

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Question	Expected answers			Marks
4 (a) (i)	Suitable vessel e.g round bottomed <i>or</i> pear shaped flask, heat source and mixture labelled (1); to open vertical condenser (1); with correct water connections and joined without leaks (1)			3
4 (a) (ii)	<i>Any 2 from 3 points:</i> Larger surface area (1); more collisions (1); faster reaction (1) <i>or,</i> more mineral exposed to acid (1); to make sure it all reacts/faster reaction (1)			2
4 (b) (i) 1.	NH ₃ (1); OH ⁻ (1)			2
4 (b) (i) 2.	<i>Any 3 points from 5:</i> Acid forms H ⁺ (1); H ⁺ reacts with OH ⁻ (to form water) (1); concentration of OH ⁻ is reduced (1); (by Le Chatelier's Principle), position of equilibrium moves to right (to counteract change) (1); to produce more OH ⁻ (1)			3
4 (b) (ii)	Iron(III) hydroxide <i>allow</i> iron hydroxide (1); Fe(OH) ₃ <i>allow</i> charges on ions if correct (1)			2
4 (c) (i)	Blue/ blue-green (1) ; yellow/brown, <i>accept</i> milky yellow/brown (1)			2
4 (c) (ii)	Redox, <i>or</i> oxidation <i>or</i> displacement (1)			1
4 (d)	Burette (1)			1
4 (e) (i)	0.300 x 25.0/1000 (1); = 7.5(00) x 10 ⁻³ moles (1) (ignore units) correct answer no working scores 2 correct answer but incorrect working scores 1			2
4 (e) (ii)	Mass of Cu in ore = 7.500 x 10 ⁻³ x 63.5 (= 0.476 g) (1); % Cu = (0.476 x 100/ 0.600) = 79.4 (1) <i>allow</i> 79-80%			2
4 (e) (iii)	Mass of actual ore will be less than 0.600 g <i>or</i> water contributes to mass of sample (1); so calculated % Cu will be too low (1) marks are linked			2
Total mark				22

Mark Scheme Page 6 of 7	Unit Code 2851 2848	Session Jun	Year 2001	Final version for examiners
Question	Expected answers			Marks
5 (a) (i)	Sunlight or UV/ light(1); (provides the energy) to break the bonds/ causes photodissociation/homolysis of molecules/(1)			2
5 (a) (ii)	HOCl → HO + Cl (1) accept formulae with unpaired electrons			1
5 (b) (i)	A photon (of light)/light/UV (1); <u>absorbed</u> (by the molecules)(1)			2
5 (b) (ii)	(Free) <u>radical</u> (1)			1
5 (b) (iii)	<i>Any 3 points from 4:</i> Cl destroy ozone (in 5.1) owtte (1); Cl are reformed in (5.3 and 5.4) (in same numbers as used up) (1); Cl are very reactive / reactions are fast (1); Cl acts as a catalyst (1)			3
5 (c)	<i>Any 5 points from 8:</i> HFCs and HCFCs (1 mark each)/ contain H (1); HFCs (and/or HCFCs) react (or break down) in troposphere/ lower atmosphere /or before they reach the stratosphere/ ozone (1); by H abstraction / C-H bond breaks / H in the molecules reacts (1); they are much more expensive to buy aw (1); we do not know the long term effect of the products formed from them (1); they still act as greenhouse gases (owtte) (1); their properties may not be ideal (1) <i>Quality of written communication (ensure text is legible and spelling, grammar and punctuation are accurate, so the meaning is clear)</i> <i>At least two readable and clear sentences with no more than one spelling, punctuation or grammatical error. (1)</i>			6
Total mark				15

Question	Expected answers	Marks
6 (a)	Softened/ deformed/ reshaped/ melts (1); on heating (1) <i>linked</i> stretches on heating scores 1	2
6 (b)	 <p>correct repeating unit (<i>bracket not essential</i>), allow if more than one unit is given but the number is stated (1); unlinked bonds present (1)</p>	2
6 (c)	<p>Any 3 points from 4:</p> <p>permanent dipole-permanent dipole forces in PVC (1); instantaneous dipole-induced dipole forces in poly(ethene) <i>accept</i> temporary dipole forces, VdW's(1); PVC IMF forces stronger (1); chains held together more tightly/ chains less able to move past each other (1)</p>	3
6 (d)	<p>A has a more regular/ ordered structure than B (1)/ A is isotactic whereas B is atactic; therefore the polymer chains in A will be packed/ will line up/ will be aligned more closely (1)</p>	2
6 (e)	Ester (1)	1
6 (f) (i)	1 mark for no, yes, yes	1
6 (f) (ii)	<p>D: Cannot hydrogen bond (to water) <i>or</i> cannot interact with water (1); E: Can hydrogen bond to water (1); F: Forms hydrogen bond to itself (1); These bonds are very strong therefore cannot hydrogen bond/ interact with water (1)</p> <p>Allow 1 mark for linking hydrogen bonding with solubility if no other marks awarded.</p>	4
Total mark		15