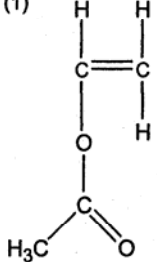
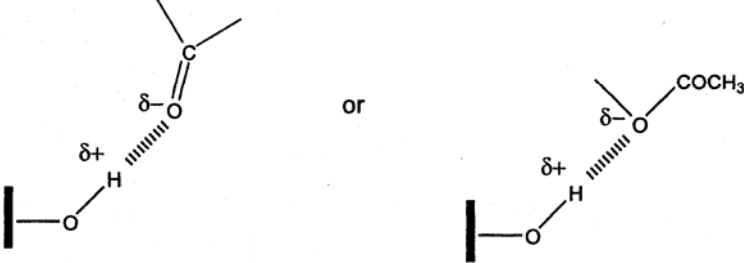
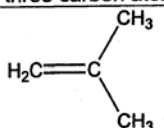


Question	Expected answers	Marks
2 (a) (i)	<p>allow $-\text{COCH}_3$ (1)</p> 	1
2 (a) (ii)	Softens/flows/melts (1); when heated/warmed (1).	2
2 (a) (iii)	Addition <i>accept additional</i> (1).	1
2 (b) (i)	M_r of monomer = 86 (1); $n = 43,000 / 86 = 500$ <i>ecf</i> (1).	2
2 (b) (ii)	More intermolecular forces/attractions between chains / chains get tangled /entwined (1); chains/molecules can not move as easily AW (1).	2
2 (c) (i)	Hydrogen bonding (1).	1
2 (c) (ii)	 <p><i>accept non-linearity of the O-H...O atoms;</i> bond (1); correct partial charges (1).</p>	3
2 (d) (i)	(Shake with/add) bromine (in solvent) (1) orange/brown (1); turns colourless (1) <i>do not accept clear</i> .	3
2 (d) (ii)	$\text{C}=\text{C}$ restricts bond rotation AW (1); substituent groups mean two different arrangements possible AW (1).	2
Total mark		17

Question	Expected answers	Marks
3 (a) (i)	$O_2 \rightarrow 2O$ (1); $O + O_2 \rightarrow O_3$ (1).	2
3 (a) (ii)	High frequency radiation only present in stratosphere AW (1); bonds are broken by this radiation AW (1).	2
3 (a) (iii)	(Intense) high frequency radiation/uv given off by firework reactions/(intense) heat/energy released (1).	1
3 (b) (i)	Increase its temperature/warm up the atmosphere (1).	1
3 (b) (ii)	Infrared (1) <i>do not allow</i> heat.	1
3 (b) (iii)	Makes it vibrate (faster)/increases its (kinetic) energy (1).	1
3 (c) (i)	Photodissociate / break down (to form oxygen molecules and atoms) (1).	1
3 (c) (ii)	E for 1 bond = 302×1000 (1) / 6.02×10^{23} (1) $J = 5.02 \times 10^{-19} J$ <i>ecf</i> (1).	3
3 (c) (iii)	$\nu = 5.02 \times 10^{-19} / 6.63 \times 10^{-34}$ (1) = $7.57 \times 10^{14} Hz$ <i>ecf</i> . <i>1 mark for 3 sig. figs.</i>	2
Total mark		14

Question	Expected answers	Marks
4 (a) (i)	$(3 / 1 \times 10^6) \times 100 (1) = 3 \times 10^{-4} \%$.	1
4 (a) (ii)	Froth flotation (1); <i>Any 2 points from 4:</i> grains are given water repellent coating (1); (air & detergent cause) the solution to froth (1); ore grains/metal are concentrated/AW in the froth (1); ore grains scooped/AW off with froth (1).	3
4 (b) (i)	Cu_2S (1).	1
4 (b) (ii)	$2p^6, 3s^2, 3p^4$ <i>12 electrons added (1); correct orbitals (1).</i>	2
4 (b) (iii)	$\text{Cu}_2\text{S} + \text{O}_2 \rightarrow 2\text{Cu} + \text{SO}_2$ <i>formulae correct, allow ecf from b(i) for copper(I) sulphide (1); balanced (1).</i>	2
4 (b) (iii)	SO_2 reacts in the atmosphere to form sulphuric/sulphurous acid / with water to form an acid (1); causes acid rain (1)	2
4 (c) (i)	hydrogen ions /protons (1).	1
4 (c) (ii)	S^{2-} (1).	1
4 (d) (ii)	Enthalpy of products lower than reactants in both cases (1); correct shape curve for reaction, single 'hump' (1); correct shape curve for catalysed reaction, two 'humps' (1); enthalpy change of reaction correct (1); both enthalpy changes of activation correct (1).	5
Total mark		18

Question	Expected answers	Marks
5 (a) (i)	Cl ₂ (1).	1
5 (a) (ii)	2-chloro-2-methylpropane name (1); number for chlorine/methyl (1).	2
5 (a) (iii)	room temperature (1) accept heat (under reflux) alone.	1
5 (b) (i)	OH ⁻ (1); must be ion.	1
5 (b) (ii)	Cl and C have different electronegativities AW/ C-Cl bond is polar (1); the C is electron deficient/ slightly positive/ δ ⁺ (1).	2
5 (c) (i)	(Concentration x volume) 2.0 x 100/1000 (1); = 0.2 mol (1)	2
5 (c) (ii)	M _r (NaOH) = 40 (1); mass = 0.2 x 40 = 8 g (1). ecf for 5 (b) (i) and incorrect M _r .	2
5 (d) (i)	Tertiary (1); no H atoms on C connected to OH (1)/only alkyl groups on C connected to OH / three carbon atoms bonded to C-OH (1).	2
5 (d) (ii)	 <p>C=C bond present (1); rest of molecule correct (1).</p>	2
5 (d) (iii)	Elimination (1).	1
5 (e) (i)	X in distillation head opposite condenser (1).	1
5 (e) (ii)	<p>2 defects from 3</p> <p>Water connections need to be reversed (1); condenser water jacket will not be filled/ product will not condense (1);</p> <p>Delivery tube and distillate flask sealed (1); closed system is dangerous/pressure builds up on heating (1);</p> <p>No anti-bumping granules (1); liquid will boil over into condenser AW (1).</p> <p>QWC At least two readable and clear sentences with no more than one spelling, punctuation or grammatical error (1).</p>	4
Total mark		22