

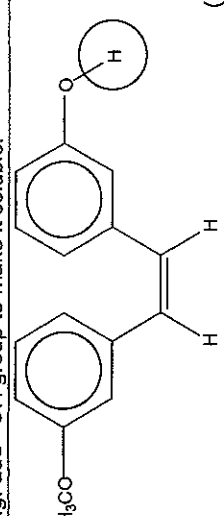
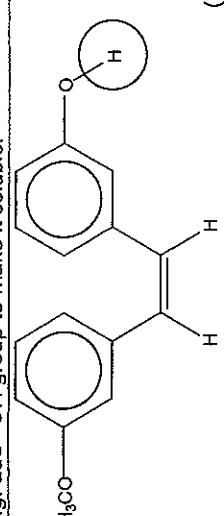
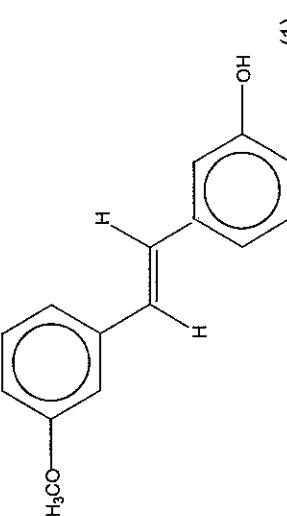
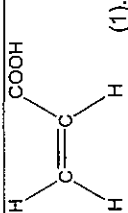
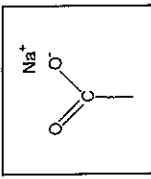



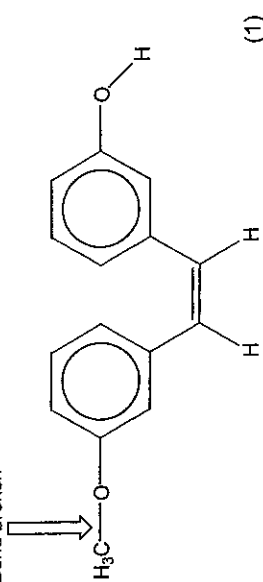
Question	Expected answers	Marks
1 (a) (i)	chloroethene (1). Ignore numbers if 1 or 2.	1
1 (a) (ii)	Softens / changes shape / remoulded (1); when heated/allow when it is melted / no cross-links (1).	2
1 (a) (iii)	 allow $-\text{CH}_2-\text{CHCl}-$ (1).	1
1 (b)	δ^+ δ^- (uses numbers to identify) correct bond (1); partial charges correct (1).	2
1 (c) (i)	Acidified/sulphuric acid (1) allow any mineral acid/ H^+ ; (potassium) dichromate/ $\text{Cr}_2\text{O}_7^{2-}$ (1).	2
1 (c) (ii)	condensing vapours (1); returning liquid to flask / vapours not allowed to escape (1).	2
1 (c) (iii)	1700-1725 cm^{-1} (1); $\text{C}=\text{O}$ (1).	2
1 (d)	Elimination (1).	1
1 (e) (i)	Bromine molecule is polarised (1); by the $\text{C}=\text{C}$ bond/electrophilic attraction/electrons/negative charge ignore electronegativity (1).	2
1 (e) (ii)	 	1
Total mark		16

Question	Expected answers	Marks
2 (a)	Any 5 points from: CO_2 absorbs (1); infrared radiation/light (1); emitted/radiated from/given off from the Earth (1); molecules/bonds vibrate (1); molecules have greater (kinetic) energy/faster vibrations (1); links energy to temperature/hotter/warmer (1); QWC 1 mark for two sentences / 2 bullet points including correct use of two of the words above in <i>italics</i> used correctly.	6
2 (b) (i)	There are two alternative ways to tackle this question: Increase in $[\text{CO}_2]$ / decrease in $[\text{HCO}_3^-]$ [1 mark for using concentrations]; then any 3 points from 4: gas moves equilibrium position in 2.1 to right/equilibrium in 2.2 to right (1); this increase in $\text{CO}_2(\text{aq})$ causes/ decrease in $\text{CO}_2(\text{aq})$ causes (1); equilib. pos. in 2.2 to move to right/ equilib. pos. in 2.1 to move to right (1); and more ions will form/more CO_2 dissolves or thus CO_2 gas is continually removed (1). QWC At least two readable and clear sentences with no more than one spelling, punctuation or grammatical error (1).	5
2 (b) (ii)	Hydrogen ions are formed (1).	1
2 (c)	Any two sensible linked points: e.g. extract CO_2 gas (1) and bury as liquid (1); encourage photosynthesis (1) by plants, or by imitating plants (1); use the right fuel for the job (1) example (1); use fewer 'vehicles'/less power generation (1) to reduce emissions/use less fossil fuel (1).	2
2 (d) (i)	Can with gas flow in and out on opposite sides (1); Granular/mesh absorbent/thin tube coated (1); correct labels (1).	3
2 (d) (ii)	$\text{Ca}(\text{OH})_2(\text{s}) + \text{CO}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O}(\text{l})$ 1 mark for correct equation; 1 mark for state symbols correct.	2
2 (e)	H^+ / H_3O^+ and CO_3^{2-} (allow carbonate or CO_3) 1 mark for each ion correct.	2
2 (f) (i)	1 mark for each one correct including sign: -1, -2, 0 allow sign after number.	4
2 (f) (ii)	O in sodium peroxide alone (1) has its oxidation state increased and decreased (1) these two are linked; The second mark can be gained for linking oxidation state change correctly to oxidation/reduction.	2
2 (f) (iii)	Oxygen is formed (1).	1
Total mark		28

Question	Expected answers	Marks
3 (a)	d block (1)	1
3 (b) (i)	$4\text{NaOH} + \text{ZrSiO}_4 \rightarrow \text{Na}_2\text{SiO}_3 + \text{Na}_2\text{ZrO}_3 + 2\text{H}_2\text{O}$ 1 mark for each side correct.	2
3 (b) (ii)	Filtration (1) allow vacuum filtration/centrifuge.	1
3 (b) (iii)	$M_r(\text{ZrSiO}_4) = 183$ & $M_r(\text{ZrO}_2) = 123$ (1); Mass of $\text{ZrO}_2 = 1000 \times 123 / 183 = 672$ kg (1).	2
3 (c) (i)	3s  3p  1 mark for 4 electrons; 1 mark for detail correct.	2
3 (c) (ii)	SiO_2 is a solid (1) CO_2 is a gas (1) (or expressed in terms of relative melting / boiling points) or describes relative compressibility/relative densities (2); or SiO_2 is insoluble in water (1) CO_2 is soluble (1).	2
3 (c) (iii)	SiO_2 has giant (covalent) structure (of atoms)/network/lattice structure (1); CO_2 has a molecular structure (1).	2
3 (c) (iv)	Intermolecular bonds/ forces between molecules are easier to break (1); than (chemical) bonds in a giant structure (1).	2
3 (d) (i)	Correct shape curve (2 humps shown, 2 nd not greater than 1 st) (1); drawn underneath profile given (1); 1 mark for each of the 2 correct labels & 1 mark for identifying the first hump (arrows can be single or double headed) (3).	5
3 (d) (ii)	Catalysed reaction has lower activation enthalpy/requires less energy(1); more collisions/particles will have the necessary activation enthalpy (1); more collisions will lead to products (1).	3
Total mark		22

Question	Expected answers	Marks
4 (a)	Any 2 points: Check that it is acceptably safe / not toxic or harmful to humans (1); synthesis (1); structural identification (1); physical properties (1); stability (1); how it is absorbed by the body (1); how it is excreted (1); biological testing (1); formulation of dosage (1). Alter structure by changing substituent/side groups (1). May be specific e.g. add -OH group to make it soluble.	2
4 (b)	 (1).	1
4 (c) (i)	 (1).	1
4 (c) (ii)	Phenol/hydroxy/lenol (1).	1
4 (d) (i)	 (1).	1
4 (d) (ii)	Addition of hydrogen to C=C double bond (1); no longer is there restricted rotation/groups in varied arrangements (1); about the C-C single bond or the molecule is now saturated/only has single bonds (1). ORA Positive (1) ion (1).	3
4 (e) (i)	Positive (1) ion (1).	2
4 (e) (ii)	CH_3 ignore charge (1).	1
4 (e) (iii)	(it represents the) most abundant (particle) (1)	1

Question	Expected answers	Marks
5 (a)	 (1)	1
5 (b)	 and  (1). <i>H₂O correct (1); structure of salt (1); correct charges (1). Do not allow C-NaO</i>	3
5 (c)	Moles of hydroxide = $(35.0/1000) \times 0.10 = (3.5 \times 10^{-3})$ <i>mark is for Concentration X Volume so may have 3.5 (1); Moles of carboxylic acid groups = 3.5×10^{-3} (1); Covalent bond (1); Between 2 polymer chains or linking polymer chains (1). Make them stronger (1) </i>	2
5 (d) (i)	Covalent bond (1);	2
5 (d) (ii)	Make them stronger (1)	1
Total mark		9

4 (e) (iv)		2
The mass difference between the two peaks is 15, hence a CH ₃ is lost (1)		
Total mark		15