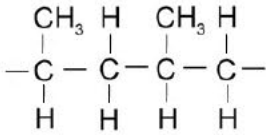
Question Number	Answer	Acceptable answers	Mark
1(a)(i)	An explanation linking (a compound containing) • hydrogen and carbon (1) • (hydrogen and carbon) only (1) • contains double / multiple bond (between carbon atoms) (1)	 ignore H and C reject {ions/molecule} of carbon and hydrogen reject mixture reject oxygen ignore 'spare bonds' allow carbon atoms not joined to the maximum number of other atoms	**(3)**

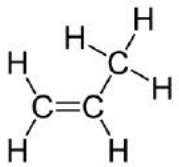
Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	**B** cracking		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	A description to include • (bromine water is) orange (1) • decolourises / turns colourless (1)	 allow brown / yellow or combinations eg orange-yellow ignore red (alone) ignore clear / changes colour / discolour	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)(i)	**D** 		**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(ii)	waterproof / rot-proof / strong / flexible / does not react with oxygen / water resistant / weather proof	allow durable / tough ignore ductile / stretchy	**(1)**

Question Number	Answer	Acceptable answers	Mark
1(b)(iii)	not biodegradable / persist in landfill sites / does not decompose	ignore answers in terms of burning / allow takes a long time to rot / decompose / takes up space in landfill	**(1)**

Question Number	Answer	Mark
2(a)	 any 3 carbon molecule **and** <u>one</u> C=C (1) fully correct molecule with <u>all bonds</u> (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(i)	**A** 333 dm^3		**(1)**

Question Number	Answer	Acceptable answers	Mark
2(b)(ii)	An explanation linking • <u>all / three</u> gases present/ <u>nitrogen, hydrogen and ammonia</u> (1) • ammonia decomposes/ ammonia turns back to reactants/ reaction goes both ways / reversible (1)	reject ammonium ignore incomplete reaction assume that "both reactions" refer to forward and backward reaction allow **<u>dynamic</u>** equilibrium	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(iii)	An explanation linking • increased / high**er** {yield / amount of ammonia} (1) • because fewer (gas) molecules/ moles on RHS/ 4 mole(cule)s on left and 2 on right/ decreased volume on RHS/equilibrium shifts to RHS/ equilibrium shifts in forward direction (1)	mark independently ignore "high yield" reject answers referring to exothermic or endothermic ignore any references to rate	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)(iv)	An explanation to include • **rate** increased/ time to reach equilibrium reduced (1) • because gas molecules closer / more concentrated (1) • so increased **collision** rate / more **collisions** in a given time / more frequent **collisions**(1)	mark independently ignore any refs to equilibrium ignore 'time is faster'/ allow 'quicker' allow atoms/ particles instead of molecules; allow more molecules present (in same container) do not allow 'more collisions'	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(a)(i)	A explanation linking the following • contains carbon (atoms) and hydrogen (atoms) (1) • only (1) • all single bonds/no double bonds (1)	reject carbon molecules and hydrogen molecules ignore no spare bonds	**(3)**

Question Number	Answer	Acceptable answers	Mark
3(a)(ii)	remains orange		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(i)	cracking		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(b)(ii)	any two reasons from insufficient petrol / supply (from crude oil) (1) higher demand for petrol (1) more fuel oil fraction than needed (1) petrol is more useful than fuel oil (1)	not enough petrol too much fuel oil	**(2)**

Question Number	Answer	Acceptable answers	Mark
3(c)	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ (3) LHS (1) RHS (1) balancing correct formula (1)	correct multiples ignore state symbols	**(3)**

Question Number	Answer	Acceptable answers	Mark
4(a)	the liquid oil is changed into a solid		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(b)(i)	**B** sodium hydroxide		**(1)**

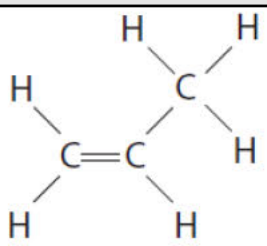
Question Number	Answer	Acceptable answers	Mark
4(b)(ii)	An explanation linking any two of • tail / {hydrophobic / hydrocarbon } end into grease (1) • head / {anion / hydrophilic} end into water (1) • allows grease to mix with water when surrounded by soap (anions) / grease is surrounded by soap (1) • surface tension lowered (1)	allow correctly labelled diagram (2) head is soluble in water (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)(i)	propanoic (acid)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(c)(ii)	$CH_3COOH + C_2H_5OH \rightarrow CH_3COOC_2H_5$ (1) + H_2O (1) award one mark if incorrectly balanced	correct products but no / incorrect reactants shown (1) allow correct molecular formulae allow correct multiples ignore state symbols	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(d)	(making) fibres/fleece/clothing/ fabrics/bedding/computer mouse mats/yarns/ropes/safety belts/filters/insulating tape/wood finishes/(plastic) carrier bags	allow any named item of clothing	**(1)**

Question Number	Answer	Acceptable answers	Mark
5(a)	C – CH_3CH_3		

Question Number	Answer	Acceptable answers	Mark
5(b)		carbon skeleton correct including double bond (1) rest of molecule correct (1) allow CH_3	(2)

Question Number	Answer	Acceptable answers	Mark
5(c)	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ • reactant formulae (1) • product formulae (1) • balancing of correct formulae (1)	accept multiples reject incorrect use of cases and non-subscripts	(3)

Question Number		Indicative content	Mark
QWC	***5(d)**	advantages • renewable / sustainable • more plants can be grown • crops use up carbon dioxide and produce oxygen when growing /photosynthesising • carbon neutral because the carbon produced during combustion is used when growing the plants • does not use up crude oil/non-renewable resources disadvantages • crops grown for bio-fuels use up land • land could otherwise be used to provide homes / less farmland available for growing food crops • lots of crops required to provide a small amount of bio-methane • bad season reduces availability • carbon emissions due to transport and production if qualified	(6)
Level	**0**	No rewardable content	
1	**1-**	• a limited description e.g. using bio-methane conserves fossil fuels and uses up carbon dioxide when plants are grown • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, puncuation and grammar are used with limited accuracy	
2	**3-**	• a simple description e.g. growing plants to produce bio-methane is sustainable and conserves fossil fuels but uses up lots of farm land which could be used to grow plants for food • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, puncuation and grammar are used with some accuracy	
3	**5 - 6**	• detailed description e.g growing plants remove carbon dioxide from the air during photosynthesis and conserves fossil fuels but lots of crops are required to make bio-methane and this uses up farm land which could otherwise be used to grow crops for food • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, puncuation and grammar are used with few errors	