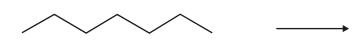
ALKANES MS

(ii)	uv (light)/high temperature/min of 400° C/sunlight (1)	1	
	a (((((((((((((((((((1	
(iii)	homolytic (fission) (1)	1	
(iv)	$C_4H_{10} + Cl \cdot (1) \rightarrow C_4H_9 \cdot + HCl (1)$		
	$C_4H_9^{\bullet} + Cl_2 (1) \rightarrow C_4H_9Cl + Cl^{\bullet} (1)$	2	
			[5]
(i)	$Cl_2 \rightarrow 2Cl \bullet$	1	
(ii)	uv (light)/high temperature/min of 400 C/sunlight	1	
(iii)	$Cl \bullet + C_6H_{12} \longrightarrow C_6H_{11} \bullet + HCl$	1	
	$C_6H_{11} \bullet + Cl_2 \longrightarrow C_6H_{11}Cl + Cl \bullet$	1	
(iv)	react with each other/suitable equation	1	
			[6]
			[5]
(i)	homolytic 🗸	1	
(ii)	$Cl_2 \rightarrow 2Cl \bullet (need \bullet on the Cl penalise only once in the 3 equations) \checkmark$	1	
(iii)	I $(C_5H_{10}) + \underline{Cl} \bullet \rightarrow (\bullet C_5H_9) + \underline{HCl} \checkmark$	1	
	II $(\bullet C_5 H_9) + \underline{Cl_2} \rightarrow \underline{C_5 H_9 Cl} + \underline{Cl \bullet} \checkmark$	1	
			[4]
(a)	(i) compound/molecule containing hydrogen and carbon only	1	
	(ii) $C_{10}H_{22}$	1	
	(iii) C_5H_{11} {ecf from (ii)}	1	
(b)	(i) (a particle that) contains/has a single/unpaired electron	1	
	(ii) UV (light) /sunlight/high temp	1	
	(iii) homolytic (fission)/ homolysis	1	
	(iv) $C_{12}H_{26} + Cl \bullet \rightarrow \bullet C_{12}H_{25} + HCl$	1	
	(the dot for the free radical does not have to be on the C)		
	$\bullet C_{12}H_{25} + Cl_2 \to C_{12}H_{25}Cl + Cl \bullet$	1	
	(v) six	1	
(c)	(i) $C_{12}H_{26} \rightarrow 2C_2H_4 + 1C_8H_{18}$	2	
	(1 mark for correct formula of octane or ethene)		
	(ii) octane/ ecf from (c) (i)	1	
	(iv) (i) (ii) (iii) (iii) (iii) (b)	 (iv) C₄H₁₀ + Cl* (1) → C₄H₉* + HCl (1) C₄H₉* + Cl₂ (1) → C₄H₉Cl + Cl* (1) (i) Cl₂ → 2Cl* (ii) uv (light)/high temperature/min of 400 C/sunlight (iii) Cl* + C₆H₁₂ → C₆H₁₁* + HCl C₆H₁₁* + Cl₂ → C₆H₁₁Cl + Cl* (iv) react with each other/suitable equation (i) homolytic ✓ (ii) Cl₂→ 2Cl* (need * on the Cl penalise only once in the 3 equations) ✓ (iii) I (C₃H₁₀) + Cl* → (*C₃H₉) + HCl ✓ II (*C₃H₁₀) + Cl* → (*C₃H₉Cl + Cl* ✓ (a) (i) compound/molecule containing hydrogen and carbon only (ii) C₁₀H₂₂ (iii) C₃H₁₁ {ecf from (ii)} (b) (i) (a particle that) contains/has a single/unpaired electron (ii) UV (light) /sunlight/high temp (iii) homolytic (fission)/ homolysis (iv) C₁₂H₂₆ + Cl* → *C₁₂H₂₅ + HCl (the dot for the free radical does not have to be on the C) *C₁₂H₂₅ + Cl₂ → C₁₂H₂₅Cl + Cl* (v) six (c) (i) C₁₂H₂₆ → 2C₂H₄ + 1C₈H₁₈ (1 mark for correct formula of octane or ethene) 	(iv) $C_4H_{10} + Cl^{\bullet}(1) \rightarrow C_4H_9^{\bullet} + HCl(1)$ $C_4H_9^{\bullet} + Cl_2(1) \rightarrow C_4H_9Cl + Cl^{\bullet}(1)$ 2 (i) $Cl_2 \rightarrow 2Cl^{\bullet}$ (ii) uv (light)/high temperature/min of 400 C/sunlight 1 (iii) $Cl^{\bullet} + C_6H_{12} \rightarrow C_6H_{11}^{\bullet} + HCl$ $C_6H_{11}^{\bullet} + Cl_2 \rightarrow C_6H_{11}Cl + Cl^{\bullet}$ 1 (iv) react with each other/suitable equation 1 (i) homolytic \checkmark 1 (ii) $Cl_2 \rightarrow 2Cl^{\bullet}$ (need \bullet on the Cl penalise only once in the 3 equations) \checkmark 1 (iii) $I (C_3H_{10}) + Cl^{\bullet} \rightarrow (\bullet C_3H_9) + HCl \checkmark$ 1 II $(\bullet C_3H_9) + Cl_2 \rightarrow C_3H_9Cl + Cl^{\bullet} \checkmark$ 1 (a) (i) compound/molecule containing hydrogen and carbon only (ii) $C_{10}H_{22}$ (iii) C_3H_{11} {ccf from (ii)} (b) (i) (a particle that) contains/has a single/unpaired electron (ii) UV (light) /sunlight/high temp (iii) homolytic (fission)/ homolysis (iv) $C_{12}H_{26} + Cl^{\bullet} \rightarrow \bullet C_{12}H_{25} + HCl$ (the dot for the free radical does not have to be on the C) $\bullet C_{12}H_{25} + Cl_2 \rightarrow C_{12}H_{25}Cl + Cl^{\bullet}$ (v) six 1 (c) (i) $C_{12}H_{26} \rightarrow 2C_2H_4 + 1C_8H_{18}$ (1 mark for correct formula of octane or ethene)

(d) (i)





1 mark for correct reagent and 1 mark for correct product.

2

(ii) 1 mark for any unambiguous formula of cyclohexane

1

1 mark for 1H₂ but check that formula of heptane is correct/equation balanced.

1

gets 2 marks

$$CH_3(CH_2)_5CH_3$$
 \longrightarrow $H_2C H_2 H_2 CH_2 + H_2$ gets 2 marks

 $C_7H_{16} \longrightarrow C_7H_{14} + H_2$ gets 1 marks

[16]

5. (i) (free radical) substitution

1

(ii) 1-bromohexane, 2-bromohexane and 3-bromohexane

[4]

6. (a) (i) uv/sunlight/high temperature (range 400 – 700 °C)

1

(ii) $Cl_2 \rightarrow 2Cl \bullet$

1

1

1

 $C_4H_{10} + Cl \bullet \rightarrow HCl + \bullet C_4H_9/C_4H_9 \bullet$

1

 $\bullet C_4 H_9 / C_4 H_9 \bullet + C l_2 \rightarrow C_4 H_9 C l + C l \bullet$

1

(iii) any two free radicals from (a) (ii)

1

(iv) homolytic (fission)

1

(b) (i) 2,3-dichlorobutane

1

1

(ii)

(iii) any dichlorobutane except 2,3-dichlorobutane.

[9]