ALKANES MS

1. (i) species with an unpaired electron **(1)** 1

(ii) uv (light)/high temperature/min of 400° C/sunlight **(1)** 1

(iii) homolytic (fission) **(1)** 1

(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

[5]

2. (i) $Cl_2 \rightarrow 2Cl\bullet$ 1

(ii) uv (light)/high temperature/min of 400 C/sunlight 1

(iii) $Cl\bullet + C_6H_{12} \rightarrow C_6H_{11}\bullet + HCl$ 1

$C_6H_{11}\bullet + Cl_2 \rightarrow C_6H_{11}Cl + Cl\bullet$ 1

(iv) react with each other/suitable equation 1

[5]

3. (i) homolytic ✓ 1

(ii) $Cl_2 \rightarrow 2Cl\bullet$ *(need • on the Cl… penalise only once in the 3 equations)* ✓ 1

(iii) I $(C_5H_{10}) + \underline{Cl\bullet} \rightarrow (\bullet C_5H_9) + \underline{HCl}$ ✓ 1

II $(\bullet C_5H_9) + \underline{Cl_2} \rightarrow \underline{C_5H_9Cl} + \underline{Cl\bullet}$ ✓ 1

[4]

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)

$\bullet C_{12}H_{25} + Cl_2 \rightarrow C_{12}H_{25}Cl + Cl\bullet$ 1

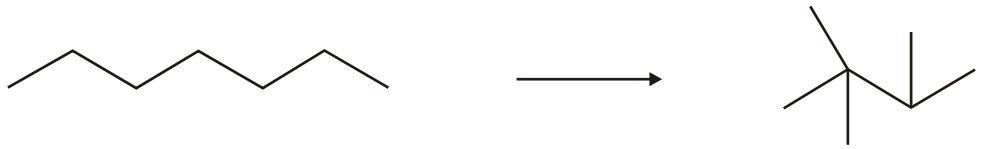
(v) six 1

(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

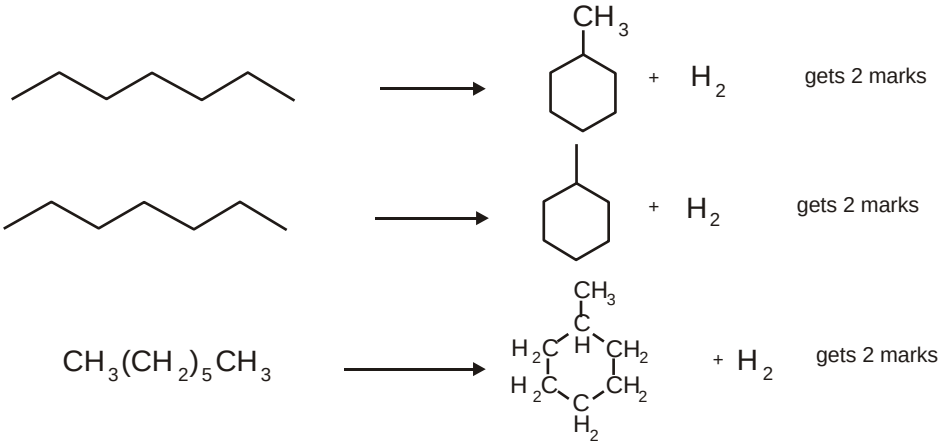
(d) (i)



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 $1H_2$ but check that formula of heptane is correct/equation balanced. 1



[16]

5. (i) (free radical) substitution 1

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

[4]

6. (a) (i) uv/sunlight/high temperature (range 400 – 700 °C) 1

(ii) $Cl_2 \rightarrow 2Cl\bullet$ 1

$C_4H_{10} + Cl\bullet \rightarrow HCl + \bullet C_4H_9/C_4H_9\bullet$ 1

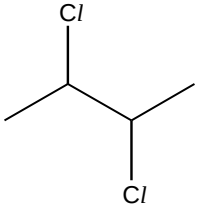
$\bullet C_4H_9/C_4H_9\bullet + Cl_2 \rightarrow C_4H_9Cl + Cl\bullet$ 1

(iii) any two free radicals from (a) (ii) 1

(iv) homolytic (fission) 1

(b) (i) 2,3-dichlorobutane 1

(ii) 1



(iii) any dichlorobutane **except** 2,3-dichlorobutane. 1

[9]