ALKENES MS

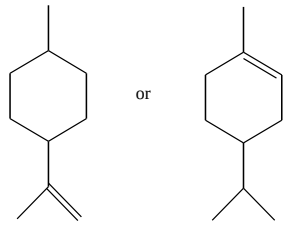
1. (a) (i) C_5H_8 1

(ii) C_5H_8 1

(b) (i) Ni/Pt/Pd 1

(ii) 1 mark for C_5H_{12} 1
1 mark for correct balancing 1

(iii)



1

[6]

2. (a) (i) alkene 1

bromine 1

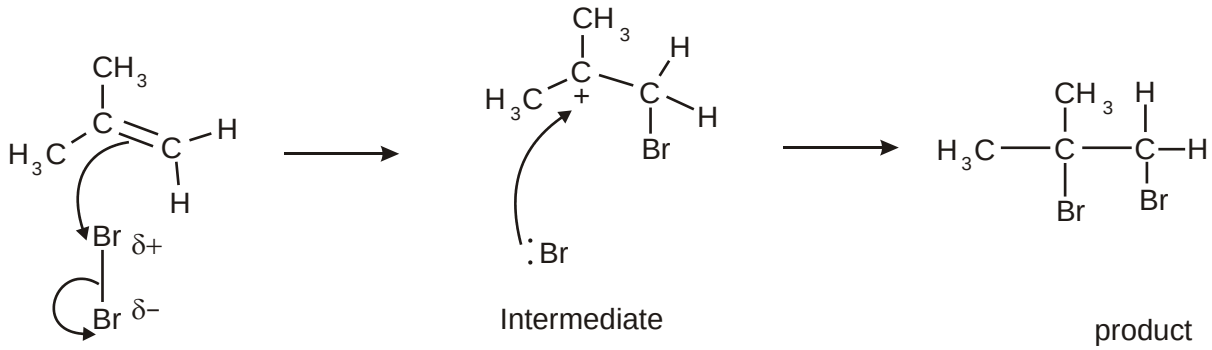
decolourises 1

(ii) 3-methylhex-2-en-1-ol/ 1-hydroxy-3-methylhex-2-ene 1

[4]

3. (i) *electrophile*: lone pair (of electrons) acceptor. ✓ 1

(ii)



Intermediate

product

essential mark intermediate carbocation/carbonium ion, accept primary /"triangular"/ ✓

essential mark product ✓

curly arrow from double bond to Br_2 ✓

curly arrow showing movement of electrons in the Br-Br bond **or** the dipole in the Br-Br ✓

curly arrow from lone pair of electrons in Br^- to intermediate ✓

mark any errors first

5 max

[5]

4. $CH_3CBr_2CH_3$ 1

$CH_3CHBrCH_2Br$ 1

$CH_3CH_2CHBr_2$ 1

($CH_3CHBrCH_2Br$ has a chiral centre, hence optical isomers of 1, 2-dibromopropane are acceptable but must be drawn with 'wedge-shape' bonds and be non-superimposable mirror images)

[3]

5. (i) $C_9H_{20} \longrightarrow C_7H_{16} + C_2H_4$ 1

(ii) $C_2H_4 + H_2O \longrightarrow C_2H_5OH$ 1

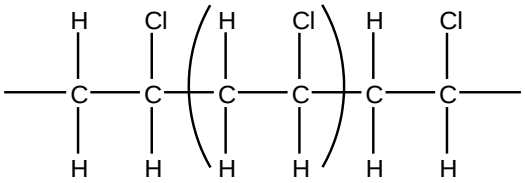
temperature > 100 °C/ steam 1

phosphoric acid (catalyst) 1

[4]

6. (i) correctly shows three repeat units with 'end bonds' 1

correctly identifies the repeat unit 1



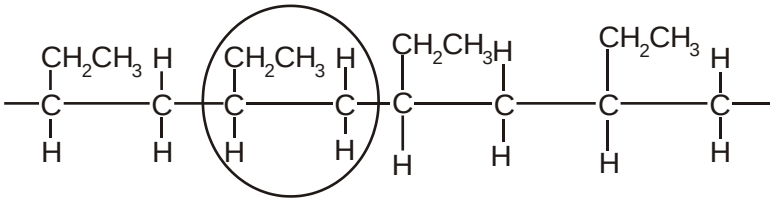
(ii) harmful/toxic fumes are produced 1

(iii) recycle/remove HC*l* by using gas scrubbers or wtte/crack polymers/used a feedstock/ source of fuel (in an incinerator)/developing biodegradable alternatives. 2

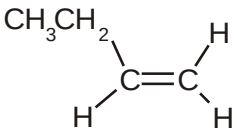
[5]

7. (i) Addition (not addition**al**) ✓ 1

(ii) ✓ 1



(iii) ✓ 1



or but-1-ene

(iv) Poly(but-1-ene) ✓ 1

[4]

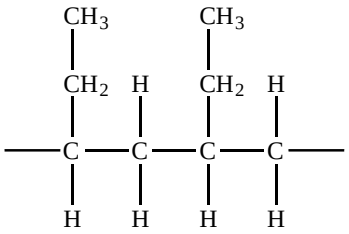
8. **1st bullet**

product: $CH_3CH_2CHBrCH_2Br$ **(1)**
equation: $CH_3CH_2CH=CH_2 + Br_2 \rightarrow CH_3CH_2CHBrCH_2Br$ **(1)**

products: $CH_3CH_2CHBrCH_3$ **and** $CH_3CH_2CH_2CH_2Br$ **(1)**
(or statement that 2-bromo- is formed)
equation: $CH_3CH=CHCH_3 + HBr \rightarrow CH_3CH_2CHBrCH_3$ **(1)**
(*i.e*. for one product)

products: $CH_3CH_2CHOHCH_3$ **and** CH3CH2CH2CH2OH **(1)**
(or statement that 2-ol is formed)
equation: $CH_3CH=CHCH_3 + H_2O \rightarrow CH_3CH_2CHOHCH_3$ **(1)**
(*i.e.* for one product) 6

2nd bullet



1 mark for skeleton with two repeat units **(1)**
1 mark for correct groups on side chains **(1)** 2

3rd bullet

two **(1)** **(1)** from
energy from incineration
development of biodegradable polymers
cracking of waste polymers 2

[10]