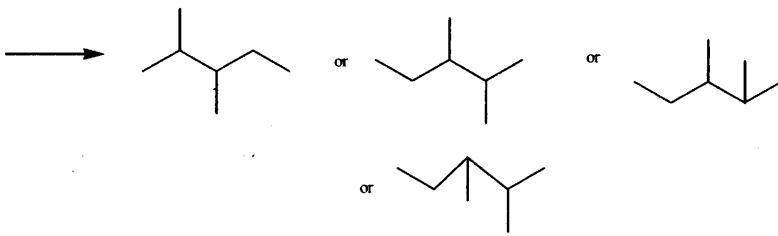


1.

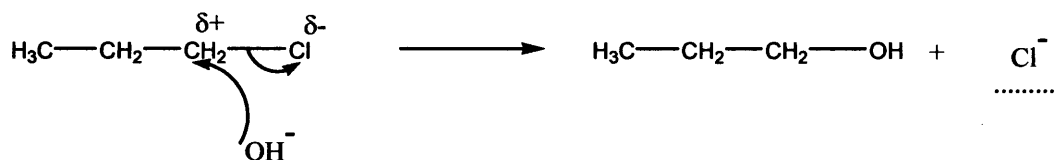
- (a) C_6H_{14} ✓
- (b) (i) boiling point increases with increase in M_R /molecular formula/ N° of carbon atoms/chain length ✓
- (ii) more intermolecular forces/electrons/surface area/
surface interactions/van der Waal forces ✓
- (iii) 120 – 130 °C ✓
- (c)(i) $C_9H_{20} \longrightarrow C_7H_{16} + C_2H_4$ ✓
- (ii) $C_2H_4 + H_2O \longrightarrow C_2H_5OH$ ✓
- temperature > 100 °C/ steam ✓
- ✓
phosphoric acid (catalyst) ✓
- (d) (i)  ✓
- (ii) 85 – 98 °C ✓
- (e) $C_7H_{16} \longrightarrow C_6H_{11}CH_3 / \text{cyclohexane ring} + H_2$ ✓✓
- $C_7H_{16} \longrightarrow \left. \begin{array}{l} H_2 \text{ as a product} \\ C_7H_{14} + H_2 \\ \text{cyclohexane ring} \end{array} \right\} \text{either of these scores 1 mark}$
- (f) more efficient fuel/better fuel/ higher octane number/reduces knocking/more volatile/lower boiling points/burn better/burn more easily/quicker ✓

[Total:

2.

- (a) (i) reaction 1 ✓
 (ii) reaction 4 ✓
 (iii) reaction 3 ✓

- (b) (i) lone pair/electron pair donor ✓



Correct dipole ✓

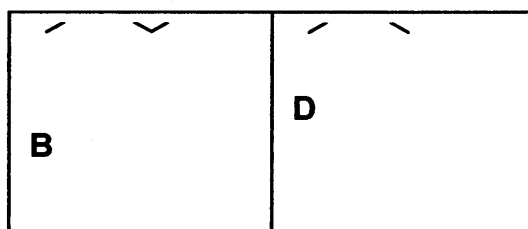
Curly arrow from the O in the OH⁻ to C in the CH₂ ✓

Curly arrow to show movement of bonded pair in the C-Cl bond ✓

Cl⁻ as a product ✓

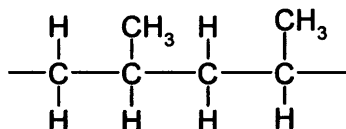
- (c) (i) same molecular formula , different structure/arrangement of atoms. ✓✓
 (same formula , different structure. ✓)

(ii)



- (d) (i) addition, (not additional) ✓
 (ii) poly(propene)/ polypropene/ polypro-1-ene, polypropylene ✓

(iii)



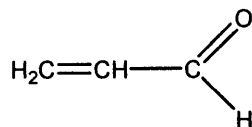
[Total: 15]

3.

- (a) (i) prop-2-en-1-ol $\text{CH}_2=\text{CHCH}_2\text{OH}$ must show the C=C double bond

✓

acrolein



must clearly show the aldehyde group and the C=C

✓

- (ii) alkene/C=C double bond

✓

- (b) (i) acidified H^+

✓

dichromate/ $\text{Cr}_2\text{O}_7^{2-}$

✓

- (ii) $\text{CH}_2\text{CHCH}_2\text{OH} / \text{C}_3\text{H}_6\text{O} / \text{C}_3\text{H}_5\text{OH} + [\text{O}] \longrightarrow \text{CH}_2\text{CHCHO} / \text{C}_3\text{H}_4\text{O} / \text{C}_2\text{H}_3\text{CHO} + \text{H}_2\text{O}$
not CH_2CHCOH

✓

- (c) acrylic acid

✓

approx 1700 cm^{-1} (range 1650 – 1750) indicates C=O

✓

approx 3000 cm^{-1} (range 2500- 3300) indicates O-H

✓

not $3230 - 3550 \text{ cm}^{-1}$

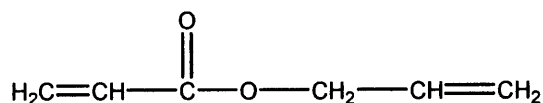
- (d) (i) $\text{CH}_2\text{CHCH}_2\text{OOCCHCH}_2$ / ($\text{C}_6\text{H}_8\text{O}_2$)

✓

 H_2O

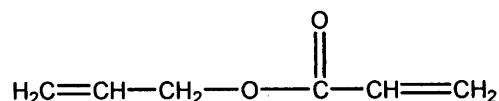
✓

- (ii)



✓✓

or



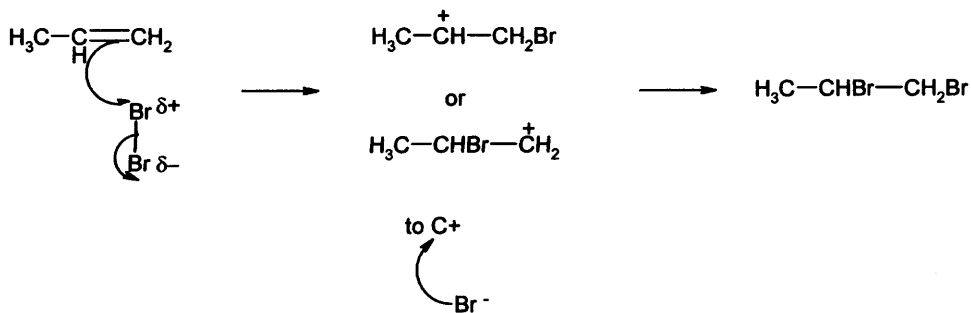
1 mark if the ester group, 1 mark for the rest of the molecule.
COO/ CO_2 without displaying the ester, they can still get 1 mark.

[Total

4.

(a) (i) decolourises/not clear/not discolours ✓

(ii)

curly arrow from C=C to Br^{δ+} ✓dipole on Br-Br **and** curly arrow showing movement of bonded pair of electrons ✓correct intermediate/carbonium ion/carbocation **and** curly arrow from Br⁻ to C+ ✓

1,2-dibromopropane as product ✓

(b) CH₃CB₂CH₃ ✓CH₃CHBrCH₂Br ✓CH₃CH₂CHBr₂ ✓

(CH₃CHBrCH₂Br 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)

[Total: 8]

5

(a)

Essential marks:

Order

RI>RBr>RCl /owtte ✓

reason for the order C-I bond weakest/length/C-Cl bond strongest and mention/intermolc forces loses the mark ✓an equation $Ag^+ + X^- \longrightarrow AgX$ (solid or ppt) or an equation for hydrolysis/using OH^- or H_2O ✓

max = 3

Two possible methods of monitoring the reaction

Method 1AgNO₃Ethanol & Waterbath/
/hydroxide
temp 40 – 80 °C
not heat/not bunsenrelative rate of
precipitation**Method 2**AgNO₃ ✓NaOH/OH⁻ ✓& neutralise with HNO₃relative amount of
precipitation ✓

(b)

Properties:

Non-toxic/harmless ✓

non-flammable ✓

any two from: ✓

(propellant in) aerosols

because it is volatile/ unreactive/ non-toxic/easily compressed

blowing polystyrene

because it is unreactive

dry cleaning

because it is a good solvent for organic material

degreasing agent

because it is a good solvent for organic material

fire extinguishers

because it is non-flammable

QWC

- reasonable spelling, punctuation and grammar throughout ✓

[Total