



AS CHAINS + RINGS

Mark Scheme 2812
January 2004

1 (a)

(i) *unsaturated* contains a double/multiple/ π bond

✓ [1]

hydrocarbon contains hydrogen and carbon **only**.

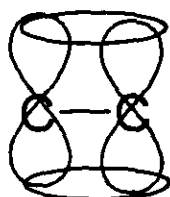
✓ [1]

(ii) angle a $109 - 110^\circ$
angle b $117 - 120^\circ$

✓ [1]

✓ [1]

(iii)

Diagram to show a minimum of 2 carbons, each with a σ -bond and p-orbitals

✓

Overlap of adjacent p-orbitals (in words or in diagram)

✓

[2]

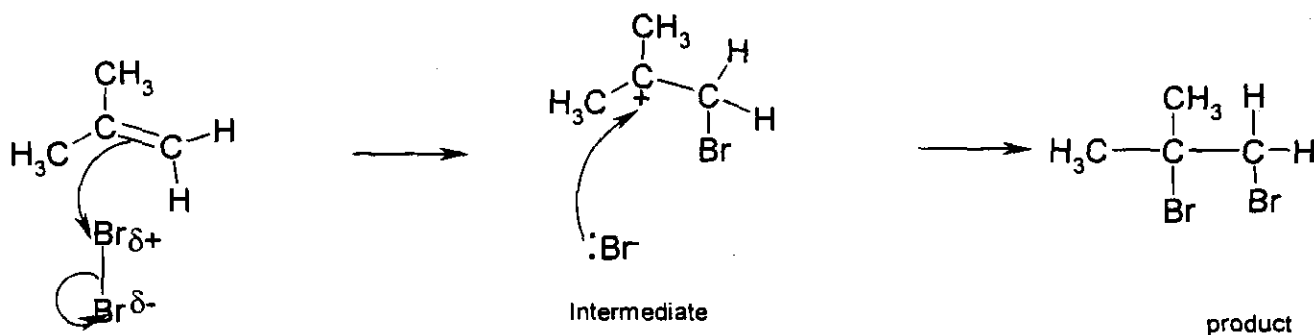
(b)

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

✓

[1]

(ii)



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

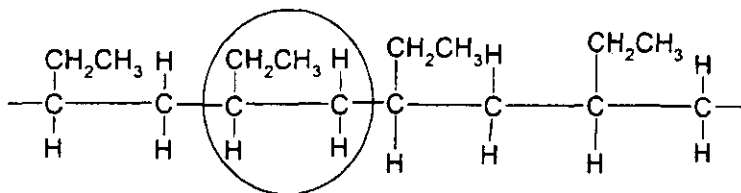
5 max = [4]

(c)

(i) Addition (not additional)

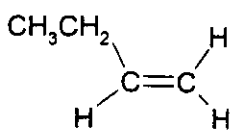
✓ [1]

(ii)



✓ [1]

(iii)



or but-1-ene

✓ [1]

(iv) Poly(but-1-ene)

✓ [1]

[Total : 15]

2

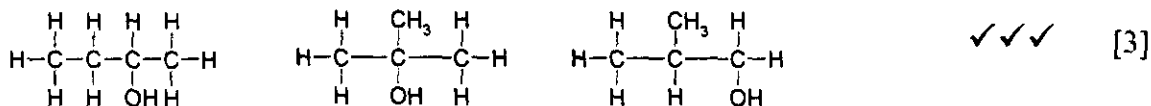
(a)

(i) bubbles/ effervescence ✓ [1]

(ii) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{O}^-\text{Na}^+ / \text{C}_4\text{H}_9\text{O}^-\text{Na}^+$ *need not be shown as ionic* ✓ [1]

Must clearly show that the Na is bonded to the O, penalise if the Na—O is a covalent bond

(iii)



(b)

(i) orange to green/dark green/brown/black ✓ [1](ii) $\text{C}_4\text{H}_9\text{OH} / \text{C}_4\text{H}_{10}\text{O} + 2[\text{O}] \rightarrow \text{C}_3\text{H}_7\text{COOH} + \text{H}_2\text{O}$ ✓✓ [2]
1 mark available for correct formula of the carboxylic acid

(iii) Identify isomer 2-methylpropan-1-ol by appropriate number/name/formula ✓ [1]

(c)

(i) CH_2 has mass = 14, $14 \times 4 = 56$ ✓ [1] $\therefore \text{C}_4\text{H}_8$ ✓ [1](ii) $\text{C}_4\text{H}_9\text{OH} \rightarrow \text{C}_4\text{H}_8 + \text{H}_2\text{O}$ ✓ [1]

(iii) Identify butan-2-ol by appropriate number/name/formula ✓ [1]

(d)

(i) H_2SO_4 ✓ [1]

(ii) 0.06 ✓ [1]

(iii) 60% ✓ [1]

[Total : 16]

3

(a)

(i) alkene

✓ [1]

alcohol/hydroxy/hydroxyl

✓ [1]

(b)

(i) I = alkene & II = alcohol... both are needed

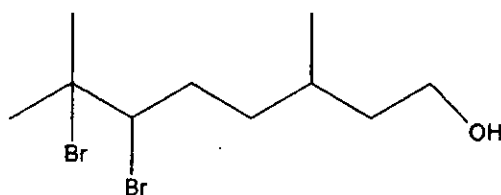
✓ [1]

(ii) decolourised / colourless

✓ [1]

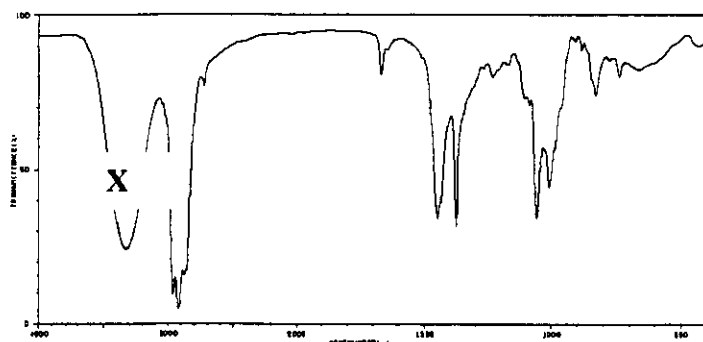
(iii)

✓ [1]



(iv) X as shown below

✓ [1]



(c)

(i) Ni/Pt/Rh/Pd

✓ [1]

(ii) compound B is C₁₀H₂₂O

✓ [1]

(iii) C₁₀H₂₀O + H₂ → C₁₀H₂₂O

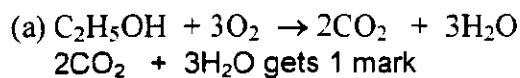
✓ [1]

[Total : 9]

- 4.
- (i) sodium hydroxide/potassium hydroxide/NaOH/KOH ✓ [1]
- (ii) heat to reflux ✓ [1]
- (iii) water/aqueous accept NaOH(aq) ✓ [1]
- (iv) ethanol/ethanolic/alcohol accept NaOH(alc) ✓ [1]
- (v) (nucleophilic) substitution/hydrolysis ✓ [1]
- (vi) elimination ✓ [1]
- (b)
$$\begin{array}{c} \text{H} \quad \text{H} \\ | \quad | \\ \text{H}_2\text{N}-\text{C}-\text{C}-\text{NH}_2 \\ | \quad | \\ \text{H} \quad \text{H} \end{array}$$
 ✓ [1]
- (c) $\text{H}-\text{C}\equiv\text{C}-\text{H}$ ✓ [1]

[Total :8]

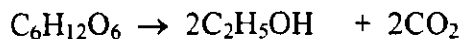
5



✓✓

(b) **Fermentation**

✓



✓

Yeast /enzyme / temperature about 30 °C/ batch process

✓

Hydration of ethene.

✓



✓

Temp > 100 °C/ Press 370 –100 atm
continuous process

/ 6 –20 MPa/phosphoric acid catalyst/

✓

Glucose is obtained from plants

✓

Ethene is obtained from crude oil/cracking/fossil fuel

✓

glucose is renewable/ethene isn't

✓

1 mark available for *Quality of written communication*..... base the award of the mark on the ability to communicate the essential chemistry by correct use of at least two from:
 fermentation/hydration/catalyst/renewable/sustainable/biofuel/enzymes/finite/cracking ✓

[Total : 12]

