

Oxford Cambridge and RSA Examinations

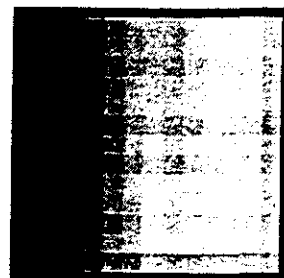
ADVANCED SUBSIDIARY GCE

AS 3882

CHEMISTRY A
CHAINS & RINGS

MARK SCHEME FOR UNIT 2812
JANUARY 2001

AS

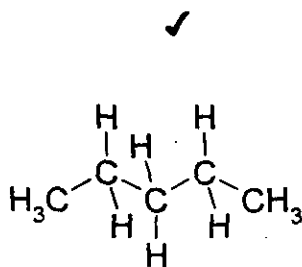


1. (a) (i) OH/hydroxy/hydroxyl/ROH ✓
(ii) $C_nH_{2n+1}OH$ ✓
(iii) $C_7H_{15}OH$ / $C_7H_{16}O$ ✓
- (b) 88. ✓
- (c)(i) 1 mark for plotting the points ✓
1 mark for the line extended to enable b.pt of $C_8H_{17}OH$ to be estimated. ✓
- (ii) I butan-1-ol 115 -125 °C ✓
II $C_8H_{17}OH$ 190 -205 °C ✓
- (ii) Boiling point increases as the M_r increases/ proportional to M_r . ✓

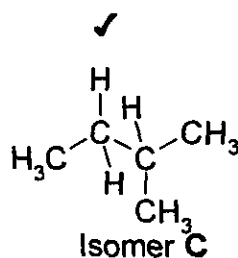
[Total : 9]

- 2 (a) contains carbon and hydrogen **only** ✓
- separates due to differences in boiling point ✓
- (b) works out/uses $M_r = 156$ ✓
- (ii) 132/156 method mark ✓
- 84.6% C ✓
- (c) $C_{11}H_{24} \rightarrow C_9H_{20} \checkmark + C_2H_4 \checkmark$
- Ethene ✓

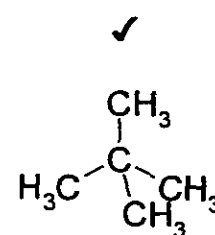
- (d) (i) Draw the isomers of pentane.



Isomer B



Isomer C



Isomer D

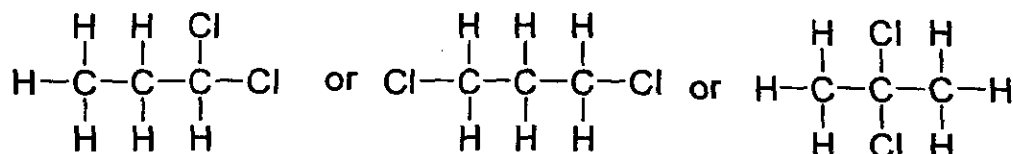
- (ii) **D, C, B** to match as drawn in (d)(i) ✓
- (iii) less van der Waals' forces in **D**/ as chain length increases so does b pt./greater the branching~lower the boiling point ✓
- (iv) $C_5H_{12} + 8O_2 \rightarrow 5CO_2 + 6H_2O$ ✓✓
- (CO₂ + H₂O gets ✓)
- (v) branched chains burn more efficiently/ add it to petrol ✓

[Total : 16]

- | | | | |
|-------|---------------|--|---|
| 3 (a) | Initiation | $\text{Cl}_2 \rightarrow 2\text{Cl}\bullet$ | ✓ |
| | Propation 1 | $\text{C}_3\text{H}_8 + \text{Cl}\bullet \rightarrow \text{HCl} + \text{C}_3\text{H}_7\bullet$ | ✓ |
| | Propagation 2 | $\text{C}_3\text{H}_7\bullet + \text{Cl}_2 \rightarrow \text{C}_3\text{H}_7\text{Cl} + \text{Cl}\bullet$ | ✓ |
| | Termination | Any two free radicals | ✓ |

[4]

- (b) (i) Compound H = 1,2-dichloropropane ✓
- (ii) 1 mark for each correct structure ✓✓



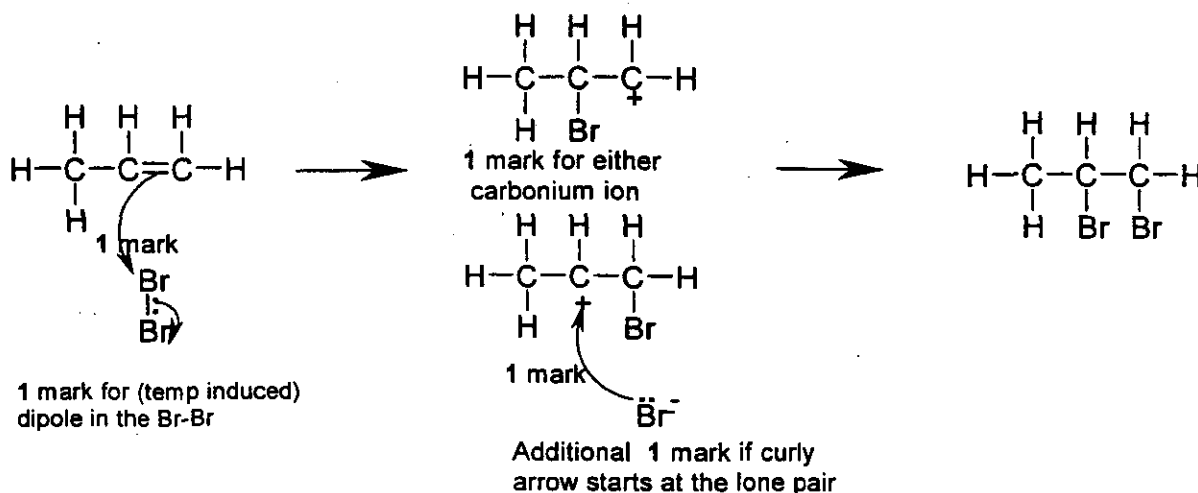
- (c) (i) water ✓
- (ii) OH^- behaves as a nucleophile ✓
- OH^- has a lone pair of electrons/ seeks out electron deficient areas/ attracted to $\text{C}^{\delta+}$ ✓

- (d) (i) reflux is the **continuous** process of **evaporation** followed by **condensation**/ description of what would be seen to indicate that the process is continuous ✓
- (ii) orange ✓
- to green ✓
- (iii) $\text{C}_3\text{H}_7\text{OH}/\text{C}_3\text{H}_8\text{O} + 2[\text{O}] \rightarrow \text{C}_2\text{H}_5\text{COOH}/\text{C}_3\text{H}_6\text{O}_2 + \text{H}_2\text{O}$ ✓✓
- (All three formulae correct gets one mark)

- (e) wavenumber 1680 – 1750 cm^{-1} ✓
- bond C=O ✓
- wavenumber 2500 – 3300 cm^{-1} ✓
- bond O-H ✓

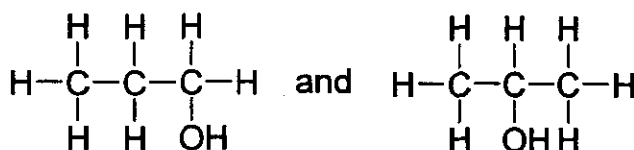
[Total : 19]

4 (a)



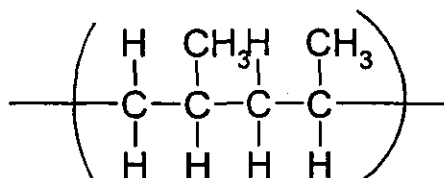
5 marking points for max of 4 marks

- (b) (i) reagent = HBr ✓
- (ii) reagent = H₂ ✓
- conditions = Ni/Pt as catalyst ✓
- (iii) ✓✓



- (c) (i) Addition polymer ✓

(ii)



- (iii) non-biodegradable or words to that effect ✓
- when burnt they release toxic fumes ✓

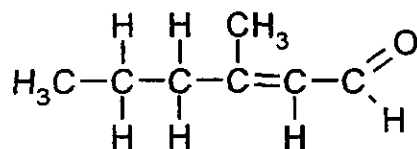
[Total : 13]

- 5 (a) (i) $C_4H_9OH/C_4H_{10}O$ ✓
- (ii) $C_4H_9OH/C_4H_{10}O + HCl \rightarrow C_4H_9Cl + H_2O$ ✓
- (b) The upper layer because the organic compounds have a **lower density** than water. ✓
- (c) (i) CO_2 ✓
- (ii) HCl ✓
- (d) (i) $51\text{ }^\circ C$ ✓
- (ii) $4/74 = 0.05(4)$ ✓
- (iii) $3.75/92.5 = 0.04(1)$ ✓
- (iv) 75% (allow 80% if (d) (ii) given as 0.05 / mark ecf for (d)(ii)/(d)(i) *100) ✓
- [Total : 9]

- 6 (a) functional group 1 alkene ✓
- test add bromine ✓
- observation decolourised ✓
- functional group 2 alcohol ✓
- test Na/ $PCl_5/$ RCO_2H ✓
- observation bubbles/ H_2 white fumes/ HCl smell ✓

[6]

(b)



Compound F

✓

[1]

[Total : 7]

7 Fermentation		✓
Yeast/enzyme		✓
Temperature about 30 °C		✓
$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$		✓
Batch process		✓
Hydration of ethene.		✓
Reagent	steam/water at > 100 °C	✓
Temp/press	300 °C & 70 –100 atm	✓
Catalyst	phosphoric acid	✓
$C_2H_4 + H_2O \rightarrow C_2H_5OH$		✓
Continuous process		✓
1 mark available for <i>Quality of written communication</i> base the award of the mark on the ability to communicate the essential chemistry		✓

[Total : 12 max = 9]

8	Ethane	saturated/single bonds only/ σ -bond	✓
		tetrahedron	✓
		109° 28'	✓
	Ethene	unsaturated/double bonds/contains a π -bond	✓
		draws or explains overlap of adjacent p-orbitals at right angle to the plane of the molecule	✓
		trigonal planar	✓
		approx 120°	✓

1 mark available for *Quality of written communication* base the award of the mark on the ability to use essential technical language such as *saturated/unstaurated/tetrahedron, trigonal planar/ overlap of adjacent p-orbitals*

[Total : 8]