

Subject: Chains and Rings Code: 2812

Session: January Year: 2005

FINAL

MAXIMUM MARK	60
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ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.
You are advised to destroy all draft versions.
2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks ($\frac{1}{2}$) should never be used.
3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme. Remember that scripts may be returned to Centres.

x = incorrect response (errors may also be underlined)
^ = omission mark
bod = benefit of the doubt (where professional judgement has been used)
ecf = error carried forward (in consequential marking)
con = contradiction (in cases where candidates contradict themselves in the same response)
sf = error in the number of significant figures
4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.
5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.
6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)
7. Strike through all blank spaces and/or pages in order to give a clear indication that the whole of the script has been considered.
8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader/Principal Examiner for guidance.

1.

- (a) (i) $24.7/12 : 2.1/1 : 73.2/35.5$ ✓
 $2.06 : 2.1 : 2.06$

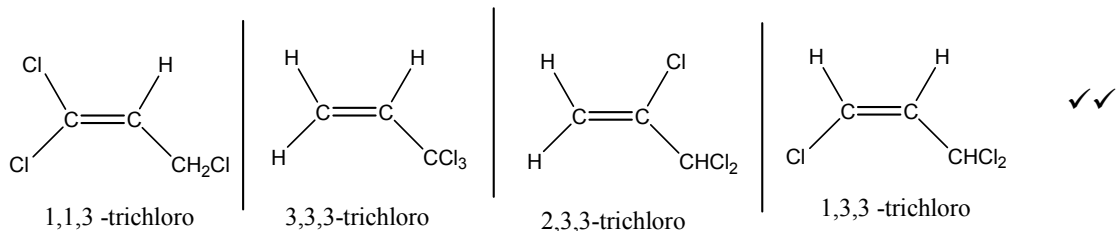
CHCl ✓

- (ii) $(\text{CHCl} = 12 + 1 + 35.5 =) 48.5$ ✓

$48.5 \times 3 = 145.5$ ✓

alternatively $(12 \times 3) + (1 \times 3) + (35.5 \times 3) = 143.5$ gets both marks

- (b) (i) Any two from



- (ii) 1,2,3-trichloropropene ✓
 (trichloropropene scores 1 mark ✓)
ignore any reference to "cis"

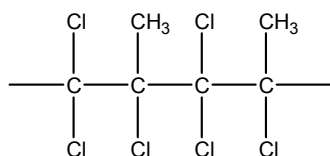
3 marking points:

- correct numbers 1,2,3
- trichloro
- propene/prop-1-ene

any two gets 1 mark

✓✓

- (c) (i)



1 mark if backbone contains 4 carbons with 'end-bonds' and a reasonable attempt has been made e.g used the wrong isomer.... max = 1 mark

✓✓

- (ii) non-biodegradable ✓

toxic fumes evolved when burnt ✓

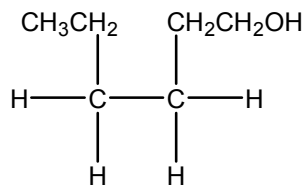
HCl or Cl• or chlorinated organic compounds such as COCl₂ also evolved/ not Cl₂ ✓
 (any reference to damaging the ozone layer loses the mark)

lack of any reference to burning... penalise once only

[Total: 13]

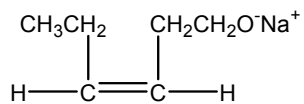
2.
(a)

(i)



✓

(ii)

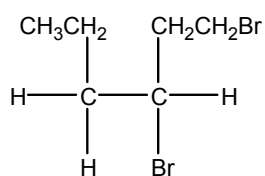


charges are not necessary
allow the alkoxide ion

✓

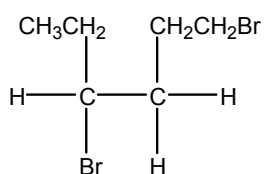
✓

(iii)



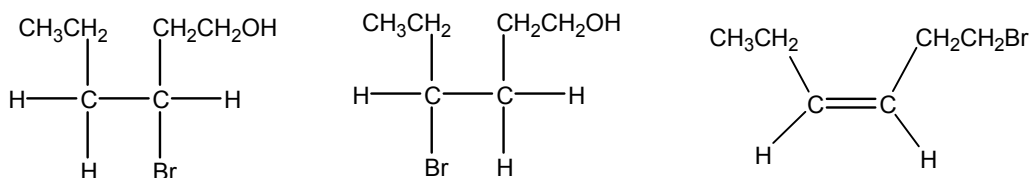
Both correct products gets 3 marks

✓✓✓



One correct product gets 2 marks

If neither of the above is correct then one mark can be awarded for any of:

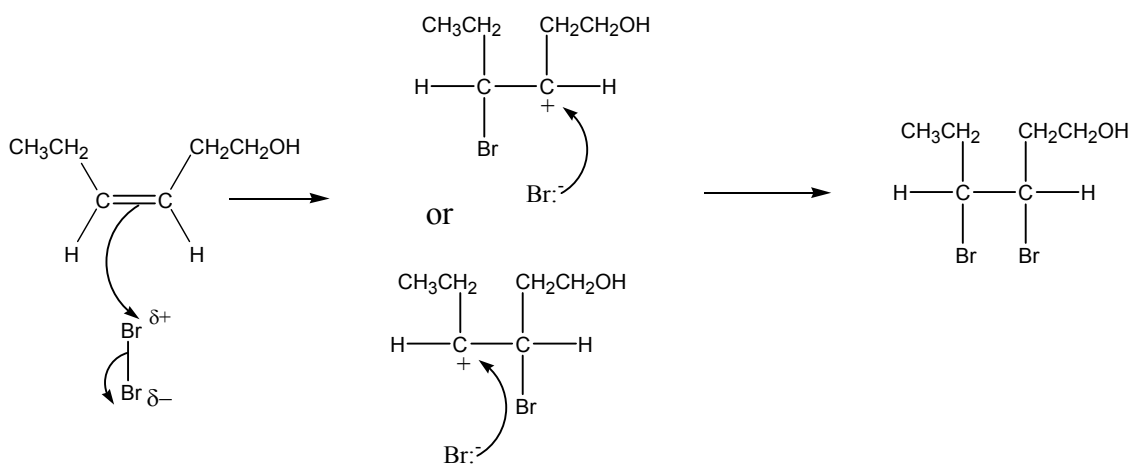


max of two marks

(b) (i) decolourises

✓

(ii)



curly arrow from $\text{C}=\text{C}$ bond to bromine

✓

dipoles on Br_2 or curly arrow to show movement of bonded pair of electrons

✓

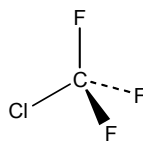
intermediate carbonium ion/carbocation

✓

curly arrow from lone pair on the Br^- ion to carbonium ion (Br^{δ^-} loses 1 mark)

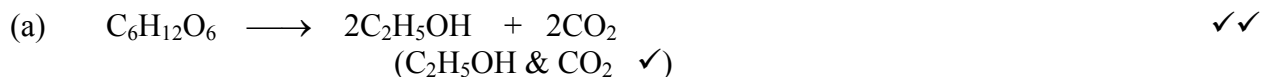
✓

[Total: 10]

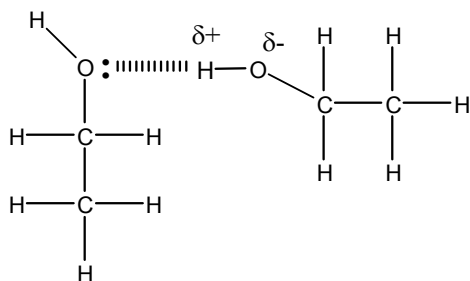
3. (a) (i) C_4H_{10} ✓
- (ii) $C_4H_{10} + 6\frac{1}{2}O_2 \longrightarrow 4CO_2 + 5H_2O$ ✓
 (CO₂ & H₂O as products ✓)
- (iii) propan-2-ol ✓
- (b) (i)  *require an attempt at a 3D structure and bond angles must clearly not be 90°.*
require at least one 'wedge' bond or one 'dotted' bond ✓
 ✓
- (ii) 108 – 111° ✓
- (iii) volatile/low boiling/gas/non-toxic/non-flammable/unreactive/liquefied under pressure/inert ✓
- (iv) homolytic = bonded pair split equally/ each retains 1 electron ✓
 fission = bond breaking ✓
- (v) C-Cl (no mark) because it is the weaker bond ✓
- (vi) Cl• ✓
 •CF₃ (allow CF₃•) (*lack of 'dots' penalise once*) ✓

[Total: 12]

4.



(b)



dipoles ✓

hydrogen bond between O in one O-H and H in the other O-H ✓

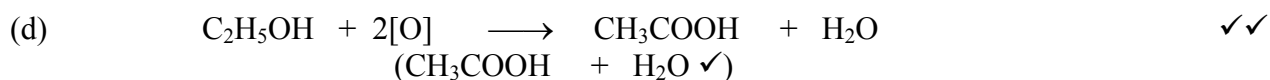
lone pair from O involved in the H-bond /or OHO in a straight line ✓
If they show a lone pair, it must be part of the H-bond

(c) (i) (volatile components) can escape/partial oxidation ✓

ethanal is most volatile/b pt less than 60 °C ∴ will distil out ✓

(ii) (volatile components) cannot escape/ refluxed ✓

complete oxidation will be achieved ✓



(e) spectrum C ✓

the other two spectra contain the OH group absorption at approx 3000 cm⁻¹ ✓

spectrum C only shows absorption at 1700 cm⁻¹ for the C=O ✓

[Total: 14]

5.

- identifies the three process as cracking, reforming, isomerisation ✓
- recognises the need for high temperature or a catalyst ✓
- equation for cracking ✓
- equation for isomerisation ✓
- state that reforming converts chains into rings/cyclic compounds ✓
- equation for reforming (balanced with H₂ could score two marks) ✓

sub-section mark = 6

- oil is finite/non-renewable ✓
- ethanol is renewable/sustainable ✓
- from plants/crops/sugar cane/sugar beet/glucose/sugar/fermentation ✓
- $C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$ ✓

sub-section mark = 4

QWC

- organise relevant information clearly and coherently, using specialist vocabulary when appropriate (minimum of 4 from cracking/ isomerisation/ reforming/ renewable/ feedstock/ finite/fermentation/non-renewable/sustainable/etc)
- reasonable spelling, punctuation and grammar throughout ✓

[Total: 11]