



Subject: Chains and Rings
Code: 2812

Session: January
Year: 2003

Final Mark Scheme

25/1/2003

MAXIMUM MARK	60
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1.

(a)(i) B ✓ [1]

(ii) C ✓ [1]

(iii) B ✓ [1]

(iv) A ✓ [1] and C ✓ [1]

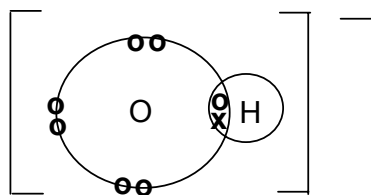
(b) equation $C_4H_9Br + NH_3 \rightarrow C_4H_9NH_2 + HBr$ (or $C_4H_9NH_3^+Br^-$) ✓ [1]

name: 1-aminobutane/(n-)butylamine/butan-1-amine ✓ [1]

solvent ethanol/alcohol ✓ [1]

(c) (i) lone pair (of electrons) donor ✓ [1]

(ii)



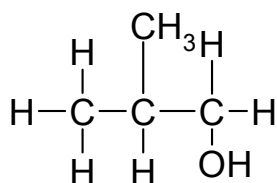
If diagram shows a total of 8 electrons ✓[1]

and has a negative charge. ✓[1]
only award if the diagram shows 8 electrons

(iii) unambiguous identification of organic product:

2-methylpropan-1-ol,

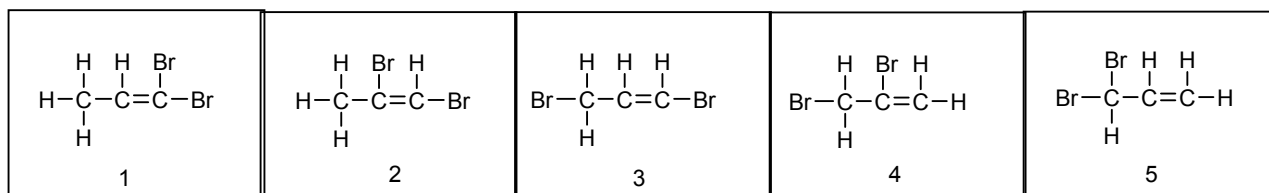
$(CH_3)_2CHCH_2OH$ ✓ [1]



[Total : 12]

2. (a)(i) same molecular formula -different structure ✓✓ [2]
same formula -different structure only scores 1 mark

(ii)



✓[1]

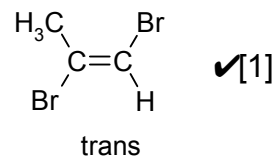
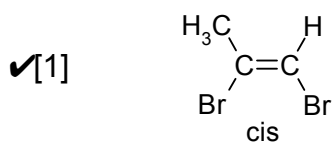
✓[1]

✓[1]

- (iii) 1,1-dibromopropene ✓ [1]

(b)

(i)



- (ii) bond angle = $120^\circ \pm 4^\circ$ ✓ [1]

- (iii) Each C in the C=C is **not** bonded to two different atoms/groups/ or equivalent. ✓ [1]

- (iv) Must be 1,3-dibromopropene. ✓ [1]

[Total : 11]

3.

(a)

(i) H ✓ [1]

(ii) G ✓ [1]

(iii) van der Waals/ instantaneous or temporary induced dipoles ✓ [1]

(b)

(i) contains a single/unpaired/lone electron/ **not** free electron ✓ [1]

(ii) $\text{Br}_2 \rightarrow 2 \text{Br}\bullet$ ✓ [1]

(iii) Homolysis/ homolytic fission/homolytic cleavage ✓ [1]

(iv) $\text{Br}\bullet + \text{C}_5\text{H}_{12} \rightarrow \bullet\text{C}_5\text{H}_{11} + \text{HBr}$ ✓ [1]

$\bullet\text{C}_5\text{H}_{11} + \text{Br}_2 \rightarrow \text{C}_5\text{H}_{11}\text{Br} + \text{Br}\bullet$ ✓ [1]

(c) I isomer **G**, 1 ✓ [1]

II isomer **H**, 3 ✓ [1]

III isomer **I**, 4 ✓ [1]

[Total : 11]

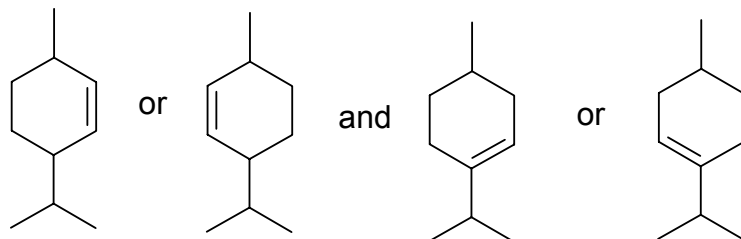
4. (a)

(i) $C_{10}H_{20}O$ ✓ [1]

(ii) alcohol/ OH/ hydroxy(l) ✓ [1]

secondary ✓ [1]

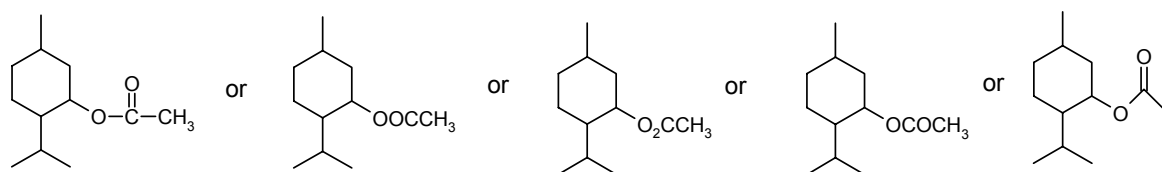
(b)



1 mark for each alkene

✓✓ [2]

(c)



or full structural formula showing all the atoms

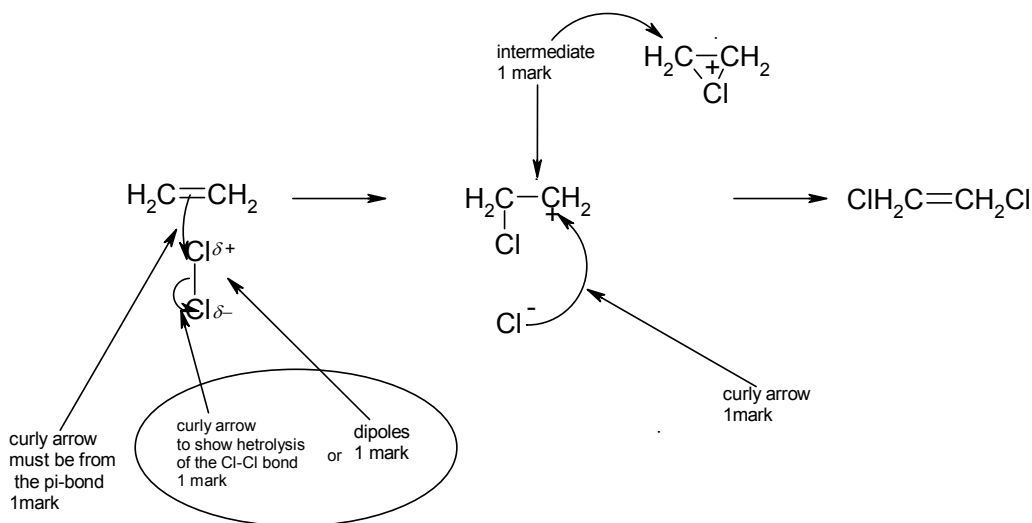
1 mark is available for the ester group showing CH_3 bonded via COO to a ring

2 marks for structure as shown ✓✓ [2]

[Total : 7]

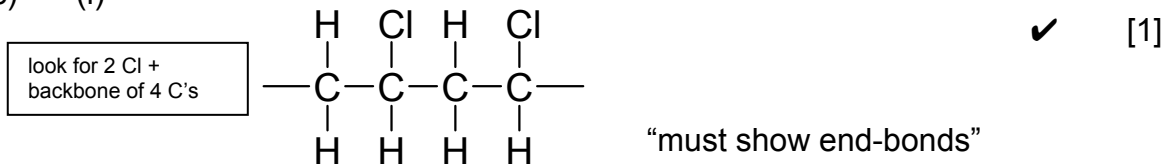
5. (a) (i) electrophilic ✓ [1] addition ✓ [1]

(ii)



4 marking points: curly arrow from double bond to Cl_2 , curly arrow showing movement of electrons in the Cl-Cl bond **or** the dipole in the Cl-Cl, Intermediate carbocation/carbonium ion, Curly arrow from Cl^- to intermediate. ✓✓✓✓ [4]

(c) (i)



(ii) *general problems:*

non-biodegradable/ not broken down by bacteria/ do not decompose ✓ [1]

when burnt toxic fumes are produced ✓ [1]

specific problem of PVC:

also produce HCl/ Cl free radicals when burnt ✓ [1]

(ii) removal of toxic products or HCl formed during combustion by gas scrubbers/ by dissolving in a spray of alkali/ recycling/feedstock recycling/use energy from combustion for domestic heating/ manufacture biodegradable polymers . ✓ [1]

[Total : 10]

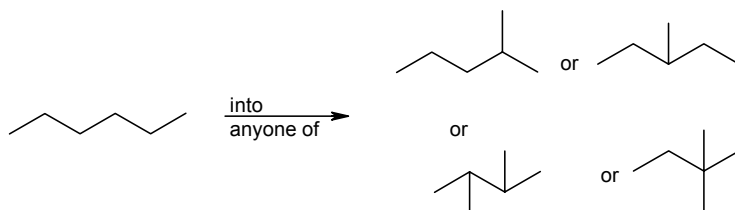
6. 3 marks for equations,
2 marks for correctly explaining (in words) each of the 3 processes.
1 mark for correctly explaining (in words) 2 of the processes.

Cracking. equation for long chain alkane into shorter chain alkane + alkene. ✓ [1]

Isomerisation

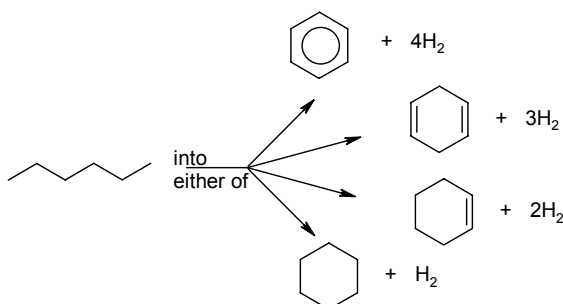
equation for straight chain alkane converted into a branched chain alkane ✓ [1]

equation could be in the form of:



Reforming

to show straight chain into ring (& must be balanced with appropriate number of H₂.) ✓[1]



(All three processes require) the use of heat and/or a catalyst (Allow once) ✓ [1]

Importance of the products: max of 3 marks. ✓✓✓ [3]

- more volatile/lower boiling points
- used in fuels because they burn better/smoothier/more efficiently/more efficient fuel
- additive to petrol
- reduce knocking/pinking/increase octane number or rating
- alkenes can form polymers/PVC (see Q5)/alcohols etc

1 mark for quality of written communication to be awarded for clear presentation and SPAG. ✓ [1]

[Total :8]