



RECOGNISING ACHIEVEMENT

CHAINS + RINGS  
Mark Scheme 2812  
January 2003



1.

(a)(i) B ✓ [1]

(ii) C ✓ [1]

(iii) B ✓ [1]

(iv) A ✓ [1] and C ✓ [1]

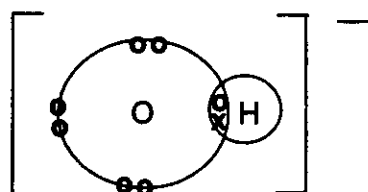
(b) equation  $C_4H_9Br + NH_3 \rightarrow C_4H_9NH_2 + HBr$  (or  $C_4H_9NH_3^+Br^-$ ) ✓ [1]

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

solvent ethanol/alcohol ✓ [1]

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

(ii)

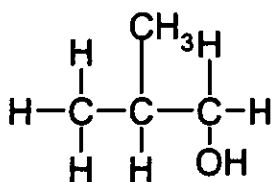


If diagram shows a total of 8 electrons ✓ [1]

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

(iii) unambiguous identification of organic product:

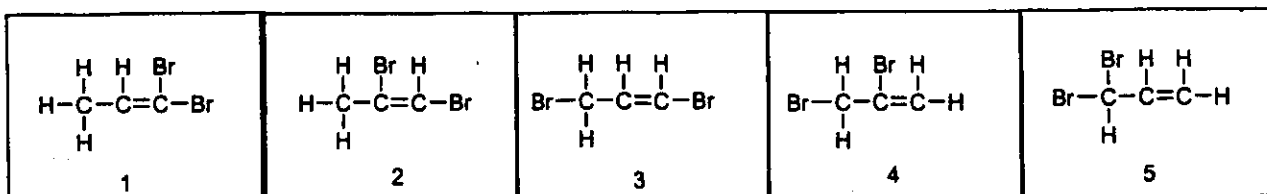
2-methylpropan-1-ol,

 $(CH_3)_2CHCH_2OH$  ✓ [1]

[Total : 12]

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

(ii)



✓[1]

✓[1]

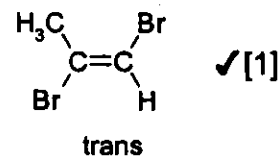
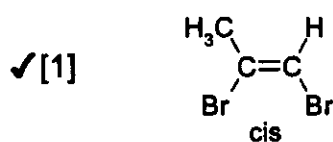
✓[1]

- (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)  $\text{Br}_2 \rightarrow 2 \text{Br}\cdot$  ✓ [1]
- (iii) Homolysis/ homolytic fission/homolytic cleavage ✓ [1]
- (iv)  $\text{Br}\cdot + \text{C}_5\text{H}_{12} \rightarrow \cdot\text{C}_5\text{H}_{11} + \text{HBr}$  ✓ [1]
- $\cdot\text{C}_5\text{H}_{11} + \text{Br}_2 \rightarrow \text{C}_5\text{H}_{11}\text{Br} + \text{Br}\cdot$  ✓ [1]

- (c) I isomer G, 1 ✓ [1]
- II isomer H, 3 ✓ [1]
- III isomer I, 4 ✓ [1]

[Total : 11]

2812

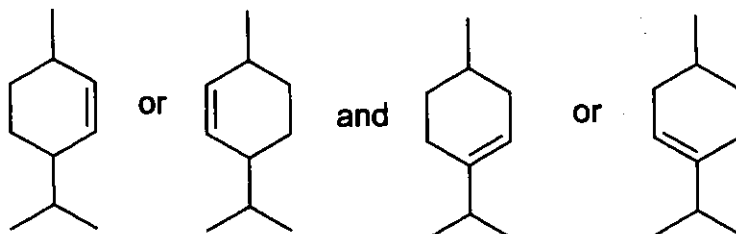
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4. (a)

- (i)  $C_{10}H_{20}O$  ✓ [1]
- (ii) alcohol/ OH/ hydroxy(l) ✓ [1]
- secondary ✓ [1]

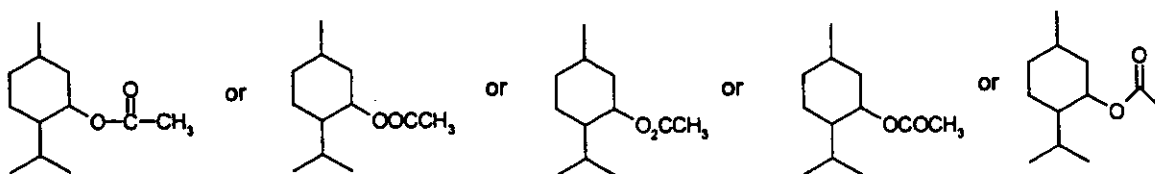
(b)



1 mark for each alkene

✓✓ [2]

(c)



or full structural formula showing all the atoms

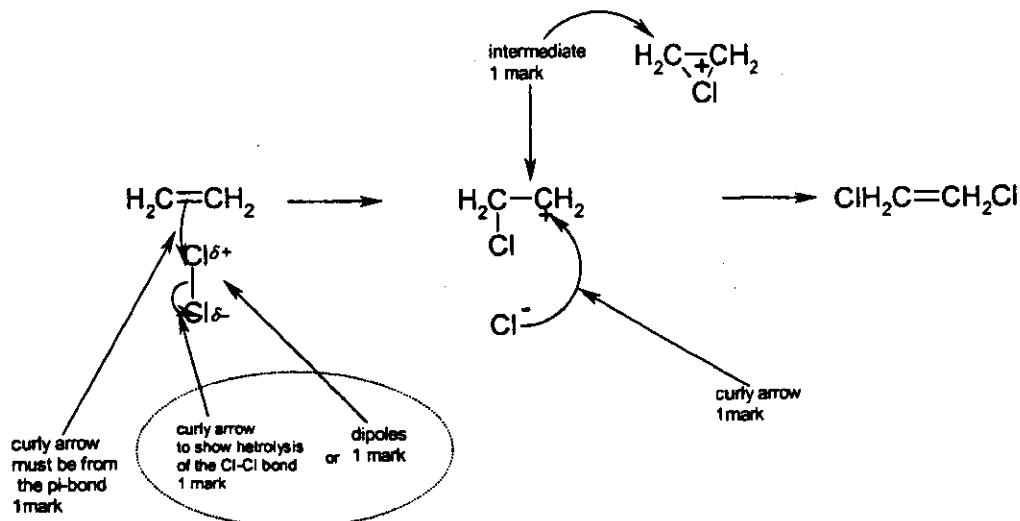
1 mark is available for the ester group showing  $CH_3$  bonded via  $COO$  to a ring

2 marks for structure as shown ✓✓ [2]

[Total : 7]

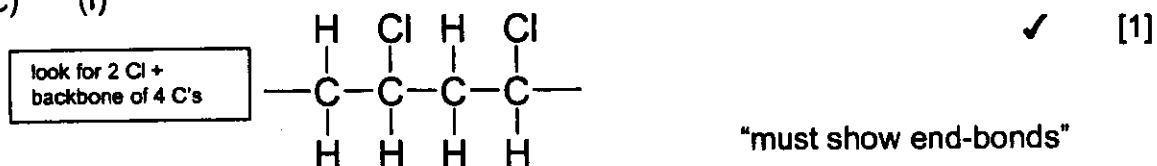
5. (a) (i) electrophilic ✓ [1] addition ✓ [1]

(ii)



4 marking points: curly arrow from double bond to  $\text{Cl}_2$ ,  
 curly arrow showing movement of electrons in the  $\text{Cl}-\text{Cl}$  bond or the dipole in the  $\text{Cl}-\text{Cl}$ ,  
 Intermediate carbocation/carbonium ion,  
 Curly arrow from  $\text{Cl}^-$  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  $\text{HCl}$ /  $\text{Cl}$  free radicals when burnt ✓ [1]

(iii) removal of toxic products or  $\text{HCl}$  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]

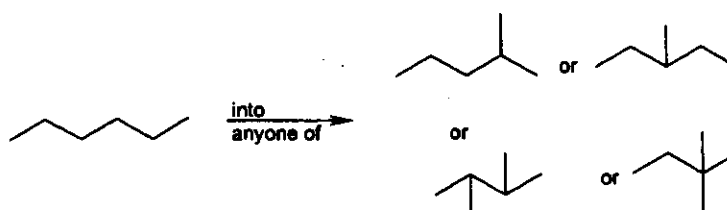
6. 3 marks for equations,  
2 marks for correctly explaining (in words) each of the 3 processes.  
1 mark for correctly explaining (in words) 2 of the processes.

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

**Isomerisation**

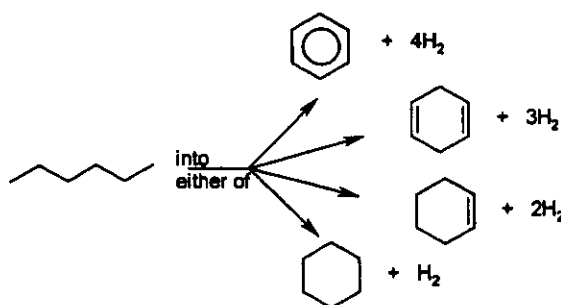
equation for straight chain alkane converted into a branched chain alkane ✓ [1]

equation could be in the form of:



**Reforming**

to show straight chain into ring (& must be balanced with appropriate number of H<sub>2</sub>.) ✓ [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]