ALCOHOLS, HALOGENOALKANES AND MODERN ANALYTICAL TECHNIQUES MS

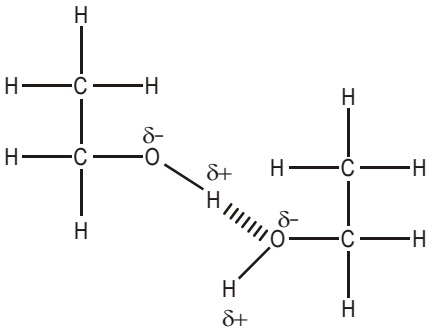
1. (i) *low volatility*, = **high** boiling point/ not easy to vapourise/owtte 1

intermolecular bonds. = bonds/forces/attractions **between** molecules 1

(ii) type of intermolecular bond = hydrogen bond 1

dipoles on both O-H bonds 1

H-bond shown as a 'dashed bond' 1



(iii) (The boiling point of glycerol will be higher than ethanol because there are)

more OH groups ∴ <u>more H-bonds</u> 1

[6]

2. (i) $C_6H_{12}O_6$ (aq) → $2C_2H_5OH(l)$ or (aq) + $2CO_2$(g) balanced equation 1

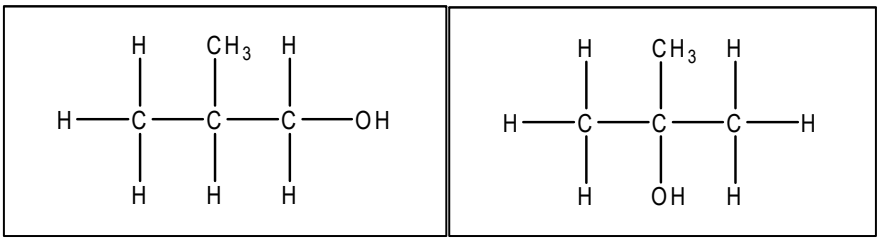
state symbols can be awarded only if equation shows $C_6H_{12}O_6$, C_2H_5OH and CO_2 1

(ii) anaerobic, aqueous, temp range 25 – 40°C/warm to just above room temp 2

(iii) no more bubbles/gas/CO_2 1

[5]

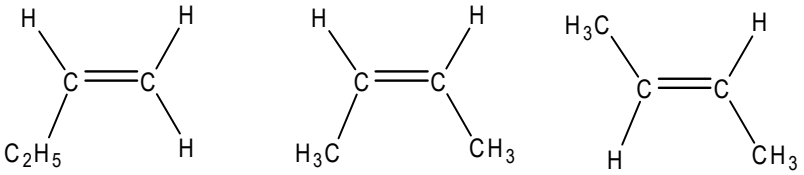
3. (i) 2



(ii) either (2-)methylpropan-1-ol or (2-)methylpropan-2-ol 1

[3]

4.



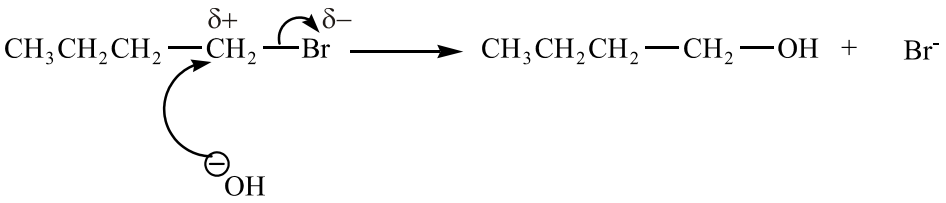
Minimum – must display/show C=C

[3]

5. (i) substitution/hydrolysis **(1)** 1

(ii) electron pair donor **(1)** 1

(iii)



correct dipole **(1)**
curly arrow from the O in the OH- to C in the CH_2 **(1)**
curly arrow to show movement of bonded pair in the C–Br bond **(1)**
Br^- as a product **(1)** 4

[6]

6. (i) 8.72/136.9 = 0.0637 mol **(1)** 1

(ii) M_r butan-1-ol = 74(.0) **(1)**

moles = 4.28/74.0 = 0.0578 mol **(1)** 2

(iii) 0.0578/0.0637 × 100 = 90.7% **(1)** 1

[4]

7. Essential marks:

Order	RI>RBr>RC*l* /owtte	1
reason for the order	C-I bond weakest/length/C-C*l* bond strongest and mention/intermolc forces loses the mark	1
an equation	$Ag^+ + X^- \longrightarrow AgX$ (solid or ppt) or an equation for hydrolysis/using OH- or H_2O	1

max = 3

Two possible methods of monitoring the reaction

Method 1	**Method 2**	
$AgNO_3$	$AgNO_3$	1
Ethanol & Waterbath/ /hydroxide temp 40 – 80°C not heat/not bunsen	$NaOH/OH^-$ & neutralise with HNO_3	1
relative rate of precipitation	relative amount of precipitation	1

[6]

8. Properties:

Non-toxic/harmless 1

non-flammable 1

any two from: 2

(propellant in) aerosols	because it is volatile/ unreactive/ non-toxic/ easily compressed
blowing polystyrene	because it is unreactive
dry cleaning	because it is a good solvent for organic material
degreasing agent	because it is a good solvent for organic material
fire extinguishers	because it is non-flammable

QWC

- reasonable spelling, punctuation and grammar throughout

[4]

9. (a) (i) (volatile components) can escape/distil out 1

ethanal is most volatile/b pt less than 60°C/partial oxidation 1

(ii) (volatile components) cannot escape/ refluxed 1

complete oxidation will be achieved/oxidised to the acid 1

(b) $C_2H_5OH + 2[O] \rightarrow CH_3COOH + H_2O$

($CH_3COOH + H_2O$ ✓) 2

(c) spectrum C 1

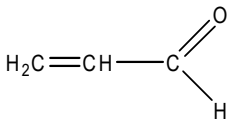
spectrum C only shows absorption at 1700 cm^{-1} for the C=O 1

the other two spectra contain the OH group absorption at approx 3000 cm^{-1} 1

[9]

10. (a) (i) prop-2-en-1-ol $CH_2=CHCH_2OH$ must show the C=C double bond 1

acrolein



***must** clearly show the aldehyde group and the C=C*

1

(ii) alkene/C=C double bond 1

(b) (i) acidified /H^+ 1

dichromate/$Cr_2O_7^{2-}$ 1

(ii) CH_2CHCH_2OH/ C_3H_6O/ $C_3H_5OH + [O] \longrightarrow$ CH_2CHCHO/ C_3H_4O/ $C_2H_3CHO + H_2O$

not CH_2CHCOH 1

[6]

11. acrylic acid 1

approx 1700 cm^{-1} (range 1650 – 1750) indicates C=O 1

approx 3000 cm^{-1} (range 2500- 3300) indicates O-H 1

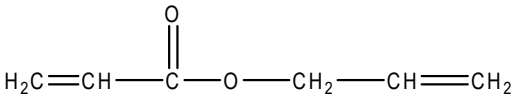
not 3230 – 3550 cm^{-1}

[3]

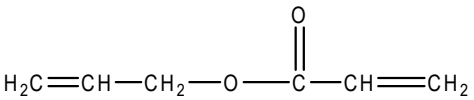
12. (i) $CH_2CHCH_2OOCCHCH_2$ /($C_6H_8O_2$) 1

H_2O 1

(ii) 2



or



1 mark if the ester group, 1 mark for the rest of the molecule.

COO/CO_2 without displaying the ester, they can still get 1 mark.

[4]