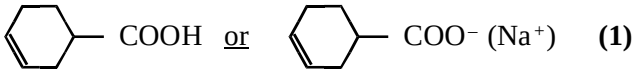
4.4, 4.5 TEST MS

1. (a) *Observation* orange <u>or</u> red-brown precipitate **(1)**

Structure

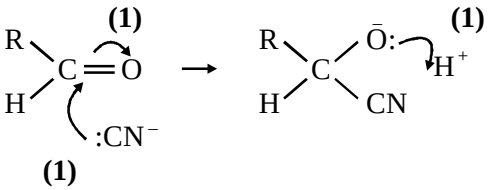


(1) 2

(b) *Equation* $RCHO + HCN \rightarrow RCH(OH)CN$ **(1)**

Type of reaction nucleophilic addition **(1)**

Mechanism



5

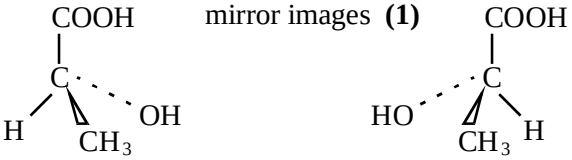
(c) *Type of isomerism* optical **(1)**

Structural feature atom with 4 different substituents <u>or</u> asymmetric <u>or</u> chiral **(1)**

Isomer 1 *Isomer 2*

tetrahedral **(1)**

mirror images **(1)**



Method of distinguishing opposite rotation of polaroid light **(1)** 5

[12]

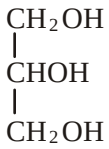
2. (a) propyl methanoate; 1

$HCOOC_3H_7 + OH^- \rightarrow HCOO^- + C_3H_7OH$

OR

$HCOOC_3H_7 + NaOH \rightarrow HCOONa + C_3H_7OH$; 1

(b) (i)



1

propan(e)-1,2,3-triol

OR

1,2,3-propan(e)triol

OR

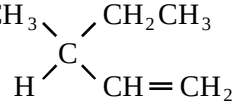
Glycerol; 1

(ii) $CH_3(CH_2)_{16}COONa$ or $C_{17}H_{35}COONa$ or $C_{18}H_{35}O_2Na$; 1

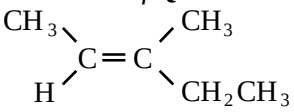
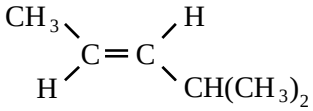
(ignore 3 in front of formula but not if indicating trimer)

(not just anion and penalise Na shown as covalently bonded) soap - allow with detergent but not detergent alone; 1

[6]

3. (a) *Structure of* **P**:  **(1)** 3

*Structures of **Q** and **R***:

 and 

NOT C_3H_7

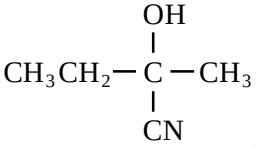
(1) **(1)**

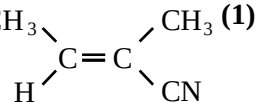
Q and R in any order

(b) (i) *Racemic mixture*: <u>equal</u> mixture of optical isomers / enantiomers
OR in explanation

Explanation: planar (>C=O) **(1)**
attack from either side is equally likely **(1)**

(ii) *Reagent **S***: HCN or (KCN / HCl **or** H_2SO_4) **(1)**

*Compound **T***:  **(1)**

*Compound **U***:  **(1)** 6

[9]

4. (a) graphical structure for CH_3CH_2COOH **(1)**
allow CH_3CH_2- or C_2H_5- 1

(b) (i) ethanol / CH_3CH_2OH / C_2H_5OH **not** just alcohol **(1)**

(concentrated or dilute) sulphuric acid / HCl / strong acid / H^+
not just acid solution

heat / reflux / warm / temperature < 100 °C **(1)**

allow second and third marks if alcohol given
third mark is dependent on first and second marks
second mark is independent on first mark 3

(ii) ethyl propanoate **(1)** 1

(iii) $CH_3CH_2COOH + CH_3CH_2OH \rightarrow CH_3CH_2COOCH_2CH_3 + H_2O$

$C_3H_6O_2 + C_2H_6O \rightarrow C_5H_{10}O_2 + H_2O$ (minimum for mark) **(1)**

$CH_3CH_2COOCH_2CH_3$ **or** $C_2H_5CO_2C_2H_5$ **(1)** 2

(c) (i) compounds with the same molecular formula /
same numbers of same atoms **(1)**

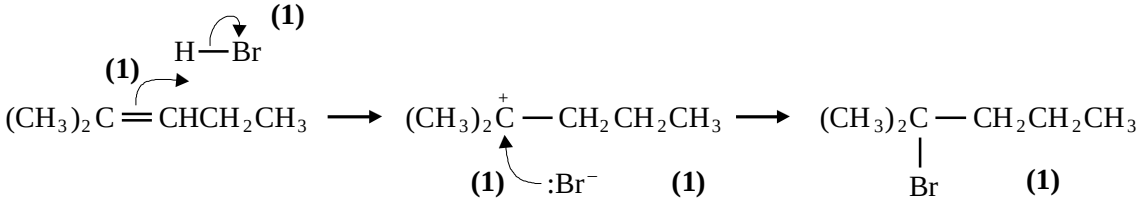
but different structural formulae / structures **or** **(1)**
atoms joined / bonded / linked in different orders / C skeletons
not atoms arranged differently 2

(ii) sodium ethanoate / CH_3COONa **(1)**

propan-1-ol / $CH_3CH_2CH_2OH$ / propanol / propan-2-ol **(1)** 2

[11]

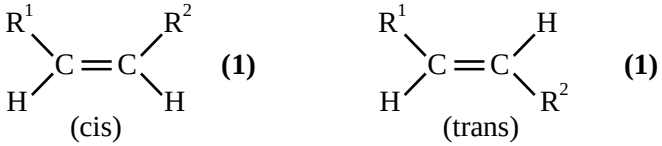
5. (a)



2–bromo–2–methylpentane **(1)**

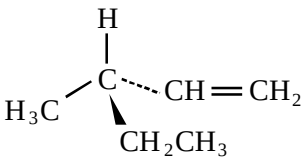
tertiary carbonium ion more stable than secondary **(1)** 7

(b) geometrical or cis–trans isomerisation **(1)**
hex–3–ene or hex–2–ene **(1)**

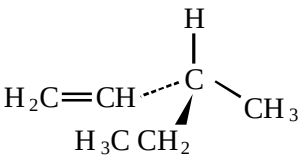


4

(c) optical **(1)** 3–methylpent–1–ene **(1)**



(1)



(1)

4

[15]