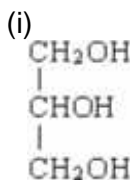



MEGA LECTURE

TOPIC 17 HW MS

1.



1

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

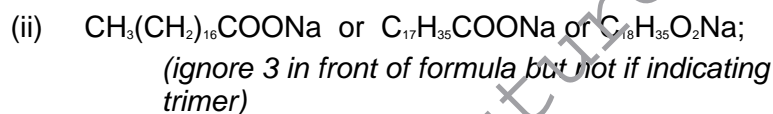
OR

1,2,3-propan(e)triol

OR

Glycerol;

1



1

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

1

[4]

2. X is CH_3CN or ethanenitrile or ethanonitrile or methyl cyanide or cyanomethane or ethyl nitrile or methanecarbonitrile

Not ethanitrile
but contradicton of name and structure lose marks

1

Y is $\text{CH}_3\text{CH}_2\text{NH}_2$ or ethylamine or aminoethane or ethanamine

1

Step 1: reagent KCN not HCN/HCl
condition (aq)/alcohol - only allow condition if reagent correct or incomplete

2

Step 2: reagent H_2 LiAlH_4 Na Zn/Fe/Sn Not

1



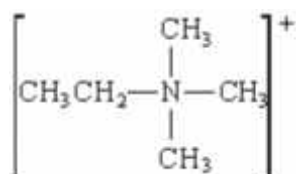
NaBH₄
condition Ni/Pt/Pd ether ethanol HCl

2

2

MEGA LECTURE

Z is an amine or aminoalkane or named amine even if incorrect name for **Z**
secondary (only award if amine correct)

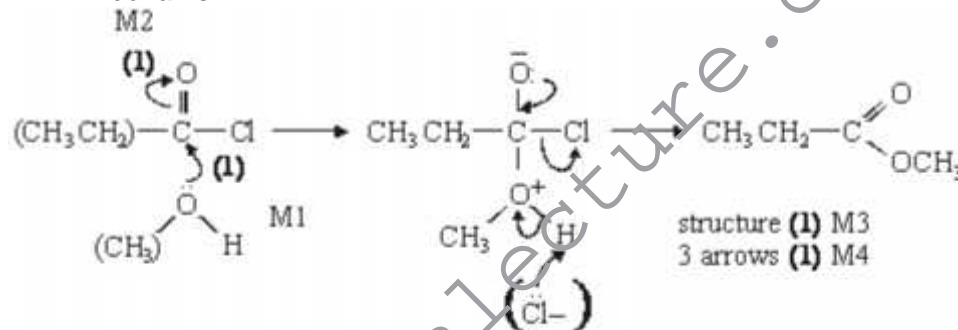


(Br-) + can be on N or outside brackets as shown

nucleophilic substitution

3.

Mechanism



Name of organic product: methylpropanoate (1)

Notes

extra curly arrows are penalised



alone loses M2 but can score M1 for attack on C+, similarly



in M4, allow extra: Cl- attack on H, showing loss of H+

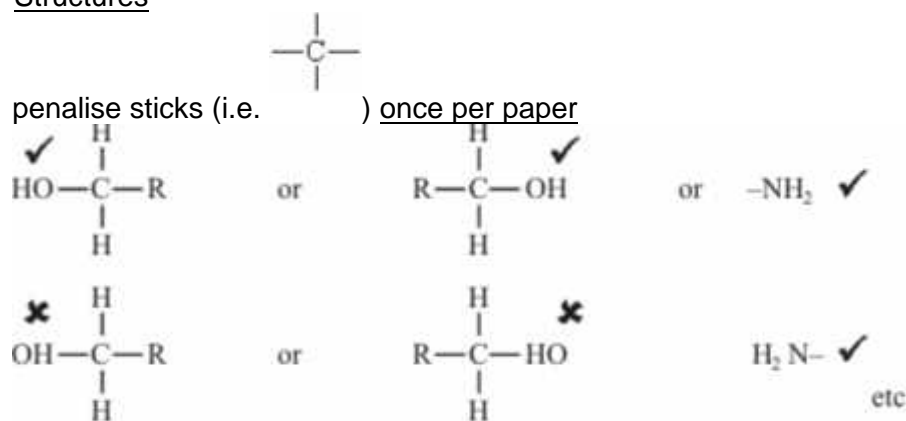
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Organic points

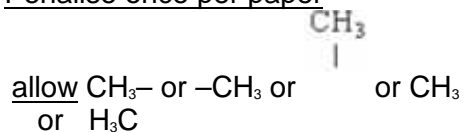
- (1) Curly arrows: must show movement of a pair of electrons, i.e. from bond to atom or from lp to atom / space
e.g.



- (2) Structures



Penalise once per paper



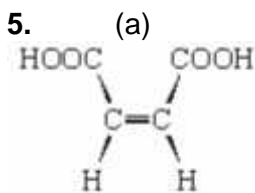
4. (a) Melting range would be wide (>3 deg C) / not sharp
Allow melts over a range of temperatures. 1
- below / before the true m.p.
Do not allow 'above or below'. 1
- (b) Temperature on thermometer not the same as the sample
Allow sample heats up at a different / higher / lower rate than thermometer. 1

[3]

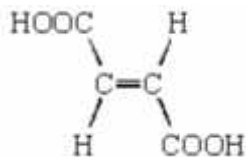


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MEGA LECTURE



1



1

NB The bonds shown in the structure must be correct

Isomerism: E-Z isomerism

If written answer is correct, ignore incorrect labelling of structures.

If no written answer, allow correctly labelled structures.

1

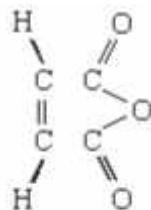
Both COOH groups must be on the same side/ close together/ cis

1

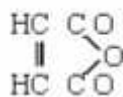
No rotation about C=C axis

1

Structure



Allow



→

1



Both H replaced

1

6



Balanced for atoms and charges

1

NB Allow ionic equations and $2\text{NaOH} + \text{C}_4\text{H}_4\text{O}_4 \rightarrow \text{C}_4\text{H}_2\text{O}_4\text{Na}_2 + 2\text{H}_2\text{O}$

Allow one if structure incorrect but molecular formula correct

Allow one for a correct equation showing one H replaced

[8]

6. Advantage; reaction goes to completion, not reversible or faster

1

Disadvantage; reaction vigorous/dangerous (exothermic must be qualified)

or HCl(g) evolved/toxic
or CH₃COCl expensive

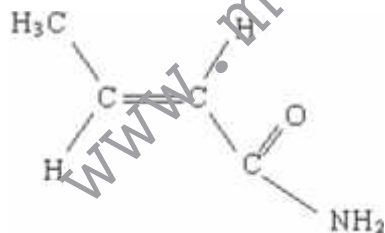
NB Allow converse answers

Do not allow reactions with other reagents e.g. water or ease of separation

1

[2]

7. (a)



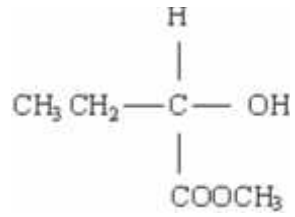
(allow 1 for amide even if not C₄H₇NO, i.e. RCONH₂)

(if not amide, allow one for any isomer of C₄H₇NO which shows geometric isomerism)

2

- (b)

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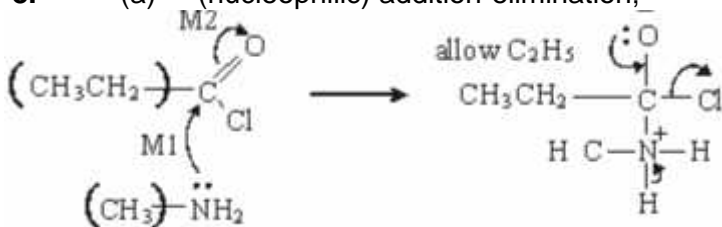


1

[3]

MEGA LECTURE

8. (a) (nucleophilic) addition-elimination;



(M3 for structure)

(M4 for 3 arrows and lone pair)

(M2 not allowed independent of M1, but allow

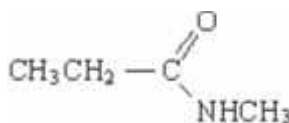
M1 for correct attack

on C+ if M2 show as independent first.)

(+on C of C=O loses M2 but ignore + if correct)

(Cl- removing Ft loses M4)

1



(If MS lost above for wrong C chain, do not penalise same error again here)

→

5

(b) M1 $\text{CH}_3\text{CH}_2\text{COCl} + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{CH}_2\text{COOH} + \text{HCl}$ 1
(penalise wrong alkyl group once at first error)

1

M2 Mr of $\text{CH}_3\text{CH}_2\text{COCl} = 92.5$ 1
(if Mr wrong, penalise M2 only)

1

M3 moles of $\text{CH}_3\text{CH}_2\text{COCl} = 1.48/92.5 = 0.016$ 1

1

M4 moles NaOH = $2 \times 0.016 = 0.032$ 1
(allow for $\times 2$ consequ to wrong no of moles)

1

M5 volume of NaOH = $0.032/0.42 = 0.0762 \text{ dm}^3$ or 76.2 cm^3 1
(with correct units)
(if $\times 2$ missed in M4 lose M5 also)

1

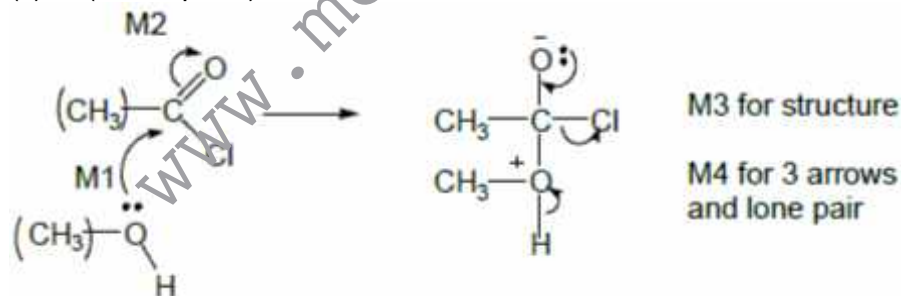
[11]



●
●
●
MEGA LECTURE

9. (a) **M1** $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
not $\text{C}_3\text{H}_7\text{COOH}$ 1
- M2** $\text{CH}_3\text{CH}_2\text{OH}$ or $\text{C}_2\text{H}_5\text{OH}$ 1
- M3** $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOCH}_2\text{CH}_3 + \text{H}_2\text{O}$
*allow $\text{C}_3\text{H}_7\text{COOC}_2\text{H}_5$
 penalise M3 for wrong products and unbalanced equation* 1
- M4** H_2SO_4 or HCl or H_3PO_4 conc or dil or neither
not HNO_3 1
- (b) **M1** $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
not $\text{C}_4\text{H}_9\text{OH}$ 1
- M2** $(\text{CH}_3\text{CO})_2\text{O}$ 1
- M3** $\text{CH}_3\text{COOCH}_2\text{CH}_2\text{CH}_2\text{CH}_3 + \text{CH}_3\text{COOH}$
*allow $\text{CH}_3\text{COOC}_4\text{H}_9$
 penalise M3 for wrong products and unbalanced equation* 1

(c) (nucleophilic) addition-elimination



not acylation alone

M2 not allowed indep of M1 but allow M1 for correct attack on C^+

$^+\text{C}=\text{O}$ loses M2

only allow M4 after correct or v close M3

ignore Cl^- removing H^-

5





R group increases electron density / donates electrons / pushes electrons / has positive inductive effect

1



1

[11]

11. 1-chloropropane no visible change
Accept 'small amount of precipitate' or 'precipitate forms slowly'.

1

ethanoyl chloride white precipitate
Accept 'large amount of precipitate' or 'precipitate forms immediately'.

1

[2]

12. A

[1]

13. A

[1]

14. C

[1]

15. C

[1]

16. D

[1]

17. A

[1]

18. D

[1]