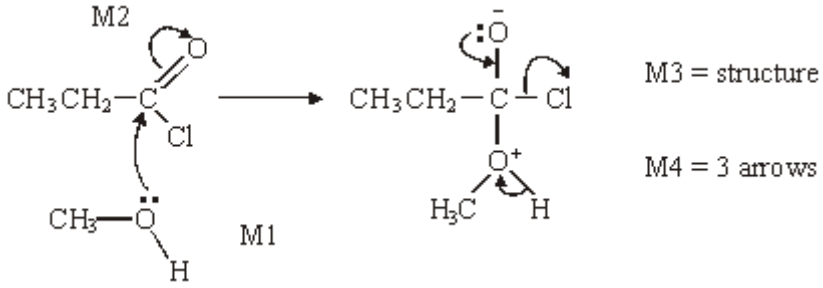
Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Mark Schemes

Q1.

X is methyl propanoate



1

M1 for arrow and lone pair,

4

M2 for arrow
addition-elimination

1

Spectrum 2
if thinks Spectrum 1 = X can only score for structure of Y

1

Y is $CH_3COOCH_2CH_3$

1

The two marks for explanation are awarded for discussing one or more of the four peaks (not those for the CH_3 of the ethyl groups)
for <u>stated δ values</u> the integration or the splitting should be related to the structure: e.g. structure of **X** shows that
at δ 3.7 – 4.1 **(1)** spectrum of **X** should have integration 3 / singlet **(1)**

or

at δ 2.1 – 2.6 **(1)** spectrum of **X** should have integration 2 / quartet **(1)**

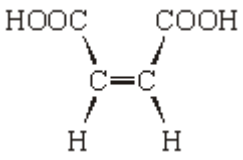
Spectrum 2 has these
[OR Spectrum 1 has
at 3.7 – 4.1 **(1)** quartet / integration 2 **(1)** so not **X**
at 2.1 – 2.6 **(1)** singlet / integration 3 **(1)** so not **X**]

2

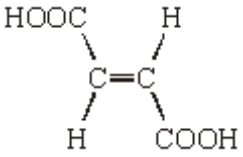
[10]

Q2.

(a)



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

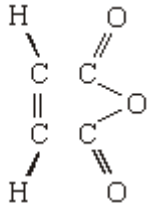
Both COOH groups must be on the same side/ close together/ cis

1

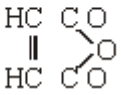
No rotation about C=C axis

1

Structure

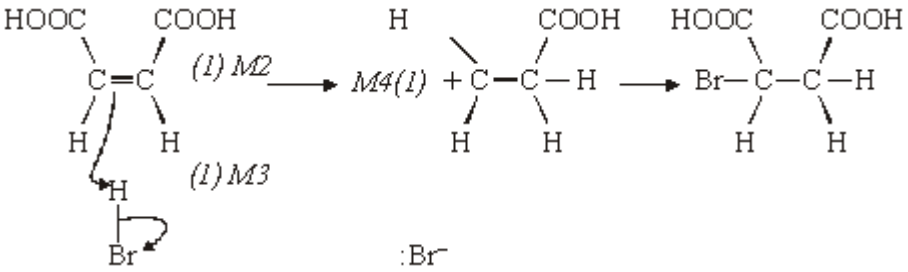


Allow



1

(b) Br_2 / HBr / H_2SO_4 / H^+ / Br^+ / NO_2^+ (*Mark M1*)



NB If electrophile H^+ / Br^+ / NO_2^+ allow M1, M2 and M4
If the acid is incorrect, M2 and M3 can still be scored
Allow M4 consequentially if repeat error from part (a)

4

(c) e.g. $2NaOH + HO_2CCHCHCO_2H \rightarrow NaO_2CCHCHCO_2Na + 2H_2O$

Both H replaced

1

Balanced for atoms and charges

1

NB Allow ionic equations and
$2NaOH + C_4H_4O_4 \rightarrow C_4H_2O_4Na_2 + 2H_2O$
Allow one if structure incorrect but molecular formula correct
Allow one for a correct equation showing one H replaced

(d) *M1* Two peaks

1

M2 No splitting or singlets

1

M3 (Two) non-equivalent protons or two proton environments

1

M4 No adjacent protons

1

M5 Same area under the two peaks or same relative intensity

1

NB Doublet could score M1 and M3 or M5 (Max 2)
More than two peaks CE = 0
Apply the "list principle" to incorrect answers if more than 3 given

Max 3

[15]