

Name of the Student: _____

Max. Marks : 27 Marks

Time : 27 Minutes

Mark Schemes

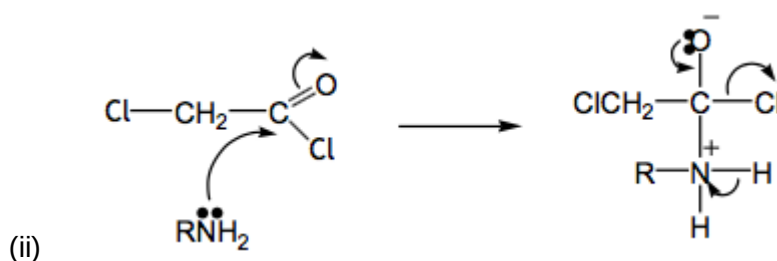
Q1.

- (a) (i) (2-)chloroethan (-1-) oyl chloride

2 not required but penalise 1- or other numbers at start. Ignore 1 in ethanoyl

Ignore hyphens, commas, spaces

1



M1 for arrow from lp on N to C

(or to space half way between N and C)

If full amine drawn, ignore slips except in -NH_2

M2 for arrow from C=O bond to O

Not score M2 as an independent first step, but can allow M1 for attack on C^+ produced

If Cl lost at this stage, Max 1 for M1

M3 for structure of ion including 2 charges

M4 for 3 arrows and lp on O

- may be scored in two steps

Ignore use of RNH_2 to remove H^+ in M4, but penalise use of Cl

4

- (b)
- Nucleophilic substitution

Allow minor spelling errors e.g. nucleophyllic

1

- (c) 9

1

- (d)
- $M_r = 234(0)$

9.4 scores 2 marks

1

% H = 9.4(0)

$$M2 = \frac{22}{M1} \times 100$$

If $M_r = 234$ not shown, can score M1 if their answer $\times 234 =$ their no of H

1

- (e) Tertiary amine OR 3° amine OR III° amine
Ignore N- substituted

1

- (f) (i) If **a** given: CE=0, can only score if answer given is **b**

M1 lp on N^b or on **b**

M2 alkyl groups donate electron density or positive inductive effect or electron donating groups attached

M3 (lp on N^b) more available or protonated amine stabilised or better lp donor/H⁺ acceptor

Ignore reference to nucleophiles

*NOTE – there is NO mark for **b** alone*

Alternatives

*M1 lp on N^a or on **a***

M2 lp or electrons (on N^a) delocalised into ring /towards O in C=O

M3 (lp on N^a) less available (to bond to H⁺/accept proton)

1

1

1

- (ii) Salt is ionic

Independent marks

1

(More) soluble (in blood/body fluids/water)

1

[15]

Q2.

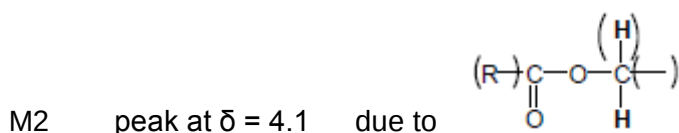
6 / six

[1]

Q3.

- (a) M1 Ester **1**
If Ester 2, can score M3 only.

1



When marking M2 and M3, check any annotation of structures in the stem at the top of the page.

1

- M3 ($\delta = 4.1$ peak is) quartet as adjacent / next to / attached to CH_3

1

- M4 Other spectrum quartet at $\delta = 2.1-2.6$ (or value in this range)

1

- (b) M1 Quaternary (alkyl) ammonium salt / bromide

1

- M2 CH_3Br or bromomethane
Penalise contradictory formula and name.

1

- M3 Excess (CH_3Br or bromomethane)
Mention of acid eg H_2SO_4 OR alkali eg NaOH loses both M2 and M3.

1

- M4 Nucleophilic substitution
Can only score M3 if reagent correct.
Ignore alcohol or ethanol (conditions) or Temp.

1

(c)

	Bromine (penalise Br but mark on)	Acidified KMnO_4 (Penalise missing acid but mark on)
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Wrong reagent = no marks.

If bromine colour stated it must be red, yellow, orange, brown or any combination, penalise wrong starting colour.

1

Benzene	no reaction / colour remains / no (visible) change	no reaction / colour remains / no (visible) change
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Ignore 'clear', 'nothing'.

Allow colour fades slowly.

Allow 'nvc' for no visible change.

1

cyclohexene	(Bromine) decolourised	(Acidified KMnO_4) decolourised
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