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A' Level Chemistry

Year 2

Unit 13: Acylation

Summer Examination Revision Pack

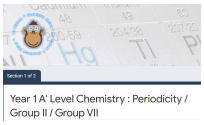
The questions in this pack should be attempted **AFTER** completing all other revision.

Grade Accelerator
Recall Definitions
Drawing Diagrams
Using Equations
Drawing Graphs

Quizlet

Quizlet Classes
Flashcard Based
Games
Tests & Quizzes
Keyword Spell Checker

Condensed Notes
Keywords & Definitions
Key Concepts
Application
Key Skills



Online Forms
Take Time to Answer
Use Paper & Calculator
Work It Out
Review Missed Marks

Use the 3 Wave Process when completing these revision packs.

1. Complete the questions without assistance
(Can't answer a question? Leave it and move on)
2. Use your notes to fill any gaps after step 1
3. Use the mark scheme to fill in any remaining gaps.

1. Having gaps after step 1 is normal, that's why we are doing revision!
2. If your notes don't help during step 2, they are not good enough!
(Change your note taking method and try to understand the problem)
3. If you don't understand why the mark scheme answer is correct, **see Andy.**

If you struggle with the questions in the pack, **STOP!** and complete some more revision.

If you come to a complete dead-end, **STOP!** and speak to **Andy** asap.

0 6 . 4 An amide link is also formed when an acyl chloride reacts with a primary amine.

Name and outline a mechanism for the reaction between CH_3CH_2COCl and $CH_3CH_2NH_2$

Give the IUPAC name of the organic product.

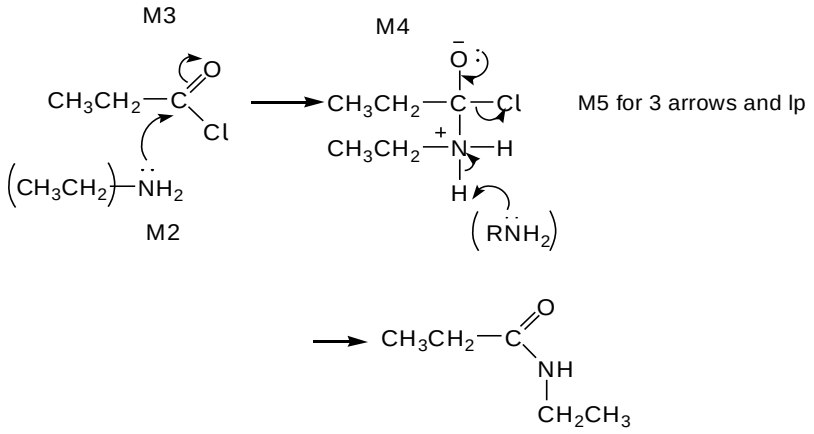
[6 marks]

Name of mechanism _____

Mechanism

IUPAC name of organic product _____

10

Question	Answers	Mark	Additional Comments/Guidance
06.4	(nucleophilic) addition-elimination  N-ethylpropanamide	M1 M2 – M5 M6	Not electrophilic addition-elimination. M2 for arrow from lp on N to C (or to space half way between N and C) Ignore $\delta+$ and $\delta-$ unless wrong M3 for arrow from C=O bond to O Not score M3 as an independent first step, but can allow M2 for attack on C+ produced If Cl lost at this stage, Max 1 for mechanism for M2 M4 for structure of ion including 2 charges (+ on N must be correct in both cases if drawn twice) M5 for 3 arrows and lp on O - may be scored in two steps Ignore use of RNH_2 to remove H^+ in M5, but penalise use of Cl^-
Total		**10**	

Question	Answers	Mark	Additional Comments/Guidance

Do not write outside the box

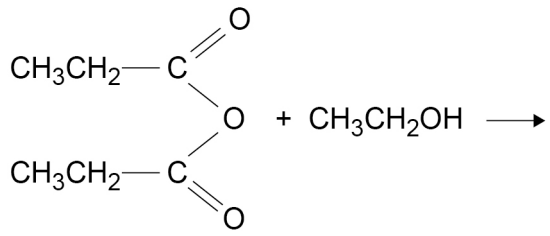
1 1 This question is about esters including biodiesel.

1 1 . 1 An ester is formed by the reaction of an acid anhydride with CH_3CH_2OH

Complete the equation. In your answer show clearly the structure of the ester.
Give the IUPAC name of the ester.

[3 marks]

Equation



Name of ester _____

1 1 . 2 In a reaction to form biodiesel, one mole of a vegetable oil reacts with an excess of methanol to form two moles of an ester with molecular formula $C_{19}H_{34}O_2$ and one mole of an ester with molecular formula $C_{19}H_{36}O_2$

Draw the structure of the vegetable oil showing clearly the ester links.

You should represent the hydrocarbon chains in the form C_xH_y where *x* and *y* are the actual numbers of carbon and hydrogen atoms.

[2 marks]

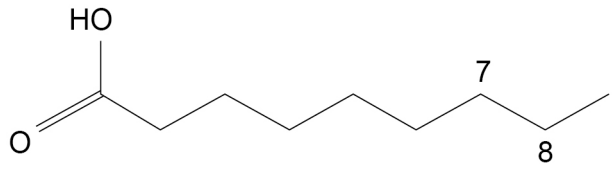
Do not write outside the box

1 1 . 3 The compound $C_{19}H_{34}O_2$ is the methyl ester of *Z*,*Z*-octadeca-9,12-dienoic acid.

Part of the structure of the acid is shown.

Complete the skeletal formula to show the next part of the hydrocarbon chain to carbon atom number 14.
In your answer, show the *Z* stereochemistry around both C=C double bonds.

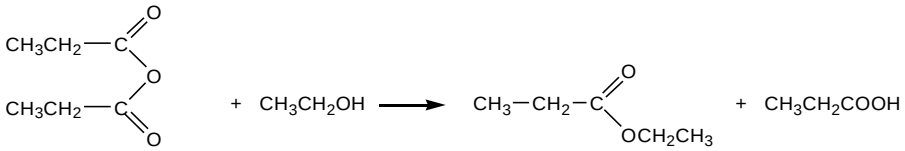
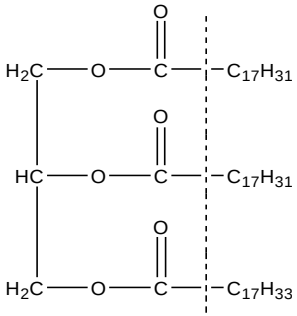
[2 marks]

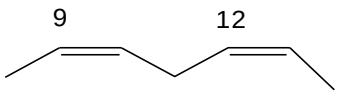
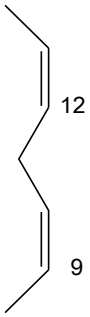
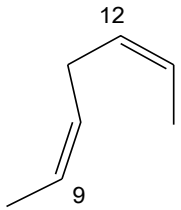
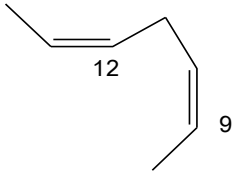


1 1 . 4 Give an equation for the complete combustion of the ester $C_{19}H_{34}O_2$

[1 mark]

Question 11 continues on the next page

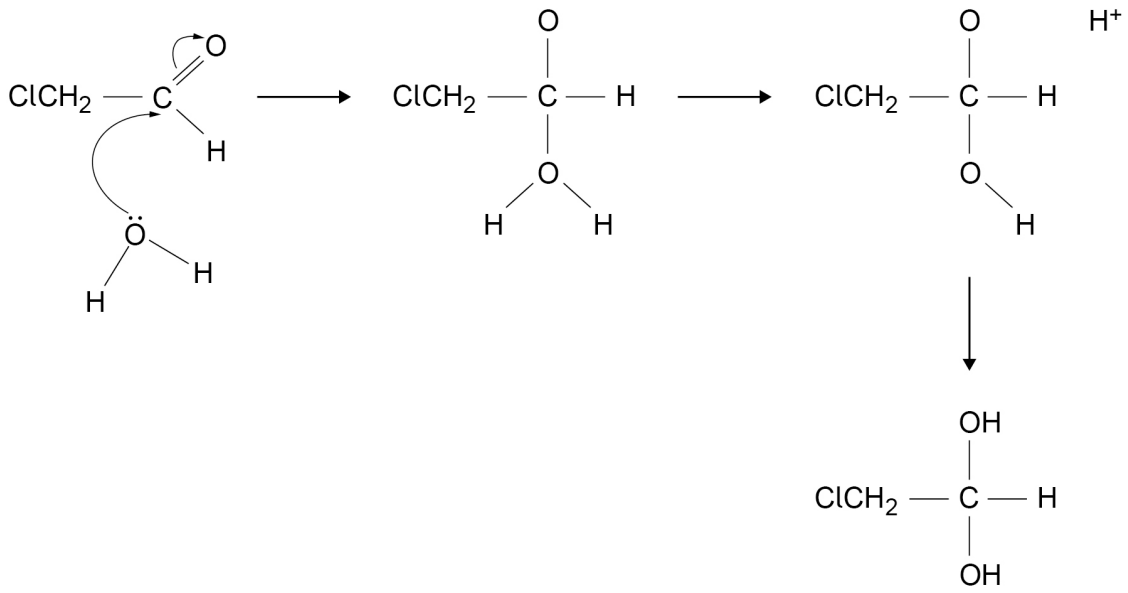
Question	Answers	Additional Comments/Guidelines	Mark
11.1	 Ethyl propanoate only	M1 Structure of ester (allow $C_2H_5CO_2C_2H_5$) M2 propanoic acid formula (allow $C_2H_5CO_2H$) and correctly balanced equation M3 Ethyl propanoate only	1 1 1
11.2	 M1 for all except $C_{17}H_{3x}$ (i.e. all to the left of the dotted line) M2 for two $C_{17}H_{31}$ and one $C_{17}H_{33}$ in any order top to bottom	Allow $–O_2C–$, $–OOC–$, $–OCO–$ Not $–CO_2–$, $–COO–$	1 1

11.3	 Other representations include   	M1 for skeleton M2 for both Z correct Independent marks	C9 – C14 shown with double bonds in the correct place Ignore structure beyond carbon 14 If hydrogens shown or not skeletal can only score M2	1 1
11.4	$C_{19}H_{34}O_2 + 26½O_2 \longrightarrow 19CO_2 + 17H_2O$	Allow 53/2 or all doubled		1

Do not write outside the box

0 9 . 5 **Figure 6** shows an incomplete nucleophilic addition mechanism for the reaction of water with chloroethanal.

Figure 6



Complete the mechanism in **Figure 6** by adding **two** curly arrows, all relevant charges and any lone pairs of electrons involved.

[3 marks]

0 9 . 6 When an excess of water is added to ethanal a similar nucleophilic addition reaction occurs.

$$CH_3CHO(aq) + H_2O(l) \rightleftharpoons CH_3CH(OH)_2(aq)$$

Suggest why this reaction is slower than the reaction in Question **09.5**.

[3 marks]

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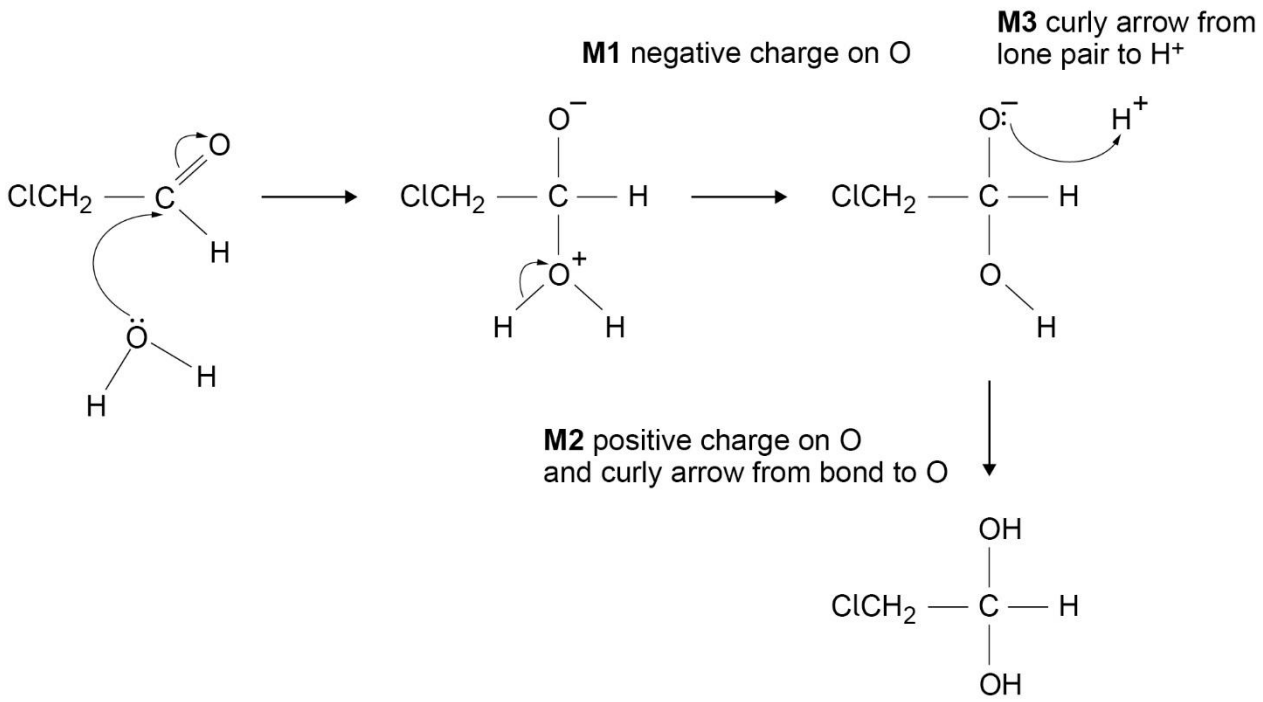
END OF QUESTIONS

09.5	 M1 negative charge on O M3 curly arrow from lone pair to H+ M2 positive charge on O and curly arrow from bond to O	3

09.6	**M1** C in C=O is less δ+ / less electron deficient **M2** Because CH_3 attached is electron donating Or CH_3 has a (positive) inductive effect **M3** So higher E_a	Allow converse Ignore discussion in terms of C-Cl bond polarity Allow for **M3** water less attracted to δ+C / electron deficient C / C in C=O (so lower collision frequency/ fewer collisions with correct orientation)	1 1 1