

## 32.1 ALCOHOLS

### Learning outcomes

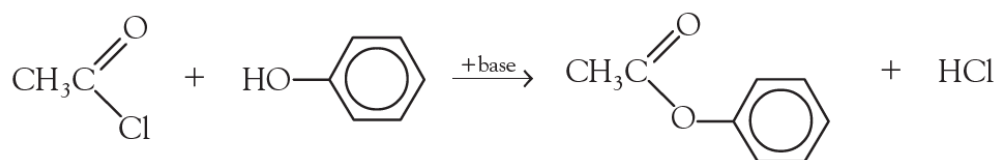
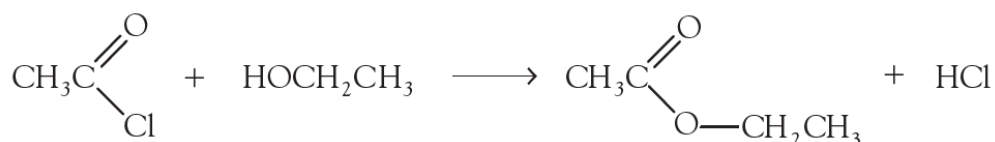
Candidates should be able to:

1. describe the reaction with acyl chlorides to form esters using ethyl ethanoate

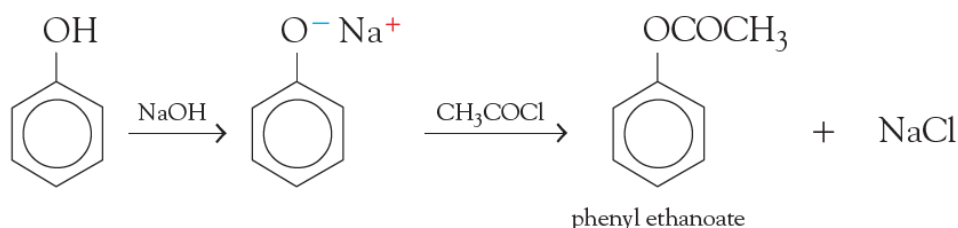
### Introduction

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Acyl chlorides react readily with alcohols or phenols, forming esters:



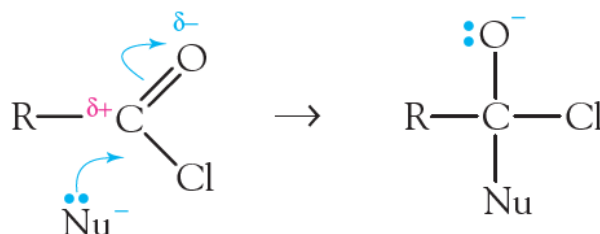
Phenols are not so nucleophilic as alcohols, because the lone pair on the oxygen atom is delocalised over the ring. The acylation of phenols is therefore usually carried out under basic conditions (NaOH or pyridine have been used), when the more nucleophilic phenoxide ion is formed as an intermediate:



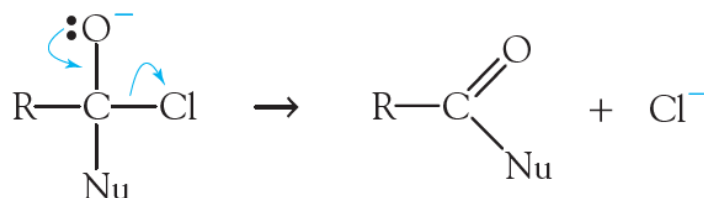
### The addition–elimination mechanism

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The carbonyl group in acyl chlorides can undergo nucleophilic addition in a similar manner to carbonyl compounds:



Unlike carbonyl compounds, however, acyl chlorides are provided with an easily removed leaving group, the chloride ion:

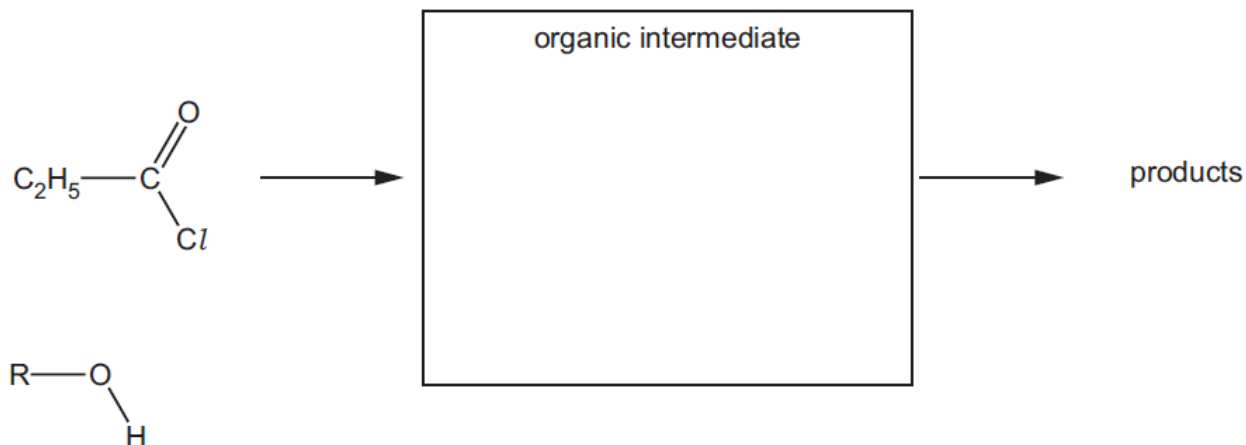


1. Ethanol reacts with propanoyl chloride,  $\text{C}_2\text{H}_5\text{COCl}$ , to form ester W.  
Give the systematic name for ester W.

..... [1]

2. (i) Complete the mechanism in Fig. 7.3 for the reaction between  $\text{C}_2\text{H}_5\text{COCl}$  and ethanol.  
 $\text{R-OH}$  represents ethanol.

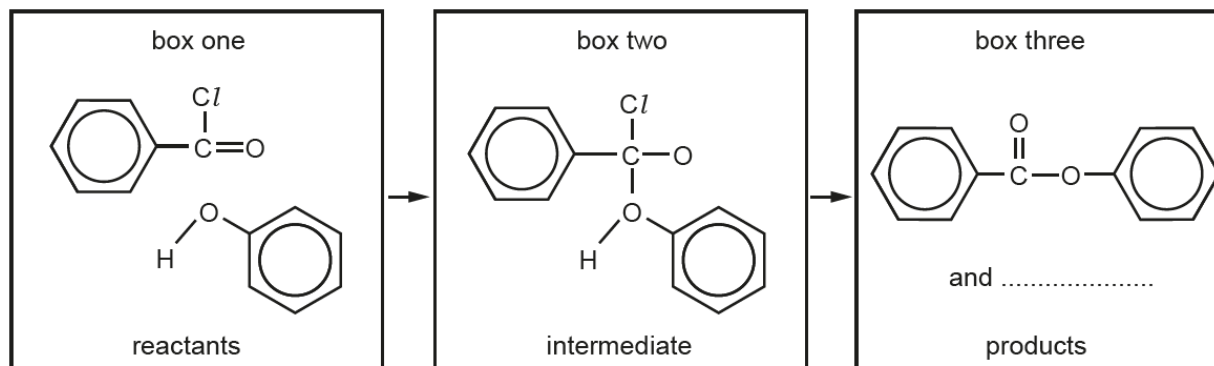
Include all relevant lone pairs of electrons, curly arrows, charges, and partial charges. [4]



- (ii) Name the mechanism for the reaction shown in Fig. 7.3.

..... [1]

3.  $\text{C}_6\text{H}_5\text{COCl}$  reacts with phenol,  $\text{C}_6\text{H}_5\text{OH}$ , to give the ester phenyl benzoate,  $\text{C}_6\text{H}_5\text{COOC}_6\text{H}_5$ .  
An incomplete description of the mechanism of this reaction is shown in Fig. 9.1.



Complete the mechanism in Fig. 9.1 and include:

- all relevant dipoles ( $\delta +$  and  $\delta -$ ) and full electric charges (+ and -) on the species in box one and in box two
- all relevant lone pairs on the species in box one and in box two
- all relevant curly arrows to show the movement of electron pairs in box one and in box two
- the formula of the second product in box three.

[4]

- (ii) Name this mechanism.

..... [1]

1. 2-nitrophenol can undergo different reactions as shown in Fig. 6.3

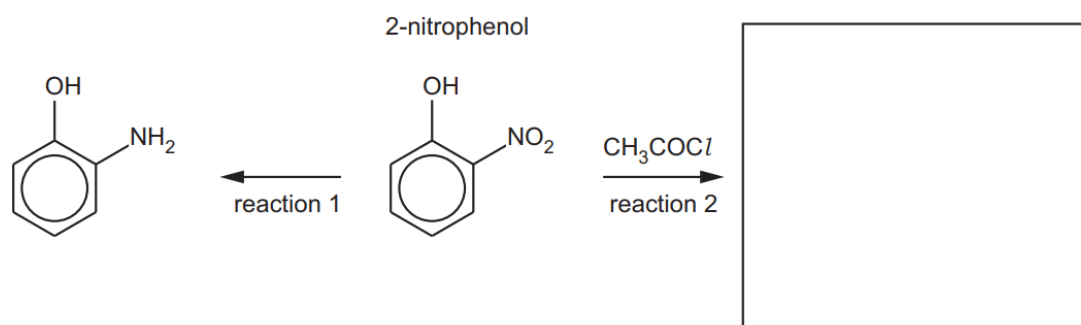


Fig. 6.3

i) Reaction 2 is carried out at room temperature.

Draw the structure of the organic product from reaction 2 in Fig. 6.3. [1]

(ii) Name the mechanism for reaction 2.

..... [1]

\*\*\*This is not a complete note. It is to guide you. It is recommended to study the prescribed textbooks along with this material. \*\*\*