

# Ester Hydrolysis and Acid Identification

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## Experiment Overview

In this experiment students are required to identify an unknown ester by hydrolysing it to the corresponding acid, which is in turn identified by its melting point. The experiment involves a number of basic synthetic organic chemistry techniques, including performing a reaction (ester hydrolysis) under reflux, reaction work-up and product purification (recrystallisation), and identification of an unknown compound.

Students are required to complete a pre-lab exercise which contains questions on OHS issues related to the experiment, with the necessary information found within the supplied chemical information sheets. Students are also required to complete a laboratory report book to enhance skills in scientific observation, note-taking and reporting. The experiment requires no special equipment beyond that which would normally be found in a typical undergraduate teaching laboratory.

## Learning Experience

This practical teaches skills fundamental for any chemistry graduate, and which are essential to the process of practical organic chemistry. By incorporating an unknown reagent into the experiment, the students are required critically evaluate their results and use problem solving skills to identify the unknown compounds. The ability of students to identify the unknown ester provides an immediate measure of the success of the experiment, and a valuable means of demonstrating the effective nature of the techniques used.

## Aims and Objectives

The experiment aims to introduce students to a number of basic synthetic organic chemistry techniques, including performing a reaction (ester hydrolysis) under reflux, reaction work-up and product purification (recrystallisation), and identification of an unknown compound. The objectives are to both understand the theoretical concepts behind these processes, and learn the practical skills necessary to achieve them.

## Level of Experiment

Suitable for second year undergraduate students

## Keyword Descriptions of the Experiment

### **Domain**

Organic Chemistry

### **Specific Descriptors**

Ester Hydrolysis, Product Isolation and Identification

## Course Context and Prerequisite Knowledge and Skills

This experiment is conducted in the first semester of chemistry II, in which students are presented with 36 lectures of material on topics including stereochemistry, thermodynamics and kinetics, metal-ligand chemistry and synthetic organic chemistry. This is the first of a series of four synthetic chemistry practicals, designed to introduce students to the practical skills necessary to carry out the synthesis and characterisation of chemical compounds.

The concepts of product purification and identification in this context are touched upon in some lectures, both at first and second year undergraduate level, but are not covered in any great detail. Further, while ester hydrolysis is a component of the synthetic organic chemistry topic, due to timetabling constraints the students may complete the experiment before covering the lecture material. The practical course therefore acts to overcome these gaps while giving students the opportunity to experience and develop some basic organic chemistry laboratory skills such as performing reactions under reflux, recrystallisation and melting point determination. The experiment is written assuming no prior knowledge of the techniques used, and contains a comprehensive introduction giving all required background.

## Time Required to Complete

**Prior to Lab:** Approximately 1-2 hours to complete pre-lab exercises

**In Laboratory:** 3 hours (including completing report and questions)

**After Laboratory:** None

## Experiment History

This experiment has been carried out and refined over a long period within the Discipline of Chemistry at the University of Adelaide. Whilst the author listed in section (1.7) is responsible for the educational analysis of this experiment, the submission of it to ACELL is done on behalf of all academic staff.