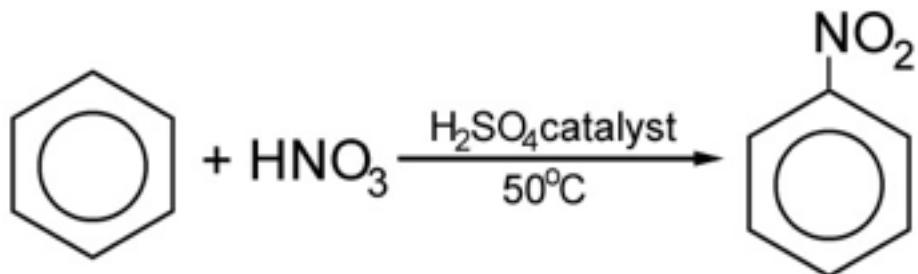


Nitration of benzene

Pre-lab activity

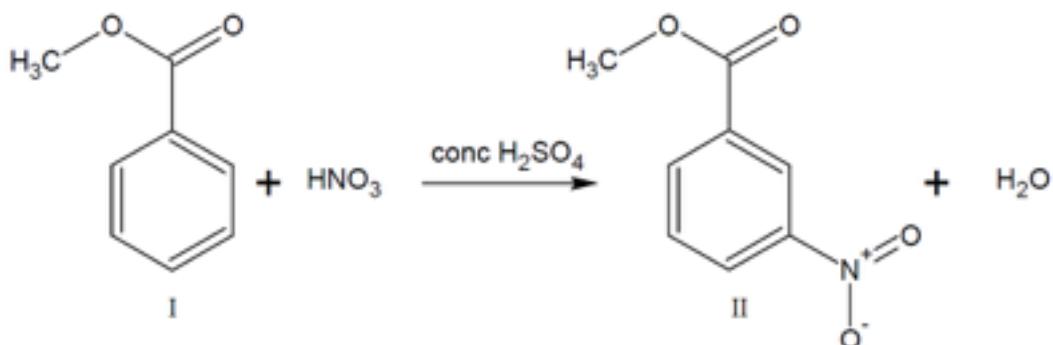


As you work through the pre-lab activity, highlight any key words in the practical steps which you think are important to carrying out the practical effectively.

Practical steps	What are the potential hazards in this step? How will you account for them?	How long will this step take?	Is there anything else you can be doing to ensure you are ready for later steps/have cleared up earlier steps?
Add 10 cm ³ of concentrated sulphuric acid to a dry 100ml conical last and cool it to below 10°C in an ice bath.			
Place approximately 4ml of benzene in a 10ml measuring cylinder. Add the liquid to the cold acid and stir the mixture while cooling.			
In a dry boiling tube mix together 3cm ³ of both concentrated nitric acid and concentrated sulphuric acid and cool in an ice bath.			

Using a dry dropping pipette, add the nitrating mixture to the conical flask dropwise while swirling the flask constantly and ensuring that the temperature remains between 5 and 15°C. Then allow the flask to cool at room temperature for 10 minutes.			
Pour the contents of the conical flask into a beaker containing 40g of crushed ice. Stir until the product solidifies.			
Filter off the solid using suction filtration and a Büchner funnel. Wash the solid with three 5ml portions of water. Then wash with two 5ml portions of ice-cold ethanol.			
Recrystallise the product using hot ethanol in a water bath. Allow the solution to cool and for crystals to form and then filter off using suction filtration. Leave the crystals to dry.			

Procedure



Practical steps	Questions
Add 10 cm ³ of concentrated sulphuric acid to a dry 100ml conical last and cool it to below 10°C in an ice bath.	Why must the conical flask by very dry for this procedure?
Place approximately 4ml of methyl benzoate in a 10ml measuring cylinder and determine the total mass. Add the liquid to the cold acid and stir the mixture while cooling. Determine the mass of the liquid added.	Why is it important to weigh by difference?
In a dry boiling tube mix together 3cm ³ of both concentrated nitric acid and concentrated sulphuric acid and cool in an ice bath.	This is the nitrating mixture. Give the equation for the chemical reaction taking place in the boiling tube. Why is this reaction an important precursor for the reaction between nitric acid and methylbenzoate?
Using a dry dropping pipette, add the nitrating mixture to the conical flask dropwise while swirling the flask constantly and ensuring that the temperature remains between 5 and 15°C. Then allow the flask to cool at room temperature for 10 minutes.	Why is it important to ensure that the temperature does not get above 15°C?

Pour the contents of the conical flask into a beaker containing 40g of crushed ice. Stir until the product solidifies.	Why does the methyl 3-nitrobenzoate form as the reaction mixture is cooled down?
Filter off the solid using suction filtration and a Büchner funnel. Wash the solid with three 5ml portions of water. Then wash with two 5ml portions of ice-cold ethanol.	Why does the product need to be washed?
Recrystallise the product using hot ethanol in a water bath. Allow the solution to cool and for crystals to form and then filter off using suction filtration. Leave the crystals to dry.	Why does the product need to be recrystallised before calculating the yield?

Analysis

Calculate the yield of methyl 3-nitrobenzoate.

Post-lab activity

Choose from one of the following tasks:

- Make a resource explaining to students how to complete this practical safely and efficiently. This could be a video, a presentation or a poster.
- Create an exam-style question about this practical and produce a mark scheme for your question.
- Using all of the organic practicals you have completed so far, create a list of ‘ten principles for working safely in organic chemistry’.