

# Edexcel International Chemistry A Level

## CP16 - The Preparation of Aspirin (A level only)

Flashcards

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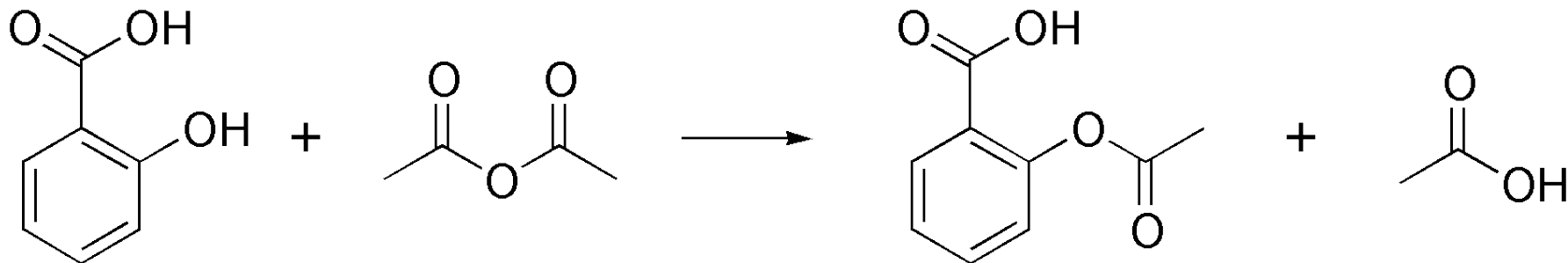
Ethanoic acid



2-hydroxybenzoic acid reacts with ethanoic anhydride to form aspirin. Use the skeletal structures of these compounds to write an equation for this reaction.



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What type of bond is formed between 2-hydroxybenzoic acid and ethanoic anhydride in the formation of aspirin?



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Ester bond



Why might the apparent yield of aspirin be higher than expected?





Why might the apparent yield of aspirin be higher than expected?

- There may be impurities in the sample
- The crystals may not be dry



How can melting point be used to assess the purity of a sample?



How can melting point be used to assess the purity of a sample?

Pure substances have a specific melting point whereas impure substances will melt over a larger range of temperatures. The smaller the range, the purer the sample.



What safety precautions should be taken when preparing aspirin?



# What safety precautions should be taken when preparing aspirin?

- Keep the room well ventilated/use a fume cupboard
- Tie back long hair and wear a lab coat and safety goggles
- Use tongs or heat-protective gloves when handling hot apparatus
- Ethanoic acid and concentrated sulfuric acid are corrosive so avoid contact with skin
- 2-hydroxybenzoic acid is harmful so take care when using
- Clear up chemical spillages and broken glassware immediately



Why is concentrated sulfuric acid used when synthesising aspirin?



Why is concentrated sulfuric acid used when synthesising aspirin?

Used as a catalyst to increase the rate of reaction



Why is the reaction mixture heated using a water bath rather than a Bunsen burner?





# Why is the reaction mixture heated using a water bath rather than a Bunsen burner?

- To maintain a constant temperature for longer
- To prevent ignition of flammable chemicals
- To prevent glassware shattering
- To prevent the reagents overheating or burning



Why might a solution containing the products of a reaction be cooled in an ice bath?



Why might a solution containing the products of a reaction be cooled in an ice bath?

To encourage crystallisation to occur



When filtering a solution, what is done to reduce the loss of solid product?



When filtering a solution, what is done to reduce the loss of solid product?

Rinse the beaker / apparatus that previously contained the solution with solvent and add the washings to the Büchner funnel



Why are aspirin crystals rinsed with ice cold water when they are in the Büchner funnel?



Why are aspirin crystals rinsed with ice cold water when they are in a Büchner funnel?

- To remove any of the impurities from the solution
- The solvent is ice cold to reduce product loss



What functional groups are involved in the formation of the bond between 2-hydroxybenzoic acid and ethanoic anhydride when producing aspirin?





What functional groups are involved in the formation of the bond between 2-hydroxybenzoic acid and ethanoic anhydride when producing aspirin?

Ethanoic anhydride - anhydride functional group

2-hydroxybenzoic acid - alcohol functional group



How could the aspirin crystals be separated from solution?



How could the aspirin crystals be separated from solution?

By filtration under reduced pressure using a Büchner funnel



# How can percentage yield be calculated?



How can percentage yield be calculated?

$$\% \text{ yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100$$

Theoretical yield is the largest possible mass of product that could be formed. Actual yield is the mass of product obtained.



The percentage yield of aspirin is less than 100%. Why?



The percentage yield of aspirin is less than 100%.  
Why?

- Reaction may be incomplete
- Some product may not crystallise (so it stays in the solution)
- Some product may be lost when transferring between apparatus



The percentage yield of aspirin is calculated as more than 100%. Why?





The percentage yield of aspirin is calculated as more than 100%. Why?

- Crystals may not be dry
- Crystals may contain impurities



# How can atom economy be calculated?



# How can atom economy be calculated?

Atom economy =

$$\frac{\text{relative formula mass of desired product}}{\text{total relative formula masses of reactants}} \times 100$$



Aspirin can be formed using ethanoyl chloride instead of ethanoic anhydride. Why is this reaction not used in industry despite having a higher atom economy?



Aspirin can be formed using ethanoyl chloride instead of ethanoic anhydride. Why is this reaction not used in industry despite having a higher atom economy?

- The reaction between ethanoyl chloride and 2-hydroxybenzoic acid would produce HCl, a toxic gas.
- The by-product of the reaction using ethanoic anhydride is ethanol which could be used in other industries.
- Using ethanoyl anhydride would have greater environmental consequences.

