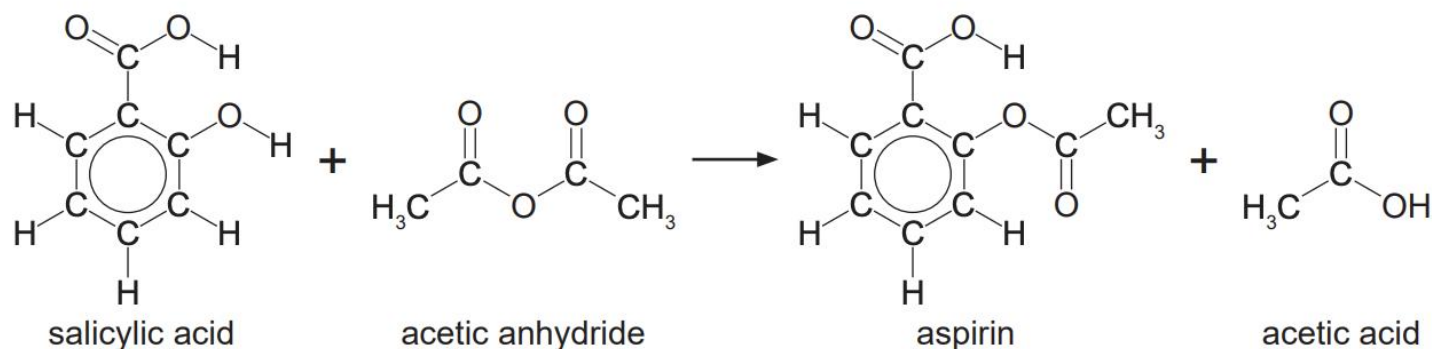


Question 40**(17 marks)**

Acetylsalicylic acid is better known as aspirin. It is used to treat pain and inflammation. Aspirin can be synthesised from salicylic acid and acetic anhydride ($C_4H_6O_3$). This process can be represented by the equation below.



The molar mass of salicylic acid is $138.121 \text{ g mol}^{-1}$.

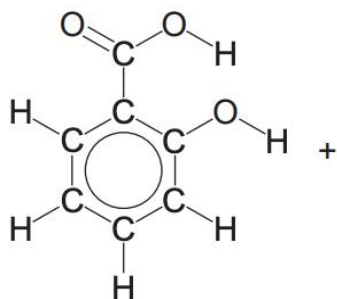
The molar mass of aspirin is $180.158 \text{ g mol}^{-1}$.

This reaction is an equilibrium reaction with a K value of approximately 5.

- (a) In the synthesis of aspirin, 45.0 g of salicylic acid was reacted with excess acetic anhydride. This produced 50.2 g of aspirin. What was the percentage yield of this reaction? (4 marks)

A student conducts a titration to determine the percentage purity of a sample of salicylic acid that was to be used in the synthesis of aspirin.

- (b) Complete the equation for the reaction between salicylic acid and sodium hydroxide solution. (2 marks)



(c) Calculate the mass of salicylic acid in the sample and therefore the percentage purity of the sample. (5 marks)

During the titration, the student used the following procedure.

Number	Procedure
1	Swirl the conical flasks while adding sodium hydroxide solution from the burette.
2	Use the same number of drops of indicator for each titration.
3	Stop the titration at the first sign of the indicator showing a colour change.
4	Wash the pipette with distilled water before filling with salicylic acid solution.
5	Slow down the addition of sodium hydroxide solution as the end point is approached.
6	Rinse down the sides of the conical flask during the titration.

- (d) Identify **two** incorrect procedures from the list above, select the effect on the calculated concentration of salicylic acid and give the reason for the effect. (6 marks)

Number	Effect on calculated concentration (circle your answer)	Reason
	increase decrease no change	
	increase decrease no change	