Question 36 (16 marks)

The active ingredient in aspirin, a painkiller, is acetyl salicylic acid. Acetyl salicylic acid is prepared by a reaction between salicylic acid and acetic anhydride in the presence of a sulfuric acid catalyst. The reaction can be represented by the following equation:

(a) Given the above reaction is endothermic, outline and justify the optimal conditions for the preparation of acetyl salicylic acid. (6 marks)

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A packet of aspirin was purchased that was labelled as double strength and should contain 500 mg of aspirin compared to standard strength tablets, which tend to contain between 300 and 320 mg of aspirin. A student removed five tablets from the packet and ground them up. The powder was then reacted with 150.00 mL of 0.0842 mol L⁻¹ sodium hydroxide solution.

The resulting solution was added to a 250.0 mL volumetric flask and deionised water added up to the mark. Aliquots (25.00 mL) of the solution were titrated against a standardised 0.03033 mol L⁻¹ hydrochloric acid solution.

The molar mass of aspirin is 180.158 g mol⁻¹.

The following results were obtained.

	Trials			
	1	2	3	4
Final volume (mL)	16.40	30.17	18.96	32.70
Initial volume (mL)	2.40	16.40	5.25	18.96
Titre (mL)				

(b)   Complete the table above and calculate the average titre.   (2 marks)

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(c) Calculate the mass of aspirin (in mg) in each tablet and comment on the accuracy of the packet label.

(8 marks)

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