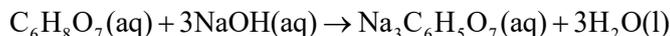


QUESTION 8 (8 marks)

Lemon juice contains several acidic chemicals, including citric acid and vitamin C (ascorbic acid).

- a) A student determined the citric acid content of a lemon juice sample using an acid–base titration. Citric acid is a weak, triprotic acid and reacts with sodium hydroxide according to the following equation.



2.00 mL of lemon juice was diluted to a total volume of 20.0 mL with distilled water. This 20.0 mL solution was titrated against a standardised 0.102 M sodium hydroxide solution. The average titre required was 14.6 mL. Note that $M(\text{C}_6\text{H}_8\text{O}_7) = 192 \text{ g mol}^{-1}$.

- i) Calculate the concentration of citric acid in the undiluted lemon juice. [5 marks]

Concentration = _____ % m/v (to three significant figures)
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- ii) During the titration, the student incorrectly rinsed their burette with deionised water.

Deduce which of the following would occur as a result of the student's error.

Indicate your response by placing a tick in one of the boxes.

[1 mark]

The calculated level of citric acid would be higher than the true value.	<input type="checkbox"/>
The calculated level of citric acid would be lower than the true value.	<input type="checkbox"/>
There would be no effect on the calculated level of citric acid.	<input type="checkbox"/>

- b) The level of vitamin C in lemon juice can be determined using a redox titration with iodine. The reaction produces dehydroascorbic acid and iodide ions as its products, and starch is used as an indicator. The equation for the reaction is as follows.



Deduce the oxidation half-equation for the reaction.

[1 mark]
