Q: 20mL of the sample solution is pipetted into a 250mL conical flask and diluted to 150mL with distilled water. It's titrated with 0.004mol L^{-1} KIO$_3$ solution. The average titre is 7.65mL. Calculate the number of moles of ascorbic acid reacted. Calculate the concentration of ascorbic acid in mol L^{-1}, mg/100mL and mg/100g.

$$2IO_3^- + 10I^- + 12H^+ \rightarrow 6I_2 + 6H_2O$$

$$\text{Ascorbic acid} + I_2 \rightarrow 2I^- + \text{dehydroascorbic acid}$$
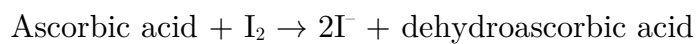
Independent variable	Whether an open or unopened orange juice package is titrated.
Dependent variable	Concentration of vitamin C in the orange juice package.
Controlled variables	• Surrounding temperature. • Surrounding pressure. • Volume of indicator added. • Indicator used.

Systematic errors:

1. Inherent error in the burette.
2. Inherent error in the measuring cylinder.
3. Inherent error in the pipette.

(I)

Random errors:

1. Parallax error – viewing burette and measuring cylinders from different angles.
2. Endpoint determination – a visual endpoint is always slightly beyond the equivalence point due to needing to see the colour change.
3. Estimating values between graduations.

(PEE)

	Improvement:
Reliability	Perform more ==repeat trials==.
Accuracy	Ensure the burette and measuring cylinders are ==viewed horizontally== to ==minimise parallax error==.
Validity	Use ==separate measuring cylinders== to measure the volume of each substance to ==avoid contamination== with other substances.

ascorbic acid $\xrightleftharpoons[\text{reduction}]{\text{oxidation}}$ dehydroascorbic acid $+\ 2H^+ + 2e^-$