Paper 4

**Questions are applicable for both core and extended candidates
unless indicated in the question**

1 **(c)** A student determines the concentration of a solution of dilute sulfuric acid, H_2SO_4, by titration with aqueous sodium hydroxide, NaOH.

step 1 $25.0\,cm^3$ of $0.200\,mol/dm^3$ NaOH is transferred into a conical flask.

step 2 Three drops of methyl orange indicator are added to the conical flask.

step 3 A burette is filled with H_2SO_4.

step 4 The acid in the burette is added to the conical flask until the indicator changes colour. The volume of acid is recorded. This process is known as titration.

step 5 The titration is repeated several times until a suitable number of results is obtained.

(i) Name the piece of apparatus used to measure exactly $25.0\,cm^3$ of $0.200\,mol/dm^3$ NaOH in **step 1**.

.... [1]

(ii) State the colour change of the methyl orange indicator in **step 4**.

from .... to .... [1]
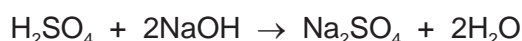
(iii) State how the student decides that a suitable number of results have been obtained.

....

.... [1]

(iv) $20.0\,cm^3$ of H_2SO_4 reacts with $25.0\,cm^3$ of $0.200\,mol/dm^3$ NaOH.

The equation for the reaction is shown.

$$H_2SO_4 \;+\; 2NaOH \;\rightarrow\; Na_2SO_4 \;+\; 2H_2O$$

Calculate the concentration of H_2SO_4 using the following steps.

● Calculate the number of moles in $25.0\,cm^3$ of $0.200\,mol/dm^3$ NaOH.

.... mol

● Determine the number of moles of H_2SO_4 that react with the NaOH.

.... mol

● Calculate the concentration of H_2SO_4.

.... mol/dm^3

[3]