3 The concentration of a solution of barium hydroxide can be determined using a standard solution of ethanedioic acid.

(a) State what is meant by the term **standard** solution.

(1)

(b) Describe the preparation of 100.0 cm^3 of a 0.0500 mol dm^{-3} standard solution of ethanedioic acid, starting with crystals of ethanedioic acid dihydrate, $H_2C_2O_4 \cdot 2H_2O$.

Your answer should include details of the apparatus used and the mass of $H_2C_2O_4 \cdot 2H_2O$ required.

(6)

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(c) 25.0 cm^3 of 0.0500 mol dm^{-3} ethanedioic acid solution, $H_2C_2O_4(aq)$, was added to a conical flask and titrated with barium hydroxide solution, $Ba(OH)_2(aq)$, of an unknown concentration.

(i) Name the piece of apparatus that should be used to add the ethanedioic acid solution, $H_2C_2O_4(aq)$, to the conical flask.

(1)

.....

(ii) The titration was carried out with a few drops of phenolphthalein indicator in the conical flask.

State the colour change observed at the end-point of the titration.

(2)

From ..... to .....

(iii) The formation of a white precipitate was observed during the titration.

Suggest the identity of the white precipitate, by name or formula.

(1)

.....

(iv) The titration was repeated, giving a mean titre of 31.55 cm^3.

Calculate the concentration of the barium hydroxide solution, $Ba(OH)_2(aq)$, in **g dm^{-3}**.

$Ba(OH)_2$ and $H_2C_2O_4$ react in a 1 : 1 ratio.

Give your answer to an appropriate number of significant figures.

(3)

(Total for Question 3 = 14 marks)

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