Question Number	Answer	Additional Guidance	Mark
3(a)	An answer that makes reference to the following point: • (solution of accurately) known concentration	Allow known mass/amount (of solute) **and** volume (of solution) Allow specific/stated for known Ignore constant/fixed/uniform/precise/exact for known Ignore solution prepared from a primary standard Ignore any reference to standard conditions	**1**

Question Number	Answer	Additional Guidance	Mark
3(b)	A description that makes reference to the following points: **M1 –** molar mass of ethanedioic acid dihydrate **(1)** **M2 –** required mass of ethanedioic acid dihydrate **(1)** **M3 –** use of volumetric flask (as final piece of apparatus) **(1)** **M4 –** use of distilled/deionised water (to make solution) **(1)** **M5 –** complete transfer of required mass of solid (to final piece of apparatus with washings if needed) and dissolving **(1)** **M6 –** making (solution) up to the mark / a total volume of 100 cm^3 **and** mixing **(1)**	<u>Example of calculation</u> = 2×1 + 2×12 + 4×16 + 2×18 = 126(.0) (g mol^{-1}) n = 0.0500 × 0.1000 = 0.005(00) (mol) mass = 0.005(00) × 126(.0) = 0.63(0) (g) TE on M1 Allow standard flask / graduated flask Do not award conical flask Do not award round-bottomed flask Do not award beaker Allow use of distilled/deionised water anywhere in the preparation **Ignore volume of water in M4 and M5** eg dissolve in beaker and transfer with washings eg transfer solid, dissolve and add washings from container eg weigh into flask and dissolve Do not award any method that would result in only partial transfer of the required mass of solid, eg some remaining in the weighing container Do not award any method that would lead to a solution volume greater than 100 cm^3 Allow any indication of mixing, eg shaking/swirling/stirring/inverting	**6**

Question Number	Answer	Additional Guidance	Mark
3(c)(i)	An answer that makes reference to the following point: • (25.0 cm^3 volumetric) pipette	 Ignore graduated/adjustable Ignore pipette filler Do not award incorrect volume, eg 50.0 cm^3 Do not award Pasteur/dropping/teat pipette Do not award burette Do not award syringe	**1**

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	An answer that makes reference to the following points: • (from) colourless **(1)** • (to pale) pink **(1)**	 Ignore clear Do not award purple Do not award red Reverse colour change scores (1)	**2**

Question Number	Answer	Additional Guidance	Mark
3(c)(iii)	An answer that makes reference to the following point: • BaC_2O_4 / barium ethanedioate	If name and formula given then both must be correct Accept $Ba(COO)_2$ / barium oxalate Allow $Ba(HC_2O_4)_2$ / barium hydrogenethanedioate Do not award $BaCO_3$ / barium carbonate Do not award $Ba(HCO_3)_2$ / barium hydrogencarbonate Do not award $BaSO_4$ / barium sulfate	**1**

Question Number	Answer	Additional Guidance	Mark
3(c)(iv)	**M1** • moles of $H_2C_2O_4$ / $Ba(OH)_2$ **(1)** **M2 and M3 – method 1** • concentration of $Ba(OH)_2$ (in mol dm^{-3}) **(1)** • concentration of $Ba(OH)_2$ (in g dm^{-3}) **and** to 2SF or 3SF **(1)** **M2 and M3 – method 2** • mass of $Ba(OH)_2$ **(1)** • concentration of $Ba(OH)_2$ (in g dm^{-3}) **and** to 2SF or 3SF **(1)**	Example of calculation $= \frac{0.0500 \times 25}{1000} = 0.00125 = 1.25 \times 10^{-3}$ $= \frac{0.00125 \times 1000}{31.55} = 0.039620$ (mol dm^{-3}) TE on M1 (= 0.039620 × 171.3 = 6.7868) 6.8 / 6.79 (g dm^{-3}) TE on M2 = 1.25 × 10^{-3} × 171.3 = 0.21413 (g) TE on M1 (= 0.21413 ÷ 0.03155 = 6.7868) 6.8 / 6.79 (g dm^{-3}) TE on M2 Correct answer **to 2SF or 3SF** with some working scores (3)	**3**

(Total for Question 3 = 14 marks)