1 (a) A solution is made by dissolving calcium chloride in water.

11.1 g of calcium chloride are dissolved in water.

The volume of the solution is made up to 500 cm^3.

Calculate the concentration, in mol dm^{-3}, of calcium chloride, $CaCl_2$, in this solution.

(relative atomic masses: Cl = 35.5, Ca = 40.0)

(3)

concentration = ... mol dm^{-3}

(b) The concentration of a solution of an alkali can be determined by titration with an acid.

25.0 cm^3 portions of the solution of the alkali are transferred into a conical flask and titrated with the acid solution, using a suitable indicator.

(i) Describe how you would measure out and transfer 25.0 cm^3 of the solution of the alkali.

(2)

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The burette readings of acid added were

	titration 1	titration 2	titration 3
final volume / cm^3	27.20	30.10	25.35
initial volume / cm^3	2.05	5.20	0.10
volume of acid added / cm^3	25.15	24.90	25.25

The volume of acid added that should be used in the calculation is

(1)

☒ **A** 24.90 cm^3

☒ **B** 25.00 cm^3

☒ **C** 25.10 cm^3

☒ **D** 25.20 cm^3

*(c) Some salts dissolved in water cause the water to be hard.

When mixed with a small volume of soap solution, hard water does not form a lather.

You are provided with three unlabelled samples of water.

- one is soft water
- one is permanent hard water
- one is temporary hard water

You are provided with soap solution and the usual laboratory apparatus.

Describe tests that you should carry out on each sample to identify the type of water in each sample.

(6)

(Total for Question 1 = 12 marks)