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**10.62 DETERMINATION OF THE TOTAL HARDNESS (PERMANENT AND TEMPORARY) OF**

**WATER**

The hardness of water is generally due to dissolved calcium and magnesium

salts and may be determined by complexometric titration.

Procedure. To a 50mL sample of the water to be tested add 1 mL buffer

solution (ammonium hydroxide/ammonium chloride, pH 10, Section 10.54)

and 30-40 mg solochrome black indicator mixture. Titrate with standard EDTA

solution (0.01 M) until the colour changes from red to pure blue. Should there

be no magnesium present in the sample of water it is necessary to add 0.1 mL

magnesium-EDTA solution (0.1 M) before adding the indicator (see Section 10.54).

The total hardness is expressed in parts of CaCO, per million of water.

If the water contains traces of interfering ions, then 4 mL of buffer solution

should be added, followed by 30 mg of hydroxylammonium chloride and then

50 mg analytical-grade potassium cyanide (Caution) before adding the indicator.

**Notes. ( 1 ) Somewhat sharper end points may be obtained if the sample of water is first**

**acidified with dilute hydrochloric acid, boiled for about a minute to drive off carbon**

**dioxide, cooled, neutralised with sodium hydroxide solution, buffer and indicator solution**

**added, and then titrated with EDTA as above.**

(2) **The permanent hardness of a sample of water may be determined as follows. Place**

250 **mL of the sample of water in a** 600 **mL beaker and boil gently for** 20-30 **minutes.**

**Cool and filter it directly into a** 250 **mL graduated flask: do not wash the filter paper,**

but dilute the filtrate to volume with de-ionised water and mix well. Titrate 50.0 mL of

the filtrate by the same procedure as was used for the total hardness. This titration

measures the permanent hardness of the water. Calculate this hardness as parts per

million of CaCO,.

Calculate the temporary hardness of the water by subtracting the permanent hardness

from the total hardness.

(3) If it is desired to determine both the calcium and the magnesium in a sample of

water, determine first the total calcium and magnesium content as above, and calculate

the result as parts per million of CaCO,.

The calcium content rnay then be determined by titration wth EDTA using either

Patton and Reeder's indicator or calcon (Section 10.60), or alternatively by titration

with EGTA (see Section 10.61).