

Answer on Question #45938, Chemistry, Physical Chemistry

A STANDARD HARD WATER CONTAIN 15gm of CaCO_3 per litre. 20ml of this standard water required 25ml of EDTA solution. 100ml of an unknown sample of water required 18ml EDTA solution. The same sample water after boiling required 12 ml EDTA solution. Calculate the temporary hardness of the given sample water in term of ppm.

Solution:

The standard water contains 15 g of CaCO_3 /l.

1000 ml of standard hard water (SHW), therefore, contain 15,000 mg of CaCO_3 .

1 ml of standard water = $15,000/1000 = 15$ mg of CaCO_3 equivalent.

25 ml of EDTA solution = 20 ml of SHW contains $20 \cdot 15 = 300$ mg of CaCO_3 equivalent.

1 ml of EDTA solution = $300/25 = 12$ mg of CaCO_3 equivalent.

Calculation of hardness of water:

100 ml of water \equiv 18 ml of EDTA solution

$\equiv 18 \cdot 12 = 216$ mg of CaCO_3 equivalent.

1000 ml of water \equiv 2160 mg of CaCO_3 equivalent.

Hence, hardness of water = 2160 mg/l or ppm.

Calculation of permanent hardness of water:

100 ml of water (after boiling) \equiv 12 ml of EDTA solution

$\equiv 12 \cdot 12 = 144$ mg of CaCO_3 equivalent.

1000 ml of water \equiv 1440 mg of CaCO_3 equivalent.

Hence, permanent hardness of water = 1440 ppm.

Calculation of temporary hardness of water:

Temporary hardness of water = (Total – Permanent) hardness

Thus,

Temporary hardness of water = $2160 - 1440 = 720$ ppm.

Answer: Temporary hardness of water = 720 ppm.