

CHEMISTRY ASSIGNMENT :

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Sec:- CSD-A

1. A sample of Water is found to contain the following salts.

19.71 mg/l $Mg [HCO_3]_2$; 12 mg/l $MgCl_2$; 48 mg/l $MgSO_4$ and 5.0 mg/l NaCl. calculate the temporary and Permanent hardness of Water and express it in PPM?

Solution:

SALTS	AMOUNT	$CaCO_3$ eq.
$Mg [HCO_3]_2$	19.71	$\frac{19.71}{146} \times 100 = 13.5$
$MgCl_2$	12.	$\frac{12}{96} \times 100 = 12.63$
$MgSO_4$	48.	$\frac{48}{120} \times 100 = 40.$

Temporary Hardness =

$$\begin{aligned}
 \text{Permanent Hardness} &= (MgCl_2) + (MgSO_4) \\
 &= 12.63 + 40. \\
 &= 52.63 \\
 &= 53 \text{ ppm.}
 \end{aligned}$$

2. Calculate the carbonate and Non-carbonate Hardness of a sample of Water containing the Dissolved salts as given below in mg/l. $Mg[HCO_3]_2 = 21.9$, $Ca[HCO_3]_2 = 243$, $MgCl_2 = 190$, $CaSO_4 = 272$, $NaCl = 50$?

Solution:
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Salts	Amount	$CaCO_3$ eq.
$Mg[HCO_3]_2$	21.9	$21.9 / 146 \times 100 = 15.$
$Ca[HCO_3]_2$	24.3	$243 / 162 \times 100 = 150.$
$MgCl_2$	190	$190 / 95 \times 100 = 200.$
$CaSO_4$	27.2	$27.2 / 136 \times 100 = 20.$

$$\begin{aligned}
 \text{Temporary Hardness} &= Ca(HCO_3)_2 + Mg(HCO_3)_2 \\
 &= 150 + 15 \\
 &= 165 \text{ mg/l.}
 \end{aligned}$$

$$\begin{aligned}
 \text{Permanent Hardness} &= (MgCl_2) + (CaSO_4) \\
 &= 200 + 20 \\
 &= 220 \text{ mg/l.}
 \end{aligned}$$

3. A sample of Water is found to contain the following data in mg/l. $Mg(CHCO_3)_2 = 18.6$; $Ca(CHCO_3)_2 = 16.2$; $MgCl_2 = 9.5$; $MgSO_4 = 6.0$. Calculate the temporary Hardness And Permanent Hardness of the sample of Water ?

Solution :

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Salts	Amount	$CaCO_3$ eq.
$Mg(CHCO_3)_2$	18.6	$\frac{18.6}{146} \times 100 = 12.7$
$Ca(CHCO_3)_2$	16.2	$\frac{16.2}{162} \times 100 = 10$
$MgCl_2$	9.5	$\frac{9.5}{95} \times 100 = 10$
$MgSO_4$	6.0	$\frac{6.0}{120} \times 100 = 5$

$$\begin{aligned}
 \text{Temporary Hardness} &= Mg(CHCO_3)_2 + Ca(CHCO_3)_2 \\
 &= 12.7 + 10 \\
 &= 22.7 \text{ Ppm.}
 \end{aligned}$$

$$\begin{aligned}
 \text{Permanent Hardness} &= (MgCl_2) + (MgSO_4) \\
 &= 10 + 5 \\
 &= 15 \text{ Ppm.}
 \end{aligned}$$

4. Calculate the hardness of Water sample containing 2.4 mg of calcium chloride in 500ml of Water?

Solution:

Given,

2.4 mg of CaCl_2 in 500ml of Water

To Find,

Hardness of the Water.

Mole of CaCl_2 = Mole of CaCO_3

$$2.4 = 2.4$$

$$2.4 = \text{Weight of } \text{CaCO}_3 / 100 = 0.024 \text{ g}$$

$$\text{Weight of } \text{CaCO}_3 = 2.4 / 100$$

$$500 \text{ ml of } 0.024 \text{ g} = \frac{0.024}{500} \times 10^6 = 4.8 \text{ ppm.}$$

5.) What is The Hardness of the solution containing 0.565g of NaCl and 0.6g $MgSO_4$,

Solution:

Given,

0.565g of NaCl

0.6g of $MgSO_4$,

\therefore NaCl \rightarrow Sodium chloride Does Not cause Hardness

$$MgSO_4 = 0.6g$$

$$= \frac{600}{100} \times 1000$$

$$= 500ppm.$$