

Answer on Question #43439 - Chemistry - Inorganic Chemistry

Question:

6.3 g of MgCl_2 is dissolved in 200 mL of water. What is the resulting concentration of Cl^- (aq) ions?

The atomic weight of Mg is 24.3, that of Cl is 35.5. Give your answer in $\text{mol}\cdot\text{L}^{-1}$ and in 2 decimals.

Solution:

MgCl_2 dissociates as follows:



We see that each molecule of magnesium chloride dissociates producing 2 Cl^- ions, i.e. chloride ions' concentration is twice as big as that of magnesium chloride.

Molar concentration of MgCl_2 can be found from the expression:

$$C_M = \frac{n}{V} = \frac{m}{MV}$$

n – Number of moles of MgCl_2 ;

V – The volume of the solution, $V = 200 \text{ mL} = 0.2 \text{ L}$;

m – The mass of MgCl_2 dissolved, $m = 6.3 \text{ g}$;

M – Molar mass of MgCl_2 , $M = M(\text{Mg}) + 2M(\text{Cl}) = 24.3 + 2 \cdot 35.5 = 95.3 \text{ g/mol}$.

$$C_M(\text{MgCl}_2) = \frac{6.3}{95.3 \cdot 0.2} = 0.33 \text{ mol/L}$$

So, the resulting concentration of Cl^- (aq) ions is:

$$C_M(\text{Cl}^-) = 2C_M(\text{MgCl}_2) = 2 \cdot 0.33 = 0.66 \text{ mol/L}$$

Answer: 0.66 mol/L.