

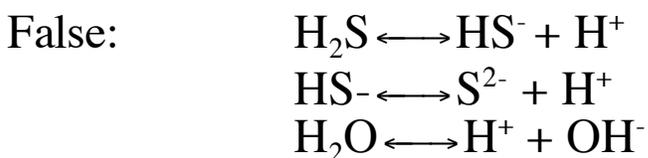
Charge Balance -The sum of positive charges equals the sum of negative charges in solution (Electroneutrality).

The right-hand side of the equation should be roughly equal to the left-hand side.

Protons and hydroxide ions are always present due to the dissociation of water:

The concentration of *either* protons or hydroxide ions can usually be neglected because their concentrations are small relative to the other components of the charge balance.

Ex.1. In a H_2S solution, $[\text{H}^+]$ is two times $[\text{S}^-]$.



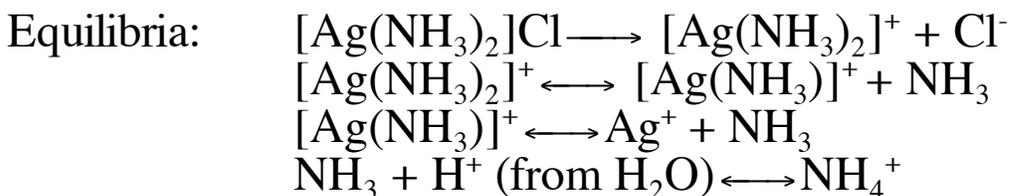
Answer: $[\text{H}^+] = 2[\text{S}^{2-}] + [\text{HS}^-] + [\text{OH}^-]$

Note: Singly charged species - charge conc. is identical to conc. of the species.

But, S^{2-} charge conc. = twice that of the species, hence we must multiply the S^{2-} conc. by 2.

Mass Balance-based on the law of mass conservation and states that the # of atoms of an element remains constant in normal chemical reactions (no atoms can be created or destroyed).

Ex.2. Write the equations of mass balance for a 1.00×10^{-5} M $[\text{Ag}(\text{NH}_3)_2]\text{Cl}$.



Cl⁻ conc. = to the conc. of the salt that is dissociated

$$[\text{Cl}^-] = 1.00 \times 10^{-5} \text{ M}$$

Ag⁺ species = to the conc. of Ag⁺ in the original salt

$$[\text{Ag}^+] + [\text{Ag}(\text{NH}_3)]^+ + [\text{Ag}(\text{NH}_3)_2]^+ = 1.00 \times 10^{-5} \text{ M}$$

We have the following N-containing species:



Note: The conc. of N from the last species is twice the conc. of $[\text{Ag}(\text{NH}_3)_2]^+$

The total conc. of N is twice the concentration of the original salt, since there are two NH_3 per molecule. Hence:

$$[\text{NH}_4^+] + [\text{NH}_3] + [\text{Ag}(\text{NH}_3)]^+ + 2[\text{Ag}(\text{NH}_3)_2]^+ = 2.00 \times 10^{-5}$$