Conjugate Acid-Base Pairs

Problem

Hydrogen bromide is a gas at room temperature. It is soluble in water, forming hydrobromic acid. Identify the conjugate acid-base pairs in the reaction between HBr(g) and water to form $H_3O^+(aq)$ and $Br^-(aq)$.

What Is Required?

You need to identify the two sets of conjugate acid-base pairs.

What Is Given?

You know that hydrogen bromide forms hydrobromic acid in aqueous solution.

Plan Your Strategy

Step 1 Write a chemical equation.

Step 2 On the left side of the equation, identify the acid as the molecule that donates a proton. Identify the base as the molecule that accepts the proton.

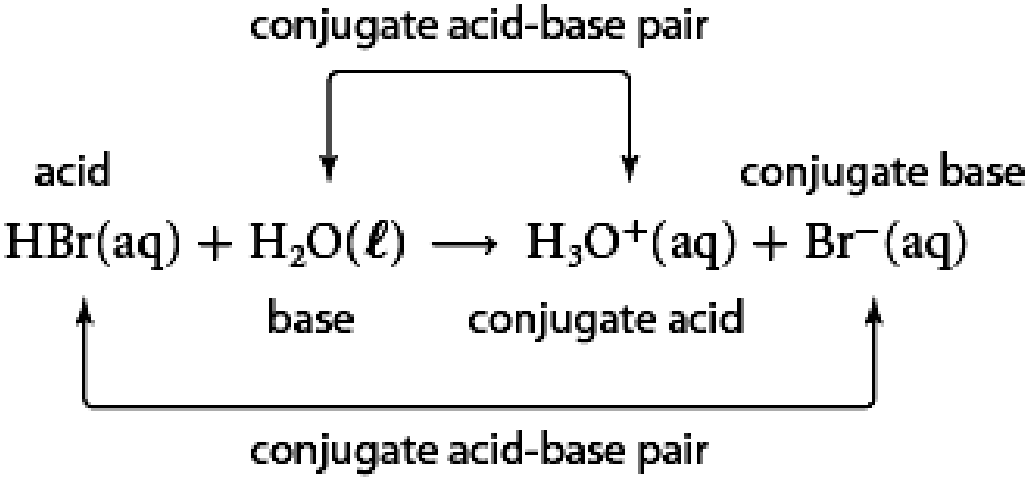
Step 3 Identify the conjugate base on the right side of the equation as the particle with one less proton than the acid on the left side of the equation. Identify the particle on the right that has one proton more than the base on the left as the conjugate acid.

Act on Your Strategy

Step 1 $HBr(g) + H_2O(\ell) \rightarrow H_3O^+(aq) + Br^-(aq)$

Step 2 Hydrogen bromide donates a proton, so it is the Brønsted-Lowry acid in the reaction. Water accepts the proton, so it is the Brønsted-Lowry base.

Step 3 The conjugate base is $Br^-(aq)$, and the conjugate acid is $H_3O^+(aq)$. The conjugate acid-base pairs are $HBr(g)/Br^-(aq)$ and $H_2O(\ell)/H_3O^+(aq)$.



Check Your Solution

The formulas of the conjugate acid-base pairs differ by one proton, H^+.

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