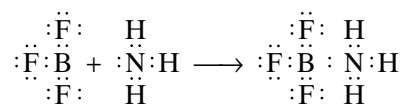


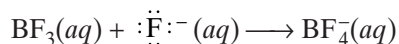
TABLE 5 Acid-Base Definitions

Type	Acid	Base
Arrhenius	H ⁺ or H ₃ O ⁺ producer	OH ⁻ producer
Brønsted-Lowry	proton (H ⁺) donor	proton (H ⁺) acceptor
Lewis	electron-pair acceptor	electron-pair donor

The Lewis definition of acids can apply to species in any phase. For example, boron trifluoride is a Lewis acid in the gas-phase combination with ammonia.



A **Lewis base** is an atom, ion, or molecule that donates an electron pair to form a covalent bond. An anion is a Lewis base in a reaction in which it forms a covalent bond by donating an electron pair. In the example of boron trifluoride reacting with the fluoride anion, F⁻ donates an electron pair to boron trifluoride. F⁻ acts as a Lewis base.

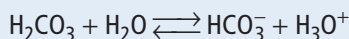


A **Lewis acid-base reaction** is the formation of one or more covalent bonds between an electron-pair donor and an electron-pair acceptor.

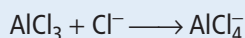
Note that although the three acid-base definitions differ, many compounds may be categorized as acids or bases according to all three descriptions. For example, ammonia is an Arrhenius base because OH⁻ ions are created when ammonia is in solution, it is a Brønsted-Lowry base because it accepts a proton in an acid-base reaction, and it is a Lewis base in all reactions in which it donates its lone pair to form a covalent bond. A comparison of the three acid-base definitions is given in **Table 5**.

SECTION REVIEW

1. Label each reactant in the reaction below as a proton donor or a proton acceptor and as acidic or basic.



2. For the reaction below, label each reactant as an electron pair acceptor or electron pair donor and as a Lewis acid or a Lewis base.



Critical Thinking

3. **ANALYZING INFORMATION** For the following three reactions, identify the reactants that are Arrhenius bases, Brønsted-Lowry bases, and/or Lewis bases. State which type(s) of bases each reactant is. Explain your answers.

