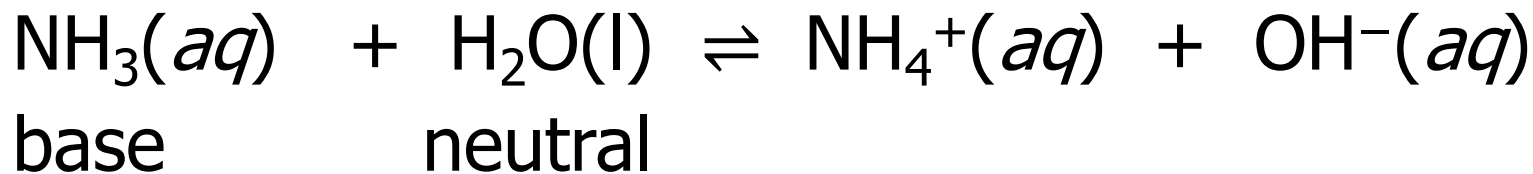
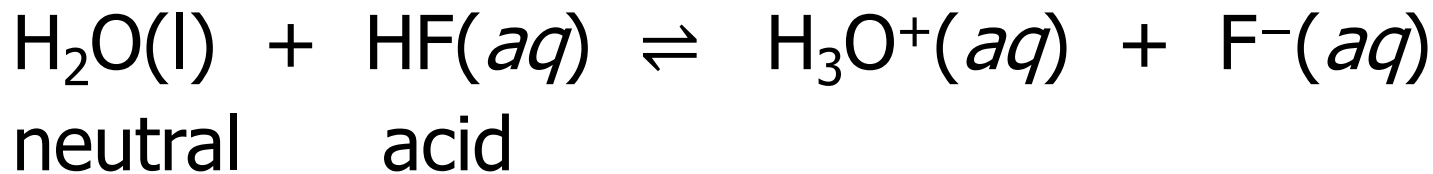
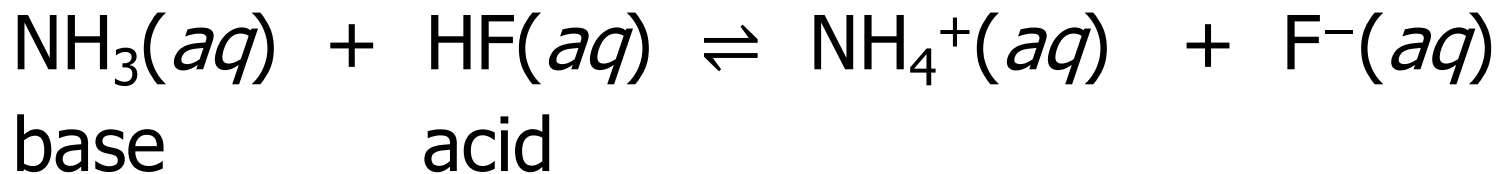


Three Definitions of Acids and Bases



- **Arrhenius**
 - An acid is a substance that generates H_3O^+ in water
 - A base is a substance that generates OH^- in water
- **Brønsted-Lowry**
- **Lewis**

Arrhenius Acid-Base Reactions?

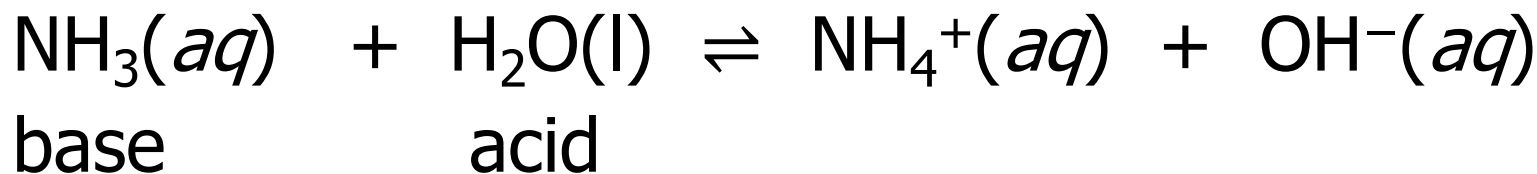
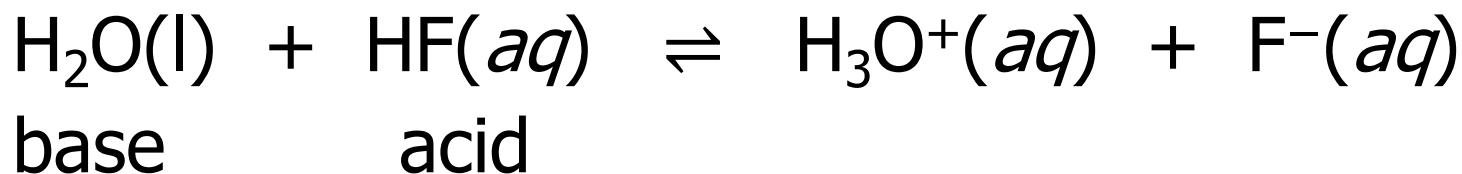
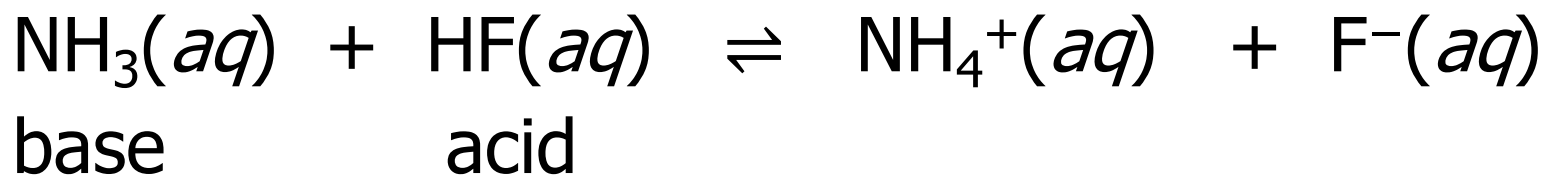


Acid and Base Definitions



- **Acid**
 - Arrhenius: a substance that generates H_3O^+ in water
 - Brønsted-Lowry: a proton, H^+ , donor
- **Base**
 - Arrhenius: a substance that generates OH^- in water
 - Brønsted-Lowry: a proton, H^+ , acceptor
- **Acid-Base Reaction**
 - Arrhenius: between an Arrhenius acid and base
 - Brønsted-Lowry: a proton (H^+) transfer

Brønsted-Lowry Acids and Bases



Why Two Definitions for Acids and Bases? (1)

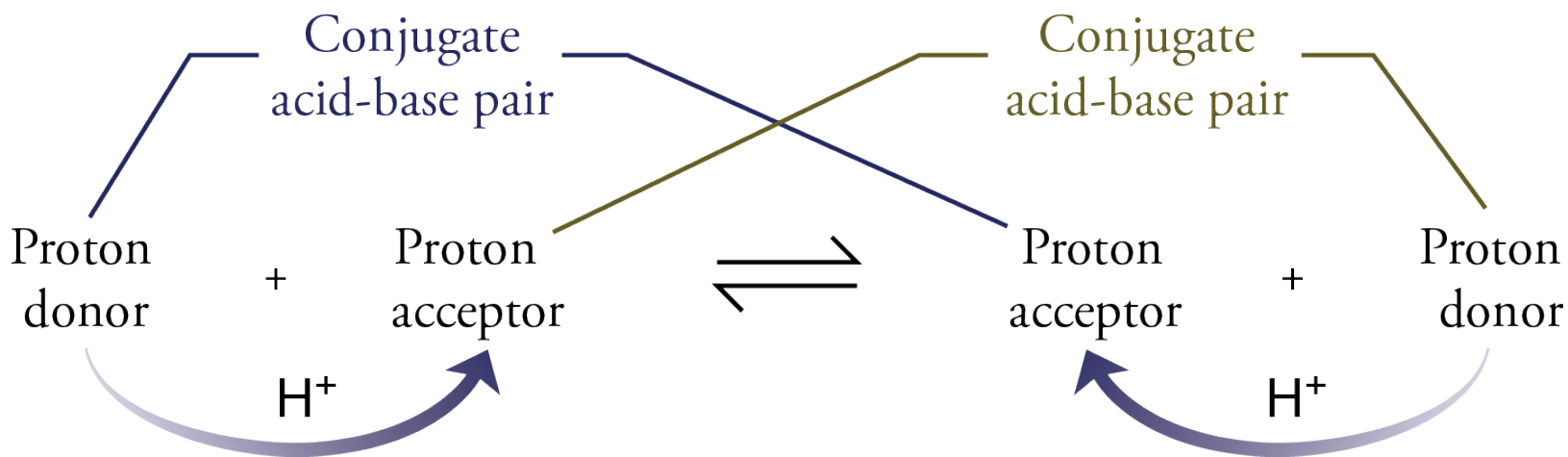
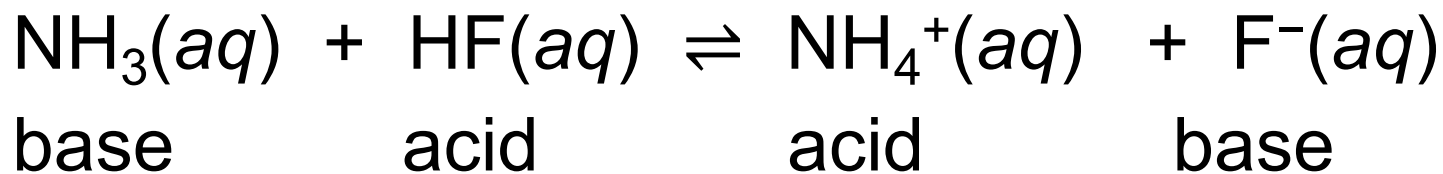


- Positive Aspects of Arrhenius Definitions
 - All isolated substances can be classified as acids (generate H_3O^+ in water), bases (generate OH^- in water), or neither.
 - Allows predictions, including (1) whether substances will react with a base or acid, (2) whether the pH of a solution of the substance will be less than 7 or greater than 7, and (3) whether a solution of the substance will be sour or bitter.
- Negative Aspects of Arrhenius Definitions
 - Does not include similar reactions (H^+ transfer reactions) as acid-base reactions.

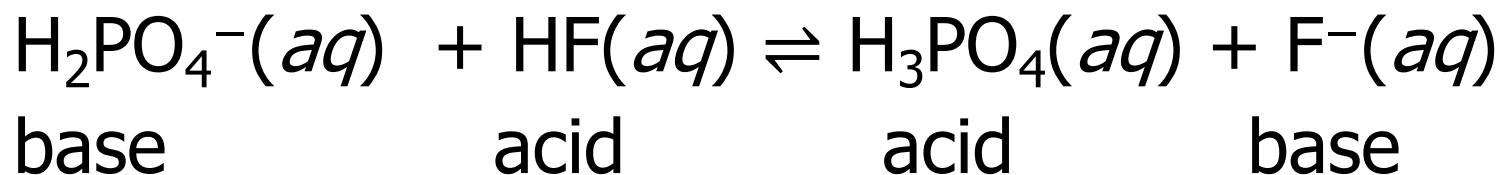
Why Two Definitions for Acids and Bases? (2)

- Positive aspects of Brønsted-Lowry model
 - Includes similar reactions (H^+ transfer reactions) as acid-base reactions.
- Negative aspects of Brønsted-Lowry model
 - Cannot classify isolated substances as acids, bases, or neither. The same substance can sometimes be an acid and sometimes a base.
 - Does not allow predictions of (1) whether substances will react with another substance, (2) whether the pH of a solution of the substance will be less than 7 or greater than 7, and (3) whether a solution will be sour or bitter.

Conjugate Acid-Base Pairs



Brønsted-Lowry Acids and Bases



- H_3PO_4 is the conjugate acid of H_2PO_4^- .
- H_2PO_4^- is the conjugate base of H_3PO_4 .
- H_3PO_4 and H_2PO_4^- are a conjugate acid-base pair.
- F^- is the conjugate base of the acid HF.
- HF is the conjugate acid of the acid F^- .
- HF and F^- are a conjugate acid-base pair.

Amphoteric Substances

Can be a Brønsted-Lowry acid in one reaction and a Brønsted-Lowry base in another?

