

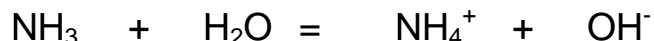
Table L Common Bases:  $\text{NH}_3 (\text{aq}) = \text{"ammonia water"}$

According to Arrhenius, Bases  $\xrightarrow{\text{H}_2\text{O}} \text{OH}^- (\text{aq})$

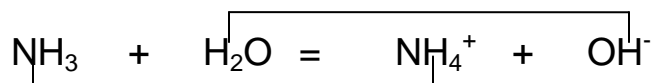
How does ammonia do this?? We need an alternate theory to explain A/B behavior?

**Aim: What is an alternate theory explain A/B behavior?**

1st, take the  $\text{H}_2\text{O}$  out of the (aq) and react it with  $\text{NH}_3$ .

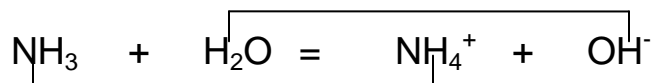


2<sup>nd</sup>, notice which species gains or loses  $\text{H}^+$ .



According to an alternate theory (aka Bronsted- Lowry Theory):

1) **A/B reactions involve the transfer of protons ( $\text{H}^+$ ).** The species (substance) that donates (loses) an  $\text{H}^+$  is the ACID; the species that accepts (gains) an  $\text{H}^+$  is the BASE.

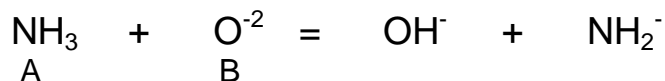


**Base**  
gains  $\text{H}^+$   
proton  
acceptor

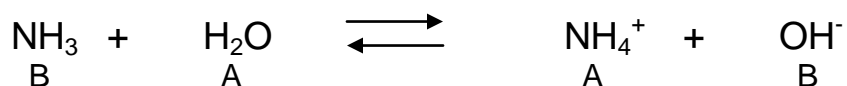
**Acid**  
loses  $\text{H}^+$   
proton  
donor

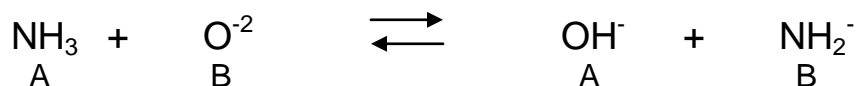
(In this case, since the  $\text{H}_2\text{O}$  is more willing to donate a  $\text{H}^+$  than accept a  $\text{H}^+$ , it acts as an acid. On the other hand, since the  $\text{NH}_3$  is more willing to accept a  $\text{H}^+$  than donate a  $\text{H}^+$ , it acts as a base)

2) Whether a substance acts as an acid or a base depends on what it reacts with. (In other words, **A/B designations are relative.**)



3) Since A/B reactions are **reversible**, in every A/B reaction there are two acids and two bases.





(NOTE: The direction favored by nature depends on the relative strengths of the acids and bases)

**4) A Conjugate A/B Pair** = is an acid/base couple that differ only by 1 H<sup>+</sup>

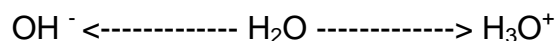
-----Lose H<sup>+</sup>----->

<-----Gain H<sup>+</sup>-----

ACID	BASE
NH <sub>4</sub> <sup>+</sup>	NH <sub>3</sub>
OH <sup>-</sup>	O <sup>-2</sup>
H <sub>3</sub> O <sup>+</sup>	H <sub>2</sub> O
HCl	Cl <sup>-</sup>
HNO <sub>3</sub>	NO <sub>3</sub> <sup>-</sup>
H <sub>2</sub> SO <sub>4</sub>	HSO <sub>4</sub> <sup>-</sup>
HCN	CN <sup>-</sup>

Note: the charge changes because a hydrogen ion has a +1 charge; therefore, in going from the acid to the base, remove an H and subtract a +1 from the initial charge.

**5) Amphiprotic** – a specie that can gain or lose an H<sup>+</sup> depending upon what it reacts with. For example,



Note: to be amphiprotic, it must have at least 1 H.