

Acids and Bases

What is an acid?

Brønsted/Lowry acid: a proton donor
proton donor?...

a proton is also an H^+ ion

in water, $\text{H}_2\text{O} + \text{donated } \text{H}^+ \rightarrow \text{H}_3\text{O}^+$

- H_3O^+ = “hydronium ion”

What is a base?

Brønsted/Lowry base: a proton acceptor
proton acceptor?...

any substance that will take an H^+ ion

in water, $\text{H}_2\text{O} + \text{base} \rightarrow \text{OH}^- + \text{Hbase}$

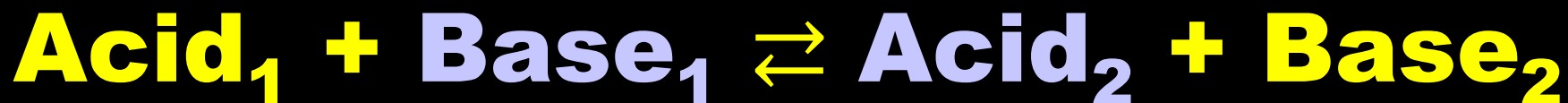
Brønsted /Lowry “neutralization”

For weak acids and weak bases



what's actually happening?

Note the “double arrow”



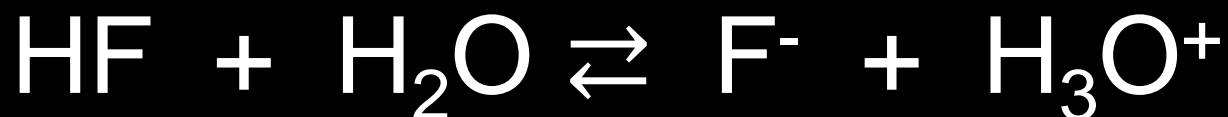
Acid₁ donates H⁺ and becomes Base₂, its “conjugate base”



- Base₁ accepts the H⁺ from Acid₁ and becomes Acid₂, its “conjugate acid”

Brønsted /Lowry “neutralization”

Examples...



HF donates an H^+ \Rightarrow is an “acid”

H_2O takes the H^+ from the HF
 \Rightarrow it is the “base”

Brønsted /Lowry “neutralization”



Look at the “reverse” reaction

which donates an H^+ \Rightarrow it is an “acid”



which takes the H^+ from the H_3O^+ \Rightarrow it is the “base”



Brønsted /Lowry “neutralization”



- HF – a weak acid – becomes F⁻, a base
- H₂O, acting as a base, becomes H₃O⁺, an “acid”

The acid becomes its “conjugate base”

The base becomes its “conjugate acid”

Brønsted /Lowry “neutralization”

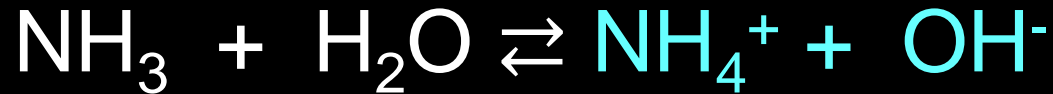
Examples...



H_2O donates an H^+ \Rightarrow is an “acid”

NH_3 takes the H^+ from the H_2O
 \Rightarrow it is the “base”

Brönsted /Lowry “neutralization”



Look at the “reverse” reaction

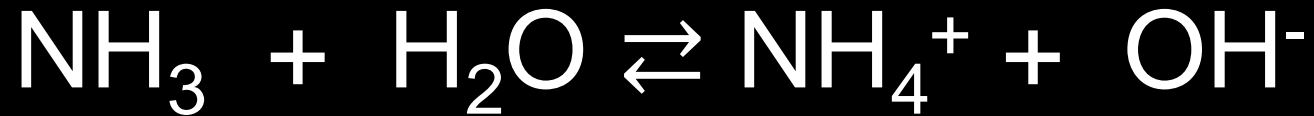
which donates an H^+ \Rightarrow it is an “acid”



which takes the H^+ from the NH_4^+ \Rightarrow it is the “base”



Brönsted /Lowry “neutralization”



- H_2O – a weak acid – becomes OH^- , a base
- NH_3 , acting as a base, becomes NH_4^+ , an “acid”

The acid becomes its “conjugate base”

The base becomes its “conjugate acid”

Brønsted /Lowry “neutralization”

a weak acid \rightleftharpoons their conjugate
+ a weak base acid and base

Weak acids lose an H^+ and
become their conjugate bases

Weak bases gain an H^+ and
become their conjugate acids



- In Brønsted/Lowry Theory, “neutralization” *only means an acid and a base react together*
- It says **NOTHING** about the pH after they react!!

B/L Neutralization \Rightarrow pH \neq 7

What is the conjugate base of...

HCl?

Cl^-

CH_3COOH ?

CH_3COO^-

HNO_3 ?

NO_3^-

H_2CO_3 ?

HCO_3^-

HNO_2 ?

NO_2^-

HCO_3^- ?

CO_3^{2-}

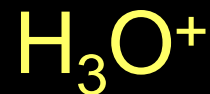
NH_4^+ ?

NH_3

H_3O^+ ?

H_2O

What is the conjugate acid of...



Did you notice...

...that H_2O was listed as an *acid*, and as a *base* \Rightarrow but a pure H_2O solution has $\text{pH} = 7$?

H_2O can act as an acid (lose an H^+) or a base (accept an H^+) depending on what it is combined with

AMPHOTERIC: act as an acid when with a base; act as a base when with an acid

Acids and Bases



Acids and Bases

