

4. Bronsted – Lowry Theory of Acids and Bases

Demo PHTH
+ methyl
orange
HCl
NaOH
NaCl
Na₂CO₃

- *takes equilibrium reactions into account!*

a) Acids

i) Proton donors – gives H⁺ to another substance



- HCl donated *one* proton to H₂O, so it is an acid.
- HCl is a “Monoprotic Acid” (donates *one* proton).



- H₂SO₄ donated a proton to H₂O
- HSO₄⁻ can also donate a proton!



- H₂SO₄ is a “Diprotic Acid” (can donate *two* protons total).



- H₂PO₄⁻ can still donate 2 protons.
- H₃PO₄ is a “Triprotic Acid” (can donate *three* protons total).

b) Bases

i) Proton acceptors – receives an H⁺ from a substance.



- NH₃ receives an H⁺ to form NH₄⁺ so it is a base.

c) Amphiprotic Species

i) Substances that act as both an acid or a base (depends on the situation).

ii) Water is a common amphiprotic substance

iii) Example:



iv) Diprotic and Triprotic Acids that have already lost a proton are also amphiprotic.

v) Example:



d) Bronsted – Lowry Reactions

i) all BL reactions have an acid and a base on both sides of the equilibrium!

ii) Example:



e) Identify the Acid and Base on the Reactant Side of Equilibrium



f) Identify the Acid and Base on Both Sides of Equilibrium



g) Conjugate Pairs

i) A conjugate pair is the two similar species on either sides of the equilibrium that differ by only one proton.

ii) Identify the conjugate pairs:



h) Conjugate Acids and Bases

i) In each conjugate pair, one is the *conjugate acid* and one is the *conjugate base*

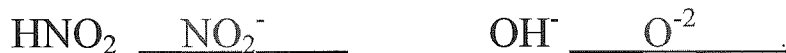
ii) Conjugate acid (CA) – the one species of the pair that has the extra proton

iii) Conjugate base (CB) – the one species of the pair that has one less proton.

iv) Identify the CA's and CB's for each equilibrium:



v) What is the conjugate base of the following species?



vi) What is the conjugate acid of the following species?



i) Summary

i) All Bronsted-Lowry reactions have a CA and a CB on each side of the equilibrium.



CA_1 and CB_1 are conjugate pairs

CB_2 and CA_2 are conjugate pairs

ii) Complete the following reactions and identify the CA and CB on both sides of the equilibrium:

