

HONORS CHEMISTRY: ACIDS AND BASES REVISITED

DATE: _____

Learning Goals: SWBAT...

- ...expand their definition of what an acid and a base are.
- ...identify conjugate acid-base pairs.
- ...differentiate between strong and weak acids.

In the 1880s, **SVANTE ARRHENIUS** came up with the definitions of acids and bases we've been using:

Acid:

Base:

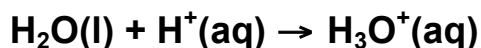
In the 1920's **JOHANNES BRONSTED + THOMAS LOWRY** defined acids and bases in a new way:

Acid:

Base:

This was a more inclusive definition since it could account for...

When an acid releases a proton into water, it joins with water molecule to form a _____.



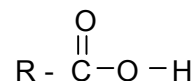
- If an acid releases only one hydrogen ion then it is called _____ ex)
- If it can release more than one than it is called _____ ex)
- ex) If it can release two protons, it would be called _____ ex)
- (Obviously, polyprotic acids will require _____ base to completely neutralize.)

- **OXYACIDS:**

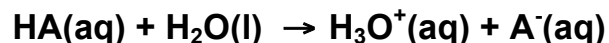
ex)

- **ORGANIC ACIDS:**

ex)



USING THE BRONSTED-LOWRY DEFINITIONS, AN ACID DISSOCIATION CAN BE REPRESENTED WITH:

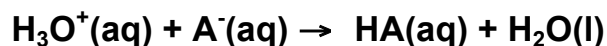


CONJUGATE ACID-BASE PAIR:

What are the two pairs?

Try this... Write the conjugate acid for NH_3 . Write the conjugate base for HClO_4 .

Nothing is stopping the conjugate base (hydronium ion) from reacting with the conjugate acid:



- This is often called the _____ reaction (as opposed to the *forward* reaction)

This sets up a competition between the forward and reverse reactions (a.k.a. _____):



If water wants the proton more than the conjugate base, then...



- The acid completely dissociates/ionizes, so it would be considered a _____

ex)



If the conjugate base wants the proton more than water, then...



- There will be little dissociation/ionization, so it would be considered a _____.

ex)

STRONG ACIDS HAVE _____ CONJUGATE BASES (THAT'S WHY THE FORWARD REACTION DOMINATES).

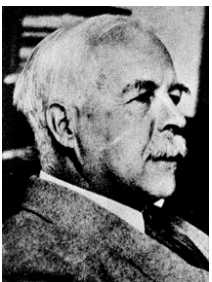
WEAK ACIDS HAVE _____ CONJUGATE BASES (THAT'S WHY THE REVERSE REACTION DOMINATES).

Note: bases can also be strong or weak, depending on how much conjugate acid forms:

ex) $\text{NH}_3(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq})$ Ammonia is a _____ base.

ex) $\text{NaOH}(\text{aq}) \xrightarrow{\text{H}_2\text{O}} \text{Na}^+(\text{aq}) + \text{OH}^-(\text{aq})$ Sodium hydroxide is a _____ base.

DID YOU KNOW... "Gilbert Newton Lewis (of Lewis Dot fame) had an even broader definition of acids and bases as electron pair acceptors and donors, respectively. Gilbert Newton Lewis was probably the greatest and most influential influential of American chemists. Lewis believed that a chemistry department should simultaneously teach science and advance it, always remembering that the most important emphasis must be placed on fundamental principles rather than its technical applications. During his career he published over 150 papers. Lewis' book, *Valence and the Structure of Atoms and Molecules*, is a classic, one of the greatest greatest contributions to modern bonding theory. Although Lewis never received the Nobel Prize, it is commonly felt that his work more than merited this award." (<http://www.woodrow.org>)



"I have attempted to give you a glimpse...of what there may be of soul in chemistry. But it may have been in vain. Perchance the chemist is already damned and the guardian the blackest. But if the chemist has lost his soul, he will not have lost his courage and as he descends into the inferno, sees the rows of glowing furnaces and sniffs the homey fumes of brimstone, he will call out-: 'Asmodeus, hand me a test-tube.'"-G.N. Lewis