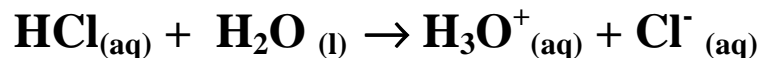


## REVISION OF ARRHENIUS' THEORY

- Arrhenius' definitions could not always correctly predict whether a substance is an acid or base
- Using Arrhenius' theory the following would be incorrectly classified as neutral
  1. Compounds of hydrogen polyatomic ions ( $\text{NaHCO}_{3(\text{aq})}$ )
  2. Oxides of metals and non metals ( $\text{CaO}_{(\text{aq})}$  and  $\text{CO}_{2(\text{g})}$ )
  3. Bases other than hydroxides ( $\text{NH}_{3(\text{aq})}$  and  $\text{Na}_2\text{CO}_{3(\text{aq})}$ )
  4. Acids that do not contain hydrogen ( $\text{Al}(\text{NO}_3)_{3(\text{aq})}$ )
- The revised Arrhenius theory involves two key ideas not considered by Arrhenius
  1. Collisions with water molecules
  2. The nature of hydrogen ions
- Substances being tested as acids or bases are done in aqueous solutions so that particles will constantly be colliding with and reacting with water
- Aqueous hydrogen ions are not likely to exist because if they came near a polar water molecule they would bond strongly to the water becoming hydrated
- A hydrated hydrogen ion is referred to as a *HYDRONIUM* ion and has the symbol  $\text{H}_3\text{O}^+_{(\text{aq})}$

- The revised theory defines an acid as a substance that reacts with water

example:



- Bases under the revised theory are still defined as substances that increase the hydroxide ion concentration
- The revised theory allows for an explanation of bases that are not ionic hydroxides
- Ionic hydroxides still dissociate completely to form strong bases
- Weak bases are defined as substances that react with water to form hydroxide ions

example:

