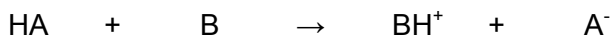
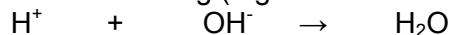


## MiniChem 6: Aqueous Solutions

### 1. Acid/Base Reactions

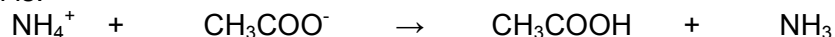


- If the acid and the base are both strong (e.g. HCl and NaOH) then the net equation is:



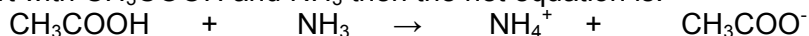
(Cl<sup>-</sup> and Na<sup>+</sup> are spectator ions when HA≡HCl and B≡NaOH)

- If the acid and the base are both weak, e.g. NH<sub>4</sub>Cl and CH<sub>3</sub>COONa, then the net equation is:



and Cl<sup>-</sup> and Na<sup>+</sup> are spectator ions.

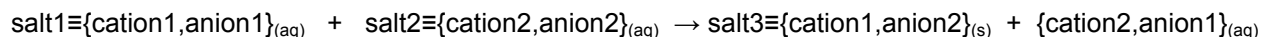
- if you start with CH<sub>3</sub>COOH and NH<sub>3</sub> then the net equation is:



and there are no spectator ions.

Note that when you dissolve a strong acid (or base) in water it dissociates completely. Thus, in the case of HCl (or NaOH) the only species in the aqueous solution (besides water and its auto-dissociation products) are H<sup>+</sup> and Cl<sup>-</sup> (or Na<sup>+</sup> and OH<sup>-</sup>). But if you dissolve a weak acid such as CH<sub>3</sub>COOH the species present in solution are CH<sub>3</sub>COOH (since it is not completely dissociated), CH<sub>3</sub>COO<sup>-</sup> and H<sup>+</sup>. Finally, if you dissolve a weak base such as NH<sub>3</sub>, the species present in solution are NH<sub>4</sub><sup>+</sup> and OH<sup>-</sup> (besides water and its auto-dissociation products).

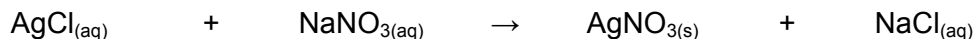
### 2. Precipitation Reactions



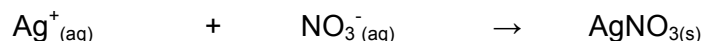
and the net ionic equation for this reaction is :



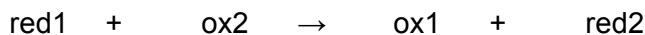
Example:



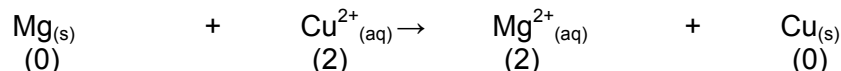
or



### 3. Redox Reactions



Example:



Note that in a red/ox reaction species change oxidation state in going from reactants to products. Redox reactions involve the exchange of electrons between species:

