1. When water is added to the reaction vessel, the temperature of the reaction mixture decreases. The decrease in temperature is due to the exothermic nature of the reaction. This indicates that the reaction is releasing heat.

2. The concentration of hydrogen ions (H+) in the solution decreases as the reaction proceeds. This is evidenced by the change in color of the indicator, which shifts from orange to blue. The decrease in H+ concentration is due to the reaction with sodium hydroxide (NaOH).

3. The reaction equation is as follows:

\[ \text{NH}_3 + \text{HCl} \rightarrow \text{NH}_4 \text{Cl} \]

The concentration of ammonium ions (NH₄⁺) in the solution increases as the reaction proceeds. This is shown by the change in color of the indicator, which shifts from blue to orange. The increase in NH₄⁺ concentration is due to the reaction with hydrogen chloride (HCl).

4. The reaction equation is as follows:

\[ \text{CuSO}_4 + \text{Fe} \rightarrow \text{FeSO}_4 + \text{Cu} \]

The concentration of copper (II) ions (Cu²⁺) in the solution decreases as the reaction proceeds. This is shown by the change in color of the indicator, which shifts from blue to green. The decrease in Cu²⁺ concentration is due to the reaction with iron (Fe).

5. The reaction equation is as follows:

\[ \text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2 \]

The concentration of hydrogen ions (H+) in the solution decreases as the reaction proceeds. This is evidenced by the change in color of the indicator, which shifts from orange to blue. The decrease in H+ concentration is due to the reaction with hydrogen sulfide (H₂S) gas.

6. The reaction equation is as follows:

\[ \text{CaCO}_3 + \text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2 \]

The concentration of calcium ions (Ca²⁺) in the solution increases as the reaction proceeds. This is shown by the change in color of the indicator, which shifts from red to yellow. The increase in Ca²⁺ concentration is due to the reaction with hydrochloric acid (HCl).