REACTION OF SODIUM HYDROXIDE WITH CARBON DIOXIDE

In this demonstration, a carbon dioxide (in the form of “dry ice”) is added to a solution of sodium hydroxide and universal indicator. Any changes in pH that occur are observed by a change in colour of the universal indicator (chart below).

The equations for the dissolution of carbon dioxide into water is given below:

\[
\text{CO}_2 + \text{H}_2\text{O} \rightleftharpoons \text{H}_2\text{CO}_3
\]

1. Is carbon dioxide an acid, a base or neither? **An acid**

2. What colour was the sodium hydroxide solution before the addition of dry ice? **Purple**

3. Predict what will happen when the carbon dioxide is added to the sodium hydroxide solution.

4. Describe what did happen and change your answer to Q1 if required. **The colour of the solution changed from purple (alkali) to green (neutral) to orange / red (weak acid).**

Challenge Questions

1. Write out the equations for the reactions of SO\(_2\), SO\(_3\), ClO\(_3\) and MgO with water. Are they acids, bases or neither?

   \[
   \begin{align*}
   \text{SO}_2 + \text{H}_2\text{O} & \rightarrow \text{H}_2\text{SO}_3 & \text{(sulfurous acid: SO}_2\text{ is an acidic oxide)} \\
   \text{SO}_3 + \text{H}_2\text{O} & \rightarrow \text{H}_2\text{SO}_4 & \text{(sulfuric acid: SO}_3\text{ is an acidic oxide)} \\
   \text{ClO}_3 + \text{H}_2\text{O} & \rightarrow \text{H}_2\text{ClO}_4 & \text{(perchloric acid: ClO}_3\text{ is an acidic oxide)} \\
   \text{MgO} + \text{H}_2\text{O} & \rightarrow \text{Mg(OH)}_2 & \text{(magnesium hydroxide: MgO is a basic oxide)}
   \end{align*}
   \]

2. Fill in the curly arrows for the reaction of water with carbon dioxide, described by equation X.