Science - Acids and alkalis

Section A: pH scale
The pH scale measures the acidity or alkalinity of a solution. The pH of a solution can be measured using a pH probe, or estimated using universal indicator and a colour chart.

<table>
<thead>
<tr>
<th>Acids</th>
<th>Neutral</th>
<th>Alkaline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasingly acidic</td>
<td>Neutral</td>
<td>Increasingly alkaline</td>
</tr>
</tbody>
</table>

Section B: What is an acid?
An acid is a substance that contains a hydrogen that can be released into water. Some substances contain hydrogen, but are not acids, because when put in water, the hydrogen remains tightly bonded to the other atoms. When an acid is put into water, the hydrogen will break away from the other atoms to form hydrogen ions (H\(^+\)). This makes the liquid acidic.
A hydrogen ion is formed when a hydrogen atom loses an electron and therefore becomes positively charged (it has a charge of +1).

Section C: What is an alkali?
An alkali is a substance that produces hydroxide ions (OH\(^-\)) when dissolved in water.
A base is a substance that will react with acids and neutralise them; however, it is not an alkali because it will not dissolve in water. We can therefore say that all alkalis are bases, but not all bases are alkalis.

Section D: Neutralisation reactions
A neutralisation reaction is a reaction between an acid and a base. Remember:
- acids in solution are sources of hydrogen ions, H\(^+\)
- alkalis in solution are sources of hydroxide ions, OH\(^-\)

In acid-alkali neutralisation reactions, hydrogen ions from the acid react with hydroxide ions from the alkali:

\[\text{H}^+ (\text{aq}) + \text{OH}^- (\text{aq}) \rightarrow \text{H}_2\text{O}(l)\]

Pure water is neutral (its pH is 7). A neutral solution can be produced if the correct amounts of acid and alkali react together. The change in pH during a neutralisation reaction can be measured using a pH probe and meter, or estimated using universal indicator solution and a pH colour chart.

Section E: Reactions of acids with metals
When acids react with metals, the products are a salt and hydrogen. In general:
- Acid + metal → salt + hydrogen

For example:
- Hydrochloric acid + magnesium → magnesium chloride + hydrogen

\[2\text{HCl}(\text{aq}) + \text{Mg}(s) \rightarrow \text{MgCl}_2(\text{aq}) + \text{H}_2(\text{g})\]

Section F: Naming salts
The name of a salt has two parts. The first part comes from the base, alkali or metal carbonate. The second part comes from the acid:
- Hydrochloric acid produces chloride salts
- Nitric acid produces nitrate salts
- Sulfuric acid produces sulfate salts