

Acids, alkalis and pH

An **aqueous solution** is formed when a substance dissolves in water. The aqueous solution may be acidic, alkaline or neutral. Water itself is neutral. **Indicators** can show if a solution is acidic, alkaline or neutral by changing colour.

1. What is an aqueous solution?
2. What sort of aqueous solutions can be made?
3. How do indicators work?

The **pH scale** is used to show how acidic or alkaline a solution is. If something is pH 7, it is neutral. If something is pH 0, it is strongly acidic. If something is pH 14, it is strongly alkaline.

4. What does the pH scale tell us?
5. What does it mean if something is: (a) pH 0, (b) pH 7, (c) pH 14?

Carbon, sulphur and nitrogen are **non-metals**. When they burn in air, they react with oxygen to make **oxides**. Carbon makes carbon dioxide, sulphur makes sulphur dioxide, and nitrogen makes nitrogen dioxide. When these gases dissolve in water, they make **acids**.

6. Name three non-metals, and the gases they make when they burn in air.
7. Match the **heads** to the correct **tails**, and write out the correct sentences:

| | |
|--|---|
|  heads carbon dioxide makes • sulphur dioxide makes • nitrogen dioxide makes • |  tails • sulphuric acid • nitric acid • carbonic acid |
|--|---|

When **metals** burn in air, they react with oxygen to make solid **oxides**. When these solid oxides dissolve in water, they make **alkalis**. For example, sodium reacts with air to make sodium oxide. This dissolves in water to make **sodium hydroxide**, which is a common strong alkali.

8. What is made when metal oxides or metal hydroxides dissolve in water?
9. Match the **heads** to the correct **tails**, and write out the correct sentences:

| | |
|--|---|
|  heads sodium oxide dissolves in water to make • potassium oxide dissolves in water to make • calcium oxide dissolves in water to make • |  tails • potassium hydroxide • calcium hydroxide • sodium hydroxide |
|--|---|

10. Draw a pH scale like this one:

| | | | | | | | | | | | | | | |
|-----------------------|---|---|---|---|---|---|---|-------------------------|---|----|----|----|----|----|
| ← increasingly acidic | | | | | | | | increasingly alkaline → | | | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

Write on your pH scale, the names of these substances at the correct positions:

| substance | pH | substance | pH | substance | pH |
|--------------------------------|----|--------------|----|------------------|----|
| ammonia | 12 | lemon juice | 2 | sodium hydroxide | 14 |
| bleach | 11 | limewater | 10 | toothpaste | 8 |
| car battery acid | 1 | milk | 6 | vinegar | 4 |
| coca cola | 5 | orange juice | 4 | water | 7 |
| concentrated hydrochloric acid | 0 | oven cleaner | 13 | washing soda | 11 |