

# Section 4 Summary

## 4.1 The pH Scale

a) Universal indicator, pH paper or a pH meter can be used to find the pH of solutions.

b) pH paper and universal (pH) indicator have different colours for pH values

Acid pH	Neutral pH	Alkali pH
<i>red/orange/yellow</i>	<i>green</i>	<i>blue/purple</i>

c) The **pH scale** has a number range from 0 to 14  
(although it is possible for pH to go below 0 and above 14)

d) If the pH **equals** 7 then the solution is **neutral**.

e) If the pH is **less than** 7 then the solution is **acidic**.

f) If the pH is **greater than** 7 then the solution is **alkaline**.

g) Water is a neutral substance with a pH = 7

- Sugar solution and salt solution are both neutral pH = 7

h) The lower the pH, the more concentrated the acid  
the greater the acidity

i) The higher the pH, the more concentrated the alkali  
the greater the alkalinity

j) Diluting **Acids** (Acids have a pH less than 7)  
Adding water to acids decreases the acidity.  
Increases pH number until it reaches 7.  
pH number never goes above 7.

k) Diluting **Alkalis** (Alkalis have a pH above 7)  
Adding water to alkalis decreases the alkalinity.  
Decreases pH number until it reaches 7.  
pH number never goes below 7.



## Section 4 Summary

### 4.2 Common Acids and Alkalis

- a) **Acids and alkalis** are very common in the home laboratory.
- b) **Laboratory acids** include (pH usually around 0-1) hydrochloric acid, sulphuric acid, nitric acid.
- c) **Household acids** include (pH usually around 3-6) vinegar, lemon juice, lemonade, soda water, coke.
- d) **Laboratory alkalis** include sodium hydroxide, lime water, ammonia solution.
- e) **Household alkalis** include baking soda, oven cleaner, dishwasher powder, bleach.

# Section 4 Summary

## 4.3 Neutralisation

a) **Neutralisation** is the process where the pH moves towards 7

- Neutralisation moves the pH of the **acid** up towards 7.
- Neutralisation moves the pH of the **alkali** down towards 7.

b) **Alkalis** and **acids** *neutralise* each other to form **water** and a **salt**.

Acid	+	Alkali	→	Salt	+	Water
hydrochloric acid	+	sodium hydroxide	→	sodium chloride	+	water
sulphuric acid	+	calcium hydroxide	→	calcium sulphate	+	water
nitric acid	+	magnesium hydroxide	→	magnesium nitrate	+	water

c) **Metal carbonates neutralise acids** producing water, a salt and carbon dioxide gas.

Acid	+	Metal Carbonate	→	Salt	+	Water	+	Carbon Dioxide
hydrochloric acid	+	potassium carbonate	→	potassium chloride	+	water	+	carbon dioxide
sulphuric acid	+	lithium carbonate	→	Lithium sulphate	+	water	+	carbon dioxide
nitric acid	+	iron carbonate	→	iron nitrate	+	water	+	carbon dioxide

d) **Naming of Salts**

<i>First Name of Salt</i>	The salts contain the <b>metal</b> from the 1. Alkali ( <b>metal</b> hydroxide) 2. <b>metal</b> carbonate
<i>Second Name of Salt</i>	<b>hydrochloric</b> acid forms <b>chloride</b> salts
	<b>sulphuric</b> acid forms <b>sulphate</b> salts
	<b>nitric</b> acid forms <b>nitrate</b> salts

e) **Everyday examples** of neutralisation

- reducing soil acidity
- reducing acidity in lakes
- treatment of indigestion.



## Section 4 Summary

### 4.4 Acid Rain

- a) **Carbon** } react with { **Carbon dioxide**  
**Sulphur** } oxygen { **Sulphur dioxide**  
**Nitrogen** } to make { **Nitrogen dioxide**
- b) **Carbon dioxide** }  
**Sulphur dioxide** } dissolve in water to produce acidic solutions  
**Nitrogen dioxide** }
- c) **Carbon** from fossil fuels (coal, oil and natural gas) burns in air to form carbon dioxide
- d) **Sulphur** is found in coal and other fossil fuels. Sulphur Dioxide is formed on burning these sulphur-containing fuels.
- e) **Nitrogen** in air turns into Nitrogen Dioxide by the sparking of air in car engines. (Lightning also produces the same effect)
- f) **Carbon dioxide** }  
**Sulphur dioxide** } dissolve in rain water to produce acid rain  
**Nitrogen dioxide** }
- g) **Acid rain** has the following damaging effects on the environment
- damages carbonate rocks in buildings
  - speeds up rusting of iron and steel structures
  - changes the pH of soil ( giving less crops)
  - kills plant life
  - kills marine animals e.g. fish