Year 9 Chemistry : Acids and Metals Knowledge Organiser

1. Acids

Acids

If you look around your kitchen, you may find some acids to eat or drink

Vitamin C = Ascorbic Acid

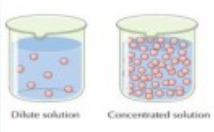
Lemons = Citric Acid

Vinegar = Ethanoic Acid

Fizzy Drink = Carbonic Acid

Some acids are more dangerous. Hydrochloric Acid (HCl), Sulfuric Acid (H_2SO_4) and Nitric Acid (HNO_3) are acids which we use in the Science Lab. These acids can come as dilute or more concentrated

Dilute acids are not as dangerous as concentrated acids. This is because there are fewer acid particles in the same volume



Irritant hazard sign, used for substances that are not corrosive but are irritants. Usually found on more dilute acids and alkali

Corrosive hazard sign. Usually found on more concentrated acids and alkali

2. Alkalis

Bases

A base is a substance that can react with acids and neutralise them. Metal oxides, metal hydroxides and metal carbonates are examples of bases.
Many bases are insoluble – they don't dissolve in water. However, if a base does dissolve in water, we also call it an alkali.

Some alkalis are harmful. However, many are harmless and useful.
Many cleaning products such as bleach, washing powder and oven cleaner contain alkalis.
The most dangerous alkalis in our homes are oven cleaners and caustic soda (used to unblock drains).

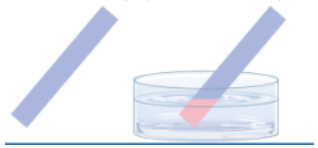
Soap and washing up liquid are safe alkalis.

Oven cleaner is a very strong alkali which is very corrosive.

KEYWORD	DEFINITION
Acid	Solution with a pH value less than 7.
Alkali	A soluble base with a pH value more than 7
Chemical reaction	A change in which atoms are rearranged to create new substances.
Concentrated	A solution is concentrated if it has a large number of solute particles per unit volume.
Concentration	A measure of the number of particles in a given volume.
Dilute	A solution is dilute if it has a small number of solute particles per unit volume.
Indicator	Substances used to identify whether unknown solutions are acidic or alkaline.
pH scale	Shows whether a substance is acid, alkali or neutral. It ranges from 0 – 14.
Physical change	A change that is reversible, in which new substances are not made. E.g. ice à water.
Reversible	A change in which it is possible to get back to the original substance.
Salt	A compound in which the hydrogen atoms of an acid are replaced by atoms of a metal element.

3. Indicators

Blue litmus paper turns red when it is put into an acid.
If the substance was an alkali or neutral, the blue litmus paper would stay blue.



Red litmus paper turns blue when it is put into an alkali.
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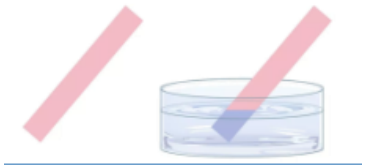

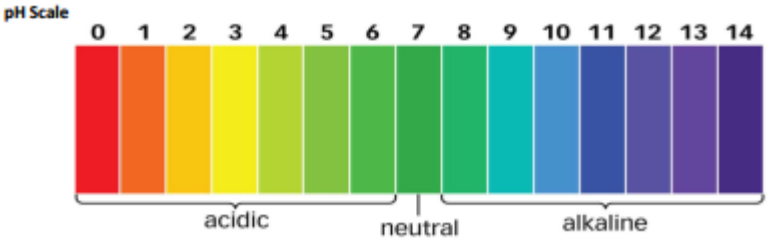

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4. Neutralisation

A chemical reaction happens if you mix together an acid and an alkali. The reaction is called neutralisation. A **neutral solution** is made if you add just the right amount of acid and base together. The products formed are **salt and water**.

acid + alkali —> salt + water

Hydrochloric acid + sodium hydroxide —> sodium chloride + water

General equations

Acid + metal —> salt + hydrogen

Acid + base —> salt + water

Acid + metal carbonate —> Salt + water + carbon dioxide

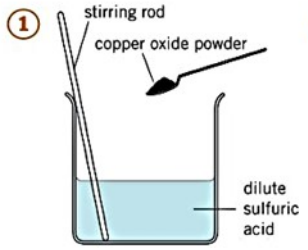
USES:

Soil for crops: Can add base (alkali) to the soil to neutralise some of the soil acid. This makes it suitable to grow crops, like tea.

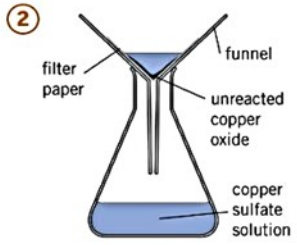
Acidic lakes: Acid rain falls in lakes and makes it more acidic. Some animals and plants cannot live there. Base is added to increase the pH.

How can you make crystals of salts?

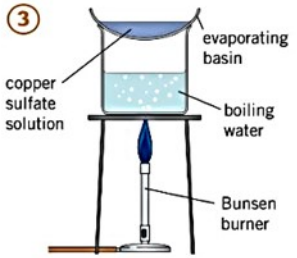
The reactions of acids with metals or bases make salt solutions. Removing water makes salt crystals. The diagrams show how to make copper sulfate crystals.



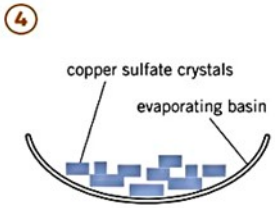
▲ Add copper oxide powder (a base) to dilute sulfuric acid. Keep adding until some copper oxide is left over. All the acid has now reacted.



▲ Filter to remove the copper oxide that has not reacted.



▲ Heat the copper sulfate solution in an evaporating basin until most of the water evaporates.



▲ Leave the evaporating basin in a warm place. The rest of the water evaporates. Copper sulfate crystals remain.

5. Naming Salts	
Hydrochloric acid	Forms chloride salts E.g. sodium oxide + hydrochloric acid —> **sodium chloride** + water
Sulfuric acid	Forms sulfate salts E.g sodium hydroxide + sulphuric acid —> **sodium sulfate** + water
Nitric acid	Forms nitrate salts E.g sodium + nitric acid —> **sodium nitrate** + hydrogen

6. Metals

○Unreactive metals are found in the Earth's crust as un combined elements. Most other metals must be extracted from ores.

○Metals that are more reactive than Carbon are extracted using electrolysis. Other metals can be extracted by heating Their ores with carbon

There is a pattern. Metals that react vigorously with dilute acids also react vigorously with oxygen. Metals that do not react with dilute acids do not react with oxygen.

Metal	Reaction with dilute acid	Reaction with oxygen
magnesium	reacts very vigorously	burns vigorously
zinc	reacts steadily	burns less vigorously
iron	reacts steadily	burns
lead	reacts slowly	do not burn; when heated, form layer of oxide on surface
copper	no reaction	
gold		no reaction

Reminder: Balancing equations

Chemical reactions are shown using:

- **Word equations**

Magnesium + Oxygen ⟶ *Magnesium Oxide*
(reactants) *(product)*

- ***Symbol equations*—*Show the atoms on both sides***

$2Mg + O_2 \longrightarrow 2MgO$

Balancing equations:

- There must always be the same number of **atoms** on both sides of a **symbol equation**.
- Atoms can't just disappear.
- You **balance** equations by putting numbers **in front** of the number.

$CH_4 + 4Cl_2 \longrightarrow CCl_4 + 4HCl$

C = 1 H = 4 Cl = 2 8

C = 1 H = 4 Cl = 5 8