

The Periodic Table & Chemical Reactions

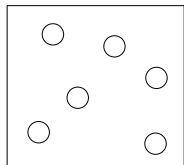
Elements & Compounds

Elements are the simplest type of substance.

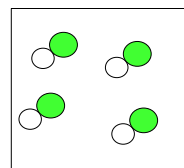
Compounds are made of **2 or more elements** joined together.

Substances are made up of **atoms**. Atoms are the smallest type of particle in substances.

Elements contain only **one type of atom**.



A **molecule** is made up of **2 or more atoms** joined together.



Elements can exist as solids, liquids or gases. Every element known to man is listed in the **Periodic Table**. This is split into **metals** and **non-metals**.

Group	1	2	Transition metals	3	4	5	6	7	8								
<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>6 ← Atomic Number = Number of Protons = Number of Electrons</p> <p>C ← Chemical Symbol</p> <p>CARBON ← Chemical Name</p> <p>12 ← Atomic Weight = Number of Protons + Number of Neutrons</p> </div> <div style="text-align: right;"> <p>NON-METALS</p> </div> </div>																	
			METALS														
1	2							3	4	5	6	7	8				
H 1 HYDROGEN	Li 3 LITHIUM	Be 4 BERYLLIUM							B 5 BORON	C 6 CARBON	N 7 NITROGEN	O 8 OXYGEN	F 9 FLUORINE	Ne 10 NEON			
Na 11 SODIUM	Mg 12 MAGNESIUM							Al 13 ALUMINUM	Si 14 SILICON	P 15 PHOSPHORUS	S 16 SULFUR	Cl 17 CHLORINE	Ar 18 ARGON				
K 19 POTASSIUM	Ca 20 CALCIUM	Sc 21 SCANDIUM	Ti 22 TITANIUM	V 23 VANADIUM	Cr 24 CHROMIUM	Mn 25 MANGANESE	Fe 26 IRON	Co 27 COBALT	Ni 28 NICKEL	Cu 29 COPPER	Zn 30 ZINC	Ga 31 GALLIUM	Ge 32 GERMANIUM	As 33 ARSENIC	Se 34 SELENIUM	Br 35 BROMINE	Kr 36 KRYPTON
Rb 37 RUBIDIUM	Sr 38 STRONTIUM	Y 39 YTIORIUM	Zr 40 ZIRCONIUM	Nb 41 NIOBIUM	Mo 42 MOLYBDENUM	Tc 43 TECHNETIUM	Ru 44 RUTHENIUM	Rh 45 RHODIUM	Pd 46 PALLADIUM	Ag 47 SILVER	Cd 48 CADMIUM	In 49 INDIUM	Sn 50 TIN	Sb 51 ANTIMONY	Te 52 TELLURIUM	I 53 IODINE	Xe 54 XENON
Cs 55 CAESIUM	Ba 56 BARIUM	Hf 72 HAFNIUM	Ta 73 TANTALUM	W 74 TUNGSTEN	Re 75 RHENIUM	Os 76 OSMIUM	Ir 77 IRIDIUM	Pt 78 PLATINUM	Au 79 GOLD	Hg 80 MERCURY	Tl 81 THALLIUM	Pb 82 LEAD	Bi 83 BISMUTH	Po 84 POLONIUM	At 85 ASTATINE	Rn 86 RADON	
Fr 87 FRANCIUM	Ra 88 RADIUM	Rf 104 RUFORMIUM	Db 105 DUBNIUM	Sg 106 SEBORGIIUM	Bh 107 BOHRIIUM	Hs 108 HASSIUM	Mt 109 MEITNERIUM	Ds 110 DUBNIUM	Rg 111 ROSGONIUM	Uub 112 UNUNBIUM	Uut 113 UNUNTRIUM	Uuq 114 UNUNQUADIUM	Uup 115 UNUNPENTIUM	Uuh 116 UNUNHEXTIUM	Uus 117 UNUNSEPTIUM	Uuo 118 UNUNOCTIUM	
<p>KEY</p> <p>☐ = Solid at room temperature</p> <p>☉ = Liquid at room temperature</p> <p>☁ = Gas at room temperature</p> <p>☛ = Radioactive</p> <p>♠ = Artificially Made</p>																	
La 57 LANTHANUM	Ce 58 CELESIUM	Pr 59 PRASEODYMIUM	Nd 60 NEODYMIUM	Pm 61 PROMETHIUM	Sm 62 SAMARIUM	Eu 63 EUROPEUM	Gd 64 GADOLINIUM	Tb 65 TERBIUM	Dy 66 DYSPROSIUM	Ho 67 HOLMIUM	Er 68 ERBIUM	Tm 69 THULIUM	Yb 70 YBBIUM	Lu 71 LUTETIUM			
Ac 89 ACTINIUM	Th 90 THORIUM	Pa 91 PROTACTINIUM	U 92 URANIUM	Np 93 NEPTUNIUM	Pu 94 PLUTONIUM	Am 95 AMERICIUM	Cm 96 CURCIUM	Bk 97 BERKELIUM	Cf 98 CALIFORNIUM	Es 99 EINSTEINIUM	Fm 100 FERMIUM	Md 101 MENDELEVIUM	No 102 NOBELIUM	Lr 103 LAWRENCIUM			

Groups of the Periodic Table

The **rows** of elements are called **periods**.

The **columns** are called **groups**. Elements in the same group react in similar ways.

Group 1 metals all react with water and are called the **Alkali Metals**.

Group 2 metals are reactive with acid and are called the **Earth Metals**.

Group 7 elements are reactive and are known as the **Halogens**.

Group 8 elements are completely **unreactive** and are known as the **Noble Gases**.

Properties of Metals and Non-metals

Metals:

- Are shiny when polished.
- Can conduct electricity and heat.
- Are solids at room temperature (except mercury).

Non-metals:

- Can be solid, liquid or gas.
- Most have low melting points.
- Are poor conductors of electricity and heat.
- Solids are brittle.

Atomic Number, Names and Symbols

Every element has its own number, name and symbol. The number is called the **Atomic Number** and elements are listed in order of increasing atomic number.

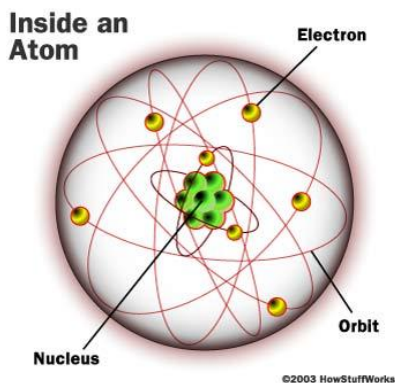
Every symbol has **one capital letter**. If a second letter is used it is a **small letter**. The symbol usually comes from the name. For example, **Carbon** has the symbol **C**. **Calcium** has the symbol **Ca** to tell it apart from Carbon. **Magnesium** has the symbol **Mg**.

Some symbols do not seem to come from the name, eg. **Iron's** symbol is **Fe**, **Lead's** is **Pb**. These have actually come from the **Latin** names of the elements.

Structure of the Atom

The atom is made up of 3 types of tiny particles:

- Protons
- Neutrons
- Electrons



the **Atomic Number** = the number of **protons**

If there is no charge on the atom:

the number of **protons** = the number of **electrons**

Particle (symbol)	Mass (a.m.u.)	Charge	Where it is found
Proton (p)	1	+1	nucleus
Neutron (n)	1	0	nucleus
Electron (e)	$1/2000 = 0$	-1	outside nucleus

Mass Number

The mass number = number of protons + number of neutrons

The number of **outer electrons** gives the **group number** of the element. For example, all the **Group One** elements react violently with water because they have only **one outer electron**.

Chemical Change versus Physical Change

A chemical reaction occurs when a **new substance is formed**. This cannot be easily reversed.

Baking a cake, frying an egg or striking a match are examples of chemical reactions in everyday life.

A physical change can be easily reversed, such as changing states of matter.

Solid ↔ Liquid ↔ Gas

These changes are all reversible.

Dissolving a chemical in a solvent is reversible as the solvent can be **evaporated** off. A **saturated** solution is one in which **no more solid can dissolve**.

Separating Mixtures

Mixtures can be easily separated as they are not chemically joined.

Iron can be separated from other elements using a **magnet**.

Soluble solids can be separated from liquids by **evaporation** of the liquid.

Insoluble solids can be separated from liquids by **filtration**.

Liquids can be separated by **distillation**.

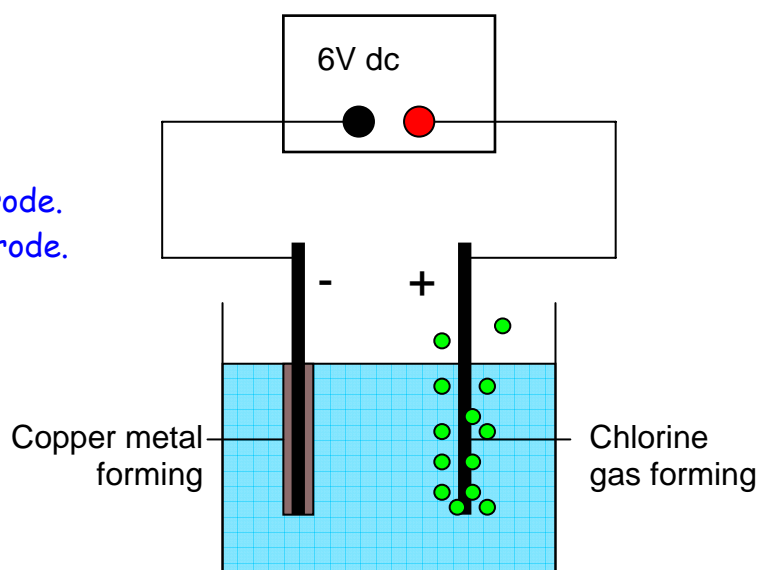
Electrolysis

Electrolysis is the reaction which **breaks down a compound** into its elements using **electricity**.

Electrolysis of **copper chloride**:

Copper forms on the **negative** electrode.

Chlorine forms at the **positive** electrode.



Electrolysis of **water** produces **hydrogen** at the **negative** electrode and **oxygen** at the **positive** electrode. If collected these can be tested because:

- Hydrogen burns with a pop.
- Oxygen re-lights a **glowing** splint.

Writing Chemical Word Equations

We can write out any chemical reaction as a chemical word equation using just the **names** of the chemicals and some symbols.

The reactants go on the left and the products go on the right.



Example:

Magnesium reacts with **hydrochloric acid** to produce **hydrogen** gas and the compound **magnesium chloride**.



Identifying Chemical Reactions

A **new substance** is always formed. The following are things to look out for to tell us a chemical reaction has occurred:

- Colour change
- Gas give off
- Temperature change (getting hotter or colder)
- Solid forming (from 2 liquids)

Reaction Rate

The **rate** is the **speed** of a reaction. This is always measured over time.

The rate of a chemical reaction can be **increased** by:

- Increasing the temperature
- Increasing the concentration
- Decreasing the particle size
- Adding a catalyst

A catalyst is **not used up** during a reaction, so it can be re-used.

