The Periodic Table of the Elements

The periodic table is a table which contains all the elements that have been discovered, which are arranged in the increasing order of atomic number.

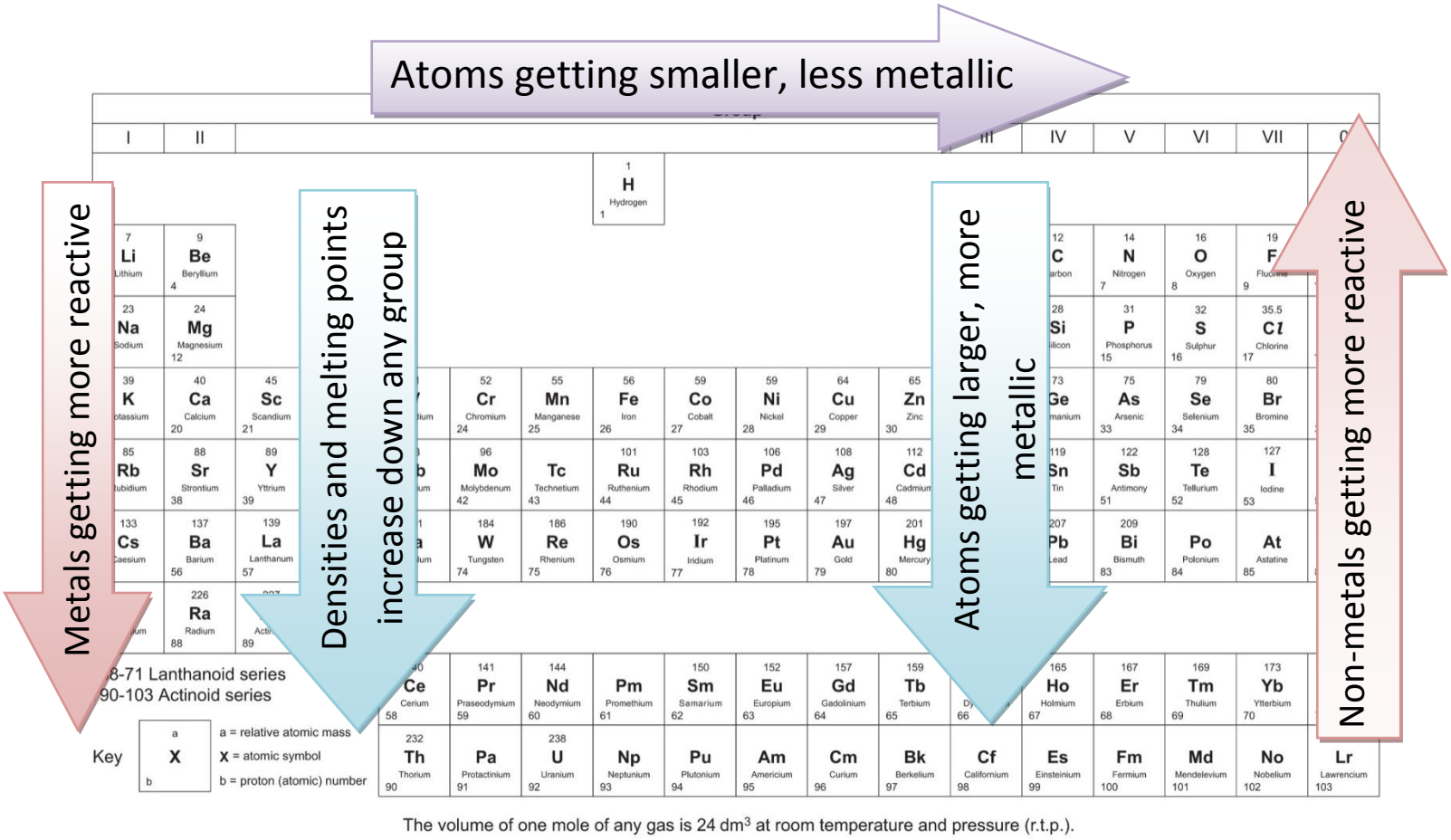
The vertical columns of elements with similar properties are called Groups.

The horizontal rows of elements are called Periods.

The periodic table can also be used to predict the properties of elements, whether chemical or physical.

The groups show the number of electrons in that element in this group. E.g. in group 5, Nitrogen has 5 electrons in its outer shell.

The elements get smaller less metallic as going to the right.



The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

The Group I elements (The reactive alkali metals):

Group 1 elements are called the alkali metals because they react with water forming alkaline solutions.

Electron arrangement in Group I:

Element	Symbol	Atomic Number	Electron Config.	Reactivity	Density	M.P & B.P
Lithium	Li	3	2.1	Increases DOWNWARDS	Increases DOWNWARDS	Increases DOWNWARDS
Sodium	Na	11	2.8.1			
Potassium	K	19	2.8.8.1			

Properties of Group I elements:

Chemical Properties:

- They have one electron in their outer shell.
- They have similar chemical properties.
- They lose their outer shell electron making positive ions.
- Their reactivity increases downwards, because their outer shell electron get further away as the size of the atom increases, so it gets easier for it to be removed.
- Very reactive.
- Burn forming oxides
- React violently with water forming hydroxides

Physical Properties:

- Their melting and boiling points increase downwards.
- Their densities increase downwards.
- They are solids at room temperature.
- When freshly cut, they have a shiny metallic surface.
- Good conductors of electricity.
- Relatively soft

Chemical reactions:

- Form hydroxides when put in water
- Form oxides when burnt in air
- React with acids to make metal salt and hydrogen gas

The transition metals:

The transition metals are found between Group II & Group III at periods 4, 5 and 6.

First row: Scandium to Zinc

Second row: Yttrium to Cadmium

Third row: Lanthanum to Mercury

The electron arrangement of some transition metals in the first row:

Element	Symbol	Atomic Number	Electron Config.
Scandium	Sc	21	2.8.9.2
Iron	Fe	26	2.8.14.2

All the transition elements in the first row have 2 electrons in their outer shell, the fourth shell. The difference is in the number of electrons in the third shell.

The chemical properties of these elements depend on the electrons in the outer shell, which are the ones most likely to be gained and lost in chemical reactions.

Properties of transition metals:

Chemical properties:

- They are less reactive than Group I elements.
- They have the ability to form ions with different oxidation states.
- Their compounds are highly coloured.
- They and their compounds are used as catalysts in some reactions.

Physical Properties:

- These have high densities.
- These have high melting and boiling points.
- These are hard, shiny metals.
- They are very good conductors of electricity and heat.

- Group VII (7) elements (Halogens):

These elements are called halogens because they react with metals forming salts.

Electron arrangement in Group VII:

Element	Symbol	Atomic Number	Electron Config.	Reactivity
Fluorine	F	9	2.7	Decreases DOWNWARDS
Chlorine	Cl	17	2.8.7	
Bromine	Br	35	2.8.18.7	

Going DOWN the group:

- The atoms get BIGGER
- LESS reactive
- DARKER in colour
- GAS to SOLID
- Melting and boiling points become HIGHER

Fluorine and Chlorine → GASES

Bromine → Liquid

Iodine → Solid

Properties:

Chemical properties:

- They are the reactive non-metals
- Do both covalent and ionic compounds
- They displace less reactive halogens from their compounds
- They react with metals making halide salts
- They are diatomic
- They can displace other less reactive halides from their salts

Physical properties:

- Poisonous
- They have a pungent smell
- Don't conduct electricity
- Colour gets darker as going down the group

Group 0 the noble Gases:

It is often called group 0.

Element	Symbol	Atomic Number	Electron Arrangement	State (at r.t.p)
Helium	He	2	2	Gas
Neon	Ne	10	2.8	Gas
Argon	Ar	18	2.8.8	Gas

The noble gases are a set of non-metallic elements, which make up 1% of air.

They are monoatomic gases with no smell or colour.

They are chemically unreactive and exist as single atoms because of a full outer shell.

Properties:

- Inert
- Colourless, monoatomic gases
- Exist as single atoms

Uses:

- Helium is used for filling balloons and airships.
- Neon is used in neon lights
- Argon is used to fill argon filament bulbs