

# Atomic Structure and The Periodic Table

## 1. Firstly a few basic definitions

Atom – an atom is the smallest particle of an element that can take part in a chemical change.

Element – an element is a substance that cannot be broken down into anything simpler by chemical means.

Molecule – A molecule is the smallest particle of an element or compound that is capable of independent existence.

Compound – a compound is a substance containing two or more elements chemically combined.

Mixture – a mixture is a sample of matter composed of two or more substances, each of which retains its identity and properties.

2. Give out questions on elements mixtures and compounds.

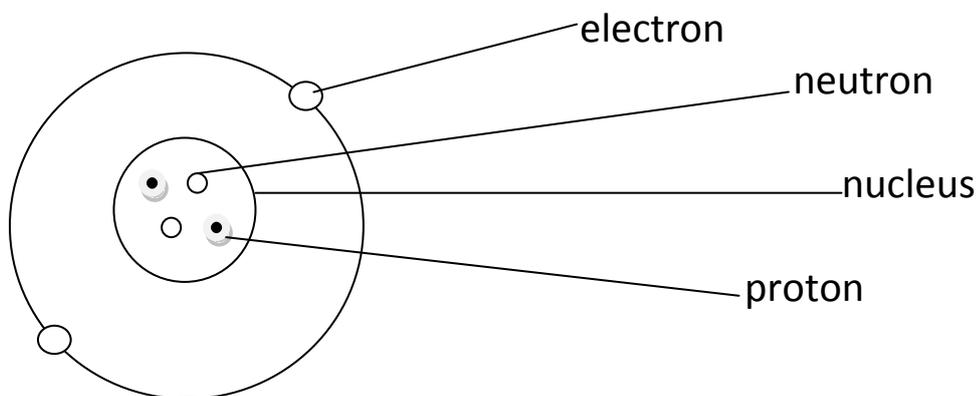
3. The 3 fundamental particles of the atom are

Protons

Electrons Easy way to remember – they spell PEN.

Neutrons

|         |           |          |
|---------|-----------|----------|
| Protons | n         | Neutrons |
| 0       | Electrons | e        |
| s       | g         | u        |
| i       | a         | t        |
| t       | t         | r        |
| i       | l         | a        |
| v       | v         | l        |
| e       | e         |          |



An atom of Helium – the protons and neutrons are in the nucleus and the electrons spin round the nucleus in orbits. The size of the nucleus compared to the size of the atom is a pea in the middle of a cricket field.

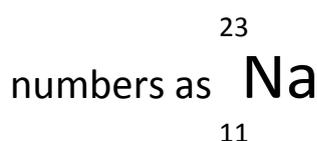
### Relative Masses and Charges of the three Fundamental Particles

| Fundamental Particle | Relative Mass/amu   | Relative Charge |
|----------------------|---------------------|-----------------|
| Proton               | 1                   | +1              |
| Electron             | 1/1837 (negligible) | -1              |
| Neutron              | 1                   | Zero charge     |

Table 1

There are about 112 elements. Each element is represented by a symbol which is either one, two or occasionally three letters. If it is one letter it is a capital, if two or three letters the symbol is a capital followed by one or two lower case letters.

Consider sodium, symbol Na. The symbol can be written with two



The superscript 23 is the mass number and the subscript 11 is the atomic number or proton number.

The atomic number (lower smaller number) gives the number of protons in the atom. As all atoms are neutral, the number of positive protons must equal the number of negative electrons. The atomic number therefore also gives the number of electrons, so the bottom or down number gives PE (number of protons/number of electrons). The way to remember it is 'when you go for a PEE it goes down and the down/bottom number gives PE protons/electrons.

The mass number gives the mass of the atom so any particles with mass contribute to this mass number. As can be seen from Table 1 above, only protons and neutrons have mass (the mass of the electron is so small compared to that of the proton or neutron that it can be

ignored). Thus the mass number gives the number of protons plus the number of neutrons.

For sodium, the mass number (number of protons + number of neutrons) is 23. The atomic number (number of protons) is 11. Thus the number of neutrons if the mass number minus the atomic number  $(23-11) = 12$ .

The following links will take you to lessons on:

1) Atoms and the Periodic Table -

[http://lincs.skool.co.uk/content/keystage4/chemistry/pc/lessons/uk\\_ks4\\_atoms\\_periodic\\_table/h-frame-ns6.htm](http://lincs.skool.co.uk/content/keystage4/chemistry/pc/lessons/uk_ks4_atoms_periodic_table/h-frame-ns6.htm)

2) Elements of the periodic Table -

[http://lincs.skool.co.uk/content/keystage4/chemistry/pc/lessons/uk\\_ks4\\_elements\\_periodic\\_table/h-frame-ns6.htm](http://lincs.skool.co.uk/content/keystage4/chemistry/pc/lessons/uk_ks4_elements_periodic_table/h-frame-ns6.htm)

3) Group 1 Metals (The Alkali metals) – Properties and Reactions

[http://lincs.skool.co.uk/content/keystage4/chemistry/pc/modules/elements\\_periodic\\_table/group\\_1\\_metals/index.html](http://lincs.skool.co.uk/content/keystage4/chemistry/pc/modules/elements_periodic_table/group_1_metals/index.html)

4) Group 7 Elements (The Halogens) – Properties and Reactions

[http://lincs.skool.co.uk/content/keystage4/chemistry/pc/modules/elements\\_periodic\\_table/group\\_7\\_elements/index.html](http://lincs.skool.co.uk/content/keystage4/chemistry/pc/modules/elements_periodic_table/group_7_elements/index.html)

5) Group 7 – Formation of Halides

[http://lincs.skool.co.uk/content/keystage4/chemistry/pc/modules/elements\\_periodic\\_table/group\\_7\\_halides\\_formation/index.html](http://lincs.skool.co.uk/content/keystage4/chemistry/pc/modules/elements_periodic_table/group_7_halides_formation/index.html)

6) Group 0 Elements (The Noble Gases)

[http://lincs.skool.co.uk/content/keystage4/chemistry/pc/modules/elements\\_periodic\\_table/group\\_0\\_elements/index.html](http://lincs.skool.co.uk/content/keystage4/chemistry/pc/modules/elements_periodic_table/group_0_elements/index.html)

This topic is 'Atomic Structure and the Periodic Table' but the following lesson on 'Structures and Bonding' follows on from this topic.

7) Structures and Bonding

[http://lincs.skool.co.uk/content/keystage4/chemistry/pc/lessons/uk\\_ks4\\_structures\\_and\\_bonding/h-frame-ns6.htm](http://lincs.skool.co.uk/content/keystage4/chemistry/pc/lessons/uk_ks4_structures_and_bonding/h-frame-ns6.htm)