MATTER

Matter is all around us. All matter has the following **general properties**:

* It is formed by very small particles called **atoms**. Atoms are the basic building blocks of matter.
* Atoms have **mass**, therefore, so does matter.
* Atoms occupy space and have volume. Matter therefore also has **volume.**

A **substance is a particular type of matter with specific properties, such as colur, hardness, melting point, etc.**

**MATTER IS EVERYTHING THAT HAS MASS AND TAKES UP VOLUME. IT IS MADE UP OF ATOMS.**

**Physical quantities are properties that can be measured and expressed with numbers. (MAGNITUDES). Length, mass and time are examples of physical quantities and meters, kilograms and seconds are the corresponding units of measurement.**

Derived quantities are the result of combining other physical quantities. (Speed**)**

**THE INTERNATIONAL SYSTEM OF UNITS (SI)**

**It is a system of units of measurement created to ease the exchange of technical and scientific information between countries.**

**LENGTH METRE (m)**

**MASS KILOGRAM (Kg)**

**TEMPERATURE KELVIN(k)**

**TIME SECOND (s)**

A measurement is a value for a physical quantity recorded using measuring instruments.

Measurements can be:

* Direct (comparing directly with a unit)
* Indirect ( based on calculations using measurement from other quantities)

**MASS** : it is the amount of matter in an object. It depends on the number of particles in the object. Kg is the unit. Mass is measured using scales.

**VOLUME**: it is the space an object occupies. It depends on pressure and temperature conditions. The Cubic metre (m3) is the unit.

**DENSITY** : it is the ratio between the mass (m) of an object and the volume (v) it occupies.

It says how concentrated a material is.

**d= m/v**

The unit of density is kg per cubic metre or grams per cubic centimetre.

**MATTER CAN BE HOMOGENEOUS OR HETEROGENEOUS**

**Homogeneous**: when the substance is uniform and we cannot distinguish the different parts**.**

**Heterogeneous:** substance is not uniform andwe can distinguish the different parts that compose it.

Uniformity depends on the scale we use to observe it.

**MIXTURES:** (MEZCLAS) A mixture is made up of different substances in variable proportions that are not chemically joined together. Mixtures can be: Heterogeneous and homogeneous.

* Heterogeneous mixtures: components can be easily identified and separated using filtration or decantation.
* homogeneous: Uniform mixtures where components cannot be identified. They are also called solutions (solvent and solute) (Solución, disolvente y soluto). Solutions can be liquid, solid (alloy) or gaseous.

PURE SUBSTANCES: a pure substance is made up of one type of particles. It has specific chemical and physical properties. Groups:

* Elements: they are made up of one type of atom.
* Compounds: they are made up of more than one element chemically joined together in specific proportions.

STATES OF MATTER AND PROPERTIES (UNIT 2)

**ATOMS!**

All the substances in the Universe are made up of atoms.

Atoms are, in turn, made up of three types of particles: **protons, electrons and neutrons**. Protons and neutrons are located in the centre of the atoms forming a very dense and small **nucleus**. Electrons form a **cloud around the nucleus** and occupy most of the atom's volume.

Protons are particles with an electrical charge of 1+.

Neutrons are neutral particles that do not have an electrical charge.

Electrons are particles with an electrical charge of 1-.

Protons and neutrons are composed of quarks.

Scientists have found that electrons within the electron cloud have different amounts of energy. Scientists model the energy differences of the electrons by placing them in energy levels. Energy levels nearer the nucleus have lower energy than those levels that are further away.

Each type of atom, known as a **chemical element,** is identified with a name and a symbol. Every chemical element has a **particular number of protons in its nucleus, this number is called the atomic number**. All known chemical elements are listed in the **Periodic Table** in numerical order of their atomic number.

The **mass number** of an atom is the sum of the number of protons and the number of neutrons in the nucleus of the atom.

**Number of neutrons = mass number - atomic number.**

**The most abundant elements in the Universe: H and He.**

**The most abundant elements is the Earth's crust: O, Si, Al, Fe.**

**The most abundant elements in living things: C, H, O, N.**

**THE PERIODIC TABLE OF THE ELEMENTS:**

Columns are called groups. Rows are called periods. Atomic number increases across the period. Atomic numbers are above the symbol and the mass number is under the symbol.

The elements have an increasing nonmetallic characteristic as you read from left to right across the table. H is nonmetallic. B, Si,Ge, As, Sb, Te, Po, At are metalloids.

Elements that are in the same group have the same number of electrons in their outer energy levels. It is the number of electrons in the outer level that determines the chemical properties of an element.

*The first energy level has one sublevel, while the second has two sublevels, and the third has three. The first sublevel in any level contains one s orbital which can contain up to two electrons. The second sublevel in any level contains three p orbitals that can contain up to two electrons. So that sublevel can contain a maximum of 6 electrons. The third sublevel contains five d orbitals, each of which can contain up to two electrons, so this sublevel can contain up to 10 electrons. The fourth sublevel contains seven f orbitals, each of which can contain up to two electrons, so this sublevel can contain up to fourteen electrons.*

Energy level 1: 2electrons

Energy level 2: 8 electrons

Energy level 3: 18 electrons

Energy level 4: 32 electrons (2n2)

 **http://glencoe.mcgraw-hill.com/olcweb/cgi/pluginpop.cgi?it=swf::520::356::/sites/dl/free/0078685540/164037/610\_Periodic\_Table.swf::The%20Periodic%20Table**

When atoms from elements join together, they can form molecules or crystals-

* **Molecules**: These are groups of a fixed number of atoms. Atoms can be of the same element, (the oxygen molecule), or of different ones (water molecule).
* **Crystals**: they are groups of a large number of atoms. The number determines the size of the crystal. Table salt.

**CHEMICAL FORMULAS**: Formulas are used to express what constitutes a substance- These formulas are combination of **symbols and subscripts** (subíndices). These are numbers that indicate how many atoms of each type are present in a molecule or crystal of that particular substance.