Group:	2º ESO	Date:	
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Subject:	Physics and Chemistry		
Student:			

UNIT 4: STRUCTURE OF MATTER

1. PURE SUBSTANCES: SIMPLE SUBSTANCES AND COMPOUNDS

On previous unit, we distinguished between pure substances and mixtures. We focused on the mixtures and we learned about concentrations and solutions.

PURE SUBSTANCES are all matter that, whatever its state was, its physical and chemical properties are uniform in all the points of the matter. These properties can be used to identify this substance from another.

But we can classify these pure substances into two different groups:

SIMPLE SUBSTANCES: A simple substance is a substance which cannot be broken down by further chemical techniques. These include heating, cooling, electrolysis and reacting with other chemicals. They are made of only ONE ELEMENT (lead, iron, calcium, gold...)

COMPOUNDS: A compound is a pure substance composed of two or more different atoms chemically bonded to one another. A compound can be destroyed by chemical means. They are made of MORE THAN ONE ELEMENT (ammonia, sulfuric acid, salt...)

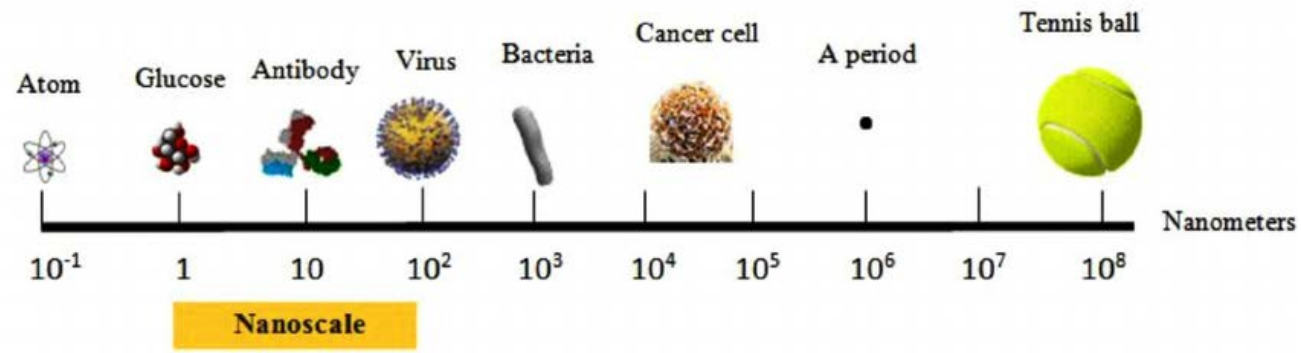
PURE SUBSTANCES
- SIMPLE SUBSTANCES
- COMPOUNDS

2. ATOMS AND SUBATOMIC PARTICLES

Sages of ancient Greece, like Leucippus or Democritus considered that matter was made of small particles. These particles cannot be divided. There must be a unit or brick indivisible and unbreakable. These particles were called ATOMS which means “indivisible”.

This idea were abandoned by the scientific until 1808, when John Dalton made the hypothesis that matter was made of elemental units called atoms, which were indivisible and immutable.

Nowadays, we can use microscopes to see individual atoms and even interact with them.



2.1 ATOMS

An ATOM is the smallest particle of a simple substance that can be divided without losing its chemical properties.

We said that a CHEMICAL ELEMENT, is a kind of matter made of the same type of atoms.

There are some phenomena that make us think that matter is related somehow with electricity. For example:

- Putting your hair on tip using a woollen jumper.
- Bending a water jet with a balloon.
- Separating pepper from salt with the help of a balloon.

These experiences confirm that the atoms are made of particles electrically charged: the SUBATOMIC PARTICLES.

2.1 SUBATOMIC PARTICLES

In 1897, **J.J. Thompson** discovered the ELECTRON (e^-). Its mass is extremely small: $9.11 \cdot 10^{-31}$ kg, this is:

0.000000000000000000000000000000911 kg

Its charge is negative, $-1.6 \cdot 10^{-19}$ C and this charge is considered the unit charge.

21 years later, in 1919, **Ernst Rutherford** discovered the PROTON (p^+). Its mass is very big in comparison with the mass of an electron: $1.67 \cdot 10^{-27}$ kg:

0.000000000000000000000000001167 kg

Its charge is positive and equals to the electron´s charge, $1.6 \cdot 10^{-19}$ C.

Finally, in 1932, **James Chadwick** discovered the last of the three particles of the atom: the NEUTRON (n^o). It has the same mass as the proton but it has no charge.

Particle	Mass (kg)	Unit mass	Charge (C)	Unit charge
Electron (e^-)	$9.11 \cdot 10^{-31}$	0	$-1.6 \cdot 10^{-19}$	-1
Proton (p^+)	$1.67 \cdot 10^{-27}$	1	$1.6 \cdot 10^{-19}$	+1
Neutron (n^o)	$1.67 \cdot 10^{-27}$	1	0	0

You can think now that there are no smaller particles inside the atom. But protons and neutrons are made of other particles called QUARKS. Specifically, they are made of three particles of two types: quark UP and quark DOWN.