

SESSION 3: MICROSCOPIC VIEW OF MATTER

KEY CONCEPTS:

- Elements and the Periodic Table
- Models of the Atom
- Atomic Structure
- Combining atoms
- Representing compounds

TERMINOLOGY

Element A substance that cannot be broken down into other substances through chemical means.

Compound A substance made up of two or more different elements that are joined together in a fixed ratio.

Periodic Table An arrangement of the elements to show similarities and differences in their physical and chemical properties.

Atom The smallest unit of any element is the atom. The atom of every element has a different number of protons

Proton Positively charged particles found in the nucleus of atoms. A proton has an atomic mass of 1μ

Neutron Neutral particles found in the nucleus of atoms. A neutron has an atomic mass of 1μ

Electron Negatively charged sub atomic particles that have a very small mass. Electrons are found in different energy levels relatively far away from the nucleus.

Atomic orbital The region around the nucleus where an electron of a specific energy may be found.

Atomic Number (Z) The number of protons in the nucleus of an atom.

Mass Number (A) The number of protons and neutrons in the nucleus of an atom

Isotopes Atoms of an element have the same number of protons (same Z), but a different number of neutrons.

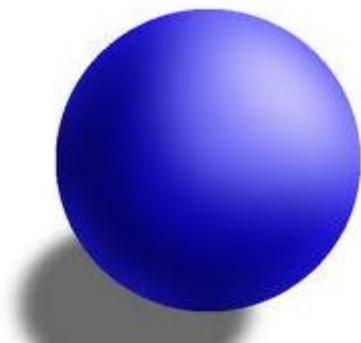
Relative atomic mass The average mass of all the naturally occurring isotopes of that element measured in atomic mass units.

X-PLANATION

Models of the Atom

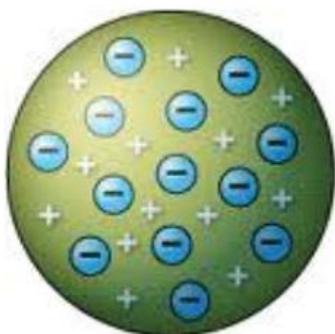
John Dalton

Based on careful analysis of chemical reactions, Dalton proposed a model in which all matter consists of tiny, solid indestructible spherical particles called atoms.



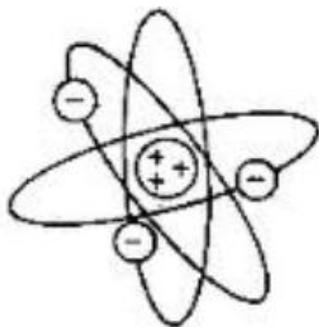
J J Thomson

Based on the growing understand of electrostatics, electricity and the discovery of tiny negatively charged particles, called electrons J J Thomson propose the Plum pudding model of the atom. He suggested that the atom is made of smaller particles that carry positive and negative charges. The charged particles on the surface of the atom can be removed when materials are rubbed together.



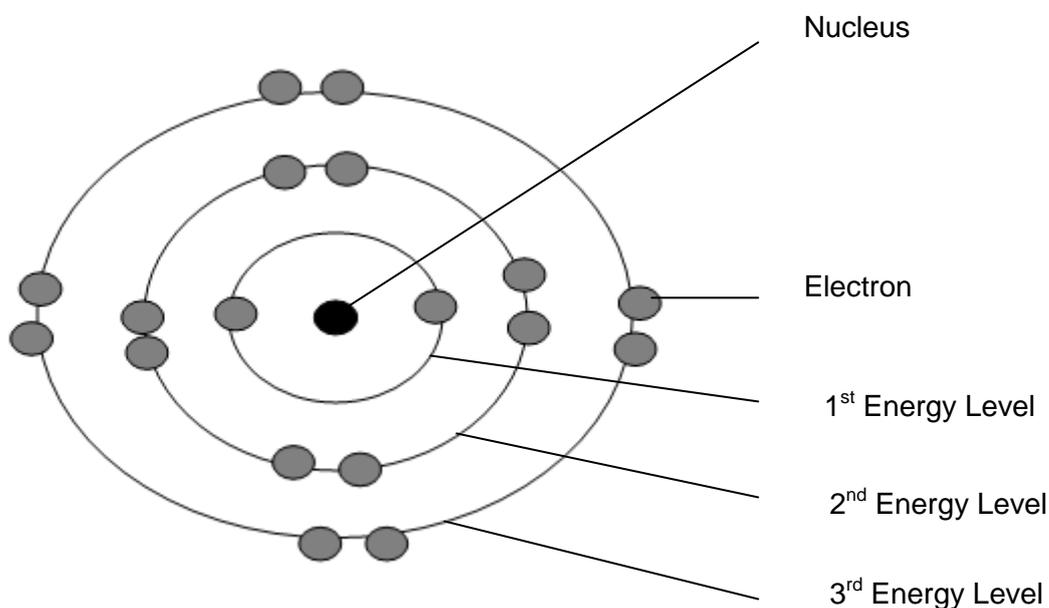
E Rutherford

Based on his gold foil experiment, he proposed a model of the atom which has a positive nucleus, containing protons and neutrons, at the centre of the atom and negatively charged electrons moving in orbits around the nucleus. In this model, the mass of the atom is mostly contained in the nucleus. The distance between the nucleus and electrons is relatively large and is empty space

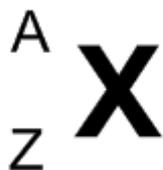


N Bohr

Bohr proposed that electrons are arranged in energy levels at different distances away from the nucleus of the atom.



Representing an atom



A – mass number

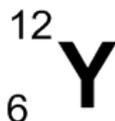
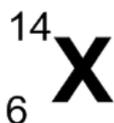
Z – Atomic number

X – the symbol of the element formed by these atoms

The number of protons is unique to each element. Only hydrogen has atoms with one proton.

X-AMPLE QUESTIONS:**Question 1:**

Consider the symbols representing two different atoms:



- Write down the number of protons, neutrons and electrons for the symbol representing atom X and atom Y.
- Identify the element in which you will find these atoms

Question 2

If a sample contains 69% of copper-63 and 31% of copper-65, calculate the relative atomic mass of an atom in that sample.

Question 3

Draw Bohr diagrams to show how electrons are arranged in the atoms of each of the following elements:

- aluminium
- phosphorus
- carbon

Question 4

Draw an energy level diagram to show how electrons are arranged in the atoms of sodium.

Question 5

Write down the electron configuration of:

- Hydrogen atom
- Fluoride ion
- Calcium ion