

LESSON 16 Atomic Structure: The Heart of Matter

Grade Level: 7-10

1. Grades 7-10

2. Overview The story of the atom has been told throughout all ages in science. Because scientists were not able to get to the heart of matter, the atom for years was wrongly defined. In recent times, much has been known about the atom. The composition of the atom reveals the presence of fundamental particles such as the nucleus, proton and electron. The presence of these particles has been accurately defined in terms of their position, mass and electrical charge.

3. Purpose There is need at all levels of the study of science to present the correct picture of any substance. The purpose of this lesson is to present the picture of the atom which is best described in terms of recent research findings. It is believed that the last word on the atom has not been written.

4. Objectives Students will be able to:

- i. Describe the atom as being made up of known particles
- ii. Define the electron, proton and neutron in terms of their location in the atom, their mass and the electrical charge which they carry.

5. Resources/materials

- Samples of various elements-iron, copper, lead, zinc and graphite [From "lead" pencils].
- A Wall Chart on the structure of the atom.

6. Activities and Procedures The story of the atom began with the findings of the Greek philosopher, Democritus. He tried to get the smallest piece of an element which he thought was representative of the whole element. He gave the name atom to such a tiny particle. This word **atom** was coined from the Greek word, **atomein**, [**a=not** and **temmein=cut** or **divide**.] Thus was the origin of the belief that the atom is the smallest indivisible part of an element. There is no doubt that the atom is very small but with modern day science and technology, the atom can be further separated [split] into yet smaller parts known as sub-atomic particles. So is the atom still to be regarded as indivisible? Of course not.

The *composition* of the atom is also of interest to the scientist. *Three sub-atomic* particles have been identified in the atom:

- **Proton**-a fundamental, sub-atomic particle characterised by a **positive charge** and atomic mass.
- **Electron**-a fundamental sub-atomic particle characterised by a **negative charge** and an extremely small mass of about 1/2000 of the entire mass of the atom.
- **Neutron**-a sub-atomic particle which has mass almost equivalent to that of the neutron, but is **electrically neutral, no charge**.

The *architecture* of the atom is simple. The centre of the atom called the nucleus contains both the proton and the neutron (where it exists). There are some atoms that do not contain neutrons. Electrons on the other hand are situated outside the nucleus in what are called **shells**.

Just as a rice grain is different from a bean seed, so an atom of iron is different from an atom of copper. However, every atom of one element is the same as every other atom of the same element. Thus, every atom of iron is exactly like all other iron atoms.

7. Tying it all together In presenting this lesson on the atomic structure to students, it is important to dispel the notion that the atom is indivisible. Protons, neutrons and electrons have been isolated.

The model presented here regarding the architecture of the atom have been modified when studying advanced science. The present model of the atom can be used to explain many things in science, especially chemical reactions.

8. Assessment Provide the students with information on the fundamental particles of different atoms of elements. Then ask the students to draw the picture of the atoms.

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10. References Croft, G et al. (2000). **Step Ahead 'O' Level Integrated Science**. Harare: Longman Zimbabwe (Pvt.) Ltd.

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