

STRONG TOWER ACADEMY

PHYSICS LESSON NOTE FOR JS ONE

DATE: 11th MAY, 2020

TOPICS: PARTICLE NATURE OF MATTER

SUB-TOPICS: STRUCTURE OF MATTER, EVIDENCE OF PARTICLE NATURE OF MATTER, MOLECULES, BROWNIAN MOTION, STATES OF MATTER

OBJECTIVES: At the end of the lessons, Students should be able to:

- 1 define an atom.
2. list the evidence particle of nature of matter,
- 3 define molecules,
4. estimate the size of molecule,
5. explain Brownian motion,
6. list and explain the states of matter,
7. differentiate between the three states of matter.

STRUCTURE OF MATTER

EVIDENCE OF THE PARTICLE NATURE OF MATTER

The idea that matter is made up of tiny particles called atom, dates back to the ancient Greeks. According to the Greek Philosopher Democritus, a piece of yam can be cut into smaller and smaller bits until the piece of yam can no longer be cut. That tiny piece of yam in which can no longer be cut is called an **Atom**.

The Atomic Theory of matter assumes that all matter is made of tiny particles called atoms and that they are always in rapid motion. The nature of this motion and its activity depends on temperature of matter and other factors.

The Experimental Evidence of this particle or atomic nature of matter is the Brownian Motion named after the Biologist, Robert Brown. Another Evidence is the Law of Definite Proportion, a third is the process of diffusion.

MOLECULES

A molecule is the smallest particle of a substance which can have a separate existence and still retain the properties of that substance.

Molecules cannot exist by themselves as individual atoms. They combine their atoms with themselves or with other atoms to form molecules. The molecules of any one substance are identical. They have the same structure, the same mass and same mechanical and electrical properties.

THE SIZE OF A MOLECULE

The size of a molecule is extremely small. It is of the order 10^{-9} - 10^{-10} m (10^{-7} – 10^{-8} cm). As a result of this small size, one gram of an element contains several millions of molecules. For example, a gram of hydrogen contains about 10^{23} molecules.

To estimate the size of a molecule, Lord Releigh in 1890, was the first to estimate appropriate size of molecule. He argued that when drop of oil is placed on top of water surface, the oil will spread out on top of the water until the thickness of the film of oil was one molecule thick.

Brownian Motion

This is the rapid, constant irregular motion of tiny particles. It is considered important for two reasons because it gives evidence for the existence of tiny particles of matter called

molecules. Secondly it gives evidence that these molecules are in constant state of random motion.

Brownian motion was discovered in 1827 by a Biologist Robert Brown. He observed with a micro scope that tiny pollen grains suspended in water moved about in Zig- Zag Path even though the water appeared to be perfect still. This is caused by the bombardment of the solid particles by the water molecules. These pollen grains were supposed to be jostled or knocked about here and there by the vigorously moving water.

Brownian motion also takes place in liquids and in solids. Example, molecules in solids such as camphor are able to leave the solid and spread into the air and our nostrils where their presence is detected.

STATES OF MATTER

Matter can exist in three states:

Solids: Here the molecules are closely packed. They are held rigidly together by intermolecular forces of Cohesion. These molecules are in a fixed position but can vibrate about these fixed positions. So solids have definite shape, volumes and cannot be poured.

LIQUIDS: Here the molecules are freer to move about because the intermolecular forces binding them are weaker than those in solids; the molecules are closely packed together but can move about randomly. A liquid has no definite shape or form but still poses a fixed volume. It always assumes the shape of its container. Liquids can be poured.

GASES: Here the cohesive forces binding the molecules are negligible. These molecules are very free to move about in all directions, are restricted only by the walls of the container. A gas has no definite shape and occupies the whole volume of its container. They are more easily compressed than liquids and solids. This is because the molecules are relatively far apart.

ASSIGNMENT

1. What is a Crytsal?
2. What is Amorphous Substance?
3. What is a Crytsal?
4. What is Amorphous Substance?