

“STRUCTURE OF MATTER”**“MODDA TUZILISHI”**

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Abstract: *In this article, we will discuss the topic “Structure of Matter” in secondary schools. First of all, we need to understand what matter is. Matter is the basis of all objects found in nature and exists in various forms. The structure of matter is a concept that studies what particles matter consists of and how those particles are located, move, and interact.*

Keywords: *Matter, basic states of matter, structure of matter and its types, uses, simple and complex substances*

Annotatsiya: *Ushbu maqolada umumta'lim maktablarida “Materyaning tuzilishi” mavzusini muhokama qilamiz. Eng avvalo biz modda nima ekanligini bilib olishimiz shart. Modda – bu tabiatda uchraydigan barcha jismlarning asosini tashkil etadi, u turli shakllarda mavjuddir. Modda tuzilishi modda qanday zarrachalardan iboratligi va u zarrachalar qanday joylashgani, harakatlanishi hamda o'zaro ta'sirlashishini o'rganadigan tushunchadir.*

Kalit so'zlar: *Modda, moddaning asosiy holatlari, moddaning tuzilishi va uning turlari, ishlatilishi, oddiy va murakkab moddalar*

Matter is a collection of particles that have mass and volume and exist in different physical states (solid, liquid, gas, plasma). Solid, liquid, and gaseous states of matter are common in nature, and these are the basic states of matter. The plasma state is also considered the fourth state of matter. Each state differs in the location and mobility of the particles (atoms, molecules) that make up the substance.

Solids Section

Solids are substances made up of atoms, ions, or molecules. In solids, the particles are very close together and experience strong intermolecular forces. Such substances can have a crystalline structure or an amorphous state, and the particles have a definite arrangement. Solids usually have high hardness because their particles are difficult to separate.

Properties: It has a definite shape and volume. This is the result of strong forces that restrict the movement of particles.

1. **Structure:** The particles of matter are densely packed and are solid in specific places, which is a characteristic of solids.
2. Examples of solids include ice, iron, and salt.

Solids are divided into 2 main types: crystalline solids and amorphous solids.

The particles in crystalline solids have a clear and orderly geometric arrangement. Examples of crystalline solids include salt and metals.

The particles of amorphous solids are arranged in a random manner. Examples of amorphous solids include glass and plastic.

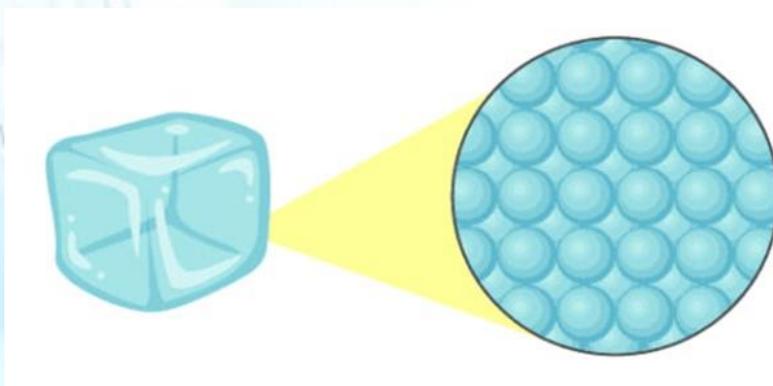


Figure 1. Structure of solids.

Particles in solids are very densely packed and close together and only vibrate.

Liquids Section

In liquids, molecules are closer together than in gases but are still able to move freely.

As the temperature increases, liquids turn into vapor, and as the temperature decreases, liquids turn into solids. Water turns into ice at 0°C . The transition from a solid to a liquid state is called liquefaction.

1. Properties: Has a changeable shape but no fixed volume.
2. Structure: Its particles are densely packed but move freely relative to each other.
3. Examples of substances in the liquid state include water, oil, and alcohol.

Liquids can also be categorized based on their properties, such as ultrasonic fluids, magnetic fluids, and others. By liquid, we mean the liquid state of a substance, and this state can also be of several types: ordinary liquids (water, oil), superfluids, gases (air, oxygen), etc.

Ordinary liquids include liquids such as water, milk, oil, and butter.

Superfluids exhibit their superfluid properties at very low temperatures. For example, helium is in a superfluid state.

Gases such as air, oxygen, and nitrogen are examples of the gaseous state of matter.

In addition, liquids can also be classified according to their composition, for example, as liquids used in chemical, food, pharmaceutical, and other industries.

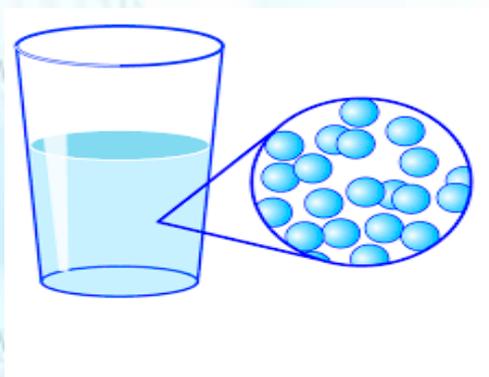


Figure 2. The structure of substances in a liquid state.

The particles are close together and can move freely over each other.

Gases Section

Gaseous substances have no fixed shape or volume, and the distance between their particles is much greater than in solids or liquids. Unlike solids and liquids, such substances do not retain their shape or volume under any conditions, but fill all available space.

1. Properties: Has a variable shape and volume.
2. Structure: The particles are far apart and move freely.
3. Examples of gaseous substances include gases and vapors that float in the air.

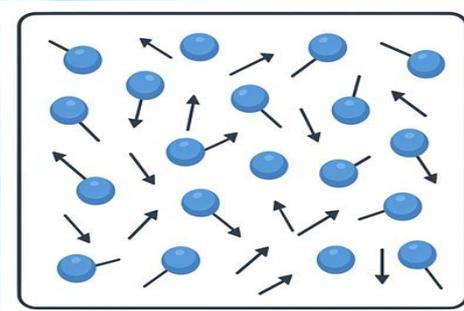


Figure 3. The structure of substances in the gaseous state. Particles are far apart, can move freely and randomly.

Plasma Section

1. Properties: Plasma is formed at very high temperatures when a gas becomes ionized into ions and electrons.
2. Structure: Atoms and molecules are separated into ions and electrons.
3. Examples of substances in the plasma state include stars (the sun), lightning, and the solar wind.



Figure 4. Substances in the plasma state.



Plasma (Greek plasma – formed) – a gas that is completely or partially ionized and in which the total charge of electrons and ions in each element volume is zero. This is the fourth state of matter, in which the substance is in the ionized gas state. In this state, atoms are separated from electrons, forming a mixture of positively and negatively charged particles.

Chemistry Structure Section

When we talk about the structure of matter, we refer to how it is composed of chemical elements, atoms, and molecules. This determines the physical and chemical properties of the substance. Each substance has its own unique atoms and their mutual bonds.

Elements and atoms: Each substance is made up of atoms of certain elements, and atoms consist of a nucleus (protons and neutrons) and electrons.

Molecules: Most substances are made up of molecules formed by the chemical bonding of one or more atoms. For example, a water molecule (H_2O) is made up of two hydrogen atoms and one oxygen atom.

State of matter: Whether a substance is solid, liquid, or gas depends on the arrangement and behavior of its particles. For example, at room temperature, only a few simple substances (mercury, bromine) are liquid, while the rest are solid or gaseous.

Structure and properties: The structure of a substance determines its physical properties (melting point, boiling point, density, etc.) and degree of chemical reactivity.

Substances are divided into natural and artificial types. Each type is further divided into several groups.

Natural substances are those that occur in nature. They are divided into elements (chemical elements that occur in nature. For example, oxygen, iron, gold) and compounds (chemical compounds that occur in nature. For example, water, salt, carbon dioxide)



Figure 5. Composition of natural products.

Artificial substances are those created by humans. Artificial substances are divided into synthetic substances (compounds created in a laboratory. Examples include plastics, synthetic fibers, and drugs) and modified substances (substances obtained by modifying natural substances. Examples include recycled wood and some food products).



Figure 6. Chemical composition of an artificial product.

Another classification of natural and artificial substances is based on the purity of the substance. That is, simple and complex substances. Simple substances are substances that consist of only one type of chemical element (for example, O_2 , N_2). Complex substances consist of two or more types of chemical elements (for example, H_2O , $NaCl$).

Substances are mainly used in agriculture, industry, medicine and many other fields, depending on their chemical and physical properties. Each substance can be used for different purposes depending on its unique properties. In agriculture, fertilizers, plant protection products and other chemicals are mainly used in agriculture to increase productivity and protect against pests. In industry, various chemicals are used in the production of plastics, paints, cleaning agents, medicines and many other products. In medicine, chemicals play an important role in the

production of medicines, diagnostics and medical devices. In other fields, substances are also widely used in many other sectors, such as the food industry, cosmetics, construction and electronics.



Figure 7. Uses of simple and complex substances in agriculture, industry, and medicine.

Substances are simple and complex substances. Simple substances consist of atoms of only one type of element, while complex substances are formed by the chemical combination of atoms of two or more types of elements.

Simple substances consist of only one type of chemical element. Depending on the type of chemical bond between atoms, they are divided into metals (Na, Mg, Al) and nonmetals (H_2 , N_2 , $[Br]_2$). They can be in molecular form (O_2 , $[Cl]_2$) or in the form of atoms (He, Ar). For example, we can give oxygen (O_2), iron (Fe), gold (Au).

Complex substances: are formed by the chemical combination of atoms of several types of elements. Unlike simple substances, they contain different elements. For example, we can give water (H_2O), salt (NaCl), carbon dioxide ($[CO]_2$).



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