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TYPES OF ORGANIC REACTIONS AND METHODS OF ORGANIZING MODERN TRAINING SESSIONS FOR THEIR EFFECTIVE STUDY

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Abstract. This article analyzes the main types of reactions in organic chemistry, their theoretical foundations and methods of effective teaching are discussed. The article analyzes innovative methods of organizing classes based on competency-based and STEAM approaches. It also substantiates the didactic effectiveness of using modern pedagogical technologies, digital technologies and interactive methods aimed at developing logical thinking and easy mastering of complex mechanisms.
Keywords: Organic reactions, substitution, combination, separation, regrouping, innovative, interactive education, digital technologies.

Organic chemistry is distinguished by its versatility and complexity of reaction mechanisms. Traditional memorization methods are losing their effectiveness today. The main goal of modern education is not just to remember reactions, but to understand the laws of electron movement and form the ability to predict the process. Teaching organic chemistry plays an important role in the modern education system. A deep understanding of organic reactions forms the skills of analyzing processes at the molecular level, planning synthesis, and solving practical problems. Today, in the educational process, along with the traditional lecture method, there is an increasing need to use interactive and problem-based teaching methods. Reactions in organic chemistry are divided into several main groups according to the mechanism and nature of the process:

1.Substitution reactions (S - Substitution): The replacement of one atom or group in a molecule with another. In these reactions, one atom or group in a molecule is replaced by another atom or group. For example, radical substitution is observed in alkanes or electrophilic substitution in aromatic rings.

2.Addition reactions (A - Addition): The addition of new atoms due to unsaturated bonds. In unsaturated compounds, the π-bond is broken and new σ-bonds are formed. For example, the addition of hydrogen or halogens to alkenes.

3.Elimination reactions (E - Elimination): The opposite of an addition reaction. A small part (for example, H_2O or HCl) is removed from the molecule, resulting in the formation of a double bond. The formation of a double bond as a result of the removal of small molecules (water, halide) from the molecule.

4.Rearrangement reactions. The formation of isomers as a result of a change in the molecular skeleton. Occurs with the replacement of internal atoms or groups. The composition of the molecule does not change, only the arrangement of atoms changes, forming a more stable isomer. A classic example is the Beckmann rearrangement reaction.

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5.Oxidation-reduction reactions. Reactions involving changes in oxidation state in organic compounds.

6.Condensation reactions. Two molecules combine to form a smaller molecule. For example, the Aldol condensation reaction occurs between carbonyl compounds.

If we make a comparative table on the classification of organic reactions, the main types of organic reactions are as follows and help to quickly distinguish reactions:

Types of organic reactions	Symbol	Nature of the reaction	Examples
Substitution	S	A-B + C → A-C + B	Chlorination of methane
Combination	A	A=B + C → C-A-B	Hydrogen addition to ethylene
Dissociation	E	X-A-B-Y → A=B + XY	Dehydration of alcohols
Regrouping	R	A-B-C →B-A-C	Conversion of butane to isobutane

Modern pedagogical approaches to teaching organic reactions

The following innovative approaches to mastering complex topics give high results:

Problem-based teaching technology. During the lesson, the student is not given a ready-made reaction, but the final product and conditions. The student seeks an answer to the question "Why was this product formed?" through the nature of the reactants. Students are given a reaction equation with an unknown mechanism, and they gradually determine the mechanism. This approach develops analytical thinking.

Digital technologies and 3D modeling. Molecular modeling programs can be used to visualize the transition state of a reaction. This method simplifies quantum-chemical concepts. In addition, the use of programs such as ChemDraw or HyperChem helps to understand the spatial structure of molecules. The assembly of "spherical" models of molecules clearly demonstrates spherical effects (the interference of molecules with each other).

STEAM approach. Through the integration of chemistry, physics and mathematics, energy diagrams are analyzed and thermodynamic parameters of the reaction are calculated.

In conclusion, it is recommended that an effective lesson on the topic of types of organic reactions consist of the following stages:

1.Motivation - the goal is to arouse interest in this topic. For this, for example, the most relevant and important real-life examples are given.

2. Visualization - To understand chemical reactions, it is important to first visualize them. For this, an animation of the reaction mechanism is shown.

3. Interactive analysis - Reactions are analyzed using various interactive methods to gain a deeper understanding and consolidate knowledge. For example, performing chain reactions in a sequential manner.

4.Refleksiya – ya'ni olingan natijalarni nazariy xulosalash va xatolarni tahlil qilish, hamda tuzatish.

In conclusion, in organic chemistry lessons, not just memorizing reactions, but teaching them to logically analyze their mechanisms is a key factor in improving the quality of education. The STEAM approach and the application of digital technologies (3D modeling) to the teaching process will not only enrich students' theoretical knowledge, but also form in them

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the skills to analyze complex molecular processes. This, in turn, will ensure the competitiveness of future specialists in the field of chemical technologies and synthesis

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