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Organization of Independent Work of Students in The Study of Oxygen-Containing Organic Compounds

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ABSTRACT

The need to form new concepts about the functional group, hydrogen bond, etc., on the one hand, and on the other hand, the expansion and deepening of existing knowledge about the structure and properties of hydrocarbons, make it possible to fully realize the cognitive abilities of students. This is facilitated by the widespread use of such forms of education as lectures followed by discussion of the material at the seminar; offsets; organization of independent work of students with a textbook when performing experimental tasks; systematic testing of knowledge. This article considers all those positions on the example of the study of individual classes of oxygen-containing compounds.

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When studying this section of the organic chemistry course, students for the first time form an idea of the functional group of atoms and its influence on the properties of substances, and further development of knowledge about homology and isomerism, the electronic structure of substances, the mutual influence of functional groups and hydrocarbon radicals in the molecules of alcohols, aldehydes, acids take place. Information about aldehydes, their structure, properties and applications can be studied sequentially over three lessons in accordance with well-known thematic planning.

But there may be another option for studying this material, when acquaintance with the structure, properties and use of aldehydes is carried out in one lesson-lecture, and in the next two lessons a seminar is organized in order to assimilate the contents of the lecture and consolidate the new material [1].

Let's take a closer look at the methodology for conducting these lessons about immediately drawing students' attention to the structure of aldehydes, their functional group - C. When considering the electronic structure, the features of the C \u003d 0 double bond are emphasized, since the electronic nature of all other bonds (we are talking about bonds) is already known to students.

To ensure the conscious assimilation of material on the electronic structure of aldehydes, models (scale and ball-and-stick), tables and other visual aids, as well as the corresponding notes on the board, are used. According to the table of the textbook "The homologous series of aldehydes", they characterize the physical properties of aldehydes and discuss the problematic question posed during the lecture about why the first homologues of the series of aldehydes, unlike alcohols, are volatile compounds. At the same time, it is important to emphasize that intermolecular hydrogen bonds do not form in aldehydes, and invite students to explain the reason for this phenomenon.

This approach will increase their attention to the content of the corresponding paragraph of the textbook and activate their cognitive activity at the seminar.

Next, the chemical properties of aldehydes are considered, emphasizing that they are mainly due to the presence of a functional group in the molecules of these substances - C. At the place of the double NH bond, addition reactions (hydrogen, water) can occur, and at the place of the C-H bond - an oxidation reaction (ammonia solution of silver oxide, copper (II) hydroxide. Note a qualitative reaction to aldehydes - with fuchsine sulfuric acid [2].

When considering the chemical properties of the oxidation reaction of aldehydes, which allow students to expand their knowledge of the mutual influence of atoms in the molecules of organic compounds. It is important to accompany the teacher's story about the chemical properties of aldehydes with demonstration experiments, some of which can be carried out by students in the laboratory in the next lesson, for example, the interaction of formaldehyde with fuchsine sulfuric acid.

At the end of the lecture, the teacher talks about the production and use of aldehydes. A common way to obtain aldehydes is the oxidation of alcohols. When explaining it, a demonstration experiment "Oxidation of alcohol to aldehyde" can be carried out. During the consolidation of the material at the seminar, students conduct this experiment in the laboratory.

Considering the methods of industrial production of formaldehyde and acetaldehyde, it is important to note that if the former is obtained by the oxidation of methanol, then the latter is obtained from unsaturated hydrocarbons, in particular from ethylene. A large team of specialists with many years of experience in scientific research and practical work in the relevant fields was involved in writing the book [5].

When characterizing the methods for producing acetaldehyde, the following is noted: the catalytic oxidation of ethylene is the most promising method for producing acetaldehyde, since ethylene is a more accessible and cheaper raw material than acetylene. It is important to emphasize that the simplified process diagram:

2CH2 \u003d CH2 + 02-»-2CH3-CHO

shows only the initial and final products A necessary condition for the occurrence of this reaction is the presence of a catalyst, which is used as chlorides of copper (GuCl) and palladium (PdCl2) [3].

As homework, students can be invited to familiarize themselves with the corresponding paragraph of the textbook, practice writing the structural and electronic formulas of aldehydes, compiling reaction equations that characterize their chemical properties, using notes in notebooks. An individual task, which the students can complete at will, includes the preparation of a report on the receipt and use of aldehydes.

The next two lessons-seminar are devoted to working out and consolidating knowledge about aldehydes. At the first of them, questions of the structure, physical and chemical properties of aldehydes are discussed, at the second, material on the use and production of aldehydes is considered. In these lessons, it is advisable to conduct short-term independent work in order to check the quality of what has been learned.

Due to the fact that students have already worked out information about aldehydes at home, at the beginning of the seminar they can be asked to repeat the structure and physical properties of aldehydes from the textbook and prepare answers to the following questions:

1. Define aldehydes and name their general formula.
2. Specify the types of chemical bonds in the acetaldehyde molecule. How are they formed?
3. How does the C=0 double bond in the aldehyde functional group differ from the C=C bond in the ethylene molecule?
4. Write the structural formulas of aldehydes corresponding to the composition of C4HsO.

Then the students perform written independent work on the options on separate sheets. The teacher reports that they will be able to check the correctness of the assignments on the control card.

1. Write the electronic formula of formaldehyde. Specify the electron density distribution in its molecule.
2. Write the structural formula of 2,3-dimethylbutanal.

Option P.

1. Write the electronic formula of acetaldehyde. Specify the electron density distribution in its molecule.
2. Write the structural formula of 2-methyl-butanal.

No more than 5-7 minutes are given to complete the work, after which the students, using a control card, conduct a self-examination: they compare their answers and correct errors, underlining them, and then set

aside the sheet (it will be required for the next work). Next, students repeat the chemical properties of aldehydes and perform laboratory experiments that confirm these properties.
As they work, they make brief notes in their workbooks. At the end of the lesson, they are offered the following task: how can one prove in two ways that this solution contains aldehyde? Students write down the equations of chemical reactions on the same sheets of paper that were used to complete the first task.
This task is checked frontally: the student, called to the board, offers his own answer, the class, if necessary, supplements the answer of his friend, each corrects and emphasizes his mistakes, and then the sheets are handed over to the teacher. He evaluates the work of students and sets marks based on the quality of their performance in laboratory experiments.
As a result of completing the homework of this and subsequent lessons, students should learn the structure, properties and practical application of aldehydes, be able to draw up reaction equations that characterize their properties and methods of obtaining. Now they should not just read the relevant textbook material, but work it out in depth. For successful management of students' activities, it is necessary to establish feedback in order to obtain information about the quality of assimilation of the studied material by each student [4].
When monitoring the assimilation and performance of tasks, the following forms of control are used: self-control, mutual control, teacher control. Self-control is exercised by the student; he compares the results with the standard and evaluates the level of his performance himself. Mutual control is possible when the student has already checked and corrected his mistakes, after which he can check the partner's task (including when filling out the summary table). The teacher is constantly supervised. Mandatory input and output control, the forms of which can be different, in our case, in the input control, the task is used to determine the formulas of substances according to the options, in the output control - control work, in the intermediate control, the forms can be very diverse - frontal conversation, practical work, independent work, test, dictation, game (magazine issue).

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