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Methodology for the Study of Acetylene and Hydrocarbons Using Interactive Methods

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Annotation: *The development of personality is of particular importance in the modern model of education. One of the aspects of personality development is the development of mental activity, where generalization and systematization of knowledge occupies a significant place. As mentioned above, the psychological and pedagogical significance of generalizing knowledge is great. It consists in the development of logical thinking, creative abilities of students, the creation of a holistic scientific picture of the world in their minds, in the formation of a scientific worldview.*

Keywords: *formula of alkynes, hydrocarbons, acetylene salts.*

The tasks of generalization and improvement of students' knowledge in the methodology of teaching chemistry have been defined since its formation. Many methodologists paid great attention to these issues, who made a great contribution to the theory and practice of teaching.

L.P. Voronina for the first time investigated the comparative effectiveness of various teaching methods used in the final generalization of knowledge, namely lectures, laboratory classes for study of acetylene and hydrocarbons, control exercises, developed special means of visualization. The paper shows the effectiveness of using in the process of final generalization of the proposed system of independent work of students: home training on the experimental manual and classroom independent work. The characteristic features of generalizing independent works are the combination of inorganic and organic chemistry material in their content, the use of various types of student activities, as well as the design of the results of the work in the form of systematic tables. An important place in the independent work of students during the final generalization is occupied by the performance of specially designed exercises.

At the formative stage of the experiment , we set the following tasks:

1. To check the effectiveness of the developed and implemented methodological system for the systematic use of the modular generalizing program "Hydrocarbons and acetylene" based on control and experimental groups.
2. Develop the content of questionnaires to test the impact of modular learning elements on students.
3. To carry out timekeeping, revealing the amount of time spent by students in the study of hydrocarbons. If two more hydrogen atoms are taken away from the ethylene molecule, i.e.

dehydrogenate it, then an even more unsaturated compound will be obtained — acetylene, in the molecule of which there is another bond between carbon atoms, i.e. a triple bond will be formed:

4. To carry out mathematical processing of the data obtained in the course of the study, which allows us to conclude about the effectiveness of the methodological system and the reliability of the results of the pedagogical experiment.

If two more hydrogen atoms are taken away from the ethylene molecule, i.e. dehydrogenate it, then an even more unsaturated compound will be obtained — acetylene, in the molecule of which there is another bond between carbon atoms, i.e. a triple bond will be formed:

H H

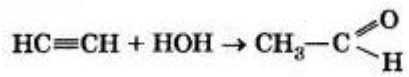
| | -H2 | |

H - C = C - H -> H - C = C - H -> H - C =- C – H

However, acetylene is not obtained in this way. In production and in the laboratory, it is obtained from calcium carbide CaC2:

CaC2 + 2H20 -> Ca(OH)2 + C2H2

Like ethylene, acetylene enters into addition reactions, which go in two stages. For example, the reaction with bromine water can be written using the equations:



Acetylene is a substance that is the ancestor of a new class of unsaturated hydrocarbons. Let's deduce the general formula of alkynes together. The general formula of CnH2n+ 2. In alkenes, due to the cleavage of two hydrogen atoms, a double bond is formed, the general formula is CnH2n. A triple bond appears in alkynes, therefore, they contain two less hydrogen atoms. So, what general formula will alkynes have?

The general formula of alkenes is CnH2n-2.

Let's play a Tic-Tac-Toe game with you. The winning way is made up of formulas that can match alkynes:

C2H2	C10H22	C7H16
C6H12	C4H6	C5H10
C5H8	C4H8	C3H4

In addition to acetylene, other hydrocarbons with a similar structure are known. From the given list of substances, write down the alkynes in the notebook:

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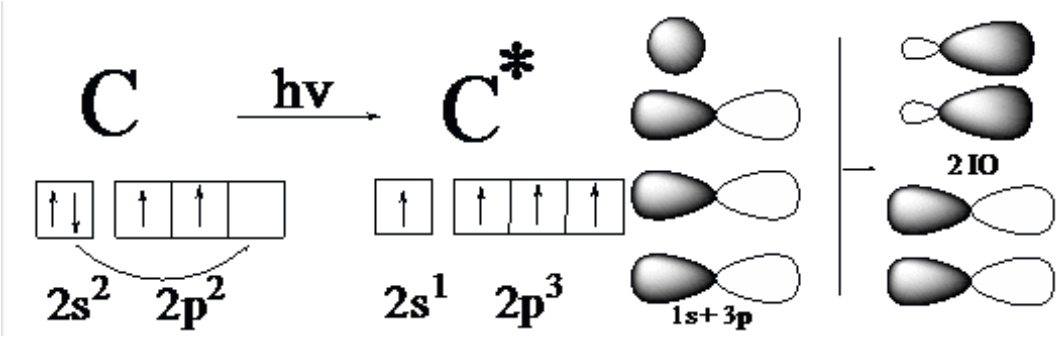
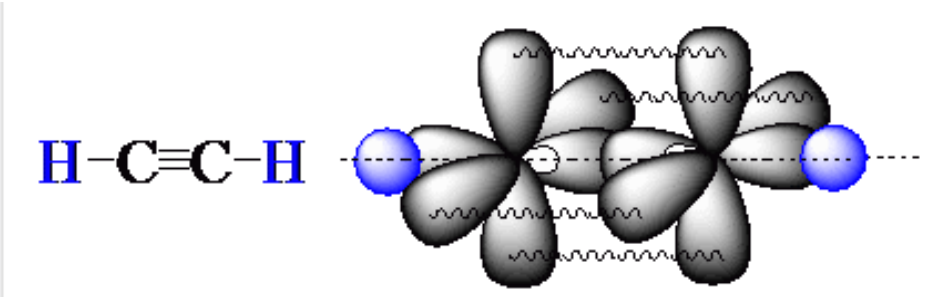
1. CH≡C-CH2-CH2-CH3
2. CH3-CH3
3. CO
4. CH3-C≡C-CH2-CH3
5. CH3 = CH – CH2 – CH3
6. CH3 = CH – CH2 – CH = CH – CH2 – CH3

Let's make a conclusion together on our first station. What hydrocarbons are called alkenes? (Alkynes are unsaturated hydrocarbons whose molecules contain one triple carbon-carbon bond. The composition reflects the formula: CnH2n-2.) Next, we note the features of the nomenclature of acetylene hydrocarbons.

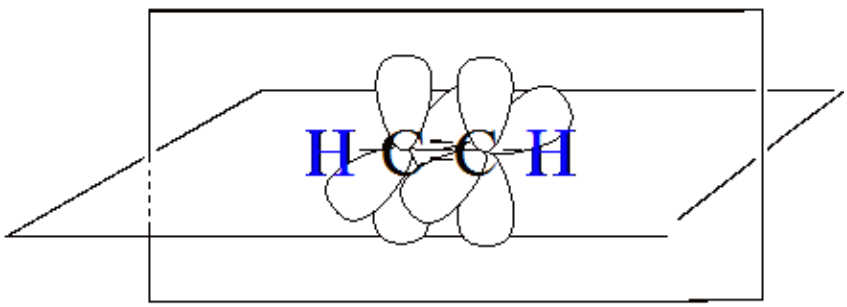
Let's consider the structure of alkynes on the example of acetylene. In the case of alkynes, 1s- and 1p-clouds participate in hybridization.



Two p-clouds remain non-hybridized, they overlap in two mutually perpendicular planes.



Thus, the acetylene molecule has a linear structure, carbon atoms are connected by one s- and two p-bonds.



Valence angle – 1800

The shape is linear

The length of the C ° C sv . – 0.120 nm

E sv = 837 kJ

Acetylene is used in autogenous welding and cutting of metals. For these purposes, two cylinders with different gases are required: oxygen and acetylene. Gases are fed into a special burner, where during the combustion of acetylene in oxygen, a temperature of about 3000 ° C is reached, which makes it possible to work even with refractory metals and steel.

Acetylene is the most important starting product in the synthesis of higher-order organic compounds. Thus, acetic acid, ethyl alcohol, solvents, plastics, rubber, aromatic hydrocarbons are synthesized from it, and are also used in the production of explosive acetylenides. These are acetylene salts obtained by reacting with some heavy metals. The resulting compounds have high chemical instability and decompose with a powerful explosion at the slightest external influences (impact or friction). Acetylenides of silver, copper and mercury are used in the industrial production of explosives. Gold acetylenide is also characterized by a very strong explosive property. Acetylene mixed with ammonia is used in the operation of rocket engines. Many chemicals familiar to us in everyday life are synthesized from acetylene, for example, polyvinyl chloride. The well-known PVA glue (polyvinyl acetate) is also obtained from acetylene.

The equilibrium of the chemical reaction is noticeably shifted already at a temperature of 1000-1300 ° C and above. At 1500 °C, methane is almost completely converted into acetylene. However, at this temperature, acetylene begins to decompose into soot and hydrogen.

Thus, the formation of acetylene occurs in the intermediate stage of decomposition of methane. In order to realize the release of acetylene, it is necessary to prevent its decay. To do this, it is necessary to reduce the residence time of the hydrocarbon in the reaction zone by reducing the pressure and applying "quenching" of the reaction products by rapidly cooling them to a temperature at which the decomposition reaction does not occur.

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