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# IMPLEMENTATION OF PRACTICAL SKILLS OF STUDENT SCIENTISTS IN DETERMINING BIOGENIC ELEMENTS

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**Abstract:** The results of hydrochemical analysis of spring water established average mineralization, average annual chemical composition, which differs from regulatory indicators (especially for drinking water standards) due to an increase in the absolute and relative concentration of ions of anthropogenic origin. The quality of spring water is sufficient for domestic use, but insufficient for drinking water supply.

**Keywords:** practical skills, student scientists, biogenic elements

Student work in student scientific societies (SSS) allows students not only to acquire ready-made knowledge, but also to acquire it independently, developing creative
The use of students' practical skills in research work is a key element in improving the quality of higher education, ensuring the integration of theoretical knowledge with scientific research and professional activities.

Student scientists of chemical disciplines carried out work on the determination of calcium and magnesium ions in some pharmacopoeial preparations [1, p. 28], improved the methods of complexometry of magnesium and calcium content using various indicators [2,p.38].

The purpose of this study is to determine the biogenic elements in the water of the Dnipro River.

The acidity (pH) of water is one of the most important indicators of water quality, which determines the nature of chemical and biological processes occurring in water.

The concentration of hydrogen ions in water is an indirect indicator of the Carbon content [3,p.95] and determines the nature of a number of biological processes that affect respiration and metabolism, therefore determining pH during water testing is mandatory.

Due to the dependence of pH on the ratio of different forms of carbonic acid, the active reaction of the aquatic environment had seasonal and daily changes. In the daily course, pH had minimal values in the pre-morning hours, when the water reaction becomes acidic due to the accumulation of $CO_2$ and $H_2CO_3$ [3, p.101].

Depending on the pH value, the rate of chemical reactions, the degree of corrosiveness of the water, and the toxicity of pollutants can vary. In river waters, the pH usually ranges from 6.5 to 8.5 [3, p.121].

The acidity of the water was determined by the potentiometric method using a pH meter. The pH of the water ranged from neutral to slightly alkaline (7.2 - 7.6). The alkalinity of water characterizes the ability of natural waters to neutralize hydrogen ions.

The main components that bind hydrogen ions in most natural waters are $HCO_3^-$ and $CO_3^{2-}$ ions, so the alkalinity of water is determined by the content of bicarbonate and carbonate ions.

The alkalinity of the water and the content of bicarbonate and carbonate ions in the water were determined by titration with a solution of hydrochloric acid in the presence of methyl orange indicator. The alkalinity of the water varied from 3.4 mmol/$dm^3$ to 4.0 mmol/$dm^3$.

The presence of organic substances characterizes the oxidability of water. This indicator allows you to assess the overall pollution of water with organic substances. Increased oxidability of water may indicate its pollution by wastewater.

Therefore, the oxidation of water is an assessment of its quality as an indicator of pollution by organic and inorganic compounds; the higher the oxidation of water, the worse its quality. The permanganate oxidation of water was determined by the Kubel method and a conclusion was made about the compliance of the water with established

standards (in the norm for surface waters - the optimal value is 10-15 mg/dm$^3$ ($O_2$), up to 30 mg/dm$^3$ ($O_2$) is allowed.

Permanganate oxidation of water was within normal limits.

Biogenic elements include nitrogen, phosphorus, silicon and iron in various compounds. They are necessary for the development of living organisms.

The concentration of biogenic elements and their regime completely depend on the intensity of biochemical and biological processes occurring in water bodies.

Nitrogen is a major component of living organisms. In nature, particularly in water bodies, there is a constant cycle of nitrogen compounds involving numerous processes in both living and non-living nature.

The decomposition of proteins in water bodies produces ammonia, which over time is oxidized to nitrites and nitrates. The largest polluters of natural waters with ammonia are livestock farms, and the largest polluters of nitrates are surface water from fields and wastewater from chemical industries.

They cause rapid growth of blue-green algae and disruption of the functioning of aquatic ecosystems. Nitrogen is one of the most important limiting nutrients. Its high content in water accelerates eutrophication processes. Phosphorus is one of the most important nutrients.

Plants and animals consume its compounds, and when they die, phosphorus-containing substances are released back into the environment. Phosphorus compounds enter water bodies with surface waters that wash them away from fields where they are applied as fertilizers; with wastewater from the production of orthophosphoric acid, phosphates and superphosphate; with household waters and waste in the composition of detergents

Thus, under the influence of anthropogenic factors, the content of phosphates, nitrates, nitrites and ammonium nitrogen increases in natural waters. Determining the concentration of these ions in water allows us to assess the level of water pollution by organic residues.

Photometric analysis was used to determine the biogenic elements in water. The concentration of ammonium nitrogen was determined by the photocolorimetric method

with Nessler's reagent, nitrites - with Griess reagent, nitrates - with sodium salicylate, and phosphates - with ammonium molybdate in the presence of ascorbic acid.

Water mineralization is the total amount of minerals dissolved in it. The level of salt content in water varies in different geological regions due to different solubility of minerals. Very low mineralization (up to 100 mg/l) worsens water quality, and water devoid of salts is generally considered harmful because it reduces the osmotic pressure inside the cells. The mineralization of water in the Dnipro River ranged from 0.546 to 0.720 g/dm$^3$.

Thus, the work performed showed that the water of the Dnipro River has an average mineralization; the current average annual chemical composition of river water differs from the regulatory indicators (especially for sweat production standards) due to an increase in the absolute and relative concentrations of ions of anthropogenic origin.

According to the results of hydrochemical analysis, the quality of the natural water of the Dnipro River was found to be sufficient for domestic use, but the quality of the natural water was insufficient for drinking water supply.

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