

PHYSICO-CHEMICAL METHOD

The physico-chemical method involves the examination of the oxygen content and specific chemical compounds, the pH of the water and physical properties such as turbidity, color, odor and temperature. Using the right reagents and customized colored keys. Information on water hardness (water-soluble calcium and magnesium salts) can be obtained during testing.

1. PH - pH of the solution, which is determined by the saturation of water with carbon dioxide and the presence of carbohydrates, the presence of nitrates, nitrites and iron⁶. Phosphates or here are the basic parameters that are subjected to research and their short characteristics and their impact on water quality: pH - the product of the concentration of hydrogen ions (H⁺) and hydroxyl ions (OH⁻).

- If $H^+ = OH^-$ it means that the water is clean and does not contain minerals, then the pH is 7.
- When the value of $H^+ > OH^-$ then the water is acidic, if it is the reverse, i.e. $H^+ < OH^-$ it means that the water is alkaline.
- In other words, the pH value is a measure of the pH of the water, that is its acidity or alkalinity. The pH scale ranges from 0 to 14. The value 0 corresponds to the extreme acidity and the value of 14 extreme alkalinity.
- The value 7 means neutral reaction. When the acidity increases, the pH decreases pH7. and if the basicity increases, the value also grows
- In most surface waters in Poland, the pH concentration is 6.5-8.5. Changing the pH value may result in the extinction of organisms in a given water body. The table below shows how the water quality class changes depending on the pH value.

water quality class	pH
I	6,5 – 8,5
II	6,0 – 8,5
III	6,0 – 9,0
IV	5,5 – 9,0
V	< 5,5 or > 9,0

2. NO3 nitrates - NO3 nitrates are formed in the decomposition of organic substances, they pass through ground waters, along with them they get to streams and rivers, and their highest concentration occurs in the spring. Increasing the nitrate content in waters may be caused by runoff from agricultural crops fertilized with nitrogen fertilizers. Concentrations of nitrates in drinking water higher than 10 mg / l may cause, especially in infants so-called methemoglobinemia (cyanosis). A large amount of nitrates is also harmful for organisms found in water.

water quality class	Maximum strength
I	5
II	15
III	25
IV	50
V	>50

3. NO2 nitrate - the natural concentration of NO2 in water free of impurities is approx. 0.01 mg / l NO29. The effects of too high levels of NO2 nitrates can be fatal to our fish! They are a strong poison that blocks the processes of breathing in their body - the fish is suffocating from the inside.

4. water hardness - determines the concentration of calcium and magnesium salts in water. There are different measures of water hardness, but we chose the most popular, ie ° n. Below is a table of water hardness:

water quality class	the scale of water hardness
0 - 5	very soft
5- 10	soft
10- 15	with medium hardness
15- 20	with considerable hardness
20 – 30	hard
>30	Very hard

5. iron - is an important element for the development and growth of plants. For satisfactory plant growth, it is necessary to concentrate the micronutrient teko in the range of 0.1 - 0.2 mg / l. Usually iron is found in small amounts in surface waters. The current regulations state that the iron content in water intended for consumption can not be higher than 0,2 mg / l11.

water quality class	maximum concentration mg Fe/l
I	0,1
II	0,3
III	1,0
IV	2,0
V	>2,0

6. turbidity - is expressed in NTU. It can be caused by clay, clay, iron compounds, manganese, plankton and microorganisms. Turbidity is associated with microbiological purity. The turbidity of drinking water can not have a turbidity exceeding 1 NTU.

7. color - is expressed in mg Pt / dm³. It is determined after the sample has been filtered, because it is an optical feature of water, thanks to which the measurement indicates the content of substances that are responsible for the water color. The changed color of water is usually caused by manganese and iron compounds and natural organic compounds.

8. fragrance - is marked in letters:

- o R - vegetable,
- o G - putrid,
- o S - specific,

The smell is determined on a scale from 0 (no smell) to 5 (very strong)