

## **Worksheet**

**Target group:** Primarily children aged 4–13 (students or preschoolers)

**Group size:** In schools (kindergartens), participation can range from teams of 3-4 people to the involvement of several classes. There is no upper limit to the number of participating institutions.

**Total time allocation:** 2-3 hours activity for an observation group 4 times per academic year.

### **Materials and equipment required for the implementation of the program:**

- Thermometer [household thermometer that can be immersed in water, with whole (or half) degree accuracy]
- Funnel [plastic, with a diameter of approx. 15 cm]
- 2 test tubes [normal laboratory test tube with colorless glass]
- 1 sheet of white paper
- some filter paper or cotton wool
- Universal indicator paper [Typically circular, pH 1–14 color scale]
- 1 m long, finger-thick rod
- Plastic card for measuring visual depth

### **A) Time schedule of examinations**

When compiling the annual programs, we always specify the 4 weekends designated for water testings (when there is neither a school break nor a freezing period). So, two times in autumn (from September to November) and two more in spring (from March to May). The exact designation of test dates is important so that the obtained measurement data and observed characteristics can be compared.

### **B) Content of the examinations**

The tests - measurements, observations - are carried out following a centrally compiled worksheet (see below). The (professional) difficulty of the tasks is at such a level that, with the help of a teacher, even elementary school students - and even kindergarteners - can successfully complete them, but they are also a challenge for senior students.

#### **1. Temperature measurement**

The water temperature must be measured away from the shore and at a depth of a span in the water, so special care must be taken that the measuring children can safely stand directly on the water's edge.

#### **2. Determining the color of the water**

You need two test tubes and a white sheet.

We compare tap water, which is considered colorless, with the live water sample taken at the given location. We fill one of the test tubes (brought from home!) with tap water, and the other one is filled with live water. The white sheet is not held behind the two joined test tubes (because then we would only see the color of a layer thickness of 1 cm, which is so pale that the perception of the color would be uncertain), but rather below them, and we look into them from above, in a vertical direction (in this way we see the color of a layer thickness of almost 20 cm).

#### **3. Determining the smell of the water**

A (plastic) funnel and some filter paper or cotton wool are required.

The weak smell of healthy running water must be "multiplied" to be perceptible, so we slowly filter a liter of water through filter paper or a cotton ball placed in the mouth of the funnel, and then remove it and determine the smell of the tested water by sniffing it closely.

#### **4. Measuring the pH of the water**

Universal indicator paper (pH1–14) is required including a color scale. (It is sufficient if the scale only shows the colors of the pHs marked with whole numbers, because based on the

color degrees, we can also read intermediate values - by estimation. We can also use a more precise pH test strip, which already indicates decimal values, but in our case, the measurement with such precision is not important.

Dip the piece of indicator paper into the tested water and immediately identify the pH based on the color scale. The professional – chemical and mathematical – interpretation of pH is not necessary in this programme (we entrust this question to the teacher who knows the given group of children well). It is enough to know that the indicator paper indicates an increasingly acidic chemistry from 7 downwards, and an increasingly alkaline chemistry 7 upward.

#### 5. Establishing transparency of the water

For this, you need a finger-thick, 1m-long measuring rod and a white plastic sheet the size of a playing card, on which the word GREEN HEART (or other short text) is printed in 1cm black letters. The card must be attached to the bottom of the rod (perpendicular to it).

In essence, we establish a depth of view. The rod - with the plastic card attached to its bottom - is slowly pushed deeper and deeper into the water, and we observe at what depth the letters become unreadable. Then we take the rod out of the water and measure the length of the wet part to the nearest cm.

#### 6. Observation of the living world

No auxiliary equipment is required for this test.

Observing the plants and animals living in the water and on the water's edge provides insight into the ecological state of the river. We can enrich that activity, e.g. by having the children make drawings (on the back of the worksheet) of the observed living beings.