Problem:

Can water pollution be detected in the standing waters of Halle?

Preliminary consideration:

In order to detect pollution in standing waters in Halle, the Ph value of the samples is determined with a Uni-Test strip. The samples are then analysed for sulphate ions using barium chloride and for chloride ions using silver nitrate and ammonia.

Hypothesis:

We hypothesise that chloride and sulphate ions can be detected in the water samples from the lakes. We also hypothesise that there is organic material in the water samples at the microscopic level.

Materials:

- Test tubes
- Beaker
- Pipette(s)
- Test tube stand
- Microscope
- Microscope slide
- Cover slips
- Universal indicator (test strip)
- Glass rod

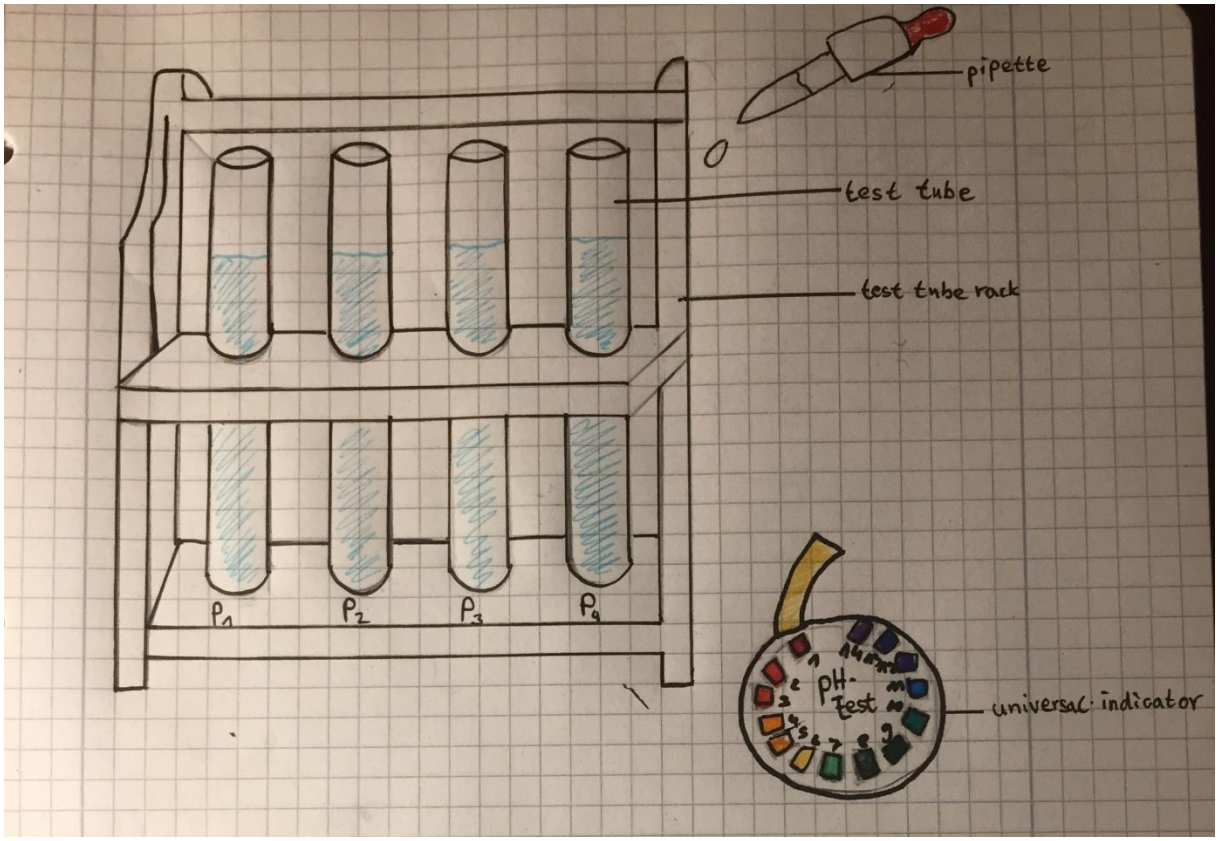
Chemicals:

- Silver nitrate
- ammonia
- barium chloride
- Distilled water

Test objects:

- Water samples from 4 different water bodies:
    - P1: Rattmannsdorfer Teiche (51.4108923, 11.9394954)
    - P2: Kiesgrube Hohenweiden (51.418693, 11.928062)
    - P3: Lieskauer Tonteiche (51.5020100, 11.8476670)
    - P4: Kreuzer Teiche (51.5032027, 11.9423105)

Sketch:



PH test:

Procedure	Observation
- Drop 4 unit test strips each with water from a sample - Drip extra test strips with distilled water - P1: slightly greenish discolouration	- P2: green discolouration - P3: discoloured green - P4: slightly greenish discoloured - Distilled water: slightly greenish discolouration

Explanation:

The greenish discolouration means that hydrogen ions as well as hydroxide ions are present in equal amounts. In this case, samples P2 and P3 have a neutral pH value, i.e. 7. Samples P1 and P4, as well as the distilled water, have a pH value of 6 and are therefore slightly acidic. There is an excess of hydrogen ions.



Detection of sulphate ions:

Procedure	Observation
- Fill equal amounts of water of the samples into individual test tubes. - Add equal amounts of barium chloride to each test tube - Stir with the glass rod	- A white turbidity develops (uniformly in the samples) - Distilled water has a very slight turbidity which is negligible

Explanation:

- The addition of barium chloride causes a precipitation reaction in which barium chloride and the sulphate ions present in the water samples react to form the non-water soluble precipitate barium sulphate, which causes the white turbidity. There are no sulphate ions in the distilled water, consequently no precipitate is formed and the turbidity precipitates.

Reaction equation:

$BaCl_2 + SO_4^{2-} \Rightarrow BaSO_4 + 2Cl^-$



Detection of chloride ions

Procedure	Observation
- Fill equal amounts of water of the samples into individual test tubes. - Add equal amounts of silver nitrate to each test tube - Stir with the glass rod - Add equal amounts of ammonia to each test tube - Stir with glass rod - A white turbidity appears in the water samples (uniformly in the samples)	- After adding ammonia the turbidity dissolves - Distilled water has a very slight turbidity which is negligible

Explanation:

The addition of silver nitrate creates a reaction equation in which silver nitrate and the chloride ions present in the water samples react to form the non-water soluble precipitate silver chloride, which causes the white turbidity. Since silver nitrate detects halide ions (Cl-,Br-,F-,I-) we use ammonia to determine the halide ion more closely. Silver chloride dissolves completely in ammonia and forms a silver diamine

complex ion, silver bromide dissolves partially to form a silver diamine complex ion and silver iodide does not dissolve at all in ammonia (fluoride ions do not form a precipitate). Thus, we have detected chloride ions.

Reaction equations:

$AgNO_3 + Cl^- \Rightarrow AgCl + NO_3$

$AgCl + 2NH_3 \Rightarrow [Ag(NH_3)_2]^+ + Br^-$



Why did we choose these locations:

P1: “Rattmansdorfer Teiche”

The “Rattmansdorfer Teich” is a popular bathing lake.



P2: Kiesgrube Hohenweiden

The Hohenweiden gravel pit was built in the 1960s and 1970s to extract gravel for the construction of the nearby Buna works.



P3: Tonteiche Lieskau

This body of water was formed by the removal of clay.




P4: Kreuzer ponds

The ponds were fished in the 15th century. Now they form a landscape conservation area and serve as a biotope for many toad species.




Error observation:

- Samples analysed three days after collection
- Test tubes in which the distilled water was analysed were not sufficiently cleaned beforehand.