A Note on the Use of Litmus/pH Paper

ir. Emile M. Hobo — 19 March 2023
E-mail: e.m.hobo@hotmail.nl

I have had some difficulty determining the pH value of fluids using litmus paper. The instructions I would receive in high school and elsewhere would typically say that the paper should be submerged in the fluid for five seconds and not more than that. Than you take it out and read the value comparing the coloring to the color chart.

This was impossible at first, because the coloring had washed away and was now a gradient, giving an error margin of more than ± 2 pH. I tried it this way by determining the acidity of household chlorides in a water solution and with lemon juice.

The household chlorides came back with a reading of being basic, but with too large an error margin as noted. The lemon juice seemed to have an acidity, as noted on the Internet elsewhere also without further reference to who determined it, of about pH 2 to 3.

This was way too great a variance for me. I need it to be more exact to leave little for interpretation. As such I had to reestablish the approach of obtaining a pH measurement.

The proper approach that I came up with was not to submerge the paper, but to apply pin drops of fluid to the paper instead. With a regular drop, which is what I used with the lemon juice, I got the reading of an acidity of pH 2 to 3 and it felt like it had a severe error margin, because it already washed away the coloring.

I used the end of a bent open paper clip to repeatedly extract little drops and applying them to the paper. I also applied it so the coloring would also be on the edge. This way I could hold it against the color chart for comparison. I got a monochrome coloring, as in a reading of only one value.

Based on the color I'm certain to say lemon juice has an acidity of pH 2 ± 0.5. The coloring still has to be read and compared to the color chart by eye. This still introduces a certain degree of uncertainty, but it's clear that it's closer to pH 2 than to pH 3. It might even lean a little toward pH 1, which means that it's a stronger acid than previously determined.

I am hopeful that when I filter the lemon juice sufficiently to remove organic materials, I might use it for my research. I will release the genetic material from my cells using a soapy solution. The acidic environment of the lemon juice might get the genetic material to materialize into visible chromosomes, by forcing it to reproduce.

If this is possible, I don't need hydrochloric acid. Students in school can also safely replicate this method for witnessing their own chromosomes through the method of DNA. I hope filtering the lemon juice three times through coffee filters is sufficient and will work.