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**BIO 1120L Section 13**

**Concentration and pH lab report**

**Introduction:**

According to BIO 1120 laboratory manual (Krane 2023), When something is dissolved in a liquid, the amount of substance compared to liquid is called concentration. Concentration is expressed in several different ways such as “Molarity”, “Normality”, “Mole fraction”, “Molality”. Each methods of concentration provide useful information depends on type of chemical reaction.

The pH of solution is defined as the negative logarithm of the hydrogen ion concentration( $H^+$ ). It shows how acidic, basic or neutral a solution is on a scale of 0 to 14. According to NOAA, Acidic solution has pH below than 7, Basic solution has pH above than 7 and Neutral solution has pH value 7 which is mainly water. Additionally, pH value of a solution can also be determined using litmus paper. When a drop of solution is added, color changed based on their properties. If litmus paper turns red then the solution is acidic whereas if it turns blue, the solution is basic. In addition to using litmus paper, pH can also be determined by anthocyanin (pigment extracted from red cabbage). These pigment changes color based on the pH of solution, turning red in acidic solution and blue to green in basic solution.

**Materials and Methods:**

In the first step, we cleaned eight clean test tube and start to labelled as “2”, “3”, “4”, “6”, “7”, “8”, “10”, “12”. Then, we added 5ml of known solution in each clean test tube. While adding the solution, my friend accidentally used the wrong syringe and made the cross contamination between two solutions. It took some time but somehow we got back in track. Then, we add 3 ml of cabbage extract in the same solution. We find that the pH value of 2 changes into bright red, the pH value of 3 changes into pink/magenta, the pH value of 4 changes into light pink, the pH value of 6 changes into light indigo, the pH value of 7 changes into clear blue, the pH value of 8 changes into dark green, the pH value of 10 changes into dusty yellow and the pH value of 12 changes into light yellow.

Secondly, we took six additional clean test tubes and labelled as “A”, “B”, “C”, “D”, “E”, “F”. We filled each tube with 5ml of a known 6 household solution which are Vinegar, Detergent, Aspirin, Anti-acid, Bleach and Soda. Then, we add each solution on litmus paper which results in change in color. We observe that test tube A with vinegar solution turned into orange with pH around 3, test tube B with detergent solution turned into light green with pH around 6, test tube C with aspirin solution turned into dark orange with pH around 10, test tube D with Anti-acid solution turned into blue green with pH around 7, test tube E with bleach solution turned into turquoise with pH around 10 and test tube F with Soda solution turned into light orange with pH around 4.

Finally, we add 3 ml of cabbage extract in each test tube A-F and were mixed properly. Then we noted that the colors in a notebook. Vinegar solution turned into reddish pink, Detergent solution turned into dark blue, Aspirin solution turned into light pink, Anti-acid solution turned into light blue, Bleach solution turned into bright yellow and Soda solution turned into light pink.

### Results:

**Table 1.2:** The following table shows the color of Anthocyanin in known pH Solution.

pH of Standard	Color of Anthocyanin	Observation
2	Bright red	Color change almost very vivid
3	Pink/ Magenta	Red with pinkish hue
4	Light Pink	Slightly duller
6	Light Indigo	Much duller
7	Clear Blue	Very dull
8	Dark Green	Dull
10	Dusty Yellow	Dark yellow color
12	Light Yellow	Slightly clear yellow

**Table 1.3:** The following table shows the pH of six Household solution found using pH test paper

Solution	Name	Color of pH Paper	pH
A	Vinegar	Orange	3
B	Detergent	Light green	6
C	Aspirin	Dark Orange	2
D	Anti-acid	Blue Green	7
E	Bleach	Turquoise	10
F	Soda	Light Orange	4

**Table 1.4:** The following table shows the pH of six household solution found using Cabbage Extract.

Solution	Name	Color of Anthocyanin	Estimated pH*
A	Vinegar	Reddish Pink	4
B	Detergent	Dark Pink	5
C	Aspirin	Light Pink	3
D	Anti-acid	Light Blue	6
E	Bleach	Bright Yellow	9
F	Soda	Light Pink	3

**Conclusion:**

The results really shocked me as the pH paper test and cabbage extra shows different kind of color and pH of the same solution. Vinegar turned orange with pH paper but reddish-pink with cabbage extract. Detergent appeared light green on pH paper, while cabbage extract produced a dark pink. Similarly, aspirin turned dark orange on pH paper but light pink with cabbage extract. Anti-acid turned blue green on pH paper but light blue with cabbage extract. Additionally, bleach turned turquoise on pH paper but bright yellow with cabbage extract. Moreover, soda turned light orange on pH paper but light pink with cabbage extract.

In conclusion, my hypothesis seems to be different than recorded results. I thought pH paper and red Cabbage extract would show the same results when used to indicate pH of solution. I expected both methods will show identical colors and pH of the same solution. However, I was surprised to find that they produced different colors and indicated different pH level.

## References

(n.d.). NOAA. Retrieved 10 Sep.2024, from [www.pmel.noaa.gov/co2/story/A+primer+on+pH](http://www.pmel.noaa.gov/co2/story/A+primer+on+pH)

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