Acid, Base, & pH Indicator Lab

Acids & Bases Lab

Question: How can various indicators be used to determine the pH of various solutions?

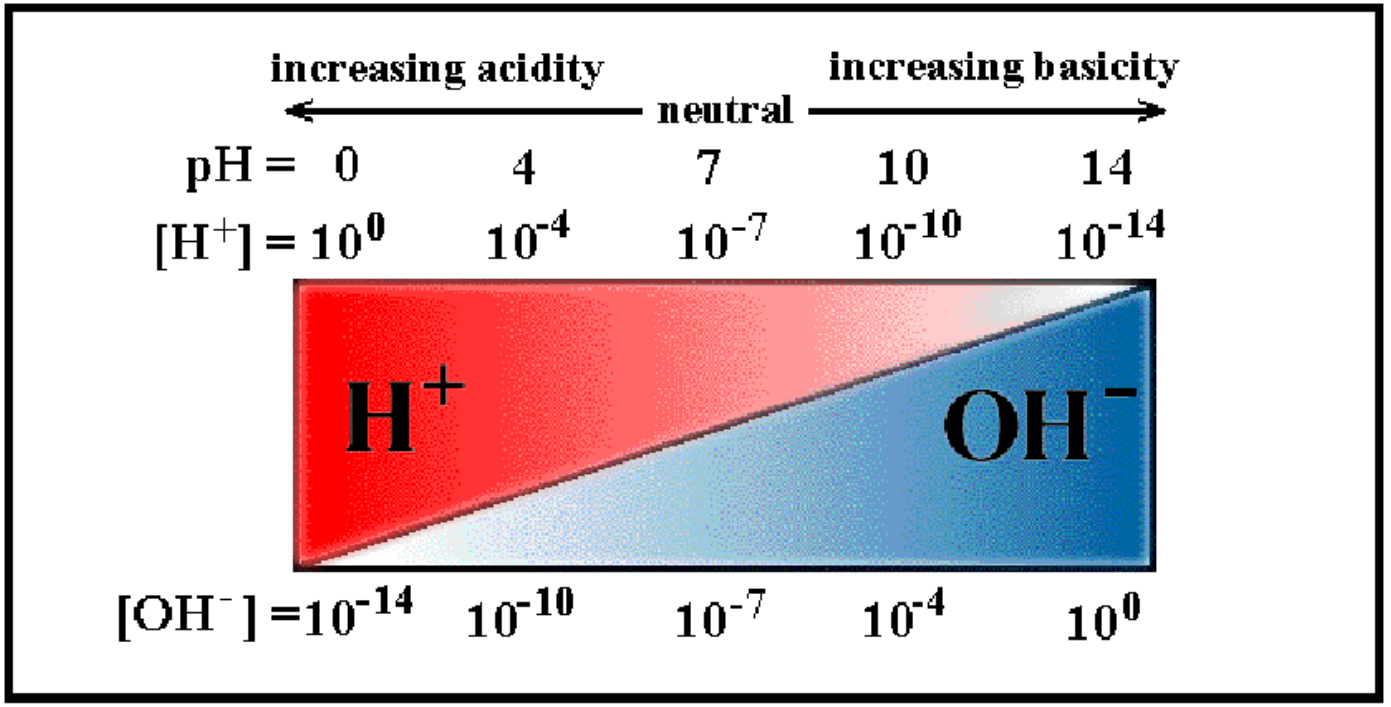
Vocabulary

- Indicator : a substance that changes color in response to changes in pH.
- Concentration: the amount of solute in proportion to the amount of solvent.
- Acidity: The strength of an acid, referring to its ability or tendency to lose a proton. A decrease in pH represents an increase in acidity.
- Alkalinity: the amount of OH^- in a solution that can be converted to salt by a strong acid; roughly, how basic a solution is.

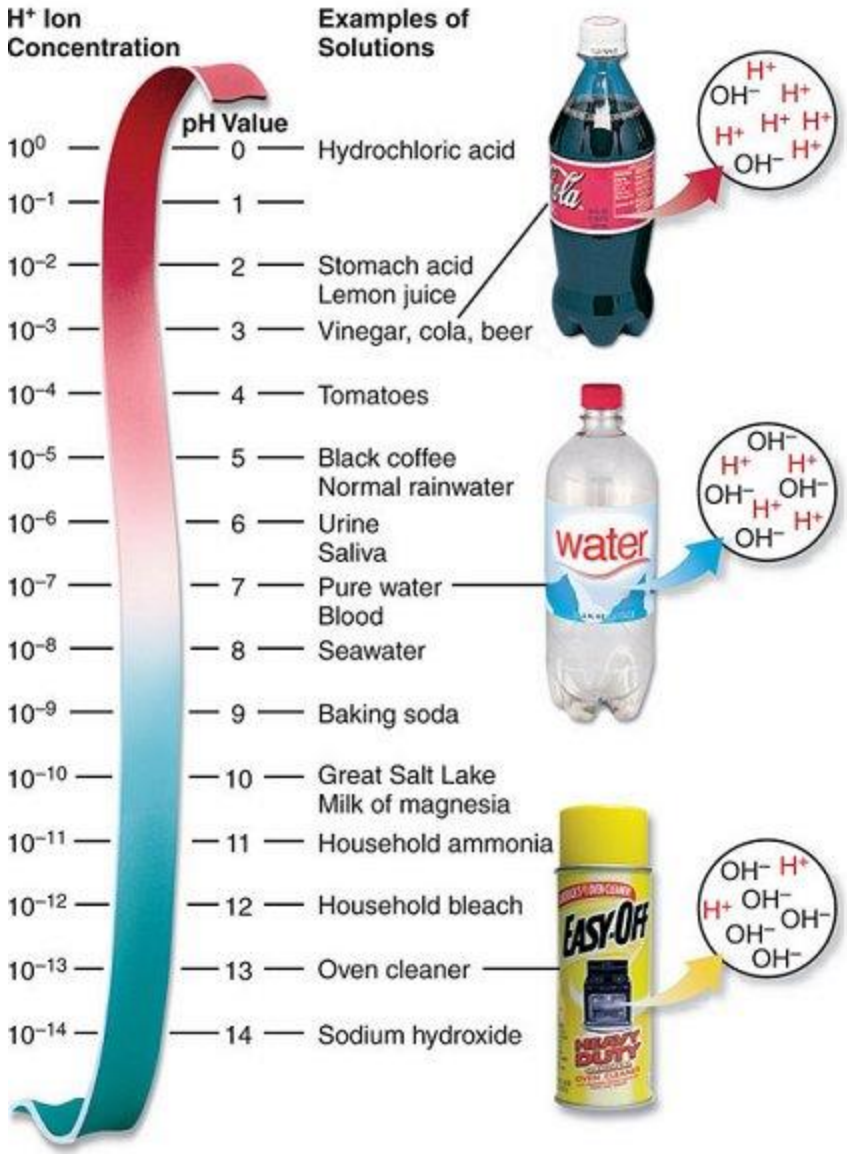
pH & concentration

An acid is a substance that when added to water increases the concentration of H^+ ions (lowers the pH). A substance that reduces the concentration of H^+ ions (raises the pH) is called a base.

Acids have pH readings below 7 and Bases have readings above 7. A substance with a pH of 7 is neutral.



- Low pH corresponds to high H^+ ion concentration and vice versa.
- Each division either increases or decreases the pH of a substance 10 times. The pH of 5 is ten times more acidic than a pH of 6

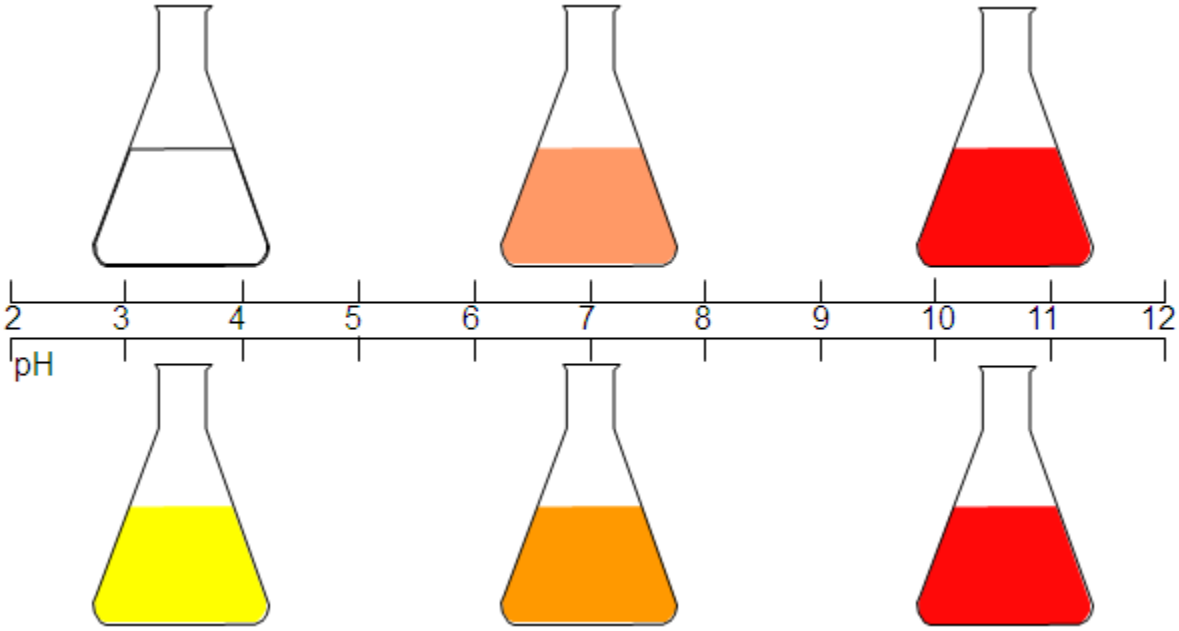


pH Indicators

- Indicators are substances that change color due to changes in pH. They are usually weak acids or bases
- There are several types of indicators. Most will turn some shade of red in the presence of an acid, and blue for a base.
- Some natural indicators, like hydrangea flowers, do the opposite.

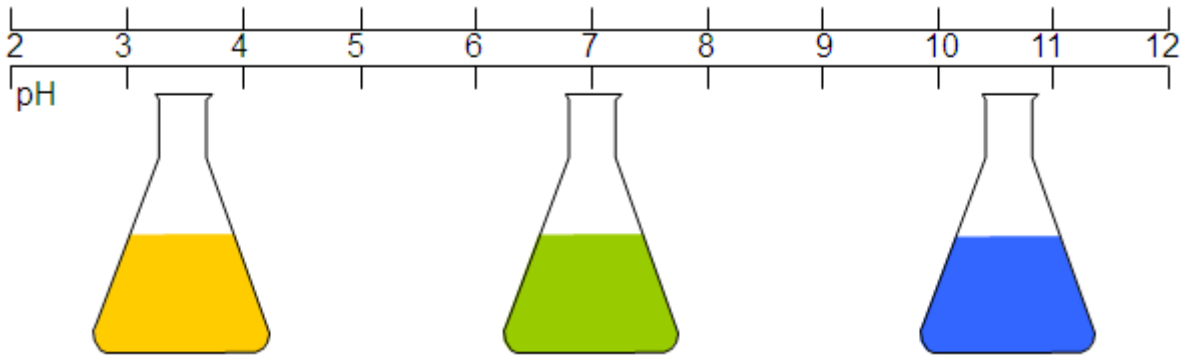
Phenolphthalein & Phenol Red

Phenolphthalein is an indicator that is clear in acids, and as the OH^- concentration increases turns pink and deepens to a dark fuscha. Phenol red is often used to stain cell slides. It shows as yellow for acidic conditions, and deepens to red as the solution becomes more basic.



Bromphenol blue

Bromphenol blue is mostly used with weak acids and bases. It is yellow in response to acids, and blue in response to bases.

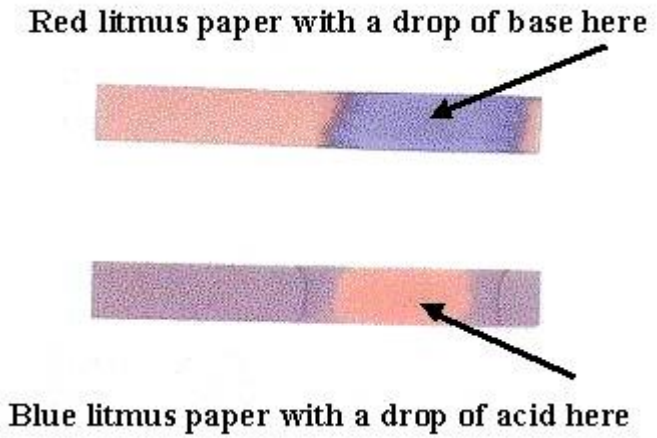


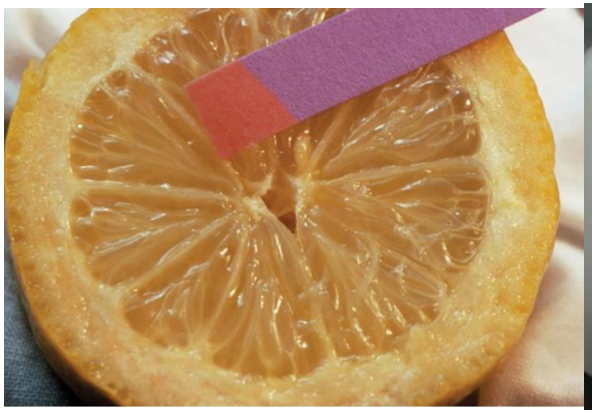
Cabbage juice

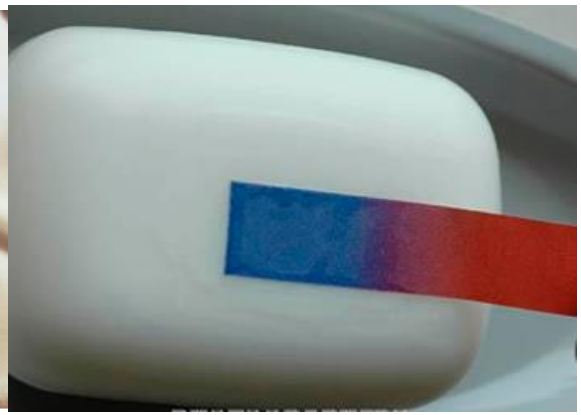
- Very acidic solutions will turn a red color. Neutral solutions result in a purplish color. Basic solutions appear in greenish-yellow.

Litmus paper

One of the most commonly used methods to measure pH is litmus paper, which has been treated with natural dyes obtained from lichens.





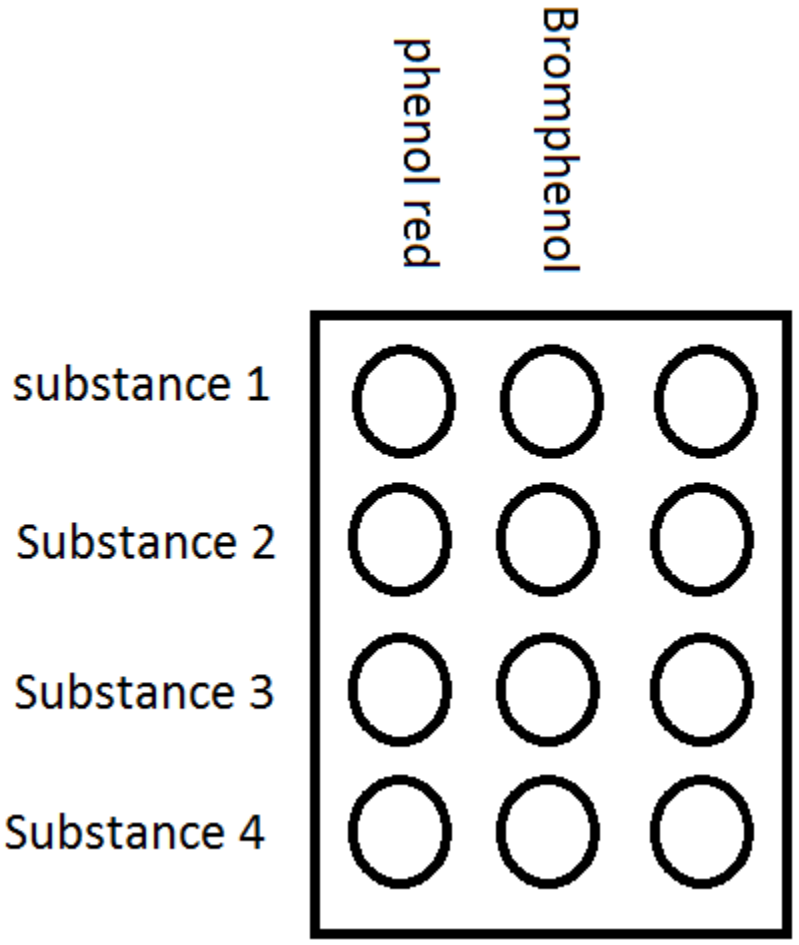


Safety precautions

- Wear goggles at all times.
- None of the solutions are strong enough to cause any serious damage, but wash your hands immediately if any of them cone in contact with your skin.
- Do not attempt to smell any of the solutions.
- Do not mix any of the test solutions.

Procedures:

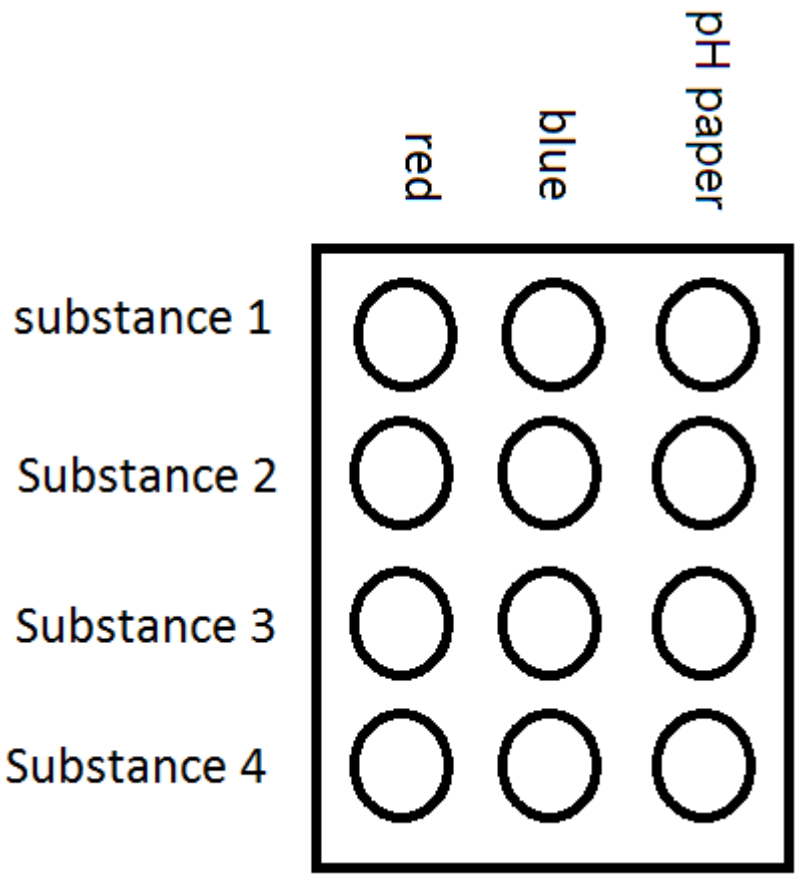
1. Place a sheet of paper under your well plate. Label the paper next to the rows of wells with the first four test substances. Label the top of the column with the two indicator solutions.



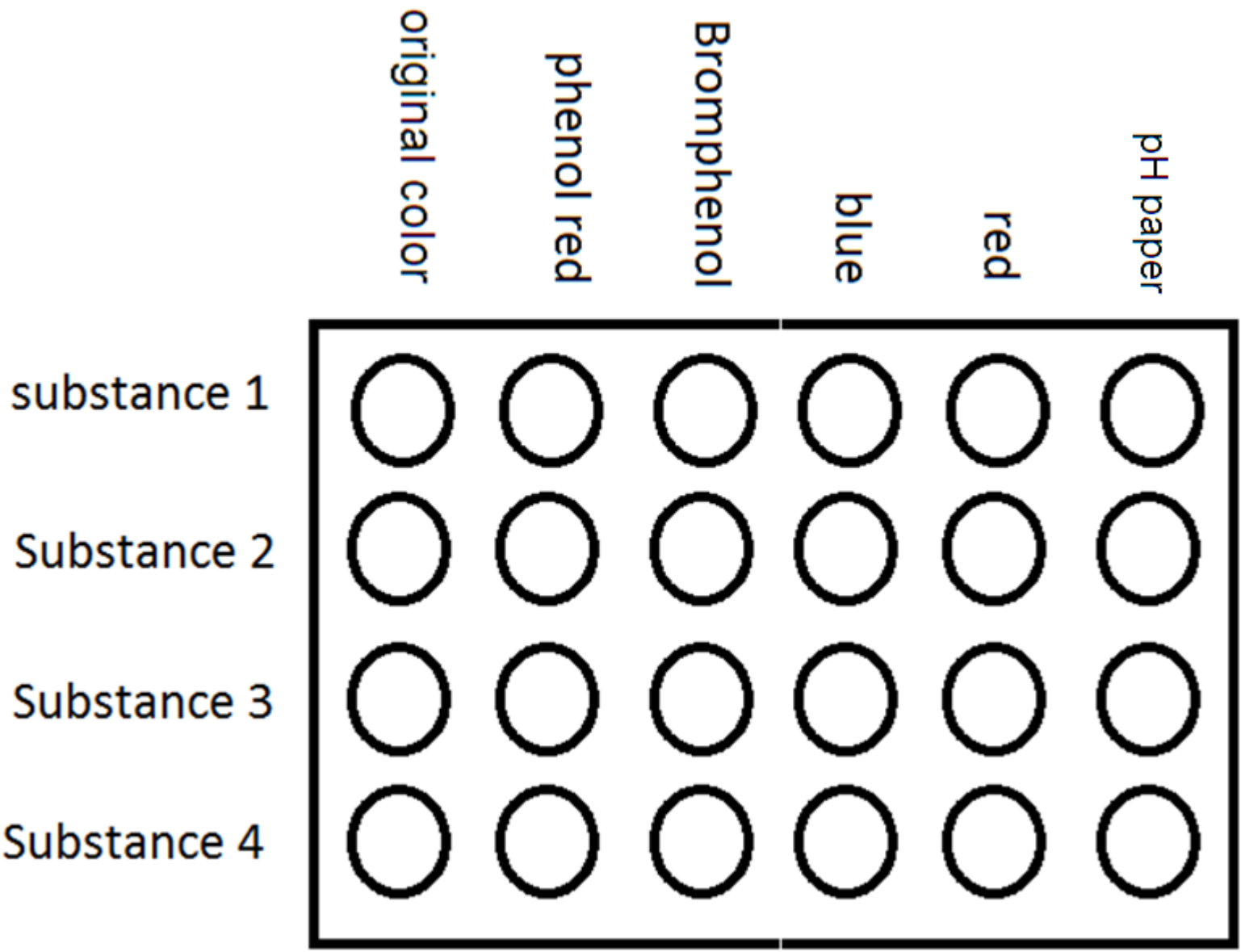
2. Place 3 drops of the appropriate test substance into each well on the well plate.
3. Place one drop of phenol red into the first well of each test solution. Record the color change, and its meaning on your data sheet.
4. Repeat the process with the Bromthymol Blue
5. Empty your well plate into the designated waste container at your station. Set the well plate aside to be cleaned later.

7. Cut a strip of red and blue litmus paper and a strip of pH paper into four pieces. Lay the pieces in separate wells of your other well tray.

8. Carefully place one drop of each substance on a red and a blue piece of litmus paper, and record any changes that occur.



Data & Observations



Analysis

Which of the liquids had the lowest pH?

Which of the liquids had the highest pH?

Which of the liquid(s) were closest to being neutral?

Conclusion

1. What is the pH of human blood? What would happen to our bodies if blood pH was changed or altered?

2. The pH of stomach acid is 2, why is this both good, but possibly destructive to our bodies?

3.When we eat too many tomato products (ex. Salsa) our stomachs can become upset. Using your understanding of pH and the pH chart in your text, why does an antacid make you feel better?

4. If the pH of a sample was 3, how many times more acidic is it than a solution with a pH of 6?

5.How might one correct the pH of a lake with a reading of 3? Explain your reasoning.

6. What could happen to our local environment if a company pumped materials into the atmosphere which created a drastic pH change in the rain water?

Errors & New Questions