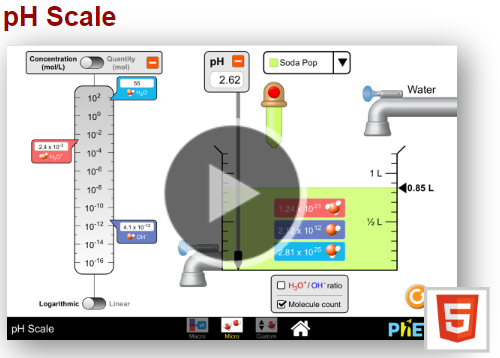
**PhET Investigation of Acids & Bases** Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
**pH Scale Simulation**

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**Directions:**

1. Open the pH Scale Simulation  
   <https://phet.colorado.edu/en/simulation/ph-scale>
   1. There are 3 Parts to the Simulation
      1. Macro
      2. Micro
      3. My Solution
2. Start with the Micro Option

**Part I: Pre-Simulation Research Questions**

1. Research the following definitions of acids and bases.
   1. Arrhenius Definition
   2. BrØnsted-Lowry Definition
   3. Lewis Definition

**Part II: Macro**

1. Create a table in Google Sheets with the following columns.
   1. pH, [H3O+], [OH-], Product of [H3O+] & [OH-]
2. Each row of the table will be for the 11 available substances.
3. Using the pH Meter, measure and record the pHs of all 11 substances.

Questions

1. What is the pH range for an acid?
2. What is the pH ranger for a base?
3. When is a solution is considered neutral? What pure substance has a pH of 7?
4. What happens to the pH of the solution when more of the substance is added?
5. What happens to the pH of the solution when water is added to the solution?
6. What does pH measure? (Research)
7. What basic equation is used to calculate the pH of a solution? (Research)

**Part III: Micro**

1. Switch over to the Micro Option of the simulation.
2. Record the concentrations for the H3O+ and OH- ions for each solution in the data table.
   1. Use the following format : for 1.0 x10-7 type in 1.0 E-7
3. Calculate the product of the two ions ( [H3O+], x [OH-] ) and record in the table.

Questions

1. What relationship exists between the concentration of the [H3O+], and [OH-]?
2. Does adding water to a solution change the product of the two ions?
3. If the solution is acidic, which ion is found in greater concentration?

**Part IV: My Solution**

1. Check the ratio box.
2. Slide the Red or Blue sliders up and down and observe what happens to the pH as well as the number of particles represented in the solution?

Questions

1. What happens to pH when the red slider increases (goes up)?
2. What happens to the red particles (acid) when the red slider increases?
3. What happens to the blue particles (base) when the red slider increases?