

pH Scale

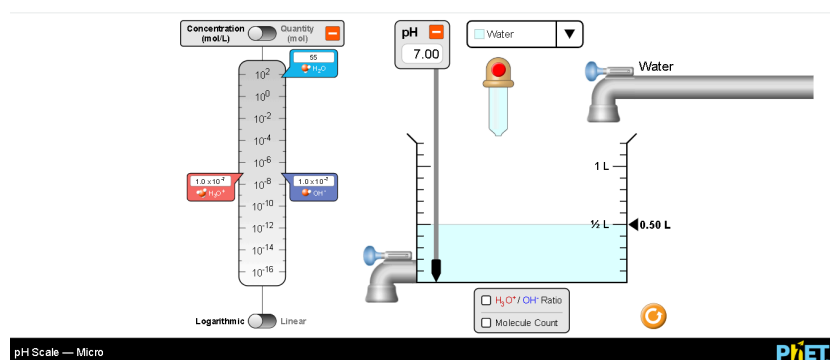
This lab uses the [pH Scale](https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale_en.html) simulations from PhET Interactive Simulations at University of Colorado Boulder, under the CC-BY 4.0 license.

https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale_en.html

Learning Goals: Students will be able to

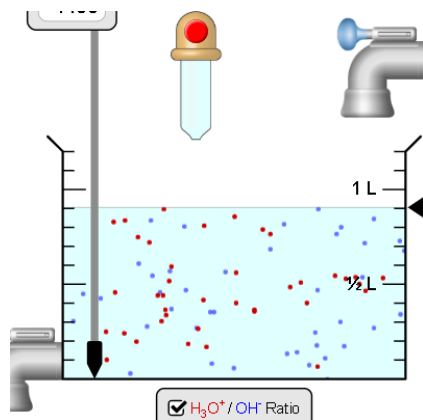
- Determine if a solution is acidic or basic using
 - molecular size representations
 - $\text{H}_3\text{O}^+/\text{OH}^-$ ratio
 - Hydronium and/or Hydroxide concentration
- Relate pH to $\text{H}_3\text{O}^+/\text{OH}^-$ ratio, Hydronium and/or Hydroxide concentration

Develop your understanding: Explore the [Micro](#) screen to see some ways that acids and bases are represented and measured.



Explain your understanding:

1. Use the [Mic](#) screen to explore molecular size representations of acids or bases.

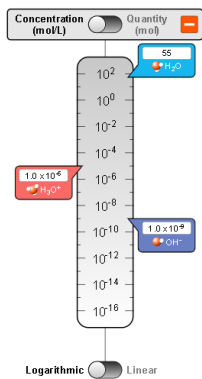


- a. Design experiments to gain a more quantitative understanding. Make sure to test changing the volume (add solution with the dropper or remove with the drain.) and dilute the solution by adding water.

b. Describe your tests, observations, and conclusions.

c. How does the molecular size representations compare to the pH?

2. Describe how you could use the chart on the left of the screen to predict the relative acid or base characteristic of a solution:



a. What do you notice when the volume changes?

b. What do you notice when the solution is diluted?

Expand your understanding mathematically:

3. How do the $\text{H}_3\text{O}^+/\text{OH}^-$ ratio compare to the pH?
4. Does changing volume or diluting the solution change any value? If so, explain why changes in the container causes the ratio to change.

Open the full simulation [pH Scale](#), then use the My Solution screen to help answer #6-8:

5. If the value of Hydronium concentration is 3.0×10^{-3} M/L, could you predict the solution to be acid, base, or neutral? Explain your answer.
6. If the number of Hydronium ions is 3.0×10^{-12} , could you predict the solution to be acid, base, or neutral? Explain your answer.
7. If the number of Hydroxide ions is 3.0×10^{-2} moles, could you predict the solution to be acid, base, or neutral? Explain your answer.

Test your understanding and self-check: For each question, predict your answer and support your answer with an explanation. Then use the full [pH Scale](#) simulation to verify and add screen captures to your explanation.

1. Which solution is acidic?

H₃O⁺ OH⁻

A B C

D. More than one E. Difficult to tell

1. Prediction and explanation with support

2. Which solution is basic?

H₃O⁺ OH⁻

A B C

D. More than one E. None

2. Prediction and explanation with support

3. Which solution is acidic?



3.01×10^{18}	9.65×10^{20}	3.01×10^{10}
3.01×10^{14}	9.65×10^{11}	3.01×10^{22}
1.66×10^{25}	1.68×10^{25}	1.66×10^{25}

A

B

C

D. More than one

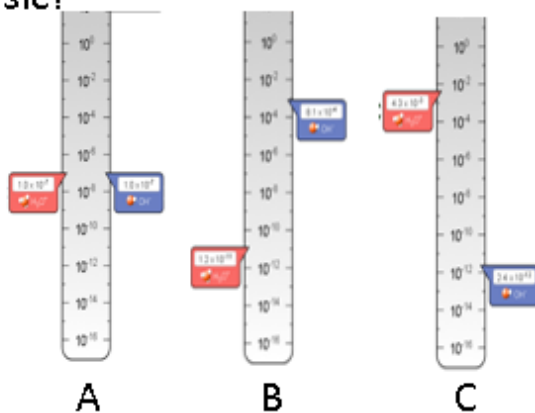
E. None

3. Prediction and explanation with support

4. What is the order from most acidic to most basic?



- A. ABC
- B. ACB
- C. BAC
- D. CBA
- E. CAB



4. Prediction and explanation with support