[**pH Scale**](https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale_en.html) **Remote Lab 2**

**(This‌ ‌lesson‌ is designed ‌for‌ ‌a‌ ‌student‌ ‌working‌ remotely‌.)‌**

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.

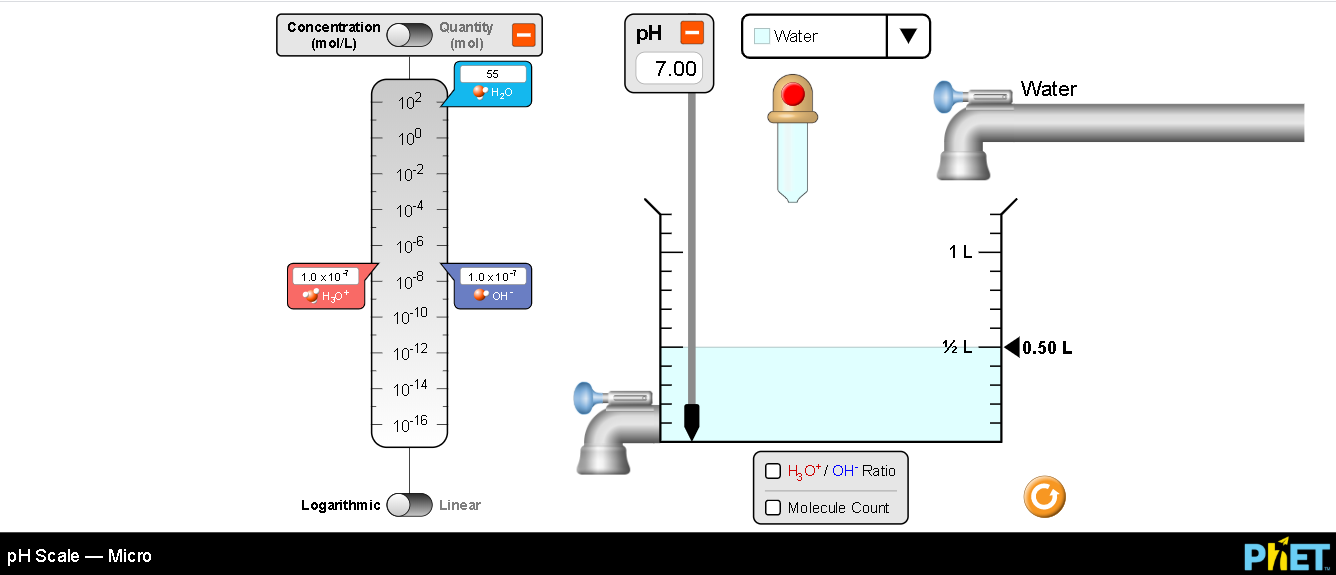
[**https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale\_en.html**](https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale_en.html)

**Note about prior learning:** Students should have completed[**pH Scale Basics Remote Lab1**](https://docs.google.com/document/d/164Z6NhheTc5DDTuQ6ObKQv3aHFZYmd8iVkNQ1Va8ivM/edit?usp=sharing) or lessons with similar learning goals.

**Learning Goals:** Students will be able to

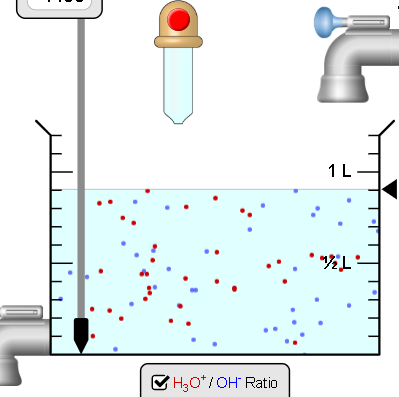
* + Determine if a solution is acidic or basic using
    - molecular size representations
    - H3O+/OH- ratio
    - Hydronium and/or Hydroxide concentration
  + Relate pH to H3O+/OH- ratio, Hydronium and/or Hydroxide concentration

**Develop your understanding:** Explore the [**Micro**](https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale_en.html?screens=2) screen to see some ways that acids and bases are represented and measured.

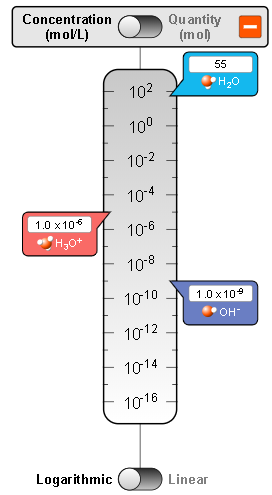
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**Explain your understanding:**

1. Use the [**Micro**](https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale_en.html?screens=2) screen to explore moleculecular size representations of acids or bases.



1. 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 diluting the solution by adding water..
2. Describe your tests, observations, and conclusions. Include images for evidence.
3. How does the moleculecular size representations compare to the pH?
4. Describe how you could use the chart on the left of the screen to predict the relative acid or base characteristic of a solution:



1. What do you notice when the volume changes?
2. What do you notice when the solution is diluted?

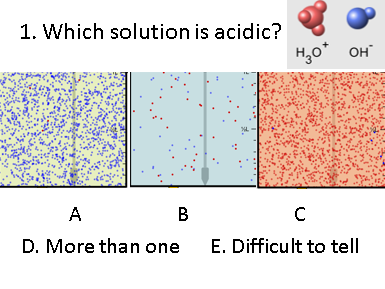
**Expand your understanding mathematically:**

1. Calculate the H3O+/OH- ratio for solutions of your choice using all three values: the Molecule count, Quantity of moles, and Concentration Show your work
   1. water
   2. one base
   3. one acid
2. How do the H3O+/OH- ratio compare to the pH?
3. Does adding solutions, water, or removing solution change any of your values in #3. If so, explain why changes in the container causes the ratio to change.

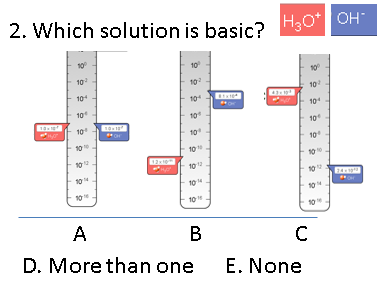
Open the full simulation [**pH Scale**](https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale_en.html), then use the My Solution screen to help answer #6-8:

1. If you measure the value of Hydronium concentration is 3.0x10-3 M/L, could you predict the solution to be acid, base, or neutral? Explain your answer.
2. If you measure the number of Hydronium ions is 3.0x1012 , could you predict the solution to be acid, base, or neutral? Explain your answer.
3. If you measure the number of Hydroxide ions is 3.0x10-2 moles, could you predict the solution to be acid, base, or neutral? Explain your answer.

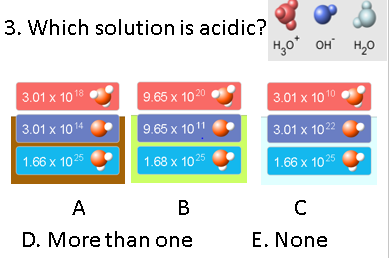
**Test your understanding and self-check**: For each question, predict your answer and support your answer with an explanation. Then use the full [pH Scale](https://phet.colorado.edu/sims/html/ph-scale/latest/ph-scale_en.html) simulation to verify and add screen captures to your explanation.



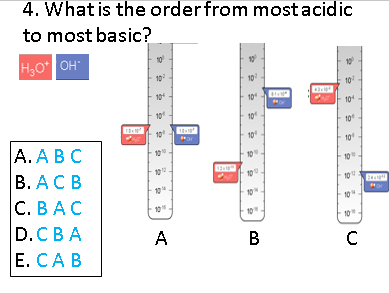
1. Prediction and explanation with support



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