

Lesson plan for [Acid Base Solutions: Strength and Concentration](http://phet.colorado.edu) <http://phet.colorado.edu>

Learning goals: Students will be able to

- Generate or interpret molecular representations (words and/or pictures) for acid or base solutions**
- Provide or use representations of the relative amounts of particles in acid or base solutions to estimate strength and/or concentration**
- Use common tools (pH meter, conductivity, pH paper) of acid or base solutions to estimate strength and/or concentration**

Specifically,

- Compare/contrast acids and bases of varying **strength**. (Given acids or bases at the same concentration)
- Compare/contrast acids and bases of varying solution **concentration**. (Given acids or bases of the same strength)
- Compare/contrast acids and bases of varying **strength** and **concentration** combinations. (Given examples like: Concentrated solution of a weak acid or base; Concentrated solution of a strong acid or base; Dilute solution of a weak acid or base; Dilute solution of a strong acid or base)
- Give examples of different combinations of strength/concentrations that result in same pH or conductivity values.

Teacher notes: look for

- *Amount dissociation in water*
- *Identifying all of the particles present in solution.*
- *Estimate relative amounts of particles*
- *Appropriate use of tools*

Background:

My students will have used Acids and Bases in stoichiometric problems, including titrations, since early in the first semester, but only as complete reactions. This activity will be part of second semester after a kinetics unit that includes introduction to equilibrium during which we use 2 PhET activities: [Reactions and Rates 2: Intro to Kinetics \(inquiry based\)](#) and [Reactions and Rates 3: Introduction to Equilibrium \(Inquiry Based\)](#). The acid-base unit is meant to use general concepts of equilibrium in a specific application. Prior to this activity, students will have done my activity [pH Scale](#).

Acid Base Solutions Introduction:

Instructors may want to read the [Tips for Teachers](#) to watch for some common student difficulties, but in general the sim is easy for students to explore and use for sense making without instruction.

Lesson: My students work in pairs in the computer lab or at home depending on computer lab availability. There are computer labs open many times during the day for students to work without my help as well.

Post-Lesson: I have included clicker questions in the activity.

Follow-up sims: I have an activity [Salts & Solubility 3](#), that I also use in this unit to apply equilibrium concepts to salts (K_{sp}).