

Objective:

The purpose of this activity is to prepare students for the neutralization activities.

Target student audience:

All levels of chemistry (AP only if a 1 year program)

ChemSense User Level:

Intermediate

ChemSense Tools used:

Drawing and Animation, Text Notes-Predicting, Teacher Feedback

Specialized Tools needed:

None

Classroom Implementation

Time: 100 – 120 minutes

Student Grouping: pairs of students

Activity Type: pairs of students

Chemistry Concepts in Activity:

CA Chemistry Standard 5.c Knows strong acids and bases fully dissociate and weak acids and bases partially dissociate.

ChemSense Aggregation: The aggregation of molecules is influenced by a variety of intermolecular and intramolecular interactions.

Prerequisite Chemistry Concepts:

Discussion of acid and base dissociation, and the meaning of strong and weak are to have been taught. Equilibrium expressions and constants should be understood prior to this activity. Following this activity the students will be ready for acid-base neutralization.

Inquiry Skills (linked to NSES):

ACTIVITY Summary:

The student will use the Arrhenius Acid-Base concept to represent acids and bases as they dissociate and release hydrogen and hydroxide ions respectively. The student will create an animation that illustrates the dissociation of acids and bases to release hydrogen and hydroxide ions.

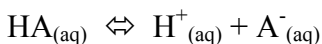
Sources:

none cited

Application:

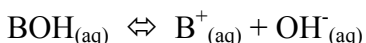
none cited

ACTIVITY:



This equation represents the simple dissociation of an acid in water. Acid strength is determined by how completely the acid dissociates.

$\text{HA}_{(\text{aq})} + \text{H}_2\text{O}_{(\text{l})} \rightleftharpoons \text{H}_3\text{O}^+_{(\text{aq})} + \text{A}^-_{(\text{aq})}$ is another way to represent the same acid dissociation. For a strong acid the equilibrium lies far to the right. For a weak acid the equilibrium lies far to the left.



This equation represents the simple dissociation of a base in water. Base strength is determined by how completely the base dissociates, similar to the way we defined strong acids. All hydroxides of periodic table Group 1 elements are strong bases.

Pre-laboratory Questions

- 1) Write the following chemical formulae in your laboratory notebook. Complete the dissociation equations. Acids: HCl, HNO₃, HC₂H₃O₂; Bases: NaOH, KOH, NH₄OH.
- 2) Sketch the molecule HCl, using circles for the atoms labeled with the symbol for the element. Sketch the dissociation into ions using circles labeled with the formulae for the ions.
- 3) Sketch the molecule NaOH, using circles for the atoms labeled with the symbol for the element. Sketch the dissociation into ions using circles labeled with the formulae for the ions.

Procedure

1. Copy the equations for the dissociation of HCl into your laboratory notebook.
2. Do an atom inventory to verify the equation is balanced.
3. In your laboratory notebook sketch a model of each molecule in the dissociation reaction using circles for individual atoms. Label the hydrogen atoms with an H, the chlorine atoms with Cl, and the oxygen atoms with an O.
4. Log onto ChemSense and open up the Neutralization folder.
5. Use the sketch you made in your notebook to create an animation of that models the HCl molecules separate when poured into a beaker of water and regrouping as hydronium and chloride ions. Your animation should show an excess of water molecules in the system. Include narrative that describes what is happening as the molecules of HCl separate into atoms and then regroup into new ions.
6. Title your work with your name and save your work to your account folder.

Rubric for scoring:

Rubric Score	Level of Competence	Expectation Level
4	Mastery	Animation has smooth transitions between frames. Artwork accurately represents the formation of hydronium and chloride ions from the hydrogen chloride. Text accurately addresses the rearrangement of the atoms.
3	Skilled	Animation may not be smooth or may have minor errors. Artwork accurately represents the formation of hydronium molecules and the chloride ions or the hydrogen chloride molecules. Text accurately addresses the rearrangement of the atoms.
2	Proficient	Animation is not smooth, but water molecules are accurate. Artwork does not accurately represent the formation of hydronium ions or chloride ions. Text accurately addresses the rearrangement of the atoms.
1	Introductory	Animation may not be smooth. Neither the hydrogen chloride molecules nor the resulting hydronium and chloride ions are correct. Text contains errors.
0	Incomplete	Animation may have smooth transitions between frames, but the artwork does not accurately represents the ions or molecules. Text contains errors.