Lesson Title	Titration Lab
Length of Lesson	1 day
Created By	Kimberley Leggett
Subject	AP Chemistry
Grade Level	$11^{th} – 12^{th}$
State Standards	Chemistry: 5 a
DOK Level	DOK 2
DOK Application	Make observations; interpret; compare; analyze
National Standards	9-12: B: Physical Science
Graduate Research Element	None, but my co-op was with a chemical company and I had to do titrations every day.

Student Learning Goal:
Chemistry: 5 Compare factors associated with acid/base and oxidation/reduction reactions: (a) Analyze and explain acid/base reactions.

- Properties of acids and bases, including how they affect indicators and the relative pH of the solution
- Formation of acidic and basic solutions

National Science Education Standards of Content 9-12
Physical Science B: Chemical Reactions

- A large number of important reactions involve the transfer of either electrons (oxidation/reduction reactions) or hydrogen ions (acid/base reactions) between reacting ions, molecules, or atoms. In other reactions, chemical bonds are broken by heat or light to form very reactive radicals with electrons ready to form new bonds. Radical reactions control many processes such as the presence of ozone and greenhouse gases in the atmosphere, burning and processing of fossil fuels, the formation of polymers, and explosions.

Materials Needed (supplies, hand-outs, resources):
Flask, pipet, buret, acid, and an acid-base indicator.

Lesson Performance Task/Assessment:
Formative: We will have an opening discussion on titrations and why we use them.

Summative: We will have a titration lab were the students actually get to perform a titration.

Lesson Relevance to Performance Task and Students:
The students will be able to perform a titration. This will really help the visual learners to see what is going on in a titration.

Anticipatory Set/Capture Interest:
The titration lab will be done after the lecture. This will allow the students to be able to actually see how the titrations work.

Guided Practice:
Teacher lecture on titrations then I will demonstrate an actual titration for the students before they go to the lab and perform a titration.

Independent Practice:
The students will perform a titration in the lab.
Procedure for titrating an acid against a standardized solution of NaOH:

- First a known quantity of acid is added to a flask.
- An acid-base indicator is added, and standardized NaOH is added from a buret.
- The equivalence point is signaled by a color change in the indicator.

Remediation and/or Enrichment:
R: Individual IEP; have a partner will doing the titration
E: Do the calculation to determine the quantity of solute by titration and compare it with the titration they performed

Check(s) for Understanding:
Make sure they can do the titration and there will be a chapter test to verify they understand titrations

Closure:
A teacher guided summary discussion

Possible Alternate Subject Integrations:
Acc Chemistry
Regular chemistry

Teacher Notes:
This can be done with many different kinds of acid and bases