Lesson Plan- Introduction to Acids and Bases

Instructor: Astella Leung | Grade Level(s): HS (9-12)

Subject: Chemistry | Topic: Acids and Bases

Central Focus for the Lesson: Acids and Bases

Content Standard(s):

Performance Expectations:
HS-PS1-11. Plan and conduct an investigation to compare properties and behaviors of acids and bases. [Clarification Statement: Examples of properties could include pH values (concentration), neutralization capability and conductivity. Observations of behaviors could include the effects on indicators, reactions with other substances, and efficacy in performing titrations.] [Assessment Boundary: Reactions are limited to Arrhenius and Bronsted-Lowry acid-base reactions.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. ● Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS1-11) ● Select appropriate tools to collect, record, analyze, and evaluate data. (HS-PS1-11)	**PS1.B: Chemical Reactions** (NYSED) Acids and bases play an important role in the daily lives of humans and other organisms (e.g. agricultural applications, environmental impacts (acid rain), animal and plant physiology). (HS-PS1-11)	**Patterns** Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HSPS1-2),(HS-PS1-5),(HS-PS1-11)

Student Population

- Regents Chemistry (10th Grade)

Learning Objectives associated with the content standards:

- SWBAT identify an acid and base in a given reaction based on the Arrhenius.
- SWBAT describe the properties of acids and bases.

Teaching Models (Check one or more)
_✓_Direct Instruction _✓_ Cooperative Learning
_✓_Discussion _✓_ Inquiry

Teaching Strategies:

1. Teacher will provide opportunities for both learning through direct instruction and peer-based sense making.
2. Teacher will walk around the classroom as students work on the group activity to gauge student understanding, misconceptions, and questions.
3. Teacher will utilize students' prior knowledge on everyday items (ex. Soap, lemons, etc.) to introduce the topic of acids and bases.

Learning Tasks

- Students will work in groups to determine patterns in compounds classified as acids vs. compounds classified as bases (Arrhenius definition).
- Students will apply their real-world knowledge to understanding properties of acids and bases.

Anchoring Phenomenon: How acidic or basic are our everyday household items?

Day 1- Arrhenius Acid and Base Definition

The teacher and students will discuss the following Do-Now together (5 min):

Engage: *Where have you heard the words "acids" and/or "bases" before in your everyday lives?*

Transition- Today, we will learn what makes something an acid and a base in chemistry.

Explore: Exploring the Chemical Composition of Acids and Bases (20 min)

- In groups, students will assign themselves the following roles:
  Recorder: Records the findings of your group
  Reporter: Present on behalf of your group
  Researchers: Uses their phones to do research online (must have internet access)
  - Together, students will fill out the following table, determining the chemical formulas of the items and classifying them as acids or bases based on their own knowledge:

Item	Acid or Base	Chemical Formula
Vinegar		
Antacids		
Milk of Magnesia		
Carbonated Soda		
Yogurt		

Liquid Soap		
Apples		
Water		
Lemons		
Gastric Juice		
Drain Cleaner		

- As students work, the teacher will go around checking their answers and asking questions like "Why do you think this is an acid/ base? Is it because of physical attributes? Do you notice any patterns so far?"
- After completing the activity, the teacher will call on each group to provide their answers for some of the items.

Explain: After describing all the items, the teacher will ask students: *What do the acids have in common? The bases?*

- Give students a few minutes to discuss (2 min)
- Show students a slide of common household acids (that they saw in their table)
  - Have students volunteer to describe the patterns they saw.
    - Students should say that they all have "H^+" ions.

Elaborate: Now that they know what an acid is, the teacher will ask students: *What properties do acids have in common*?

- Have students volunteer– they will most likely say that they are sour.
- Students will take notes on the following properties: Acids are…
  - Sour
  - Contain H^+ ions
  - React with certain metals to produce H_2 gas.

- Teacher will ask students: *What do the bases have in common?*
  - Have volunteers describe the patterns they saw
    - Students should say that they all have OH^- ions.
- Now that they know what an acid is, the teacher will ask students: *What properties do bases have in common*?
  - Have students volunteer– they will most likely say that bases are slippery and taste bitter.
  - Students will take notes on the following properties: Bases…
    - Taste bitter
    - Feel slippery
    - Contain OH^- ions
- Have students copy the following definitions of Arrhenius Acids and Bases:
  - An Arrhenius acid is a substance that yields H+ ions in solution (usually water).
  - An Arrhenius base is a substance that yields OH- ions in solution (usually water).

Evaluate: End-of-Class Report (5-min)

- Exit Ticket- What are three things you learned about acids and bases? Focus on differences.

Differentiation and Planned Supports:

- Provide guided notes to students.
- Create a word wall and equation bank for the classroom.
- Pair students based on English and math proficiency.
- Given the emphasis on social learning, sentence starters will be in the classroom (ex. “I think…”)

Exit Ticket Rubric-

Point	Characteristics
Exemplary	The student clearly lists three differences between acids and bases, focusing on the different ions and physical properties of each.
Proficient	The student lists only two differences between acids and bases, focusing on the different ions and physical properties of each.
Developing	The student lists only one difference between acids and bases, or excludes the difference in ion dissociation.
Needs Improvement	The student does not list any differences between acids and bases.
Comments-	