

UNIT OVERVIEW/OUTLINE

<p>The Design Down Process for this unit (topic or text):</p> <p>Acids and Bases</p>	<p>Subject: Chemistry(?)</p>
<p>Stage 1 – Desired Results</p> <p>Students will understand... What relevant overall expectations and threshold knowledge will this unit address? The filter is “what will I be formally assessing throughout the unit (formative assessment for and as learning) and in my Rich Performance Task/Culminating Project (formative assessment and summative assessment OF Learning.”</p> <p>➤ Students will understand the structure and function of acids with the goal of answering which of them is the strongest and being able to explain why</p> <ul style="list-style-type: none">○ What I will be formally assessing throughout this unit will be the concepts of pH, relative strength of acids or bases, $[H^+]$ and $[OH^-]$, and reactivity.<ul style="list-style-type: none">▪ In a broader sense looking at how these substances and their strength/reactivity have lasting effects on the environment around us.○ My “Culminating Project” will be<ul style="list-style-type: none">▪ a roundtable discussion either explaining their case study and how their Acid/base of choice is beneficial/detrimental to health.▪ A short PSA (YouTube video) on how chemical substances should be stored in their homes and a questionnaire/checklist for their peers to take that learning home and do a self-assessment.	
<p>Enduring Understandings(s)/Threshold Knowledge: What are the big ideas from looking at the overall expectations for the unit in plain language?</p> <p>Conceptual:</p> <ul style="list-style-type: none">- Strong Acid vs Weak Acid- Strong Base vs Weak Base- Corrosivity of Acids/Bases <p>Procedural:</p> <ul style="list-style-type: none">- Calculating pH and pOH- Acid dilutions- Titration Calculations	<p>Essential Question: What provocative question will foster inquiry, understanding and transfer of learning from the academic world to the real world in this unit?</p> <p>When do acids become dangerous?</p>

Skills -- Students will be able to/ I know I can . . . because statements: What specific skills/applications are you teaching the students?

Identify strong acids given chemical formula

Predict the products of an acid/base reaction and calculate the overall pH of resulting solution.

Identify the conjugate acid/base pairs in a chemical reaction

Be able to explain the uses of different strength acid and bases, the dangers and misuses of each, etc.

Identify household substances that are acids or bases and how they should be properly stored for safe keeping.

Subquestions/Guiding Questions: What questions will constantly focus the students on the Big ideas/Critical Question within the unit in student language?

- What is pH and how does it measure the concentration of acids and bases?
- How do acids and bases react with each other?
- What are the applications of acid/base reactions and their impact on our lives and the environment?

Misconceptions: What might students commonly misunderstand about the subject? How will I directly address these?

- All acids are the same
 - o There are two different classifications of acids, both strong and weak acids that act differently in solutions. Both in corrosivity and pH/[H+].
- All strong acids are the same
 - o They give off different k_a values which determine the overall strength.
- Bases aren't corrosive/dangerous.
 - o The term used is caustic instead of corrosive
 - o Bases react more with organic substances than inorganic substances.
 - o <https://www.youtube.com/watch?v=WnPrtYUKke8>

Rich Performance Tasks/Culminating Projects:

Written Composition:

Content: Case Studies of How Acids/Bases benefit/endanger our health.

Process: Short research paper discussing articles that the students have found. Describing their research through the lens of how their acid/base does work to our human system.

Product: 2-3 page papers

Goals met: Data Analysis, Communicating evidence

1. Group Multimedia Composition:

This is blended in with the Social learning activity below

2. Service Learning/Social Action Project

Content: Case Studies of How Acids/Bases benefit our health.

Process: Short PSA on corrosive substances. Either on how they should be stored in the house or schools.

Tips to have kids to do their own “self assessment” of their surroundings and how to remedy it.

Product: Either a YouTube video or flyers and presentation on how proper storage and usage is imperative to your health and the environment

Goals met: Data Analysis, Communicating evidence, awareness in their own homes/environment of the chemicals around them.

One-Sentence formative and summative assessment descriptions

1. **Bell Ringers identifying strong vs weak bases/acids.**
2. **In class small group activities dealing with pH/pOH calculations**
3. **In class discussions.**
4. **Corrosion activities, Observational Labs**
5. **Can I drink this Inquiry Lab**

Stage 2 -- Learning Activities: How will I help my students Learn?

What learning experiences and instruction will enable all students to achieve on a day to day basis in my classroom and will foster Differentiate Instruction?

“Can I drink this” Inquiry Lab

- Discussion/Testing and identification of unknown solutions.

Naming Acids POGIL

Curricular Coherence

Critical vocabulary

acid

base

neutral

pH

concentration

volume

Corrosive/Corrosion

- W = Help the students know **where** the unit is going and **what** is expected in plain language that the students can understand and relate to. Help the teacher know **where** the students are coming from (prior knowledge and interests) Class profiles, Interest surveys, diagnostic testing.

➤

“What is an indicator?” Discussion (+mind map) and then cabbage juice lab activity.

Motivation/Continuing impulse to learn

H = **Hook** and engage all students and hold their interest by providing meaningful curriculum which relates to real life experiences for those students in front of you. Essential and guiding questions, enduring learnings/threshold knowledge, visible signs of accomplishment, continual disciplinary/ real life connections to the students in front of you.

- Corrosion Reading and Questions.

- Have them do a little research outside of class as to other kinds of corrosion.

<http://www.juliantrubin.com/encyclopedia/chemistry/corrosion.html>

- Previous activity can also work as a hook for students

- Create their own pH scale and allows them to see the color changes of what is acidic and what is more alkaline.

Assist/apprentice students to greater expertise/provide deliberate practice with “correspondence concept” threshold knowledge

E = **Equip** students, help them **experience** the key ideas and explore the issues to the best of their abilities. Help them deliberately practice over time expert strategies in contexts of use. Appropriate reading materials, frontloading, think alouds, DRTAs, drama/action strategies, visual strategies, question and discussion strategies, group structures, tiered questions and assignments, challenging and engaging and differentiated assignments, the use of technology, adaptive technology

➤ **Corrosion Observation activities** (24 hr observation labs)

➤ **pH of the food we eat labs**

○ What is the use of an indicator? How does that help us in determination of relative strength of an acid?

○ Titration Lab

➤ Connect Corrosion and relative strength of Acid/Base

○ pH calculation lecture notes

R = Provide opportunities to **rethink** and **revise** their understandings of work, assessment as and for learning, multiple assessment/evaluation opportunities with descriptive/procedural feedback. Clear criteria for summative assessment of learning that can be used to revise.

➤ Revisit the frontloading questions and have them make amendments to their original answers.

➤ Add to the mind map that they originally created.

○ Reflect on how their knowledge has changed.

E = Allow students to **evaluate** their work and its implications. Self, peer assessment and continual use of descriptive/procedural feedback.

➤ Through the culminating project they will have to peer review their work and get feedback in order to improve and expand upon their own ideas.

T = Be **tailored** (differentiated/layered/personalized) to the different needs, interests, and abilities of learners. IEP, literacy needs, learning styles, academic stream, chunking, tiered questions, layered curriculum, flexible groupings, learning contracts, blooms taxonomy, compacting, graphic organizers, inductive, deductive, dialectic thinking, scaffolding, think pair share, KWL, semantic maps, universal design, authentic versus inauthentic work, selecting instructional strategies that respond to students needs, rubrics in plain language suited for the student.

- O = Be **organized** to maximize initial and sustained engagement as well as effective learning and be prepared to differentiate the assessment/evaluation process by concomitant assessment evidence, what the student has learned, more recent, more consistent.

Day 1: Introduction to Acids/Bases Naming Acids POGIL.

Day 2: Finish naming acids POGIL

Discuss a class set of guidelines to naming acids

Day 3: “Can I drink this?” activity

Day 4: Red Cabbage indicator lab

Create their own pH scale from lab

Day 5: Lab continued.

Day 7: Talk about results and what characteristics each substance had and how we categorize it based on our rules

Discussion of Indicators/Draw out mind map connecting all of the ideas.

Talk about how industries may use indicators/how they are used in everyday life.

Day 8: Strong vs. Weak Acids and Bases

pH and pOH calculations.

Day 9 Day 2 Calculations

Day 10: “What is pH? Can it be balanced?” Lab

Day 11: Lab continued

Day 12: Finish Lab write up and discuss results

Day 13: Jigsaw reading on Corrosion

Day 14: Corrosion Observation Lab

Day 15: Introduce Culminating Project

Build a case file on one of the selected substances.

Read through “When does an acid become dangerous?” Activity

Day 15-18: Work Days. Paper due on Day 18 due end of the day.

STAGE 3: SUMMATIVE ASSESSMENT OF LEARNING/MOVING IN TO THE FUTURE

HOW WILL STUDENTS PRESENT AND SHARE WHAT THEY HAVE LEARNED?

- **They will present answer to my essential question of “What are the applications of acid/base reactions and their impact on our lives and the environment?” through a research paper.**

HOW WILL THEY USE PRECISE EXPECTATIONS/PROCEDURAL FEEDBACK TO EVALUATE THEIR WORK?

- **By showing them how to name acids and calculate the pH**
- **I will be checking for understanding with bell ringers, exit tickets, and procedural feedback on the lab activities throughout the unit.**
- **Finally I will have the ability to**

HOW WILL ASSESSMENT TOOL/S BE MATCHED TO THE GOALS, SITUATION AND LEARNING?

- **The assessment tools will be looking at each of the labs and smaller formative assessments working towards the idea of understanding how acids work.**
- **Each lab will help then recognize that the foods and household items that they have in their homes all have a pH of some sort and fall upon the pH scale.**

HOW WILL LEARNING BE APPLIED DURING THE UNIT? IMAGINATIVELY REHEARSED FOR USE AFTER THE UNIT?

- **One of the first activities that the kids will be doing is that they will be establishing their own pH scale. They will have to test various substances of varying pH levels and figure out trends that each substance has and how they relate to each other.**

HOW WILL STUDENTS CULTIVATE TRANSFER, IMAGINING AND PREPARING FOR HOW TO USE WHAT THEY HAVE LEARNED NOW AND IN THE FUTURE?

The culminating project will allow students to be aware of how acids/bases can benefit our body as a whole.

They will also have the ability to look at the concept of corrosion and think about how we as humans are effecting our environment and making our own systems corrosive.

Lesson Plan:
Corrosion Article Discussion Day.

Lesson Topic	Corrosion
Lesson Rationale	<p>This applies to acid base chemistry by looking at the affect that acid has on various substances.</p> <p>This unit looks directly at one of my sub questions dealing with corrosion and the effects on real world substances. Engaging students in discussion as a whole class and in pairs or small groups of kids.</p>
Standards	<ul style="list-style-type: none"> - 11-12.C.1.2.4 Distinguish the common theories defining acids and bases. - 11-12.C.1.3.6 Express concentrations of solutions in various ways including molarity - 11-12.C.1.3.8 Analyze quantitative relationships involved in acid/base chemistry including pH. - 11-12.C.2.1.5 Explain the relationship and reactions of acids, bases, and salts. <p>NGSS</p> <ul style="list-style-type: none"> - HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. <p>Cross Cutting Concepts</p> <ul style="list-style-type: none"> - Patterns - Scale, Proportion, and Quantity
Evidence	Small Group discussion on observations on demos
Desired Results	<ol style="list-style-type: none"> 1. Define corrosion and apply it on a global scale. 2. Predict the effects of various corrosive substances on different metals. 3. Explain why the industry has to go through all of these anti corrosion measures
Learning/ Teaching Activities	<p>Introduction:</p> <p>Entry Point: Start out with a 5-minute write on their initial thoughts and ideas on corrosion.</p> <ul style="list-style-type: none"> ■ Bring the class together and see if there are any common ideas between students (think, pair, and share). ■ After the discussion have them read the article on corrosion, and how to applies to the red color of Prince Edward Island soil. ■ Jigsaw the article so that small group discussion can be had about each part of the article. <p>Finally talk about each reaction and make predictions for each of the reactions. Have them write hypotheses for each rxn. Discuss each reaction and what variable we are changing with each one.</p>

Materials Needed	Acid/Base Lab Equipment List Corrosion Article Materials list can be found in the lab hand out for the Corrosion demos
Assignment / Follow-up	This will cause my students to think about developing multiple hypotheses and considering multiple variables. The idea of corrosion is a bit abstract for kids. They are all aware of the idea that acids can break things down and dissolve many substances. However they aren't usually aware that there is technology out there today that companies can use to stop corrosion.

Lesson Plan:

Lesson Topic	Acid and Base Chemistry: pH
Lesson Rationale	This gives kids a hands on experience dealing with acids and bases and how they interact with each other.
Standards	<ul style="list-style-type: none"> - 11-12.C.1.2.4 Distinguish the common theories defining acids and bases. - 11-12.C.1.3.6 Express concentrations of solutions in various ways including molarity - 11-12.C.1.3.8 Analyze quantitative relationships involved in acid/base chemistry including pH. - 11-12.C.2.1.5 Explain the relationship and reactions of acids, bases, and salts. -
Evidence	Lab handout
Desired Results	<ol style="list-style-type: none"> 4. Classify substances as Acids or Bases. 5. Predict products of a neutralization reaction of a strong acid/base. 6. Identify acids and bases and their conjugates 7. Explain the difference between strong and weak acids and bases and relate their strength to their ionization equation.
Learning/Teaching Activities	<p>Introduction:</p> <p>Entry Point: This will be a lab that helps them identify both household substances and chemicals found in the lab as acid or base.</p> <p>Presentation of new information: Each new activity in the lab is preceded by a section of reading that gives them some clue as to what they are about to do.</p>
Materials Needed	<p style="text-align: center;">Acid/Base Lab Equipment List</p> <p>From Grocery Store</p> <ul style="list-style-type: none"> ➤ red cabbage ➤ lemon juice ➤ orange juice ➤ vinegar ➤ mineral water ➤ milk ➤ dishwashing solution ➤ Milk of Magnesia

	<ul style="list-style-type: none"> ➤ apple juice ➤ household ammonia
Assignment / Follow-up	<p>There are several follow up questions that will test their knowledge of acids, bases, and various other things that are related to the concept.</p> <p>This activity will have then look at products that they use every day. Giving them some real world application and more connection to the topic as a whole.</p>

Reflection:

This unit was really fun to teach and to organize for the kids. As I was coming up with all of the activities and labs for this unit I really tried to keep things rooted in the real world. Trying to connect all of the substances that they were working with with something that they could run into in their daily lives.

One activity that I really enjoyed putting together and shifting to fit my schedule was the reading on corrosion and the 24hr lab. Kids were able to read about how this process is important to plant life and sustainability of our livelihood. They also were able to connect that having iron in our soil doesn't necessarily mean that the plants are able to use it, it all has to do with the alkalinity or the acidity of the soil. Then having them put these reactions together and record observations and make extensions on what is happening. This was an important lesson because every substance that my kids had considered corrosive wasn't used in this lab.

This linked well into my culminating project of building a case file on a corrosive substance. We started with an intro activity looking at a real world situation, the flint water crisis, I had put together a case file on what was happening there with four articles that they needed to read and discuss with each other. Each one talking about what had happened. Given this information they needed to build a case themselves dealing with an assigned substance. The flint articles really helped link the ideas of corrosions and pH to the real world. They found out that not all corrosion prevention measures really help, and that the treatments of water sources prior to entering a city water system plays a big role in the health of a community.

I am really impressed with what my kids were able to come up with. I gave them creative freedom for the culminating project and they have gone above and beyond my expectations.

This unit was helpful in showing my kids that acids are everywhere and most of them play an important role in our society. However if they are misused and mishandled then they can become dangerous.