

BPS Science Department Chemistry – Unit 12

Chemistry Unit 12 – Acids and Bases

Unit Overview: In this unit, the students will learn the Arrhenius Theory and alternate theories of acids and bases. Given this information students will be able to identify a substance as an acid or base and be able to describe the properties of acids and bases. Students will be able to write simple neutralization reactions. Using the titration formula students will be able to calculate the molarity of an unknown acid or base. Understanding the logarithmic nature of the pH scale the ability to identify indicators at a given pH will be taught.

Essential Questions:

- What is Arrhenius Theory?
- What are acids?
- What are the properties of acids?
- What are bases?
- What are the properties of bases?
- How is a neutralization reaction written?
- What is pH?
- What information is obtained from a titration?
- How can pH indicators be used to determine the pH of a solution?

MST Standard 4 - Science

Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

New York State Science Learning Standards Performance Expectations:

HS-PS 1-10 Use evidence to support claims regarding the formation, properties and behaviors of solutions at bulk scales.

HS-PS 1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

HS-PS 1-11 Plan and conduct an investigation to compare properties and behaviors of acids and bases.

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Time Frame	Skills, Practices, or Expectations	Specific Standards / Performance Indicators	Resources	Content Vocabulary	Measurement of Student Learning
03.13.2023 - 03.24.2023	<p>Arrhenius Theory Given properties, identify an aqueous solution as an acid or a base. Understand that in an aqueous solution H^+ and H_3O^+ are synonymous.</p> <p>Neutralization Recognize and balance a neutralization reaction.</p> <p>Titration Calculate the concentration or volume of a solution using titration data.</p> <p>Alternate Theory (Bronsted-Lowry) Use proton transfer to identify a substance as an acid or a base.</p> <p>Indicators and pH Use and understand the pH scale. Interpret changes in acid/base indicator color.</p>	<p>MST Standard 4 Science Key Idea 3 3.1 - Explain the properties of matter in terms of the arrangement and properties of the atoms that compose them. 3.1uu – Behavior of many acids and bases can be explained by Arrhenius Theory. Arrhenius acids and bases are electrolytes. 3.1rr – An electrolyte is a substance which, when dissolved in water, forms a solution capable of conducting an electric current. The ability of a solution to conduct an electric current depends on the concentration of ions. 3.1ss – The acidity or alkalinity of an aqueous solution can be measured by its pH value. The relative level of acidity or alkalinity of these solutions can be shown by using indicators. 3.1tt – On the pH scale, each decrease of one unit of pH represents a tenfold increase in hydronium ion concentration. 3.1vv – Arrhenius acids yield H^+ (aq), hydrogen ions as the only positive ion in an aqueous solution. The hydrogen ion may also be written as H_3O^+ (aq) hydronium ion. 3.1ww – Arrhenius bases yield OH^- (aq), hydroxide ion as the only negative ion in an aqueous solution. 3.1xx – In the process of neutralization, an Arrhenius acid and an Arrhenius base react to form a salt and water.</p>	<p>Castle Learning- Access through Clever</p> <p>BPS Science Department Recommended Virtual Labs – must be logged into BPS google document account through BPS Gmail account to access</p> <p>Holt NY Chemistry Textbook Chapters 15</p> <p>Regents Chemistry Reference Tables - Table K, L, M, T</p> <p>Dynamic Periodic Table</p> <p>BPS Science K-12 Schoology Folder 9-12 Resources Chemistry Resources</p> <p>PhET Interactives: Acid-Base Solutions</p> <ul style="list-style-type: none"> ● Introduction - Form various solutions (equilibrium reactions); measure pH; litmus paper; conductivity ● My Solution - Change variables like concentration, strength, acidity to measure pH; litmus and conductivity <p>pH Scale Basics - Measure pH of various substances; add/ remove water to change concentration and see effect on pH</p> <p>pH Scale</p> <ul style="list-style-type: none"> ● Macro - Same as pH scale Basics ● Micro - See concentration; moles and ratio of H_3O^+ and OH^-; pH of various substances ● My Solution - Change variables to see pH and concentration; moles and ratio of H_3O^+ and OH^- <p>Virtual PPTs:</p> <ul style="list-style-type: none"> ● Acids and Bases - Acids, bases, pH and indicators 	<ul style="list-style-type: none"> ● acid ● alkaline ● amphoteric ● base ● Bronsted-Lowry acid ● Bronsted-Lowry base ● hydrogen-ion/proton hydronium ● indicator ● neutralization ● neutral ● pH 	<ul style="list-style-type: none"> ● Ticket Out ● Think-Pair –Share ● Formative Assessment ● Weekly Quiz ● Unit Test ● Homework ● Review Questions ● DDI process using data from Edoctrina & Castle Learning to generate data <p>Higher Level Questions: Regents Exams:</p> <p>January 2020 Questions 71-72 August 2019 Question 63</p>

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		<p>3.1yy – There are alternate acid-base theories. One theory states that an acid is an H⁺ donor and a base is an H⁺ acceptor.</p> <p>3.1zz – Titration is a laboratory process in which a volume of a solution of known concentration is used to determine the concentration of another solution.</p>	<p>Royal Society of Chemistry Interactive simulations with questions</p> <ul style="list-style-type: none"> ● Titration Level 1 - Examine samples from a river, data collection included ● Titration Level 2 - Analyze aspirin tablets to find aspirin concentration ● Titration Level 3 - Analyze hair product to find the amount of ammonia ● Titration Simulation - Analyze iron tablet to find concentration of iron 		
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Resources

<http://ngss.nsta.org/Classroom-Resources.aspx> - Searchable NYSSLS/NGSS aligned resources curated by NSTA

[Buffalo Public Schools Science Department Chemistry Webpage](#) – BPS chemistry curriculum resource hub

[BPS Science Department Recommended Virtual Labs](#) – Virtual lab resources with embedded links to virtual labs and student sheets. Must be logged into BPS google document account through BPS Gmail account to access.

[NYS Regents Chemistry Exams 2012-2020](#) NYSED’s Office of State Assessment webpage for released Regents Chemistry Examinations

[NYS MST Science Learning Standards Physical Setting/Chemistry](#) – Current NYS Physical Setting/Chemistry Standards

[NYS P-12 Science Learning Standards \(HS\)](#) – NYSSLS High School Standards

[Regents Chemistry Reference Tables](#) – Reference Tables for Regents Chemistry

<p>ELL Enhancement To access hyperlinked material, you must be logged into your BPS Google Drive</p>	<p>Listening</p> <ul style="list-style-type: none"> ● Cross- Linguistic Practices: Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates.) ● Build background knowledge ● Activating Prior Knowledge Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content ● Activating Prior Knowledge ● Visuals - GIFs, pictures- will assist students in understanding what they are listening to. Use visual thinking strategies to set the lens for learning. ● Video to review or introduce a topic – use closed captioning to help 	<p>Speaking</p> <ul style="list-style-type: none"> ● Sentence Frames - to begin a sentence - such as <i>Evolution is...</i> or <i>I think that evolution is...</i> ● Academic Conversation Starters: Have a visual of a list of academic sentence starters that students can refer to in a discussion. Examples include- I expect ____ to happen. My data shows that... This helps students have a more science focused dialogue. ● Choral Reading - To build fluency, self-confidence and motivation with reading/speaking ● Create movement to go with the word. Movement can be a motivating factor, as well as a 	<p>Reading</p> <ul style="list-style-type: none"> ● Supplementary Text to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension. ● Visual Aids - Pictures or models to support vocabulary words and concepts ● Video to review or introduce a topic - use closed captioning to help students read along while they listen to the content ● 4 Square / Frayer models to help students gain a deeper understanding of vocabulary. ● Highlighting important text to assist students in answering questions after the reading. ● Chunking-Break reading of text into chunks or paragraphs ● Vocabulary Morphology- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. 	<p>Writing</p> <ul style="list-style-type: none"> ● Sentence Frames - to begin a sentence- such as <i>Biodiversity is...</i> or <i>An example of competition is....</i> ● Cloze passages with word banks ● Word banks ● Graphic Organizers to help break down the writing process and organize thoughts ● Standards-based sentence stems ● Performance Level Descriptors this document provides teachers with a description of what output they can 	<p>Instructional Accommodations (depending on the student’s needs)</p> <ul style="list-style-type: none"> ● Extended time for tests in class, projects and assignments ● Directions read. Broken down as necessary ● Model how to complete the activity in the lesson ● Oral simplification of directions or questions ● Translated version of test when available. Student may have both version English and native language version ● Use of approved bilingual glossaries from NYS in each subject
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	<p>students see the words and pronunciations while they listen to the content.</p> <ul style="list-style-type: none"> ● Word stretching / Vowel stretching when instructing allows student to listen closely to the pronunciation of the word ● Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening Scroll for grades 9-12. 	<p>kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning</p> <ul style="list-style-type: none"> ● Performance Level Descriptors This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of speaking. Scroll for grades 9-12 	<p>Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary</p> <ul style="list-style-type: none"> ● Performance Level Descriptors this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of reading. Scroll for grades 9-12. 	<p>expect from students based on earned NYSESLAT levels in the modality of writing. Scroll for grades 9-12.</p>	
<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p>Instructional</p> <ul style="list-style-type: none"> ● Pre-teach vocabulary ● Use picture vocabulary ● Scaffold Depth of Knowledge questions ● Provide copy of notes/notes in “cloze” form ● Use of Think, Pair, and Share strategy to help process information ● Scaffold written assignments with the use of graphic organizers ● Allow for multiple ways to respond (verbal, written, response board) ● Provide model of performance task ● Modify informational text to fit the needs of the students ● Provide a digital or paper interactive notebook ● Present complex tasks in multiple ways ● Provide mnemonic strategies for Chemistry concepts 		<p>Technology:</p> <ul style="list-style-type: none"> ● Audio reading of text ● Text to type functions ● Videos to clarify/visualize Chemistry concepts ● Record class lecture/discussions and make accessible to student ● Nearpod- interactive presentations of notes ● Playposit - show a video clip about the topic and add your own questions for them to answer as they watch ● Allow students to type answers in chat on Teams <p>Other:</p> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction ● Accessible lab space (counter level) 		<p>In Class Assessments</p> <ul style="list-style-type: none"> ● Provide review packet or review sheet of concepts covered on the test ● Practice similar questions prior to the test ● Provide multiple options for projects ● Give a timeline of when things are due and remind them of the process often. ● Use of timer in class ● Break all complex tasks into chunks
<p>Step Up to Writing</p> <p>Step Up to Writing materials can be found in BPS Science K-12 Schoology Folder 9-12</p> <p>Resources Chemistry Resources Curriculum Materials</p>	<p>SUTW Strategy</p> <ul style="list-style-type: none"> ● Informal Outline ● Color-Coding – Informative/Explanatory Text ● Two-column notes ● I-V-F Topic Sentence progressing to Four Step Summary Paragraph ● CUPS – Capitalization, Usage, Punctuation, Spelling ● Transitions 				

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**Culturally and
Linguistically
Responsive
Teaching
(CLRT) in the
Science
Classroom**

Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications

- Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population
- All students are given an opportunity to engage in science discourse
- Teacher demonstrates high expectations for all students

CLRT resources which align to Science content are denoted with a *