Unit 08: Acids and Bases

Content Area:
Course(s):
Time Period: **Year**
Length: **180**
Status: **Published**

Unit 8

Unit Title:	Acids and Bases
Suggested Duration:	**Three weeks**

Interdisciplinary Connections

Interdisciplinary Connections
Reading and Writing Companion Standards for History, Social Studies, Science and Technical Subjects ▪ Grades 9-10 ▪ Grades 11-12 **Math Practices**: https://www.nj.gov/education/standards/math/Index.shtml **Science Practices**: https://www.nj.gov/education/standards/science/Index.shtml Find and paste appropriate Companion Standards or Practices here.

Mathematics—Metric conversions, solving for an unknown, interpreting graphs
Language Arts- Reading scientific documents for comprehension, writing conclusions, writing lab reports
Social Studies—Historical events leading to scientific discoveries and/or revisions
Foreign Language – Chemical nomenclature relates to the learning of any language

Technology Integration

Technology Integration
Northern supports the integration of the SAMR Model: a framework which extends learning through the use of technology. The installation of interactive boards, the purchase of softwares and subscriptions, and the investment in 1:1 laptops and various other instructional technologies are examples of Northern's commitment to enhancing students' learning and preparing the 21st century learner for college and careers.

- *Use of Atomic Emission Spectroscopes*
- Vernier Computer-based probes and software
- ViewBoard for presentation of information and interactive activities
- United Streaming/Discovery Education
- Laptops/Computer Lab—web based project
- AP Classroom.

Standard(s) Addressed

Course Skills

SAP-9.A Calculate the values of pH and pOH, based on Kw and the concentration of all species present in a neutral solution of water.
SAP-9.B Calculate pH and pOH based on concentrations of all species in a solution of a strong acid or a strong base
SAP-9.C Explain the relationship among pH, pOH, and concentrations of all species in a solution of a monoprotic weak acid or weak base.
SAP-9.D Explain the relationship among the concentrations of major species in a mixture of weak and strong acids and bases.
SAP-9.E Explain results from the titration of a mono- or polyprotic acid or base solution, in relation to the properties of the solution and its components.
SAP-9.F Explain the relationship between the strength of an acid or base and the structure of the molecule or ion.
SAP-10.A Explain the relationship between the predominant form of a weak acid or base in solution at a given pH and the pKa of the conjugate acid or the pKb of the conjugate base.
SAP-10.B Explain the relationship between the ability of a buffer to stabilize pH and the reactions that occur when an acid or a base is added to a buffered solution.
SAP-10.C Identify the pH of a buffer solution based on the identity and concentrations of the conjugate acid-base pair used to create the buffer.
SAP-10.D Explain the relationship between the buffer capacity of a solution and the relative concentrations of the conjugate acid and conjugate base components of the solution.

STAGE I Desired Results

STAGE I Desired Results

Objective (Transfer)

This unit builds on the content about chemical equilibrium studied in Unit 7. Chemical equilibrium plays an important role in acid-base chemistry and solubility. The proton-exchange reactions of acid-base chemistry are reversible reactions that reach equilibrium quickly, and much of acid-base chemistry can be understood by applying the principles of chemical equilibrium. Most acid-base reactions have either large or small values of K, which means qualitative conclusions regarding equilibrium state can often be drawn without extensive computations. The dissolution of a solid in a solvent can also be understood by applying the principles of chemical equilibrium because it is a reversible reaction that often reaches equilibrium quickly. In the final unit, the equilibrium constant is related to temperature and the difference in Gibbs free energy between the reactants and products.

Mastery

Big Ideas/Understandings	Essential Questions
BIG IDEA 2: STRUCTURE AND PROPERTIES (SAP) Properties of substances observable at the macroscopic scale emerge from the structures of atoms and molecules and the interactions between them. Chemical reasoning moves in both directions across these scales. Properties are predicted from known aspects of the structures and interactions at the atomic scale. Observed properties are used to infer aspects of the structures and interactions.	How are reactions involving acids and bases related to pH? How does your body maintain pH balance?

Acquisition

Students will know . . .	*Students will be skilled at . . .*
See "essential knowledge" in each topic of College Board CED for Unit 8	In Unit 8, students will apply the explanations and calculations they learned in Unit 7 to the acid-base equilibrium system. Students will collect titration data and develop titration curves to represent a variety of acid-base systems. They will analyze these titration curves to describe the similarities and differences between a strong acid strong base and a weak acid-strong base titration, identify the equivalence points and the half-equivalence points, and identify the buffering regions of the curves. Students will use the information presented graphically in the titration curves to complete calculations to find the equilibrium constant for the reactions (Ka or Kb), determine the concentration of an unknown, and support claims about how a particular

	buffer system may work when an acid or base is introduced. From these calculations and what is known about the chemical system, students will then develop explanations for how potential sources of error may have affected experimental results and associated calculations.

STAGE II Assessment Evidence

STAGE II Assessment Evidence	
Common Summative Assessments	Common Formative Assessments
Tests Quizzes Laboratory Reports and analyses	Exit Slips Quizzes Homework Problems Participation in class discussions and in performance of lab experiments Laboratory notebook AP Classroom Unit checks
Modifications	
How are the evaluations/assessments modified/accelerated? (i.e.: alternate assessment). All courses follow a balanced assessment system with Practice, Assessments, Evaluations.	

Modifications on 504 plans may be submitted at (SSD). prior to testing. Both exclusion statements and extensions exist for each standard to accommodate different paces.

STAGE III Learning Plan

STAGE III Learning Plan
Organize plan by weeks
8.1 Introduction to Acids and Bases 8.2 pH and pOH of Strong Acids and Bases

8.3 Weak Acid and Base Equilibria
8.4 Acid-Base Reactions and Buffers
8.5 Acid-Base Titrations
8.6 Molecular Structure of Acids and Bases
8.7 pH and pKa
8.8 Properties of Buffers
8.9 Henderson-Hasselbalch Equation 8.10 Buffer Capacity

Modifications
How are the activities modified/differentiated? (i.e.: abridged text)

Modifications on 504 plans may be submitted at (SSD). prior to testing. Both exclusion statements and extensions exist for each standard to accommodate different paces.

Specific Resources for Unit

Specific Resources for Unit
Attached Affirmative Action Compliance Checklist

Selected College-Board practice problems
Chang, Raymond and Goldsby, Kenneth A. Chemistry, 13th Edition. New York, McGraw-Hill. 2019
The College Board. AP Chemistry Guided Inquiry Experiments: Applying the Science Practices. 2013.
Demmin, Peter and David Hostage. AP Chemistry, Fifth Edition. New York: D&S Marketing Systems, Inc., 2005
Vonderbrink, Sally. Laboratory Experiments for Advanced Placement Chemistry. Batavia: Flinn Scientific, 2001.
POGIL Activities for High School Chemistry, Batavia: Flinn Scientific, 2012,
AP Classroom

Diversity, Equity, & Inclusion

Diversity, Equity &Inclusion
Provide a brief description of how this unit addresses DE&I.

Career Readiness (9.2), Life Literacies and Key Skills (9.4) Standards

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.2	Attend to financial well-being.
WRK.K-12.P.3	Consider the environmental, social and economic impacts of decisions.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.6	Model integrity, ethical leadership and effective management.
WRK.K-12.P.7	Plan education and career paths aligned to personal goals.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Climate Change Education

ClimateChange Education	
Enduring Understandings/Core Ideas	Performance Expectations
Math and ELA- Provide a brief description of a lesson or activity that relates to Climate Change. All other Content Team copy and paste the Core Idea and Performance Expectation from NJDOE link above.	