MYP/3D Science Unit Planner

Marietta City Schools

Grade & Course: 9-12 Chemistry	**Topic:** Solutions and Acids/Bases	**Duration:** 8 weeks

Georgia Standards and Content:

SC6a. Develop a model to illustrate the process of dissolving in terms of solvation versus dissociation.
SC6b. Plan and carry out an investigation to evaluate the factors that affect the rate at which a solute dissolves in a specific solvent.
SC6c. Use mathematics and computational thinking to evaluate commercial products in terms of their concentrations (i.e., molarity and percent by mass).
SC6d. Communicate scientific and technical information on how to prepare and properly label solutions of specified molar concentration.
SC6e. Develop and use a model to explain the effects of a solute on boiling point and freezing point.
SC6f. Use mathematics and computational thinking to compare, contrast, and evaluate the nature of acids and bases in terms of percent dissociation, hydronium ion concentration, and pH. (Clarification statement: Understanding of the mathematical relationship between negative logarithm of the hydrogen concentration and pH is not expected in this element. Only a conceptual understanding of pH as related to acid/basic conditions is needed.)
SC6g. Ask questions to evaluate merits and limitations of the Arrhenius and Bronsted-Lowry models of acid and bases.
SC6h. Plan and carry out an investigation to explore acid-base neutralization.

Narrative / Background Information

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

SPS6. Obtain, evaluate, and communicate information to explain the properties of solutions.

a. Develop and use models to explain the properties (solute/solvent, conductivity, and concentration) of solutions.
b. Plan and carry out investigations to determine how temperature, surface area, and agitation affect the rate solutes dissolve in a specific solvent.
c. Analyze and interpret data from a solubility curve to determine the effect of temperature on solubility.
d. Obtain and communicate information to explain the relationship between the structure and properties (e.g., pH, and color change in the presence of an indicator) of acids and bases. (Clarification statement: Limited to only the structure of simple acids and bases (e.g., HCl and NaOH) that demonstrates the presence of an H+ or OH-.
e. Plan and carry out investigations to detect patterns in order to classify common household substances as acidic, basic, or neutral.

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

Changes to the measurement of chemicals added to Flint Michigan's water supply created dangerous levels of lead contamination in the drinking water.

Unit Phenomena (LEARNING PROCESS)

The pH of seawater is decreasing due to increased carbon dioxide absorption by the oceans, negatively impacting marine ecosystems, coral reefs, and marine life with potential far-reaching consequences on biodiversity and global food chains.

MYP Inquiry Statement:

A dynamic exchange of solute and solvent particles exists within aqueous solutions, leading to the establishment of chemical equilibrium and influencing crucial properties like pH levels.

MYP Global Context:

Fairness and Development

Approaches to Learning Skills:

- Communication skills
- Social skills
- Self Management skills
- Research skills
- Thinking skills

Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)

- Solvation
- Dissociation
- Rate of Dissolving
- Molarity
- Percent by Mass
- Dilution
- Solution Preparation and Proper Labeling
- Colligative Properties
- Boiling Point Depression

Crosscutting Concepts: (KNOWLEDGE & SKILLS)

CCCs

- Systems and System Models
- Structure and Function

MYP Key and Concept:

Systems

Related Concept(s)

- Models
- Movement

	● Freezing Point Depression ● Acids and Bases ● Percent Dissociation ● H_3O^+ Concentration ● pH ● Arrhenius Model ● Bronsted-Lowry Model ● Neutralization ● Titration	● Interaction ● Conditions ● Function

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

A solution is any two things mixed together.
Acid indicator is strictly a piece of paper.
All acids are toxic.
All salts are neutral.
Sodium chloride is always the product of a neutralization reaction.
All acids are named with the prefix hydro-.
If there is any excess solute, the solution is supersaturated.
Only ionic compounds affect colligative properties.
All bases have hydroxide.
All acids start with hydrogen.
Acids only give one hydrogen.

Key Vocabulary: (KNOWLEDGE & SKILLS)

- Solvation
- Dissociation
- Rate of Dissolving
- Molarity
- Percent by Mass
- Dilution
- Solution Preparation and Proper Labeling
- Colligative Properties
- Boiling Point Depression
- Freezing Point Depression
- Acids and Bases
- Percent Dissociation
- H_3O^+ Concentration
- pH
- Arrhenius Model
- Bronsted-Lowry Model
- Neutralization
- Titration

Inquiry Questions:

Factual - What are the different types of solutions? What is concentration? What are the difference between acids and bases?

Conceptual - How is something diluted? What happens during a titration of a strong acid and strong base?

Debatable- Should water be classified as an acid or base?

MYP Objectives	Summative assessment	
Sciences	Criterion A: Knowing and Understanding ● Common Summative Assessment Criterion B: Inquiring and Designing Criterion C: Processing and Evaluating ● Common Laboratory Experience	Relationship between summative assessment task(s) and statement of inquiry: Students will perform tasks and respond to assessment items that will gauge their mastery of reactions as required by the Georgia Standards of Excellence. Mastery of these concepts is necessary to move forward in our student of chemical behavior.

Unit Objectives:

Learning Activities and Experiences	Inquiry & Obtain: (LEARNING PROCESS)	Evaluate: (LEARNING PROCESS)	Communicate: (LEARNING PROCESS)
Weeks 1-5:	**Engage:** ● Core Interactive Text: Thinking About Solutions ● Video: Salt and fluid balance is essential in all living organisms. What roles do salts play in your body? ● Image: How do intravenous fluids help a patient rebound? ● Image: What can you do to cause sugar to dissolve faster in a cup of coffee? **Explore:** ● Core Interactive Text: What Are The Various Parts of a Solution? ● Video: What is the difference between a solvent and a solute? ● Reading Passage: What material is used to make “tin” cans? ● Core Interactive Text: How Do Various Factors Affect the Solubility of a Solute? ● Exploration: What factors affect the solubility of salts? ● Image: What do CO_2 and O_2 have such different solubility? ● Video: Why can’t Henry’s law apply to the solubility of gases when they are dissolved in other gases?	**Evaluate:** ● Common Formative Assessment ● Common Summative	**Explain:** ● Core Interactive Text: Explaining Solutions **Elaborate:** ● Core Interactive Text: Applying Solutions ● Image: What effect does the addition of salt have on the time it takes for a solution to freeze? ● Video: How can ice cream be made using a simplace chemistry experiment?

	● Video: What are the differences among saturated, unsaturated, and supersaturated solutions? ● Video: How do you calculate the molarity of a solution? ● Core Interactive Text: What are the various colligative properties of solutions? ● Video: How do the colligative properties of boiling point elevation and freezing point depression depend on changes in temperature? ● Image: How does antifreeze keep liquids in your car from freezing up?		
Weeks 6-8:	**Engage:** ● Core Interactive Text: Identifying Acids, Bases, and Salts ● Video: What are ways in which you use acids and bases in your everyday life? ● Image: How can you use your knowledge of chemistry to help relieve heartburn? ● Video: How is the name of an acid related to its anion? ● Video: What effect does citric acid have on teeth? **Explore:** ● Core Interactive Text: What are similarities and differences among the Arrhenius, Bronsted-Lowry, and Lewis Acid-Base Theories? ● Image: Why are acids formed from anions and not cations? ● Image: Why are bases formed from cations and not anions? ● Video: What are some common properties of acids? ● Video: What is formed when an acid and a base are mixed and neutralized? ● Video: What were two limitations of the Arrhenius definition of acids and bases that were resolved by the	**Evaluate:** ● Common Formative Assessment ● Common Summative Assessment	**Explain:** ● Core Interactive Text: Explaining Acids, Bases, and Salts **Elaborate:** ● Image: How can buffers help with food preservation? ● Video: What environmental effect can excess nutrients have on lakes and oceans? ● Image: What are some methods that a farmer could take to avoid polluting nearby waterways with runoff from fertilizers?

	Bronsted-Lowry definition of acids and bases? ● Video: How can the strength of an acid or base be calculated? ● Video: How do titration calculations relate to molarity calculations? ● Hands-On Lab: What is the purpose of an acid-base titration?		

Resources (hyperlink to model lessons and/or resources):
Discovery Education Science Techbook

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit
(click here)	(click here)	(click here)