Clarion University Science in Motion

pH of Household Substances

Grade/Grade Band: 6-8 / 9-12	**Topic:** Properties of substances	**Subject Area:** Biology/ Chemistry
Brief Lesson Description: Students will investigate the pH of various household substances using different indicators - litmus paper, pH meters, and universal pH indicator.		
NGSS Performance Expectations: **MS-PS1-2** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. **HS-PS1-3** Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.		
Science & Engineering Practices: ● Developing and Using Models ● Analyzing and Interpreting Data ● Constructing explanations and Designing Solutions	**Disciplinary Core Ideas:** PS1.A Structure and Properties of Matter PS1.B Chemical Reactions	**Crosscutting Concepts:** ● Patterns ● Energy and Matter: Matter is conserved because atoms are conserved in physical and chemical processes (MS-PS1-5)

LESSON PLAN – 5-E Model

ENGAGE: Suggested Opening Activity (Access Prior Learning / Stimulate Interest / Generate Q's)
Have ss. read Chem4Kids "Acids and Bases are Everywhere" and classify the following substances as acid, base, or neutral: HCl, NaOH, H_2SO_4, NaCl, KOH, H_2O (or HOH). Have them try to identify **patterns** in the chemical formulas.

EXPLORE: **Lesson Description:** Students will investigate the pH of household substances first with litmus paper, then with a pH probe or sensor. They should observe the properties of the substances to determine **patterns** (e.g. bases have a "slippery" feel while acids have a "squeaky" feel; many cleaning products are bases while fruit juices are acidic). **SAFETY:** *Students should wear safety glasses and avoid contact of the solutions with skin and clothing. When testing the feel of the substances, wear disposable gloves.*	**Materials Needed:** Litmus paper Well plates or test tubes pH probes or sensors Purple cabbage juice indicator Household substances **Lesson Handout** **Cabbage Indicator Reference**
EXPLAIN: Concepts Explained: When you put molecules into water, sometimes they break down and release an H+ (hydrogen) ion. At other times, you find the release of an OH-(hydroxide) ion. When a hydrogen ion is released, the solution becomes acidic. When a hydroxide ion is released, the solution becomes basic. Those two special ions determine whether you are looking at an acid or a base. The pH scale measures the concentration of these ions in solution. It is these ions that are involved in chemical reactions with other substances.	**Key Vocabulary:** pH Acid Base Dissociation

ELABORATE: Suggested Activity *(Making sense through building*	**SEP (Select / Highlight)**	**CCC (Select / Highlight)**
	1. Asking questions	1. Patterns.

models and constructing explanations by connecting concepts to the SEP and CCC.) Using purple cabbage juice as a pH indicator, test all of the household substances now that the pH is known and create a pH scale of colors that the cabbage juice changes to in the presence of each substance. Students should develop a model for how the different substances cause the color of the cabbage juice to change.	2. Developing and using models 3. Planning and carrying out investigations 4. Analyzing and interpreting data 5. Using mathematics and computational thinking 6. Constructing explanations 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information	2. Cause and effect 3. Scale, proportion, and quantity. 4. Systems and system models. 5. Energy and matter 6. Structure and function 7. Stability and change.
EVALUATE Formative Monitoring (Questioning / Discussion):		**Summative Assessment (Quiz / Project / Report):**
Suggestion(s) to Elaborate Further / Reflect/ Enrich: *What is causing ocean acidification and how is that affecting organisms that live in the ocean?* *YouTube video: https://www.youtube.com/watch?v=HkLOt5lLbDU*		