Lesson Title	Acids, Bases, and pH Relevance
Length of Lesson	One (50 minute) class period
Created By	Charlotte Buehler
Subject	General Science
Grade Level	7th grade
State Standards	7th: Inquiry (1a), Physical Science (2b)
DOK Level	DOK 3
DOK Application	Investigate, Compare, Draw Conclusions
National Standards	5-8: Inquiry (A), Physical (B)
Graduate Research Element	Understanding what a hypothesis is and how scientists use hypotheses as part of the scientific method is an important skill and habit to develop as a researcher. To conducting science experiments and carry out projects one scientists make educated predictions.

Student Learning Goal:
MS 7th Grade:
Inquiry- (a) Design, conduct, and draw conclusions from on investigation that includes using experimental controls, (b) Organize data in tables and graphs and analyze data to construct explanations and draw conclusions.

National Science Education Standards of Content 5-8:
Inquiry (A)-- Use appropriate tools and techniques to gather, analyze, and interpret data.
Physical Science (B)—Properties and changes of properties in matter

Materials Needed (supplies, hand-outs, resources)
Pencil, computer, projector, INSPIRE_Buehler_pHchart_9_6_11, INSPIRE_Buehler_pHppt_9_6_11, litmus paper, hydrion paper, Bottled water Fountain water, Colored water, Shampoo, Conditioner, Vinegar, Milk of Magnesia Hydrogen Peroxide, Milk, Mountain Dew, Lemon Juice, Saliva

Lesson Performance Task/Assessment:
Acids, bases, and pH are essential concepts to learn in chemistry. The lesson will integrate a brief lecture on acids, bases, and pH and then incorporate time in the lab for actually testing the pH of various materials (e.g. lemon juice, milk of magnesia). The students will work in groups of four and hypothesize, test, and record the pH of all the materials set out in the lab. For simplicity, there will be six stations set up with two substances in each station. The student groups will then rotate through each of the six

stations. Once every group has rotated through each station, the instructor will revisit each station and ask what pH the groups hypothesized and what pH the groups actually derived. Each student will have their pH chart (INSPIRE_Buehler_pHchart_9_6_11) collected. It should be noted that each student group will be given only twelve litmus strips (six red and six blue) and 6 hydrion strips. They should be careful and mindful, taking precaution not to lose their strips. The lesson here is that a scientist should always be mindful and attentive when using lab equipment and material. The lesson will incorporate hypothesizing, testing, and reporting results. The students, upon completion of the lab, will be asked to make conclusions about the products they tested and relate acidity, basicity, and pH to real world problems like acid rain.

Lesson Relevance to Performance Task and Students:
Chemistry is often an intimidating subject for young students, however, introducing concepts like acidity, basicity, and pH are fundamentals in chemistry that have apparent real world applications in which the students may be more familiar. For example, they might use antacids such as milk of magnesia for an upset stomach but not know why it works, or, in a broader picture, wonder about if acid rain is real and what causes it and if they might be affect by it.

Anticipatory Set/Capture Interest:
Starting with the broad picture, the instructor will show pictures acid rain damage or acid mine drainage and explain generally how acid rain or acid mine drainage is created.

Guided Practice:
The lesson will begin with a short lecture on the basic definitions of acids, bases, and pH. The instructor will then provide an example to the students including what they should hypothesize for a material (e.g. bottled water), how they should use and read the litmus and hydrion paper, and what the results mean.

Independent Practice:
After the guided practice, the class will be divided into groups in which they can use the litmus and hydrion paper to test the pH on varying materials. The students should be sure to write down their predictions using the provided chart.

Remediation and/or Enrichment:
Remediation- Individual IEP; instructor guided demonstrations for all the pH test materials.
Enrichment – Ask students to think about other substances they could test and why that might be important (e.g. soil pH, blood pH, pH of ocean water).

Check(s) for Understanding:

The students will be asked to provide formative feedback about what they leaned in relation to pH. The chart they made predictions on will be collected for summative feedback.

Closure:
Question 1: The presence of what ion indicates acidity? The presence of what ion indicates basicity?

Question 2: A weak acid would fall between what values on the pH scale? A solution that has a pH of 13 would be considered _____.

Possible Alternate Subject Integrations:
Life science

Teacher Notes:
If there is no class access to a laboratory, the instructor might demo the lab him/herself in front of the class and call on students to come up.