

Project Based Learning - Let's Get a Reaction out of You!

Grade: 10 Pre-IB

Subject: Science

Unit: Matter & Chemical Change

Driving Question: *How do chemicals act and react around us?*

Curriculum Outcomes:

- *predict the products given the reactants of these types of reactions*
- *represent chemical reactions using the chemical symbols and phase labels*
- *demonstrate the conservation of mass using molecular models, and balanced symbolic equations*
- *categorize the following types of chemical reactions: synthesis, decomposition, single displacement, double displacement and hydrocarbon combustion*
- *describe the factors that affect the rate of a chemical reaction*
- *design, carry out and control variables to illustrate how factors can affect chemical reactions*
- *work cooperatively with a team to research and describe the relationship between domestic and industrial technologies and the formation of acid rain*

Prior Knowledge:

Students have previously been taught:

- How to interpret periodic table trends
- lab safety and WHMIS
- Atomic structure and electron configuration
- Chemical nomenclature of ionic and molecular compounds

Supporting Documents Link(s): All student handouts and presentations can be found in dropbox at the following link:

<https://www.dropbox.com/sh/0xyyc5navsw7r8p/AAAFHme1tkcgH7ZigmfOUkFba?dl=0>

Chemistry Virtual Labs for Reinforcement or for students absent can be found at the following link:

<http://phet.colorado.edu/en/simulations/category/chemistry>

Online chemical equation balancer for reinforcement

<http://www.webqc.org/balance.php>

Useful apps - VideoScience, Science 360 for Ipad, Reaction 101, Nova Elements, Lewis Dots, Elements 4D by Daqri, Chem 3D, Khan Academy, Chemical Reaction Lite, Chem Crafter

Expected Time: 9 classes x 80 minutes

Resources:
(Tools & Tech)

Lesson Procedure

I do:

Entry Event - Unit Opener

Lesson 1. **Chemistry in a Bag Observation Lab**- Signs of a Chemical Reaction - Teacher will demonstrate the chemical reaction of citric acid and sodium bicarbonate.

Lesson 2: What is a chemical reaction? The law of conservation of mass and **Balancing Chemical Equations - screencast** - Available at

<https://www.educations.com/lesson/view/balancing-chemical-equations/29868852/?s=7wSzze>

Lesson 3: **Types of Chemical Reactions** - Video available at <http://viewpure.com/tE4668aarck>

Lesson 4: **Dancing Partners**... Have four students dance as two sets of partners. Then have them both switch partners to model a double displacement reaction. Go over Activity 25 answers.

Lesson 5: **All about that Base...(no acid)** - (3:40)

<http://viewpure.com/IAjsZWhj6GI> followed by Acids/Bases/pH scale/measuring pH powerpoint

Lesson 6: **Industrial Chemicals** - Share a current news story about proposed changes to the Fisheries Act Use **Today's Meet** to discuss student opinions on the topic. Article can be found on my blog at

<http://education.weebly.com/weebly/main.php#>

Lesson 7, 8, 9: **Think Tac Toe Project** Introduction and work period. Students will be given an instruction sheet and a Project Passport for the design lab component. The use of a Think Tac Toe **Differentiation** Activity encourages

	students to choose tasks that they have an interest or aptitude to do well.
	<ul style="list-style-type: none"> * find, validate * remember, understand * collaborate, communicate * analyze, synthesize <ul style="list-style-type: none"> * critical thinking * evaluate, leverage <input type="checkbox"/> create, publish * citizenship
	<p>You do:</p> <p>Lesson 1: Students will individually complete an observation sheet based on the teacher demonstration.</p> <p>Lesson 2: Students will do an introductory worksheet to identify the number of atoms present and to do a tally of the number of atoms of each type on each side of the reaction arrow.</p> <p>Lesson 3: Students will be given five examples of chemical reactions on PollEv.com to identify using their electronic devices.</p> <p>Lesson 4: Proceed to Activity Series Lab as groups</p> <p>Lesson 5: Individually, students will complete a virtual lab and worksheet to identify acids and bases and become familiar with neutralization reactions. The virtual lab is available at http://www.lawrencehallofscience.org/kidsite/portfolio/alien-juice-bar/</p> <p>Lesson 6: Industrial Chemicals Interactive Worksheet - Students will complete an interactive worksheet that they will access through Moodle, complete in the computer lab or on their own device and submit for grading through Moodle. They will critically analyze news articles, videos, images and use various methods to search for scientific information. They will evaluate the sources of their information to encourage digital citizenship.</p> <p>Lesson 7, 8, 9: Students will work individually on 2/3 components of the project.</p>
	<ul style="list-style-type: none"> * find, validate * remember, understand * collaborate, communicate * analyze, synthesize <ul style="list-style-type: none"> * critical thinking * evaluate, leverage <input type="checkbox"/> create, publish * citizenship
	<p>We do:</p> <p>Lesson 1: Students will work in groups to complete the Chemistry in a Bag lab. This will be handed in and assessed.</p> <p>Lesson 2: In groups, students will use molecular model kits to model three different chemical reactions. They will</p>

	<p>then be asked to create their own chemical reaction using the models.</p> <p>Lesson 3: Types of Reactions Demonstration Lab - I will demonstrate 6 chemical reactions in the chemistry lab while lab groups of students make observations, write balanced chemical equations and a way to identify the reaction type on a worksheet.</p> <p>Lesson 4: Activity Series Lab - Student groups will follow the procedure to develop an activity series of metals by performing double replacement reactions. Lab report will be submitted for assessment.</p> <p>Lesson 5: Acidic, Basic, or Neutral?- In groups, students will test the liquids that they brought from home along with other materials provided from the lab. They will use Pasco digital pH probes, litmus paper, pH paper, phenolphthalein and red cabbage juice to determine how acidic or basic each substance is. This activity can be found on page 161 in <i>Nova Scotia Science 10 textbook by McGraw Hill Ryerson</i>.</p> <p>Lesson 6:</p> <p>Lesson 7, 8, 9: Design Lab - Students will work in groups of 3-4 to design an experiment about acid precipitation. They will formulate their own research question, identify variables to control and manipulate, carry out the experiment, collect data, process and display the data and analyze the results to form a conclusion. They will evaluate the limitations of their procedure and suggest ways their experiment could be improved.</p>
	<ul style="list-style-type: none"> * find, validate * remember, understand * collaborate, communicate * analyze, synthesize <ul style="list-style-type: none"> * critical thinking * evaluate, leverage * create, publish * citizenship
	<p>We share:</p> <p>Lesson 1: Students will be asked to brainstorm chemical reactions that take place in everyday life and to reiterate the signs that a chemical reaction has taken place.</p> <p>Lesson 2: Groups will share their chemical reactions with the class. Teacher will photograph the models with the iPad and project onto the screen using AirServe for sharing.</p> <p>Lesson 3: Students will be asked for feedback on which reaction was the most exciting and why? They will also be asked to describe the six types of reactions in their own words and to create a mindmap/flow chart to determine</p>

	<p>the reaction type using Lucidchart app (or similar). A worksheet will be assigned for homework on double displacement reactions to consolidate learning - <i>Activity 25 in Nova Scotia Science 10 Teaching Resource</i></p> <p>Lesson 4: Each group will report their list of metals from most to least reactive. Student groups will discuss their reasoning for their rankings and students may choose to revise their ranking based on class data. This will be consolidated on the board to examine commonalities and trends. Students will be asked to bring in a liquid from home for next class.</p> <p>Lesson 5: Various substances will be suggested and Plickers will be used by students to indicate whether the substance is a base, acid or neutral or whether they do not know.</p> <p>Lesson 6: Students will be given an exit card to determine if they know how to evaluate digital resources.</p> <p>Lesson 7, 8, 9: Student projects will be shared "science fair" style but will also be photographed and shared in a Haiku Deck presentation for publishing. Work can be shared...</p>								
	<table border="0"> <tr> <td><input type="checkbox"/> find, validate</td> <td>* critical thinking</td> </tr> <tr> <td>* remember, understand</td> <td>* evaluate, leverage</td> </tr> <tr> <td>* collaborate, communicate</td> <td>* create, publish</td> </tr> <tr> <td>* analyze, synthesize</td> <td>* citizenship</td> </tr> </table>	<input type="checkbox"/> find, validate	* critical thinking	* remember, understand	* evaluate, leverage	* collaborate, communicate	* create, publish	* analyze, synthesize	* citizenship
<input type="checkbox"/> find, validate	* critical thinking								
* remember, understand	* evaluate, leverage								
* collaborate, communicate	* create, publish								
* analyze, synthesize	* citizenship								
<p>Differentiation:</p>									
<p>Modification:</p> <p>Selective grouping of students. Use of templates. Extra time and frequent check ins. Scaffolding of project with check list. Reduce the number of concepts required. Student choice on Think Tac Toe Project allows for differentiation.</p>	<p>Enrichment:</p> <p>Study more complex reactions. Incorporate more in-depth research (ie. scientific journals) Student choice on Think Tac Toe Project allow for differentiation.</p>								
<p>Evaluation:</p> <p>Formative Assessments - exit cards, PollEv.com, Plickers Chemistry in a Bag Informal Lab Types of Reactions Observation Assignment</p>									

Activity Series Lab Report
Industrial Chemicals Interactive Worksheet
Think Tac Toe Project
Chemical Reactions Unit Test

Teacher Reflection: