**Elements Assemble!**

**Teacher Version**

Chemistry is the science of matter and the interactions between different elements and molecules.  These interactions are in part governed by the properties of the elements.  In a way, elements are like people--the way people interact is related to their personalities and traits. Extending that metaphor, this assignment asks students to create an assembly of four superheroes or supervillains, each one representing a certain element.  The general characteristics and powers and weaknesses of the hero/villain, along with how s/he interacts with others, are to be interpreted by the properties of the element, and must include an explanation.

This project assesses students’ *understanding of the chemical and physical properties of elements*. Students will also explore *how properties can change when elements combine to form compounds*. Applying these properties as a metaphor for superpowers engages higher-level thinking and creation.

Comic book superheroes, such as Superman and Batman, have persisted for decades.  In recent years, there has been an influx of superhero movies that have been hugely popular and hugely successful.  Having students create their own supernatural beings connects science with something that many of them enjoy: the world of superheroes.  With this project, they can tap into their creativity, both in the characterization and the presentation.

Students can play to their strengths and interests by presenting the project in a variety of formats. Some such formats include: stories, large posters, songs, comic strips, picture books, plays. This addresses the need for differentiation and adaptation because the presentation format is open-ended. However, the scope can be narrowed by limiting the number of formats available for students.

The specific PLOs that this project addresses are:

* A3: represent and interpret information in graphic form
* A4: demonstrate scientific literacy
* A7: demonstrate competence in the use of technologies specific to investigative procedures and research
* C1: use modern atomic theory to describe the structure and components of atoms and molecules
* C2: use the periodic table to compare the characteristics and atomic structure of elements
* C3: write and interpret chemical symbols of elements and formulae of ionic compounds
* C4: describe changes in the properties of matter

The criteria that should be included in all projects are:

* scientific accuracy: all facts are accurate, and appropriate resources were used in research
* creativity/originality/novelty: projects should be presented in a way that is engaging and shows creativity and individuality in the characterization of the heroes/villains
* presentation: the final product should be well executed and show good effort

Useful resources:

* <http://www.webelements.com>
* <http://www.glogster.com/>
* <http://comiclife.com/>
* <http://www.chemicool.com>
* <http://www.lenntech.com/periodic/periodic-chart.htm>
* <http://www.chemicalelements.com>
* <http://www.periodicvideos.com>
* <http://www.heromachine.com>

**Elements Assemble!**

**Student Hand-out**

Everything in the universe is made up of matter. Chemistry is the science of matter and the interactions between different elements and molecules.  All interactions between elements depend on their properties.  In a way, elements are like people--the way people interact is related to their personalities and traits.

To demonstrate your understanding of the periodic table of elements, you are to create an assembly of three superheroes or supervillains, each one representing a certain element (think the Avengers, Avatar, Planeteers or the Justice League).  The general characteristics and powers and weaknesses, along with how they interact with others, will be interpreted by the chemical and physical properties of the element.

You must include explanations for your characters’ traits and abilities. Just saying something like, “Golden Girl is very shiny,” is not enough. Every power, weakness, and interaction must be explained by relating them to the properties of the element or compound, including chemical reactions if necessary.

**Example:** Evil Caesium has the shortest temper of all the Alkali-Villains, and has the ability to spark devastating explosions.  Confrontations between Caesium and the hero compound formed by Hydrogen and Oxygen always result in catastrophic destruction. This relates to the highly reactive nature of all alkali metals such as caesium. Caesium reacts violently with water, creating hydrogen gas which is a highly explosive gas.

Choose a format that plays to your interests and strengths! Please choose one of the following formats: large posters ([www.glogster.com](http://www.glogster.com)), comic strips ([www.comiclife.com](http://www.comiclife.com)) , or picture books.

The following items must be included in all projects, regardless of format:

* Hero/Villain name and an image for each (6 in total)
* Element that each character represents and basic information (chemical symbol, atomic number, etc.)
* At least one metal, and one non-metal
* At least two strengths and two weaknesses that are related to the elements’ *chemical and physical properties*
* At least one way that each hero/villain interacts with other heroes/villains
* A works cited/bibliography

You will be assessed on the following:

* scientific accuracy:
	+ all facts are accurate, and appropriate resources were used in research
* creativity/originality/novelty:
	+ projects should be presented in a way that is original, engaging, and shows creativity and individuality in the characterization
* presentation:
	+ final product should be well-executed and show good effort

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| --- | --- | --- |
| **Assignment** | **Due Date** | **Marks** |
| Draft Element Profiles | October 24, 2012 | /10 |
| Rough Draft and Checklist | October 26, 2012 | /5 |
| Works cited/Bibliography | November 1, 2012 | /3 |
| Self-Evaluation and Final Element Profiles | November 1, 2012 | /2 |
| Final Submission and Teacher assessment by Rubric | **November 5, 2012** | /30 |
| Gallery Walk Participation and Peer assessment participation | November 14, 2012 | /5 |

**Total Marks: \_\_\_\_\_\_/55**

**Grading Rubric:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **1: Needs Work            /10** | **2: Still Learning             /15** | **3: Good          /25** | **4: Best/Excellent   /30** |
| **Scientific Knowledge** | Student does not have grasp of information; student cannot relate concepts of the periodic table to actual applications and representations. | Student demonstrates limited understanding of the periodic table and the connections between elements and their properties. | Student displays good understanding of the periodic table and the connections between elements and their properties but fails to elaborate. | Student understands the periodic table fully; demonstrates full knowledge of the physical and chemical properties of elements with explanation and elaboration |
| **Accuracy** | Characteristics are poorly defined and linked with accurate descriptions and explanations of chemical and physical properties; poor reasoning. Many errors are present. (>5) | Characteristics are moderately linked and defined with moderate descriptions and explanations of chemical and physical properties; moderate reasoning. Some errors are present (<5) | Characteristics are mostly linked and defined well with mostly accurate written descriptions and explanations of chemical and physical properties; good reasoning. Few errors are present. | All characteristics are clearly linked and defined with accurate written descriptions and explanations of chemical and physical properties; excellent reasoning. No errors. |
| **Creativity/ Originality** | Characters display little creativity and originality in the relation to the elements’ properties. | Characters display a moderate degree of creativity and originality in the relation to the elements’ properties. | Characters display a good degree of creativity and originality in the relation to the elements’ properties. | All characters display a high degree of creativity and originality in the relation to the elements’ properties. |
| **Execution** | The project layout is poorly designed; hard to follow and understand. Project is missing most criteria. | The project layout is acceptable but disorganized with limited flow. Project may be missing some criteria. | The project layout is well designed and attractive; has good flow throughout. Project may be missing one or two criteria.  | The project layout is exceptionally designed and attractive; very easy to follow. Project has no missing criteria. |

**DUE DATE:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Useful resources:**

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* <http://www.chemicool.com>
* <http://www.lenntech.com/periodic/periodic-chart.htm>
* <http://www.chemicalelements.com>
* <http://www.periodicvideos.com>
* <http://www.heromachine.com> (for those who don’t wish to draw, you can create your heroes using this site)

**Elements Assemble!**

Checklist:

Does your Element Bio project have:

1. Atomic Mass

2. Atomic Number

3. Symbol

4. Full name

5.Family/Group

6. Name for each of your heroes or villains









7. At least one metal, and one non-metal



8. At least two strengths and two weaknesses that are related to the elements’ *chemical and physical properties*



9. At least one way that each hero/villain interacts with other heroes/villains

10. A works cited/bibliography





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