New Rules for Naming New Elements

The Problem
In 1996, U.C. Berkley in Berkley, California, the Joint Institute for Nuclear Research in Dubna, Russia, and GSI in Darmstadt, Germany, completed their efforts to synthesize elements 104-112. As it turned out, naming the new elements caused more controversy than anything else connected with their discovery. Traditionally, the discoverer of an element is allowed to name it. However, because there was a dispute among the researchers at Berkley, Dubna, and Darmstadt about who really discovered the various elements, competing names were submitted. After several years of dispute, the International Union of Pure and Applied Chemistry (IUPAC), the scientific body that is the keeper of the list of elements, finally settled on the names for the new elements.

Recently two new elements, 114 and 116, were added to the Periodic Table after they were discovered through a collaboration between the Joint Institute for Nuclear Research in Dubna, Russia, and the Lawrence Livermore National Laboratory in Livermore, California. Similar to the naming debacle that occurred in 1996, the naming process for these elements was arduous.

The IUPAC has very strict rules about what is an acceptable name for an element. For example, if the IUPAC rejects a name, that name cannot be proposed for any subsequent element discoveries. In addition, the IUPAC’s acceptance of global opposition to newly proposed names poses the potential to impede the official approval process.

Mission Deliverable
Your mission is to develop a set rules that should be used to name new elements that will be added to the Periodic Table. You will submit these rules to the International Union of Pure and Applied Chemistry (IUPAC).

Guiding Questions
1. Do current naming rules for new elements impede or promote collaboration between global researchers?
2. How does the Periodic Table impact my daily life?

Key Concepts Addressed
Early scientists, such as Dmitri Mendeleev and Lothar Meyer, observed that the chemical properties of the known elements repeated in a predictive manner when the elements were placed in order of increasing mass (a physical property). These patterns eventually led to the development of the modern Periodic Table. Group A elements (the representative elements) within the same Group (column) have similar chemical properties.
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Getting Started Videos

Brightstorm Educational Videos: “The Periodic Table”

How Stuff Works Videos: “100 Greatest Discoveries: The Periodic Table”

Internet Resources

Live Science: “Two New Elements Named: Livermorium and Flerovium”

National Public Radio (NPR): “How To Put A New Element On The Periodic Table”

The Week: “How New Periodic Table Elements Get Their Names”

Performance Goals:
College and Career Readiness

Cross-Disciplinary Standards

Key Cognitive Skills

A. Intellectual Curiosity
1. Engage in scholarly inquiry and dialogue.
   a. Identify what is known, not known, and what one wants to know in a problem.
   b. Cite examples or illustrations in which a clear-cut answer cannot be reached.

B. Reasoning
1. Consider arguments and conclusions of self and others.
   a. Know and apply logic to analyze patterns and descriptions and to evaluate conclusions.
   b. Cite valid examples or illustrations that support the conclusions.
   c. Question whether the claims and conclusions of self and others are supported by evidence.
   d. Identify counter examples to disprove a conclusion.

C. Problem Solving
1. Analyze a situation to identify a problem to be solved.
   a. Apply previously learned knowledge to new situations.
# New Rules for Naming New Elements

## Student Checklist

<table>
<thead>
<tr>
<th>Task</th>
<th>Resources</th>
<th>Due Date</th>
<th>Status</th>
</tr>
</thead>
</table>
| 1. Build your background knowledge of the problem by viewing the “Getting Started Video” and “Internet Resources” on page 2. | 1. PC or Mac Computer  
2. Internet | | □ Complete  
□ Not Complete |
| 2. Conduct Internet research to learn about the following topics:  
a. Purpose of the IUPAC  
b. How new elements are discovered and added to the Periodic Table  
c. Current rules that are used to name new elements  
d. Process that is followed to dispute the name of a new element  
e. Process that is followed to promote the name of the new element | 1. PC or Mac Computer  
2. Internet | | □ Complete  
□ Not Complete |
| 3. Produce the first draft of your “Element Naming Rules.” Your rules should:  
a. Reflect your knowledge of the research that you collected in Tasks #1 and #2  
b. Appeal to and address the interests of global citizens  
c. Be clear and specific | 1. PC or Mac Computer  
2. Internet  
3. Word Processing Software Application | | □ Complete  
□ Not Complete |
| 4. Proof and edit the first draft of your “Element Naming Rules.” | 1. PC or Mac Computer  
2. First Draft of “Element Naming Rules” | | □ Complete  
□ Not Complete |
| 5. Submit the final draft of your “Element Naming Rules” to the IUPAC. | 1. Final draft of “Element Naming Rules”  
2. Mailing address for the IUPAC  
3. Postage | | □ Complete  
□ Not Complete |

**Final Due Date:**
**New Rules for Naming New Elements**  
Rubric and Grade Sheet

<table>
<thead>
<tr>
<th>Category</th>
<th>Exceeds Expectations 3 points</th>
<th>Meets Expectations 2 points</th>
<th>Below Expectations 1 point</th>
<th>SCORE</th>
<th>Teacher Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Mastery</td>
<td>Included detail on all components and SCOPE Key Concepts.</td>
<td>Included some detail on most components and SCOPE Key Concepts.</td>
<td>Included little to no detail on components and SCOPE Key Concepts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application of Content</td>
<td>Student correctly supported all SCOPE content AND goals.</td>
<td>Student correctly supported most SCOPE content AND goals.</td>
<td>Student did not support SCOPE content AND goals.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research</td>
<td>All information is accurate and is taken from at least four sources.</td>
<td>Most information is accurate and is taken from 2-3 sources.</td>
<td>Little to no information is accurate and is taken from one to no sources.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>Final product is attractive, all components are easily identified, and the student can clearly dialogue about the project.</td>
<td>Final product is somewhat attractive, most components are easily identifiable, and the student can somewhat dialogue about the project.</td>
<td>Final product is not presented well, components are difficult to identify, and the student cannot clearly dialogue about the project.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL SCORE:**