360Storylines: Pure Elements

Lab 1: Develop a Periodic Table

IP: How are elements arranged in the periodic table? Write a possible explanation of this phenomenon.	**AP:** Why are pure elements so rare in nature? Based on what you learned in this experiment, try to formulate an explanation to answer this question. What evidence did this experiment supply to aid in your understanding?
Students will probably note that there is an order to the way that elements are arranged on the periodic table. However, they are unlikely to know why the rows are specific lengths. Some students will comment that similar elements are grouped together.	Students should come to understand that there are a specific number of elements, each with its own unique properties. Since we clearly encounter more than 188 types of matter each day, the majority of matter must be made of compounds and not pure elements.
Revised Explanation: After performing the experiment, what revisions need to be made to your explanation of the ***IP***? What observations did you make that led to these revisions? Write your new explanation.	
Students should come to understand that the periodic table is a convenient way to group and arrange elements. They will notice that there are trends within the periodic table that make it possible for scientists to predict the properties of other elements.	

Lab 2: Elemental Metals, Nonmetals, and Metalloids

IP: How can bulk properties be used to classify elements? Write a possible explanation of this phenomenon.	**AP:** Why is it useful to divide elements into metals, nonmetals, and metalloids?
Students may already be familiar with the properties of metals, but probably not with their location on the periodic table. A good explanation of a metalloid and why they are important would be unusual at this point. It is a common mistake for students to assign nonmetals the opposite properties of metals.	Students should be able to explain the different applications of each material type. They should also begin to understand that metalloids provide a unique set of properties that make them suitable for use in niche applications.
Revised Explanation: After performing the experiment, what revisions need to be made to your explanation of the ***IP***? What observations did you make that led to these revisions? Write your new explanation below.	**Working Model:** Apply what you have learned in labs 1–2 to formulate an explanation of periodicity.
Students should note that while metals tend to be consistent in their properties, nonmetals can vary widely. They will observe that graphite is conductive, but sulfur is not. If the advanced activity is undertaken, then they will observe that graphite is a better conductor than silicon.	At this point, students should recognize that the periodic table is organized in such a way that the groups it contains can be easily identified. They should note that the boarders between these groups are not always clearly defined and there may even be some overlap.

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Lab 3: Periodic Trends and Properties

IP: What happens when elements react? Are some elements easier to react than others? Write a possible explanation of this phenomenon.	**AP:** In what way(s) do you think this lab experiment relates back to the anchoring phenomenon? How does the evidence collected in this experiment add to your understanding of the rarity of pure elements?
Student answers at this point will most likely be basic. They may reference bonds forming, but it is unlikely that they will be able to predict the products of a reaction. Likewise, they will probably instinctively know that different elements have different reactivities, but will not be able to make predictions.	Students should now understand that, generally speaking, when an element reacts the product is no longer an element. They should now feel comfortable with the idea of being able to make simple predictions about the properties and reactivity of certain elements.
Revised Explanation: After performing the lab experiment, what revisions need to be made to your explanation of the ***IP***? What observations did you make that led to these revisions? Write your new explanation below.	**Working Model:** Apply what you have learned in labs 1–3 to formulate an explanation of elements and their periodicity.
Students should note that the compounds formed in a reaction can have different properties. However, they should now realize that those properties can be predicted through careful examination and understanding of the periodic table. Similarly, an element's activity is a periodic trend.	Students should now understand that the concept of periodicity applies not only to elements, but also their products. Again the point can be made that an understanding of the structure of the periodic table greatly reduces the amount of information a scientist needs to memorize.

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Lab 4: Gravimetric Analysis of Periodic Trends

IP: Can you use careful measurement and an understanding of periodicity to make an accurate prediction? Write a possible explanation of this phenomenon.	**AP:** In what way(s) do you think this lab experiment relates back to the anchoring phenomenon? How does the concept of periodicity empower scientists when developing new materials?
Students should recall from the first lab that periodicity meant that undiscovered elements could have their properties predicted. What they probably don't realize is that you don't need to be a world-class scientist to make such a prediction.	Students should note that the properties of the compounds they are investigating are related to the properties of the pure elements that make them up. So while pure elements might be rare in nature, learning about them and understanding their reactions is important.
Revised Explanation: After performing the lab experiment, what revisions or additions need to be made to your explanation of the ***IP***? What observations did you make that led to these revisions? Write your new explanation below.	**Final Model:** Apply what you have learned in labs 1–4 to formulate an explanation of elements and periodicity.
Most students should feel that their original answer was very close to correct. The main new realization is that science is within the grasp of the average person. Anyone can make new discoveries, as long as they are careful and methodical in their approach.	Students should now understand the power of periodicity. They should have grasped the idea that all matter is made from elements and the properties can be predicted. These predictions are used by scientists to aid in the discovery and development of new materials.