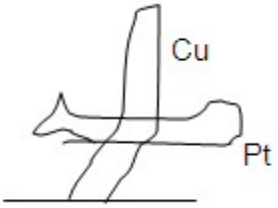
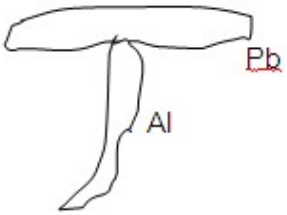
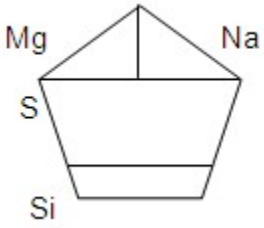
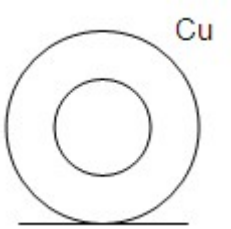
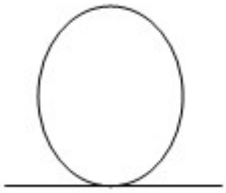
Moley Avogadro's statues project.
This CBIL, Moley Avogadro's statues project, was implemented as a part of a unit on the chemical and physical changes and properties of metals, nonmetals, and metalloids. When using this lesson in our classroom, we provided students with samples of all necessary elements except Na, Pt, and S and allowed them to choose how much of each element they wanted to use. (The students were told that these elements were not available, but they were welcome to conduct research to find out why not). They were also asked to consider environmental issues. Students were allowed to make adaptations, such as changing a structure. See "Moley Avogadro's Statues Project worksheet" for complete instructions and "Sample properties tested by the Moley Avogadro statues project" for a student work sample.

Moley Avogadro's statues project worksheet.

Objective
The city of Atlanta is hiring you to determine which statue design should go in Centennial Park. Moley Avogadro designed all five statues below. Your job is to find the best statue by studying all of the properties of the substances used in creating these statues. You must do at least one quantitative physical property test, one qualitative or quantitative chemical test, and three other tests. Record which is the best statue (in your lab notebook) and prepare a slideshow presentation using the results of the tests you conducted.

	Moley's statues	**Statue component volumes**
Statue 1		Cu: 750,000 cm^3 Pt: 750,000 cm^3
Statue 2		Pb: 750,000 cm^3 Al: 750,000 cm^3
Statue 3		S: 750,000 cm^3 Mg: 250,000 cm^3 Na: 250,000 cm^3 Si: 250,000 cm^3

Statue 4		Cu: 1,000,000 cm^3 Zn: 500,000cm^3
Statue 5		This statue consists of 100,000 post-1982 pennies in the shape of a water droplet. It represents the water issues in Atlanta.

Assignment

Research as much as you can about each substance (include the type of substance, location on periodic table, physical properties, chemical properties, and uses). Design a data table and get approval from the lab consultant before going to the lab, then test as many of these properties as you can. Consider the environment that each statue will be subjected to and environmental concerns that these substances might pose to the environment. Your final task will be to choose one of the statues. You can suggest modifications in the materials used as long as they do not change the look of the statue and you have data to support your changes.

Example of student generated properties to test.

Test	Purpose	Procedure	Type of test
Malleability	Test durability.	1. Bend element with your hands or hit with hammer. 2. Record how well it bends.	Physical and qualitative
Acid reactions	If reactive to acid rain, it will ruin statue and be harmful.	1. Place a small piece of the element in a well plate. 2. Drizzle with acid rain until covered. 3. Leave for 50 minutes. 4. Record results.	Chemical, quantitative, and qualitative
Cutting	To test durability and hardness	1. Get piece of element. 2. Use knife to decide which element can be cut. [**Safety note**: Use caution when dealing with pointed objects.] 3. Record results.	Physical and qualitative
Runoff	To find out if the water runoff will effect soil	1. Test conductivity of tap water with conductivity probe.	Chemical quantitative

	and environment	2. Check again with conductivity probe after exposure to runoff. 3. Determine if it is safe	
Density	To test if it will be sturdy enough for the statue.	1. Use a balance to measure the mass of a small piece of metal. 2. Measure volume with graduated cylinder and water displacement.	Physical and quantitative
Water	To see the reaction and the effect it will have on the element.	1. Place small piece of metal in 20 ml of tap water and observe reaction.	Chemical and qualitative