Lesson Title	Elements on the Wall
Length of Lesson	4-6 Class Periods (depending on class size)
Created By	Torri Clay
Subject	Physical Science, Chemistry
Grade Level	10-12
State Standards	Physical Science 1g, 4a, 4c, 4d, Chemistry 2c
DOK Level	1, 2, 3
DOK Application	Apply, Demonstrate, Identify, Create
National Standards	9-12 A (Inquiry); B (Physical Science)

Student Learning Goal:

National Standards

9-12A: Formulate and revise scientific explanations and models using logic and evidence

B:Structure of Atoms

- Matter is made of minute particles called atoms and atoms are composed of even smaller components. These components have measurable properties, such as mass and electrical charge. Each atom has a positively charged nucleus surrounded by negatively charged electrons. The electric force between the nucleus and electrons holds the atom together.
- The atom's nucleus is composed of protons and neutrons, which are much more massive than electrons. When an element has atoms that differ in the number of neutrons, these atoms are called different isotopes of the element.

Structure and Properties of Matter

- An element is composed of a single type of atom. When elements are listed in order according to the number of protons (called the atomic number), repeating patterns of physical and chemical properties identify families of elements with similar properties. This "Periodic Table" is a consequence of the repeating pattern of outermost electrons and their permitted energies.

State Standards

Physical Science

1. Apply inquiry-based and problem-solving processes and skills to scientific investigations.

g. Communicate effectively to present and explain scientific results, using appropriate terminology and graphics. (DOK 3)

4. Develop an understanding of the atom.

a. Cite evidence to summarize the atomic theory. (DOK 1)

- Models for atoms
- Building blocks of matter (e.g., proton, neutron, and electron) and elementary particles (e.g., positron, mesons, neutrinos, etc.)

c. Research the history of the periodic table of the elements and summarize the contributions which led to the atomic theory. (DOK 2)

- Contributions of scientists (e.g., John Dalton, J.J. Thomson, Ernest Rutherford, Newton, Einstein, Neils, Bohr, Louis de Broglie, Erwin Schrödinger, etc.)
- Technology (e.g., x-rays, cathode-ray tubes, spectroscopes)
- Experiments (e.g., gold-foil, cathode-ray, etc.)

d. Utilize the periodic table to predict and explain patterns and draw conclusions about the structure, properties, and organization of matter. (DOK 2)

- Atomic composition and valence electron configuration (e.g., atomic number, mass number of protons, neutrons, electrons, isotopes, and ions)
- Periodic trends using the periodic table (e.g., valence, reactivity, atomic radius)
- Average atomic mass from isotopic abundance
- Solids, liquids, and gases
- Periodic properties of elements (e.g., metal/nonmetal/metalloid behavior, electrical/heat conductivity, electronegativity, electron affinity, ionization energy, atomic/covalent/ionic radius) and how they relate to position in the periodic table

Chemistry

2. Demonstrate an understanding of the atomic model of matter by explaining atomic structure and chemical bonding.

c. Develop a model of atomic and nuclear structure based on theory and knowledge of fundamental particles. (DOK 2)

- Properties and interactions of the three fundamental particles of the atom
- Laws of conservation of mass, constant composition, definite proportions, and multiple proportions

Materials Needed (supplies, hand-outs, resources):

- **Reference materials (periodic table, internet access, books)**
- **Various materials for students to construct their tiles (glue, scissors, colored paper, glitter, paint, etc.)**
- **Paper (11” x 17” or chosen size)**
- **Computer (for students to complete their powerpoint)**
- **"Elliott's" Elements Grade Sheet**
- **"Elliott's" Elements Presentation Rubric**
- **"Elliott's" Elements Presentation Score Sheet**

****The rubric, score sheet, and grade sheet, along with pictures, detailed instructions and examples can be found at the following web address:**
http://www.scsc.k12.in.us/SMS/Teachers/Elliot/Elements%20WebQuest/Elements%20WebQuest.htm

Lesson Performance Task/Assessment:
Students will apply what they learned in the lesson on the the periodic table and its arrangements. Students should have an understanding of the composition of atoms and how elements are arranged in the periodic table. Students should also have an understanding of physical and chemical properties so they will be able to give this information in their presentation related to their assigned element. The quiz that goes with this lesson is directly related to the lesson and the lab and serves as a great assessment for student knowledge.

Lesson Relevance to Performance Task and Students:
This lesson gives students a hands-on experience of how to calculate atomic information such as atomic number, atomic mass, and electron number. It also enhances student knowledge on the concepts related to the periodic table and its arrangement.

Anticipatory Set/Capture Interest:
The teacher will lead the discussion by introducing a group of several household/everyday items that are used by students. The students will be asked if they think any of the elements we have talked about are found in the products. Once students are allowed to brainstorm and give their responses, I will list the elements found in the products.

Guided Practice:
After the material has been covered on the periodic table and the elements which make it up, the teacher will lead the students through the following events:

Day One
Each student will randomly be assigned an element from the periodic table. The students will use the available computers to research the element they have been assigned.

Day Two
Using the information gathered in day one, students will create a powerpoint which contains the required information

Day Three

Students will use the information gathered to construct their element tiles which will be put together to create a large periodic table on the wall. (See picture below courtesy of **http://www.scsc.k12.in.us/SMS/Teachers/Elliot/Elements%20WebQuest/Elements%20WebQuest.htm#EVALUATION)**

Day Four

Students will give an oral presentation to the class (about 3 minutes) detailing their element and the interesting facts about their element which was found during their research.

Independent Practice:

Students will work individually on their research and tile construction. The teacher should serve as a guide to help students with powerpoint questions and formatting questions.

Remediation and/or Enrichment:

Remediation:

- Pair students with other students who understand the material
- Let students use visual materials to work on
- Give a simpler version of the activity
- IEP's will be followed

Enrichment:

- Some students may be allowed to do extra tiles, or build a model of the element they were assigned to go along with their presentation

Check(s) for Understanding:

1. Inquiry questions will be asked throughout the lesson
2. While students are working, they will be assessed on their ability to properly determine the correct number of subatomic particles, as well as choosing the correct element name and symbol
2. Students will be evaluated on their participation and contribution to the lab

Closure:

Students will discuss information they learned from the presentations of other students. They will be asked if they remember any of the products mentioned by other students that relate to specific elements.

Possible Alternate Subject Integrations:

Biology, Physics, Human Anatomy

Teacher Notes:

- **The resources available (grade sheets and rubrics) can be changed to the title of the teacher's choice. For my class, I typed a separate instruction sheet and titled it "Periodic Table of Clay's Elements".**
- **For high school students, this can be given as an at-home project to compensate for time issues**
- **Depending on time constraints and computer availability, students can complete the Powerpoint on day one if necessary.**
- **Teachers can use the information required in the presentation rubric, or they can revise the worksheet to include the information of choice**
- **If there are not enough students in the class to compile an appropriate periodic table, students may be allowed to sign up for the remaining elements if they choose to for extra credit.**
- **This lesson was first developed by Paul Elliot in Indiana, and there is a wonderful website with pictures and actual presentations of other students at www.scsc.k12.in.us/SMS/Teachers/Elliot**