**Title of Lesson:** Developing of the Periodic Table and Classifying its Elements.

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Teaching Date and Time: November 3rd, 2010 at 12:50

Length of Lesson: 50 minutes

Grade: 10th

Topic: Chemistry

**Knowledge Package:**

In the previous lesson we discussed how atoms differ. This lesson will take this previous knowledge they acquired about the individual elements; their components such as protons and electrons, and how to properly read each element in order to solve for electron configurations. The students also had electron configuration taught to them throughout the week preceding this lesson. Therefore, the students would use this knowledge in a group setting to solve for individual elements in certain groups and periods. They were then required to collaborate and come up with similarities and trends they saw in the periodic table in order to figure out the classification of it. After the students attempted this on their own, they were presented the material about the organization and classification of the periodic table, such as the s-, p-, d-, and f- blocks, the metals, nonmetals, and metalloids, and the families the groups and periods are organized in. Knowing the basis of the periodic table will be used in most following chemistry lessons the students will be presented.

**Key concepts and vocabulary to cover:**

* History of the periodic table’s development
* The modern periodic table
* Classifying the elements
* Organizing the elements by electron configuration
* Valence electrons and their period and group number
* The s-, p-, d-, and f-block elements

Vocabulary:

* Periodic table, group, period, representative element, transition element, metal, alkali metal, alkaline earth metal, transition metal, inner transition metal, nonmetal, halogen, noble gas, metalloid

**Performance Objectives:**

Students will be able to:

* Trace the development and identify key features of the periodic table.
* Explain why elements in the same group have similar properties.
* Identify the four blocks of the periodic table based on electron configuration.

**National Science Education Standards:**

**Guide to the Content Standard**

**Fundamental concepts and principles that underlie this standard include**

**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.
* The nuclear forces that hold the nucleus of an atom together, at nuclear distances, are usually stronger than the electric forces that would make it fly apart. Nuclear reactions convert a fraction of the mass of interacting particles into energy, and they can release much greater amounts of energy than atomic interactions. Fission is the splitting of a large nucleus into smaller pieces. Fusion is the joining of two nuclei at extremely high temperature and pressure, and is the process responsible for the energy of the sun and other stars.
* Radioactive isotopes are unstable and undergo spontaneous nuclear reactions, emitting particles and/or wavelike radiation. The decay of any one nucleus cannot be predicted, but a large group of identical nuclei decay at a predictable rate. This predictability can be used to estimate the age of materials that contain radioactive isotopes.

**STRUCTURE AND PROPERTIES OF MATTER**

* Atoms interact with one another by transferring or sharing electrons that are furthest from the nucleus. These outer electrons govern the chemical properties of the element.
* 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.

**Sunshine State Science Standards:**

Benchmark Number: SC.912.P.8.5

Benchmark Description: Relate properties of [atoms](javascript:) and their position in the [periodic table](javascript:;) to the arrangement of their [electrons](javascript:).

Subject Area: Science Grade Level: 912 BODY OF KNOWLEDGE: Physical Science Standard: [Matter](javascript:;) -

A. A working definition of [matter](javascript:;) is that it takes up [space](javascript:;), has [mass](javascript:;), and has measurable properties. [Matter](javascript:;) is comprised of atomic, subatomic, and elementary particles.

B. [Electrons](javascript:;) are key to defining chemical and some physical properties, reactivity, and molecular structures. Repeating (periodic) patterns of physical and chemical properties occur among elements that define groups of elements with similar properties. The [periodic table](javascript:;) displays the repeating patterns, which are related to the atom's outermost [electrons](javascript:;). [Atoms](javascript:;) bond with each other to form [compounds](javascript:;).

C. In a chemical reaction, one or more reactants are transformed into one or more new products. Many factors shape the nature of products and the [rates of reaction](javascript:;) .

D. Carbon-based [compounds](javascript:;) are building-blocks of known life forms on earth and numerous useful natural and synthetic products.

Date Adopted or Revised: 02/08 Date of Last Rating: 05/08 Cognitive Complexity: Moderate   -  [What does this mean?](http://www.floridastandards.org/glossary/dok.html" \t "_blank) Status: State Board Approved

**Equipment/Material List:**

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| **ITEM** | **QUANTITY** | **SOURCE** |
| Classification of elements worksheet (Group work) | 5 | Provided by instructor |
| Blank Periodic table and vocabulary list | 20 | Provided by instructor |
| PowerPoint | 1 | Provided by instructor |
| Whiteboard | 5 | Checked out from NRN 174 |
| 4 different colored markers, eraser, and clearer set | 5 | Checked out from NRN 174 |
| Digital recorder | 1 | Checked out from NRN 174 |

**Safety requirements:**

Tell the students to only use the white boards to share their answers, just to keep the students on task. Nothing in this lesson is dangerous for high school children.

**Pre-Test/ Post-Test:**

Pre- Students will be asked to work on their classification of elements worksheet in groups to test their prior knowledge.

Post- Students will be quizzed in groups on the powerpoint in a game/ competition type manner to get more student participation. Questions are listed in the 5-E lesson plan.

**Accessibility to English Language Learners:**

Powerpoint presentation will have vocabulary bolded for students to write down definitions on their paper provided to them. They will be encouraged to write definitions in their own words and will be pushed to do it more by the pace the powerpoint will be presented to them. Examples of short-hand definitions will be given verbally to the class so they can get the idea of how to write their own definitions. Visual aid will be put on each slide of the periodic table. The post-test quiz bowl will allow students to discuss amongst each other any questions they may have, allowing them to learn the material they are having difficulty grasping through my instruction by their peers.

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| **ENGAGEMENT Time: \_\_\_\_5 min\_\_\_\_\_** | | |
| **What the Teacher Will Do** | **Probing Questions** | **Student Responses and Potential Misconceptions** |
| **Lighten up the mood by playing a video of “Meet the Elements.”**  **http://www.youtube.com/watch?v=d0zION8xjbM&feature=related** | **Ask the students to pay attention to the logical scientific references throughout the video.** | **Specific elements**  **Make compounds**  **Stand alone as they are**  **Every living thing is made of four main elements: Carbon, hydrogen, nitrogen, and oxygen.** |
| **Ask the students questions explaining what they know about their responses.** | **What makes elements different?**  **Are there specific trends in our periodic table?** | **Amount of protons**  **yes** |

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| **EXPLORATION Time: \_\_\_\_10 min\_\_\_\_\_** | | |
| **What the Teacher Will Do** | **Probing/Eliciting Questions** | **Student Responses and Misconceptions** |
| **Pass out Classification of the Elements worksheet to students who will be put in groups. Students are to solve the problems on the worksheet together, write their findings on a whiteboard, and prepare to share their results with the class.** | **Write out the electron configuration for each set of elements.**  **Discuss with your group the similarities and trends you see within each set of elements’ electron configurations.**  **Prepare to share with the class your ideas of the similarities and trends you discovered and how these can help classify the elements using the white board provided.** | **Answers vary for each set.**  **Should see similarities in the electron configuration and the row or period that they are in.**  **Be able to point out periods, groups, and any other trends they see relating to the electron configuration.** |
| **Students will be given a blank periodic table for them refer to. Vocabulary is included on the sheet too so they can copy what they would like from the powerpoint or the book for their reference.** | **Students can look at page 157 in the book and color the periodic table in accordance to the classifications. Ie the metals, metalloids, and nonmetals.**  **Look at figure 6-10 in the book and label the blocks accordingly on your periodic table.** | **Examples :**  **Groups: series of columns in the periodic table. Periods: the rows**  **Metals: the elements that are generally shiny when smooth and clean, solid at room temperature, and good conductors of heat and electricity.**  **Alkaline earth metals: 2A group** |

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| **EXPLANATION Time: \_\_\_\_25 min\_\_\_\_\_** | | |
| **What the Teacher Will Do** | **Probing/Eliciting Questions** | **Student Responses and Misconceptions** |
| **Students will have the lesson presented to them via powerpoint.** | **Verbal questions will be asked about the topics will follow the immediate presentation on each powerpoint slide.**  **Ie. How many elements are non-metals on the periodic table?**  **What are the groups and periods?**  **Can someone come up and point out what blocks are where? (encouragement of coming up to the board and pointing out things will be used a lot in this lesson to keep students on their toes, literally)** | **8**  **Groups: vertical (opportunity to joke with students about not being a Seminole if they use hand motions.)**  **Rows: horizontal** |
| **Students can use the paper handed out to them so they can write down key vocabulary definitions or what they find pertinent following the bolded word provided so the students can have notes to refer back to.** |  |  |

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| **ELABORATION Time: \_\_\_2 min\_\_\_\_\_\_** | | |
| **What the Teacher Will Do** | **Probing/Eliciting Questions** | **Student Responses and Misconceptions** |
| **Put up a picture of the periodic table and allow students to explain everything they just learned about it.** | **Time for you guys to tell me everything you know about the periodic table.** | **Students should explain about the classification features that were gone over during the lesson.** |

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| **EVALUATION Time: \_\_\_\_10 min\_\_\_\_\_** | | |
| **What the Teacher Will Do** | **Probing/Eliciting Questions** | **Student Responses and Misconceptions** |
| **Students will be given a quiz on what they learned through a jeopardy like game. Students will be split into random groups and each will be given opportunities to answer the questions.** | **What type of metal is Potassium?**  **True or False. Groups are the horizontal rows going left to right.**  **What is the electron configuration of Sodium?**  **How many valence electrons alkaline earth metals have?**  **What is unique about nobel gases?**  **Give me three of the four characteristics that metals have?**  **How many elements are metalloids? Name them.**  **How many groups and periods are there?**  **Fill in the blank: atoms in the same group have similar chemical properties because they have the same number of \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_.**  **What colors correlate with metals, nonmetals, and metalloids.**  **Group 7 is known as \_\_\_\_\_\_\_\_\_ and what about their electron configuration allows these elements to be grouped together?**  **What block is Einsteinium located in?**  **If an elements valance electrons are in the fourth energy level, what period is it located in?**  **Give the following information for this electron configuration: [Ar] 4s23d104p6**   * + **Element name**   + **Group number**   + **Period number**   + **Family name**   + **Metal, nonmetal, or metalloid**   **Sketch the periodic table on your white board and indicate the location of:**   * + **groups**   + **periods**   + **metals**   + **nonmetals**   + **metalloids**   + **and s-,p-,d-,f- blocks** | **Alkali metals**  **False. Periods are.**  **1s12s22p63s1**  **Two**  **They have a full outer orbital with 8 valence electrons and are NONREACTIVE.**  **Shiny and smooth when clean**  **Solid at room temperature**  **Good conductors of heat and electricity**  **Malleable and ductile**  **8: boron, Silicon, Germanium, Arsenic, Antimony, Tellurium, Polonium, Astatine**  **18 groups**  **7 periods**  **Valence electrons**  **Blue**  **-Metals**  **Yellow**  **-Nonmetals**  **Pink**  **-metalloids**  **Halogens. They all fill up to p6 on the periodic table.**  **F block**  **Fourth period ie [Ar] 4s23d1o4p1**  **Element name : Krypton**  **Group number: 8A**  **Period number: 4**  **Family name: noble gases**  **Metal, nonmetal, or metalloid: nonmetal** |

There were no special needs students in the class. During the evaluation process via a game, students will be allotted communication amongst themselves and myself to demonstrate the knowledge they obtained from the lesson just taught. Questions asked on the game can be expanded on by myself so they don’t feel intimidated by the first question, which should be easier that the one proceeding. This will boost students’ confidence to participate during the quizzing portion. The game makes the evaluation also seem less intimidating in general.