

Foundations of Instruction (all 4 lessons): All of the lessons attached below were written by me and are aligned to the New York State Science Learning Standards which are being adopted in the 2021-2022 school year. These standards are based on the NGSS standards with some modifications that New York State felt were necessary to include/change. Each of the lessons have the same anchoring performance indicator, but the DCIs, CCCs, and SEPs are all different based on the content, learning tasks, and the activities that the students are conducting throughout the different lessons.

Summarize/Evaluate/Reflect: In general, over the past 10 years that I have been teaching Chemistry, understanding the organization and information available on the periodic table is essential to students making connections to elements in every other sequential unit. In my tenure of teaching, I have made lots of adaptations and modifications to this unit (as well as all others) to make it more hands on, reflective, and engaging for students to build, develop, and expand upon their own understandings of the periodic table to really understand and interpret the genius behind its modern organization. The lessons that make up this unit plan below reflect the changes and modifications I have made throughout the years by learning from others, building and developing my teaching practices, collaborating with colleagues, and learning what teaching strategies and techniques work best to help engage, stimulate, and educate the students in my class.

Lesson 1 □ This was the first year that I had the students research the groups/blocks of the periodic table themselves and then share out their learning with their classmates. I found that it worked well but the students needed more time than I had originally expected, and I should have provided more clear instructions about what they should have written as they conducted their research. The sheet that I made and is found in the glossary at the end of the unit plan is the modified sheet to allow the students to be more concise in their research. In general, they remembered the content well after finding and sharing it themselves. I do need to place more of an emphasis on having them remember the 7 diatomics throughout the unit and what being diatomic means. I found that when I got to the unit on writing chemical formulas, my students wanted to place small 2's next to any element that was by itself. Next year I have made a note to be clearer and reiterate the diatomics more throughout the periodic table unit.

Lesson 2 □ This is also the first year that I completed this activity and I thought that it was an excellent introduction to the arrangement of the periodic table. I got this activity from the STANYS conference in the beginning of November and Marisa Kroger and myself used it the way the teacher who presented it did. We didn't think it fit for our students, so we modified it slightly from the version she provided and the NGSS site version. We found that the cards were too large, and it made the students frustrated because they couldn't fit them all on the desk. It was also challenging for analysis and clean-up because the cards weren't color coded to see what iteration of the model they came from. In the glossary at the end of the unit plan you can see the modified sheets and activity cards we made based on the NGSS resources and the ones shared by Sarah English. All in all, this lesson was very helpful to students seeing that there are many ways to break down and sort information but that some are better than others, leading to the most modern version of the periodic table.

Lesson 3 □ I am noticing a theme here, but this lesson is again something new that I tried this year. I have tried many different ways to introduce the history of the periodic table and how it has evolved over time. This year, as the students generated their own timelines, I feel that they learned the most about what went into the different iterations of the table and why it was settled by atomic number. It was also great conversation to hear them connecting content from the atoms unit we had just finished to the element's identities and their table placements. The most exciting comment/connection for me was when the students linked the bright line spectra to the atoms identity and asked if we could use that as a way to arrange the table. The synthesis of content that my students were making as they worked through the unit in this manner was amazing to observed. I also think that going through the history after having them learn about the periodic table groups/blocks and different arrangements gave my students a much different perspective and respect for the underlying reasons for the table's arrangement.

Lesson 4 □ This lesson is one of my favorite lessons that I have been tweaking since I came up with it almost 6 years ago. I used to have my students use data and graph the trends for ionization energy, electronegativity, and atomic radius then answer questions about interpreting the graph because it was the lab that someone gave me. I didn't like it and I didn't find it helpful for my students to understand the trends and why they were occurring. They also didn't seem to remember what the trends were because I believe they were only mindlessly graphing and not interpreting. The conclusion questions were pretty bad too. It took a lot of tweaks and time to get to this activity, but it is hands down one of the best activities I have made in all of my units. The visualizations, manipulations, and thoughtful analysis questions engage my students in thinking, understanding, and explaining why the trends happen. They have remembered the trends so much better since doing this activity and were very active in sharing ways they thought they could have designed the models better. What they don't know is that their 4th quarter take home assignment will be to create a model of something we have learned throughout the year, and I am hoping to see some of their periodic table suggestions come in.

Lesson 1: Introduction to the Periodic Table

Name of Core Document	New York State Science Learning Standards (NYSSLs)
Content	
Performance Indicators	HS-PS1-1: Valence Electrons and Properties of Elements-Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
Disciplinary Core Idea	Repeating patterns of the periodic table reflect patterns of outer electrons.
Cross Cutting Concept	Students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena.
Science and Engineering Practice	Evaluate merits and limitations of two different models of the same proposed tool, process, mechanism or system in order to select or revise a model that best fits the evidence or design criteria.

Performance Objectives

- Students will be able to identify the different groups on the periodic table based on the patterns that emerge

- Students will be able to observe the various patterns in the periodic table through researching and collaboratively working together, then answering questions applying the patterns to the content

Prerequisite skills

- To be successful in this lesson, students will need to be able to work individually as well as collaboratively to identify the different groups on the periodic table and properties seen throughout the different groups and periods on the periodic table.
- There is no prior lesson- this is the introduction lesson

Vocabulary

- Alkali metal, alkaline earth metal, halogen, noble gas, lanthanide, actinide, transition metal, diatomic

Materials: Research sheet for the different groups on the periodic table. See attached glossary at the end of the unit plan.

Adaptations:

- For students who need additional support/time to process, placing them into an easier group/block of the periodic table for research or giving them only one section to research instead of two
- Breaking the students into research groups that are supportive and collaborative for the beginning research is also essential to keep the students focused and on task, varying the ability levels in the jigsaw research groupings

Lesson –

Pre-assessment- we haven't learned about the periodic table yet, so any patterns they observe will be based on visual observations they make individually. Having the students complete the do now below will engage them in thinking about the periodic table, how it is arranged, and why it is arranged the way that it is. This will be the guiding focus throughout the lesson.

a. **Opening activity** – (2 minutes) Have the students look at the periodic table and ask them if they can see or observe any patterns that easily emerge. Begin having a conversation about the periodic table and importance of it to chemistry.

b. **Learning and Teaching Experiences** (30 minutes) Assign each student a section of the periodic table to research and fill out the front of their jigsaw note sheet, identifying the key information found in each group of the periodic table. Have the students work together in small groups for each specific part of the periodic table. This should take about 15 minutes depending on the availability of devices for your students and how much research guidance you have presented in the past. Once they are done with their individual research have the students break into their secondary groups and share out each of their sections of the periodic table that they researched. Set a timer and provide each student 4-5 minutes to present their content and allow the other students time to fill out their notes.

Key Questions: to be asked throughout the lesson as students do individual research and share out their jigsaw answers

- What similarities do you notice about elements in the same groups?
- Are there any recognizable patterns down the groups of the periodic table?
- Are there any recognizable patterns across the periods of the periodic table?

- Which groups of the periodic table are the most reactive? Why do you think so?
- Which groups of the periodic table are the least reactive? Why do you think so?

c. Assessment:

a) During the lesson- Walk around the room and monitor student progress on completing the individual research sections of the jigsaw activity. Make sure that they are getting the correct information in each section and using proper sites to obtain their content. As they complete the multiple-choice questions individually walk around the room and answer any clarifying questions the students have on the different types of questions and synthesizing the content to obtain the answers.

b) At the end of the lesson (15 minutes) have students independently answer the multiple-choice questions utilizing their research on the individual sections of the periodic table (10 minutes). Then go over the correct answers to the questions (5 minutes).

d. Closure (2 minutes)- Have each student select 2 groups on the periodic table and identify one way they are similar and one way they are different based on their location on the table, valence electrons, reactivity, etc. Share out if time or collect on the way out as a review.

Post-assessment- As seen in the closure, asking the students to compare 2 different groups or sections of the periodic table based on research they conducted to learn about the table and its arrangement will elicit the content knowledge that they are beginning to understand how the table is arranged why it is the way it is. Students can begin to make the connection between elements reactivity, properties (physical and chemical) and valence electrons based on where they are placed on the periodic table.

Lesson 2: Modeling Changes of the Periodic Table

Name of Core Document	New York State Science Learning Standards (NYSSLs)
Content	
Performance Indicators	HS-PS1-1: Valence Electrons and Properties of Elements-Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
Disciplinary Core Idea	Repeating patterns of the periodic table reflect patterns of outer electrons.
Cross Cutting Concept	Students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena.
Science and Engineering Practice	Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system.

Performance Objectives

- Students will be able to generate a model from various materials to visualize how the periodic table has changed throughout history based on the discovery of new elements
- Students will be able to observe how the patterns of elements change and new models need to be generated based on the introduction of new knowledge and content

Prerequisite skills

a. To be successful in this lesson, students will need to be able to work collaboratively to develop a model and then refine it as new “evidence” is provided to them. This may be a challenge depending on how often you have had your students develop models in the past, but this can also be a great activity to introduce how to modify models as new information becomes available.

Vocabulary

(a) No new introduced vocabulary.

Materials: Student activity sheet and element cards. The activity was shared with me by Sarah English who modified it from an NGSS activity. I also modified it further with Marisa Kroger. The original NGSS site is <https://ngss.nsta.org/Resource.aspx?ResourceID=1103> See attached glossary at the end of the unit plan.

Adaptations:

- The only modification is to ensure that the collaborative groupings that you place the students into are constructive and provide the opportunity for meaningful conversations

Lesson –

Pre-assessment-Showing the students the phenomena for the various metals and their reactions with water and then having them explain what they are seeing and ranking the reactivities on their own is a great way to have students make connections between the various groups and trends on the periodic table. It is also great that the students are explaining the trends and patterns in their own words. Also, by having them make predictions based on observed trends, you can see if they understand how the patterns occur and they can relate back to them throughout the activity.

a. **Opening activity** (10 minutes)- Either run the phenomena for the metal reactivities or show videos to present the reactivities on the front page of the student activity sheet. Have the students write observations about each of the reactivities. Allow the students 2-3 minutes to work alone to identify the patterns of reactivity observed across the periods and down the group. Have students share out their observed patterns and come to a class consensus on the patterns of reactivity both across the periods and down the groups. Individually allow the students 1 minute to predict the reactivity of Be. Do not go over this one and do not have them share out their predictions.

b. **Learning and Teaching Experiences** (50-60 minutes)- Break the students into groups of 3-4, but no more than 4 people in a group. Provide them with the first set of cards and have them organize them and complete the questions. Do not guide the students into how to organize the cards. Be sure to remind them to not clean up their first set of cards. Have them complete the steps above for the next 2 sets of cards. Then have them complete the conclusion questions in their groups, using their knowledge of the basics of the periodic table and the model they created using all the cards.

Key Questions:

- What criteria did you use to organize your cards?
- Did you have to change the way your model was created each time you added in cards?
- If yes, what did you change to? If no, how did you arrange them?
- What are some of the patterns that you observe in your model cards? Were there any?

c. Assessment:

a) During the lesson- walk around the room and monitor student progress as they generate their models and ask general questions to keep them on task, but avoid answering questions on how to organize, and the answers to the conclusion questions as the students move through the activity. The purpose of the activity is to have the students generate the pattern independently.

b) At the end of the lesson- (3-4 minutes) Have them complete the group exit ticket that is at the end of the student activity sheet and check it before they clean up their model cards.

d. Closure- In their groupings, have the students summarize in 3 bullet points what they noticed about how the arrangement of the periodic table models they generated had to change over time as new content and information was added/provided to them.

Post-assessment- One thing to be sure to link to is the predicted reactivity of Be compared to what the reactivity of Be is on the element card as they add it into their periodic table model. Also, having the students verify if their predictions are correct based on observations can help provide evidence to support the arrangement of the elements on the table based on valence electrons and properties.

Lesson 3: Changes to the arrangement of the Periodic Table

Name of Core Document	New York State Science Learning Standards (NYSSLs)
Content	
Performance Indicators	HS-PS1-1: Valence Electrons and Properties of Elements-Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
Disciplinary Core Idea	Repeating patterns of the periodic table reflect patterns of outer electrons.
Cross Cutting Concept	Students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena.
Science and Engineering Practice	Evaluate merits and limitations of two different models of the same proposed tool, process, mechanism or system in order to select or revise a model that best fits the evidence or design criteria.

Performance Objectives

- Students will be able to construct a timeline of the history of the periodic table through watching a video, collaborating with their classmates and independently working
- Students will be able to see how patterns change and discrepancies are eliminated as new information is gained and models are re-developed
- Students will be able to make connections between the history of the periodic table and how its arrangement has changed throughout history and correlate to the 3 different models they generated yesterday

Prerequisite skills

a. To be successful in this lesson, students will need to be able to work individually as well as collaboratively to synthesize how the periodic table has changed over time and what each scientist contributed to the development of the modern periodic table. They will also need to

be able to make connections to the models they generated in the prior lesson to how the actual periodic table changed over time.

Vocabulary

- a. Mendeleev, Mosley, atomic number, atomic mass

Materials: Periodic Table timeline sheet for the different groups on the periodic table. See attached glossary at the end of the unit plan.

Adaptations:

- None

Lesson –

Pre-assessment- It is important to begin this lesson and allow the students to start with synthesizing the models created yesterday and reviewing how they needed to change and adapt them to fit newly discovered information. This is also an important overarching concept in scientific advancement because through tracking changes and advancements/developments we can help our students re-evaluate their thinking to design better solutions.

a. **Opening activity** – (2-3 minutes) have the students synthesize the models they created yesterday to come to a consensus of the importance of organizing the periodic table in a way that the patterns make sense and have a space for every element.

b. **Learning and Teaching Experiences** (20 minutes) Begin by playing the following Ted-ED video

https://www.ted.com/talks/lou_serico_the_genius_of_mendeleev_s_periodic_table?language=en

This video introduces Mendeleev's periodic table and the importance of what his table showed, provided and predicted. Then show them this video about Henry Mosley and his version of the periodic table <https://www.youtube.com/watch?v=ukZExf73JMo>. After watching both videos have the students place the 2 scientists and their dates in history onto the history of the periodic table timeline. Then ask the students to think of anything else from the videos that they think is important to add to the timeline. Make a class timeline combining together all of the information so that the students have a visual representation of how the periodic table has changed and evolved over time.

Key Questions: to be asked throughout the lesson as students are working on their individual timelines and the class timeline

- How was the first periodic table organized?
- Does it make sense to organize it that way?
- What are some of the patterns seen when the periodic table is organized based on mass?
- Do the discrepancies get eliminated as the model of the periodic table changes?
- What else does the importance of the atomic number tell us about atoms?

c. **Assessment:**

a) During the lesson- facilitate the conversation regarding the history of the periodic table timeline and help generate a class timeline. Lead the students into the timeline generation by asking questions related back to the video.

b) At the end of the lesson (10 minutes) Have the students evaluate which model of the periodic table they think is the best based on the 2 videos and the class timeline we created. Have them make connections to the activity they completed yesterday as well.

d. Closure (2 minutes)- Have each student independently suggest and then analyze 1) why the modern layout of the periodic table is beneficial 2) who it benefits and 3) other ways that this modern layout can be useful/what other information can be obtained. Share out if time or collect on the way out to review.

Post-assessment- By using the most modern version of the periodic table students should be able to see that the arrangement eliminates discrepancies and opens up the opportunities to try incorporating/substituting different elements as replacements or new engineering and design features.

Lesson 4: Modeling Periodic Trends

Name of Core Document	New York State Science Learning Standards (NYSSLs)
Content	
Performance Indicators	HS-PS1-1: Valence Electrons and Properties of Elements-Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
Disciplinary Core Idea	The sub-atomic structural model and interactions between electric charges at the atomic scale can be used to explain the structure and interactions of matter, including chemical reactions and nuclear processes. Repeating patterns of the periodic table reflect patterns of outer electrons.
Cross Cutting Concept	Students observe patterns in systems at different scales and cite patterns as empirical evidence for causality in supporting their explanations of phenomena. They recognize classifications or explanations used at one scale may not be useful or need revision using a different scale; thus, requiring improved investigations and experiments.
Science and Engineering Practice	-Develop and/or use multiple types of models to provide mechanistic accounts and/or predict phenomena and move flexibly between model types based on merits and limitations. - Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems.

Performance Objectives

- Students will be able to use models to represent the trends for ionization energy, electronegativity, and atomic radius that predict how and why elements react
- Students will be able to use models to visualize the trends and provide evidence to support and explain why the trends occur both down a group and across a period
- Students will be able to compare the benefits and drawbacks of different models as well as provide an opportunity to refine a model to make it better/easier to understand

Prerequisite skills

- a. To be successful in this lesson, students will need to be able to interpret the models and what they know about periodic table arrangement to explain why the trends occur based on the elements and their location on the periodic table
- b. The lesson before this one is notes going over the different groups of the periodic table, what different groups have in common and the basics of how the periodic table are arranged.

Vocabulary

(a) ionization energy, electronegativity, atomic radius, valence electrons, atomic mass, electron cloud shielding effect, nuclear charge, nuclear pull

Materials: 2 well plates with the periodic table written on the back, straws cut to represent ionization energy and electronegativity, chart for straw length for ionization energy and electronegativity, pipe cleaners and beads for the atomic radius model, student worksheets, periodic table. See attached glossary at the end of the unit plan.

Adaptations:

- The only modification is to ensure that the collaborative groupings that you place the students into are constructive and provide the opportunity for meaningful conversations

Lesson –

pre-assessment- There is no specific pre-assessment for this lesson, because the culmination of this lesson will incorporate the content from this and the 3 prior lessons to analyze and synthesize why the trends on the periodic table occur.

a. **Opening activity** – There is no opening activity, just have the students begin creating their models in groups of 4.

b. Learning and Teaching Experiences (50-60 minutes)

- 1) Split the groups of 4 into 2 smaller groups and give them the materials to create the ionization energy and electronegativity models.
- 2) Once they complete those models, check them and then provide them with the atomic radius worksheet.
- 3) Have the students complete the worksheet, then provide them with the material to generate the atomic radius models.
- 4) Once their 3 models are created and visible on their desks, hand them the student assessment questions and instruct them to only use the models they see and what they know about the periodic table to answer the questions.

Key Questions:

- What are the similarities you see in the ionization energy and electronegativity models?
- What are the differences you see in the ionization energy and electronegativity models?
- Why do you think this is?

c. Assessment:

a) During the lesson- As the students are developing their models ask questions to ensure that they are building them correctly and remind them to look at the valence electrons for the atomic radius models. When they ask questions about the student analysis questions, avoid

answering their questions directly but probe them into thinking about the organization of the periodic table and using that to answer their questions.

b) At the end of the lesson- (5 minutes) Generate a class summary on the board about the 3 trends, how they occur on the periodic table, and why they occur.

d. **Closure-** (5 minutes)- Have the students individually think about better models to represent the trends on the periodic table and then the share those examples out. Ask the following question- what are some benefits of using models to represent trends? What are some of the drawbacks to using models to represent trends?

Post-assessment- The question wording and structure designed throughout this activity guide the students into thinking about the underlying reasons why the periodic trends occur and have them generate the reasons on their own. By structuring it this way, the students are discovering and utilizing evidence they obtained from the prior lessons to develop their own conclusions for the trends. This helps them remember the trends better because they discovered them independently and had to build towards their understanding of them. Additionally, the closure of having the student groups refine the models that I provided to them lead them into incorporating the SEPs from the NYSSLS (NGSS adapted for NYS) and having them think about better ways to create models and engineering design.

Lesson Glossary- Materials are provided for each lesson, in order. Anything (worksheets, activities, videos, etc.) not generated by me is cited above in APA format.

Lesson 1: Questions were obtained from the NYS Regents Chemistry Exam Bank, ExamGen

Properties of Groups on the Periodic Table Research Activity

<p style="text-align: center;">Alkali Metals: Group 1</p> <p># Valence Electrons: Physical Properties:</p> <p>Chemical Properties:</p>	<p style="text-align: center;">Alkaline Earth Metals: Group 2</p> <p># Valence Electrons: Physical Properties:</p> <p>Chemical Properties:</p>
<p style="text-align: center;">Halogens: Group 17</p> <p># Valence Electrons: Physical Properties:</p> <p>Chemical Properties:</p> <p>Element that is a liquid:</p>	<p style="text-align: center;">Noble Gases: Group 18</p> <p># Valence Electrons: Physical Properties:</p> <p>Chemical Properties:</p>
<p style="text-align: center;">Lanthanides & Actinides: F-block</p> <p>Physical Properties:</p> <p>Chemical Properties:</p>	<p style="text-align: center;">Transition Metals: Groups 3-12, Rows 4-7</p> <p>What happens when they are in solution?</p> <p>Physical Properties:</p> <p>Chemical Properties:</p> <p>Element that is a liquid:</p>

Define diatomic:

List the seven diatomic elements (GEN) series:

- 1) Which properties are characteristic of the Group 1 metals?
A) high reactivity and the formation of unstable compounds
B) low reactivity and the formation of stable compounds
C) high reactivity and the formation of stable compounds
D) low reactivity and the formation of unstable compounds
- 2) Which group of elements occur only as compounds in nature because they are extremely reactive?
A) 1 B) 16 C) 18 D) 11
- 3) Which of the following is the atomic number of an alkali metal?
A) 12 B) 13 C) 10 D) 11
- 4) Which of the following is the atomic number of an alkali metal?
A) 20 B) 19 C) 18 D) 31
- 5) To what group in the Periodic Table do the alkaline earth metals belong?
A) 1 B) 2 C) 11 D) 12
- 6) What group in the Periodic Table contains the elements of the alkaline earth family?
A) 1 B) 2 C) 17 D) 18
- 7) Which group contains elements with a total of two electrons in the outermost principal energy level?
A) 18 B) 14 C) 16 D) 2
- 8) Beryllium is classified as
A) an alkaline earth metal C) a transition element
B) an alkali metal D) a noble gas
- 9) Which of the following is an alkaline earth metal?
A) Li B) Mg C) Zn D) Pb
- 10) In which period of the Periodic Table are transition elements found?
A) 1 B) 2 C) 3 D) 4

- 11) An element whose atoms have the electron configuration 2-8-18-1 is
 A) a noble gas
 B) an alkali metal
 C) an alkaline earth
 D) a transition element
- 12) In what classification is an element placed if its ground state electron configuration is 2-8-13-2?
 A) transition metals
 B) nonmetals
 C) alkaline earth metals
 D) metalloids (semimetals)
- 13) Which of the following is the electron configuration of a transition element?
 A) 2-2
 B) 2-8-9-2
 C) 2-8-8-2
 D) 2-8-2
- 14) Which element forms a colored ion in solution?
 A) Li
 B) K
 C) Ni
 D) Mg
- 15) Which compound forms a colored aqueous solution?
 A) KBr
 B) CrCl_3
 C) NaOH
 D) CaCl_2
- 16) A white anhydrous powder that dissolves in water to form a blue aqueous solution could be
 A) CuSO_4
 B) BaSO_4
 C) MgSO_4
 D) CaSO_4
- 17) A chloride dissolves in water to form a colored solution. The chloride could be
 A) CaCl_2
 B) CuCl_2
 C) HCl
 D) KCl
- 18) Which aqueous salt solution has a color?
 A) $\text{BaSO}_4(\text{aq})$
 B) $\text{SrSO}_4(\text{aq})$
 C) $\text{MgSO}_4(\text{aq})$
 D) $\text{CuSO}_4(\text{aq})$
- 19) Which compound is colorless in a water solution?
 A) $\text{Fe}_2(\text{SO}_4)_3$
 B) $\text{Co}_2(\text{SO}_4)_3$
 C) $\text{Al}_2(\text{SO}_4)_3$
 D) $\text{Cr}_2(\text{SO}_4)_3$
- 20) What group of the Periodic Table is known as the halogens?
 A) 1
 B) 2
 C) 17
 D) 18
- 21) Which element is a member of the halogen family?
 A) S
 B) K
 C) B
 D) I
- 22) Which halogen is a liquid at STP?
 A) I_2
 B) Cl_2
 C) Br_2
 D) F_2
- 23) Which element exhibits a crystalline structure at STP?
 A) fluorine
 B) iodine
 C) chlorine
 D) bromine
- 24) Which group contains elements composed of diatomic molecules at STP?
 A) 7
 B) 11
 C) 17
 D) 2
- 25) Which element in Period 3 exists as diatomic molecules at STP?
 A) argon
 B) chlorine
 C) sodium
 D) aluminum
- 26) Which of the following statements describes a chemical property of the element iodine?
 A) It dissolves in alcohol.
 B) It forms a violet-colored gas.
 C) Its crystals are a metallic gray.
 D) It reacts with hydrogen to form a gas.
- 27) What group of the Periodic Table contains the noble gases?
 A) 1
 B) 2
 C) 17
 D) 18
- 28) Which represents the correct electron configuration of a Group 18 element in the ground state?
 A) 2-8
 B) 2-8-7-1
 C) 8
 D) 1-1

Lesson 2: Modified activity from the NGSS site provided below as well as hard copy provided by Sarah English in person.
 Oakland Unified School District. *10.1.3 Organization of the Periodic Table*. November 5, 2019, <https://ngss.nsta.org/Resource.aspx?ResourceID=1103>

Name _____

Date: _____

Student Analysis Sheet: The Genius of the Periodic Table

Observations of Phenomena			Patterns Emerging	
	Group 1	Group 2	Group 3	
Period 2:	Li	Be --not tested---	B	Across: Down: Predict Be Reactivity:
Period 3:	Na	Mg	Al	
Period 4:	K	Ca	not tested	

Back into Groups:

1. Obtain a set of element cards labeled A: Lavoiser
2. As a group, arrange the cards into a pattern. The only thing you can't do is separate them by solid, liquid, and gas.
 - a. How did your group organize the elements? Explain your process.

b. Did your group change your strategy at any time during the process? _____ Explain why you did or did not change your process.

DO NOT CLEAN UP!!

Obtain Card Set B: Mendeleev

1. Look through Card Set B. Integrate Card set B into your model from Card set A.
 - a. Does the new set of cards fit your model from card set A? _____
 - b. If yes, where do they go? If not, how do you need to rearrange your model.

2. Looking at your prediction for Be in the starting phenomena, were you correct in your prediction of the reactivity for Be? _____

3. Did the phenomena (video's we watched) meet the condition stated on the element cards for Li, Na, K, Mg, and Ca? _____

4. Analyze and discuss your phenomena patterns for groups and periods and determine how Be would react given the observations you recorded.

DO NOT CLEAN UP!!

Obtain Card Set C: Mosely

1. Look through Card Set C. Integrate Card set C into your model.

a. Does the new set of cards fit your model from card sets A & B? _____

b. If yes, where do they go? If not, how do you need to rearrange your model.

c. Find the element He. Explain your rationale for placement of this element on your card model?

Analysis of your Card Model:

1. Group the elements by valence number, if you have not already done so;

Valence: this word means the number of electrons in the outer shell of the atom.

2. Use your reference table to compare your valence model to the periodic table of elements.

a. Describe any patterns you see regarding how the periodic table, organizes atoms based on valence electrons.

3. Look at the reactivity written for specified elements. Reactivity of an element depends on the number of valence electrons in its outermost shell. Based on their positions on the periodic table, describe the pattern(s) you see regarding the relationship between the reactivity of the elements and the number of valence electrons found in the respective groups.

-
-
-
-
-
-
-
-
4. Again, find the element He on the real periodic table. As a group, come up with an explanation on why He has been placed in group 18 and not in group 2.

-
-
-
-
5. The term periodic is defined as appearing or occurring at intervals.

Synonyms: regular, periodical, at fixed intervals, recurrent, recurring, repeated cyclical, seasonal
Describe why the periodic table is called "periodic" and explain how the periodic table can be used to predict how an element may or may not react.

-
-
-
-
6. Using your knowledge about forces of attraction between protons and electrons discuss with your group how you think these attraction affects both the valence electrons and the reactivity of the elements found on the periodic table. Hint* Think about the structural difference between Li and K and the reactivity difference between them.

-
-
-
-
7. Using your knowledge about forces of attraction between protons and electrons, explain why Be reactivity should be less than Li *and* less than Mg based on location on the periodic table.

Group Exit Ticket:

History and discovery of the oganesson (Og) element

The element was discovered on July 19, 2000 by scientists working at the Joint Institute for Nuclear Research in Dubna, Russia together with scientists from the U.S. Department of Energy's Lawrence Livermore National Laboratory. The scientists produced oganesson by bombarding atoms of californium-249 with ions of calcium-48. This produced oganesson-294, an isotope with a half-life of about 0.89 milliseconds (0.00089 seconds), and three free neutrons. The californium target was irradiated with a total of 1.6×10^{19} calcium ions over the course of 1080 hours, resulting in the production of three atoms of oganesson.

Uses Oganesson currently has no uses outside of basic scientific research.

The Properties of the Oganesson Element

- Eight valence electrons

- Atomic Weight: 294
- Does not react with any known elements

Abundances

% in Universe N/A, % in Sun None, % in Meteorites None, % in Earth's Crust None, % in Oceans None, % in Humans None

Using a dry erase marker and the blank element template, fill in the information for oganesson and place the Og element into your PT model of Card sets A, B, and C.

_____ Teacher Initials of completed model and returned card sets.

Element Cards for Activity

<p>Set A Lavoisier 1789</p> <p>Hydrogen H Element Weight: 1</p> <p>State at Room Temperature: Gas</p> <p>Valence: 1</p> <p>Reactivity: Highly Flammable</p>	<p>Set A Lavoisier 1789</p> <p>Carbon C Element Weight: 12</p> <p>State at Room Temperature: Solid</p> <p>Valence: 4</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Nitrogen N Element Weight: 14</p> <p>State at Room Temperature: Gas</p> <p>Valence: 5</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Oxygen O Element Weight: 16</p> <p>State at Room Temperature: Gas</p> <p>Valence: 6</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Magnesium Mg Element Weight: 24</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity: Reacts with oxygen to form solids that melt at very high temperatures</p>
<p>Set A Lavoisier 1789</p> <p>Phosphorus P Element Weight: 31</p> <p>State at Room Temperature: Solid</p> <p>Valence: 5</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Sulfur S Element Weight: 32</p> <p>State at Room Temperature: Solid</p> <p>Valence: 6</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Chlorine Cl Element Weight: 35</p> <p>State at Room Temperature: Gas</p> <p>Valence: 7</p> <p>Reactivity: Reacts with metals to form salts</p>	<p>Set A Lavoisier 1789</p> <p>Chromium Cr Element Weight: 52</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Manganese Mn Element Weight: 55</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>
<p>Set A Lavoisier 1789</p> <p>Iron Fe Element Weight: 56</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Cobalt Co Element Weight: 59</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Nickel Ni Element Weight: 59</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Copper Cu Element Weight: 64</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Zinc Zn Element Weight: 65</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>
<p>Set A Lavoisier 1789</p> <p>Arsenic As Element Weight: 75</p> <p>State at Room Temperature: Solid</p> <p>Valence: 5</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Molybdenum Mo Element Weight: 96</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Silver Ag Element Weight: 108</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Tin Sn Element Weight: 122</p> <p>State at Room Temperature: Solid</p> <p>Valence: 5</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Antimony Sb Element Weight: 122</p> <p>State at Room Temperature: Solid</p> <p>Valence: 5</p> <p>Reactivity:</p>

<p>Set A Lavoisier 1789</p> <p>Tellurium Te Element Weight: 128</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Tungsten W Element Weight: 183</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Platinum Pt Element Weight: 195</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Gold Au Element Weight: 197</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Mercury Hg Element Weight: 201</p> <p>State at Room Temperature: Liquid</p> <p>Valence: 2</p> <p>Reactivity:</p>
<p>Set A Lavoisier 1789</p> <p>Lead Pb Element Weight: 207</p> <p>State at Room Temperature: Solid</p> <p>Valence: 4</p> <p>Reactivity:</p>	<p>Set A Lavoisier 1789</p> <p>Bismuth Bi Element Weight: 209</p> <p>State at Room Temperature: Solid</p> <p>Valence: 5</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Lithium Li Element Weight: 7</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity: react vigorously with water</p>	<p>Set B Mendeleev 1869</p> <p>Beryllium Be Element Weight: 9</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity: Reacts with oxygen to form solids that melt at very high temperatures</p>	<p>Set B Mendeleev 1869</p> <p>Boron B Element Weight: 11</p> <p>State at Room Temperature: Solid</p> <p>Valence: 3</p> <p>Reactivity:</p>
<p>Set B Mendeleev 1869</p> <p>Fluorine F Element Weight: 19</p> <p>State at Room Temperature: Gas</p> <p>Valence: 7</p> <p>Reactivity: Reacts with metals to form salts</p>	<p>Set B Mendeleev 1869</p> <p>Sodium Na Element Weight: 23</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity: react vigorously with water</p>	<p>Set B Mendeleev 1869</p> <p>Aluminum Al Element Weight: 27</p> <p>State at Room Temperature: Solid</p> <p>Valence: 3</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Silicon Si Element Weight: 28</p> <p>State at Room Temperature: Solid</p> <p>Valence: 4</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Potassium K Element Weight: 39</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity: react vigorously with water</p>
<p>Set B Mendeleev 1869</p> <p>Calcium Ca Element Weight: 20</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity: Reacts with oxygen to form solids that melt at very high temperatures</p>	<p>Set B Mendeleev 1869</p> <p>Titanium Ti Element Weight: 48</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Vanadium V Element Weight: 51</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Selenium Se Element Weight: 79</p> <p>State at Room Temperature: Solid</p> <p>Valence: 6</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Bromine Br Element Weight: 80</p> <p>State at Room Temperature: Liquid</p> <p>Valence: 7</p> <p>Reactivity: Reacts with metals to form salts</p>
<p>Set B Mendeleev 1869</p> <p>Rubidium Rb Element Weight: 85</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity: react vigorously with water</p>	<p>Set B Mendeleev 1869</p> <p>Strontium Sr Element Weight: 88</p> <p>State at Room Temperature: Solid Valence: 2</p> <p>Reactivity: Reacts with oxygen to form solids that melt at very high temperatures</p>	<p>Set B Mendeleev 1869</p> <p>Yttrium Y Element Weight: 89</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Zirconium Zr Element Weight:</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Niobium Nb Element Weight: 93</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity:</p>

<p>Set B Mendeleev 1869</p> <p>Ruthenium Ru Element Weight: 101</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Rhodium Rh Element Weight: 103</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Palladium Pd Element Weight: 106</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Cadmium Cd Element Weight: 112</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Indium In Element Weight: 115</p> <p>State at Room Temperature: Solid</p> <p>Valence: 3</p> <p>Reactivity:</p>
<p>Set B Mendeleev 1869</p> <p>Iodine I Element Weight: 127</p> <p>State at Room Temperature: Solid</p> <p>Valence: 7</p> <p>Reactivity: Reacts with metals to form salts</p>	<p>Set B Mendeleev 1869</p> <p>Xenon Xe Element Weight: 131</p> <p>State at Room Temperature: Gas</p> <p>Valence: 8</p> <p>Reactivity: non-reactive</p>	<p>Set B Mendeleev 1869</p> <p>Cesium Cs Element Weight: 133</p> <p>State at Room Temperature: Solid</p> <p>Valence: 1</p> <p>Reactivity: react vigorously with water</p>	<p>Set B Mendeleev 1869</p> <p>Barium Ba Element Weight: 137</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity: Reacts with oxygen to form solids that melt at very high temperatures</p>	<p>Set B Mendeleev 1869</p> <p>Tantalum Ta Element Weight: 181</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>
<p>Set B Mendeleev 1869</p> <p>Osmium Os Element Weight: 190</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Iridium Ir Element Weight: 192</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set B Mendeleev 1869</p> <p>Thallium Tl Element Weight: 204</p> <p>State at Room Temperature: Solid</p> <p>Valence: 3</p> <p>Reactivity:</p>	<p>Set C Mosley 1913</p> <p>Helium He Element Weight: 4</p> <p>State at Room Temperature: Gas</p> <p>Valence: 2</p> <p>Reactivity: non-reactive</p>	<p>Set C Mosley 1913</p> <p>Neon Ne Element Weight: 20</p> <p>State at Room Temperature: Gas</p> <p>Valence: 8</p> <p>Reactivity: non-reactive</p>
<p>Set C Mosley 1913</p> <p>Argon Ar Element Weight: 40</p> <p>State at Room Temperature: Gas</p> <p>Valence: 8</p> <p>Reactivity: non-reactive</p>	<p>Set C Mosley 1913</p> <p>Scandium Sc Element Weight: 45</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity:</p>	<p>Set C Mosley 1913</p> <p>Gallium Ga Element Weight: 70</p> <p>State at Room Temperature: Solid</p> <p>Valence: 4</p> <p>Reactivity:</p>	<p>Set C Mosley 1913</p> <p>Germanium Ge Element Weight: 73</p> <p>State at Room Temperature: Solid</p> <p>Valence: 4</p> <p>Reactivity:</p>	<p>Set C Mosley 1913</p> <p>Krypton Kr Element Weight: 84</p> <p>State at Room Temperature: Gas</p> <p>Valence: 8</p> <p>Reactivity: non-reactive</p>
<p>Set C Mosley 1913</p> <p>Radon Rn Element Weight: 222</p> <p>State at Room Temperature: Gas</p> <p>Valence: 8</p> <p>Reactivity: non-reactive</p>	<p>Set C Mosley 1913</p> <p>Radium Ra Element Weight: 226</p> <p>State at Room Temperature: Solid</p> <p>Valence: 2</p> <p>Reactivity: Reacts with oxygen to form solids</p>		<p>Exit Ticket</p> <p>Name:</p> <p>Symbol:</p> <p>Element Weight:</p> <p>State at Room Temperature:</p> <p>Valence:</p>	

	that melt at very high temperatures		Reactivity:	
--	--	--	-------------	--

Lesson 3: History of the Periodic Table Timeline

[7activestudio]. (2016, June, 1). *MODERN PERIODIC TABLE*.

<https://www.youtube.com/watch?v=ukZExf73JMo>

Serico, Lou. TED-ED. (2012, November). *The genius of Mendeleev's periodic table*.

https://www.ted.com/talks/lou_serico_the_genius_of_mendeleev_s_periodic_table?language=en

History of the Periodic Table Timeline Worksheet

Original _____ Modern
Table _____ Table

Lesson 4: Modeling periodic trends activity

Name: _____

Date: _____

Lab Activity: Modeling Periodic Trends

Introduction: In this activity, you will model the properties of the elements that show trends across a period and down a group on the periodic table.

Part 1: Building your models

Straws cut to specific lengths will be used to represent the values of Ionization Energy and Electronegativity for selected elements (see chart on last page). Straws will be placed vertically in well plates, with each well corresponding to an element. Pipe cleaners and beads will be used to model Atomic Radius. Once each model is assembled, you will have a visual representation of the trends for the properties both across a period and down a group of the periodic table.

Ionization Energy and Electronegativity Procedure:

1. Obtain supplies for each group:
 - two bags of straws, one labeled Ionization Energy and the other Electronegativity
 - two well plates with periodic table written on the back
 - Rulers and 2 sheets of yellow paper
2. In pairs in your lab groups, take out your straws and lay them in order of increasing length on the lab table. Keep each set of straws separate.
3. Using the chart on the last page, find the largest number value for your trend. Pick up the longest straw and place it into the corresponding element slot in the well plate. Make sure you are looking at the column that matches the property on your baggie!

4. Repeat step 4 for the rest of the elements in the chart, working from largest to smallest straw.

6. Once both straw models are built, move them to the side of your lab bench.

Atomic Radius Procedure:

1. Obtain Supplies for each group:
 - Reference table, baggie and element fill-in chart
2. Complete the fill in chart using your reference tables.
2. Using the fill in chart, create a model to represent each of the atoms for the first 4 elements in group 1. Make sure they are in the correct order on your lab bench
 - Make sure that you have the correct number of protons and neutrons in the nucleus. These beads stack on top of each other so they fit into the nucleus.
 - Place the correct orbitals around the nucleus.
- Next, create models to represent each of the elements as you move across period 2 using the same rules as step 3. Do not create Lithium again.

Element	Electronegativity Straw Length (cm)	Ionization Energy Straw Length (cm)
1 H	2.2	6.56
2 He	n/a	11.86
3 Li	1.0	2.6
4 Be	1.6	4.5
5 B	2.0	4.0
6 C	2.6	5.43
7 N	3.0	7.01
8 O	3.4	6.57
9 F	4.0	8.4
10 Ne	n/a	10.45
11 Na	0.9	2.48
12 Mg	1.3	3.69
13 Al	1.6	2.89
14 Si	1.9	3.93
15 P	2.2	5.06
16 S	2.6	5
17 Cl	3.2	6.25
18 Ar	n/a	7.60
19 K	0.8	2.09
20 Ca	1.0	2.95
31 Ga	1.8	2.89
32 Ge	2.0	3.81
33 As	2.2	4.72
34 Se	2.6	4.72
35 Br	3.0	5.7

36 Kr	n/a	6.75
37 Rb	0.8	2.01
38 Sr	1.0	2.74
49 In	1.8	2.79
50 Sn	2.0	3.54
51 Sb	2.1	4.15
52 Te	2.1	4.34
53 I	2.7	5.04
54 Xe	n/a	5.85

Name: _____

Model of Atomic Radius Activity

Group 1

HYDROGEN
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____



KEY	1 st Shell Yellow Pipe Cleaner
Protons: Red bead	2 nd Shell Purple Pipe Cleaner
Neutrons: Crystal bead	3 rd Shell Green Pipe Cleaner
Electrons: Blue bead	4 th Shell Brown Pipe Cleaner

LITHIUM
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

BERYLLIUM
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

BORON
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

CARBON
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

NITROGEN
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

OXYGEN
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

FLUORINE
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

NEON
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

SODIUM
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

POTASSIUM
 P = _____
 N = _____
 E = _____
 Electron configuration = _____
 shells = _____

Part 2: Model Analysis

Questions: Using your models, observe, identify and then explain the general trends you developed models for:

A. Ionization Energy

1. Make as many observations as you can about the trends you see in your model. Be sure to include observations both down the group and across the period.

2. Fill out the chart to explain the trend using the definition:

Ionization Energy: The energy required to remove an electron from the outermost energy level (valence shell) of an atom

	Summary of Trend (increases or decreases)	Explanation of trend and why it occurs
Across a period		
Down a group		

B. Electronegativity

1. Make as many observations as you can about the trends you see in your model. Be sure to include observations both down the group and across the period.

2. Fill out the chart to explain the trend using the definition:

Electronegativity: The attraction of electrons to an atom (want for electrons)

	Summary of Trend (increases or decreases)	Explanation of trend and why it occurs
--	--	---

Across a period		
Down a group		

C. Atomic Radius

1. Make as many observations as you can about the trends you see in your model. Be sure to include observations both down the group and across the period.

2. Fill out the chart to explain the trend using the definition:

Atomic Radius: The radius of the atom

	Summary of Trend (increases or decreases)	Explanation of trend and why it occurs
Across a period: You may not see a trend as you go across a period, but the atomic radius actually decreases. Explain why you think this happens. Hint: keep in mind the size and charge of subatomic particles.		

Nonmetal _____

Explanation:

Name: _____ Modeling Trends Closing Comments

1. Do you think that these models helped you understand the trends of the periodic table? Why or why not?

2. Were these models effective in helping you understand and visualize the trends and to what extent?

3. Are there any suggestions you have that you think would make this activity better in the future? Or, do you have a better way of modeling the trends?