Unit 1: Hunter Museum - Innovating Art Unit Length: 6 Weeks

STEM SCIENCE TECHNOLOGY ENGINEERING MATH	**Science Unit Plan**	
Teacher: Pritchard	Grade: 10th	Course: Chemistry
Unit Title: Hunter Museum – Innovating Art		

LEARNING TARGETS

LT 1 I can compare and contrast the major models of the atom (i.e., Bohr, and the quantum mechanical model). (TN SPI 3221.1.1)
LT 2 I can interpret the periodic table to describe an element's atomic makeup. (TN SPI 3221.1.2)
LT 3 I can describe the trends found in the periodic table with respect to atomic size, ionization energy, or electronegativity. (TN SPI 3221.1.3)
LT 4 I can determine the Lewis electron- dot structure or number of valence electrons for an atom of any main-group element from its atomic number or position in the periodic table. (TN SPI 3221.1.4)
LT 5 I can represent an electron's location in the quantum mechanical model of an atom in terms of the shape of electron clouds (s and p orbitals in particular), relative energies of orbitals, and the number of electrons possible in the s, p, d, and f orbitals. (TN SPI 3221.1.5)

UNIT OVERVIEW — **Overall summary of the unit, activities, tasks, and/or content.**

Students will research two or more art pieces from the Hunter Museum of Art in Chattanooga, TN. They will compare and contrast the historical time periods and influences on the artists and art pieces. They will select one of the researched art pieces to create an original digital or 3-D printed piece. Students will use algebraic functions to draw a draft of their original piece. Their selected work will include an assessment of the electron arrangement and shape of colors in the original or innovative piece of art. Students will also write an explanatory or narrative text detailing the process of their innovation.

MOTIVATORS — **Hooks for the unit and supplemental activities. (PBL scenarios, video clips, websites, literature)**

Week 1 – "The Element Song" https://www.youtube.com/watch?v=OduTDUGeAXE is shared with students to get them excited about the unit. It is a catchy and fun rhythm that reviews all elements, old and new.

Week 2 – Joke Day – Who can find or create their own atomic jokes? Why does this joke work? Below are two examples of possible jokes.
A neutron walks into a restaurant and orders a couple of drinks. As she is about to leave, she asks the waiter how much she owes. The waiter replies, "For you,

No Charge!!!"

Two atoms are walking down the street.
One atom says to the other, "Hey! I think I lost an electron!"
The other says, "Are you sure??"
"Yes, I'm positive!"

Week 3 – The introduction to periodic trends is abstract to most students in being able to identify periodic trends of atoms when we cannot see or measure them. The following is a light-hearted way to discuss what trends students are familiar with and build a personal connection to the concept.
Trending – HARDEST WORKING, BRIGHTEST STUDENTS IDENTIFIED AT STEM SCHOOL IN MRS. P'S CHEMISTRY CLASSROOM!! WHAT IS THEIR SECRET?
WHAT DOES STEM HAVE THAT OTHERS DO NOT?
What are the fashion trends of today? What do you think they will be next year? 10 years? What are other areas where trends are found? (Lead students to the idea that scientist and mathematicians look for trends in their profession that allows them to summarize happenings.)

Week 4 and 5
Where do you live? How do you let others know where to find you? Which room do you spend most of your time? How would I find this room?
Scientists have a unique system for identifying where electrons "live" and where they spend most of their time. This week we will learn how scientists communicate the address of every electron to others.

Week	Learning Targets	Materials & Resources	Instructional Procedures	Differentiated Instruction	Assessment
1	**LT 1** I can compare and contrast the major models of the atom (i.e., Bohr, and the quantum mechanical model). (SPI 3221.1.1)	"The Element Song" https://www.youutube.com/watch?v=OduTDUGeAXE The Photographic Card Deck of the Elements Samples of elements	Essential Questions How did scientists discover the atom and its various parts? What are the various types of models and how did our knowledge of the atom grow? Set How do you sort items? How do you keep your games on your iPad organized? What does your closet look like? Your room? What are some organization traits you recognize in my room? Discussion of categorizing items based on similarities will lead to the playing of "The Element Song". Teaching Strategies 5E Inquiry – Predominate teaching strategy. Students explore, explain, and elaborate continuously throughout unit. Each subtopic is explored, explained	Remediation Individual/group study time. Students will work collaboratively with peer tutors. Students will resubmit low quality work per teacher feedback. Khan Academy coach account with all students	Assessments Formative Element memory evaluations Written analysis comparing Battleship game and Rutherford's Gold Foil Experiment. Atomic Theory

		Atomic Battleship App from iTunes store "How Protons, Neutrons, and Electrons were discovered" at https://www.youutube.com/watch?v=kBgIMRV895w Atomic Theory Foldable Digital Timeline App	and connected to previous topics. Flipped Classroom will require students to watch and take notes on assigned videos discussing learning targets. Students will discuss videos the next day in class. Games will be utilized and possibly student created that will deepen the understanding of students knowledge. **Atomic Theory and Periodic Table** **Day 1** **Engage** Play: "The Element Song" https://www.youtube.com/watch?v=OduTDUGeAXE **Explore** What do we know about atoms and the Periodic Table? General class discussion to verbally assess prior knowledge. Many students will remember items as they hear others sharing. Distribute samples of elements and have students record their observations. Assign Element Cards for students to create a digital "Family" album. Students will continue to make additions to family album as semester progresses. **Day 2** **Explore** "Atomic Battleship" Game Students will download App that will allow them to play Battleship with a partner. Pairs of students will seek to locate battleship and identify location without seeing the ship. Continue to work on "Family" album. **Day 3** **Flipped Activity** Before coming to class on Day 3, students watch "How Protons, Neutrons, and Electrons were discovered" at https://www.youtube.com/watch?v=kBgIMRV895w **Explore** Foldable "Atomic Theory" Activity – Students create a foldable labeling the evolution of the Atomic Theory – Dalton, Thomason, Rutherford, Bohr, Quantum Mechanical Model	registered in teacher's class. Students will remediate appropriate topic and complete the appropriate content assessment at www.sciencegeek.com. Students will screenshot the score to instructor identifying a passing score. Enrichment Students will peer tutor classmates that are struggling to master learning targets. Students will lead lab groups in designing investigations. Application opportunities to more explore more difficult/challenging topics or combinations of elements. Learning Styles Kinesthetic Auditory Secretarial Visual Technology-driven	Foldable Assessment Summative Digital Timeline

			Explain Using the foldable on atomic theory class will discuss the progression of understanding of the Atomic Theory. Summarizing Strategy **Day 4/5** **Evaluate** Create a digital timeline tracing the development of the Atomic Theory. Include important discovery dates, major contributors, and short explanation for each item. In addition to the following five required notations, timeline must include three notable events that contributed to the understanding of the atom: • Dalton • Thomason • Rutherford • Bohr • Quantum Mechanical Model You may use any time line creation tool that is available. Students desiring Advanced on LT1 will need to include three additional events that contributed to our current understanding of the atom. Examples may include current understanding of the make up of protons and neutrons, Schrödinger's contribution, Heisenberg's Uncertainty Principal, etc. Homework Watch video on proton, neutron, and electron discovery. (flipped classroom) Collect information and begin creating Digital Family Album		
2	**LT 2** I can interpret the periodic table to describe an element's atomic makeup. (SPI 3221.1.2)	Pennium Isotope Lab • Sealed opaque container • Mixture of 10 pennies in each container – some pre-1982 and some post-1982. • Balance • Empty	Essential Questions How can one use the periodic table to identify an elements atomic makeup? How many protons, neutrons, electrons make up all possible isotopes of elements? How do scientists identify matter and it atomic makeup? Set Teaching Strategies **Periodic Table** **Day 6** **Explore** Working in pairs, identify five free apps on the periodic table for iPad. Analyze the apps using an app evaluation rubric and present top two apps to class focusing on organizational methods.	Remediation Individual/group study time. Students will work collaboratively with peer tutors. Students will resubmit low quality work per teacher feedback. Khan Academy coach account with all students registered in	

		opaque containers • Numerous pennies for students to use for experimental purposes	**Day 7** **Explain** Discuss periodic table structure and proper method of using this valuable tool to analyze an element's atomic makeup. Word Wall – Identify vocabulary and place on word wall **Day 8** **Explore** Create a Blank Periodic table in iPad and label w/ families, groups, metals, non- metals, metalloids, etc. Students will have PPT "Periodic Table" uploaded for reference material and may also use information collected from app evaluation and presentation completed earlier. Design procedure for determining the isotopic composition of the imaginary element Pennium. **Day 9/10** **Practice** Read PPT on Isotopes, complete "Isotopic Notations", and check answers before proceeding to Pennium Isotope Lab. **Explore** "Pennium Isotope Lab" – students will complete lab using their designs previously created. Time will be available for revisions and 2nd attempts at solving the unknown isotopes composition. Homework Complete a lab report identifying the procedure followed and composition of the element "Pennium".	teacher's class. Students will remediate appropriate topic and complete the appropriate content assessment at www.sciencegeek.com. Students will screenshot the score to instructor identifying a passing score. Enrichment Students will peer tutor classmates that are struggling to master learning targets. Students will lead lab groups in designing investigations. Application opportunities to more explore more difficult/challenging topics or combinations of elements. Learning Styles Kinesthetic Auditory Secretarial Visual Technology-driven	
3	**LT 3** I can describe the trends found in the periodic table with respect to atomic size, ionization energy, or electronegativity.	Khan Academy coach account with all students registered in teacher's class. http://www.khanacademy.org/science/chemistry	Essential Questions How can trends in atomic size, ionization energy, and electronegativity be predicted and explained using the period table? Set Trending – HARDEST WORKING, BRIGHTEST STUDENTS IDENTIFIED AT STEM SCHOOL IN MRS. P'S CHEMISTRY CLASSROOM!! SECRETS TO BE REVEALED OCTOBER 26!! MOLE DAY WILL NEVER BE THE SAME. What are trends? Fashion trends? Music trends? Trending on social media?	Remediation Individual/group study time. Students will work collaboratively with peer tutors. Students will resubmit low quality work per	Assessment Formative 5 question exit slip or homework submission on days 11, 12, and 13 over Periodic Trends

	(SPI 3221.1.3)	/periodic-table-trends-bonding/v/atomic-radius-trend http://www.khanacademy.org/science/chemistry/periodic-table-trends-bonding/v/periodic-table-trends-ionization-energy https://www.khanacademy.org/science/chemistry/periodic-table-trends-bonding/v/electronegativity-trends Apps identified and uploaded to iPad from week one.	Career trends? What would be the advantages to identifying these trends? What clues could one use to predict trends? The discussion above takes place the day before the introduction of Periodic Trends. Teaching Strategies **Periodic Trends** **Day 11** **Flipped Activity** **Atomic Size** Students will watch Atomic Radius Trends on Khan Academy before coming to class. http://www.khanacademy.org/science/chemistry/periodic-table-trends-bonding/v/atomic-radius-trend **Engage** Students share three points from video with table partner. Partners choose two points to share with the class. List of items addressing concept are compiled and revisited after the exploration activity. **Explore** Students use one of the apps identified in week one to identify the atomic size of Li, Be, B, C, N, O, F, Na, Mg, Al, Si, P, S, Cl, K, Ca, Ga, Ge, As, Se, Br, Rb, Sr, In Sn, Sb, Te, I, Cs, Ba, Tl, Pb, Bi and Po. This information is then used to plot and draw graphs of the periodic trends in atomic radius. Students use the graphs and any prior information obtained to explain the periodic trends across the periods, down the groups and to predict the periodic trends of other elements in subsequent periods. **Evaluate** Five question evaluation on atomic size – comparison of elements radius based on position in periodic table **Day 12** **Flipped Activity** **Ionization Energy** Students will watch Periodic Trends Ionization Energy on Khan Academy before coming to class. http://www.khanacademy.org/science/chemistry/periodic-table-trends-bonding/v/periodic-table-trends-ionization-energy **Engage** Students share three points from video with table partner. Partners choose two points to share with the class. List of items addressing	teacher feedback. Khan Academy coach account with all students registered in teacher's class. Students will remediate appropriate topic and complete the appropriate content assessment at www.sciencegeek.com. Students will screenshot the score to instructor identifying a passing score. Enrichment Students will peer tutor classmates that are struggling to master learning targets. Students will lead lab groups in designing investigations. Application opportunities to more explore more difficult/challenging topics or combinations of elements. Learning Styles Kinesthetic Auditory Secretarial Visual Technology-driven	Assessment Summative LT 2 and LT 3 summative assessment

			concept are compiled and revisited after the exploration activity. **Explore** Students use one of the apps identified in week one to identify the ionization energy of Li, Be, B, C, N, O, F, Na, Mg, Al, Si, P, S, Cl, K, Ca, Ga, Ge, As, Se, Br, Rb, Sr, In Sn, Sb, Te, I, Cs, Ba, Tl, Pb, Bi and Po. This information is then used to plot and draw graphs of the periodic trends in ionization energy. Students use the graphs and any prior information obtained to explain the periodic trends across the periods, down the groups and to predict the periodic trends of other elements in subsequent periods. **Evaluate** Five question evaluation on ionization energy – comparison of ionization energy based on position in periodic table **Day 13** **Flipped Activity** **Electronegativity** Students will watch Electronegativity Trends on Khan Academy before coming to class. https://www.khanacademy.org/science/chemistry/periodic-table-trends-bonding/v/electronegativity-trends **Engage** Students share three points from video with table partner. Partners choose two points to share with the class. List of items addressing concept are compiled and revisited after the exploration activity. **Explore** Students use one of the apps identified in week one to identify the electronegativity of Li, Be, B, C, N, O, F, Na, Mg, Al, Si, P, S, Cl, K, Ca, Ga, Ge, As, Se, Br, Rb, Sr, In Sn, Sb, Te, I, Cs, Ba, TL, Pb, Bi and Po. This information is then used to plot and draw graphs of the periodic trends in electronegativity. Students use the graphs and any prior information obtained to explain the periodic trends across the periods, down the groups and to predict the periodic trends of other elements in subsequent periods. **Evaluate** Five question evaluation on electronegativity – comparison of electronegativity based on position in periodic table Summarizing Strategy **Day 14/15** **Evaluate LT 2 and LT 3**		

			Homework Students will watch the assigned video the night before class. This will serve as the lecture component on Periodic Trends. Time in class will address the comparison of elements by period and group.		
4	**LT 4** I can determine the Lewis electron- dot structure or number of valence electrons for an atom of any main-group element from its atomic number or position in the periodic table. (SPI 3221.1.4) **LT 5** I can represent an electron's location in the quantum mechanical model of an atom in terms of the shape of electron clouds (s and p orbitals in particular), relative energies of orbitals, and the number of electrons possible in the s, p, d, and f orbitals. (SPI 3.221.1.5)	Atomic Hotel http://www.umich.edu/~chemstu/content_weeks/F_06_Week3/F_06_S3a_atomic%20hotel.doc. Laboratory Exercise – Flame Test Ionic Salts (sodium chloride, potassium chloride, strontium chloride, lithium chloride, calcium chloride, copper (II) chloride, Unknown substance, Q-tips, distilled water, and Bunsen Burner	Essential Questions What information can one learn from the atomic number or position of an element in the periodic table? How many valence electrons exist for an atom and how is these used in bonding? How are electrons distributed in an atom? What region in space can an electron be found 95% of the time? How do scientists predict locations of , energies, and orientations of electrons? Set Where do you live? How do you let others know where to find you? Which room do you spend most of your time? How would I find this room? Scientists have a unique system for identifying where electrons "live" and where they spend most of their time. This week we will learn how scientists communicate this information to others. Teaching Strategies **Electron Configurations and Lewis Structures** **Day 16 /17/18** **Engage** Introduce concept of E- Configuration **Explore** Atomic Hotel Activity is a three to four day activity which addresses • Electron Configurations • Valence Electrons • Aufbau Principle • Pauli Exclusion Principle • Hund's Rule • Four Principal Quantum Numbers Daily assessments to monitor progress and understanding. **Day 19/20** **Explore** Laboratory Exercise Potentially hazardous unknown liquid waste discovered at local creek that runs through a neighborhood. Your company has been hired to determine the chemical makeup of the pollutant and identify precautionary steps that must be followed to safely remove chemicals.	Remediation Individual/group study time. Students will work collaboratively with peer tutors. Students will resubmit low quality work per teacher feedback. Khan Academy coach account with all students registered in teacher's class. Students will remediate appropriate topic and complete the appropriate content assessment at www.sciencegeek.com. Students will screenshot the score to instructor identifying a passing score. Enrichment Students will peer tutor classmates that are struggling to master learning targets. Students will lead lab groups in designing investigations. Application opportunities to more explore more	Assessment Formative Atomic Hotel Activity identifying electron configurations, valence electrons, Aufbau Principle, Pauli Exclusion Principle and Hund's Rule Laboratory Report and identification of unknown substance.

			Homework Review concepts addressed in class and study for summative assessment on LT 4 and LT 5	difficult/challenging topics or combinations of elements. Learning Styles Kinesthetic Auditory Secretarial Visual Technology-driven	
5	**LT 4** I can determine the Lewis electron- dot structure or number of valence electrons for an atom of any main-group element from its atomic number or position in the periodic table. SPI 3221.1.4) **LT 5** I can represent an electron's location in the quantum mechanical model of an atom in terms of the shape of electron clouds (s and p orbitals in particular), relative energies of orbitals, and the number of electrons possible in the s, p, d, and f orbitals. (SPI 3221.1.5)	Students will have their needed resources from PBL research done over the unit.	**Day 21** **Explain** Review LT 4 and 5 for summative assessment. Summarizing Strategy **Day 22** **Evaluate** Summative LT 4 and 5 **Day 23/24/25** **Elaborate** Students will work on finalizing PBL for Hunter Art Museum and making the connections to the content addressed in LT 1, 2, 3, 4, and 5. Homework Finalize the chemistry component for the PBL. Bring any concerns to class on Monday.	Remediation Individual/group study time. Students will work collaboratively with peer tutors. Students will resubmit low quality work per teacher feedback. Khan Academy coach account with all students registered in teacher's class. Students will remediate appropriate topic and complete the appropriate content assessment at www.sciencegeek.com. Students will screenshot the score to instructor identifying a passing score. Enrichment Students will peer tutor classmates that are struggling to master learning targets. Students will lead lab groups in	Assessment Summative LT 4 and LT 5 Assessment

				designing investigations. Application opportunities to more explore more difficult/challenging topics or combinations of elements. Learning Styles Kinesthetic Auditory Secretarial Visual Technology-driven	
6			Essential Questions How is the chemistry of atoms, electron arrangement and periodic trends applicable in the world of art? Set Practice time for presentations at Hunter Art Museum. Teaching Strategies Student Presentations Summarizing Strategy **Day 26** **Elaborate** Students will finalize model construction and written submissions. **Day 27, 28, 29 and 30** **Presentations** Students will present and discuss their models during each class session at end of the week. Homework Prepare for presentations.	Remediation Individual/group study time. Students will work collaboratively with peer tutors. Students will resubmit low quality work per teacher feedback. Khan Academy coach account with all students registered in teacher's class. Students will remediate appropriate topic and complete the appropriate content assessment at www.sciencegeek.com. Students will screenshot the score to instructor identifying a passing score. Enrichment Students will peer tutor classmates	Assessment Summative PBL Unit for Hunter Art Museum

				that are struggling to master learning targets. Students will lead lab groups in designing investigations. Application opportunities to more explore more difficult/challenging topics or combinations of elements. Learning Styles Kinesthetic Auditory Secretarial Visual Technology-driven	