Course: Science 9	Unit: Chemistry	Teachers:	Year: 2016-2017

UNDERSTAND - Big Ideas *(from Curriculum Docs)*	**Essential Questions** *(WEIRD, WHOA, WOW and WHY)*
The electron arrangement of atoms impacts their chemical nature.	• **What is God's building block for the physical world and universe He made?** • How are electrons arranged around a nucleus? • What are the different chemical natures of elements and why do they exist? • Why are some elements more reactive than others? • How can a dangerous/reactive element become safe? Or vice versa? • **Knowing that humans often try to make sense of patterns in God's natural creation, how was the periodic table developed and how can it be used?**
DO – Curricular Competencies *From Curriculum Docs*	**KNOW – Content** *(the vehicle with which they'll achieve the curricular competencies)*
Students will be able to…. • Formulate multiple hypotheses and predict multiple outcomes • Consider the changes in knowledge over time as tools and technologies have developed • Consider social, ethical, and environmental implications of the findings from their own and others' investigations • Seek and analyze patterns, trends, and connections in data, including describing relationships between variables (dependent and independent) and identifying inconsistencies • Experience and interpret the local environment • Formulate physical or mental theoretical models to describe a phenomenon • Analyze cause-and-effect relationships • Assess risks and address ethical, cultural and/or environmental issues associated with their proposed methods and those of others • Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect	• **One: All matter, humans, creation are composed of atoms which are the building blocks of matter** • Structure of an atom and how structure affects different properties • How scientists discovered the different properties of atoms/elements • How element properties are organized in the periodic table • How the arrangement of electrons determines the compounds formed by elements • How to write the formulas and names of ionic and covalent compounds

reliable data (qualitative and quantitative) • Describe specific ways to improve their investigation methods and the quality of the data • Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Communicate scientific ideas, claims, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations • Transfer and apply learning to new situations • Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled • Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions • Make observations aimed at identifying their own questions, including increasingly complex ones, about the natural world • Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data • **Community: Always contribute to care for self, others, community, and world through individual or collaborative approaches when pursuing science**	
Catholic Worldview	**Aboriginal Worldview**
• The study of science helps us understand the world around us and the beauty of creation • **Christ-Centered and Holy – We start every class with a prayer. Teacher-led for now but will be student-led later; our faith in Christ is evident and permeates all facets of the educational environment** • **Love: We will recognize the inherent dignity of every human person, and love and respect will be shown to all individuals especially when sharing knowledge and asking questions**	• Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors • Learning involves recognizing the consequences of one's actions • Learning involves patience and time.

Evidence of Classroom Differentiation

How are the students actively learning? What different materials are being used? How else will the curricular competencies be practiced? What modelling and scaffolding is necessary? What learning experiences can be provided? How the lessons will be differentiated for all learners?

- Direct instruction of content
- Use of interactive videos
- Use of video clips for abstract ideas
- Small group critiquing and selection of work
- Sharing and presentation of ideas
- Use of Bohr model diagrams
- Lab work to build on questioning skills
- Comparing and contrasting elements based on properties and atomic structure
- Tactile Bohr diagram building
- Considering and commenting on the ethics of science

Assessment

Formative	Summative
• Class discussions • Class presentations • M&M lab exercise • Atom analogy • Formative practice worksheets • Evolution of technology assignment • Comparison and contrasts	• Comparing two elements and their properties and atomic structures and an explanation as to *why* they are different • Ethical Science Code • Flame Test lab • Atom Test • Compounds and Periodic Table Test

Resources *(what will I need?)*	**Evaluation/Feedback (How did it go? What will I change?)**
• M&Ms/beads/Periodic Table activity materials • Notes • Worksheets • Flame Test lab materials	

• Tablet computer • Poster paper	

Lesson	Curricular Competency	Assessment Tasks Achievement Indicators	Learning Opportunities Instructional Strategies Planning for Assessment
1 Safety	• Assess risks and address ethical, cultural and/or environmental issues associated with their proposed methods and those of others • Contribute to care for self, others, community, and world through individual or collaborative approaches	• Formative worksheet • Class discussion	Students will: • Review the Lab Safety Contract • Complete the Safety Scavenger Hunt to identify the different safety emergency equipment in a classroom • Get parents to sign the Lab Safety Contract in order to participate in labs this year • **Inalienable: Because parents have "the right and the duty of….[educating] their children" and "…have the first responsibility for the education of their children" they will sign Lab Safety Contracts** •
2 Scientific Method Lab	• Formulate multiple hypotheses and predict multiple outcomes • Collaboratively and individually plan, select, and use appropriate investigation methods, including field work and lab experiments, to collect reliable data (qualitative and quantitative) • Seek and analyze patterns, trends, and connections in data, including describing relationships between variables (dependent and independent) and identifying inconsistencies • Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data • Make observations aimed at identifying	• Formative lab exercise • Class discussion	Students will: • Will view observation/inference ppt • Perform the M&M lab • Link to their lab performance to asking good questions • Link their lab performance to experimentation with atoms and discovery

	their own questions, including increasingly complex ones, about the natural world		
3 Atoms: The Building Blocks of Life	• Formulate physical or mental theoretical models to describe a phenomenon	• Formative class discussions • HW: Atom Analogy	Students will: • View the clip "Gigapixels of Andromeda" and the "Harvard: Life of a Cell" • In a think pair share, determine what these clips have in common (made of atoms is the basic answer, but students may come up with other answers) • Brainstorm their prior knowledge of atoms and the periodic table • Generate questions about atoms/periodic table by viewing images • View the clip "How Small is an Atom?" • Notes on atoms and subatomic particles • Label the diagram of an atom • Create an analogy for the structure of an atom (it's an added bonus if they can incorporate the charges). Be ready to present to others next class. Whatever isn't finished must be done for next class
4 Atomic Theory And New Technology	• Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled • Communicate scientific ideas, claims, information, and perhaps a suggested course of action, for a specific purpose and audience, constructing evidence-based arguments and using appropriate scientific language, conventions, and representations • Consider the changes in knowledge over time as tools and technologies have developed • Consider social, ethical, and environmental	• Summative assessment: Make a poster advertising a new technology that changed our knowledge	Students will: • Present their analogies to each other in groups of 4 • Pick the clearest one and present it to the class and justify WHY it is the clearest one • Go through scientists (notes) and look at changes over time with the different technologies • Recognize that they helped us have a better understanding of the atom and the understanding evolved over time with new technologies • Now apply it to a form of technology that is

	implications of the findings from their own and others' investigations		relevant to them, knowledge that is relevant to them • Give example of how listening to music has changed → walkman, cd player, ipod, iphone • This is how scientific knowledge progresses with new technologies • HW: come up with something that has evolved over time due to new technology • What was the result of this change? • Think about something we do: watching tv, reading, eating, getting to school, communicating, how our knowledge has changed • Be ready to present next class
5 Elements	• Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Transfer and apply learning to new situations	• Summative assignment: Comparison of two elements and their properties and atomic structures and an explanation as to *why* they are different	Students will: • Take notes on Elements (include property definitions) • Complete the Element scavenger hunt in classroom (smartphone use allowed) • Compare and contrast two different elements and their properties (in a scientific method format) • Compare and contrast the atomic structures of those same elements → What are the differences? Electron arrangement and atom size • Determine what we can conclude? • HW: choose two different elements (from the ones shown in class) and compare the properties AND atomic structure. Derive a conclusion as to why they are different
6 Messing with Nature: Natural Elements vs. Synthetic	• Consider social, ethical, and environmental implications of the findings from their own and others' investigations • Assess risks and address ethical, cultural and/or environmental issues associated with their proposed methods and those of	Summative assignment: Oppenheimer Journal	Students will: • **Tradition: Follow the Catholic Tradition and be guided through selected content and resources in pursuit of truth through faith and reason when faced with questions in**

Ones The Atomic Bomb	others		**the ethics of science** • Learn about the atom bomb • Learn about the social/ethical implications of what happens when you try to manipulate nature ie. splitting an atom • Complete a worksheet on the atom bomb assessing the risks • HW: Write a code of conduct as a scientist; really think about the PURPOSE of and motivation behind knowledge, exploration, and discovery. What is their personal motivation?
7 Periodic Table Activity	• Seek and analyze patterns, trends, and connections in data, including describing relationships between variables (dependent and independent) and identifying inconsistencies • Experience and interpret the local environment	Formative assessment: Group work activity	Students will : • Use the classification activity (Which may actually take two classes)
8 Periodic Table Explained Metal and Non-Metals	• Use knowledge of scientific concepts to draw conclusions that are consistent with evidence	Formative class discussion	Students will: • Understand that the periodic table is like an ingredients list for ALL things – EVERYTHING • Learn about how element properties are organized into a periodic table (metals/non-metals, families etc) • Look at samples of metals and non-metals and classify them as such • Students will watch the clip below and take their own notes on metals and non-metals: http://www.bbc.co.uk/bitesize/ks3/science/chemical_material_behaviour/atoms_elements/activity/
9 Periodic Table	• Seek and analyze patterns, trends, and connections in data, including describing relationships between variables (dependent	Formative assignment on terms Review Worksheets	Students will • Learn about atomic number, mass, ion charge and how it links to the number of

Further explained	and independent) and identifying inconsistencies		protons, neutrons, and electrons through notes
10 Flame Test Lab	• Seek and analyze patterns, trends, and connections in data, including describing relationships between variables (dependent and independent) and identifying inconsistencies • Describe specific ways to improve their investigation methods and the quality of the data • Make observations aimed at identifying their own questions, including increasingly complex ones, about the natural world • Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions	Summative assignment: Flame Test Lab discussion questions	• Students will do the Flame Test Lab with tougher questions at the end
11 Assessment	•	Summative: Assessment based on atoms on their own	• Students will write a skills based Test focused on only atoms
12 Bohr Diagram Spotlight	• Use knowledge of scientific concepts to draw conclusions that are consistent with evidence	Formative compare and contrast	Students will: • Study the periodic table in light of electron arrangement by studying the Bohr diagram periodic table through directed instruction • Also determine the difference between atoms and ions and the behaviour of metals vs. non-metals and families based on electron configuration
13 Reactive Elements and Compounds	• Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Transfer and apply learning to new situations	Formative HW	Students will • Watch this clip on compounds: http://www.bbc.co.uk/bitesize/ks3/science/chemical_material_behaviour/compounds_mixtures/activity/ • Do a bead Bohr diagram activity that will help them understand reactivity and the

			formation of compounds • Make a metal and a non-metal and ask which is most likely to give beads away • Also study the formation of compounds and how a reactive compound suddenly becomes stable when bonded • Determine the differences between covalent and ionic • Work on ionic bonding worksheet • HW: find an example of a reactive element that was stabilized; draw the atomic structure and the ionic bonding transfer that occurred; be prepared to share it with classmates • Teacher will give an example with Sodium
14 Compound Stability and Carrying Capacity Activity	• Formulate physical or mental theoretical models to describe a phenomenon • Transfer and apply learning to new situations	Formative class activity	Students will • Get into groups of 4 and share their chosen compound from last class • They will then choose one to present to everyone and justify WHY it's chosen • We will then refocus on ion charges in periodic table and review what that means in the carrying capacity activity • They will then better understand the flip-flop-drop method
15 Naming and Formula writing for basic compounds	• Transfer and apply learning to new situations	Formative practice worksheets	Students will: • Write chemical formulae for ionic compounds, including those involving metals with non-metals, and multivalent metals • Name ionic compounds, given the chemical formula
16 Naming and writing for polyatomic compounds	• Transfer and apply learning to new situations	Formative practice worksheets	Students will: • Write chemical formulae for ionic compounds, including those involving metals with non-metals, multivalent metals, and polyatomic ions

			• Name ionic compounds and polyatomic ions, given the chemical formula
17 Practice	• Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions	Formative group work	Students will: • practice naming and formula writing and help each other using Coach's eye app
18 Concept Review	• Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Transfer and apply learning to new situations	Formative work	Students will: • link all the big concepts using teacher provided pictures and make old school powerpoints
19 Skills Review	• Use knowledge of scientific concepts to draw conclusions that are consistent with evidence • Transfer and apply learning to new situations	Formative review work	Students will: • practice the major skills in today's class
20		Summative: Assessment based on periodic table and compounds	Students will write a skills based Test focused on the periodic table and compounds