THOMPSON RIVERS UNIVERSITY | Education & Social Work

Bachelor of Education (Elementary) & Bachelor of Education (Secondary) STEM Unit Plan Template

Unit Title: Chemistry | Number of Lessons: 9 | Time (in weeks): 1.8

Name: Danielle Belliveau | Subject(s): Science | Grade(s): 8

Rationale

The world we experience is made up of matter, down to the very last grain of sand. This Grade 8 Chemistry unit provides students with a foundational understanding of matter, atomic theory, and energy, essential for exploring the physical world. Chemical elements interact with one another and behave in various ways due to the structure and properties of their atoms. Understanding atomic theory and the structure of an atom, as well as how kinetic molecular theory affects the behaviour of atoms, is critical for students to be able to conceptualize and/or visualize chemical reactions and why there exists such diversity in the universe. Understanding particle interactions allows students to develop a curiosity and comprehension of observable the phenomena around them. Hands-on activities and experiments will help build students' practical skills in scientific inquiry, data collection, and analysis, while enhancing their critical thinking and problem-solving abilities. They will work on their scientific communication skills by presenting their understanding of concepts using accurate vocabulary and will work on their collaboration skills through peer/group work and discussions.

Overview:

Throughout this unit, students will be introduced to the basic concepts surrounding chemistry, atomic theory, and properties of matter. The information will flow from learning about the big picture (matter) to learning about what makes up matter (atoms, subatomic particles), to finally learning about the behaviour of matter to understand the chemical events we experience daily (physical and chemical properties, states of matter, and KMT). Students will be exposed to the material in several ways. They will be frontloaded the background information via slideshow notes where they will be filling in their corresponding skeleton notes as we go through the slides. Throughout the slideshows there are several linked educational YouTube videos and pauses for brain breaks. The slideshow is designed to be interactive with natural breaks for checks for understanding and to have quick-fire questions to get students to recall what they learned and to help with their desire to focus.

This unit has an Atom Poster assignment that is aimed to get students thinking about the elements that make up the things around them and to spark their curiosity and creativity when coming up with essential information and fun facts to include in their poster design. This assignment also allows students to work on their scientific communication skills through the gallery walk task which has students explaining their findings to their peers.

The density lab activity has students doing some hands-on learning and working on their lab skills → weighing, measuring, lab safety, classroom and peer respect, etc. This activity is paired with deeper thinking questions to get students to help their ability to apply their understanding.

This unit also includes a graph literacy/numeracy assignment. All subjects should work on literacy and numeracy, and understanding graphs is vitally important in essentially all fields of study and work. Students will be exposed again to reading graphs to help them build their graphing skills.

The review activities – the summative hexagonal thinking assignment and the review stations lab will help students build their critical thinking skills while solidifying the information through their creation of

posters. The final lab activity is planned as a fun and interactive way to finalize the unit. The stations are designed to have abstract thinking questions that will get students to analyze situations and their knowledge (upper-level Bloom's Taxonomy).

CORE COMPETENCIES

Communication	Thinking	Personal & Social
Communicating: Students will be working on their communication skills through group work in this unit, as well as working on their scientific communication skills via the atomic poster assignment and hexagonal thinking assignment (oral and written, respectively). Throughout the unit, students will be reminded to use correct scientific terminology (vocab list on the notes package). The final summative assignment is a communication task, and students will be instructed to explain their reasonings and connections as best they can (through words or diagrams) to demonstrate their understanding. **Collaborating:** Students will be working on their collaboration skills when doing group assignments and group discussions. The hands-on lab activities have students in groups, and they must ensure that they are working together and dividing tasks equally to achieve a common goal.	**Critical thinking:** Students will be required to recall previous knowledge (from the energy unit) and be able to apply their thinking and understanding throughout several assignments/tasks in this unit. There are several areas for reflective thinking in the slideshow notes that have open-ended questions or opportunities to connect real-life scenarios to the concepts of chemistry that they have learned. **Creative thinking:** Students will have the opportunity to work on their creativity through various aspects of this unit. They have full creative freedom for their atom posters and can do whatever they would like while including the criteria outlined on the instruction page. The review activities also leave a lot of room for creativity. In the hexagonal thinking assignment students have the freedom to connect the concepts however they think best and are encouraged to think outside the box on how ideas can relate to each other. In the lab stations review activity, students will be using their critical thinking and creativity skills to help them solve the deeper thinking and problem-solving questions.	**Positive personal and cultural identity:** Through using real-world examples, students can relate to the concepts of matter and chemical reactions that they experience in their everyday lives. This could include things such as meals and recipes traditionally used in their cultures (cooking is a chemical change, making recipes requires an understanding of solubility, densities, etc.), or even the chemistry that goes behind fireworks for events and celebrations. Additionally, through practicing hands-on activities and their use of scientific vocabulary at several points throughout this unit, students can gain confidence in their science lab skills and their ability to express their thinking clearly. **Personal awareness and responsibility:** Students will be working on their personal awareness and responsibility skills in this unit in various ways. As young students, they are still figuring out what ways of learning works best for them, and this unit has the material delivered in multiple ways (hands-on, orally, reading, filling in notes, videos, etc.), which can help students come up with learning strategies to help their own success. Students are also in charge of their work, following instructions, cleaning up after themselves, and ensuring they are keeping themselves safe

		with hands-on experiments, which ultimately helps with their responsibility and accountability skills. Social responsibility: Students will be working on their social responsibility skills through collaborative learning approaches by ensuring that they are showing respect and consideration to their peers and valuing the opinions and thoughts of others. There is a class brainstorm scheduled before the density lab to get students to think about how they can practice responsibility, safety, and respect during labs, and these are important foundational skills to build before students are working with more hazardous or dangerous lab materials in future grades.

BIG IDEAS

(multiple subject areas for integrated unit)

Subject Name: Science 8
The behaviour of matter can be explained by the kinetic molecular theory and atomic theory.

LEARNING STANDARDS

Curricular Competencies	Content
Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest	Atomic Theory and Models
Transfer and apply learning to new situations	Kinetic Molecular Theory
Co-operatively design projects	protons, neutrons, and quarks
Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate	electrons and leptons
Make predictions about the findings of their inquiry	
Observe, measure, and record data (qualitative and quantitative), using equipment, including digital technologies, with accuracy and precision	
Ensure that safety and ethical guidelines are followed in their investigations	

Use scientific understandings to identify relationships and draw conclusions	
Make observations aimed at identifying their own questions about the natural world	
Seek patterns and connections in data from their own investigations and secondary sources	
Identify a question to answer or a problem to solve through scientific inquiry	

Prerequisite Concepts and Skills:

Research skills (using google, finding credible sources) Lab skills (using scales, reading measurements, etc.) Background knowledge of some concepts that apply to energy (previous unit)

Teacher Preparation Required:

Lesson #	Teacher Preparation Required (See Unit Plan Sample)
Lesson 1	Introduction to me slideshow Introduction to chemistry and what is matter slideshow YouTube links pre-loaded Notes package prepared and printed Matter vs. Energy game slideshow Paddles with M/E for the game Extension activity instructions
Lesson 2	Atomic Theory slideshow YouTube links pre-loaded Popsicle sticks with student names for review questions A4 paper Craft supplies (glue, pencil crayons, markers, pom-poms)
Lesson 3	Poster material Chromebooks Slideshow activity
Lesson 4	Properties of matter slideshow Properties of matter YouTube links – has examples Gallery walk plan & instructions
Lesson 5	Purchase white corn syrup, plastic cups, oil, bring golf balls Lab preparation – all appropriate supplies gathered and pouring completed before hand Density lab printouts for each group Padlet for brainstorming lab behaviour expectations Textbook page numbers
Lesson 6	Video links loaded Graphing assignment printed out Brain break ideas planned out
Lesson 7	Chemistry unit slideshow - KMT Instructions posted on google classroom Chromebooks A4 paper Hexagon printout Scissors Glue
Lesson 8	Instructions posted on google classroom Chromebooks A4 paper Hexagon printout

	Scissors Glue
Lesson 9	Lab station supplies (kidney beans, iron nails, sugar, water, oil, baking soda, vinegar, Erlenmeyer flasks, cornstarch, containers, balloons, scales) Chromebooks Blooket link PhET simulator link Printed lab station booklet

Cross-Curricular Connections:

Math - Density calculations, graphing assignment
Art – Atom posters

Aboriginal Connections/ First Peoples Principles of Learning:

FPPL #2 Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).

1 - Students will learn that they and everything around them is made of matter. They will learn the interconnectedness of energy (previous unit) and matter and test their knowledge in a fun and interactive manner. We will start the unit with this holistic lens that matter is everything and dive deeper into smaller concepts surrounding matter.

3 - Throughout the atom poster assignment, students will be investigating some real-world applications of elements or interesting facts to make them more “real” to them.

4 - Students will be working together in their groups to create and explain the knowledge that they gained during their research of their elements. Peer communication and educational relationships will be nurtured during the gallery walk and students were encouraged to find information that is interesting and relevant to them or the environment they live in (making the process more fun and engaging).

5 - Students will be getting hands-on experience and be able to predict and then visualize how objects of different densities behave when they are combined.

7 - Having a hands-on review activity that focuses on the relationships and connectedness of the concepts they have learned as well as connections to other content and/or phenomena they have experienced before will help students find meaning in the content and hopefully will help them find ways they can apply their learning to other situations.

8,9 - Having a hands-on review activity that focuses on the relationships and connectedness of the concepts they have learned as well as connections to other content and/or phenomena they have experienced before will help students find meaning in the content and hopefully will help them find ways they can apply their learning to other situations.

FPPL#3: Learning involves recognizing the consequences of one‘s actions.

3 - Students are expected to contribute to their group assignments and to understand the information that is on their posters. Student groups of 4 will be split into 2 groups of 2 when they do their gallery walk, and it will be easy to identify if students did not contribute if they are not able to explain the ideas or information on their poster.

4 - If students did not contribute to their group, they will be lost when it comes time to present their newly gained knowledge of their elements during the gallery walk, and they will not be able to communicate their findings effectively if they were not involved in the creation process.

5 - Students will be brainstorming ways they can be respectful and responsible during lab activities and are expected to follow all guidelines laid out ahead of time. They are beginning to work on their responsibility and accountability skills as grade 8 students and labs are a great way to help students develop these skills.

FPPL #6: Learning is embedded in memory, history, and story.

2 - Since ancient Greece, scientists have been speculating and researching the idea that matter stems from particles that are indivisible. Understanding that learning and understanding are continuous, and that knowledge builds on top of prior discoveries is necessary in the field of science that is constantly evolving.

FPPL #7: Learning involves patience and time.

6 - These students have gone over graphing a few times before this, and most recently had a graphing question on their physics and optics unit test, with few students managing to demonstrate their understanding. Going over the basic components of a graph again should help some students solidify these concepts.

Universal Design for Learning (UDL)

Content delivered in multiple modes – slideshows, notes package, informative videos, discussions, questions, labs, worksheets, review activities.
Voice and choice in several of the activities planned and open-ended criteria.
Lots of repetition and daily reviews of the content we have learned up to that point to solidify understanding.
Participation encouraged.
Group work to promote peer-learning and collaboration between students (lowers nerves as opposed to working on things alone).
Low floor, high ceiling guidelines for assignments clearly stated on the instructions

Differentiated Instruction (DI):

Several students in this class have IEPs. TM has stated that no specific accommodations have had to been made for these students thus far, as they primarily need assistance in other courses or in behavioural aspects. The content is accessible to everyone. Students are aware that I am available for one-to-one support whenever they need it, including during breaks, lunches, and after school. Extra check-ins are done with these students during the class to make sure they are on track and understanding and are given help working on their assignments whenever needed. All materials will be posted on google classroom for students to refer to.

Overview of Lessons:

Lesson 1

Name &Time (Minutes Allotted):	Introduction to Chemistry/Matter (79 min)
Learning Standards: Curricular Competencies	Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest Transfer and apply learning to new situations
Learning Standards: Content	Atomic Theory (defining matter and difference from energy (previous unit))

Instructional Objectives	Students will be able to identify vocabulary words associated with matter. Students will be able to better conceptualize the differences and interconnectedness of matter (this unit) and energy (previous unit).
Assessment:	Conversational/Summative → Game Product/Summative/Informal → Extension activity
Teaching Strategies:	Engaging, discussion-based slideshow (lots of open-ended questions) Time to ensure notes are being filled in before moving on Class participation and discussion with the game
Materials:	Slideshows, Videos, Paddles
Lesson Activities:	
Introduction/Hook:	Introduction to Chemistry – cool videos to spark interest and show how fun it can be
Body:	What is matter? Filling in notes package, class discussion, and going through slides together. Matter vs. Energy game Time to work on discussion questions in notes package
Closure:	Extension activity about energy and matter (interconnected) Clean up, chairs up

Lesson 2

Name &Time (Minutes Allotted):	Atomic Theory and Structure (79 min)
Learning Standards: Curricular Competencies	Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal interest Co-operatively design projects
Learning Standards: Content	Atomic theory and models
Instructional Objectives	Students will be able to understand the structure of an atom and where subatomic particles reside in an atom as well as some basic information found on a periodic table
Assessment:	Conversational/Formative → We will label a diagram of an atom together as a class Conversational/Summative → We will go over the check for understanding sections together as a class
Teaching Strategies:	Checks for understanding throughout presentation
Materials:	Slideshow Notes package Video links A4 paper Pom-poms or something to represent protons/neutrons/electrons Chromebooks (half class set)
Lesson Activities:	
Introduction/Hook:	Review video of matter for the students who missed class the previous day and to get everyone on the same page. Directed question → how many times can something be split in half until it isn't matter anymore? Is that possible?
Body:	Slideshow of Atomic Theory & How to read a periodic table. Check for understanding Atom poster assignment – students in groups of 4 will be assigned 2 elements/group and must find their atomic #/# of protons, neutrons, electrons, symbol for that element, and at least 4 interesting facts per element. Students will do a gallery walk the following day (their choice).

Closure:	Clean up/Chromebook away. Posters set aside for safe keeping.

Lesson 3

Name &Time (Minutes Allotted):	Leadership Activity/Quiz Review/Atom Poster Completion (79 min)
Learning Standards: Curricular Competencies	Co-operatively design projects Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate
Learning Standards: Content	Atomic Theory and models
Instructional Objectives	Students will be able to understand the structure of an atom and be able to find information pertaining to elements on the periodic table Students will be able to work collaboratively with their peers to complete the posters
Assessment:	Atom poster assignment (Summative/COP) (assessing multiple things → collaboration skills, planning and execution skills, communication skills)
Teaching Strategies:	Circling around room to ensure students are staying on task and to encourage participation from every student in each group.
Materials:	Chromebooks Craft Supplies
Lesson Activities:	
Introduction/Hook:	Grade 11 and 12 students' leadership activity with the Grade 8s (~30 min)
Body:	Physics unit quiz review Time to finish Atom posters with group
Closure:	Chromebooks away Instructions for the following day Clean up/pack up

Lesson 4

Name &Time (Minutes Allotted):	Atom Poster Gallery Walk/ Introduction to properties of matter
Learning Standards: Curricular Competencies	Communicate ideas, findings, and solutions to problems, using scientific language, representations, and digital technologies as appropriate
Learning Standards: Content	Atomic Theory and models Kinetic Molecular Theory
Instructional Objectives	Students will be able to work collaboratively with their peers to complete the posters Students will be able to communicate their knowledge of their elements using appropriate scientific language while presenting their posters during the gallery walk
Assessment:	Atom poster assignment (Summative/COP) (assessing multiple things → collaboration skills, planning and execution skills, communication skills)
Teaching Strategies:	Skeleton notes to fill in during slideshow Videos to solidify knowledge, pausing in between to ask questions and check for understanding
Materials:	Chromebooks Properties of matter slideshow Chemistry unit skeleton notes

	Video links
Lesson Activities:	
Introduction/Hook:	Time to work on poster (20 min)
Body:	Atom Poster Gallery Walk Intro to properties of matter slideshow and notes
Closure:	Review video of chemical vs. physical properties of matter with open-ended questions throughout Clean up/pack up/ reminder to bring calculators

Lesson 5

Name &Time (Minutes Allotted):	Density Lab (79 min)
Learning Standards: Curricular Competencies	Make predictions about the findings of their inquiry Observe, measure, and record data (qualitative and quantitative), using equipment, including digital technologies, with accuracy and precision
Learning Standards: Content	Atomic Theory and Models, Kinetic molecular theory
Instructional Objectives	Students will be able to use scales and graduated cylinders to measure mass/volumes of objects, then calculate their densities Students will be able to work collaboratively with their peers to follow instructions and complete a lab and mini lab write-up
Assessment:	Students will be evaluated on their ability to accurately measure values and use calculations to find unknowns (Summative, Product) Students will be assessed on their ability to follow directions and display teamwork when contributing to this lab (Formative, Observational)
Teaching Strategies:	Practice density questions before the lab in anticipation of confusion Clear explanation of the lab procedure and expectations ahead of time Padlet to post lab behaviour expectations while students are contributing to the discussion → gets them thinking about it
Materials:	Purchase white corn syrup, plastic cups, oil, bring golf balls Lab preparation – all appropriate supplies gathered and pouring completed before hand Density lab printouts for each group Padlet for brainstorming lab behaviour expectations
Lesson Activities:	
Introduction/Hook:	Review of density (went over it previous day) Complete practice density questions Go over instructions of lab together as a class Class brainstorm on Padlet of how we can practice responsibility and respect during a lab
Body:	Density Lab Density Lab clean-up
Closure:	Clean up/ Work on textbook inquiry page until end of class

Lesson 6

Name &Time (Minutes Allotted):	Graph Numeracy/States of Matter/Intro KMT (79 min)
Learning Standards: Curricular Competencies	Use scientific understandings to identify relationships and draw conclusions Make observations aimed at identifying their own questions about the natural world
Learning Standards: Content	Kinetic Molecular Theory
Instructional Objectives	Students will be able to understand the basics of a line graph and be able to utilize data on a graph to perform density calculations

	Students will be able to understand how states of matter relate to KMT
Assessment:	Graph literacy assignment (S, O, P) Open-ended questions (S, O, C)
Teaching Strategies:	Time to work on the graphing assignment alone/can communicate with peers, then go over as a class together to help students solidify it Brain breaks to help keep focus
Materials:	Video links loaded Graphing assignment printed out Students will have their note packages Brain break ideas planned out KMT demo (if needed)
Lesson Activities:	
Introduction/Hook:	Science Tidbit (interesting science fact with explanation)
Body:	Graph literacy worksheet Go over worksheet States of matter slideshow/intro to KMT Brain breaks in between slideshow (with KMT activity)
Closure:	Plan for the rest of the days as we wrap up the unit Clean up/pack up

Lesson 7

Name &Time (Minutes Allotted):	Chemistry wrap-up & Hexagonal thinking (79 min)
Learning Standards: Curricular Competencies	Seek patterns and connections in data from their own investigations and secondary sources Use scientific understandings to identify relationships and draw conclusions
Learning Standards: Content	Kinetic Molecular Theory atomic theory and models protons, neutrons, and quarks electrons and leptons
Instructional Objectives	Students will be able to demonstrate their understanding of the relationships, trends, and applications of the concepts they have learned this unit in a clear and effective manner
Assessment:	Hexagonal thinking poster (Summative, C, P) → If students are struggling in the design of their poster to show their understanding, can they demonstrate their understanding through conversation?
Teaching Strategies:	Instructions for the hexagonal thinking posted on the google classroom Low floor high ceiling clearly explained in the instructions Having a summative assignment where students can use their notes and the internet to further their thinking and to help them establish relationships and connections in a low pressure setting rather than have a cumulative quiz/test Brain breaks
Materials:	Chromebooks Chemistry slideshow and notes package A4 paper Hexagon printout Scissors Glue
Lesson Activities:	
Introduction/Hook:	Fun science Tidbit (why do deer shed antlers)

Body:	Finish up states of matter Slideshow kinetic molecular theory Brain breaks in between certain moments of the slideshow presentation Introduction to hexagonal thinking assignment and work time
Closure:	Wrap up/clean up, posters away for safe keeping

Lesson 8

Name &Time (Minutes Allotted):	Hexagonal Thinking Activity (79 min)
Learning Standards: Curricular Competencies	Seek patterns and connections in data from their own investigations and secondary sources Use scientific understandings to identify relationships and draw conclusions
Learning Standards: Content	Atomic Theory and Models, Kinetic Molecular Theory
Instructional Objectives	Students will be able to demonstrate their understanding of the relationships, trends, and applications of the concepts they have learned this unit in a clear and effective manner
Assessment:	Hexagonal thinking poster (Summative, C, P) → If students are struggling in the design of their poster to show their understanding, can they demonstrate their understanding through conversation?
Teaching Strategies:	Relaxing Christmas music to help keep students focused Wandering the classroom to help any students that require it
Materials:	Hexagon paper for cutting out Chromebooks Glue Scissors A4 paper Instructions posted on google classroom
Lesson Activities:	
Introduction/Hook:	KMT Demo (ball through the ring)
Body:	Hexagonal Thinking Activity work time
Closure:	Wrap up/clean up/ outline of the next day

Lesson 9

Name &Time (Minutes Allotted):	Review Lab Stations (79 min)
Learning Standards: Curricular Competencies	Transfer and apply learning to new situations Identify a question to answer or a problem to solve through scientific inquiry Use scientific understandings to identify relationships and draw conclusions
Learning Standards: Content	Atomic Theory and Models, Kinetic Molecular Theory
Instructional Objectives	Students will be able to apply their knowledge and their observations to answer the critical thinking questions at each lab station.
Assessment:	Lab station hand out & walking around during the class (S, P, C, O)
Teaching Strategies:	Fun and interactive lab stations to help with engagement. Critical thinking questions attached with each station to get students thinking while doing. Walking around to help with questions and to manage lab safety
Materials:	Lab station supplies (kidney beans, iron nails, sugar, water, oil, baking soda, vinegar, Erlenmeyer flasks, cornstarch, containers, balloons, scales) Chromebooks

	Blooket link PhET simulator link Printed lab station booklet
Lesson Activities:	
Introduction/Hook:	Attendance, explanation of each lab station
Body:	Stations Lab Review Blooket PhET simulators
Closure:	Clean up/ pack up

Resources:

Chemistry skeleton notes package Chemistry slideshow All youtube links (linked into slideshow presentation) All blooket/review activity links (posted to google classroom) Density lab printout Graph literacy assignment printout Review lab station printout Instructions to all activities created and posted on google classroom Chromebooks

Extensions to Unit:

Bunsen Burner lab if time → marshmallows, changes between physical and chemical properties Physical and Chemical properties of water → slideshow and labs (this would take a few days)

Reflections and Revisions
