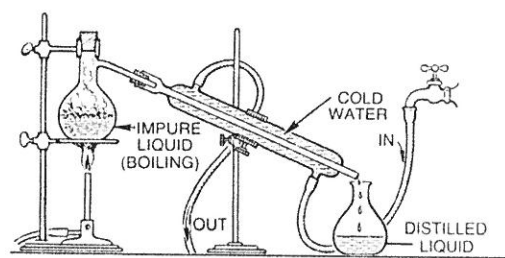


Chemistry 11

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Distillation Apparatus

What are the **Big Ideas** in Chemistry 11?

- 💡 **Atoms and molecules** are building blocks of matter.
- 💡 **Organic chemistry** and its applications have significant implications for human health, society, and the environment.
- 💡 The **mole** is a quantity used to make atoms and molecules measurable.
- 💡 Matter and energy are conserved in **chemical reactions**.
- 💡 **Solubility** within a solution is determined by the nature of the solute and the solvent.

Hello, and welcome to Chemistry 11. In the coming semester, we will be exploring these Big Ideas together, learning the habits of mind with “doing” science, and gaining the **Core Competencies** of:

- 🗨️ Have a curiosity to continually learn more about something of interest.
- 🗨️ Communicate scientific ideas and information, and a suggested course of action.
- 🗨️ Make an argument based on evidence.
- 🗨️ Contribute to care for self, others, community, and the world.



Classroom Expectation

- 👍 Regular attendance is mandatory. Please come to the class on time.
- 👍 If you are going to miss class, please talk to me ahead of time.
For sudden illness or emergency, please email me at your earlier convenience.
- 👍 Assignments are due at the beginning of the class on the due date.
Late assignments may result in penalties.
- 👍 You will be working with other students in different experiments and projects.
You might start with the same data or observation, but you will still have to do individual work in your own words.
Copying will result in no mark on the assignment.
- 👍 Respect your teacher and classmates by not using your cellphone in class.

Assessment

The process of your learning will be evaluated in various ways.

10% Classroom Participation

- Self-assessment and reflections
- Providing and receiving peer feedbacks
- Homework checks

55% Experiments and Inquiry Projects

- Experiments and laboratory reports
- Grow a crystal and laboratory journal
- Making a Soap and designing an experiment

35% Tests and Final Exam

- The midterm exam will cover contents in the first half of the course and the final exam will cover contents in the second half of the course.
- A better result in the midterm exam will also replace the overall test mark in the first half of the course. A better result in the final exam will also replace the overall test mark in the second half of the course.

Week	Unit	Big Ideas
1 – 3	1. Introduction and Nomenclature	💡 Atoms and molecules are building blocks of matter.
3 – 6	2. Mole	💡 The mole is a quantity used to make atoms and molecules measurable.
5 – 7	3. Stoichiometry	💡 Matter and energy are conserved in chemical reactions .
8 – 9	4. Atomic Theory	💡 Atoms and molecules are building blocks of matter.
10 – 11	5. Solubility	💡 Solubility within a solution is determined by the nature of the solute and the solvent.
12 – 14	6. Organic Chemistry	💡 Organic chemistry and its applications have significant implications for human health, society, and the environment.

<p><u>Big Ideas:</u></p> <ul style="list-style-type: none"> • Atoms and molecules are building blocks of matter. 	<p><u>Core Competencies:</u></p> <p>Communication</p> <ul style="list-style-type: none"> • I can communicate clearly about topics I know and understand well, using forms and strategies I have practiced. I gather the basic information I need and present it. <p>Creative Thinking</p> <ul style="list-style-type: none"> • I can use my imagination to get new ideas of my own, or build on other's ideas, or combine other people's ideas in new ways. <p>Critical Thinking</p> <ul style="list-style-type: none"> • I can assess my own efforts and experiences and identify new goals. I give, receive, and act on constructive feedback.
<p><u>Question to Support Inquiry:</u></p> <p>How would you estimate the uncertainty in a measurement?</p> <p>How does a firework show be spectacular yet safe?</p> <p>Why do chemicals have similar sounding names?</p>	<p><u>Content:</u></p> <p>Dimensional analysis:</p> <ul style="list-style-type: none"> • factor-label method (unit-analysis method) • calculation of mass and molar quantities (using significant figures) <p>Bonds:</p> <ul style="list-style-type: none"> • ionic bond • covalent bond <p>Nomenclature:</p> <ul style="list-style-type: none"> • multivalent ions • polyatomic ions • acids
<p><u>Curricular Competencies:</u></p> <p>Questioning and Predicting</p> <ul style="list-style-type: none"> • Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world <p>Processing and Analyzing Data and Information</p> <ul style="list-style-type: none"> • Analyze cause-and-effect relationships <p>Evaluating</p> <ul style="list-style-type: none"> • Exercise a healthy, informed skepticism and use scientific knowledge and findings to form their own investigations to evaluate claims in primary and secondary sources 	

<p><u>First Peoples Principles of Learning:</u></p> <ul style="list-style-type: none">• Learning involves patience and time.	<p><u>Learning Targets:</u></p> <ol style="list-style-type: none">1. Identify the safety and protective equipment available in the laboratory and describe how and when to use each piece of equipment.2. Describe common chemistry laboratory hazards and the appropriate procedure or technique for dealing with each.3. Find the location of the nearest fire alarm and appropriate fire exits.4. Derive a chemical name, given a formula, periodic table, and table of common ions5. Derive a formula (or symbol), given a chemical name, periodic table, and table of common ions.6. Use the prefix naming system for covalent compounds7. Use various mechanical means to separate components of a mixture, including filtration, evaporation and chromatography. <p><u>Assessments:</u></p> <p>Formative:</p> <ul style="list-style-type: none">• Homework checks and review• Reading values from chemical apparatus• Fire drill with additional discussion involving the laboratory <p>Summative:</p> <ul style="list-style-type: none">• Unit test• Density lab report - data, graphing, uncertainties and analysis
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<p><u>Big Ideas:</u></p> <ul style="list-style-type: none"> The mole is a quantity used to make atoms and molecules measurable. 	<p><u>Core Competencies:</u></p> <p>Communication</p> <ul style="list-style-type: none"> I contribute during group activities, cooperate with others, and listen respectfully to their ideas. I can work with others for a specific purpose. <p>Critical Thinking</p> <ul style="list-style-type: none"> I use observation and data to draw conclusions, make judgments, and ask new questions. <p>Personal Awareness and Responsibilities</p> <ul style="list-style-type: none"> I can take action toward meeting my own wants and needs and finding joy and satisfaction, and work toward a goal or solving a problem.
<p><u>Question to Support Inquiry:</u></p> <p>How does a mole compare to other units of measure?</p> <p>How many atoms are there in a cup of water?</p> <p>How do we know how many atoms there are?</p>	<p><u>Content:</u></p> <p>Mole:</p> <ul style="list-style-type: none"> molar mass STP molarity density atom and molecules
<p><u>Curricular Competencies:</u></p> <p>Planning and Conducting</p> <ul style="list-style-type: none"> Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data <p>Processing and Analyzing Data and Information</p> <ul style="list-style-type: none"> Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies <p>Evaluating</p> <ul style="list-style-type: none"> Evaluate their methods and experimental conditions, including identifying sources of error or uncertainty, confounding variables, and possible alternative explanations and conclusions 	

First Peoples Principles of Learning:

- Learning is holistic, reflexive, reflective, experimental, and relational (focused on connectedness, on reciprocal relationships, and a sense of place)
- Learning involves patience and time.

Learning Targets:

1. Identify the mole as the unit for counting atoms, molecules, or ions.
2. Convert among the numbers of particles, moles, and mass.
3. Determine the molar mass of an element or compound.
4. Calculate the moles or mass of a gas from a given volume at STP.
5. Determine the empirical formula for the compound from the percent composition by mass.
6. Prepare a solution of known molarity (standard solution).
7. Calculate the resulting concentration when a given volume of a standard solution is diluted with water.

Assessments:

Formative:

- Homework checks and review
- Teacher signature to provide oral feedback during data measurement for the experiment
- Crystal growing project daily journal feedback

Summative:

- Unit Test
- Hydrate lab report
 - data collection, calculation and analysis assessment
- Crystal growing project

<p><u>Big Ideas:</u></p> <ul style="list-style-type: none"> Matter and energy are conserved in chemical reactions. <p><u>Question to Support Inquiry:</u></p> <p>How could you measure negative and/or positive impacts of chemical reactions on human health, society, and the environment in your local community??</p> <p>How can you observe the conservation of mass and energy in chemical reactions you encounter in your everyday life?</p>	<p><u>Core Competencies:</u></p> <p>Communication</p> <ul style="list-style-type: none"> I listen and respond to others. I can consider my purpose when I am choosing a form and content. I can communicate clearly about topics I know and understand well. <p>Critical Thinking</p> <ul style="list-style-type: none"> I can use what I know and observe to identify problems and ask questions. <p>Social Awareness and Responsibilities</p> <ul style="list-style-type: none"> I can interact with others and my surroundings respectfully.
<p><u>Curricular Competencies:</u></p> <p>Planning and Conducting</p> <ul style="list-style-type: none"> Use appropriate SI units and appropriate equipment, including digital technologies, to systematically and accurately collect and record data <p>Processing and Analyzing Data and Information</p> <ul style="list-style-type: none"> Construct, analyze, and interpret graphs, models, and/or diagrams <p>Evaluating</p> <ul style="list-style-type: none"> Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled <p>Communicating</p> <ul style="list-style-type: none"> Formulate physical or mental theoretical models to describe a phenomenon 	<p><u>Content:</u></p> <p>Stoichiometric calculations:</p> <ul style="list-style-type: none"> mass number of molecules gas volumes molar quantities excess and limiting reactants <p>Chemical processes: preparation of soap</p> <p>Reactions:</p> <ul style="list-style-type: none"> predicting products, reactants and energy changes (ΔH) <p>Stoichiometric calculations in aqueous solutions:</p> <ul style="list-style-type: none"> molarity dilution effect concentration of ions in solution when two solutions are mixed

First Peoples Principles of Learning:

- Learning involves patience and time.

Learning Targets:

1. Observe and record changes that occur during a chemical reaction.
2. Gather experimental data that lead to the law of conservation of mass.
3. Balance formula equations for chemical reactions.
4. Use abbreviations (s, l, g, aq) to represent solids, liquids, gases, and aqueous solutions
5. Classify, predict products, and write balanced equations
6. Classify reactions as exothermic or endothermic based on experimental observations.
7. Relate the coefficients in a balanced equation to the relative number of molecules or moles (the mole ratio) of reactants and products in the chemical reaction.
8. Perform calculations involving a limiting reagent

Assessments:

Formative:

- Homework checks and review
 - Teacher signature to provide oral feedback during data measurement for the experiment
 - Group discussion and peer review of the soap project
- Summative:
- Titration lab report
 - data collection, calculation and analysis assessment
 - Soap making project
 - research, experimental design, data collection and analysis assessment
 - Unit test

<p><u>Big Ideas:</u></p> <ul style="list-style-type: none"> • Atoms and molecules are building blocks of matter. <p><u>Question to Support Inquiry:</u></p> <p>How does the quantum mechanical model extend our understanding of the atom?</p> <p>Why is fluorine the most electronegative element?</p> <p>How do spectral lines relate to the quantum mechanical model?</p>	<p><u>Core Competencies:</u></p> <p>Communication</p> <ul style="list-style-type: none"> • I can identify and apply roles and strategies to facilitate groupwork. I am an active listener and speaker <p>Critical Thinking</p> <ul style="list-style-type: none"> • I consider more than one way to proceed and make choices based on my reasoning and what I am trying to do. <p>Positive Personal & Cultural Identity</p> <ul style="list-style-type: none"> • I can identify my individual characteristics and explain what interests me.
<p><u>Curricular Competencies:</u></p> <p>Questioning and Predicting</p> <ul style="list-style-type: none"> • Make observations aimed at identifying their own questions, including increasingly abstract ones, about the natural world <p>Planning and conducting</p> <ul style="list-style-type: none"> • Assess risks and address ethical, cultural, and/or environmental issues associated with their proposed methods <p>Processing and Analyzing Data and Information</p> <ul style="list-style-type: none"> • Experience and interpret the local environment <p>Evaluating</p> <ul style="list-style-type: none"> • Evaluate the validity and limitations of a model or analogy in relation to the phenomenon modelled 	<p><u>Content:</u></p> <p>Electron configuration:</p> <ul style="list-style-type: none"> • molecular geometry • valence shell electron pair repulsion (VSEPR) theory <p>Chemical bonding:</p> <ul style="list-style-type: none"> • Lewis structures of compounds • polarity <p>Bonds/forces:</p> <ul style="list-style-type: none"> • covalent bond • hydrogen bond • intra- and intermolecular forces • impact on properties

First Peoples Principles of Learning:

- Learning involves patience and time.
- Learning is embedded in memory, history, and story.

Learning Targets:

1. Describe changes in the model of the atom as a result of the work of Dalton, Thomson, Rutherford, and Bohr.
2. Identify the atomic number of an element, using a table.
3. Define isotope
4. Calculate the number of neutrons, protons, and electrons for an atom or ion, given the mass number of the isotope and the charge of the ion.
5. Describe trends in properties such as melting point, ionization energy, atomic radius, chemical reactivity, ion charge, and conductivity.
6. Describe some properties of the alkali metals, alkaline earth metals, halogens, noble gases, and transition metals
7. Predict the formulae of compounds given the formula of another compound containing elements in the same families.

Assessments:**Formative:**

- Homework checks and review
- Inquiry video on spectral lines
- Making mini fireworks

Summative:

- Atomic model / story project

<p><u>Big Ideas:</u></p> <ul style="list-style-type: none"> • Solubility within a solution is determined by the nature of the solute and the solvent. <p><u>Question to Support Inquiry:</u></p> <p>How does the bent shape of the water molecule cause polarity?</p> <p>Why do some materials dissolve in water or other liquids, but others do not?</p> <p>How could you use solution chemistry analysis techniques to investigate local water or soil samples?</p>	<p><u>Core Competencies:</u></p> <p>Communication</p> <ul style="list-style-type: none"> • I recognize how my contributions and those of others complement each other. I can plan with others and adjust our plan according to the group's purpose. <p>Critical Thinking</p> <ul style="list-style-type: none"> • I consider alternative approaches and make strategic choices. • I take risks and recognize that I may not be immediately successful. <p>Creative Thinking</p> <ul style="list-style-type: none"> • I generate new ideas as I pursue my interests. I deliberately learn a lot about something by doing research, talking to others, or practicing, so that I can generate new ideas.
<p><u>Curricular Competencies:</u></p> <p>Questioning and Predicting</p> <ul style="list-style-type: none"> • Demonstrate a sustained intellectual curiosity about a scientific topic or problem of personal, local, or global interest <p>Evaluating</p> <ul style="list-style-type: none"> • Connect scientific explorations to careers in science <p>Applying and innovating</p> <ul style="list-style-type: none"> • Co-operatively design projects with local and/or global connections and applications • Implement multiple strategies to solve problems in real-life, applied, and conceptual situations 	<p><u>Content:</u></p> <p>Solubility:</p> <ul style="list-style-type: none"> • dissociation of ions • dissociation equation <p>Bonds/forces:</p> <ul style="list-style-type: none"> • hydrogen bond • intermolecular forces • impact on properties <p>Chemical processes:</p> <ul style="list-style-type: none"> • solvents, crystal growing

First Peoples Principles of Learning:

- Learning involves patience and time.

Learning Targets:

1. Define solution as a homogeneous mixture comprised of a solute and solvent.
2. On the basis of lab observations, make deductions concerning the solubility of ionic, polar, and non-polar solutes in polar and nonpolar solvents.
3. Use lab observations to describe the relative conductivity of several solutes in aqueous solution.
4. Summarize the results of a conductivity experiment as to the types of solute that conduct electricity when dissolved in water.
5. Write dissociation or ionization equations for several substances that dissolve in water to give conducting solutions.
6. Calculate the molarity of each ion in a salt solution given the molarity of the solution.
7. Calculate the concentration of ions resulting when two solutions of known concentration and volume are mixed (assuming no reaction).

Assessments:**Formative:**

- Homework checks and review
- Solubility testing of various chemicals to confirm predictions

Summative:

- Unit test
- Crystal growing project lab journal and crystal evaluation

<p><u>Big Ideas:</u></p> <ul style="list-style-type: none"> Organic chemistry and its applications have significant implications for human health, society, and the environment. <p><u>Question to Support Inquiry:</u></p> <p>How do organic compounds differ in structure and properties?</p> <p>How is carbon the basis for all living things?</p> <p>How do the structure and geometry of organic compounds contribute to their usefulness in medicine?</p>	<p><u>Core Competencies:</u></p> <p>Creative Thinking</p> <ul style="list-style-type: none"> I can get new ideas or reinterpret others' ideas in novel ways. <p>Critical Thinking</p> <ul style="list-style-type: none"> I can ask questions and offer judgments, conclusions, and interpretations supported by evidence I or others have gathered. <p>Positive Personal & Cultural Identity</p> <ul style="list-style-type: none"> I can identify my individual characteristics and explain what interests me. I can describe different groups that I belong to.
<p><u>Curricular Competencies:</u></p> <p>Processing and analyzing data and information</p> <ul style="list-style-type: none"> Use knowledge of scientific concepts to draw conclusions that are consistent with evidence <p>Communicating</p> <ul style="list-style-type: none"> Communicate scientific ideas and 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 	<p><u>Content:</u></p> <p>Organic compounds:</p> <ul style="list-style-type: none"> names structures geometry <p>Chemical bonding:</p> <ul style="list-style-type: none"> polarity <p>Chemical processes:</p> <ul style="list-style-type: none"> soap

First Peoples Principles of Learning:

- Learning involves patience and time.
- Learning involves recognizing the consequences of one's actions.

Learning Targets:

1. Identify carbon as the "backbone" of organic chemistry
2. Identify the multiple bonding character of carbon atoms
3. Relate organic chemistry to products such as plastics, fuels, pharmaceutical drugs, pesticides, insecticides, solvents, and synthetics.
4. Identify major sources of organic compounds
5. Classify a hydrocarbon as either saturated or unsaturated
6. Compare the geometry of single, double, and triple bonds between two carbon atoms.
7. Recognize and name the substituent groups methyl, ethyl, fluoro, chloro, bromo, and iodo.
8. Compare the rotational ability in single, double, and triple bonds.
9. Consistently identify cis- or trans- isomers of alkenes.
10. Name and draw structures for simple alcohols.

Assessments:

Formative:

- Homework checks and review
- Organic compound model building

Summative:

- Soap making reflection
- Presentation of Petroleum based organic material and their influence on our daily life