

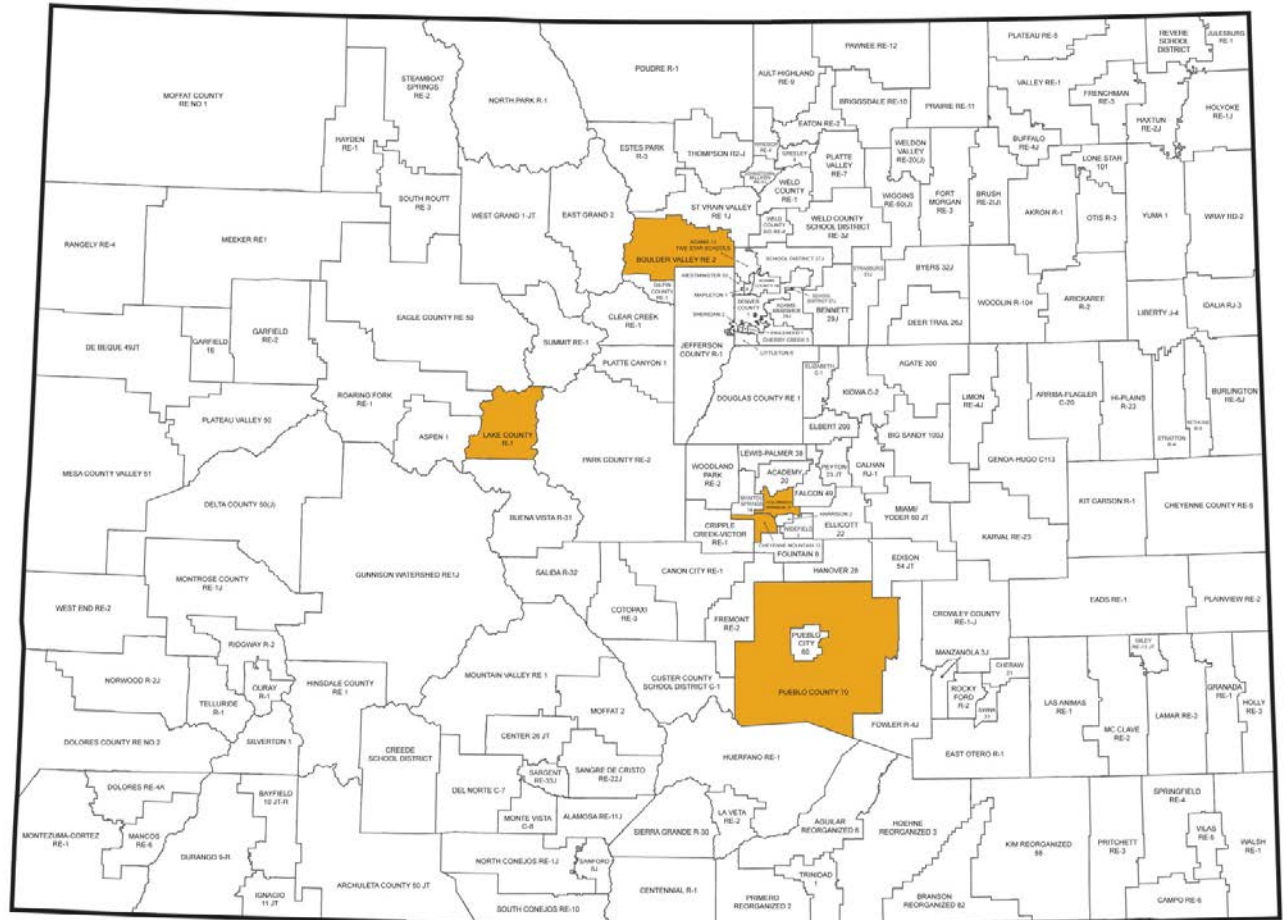
Unit Title: Mixtures and Substances

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BASED ON A CURRICULUM OVERVIEW SAMPLE AUTHORED BY

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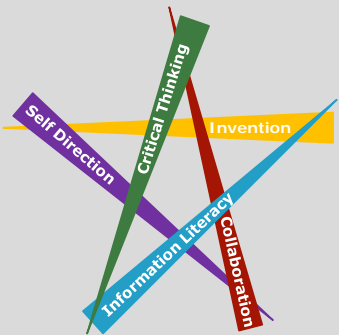


This unit was authored by a team of Colorado educators. The template provided one example of unit design that enabled teacher-authors to organize possible learning experiences, resources, differentiation, and assessments. The unit is intended to support teachers, schools, and districts as they make their own local decisions around the best instructional plans and practices for all students.

Colorado Teacher-Authored Sample Instructional Unit

Content Area	Science	Grade Level	7 th Grade
Course Name/Course Code			
Standard	Grade Level Expectations (GLE)	GLE Code	
1. Physical Science	1. Mixtures of substances can be separated based on their properties such as solubility, boiling points, magnetic properties, and densities	SC09-GR.7-S.1-GLE.1	
2. Life Science	1. Individual organisms with certain traits are more likely than others to survive and have offspring in a specific environment	SC09-GR.7-S.2-GLE.1	
	2. The human body is composed of atoms, molecules, cells, tissues, organs, and organ systems that have specific functions and interactions	SC09-GR.7-S.2-GLE.2	
	3. Cells are the smallest unit of life that can function independently and perform all the necessary functions of life	SC09-GR.7-S.2-GLE.3	
	4. Photosynthesis and cellular respiration are important processes by which energy is acquired and utilized by organisms	SC09-GR.7-S.2-GLE.4	
	5. Multiple lines of evidence show the evolution of organisms over geologic time	SC09-GR.7-S.2-GLE.5	
3. Earth Systems Science	1. Major geologic events such as earthquakes, volcanic eruptions, mid-ocean ridges, and mountain formation are associated with plate boundaries and attributed to plate motions	SC09-GR.7-S.3-GLE.1	
	2. Geologic time, history, and changing life forms are indicated by fossils and successive sedimentation, folding, faulting, and uplifting of layers of sedimentary rock	SC09-GR.7-S.3-GLE.2	

Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Reading & Writing Standards for Literacy in Science and Technical Subjects 6 - 12

Reading Standards

- Key Ideas & Details
- Craft And Structure
- Integration of Knowledge and Ideas
- Range of Reading and Levels of Text Complexity

Writing Standards

- Text Types & Purposes
- Production and Distribution of Writing
- Research to Construct and Present Knowledge
- Range of Writing

Unit Titles	Length of Unit/Contact Hours	Unit Number/Sequence
Mixtures and Substances	2-3 weeks	3

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Unit Title	Mixtures and Substances	Length of Unit	2-3 weeks
Focusing Lens(es)	Properties Classification	Standards and Grade Level Expectations Addressed in this Unit	SC09-GR.7-S.1-GLE.1
Inquiry Questions (Engaging-Debatable):	<ul style="list-style-type: none"> • What would earth be like if we were unable to separate or classify the matter that makes up a substance or mixture? • Does the environmental impact of mining outweigh the benefits gained through extracting and separating these resources? 		
Unit Strands	Physical science		
Concepts	Classification, properties, matter, mixture, substance, solution, density, physical size, boiling point, solubility, magnetic properties, materials, filtration, scientific investigations		

Generalizations My students will Understand that...	Guiding Questions	
	Factual	Conceptual
Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence (SC09-GR.7-S.1-GLE.1-EO.a;RA.1,2,3)	<p>How do you separate a mixture based on the physical properties of its matter? (SC.09-GR.7-S.1-GLE.1-EO.a;IQ.1)</p> <p>Which properties (i.e. boiling point, density, physical size, solubility, and magnetic properties) are most useful in classifying mixtures of substances? (SC.09-GR.7-S.1-GLE.1-EO.a;IQ.2)</p>	<p>Why is it important and necessary to be able to separate mixtures? (SC09-GR.7-S.1-GLE.1-EO.a)</p> <p>How does classifying mixtures and solutions help our understanding of them? (SC09-GR.7-S.1-GLE.1-EO.a)</p> <p>When is it useful to separate mixtures? When is it detrimental to separate mixtures? (SC09-GR.7-S.1-GLE.1-EO.a)</p>
Scientific investigations often guide the exploration of the properties of matter helpful in determining if a substance is composed of different types of natural resources (e.g. fossil fuels) and if the substance can be used for human consumption (SC.09-GR.7-S.1-GLE.1-EO.b; RA.1,2)	How do we know that substances are composed of different types of matter? (SC09-GR.7-S.1-GLE.1-EO.a)	How much difference must there be among the properties of substances for the properties to be useful in separating the substances? (SC.09-GR.7-S.1-GLE.1-EO.a; IQ.3)
The separation of mixtures allows for purification of materials which often facilitates the creation of new materials or enhances existing products which may drive what industries manufacture (SC09-GR.7-S.1-GLE.1-EO.b; RA.1)	<p>What properties are important in mining and oil refining processes? (SC09-GR.7-S.1-GLE.1-EO.b; RA.2)</p> <p>How are the method used for separation of mixtures in mining and single-stream recycling plants the same? How are they different? (SC09-GR.7-S.1-GLE.1-EO.b; RA.2)</p>	Why is separating mixtures important to industries? (SC09-GR.7-S.1-GLE.1-EO.b; RA.1, 2)

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Critical Content: My students will Know...	Key Skills: My students will be able to (Do)...
<ul style="list-style-type: none"> • The physical properties of a substance in a mixture such as boiling point, melting point, freezing point, solubility, magnetic properties, physical size, and density (SC.09-GR.7-S.1-GLE.1-EO.a;IQ.2,3) • Matter’s physical properties which can be used to separate mixtures and solutions (SC.09-GR.7-S.1-GLE.1) • Examples of how the separation of mixtures helps to understand the variations of matter in its composition (SC.09-GR.7-S.1-GLE.1; IQ.3;RA.1,2,3; N.2,4) • Various techniques and tools used to separate mixtures and substances (SC.09-GR.7-S.1-GLE.1-EO.b;IQ.1,2;RA.1,2;N.1,2,4) • Properties of matter used to determine usefulness in industrial manufacturing (SC.09-GR.7-S.1-GLE.1-EO.b;IQ.1,2;RA.1) 	<ul style="list-style-type: none"> • Identify properties of substance in a mixture that could be used to separate those substance from each other (SC.09-GR.7-S.1-GLE.1-EO.a) • Develop and design a scientific investigation to separate the components of a mixture (SC.09-GR.7-S.1-GLE.1-EO.b) • Use specific techniques to separate mixtures and solutions (e.g. NAME A FEW) (SC.09-GR.7-S.1-GLE.1-EO.b;IQ.1,2;RA.1,2;N.1,2,4) • Evaluate and critique experimental procedures designed to separate mixtures (SC.09-GR.7-S.1-GLE.1; N.2) • Describe ways in which scientists study mixtures (SC.09-GR.7-S.1-GLE.1; N.3) • Ask testable questions and make falsifiable hypothesis to perform separation of mixtures (SC.09-GR.7-S.1-GLE.1; N.1) • Evaluate and critique experimental procedures designed to separate mixtures (SC.09-GR.7-S.1-GLE.1; N.2) • Share experimental data, and respectfully discuss inconsistent results (SC.09-GR.7-S.1-GLE.1; N.3)

<p>Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline. EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: <i>“Mark Twain exposes the hypocrisy of slavery through the use of satire.”</i></p>	
<p>A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):</p>	<p><i>I can classify matter based on physical properties such as its boiling point, density, or attraction to metal. I can separate a mixture if I know the properties of the matter in a substance.</i></p>
<p>Academic Vocabulary:</p>	<p>Classify, compare, contrast, separate, properties, evaluate, critique, investigate, substances, inconsistent results, variation</p>
<p>Technical Vocabulary:</p>	<p>Mixture, solubility, density, boiling point, melting point, freezing point, filtration, solution, matter, falsifiable hypothesis, experimental procedures, magnetic properties, physical size</p>

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Unit Description:	The focus of this unit is on properties of matter and investigating and analyzing mixtures, solutions, and substances. Beginning with filtration, purification, solubility, boiling point, density, magnetism, and physical size, across the unit students investigate how matter can be combined and identified based on these properties. The unit culminates in a performance assessment that asks students to explore the potential for a new mining site in their area.
Considerations:	<p>Possible misconceptions:</p> <ul style="list-style-type: none"> Mass is the same as weight Energy is matter Everything is made of matter Evaporation is a chemical change Water is not a chemical
Unit Generalizations	
Key Generalization:	Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence
Supporting Generalizations:	Scientific investigations often guide the exploration of the properties of matter helpful in determining if a substance is composed of different types of natural resources (e.g. fossil fuels) and if the substance can be used for human consumption
	The separation of mixtures allows for purification of materials which often facilitates the creation of new materials or enhances existing products which may drive what industries manufacture

Performance Assessment: <i>The capstone/summative assessment for this unit.</i>	
Claims: (Key generalization(s) to be mastered and demonstrated through the capstone assessment.)	Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence
Stimulus Material: (Engaging scenario that includes role, audience, goal/outcome and explicitly connects the key generalization)	You are a miner asked to explore the potential for a new mining site in the area. You will collect a sample (water and soil solution/ mixture) from your local river and conduct tests using at least four properties of matter in your determination of the composition of the sample. You will need to create a report of your analysis, including narrative, data tables, graphs, and percentages relative to the composite sample, to share with your local community (e.g., city council, mining company, EPA, water conservation agency).
Product/Evidence: (Expected product from students)	Students must collect a sample from a local river and conduct testing using a filtration process with at least four properties of matter (e.g., solubility, density, physical size, boiling point, magnetism). They must create a written report detailing their findings including data tables, graphs, percentages, and narratives.
Differentiation: (Multiple modes for student expression)	<ul style="list-style-type: none"> Teachers may provide a table with four properties of matter included. Teachers may offer students the option of a different format for results. Teachers may offer some guiding questions that lead to results. Teachers may allow students to create a video of their results.

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To extend this work, students may expand upon solubility discussing sulfates and nitrates.

Texts for independent reading or for class read aloud to support the content

Informational/Non-Fiction	Fiction
<p><i>Measuring Area, Volume, and Density</i>- Barbara A. Somerville [lexile level 880] <i>Properties of Water</i> – Alfred J. Smuskiewicz [lexile level 1210]</p>	<p><i>Beyond the Sea of Ice</i> – Joan Elizabeth Goodman [lexile level 870] <i>The Hoover Dam</i> –Elizabeth Mann [lexile level 1020] <i>The Properties of Water</i> – Hannah Roberts McKinnon [lexile level 1210]</p>

Ongoing Discipline-Specific Learning Experiences

1.	Description:	Thinking like a scientist: Scientific method and experimentation.	Teacher Resources:	<p>http://www.brainpopjr.com/science/scienceskills/scientificmethod/grownups.weml (Near middle of page teacher resources page with activities) http://undsci.berkeley.edu/teaching/misconceptions.php (A list of common misconceptions about the nature of science) http://undsci.berkeley.edu/teaching/ (Tips for introducing and teaching scientific method and experimentation) http://www.livescience.com/6727-invisible-gorilla-test-shows-notice.html (Video in which most people fail to observe large “gorilla” moving across room) http://www.shodor.org/succeed-1.0/forensic/teacher/lessons/observation.html (Lesson plan devoted to developing observation skills) http://blogs.loc.gov/teachers/2011/06/look-again-challenging-students-to-develop-close-observation-skills/ (Library of Congress brief of tools for helping students develop observation skills)</p>
	Skills:	Write a testable question to be answered in an experiment. Design an experiment that controls for independent and dependent variables. Understand and use scientific	Student Resources:	<p>http://www.brainpopjr.com/science/scienceskills/scientificmethod/grownups.weml (At top of page student link for movie and activities about scientific method) http://www.glencoe.com/sites/common_assets/science/virtual_labs/E16/E16.html (Virtual lab to practice use of scientific method and experimentation) http://www.brainpop.com/science/scientificinquiry/scientificmethod/preview.weml (Movie and quiz for scientific method/inquiry) http://lifel hacker.com/5960811/how-to-develop-sherlock-holmes-like-powers-of-observation-and-deduction (Explanation of tools to increase observation skills with hook related to Sherlock Holmes)</p>
	Assessment:			Within learning experiences.

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		and academic language Analyze experimental results with respect to their support of the hypothesis. Critique research methodology of scientists or other students.		
2.	Description:	Working like a Scientist: Create and analyze graphs.	Teacher Resources:	Power Point presentation (Dealing with identification of dependent and independent variables) http://professionaldevelopment.ibo.org/files/ocd/TaughtPractice%20with%20%20identifying%20variables.pdf (Practice worksheet for identifying dependent and independent variables) http://www.clemson.edu/ces/phoenix/tutorials/graph/index.html (Rules for graphing) http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut_9_bar.htm#line3 (Teaches how and why to use different graphs and also teaches how to read a graph) http://www.teachervision.fen.com/skill-builder/graphs-and-charts/48946.html?page=1&detoured=1 (Provides questions to ask students as they analyze a graph) http://nces.ed.gov/nceskids/createagraph/default.aspx (Online way to create different types of graphs)
			Student Resources:	http://nces.ed.gov/nceskids/createagraph/default.aspx (Online way to create different types of graphs)
	Skills:	Label and title axes Identify dependent and independent variables. Determine the appropriate type of graph. Identify trends in graphs and tables. Read different types of graphs. Compare two or more sets of data to relate and draw conclusions. Synthesize given information in graphic organizer.	Assessment:	Students may create graphs using data from learning experiences in order to analyze relationships between variables. Teachers may make real-time observations and provide feedback for students on their ability to set up a graph correctly.
3.	Description:	Working like a scientist: Using laboratory safety	Teacher Resources:	http://www.proprofs.com/quiz-school/story.php?title=Lab-Safety-Practice-Quiz (lab safety quiz and video)

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				http://www.edquest.ca/component/content/article/110 (lab safety quiz)
			Student Resources:	http://www.proprofs.com/quiz-school/story.php?title=Lab-Safety-Practice-Quiz (lab safety quiz and video)
	Skills:	Practice science safety Keep laboratory space clean and organized	Assessment:	The student will take a lab safety quiz (practical or written).

Prior Knowledge and Experiences

Students must have a basic understanding of the scientific method, density, and matter.

Vertical alignment of physical science: Students have last seen concepts within this unit in 6th, 5th, 3rd, 1st grades and Kindergarten.

Learning Experience # 1

The teacher may lead a discussion introducing the Periodic Table so that students can understand that the Periodic Table is organized by patterns of properties.

Generalization Connection(s):	Mixtures separated by their properties (solubility, magnetism, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence The separation of mixtures allows for purification of materials which often facilitates the creation of new materials or enhances existing products which may drive what industries manufacture
Teacher Resources:	https://www.google.com/search?q=blank+periodic+table+printable&espv=2&source=lnms&tbm=isch&sa=X&ei=Sn_qU6GBI8z3yQT8t4KYBQ&ved=0CAYQ_AUoAQ&biw=640&bih=399&dpr=1.25 (Blank Periodic Tables images) https://www.google.com/search?q=periodic+table+trends&espv=2&tbm=isch&tbo=u&source=univ&sa=X&ei=YHqU5bcJpP8yQSmsCoCA&sqi=2&ved=0CBwQsAQ&biw=640&bih=399 (Trends within the Periodic Table) www.ptable.com (Interactive online Periodic Table)
Student Resources:	http://www.mhhe.com/biosci/genbio/virtual_labs/periodic_table/main.html (Virtual investigation of the Periodic Table) http://www.abpishools.org.uk/activescience/module5/home.html (Periodic Table game) http://www.cta.org/~media/Documents/PDFs/Conferences/GTCN2012/Eighth%20Grade%20Science%20Standards%20with%20Manipulatives.pdf?dmc=1&ts=20140814T0831531954 (Directions for manipulatives for differentiation)
Assessment:	Students will recreate the patterns within the Periodic Table, using a skeletal template, by answering teacher-led questions (e.g., “put a dot in the box that represents the lowest atomic mass”). https://www.google.com/search?q=blank+periodic+table+printable&espv=2&source=lnms&tbm=isch&sa=X&ei=Sn_qU6GBI8z3yQT8t4KYBQ&ved=0CAYQ_AUoAQ&biw=640&bih=399&dpr=1.25 (Blank Periodic Tables images)

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Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	<p>The teacher may provide a word list</p> <p>The teacher may provide manipulatives to enhance understanding of chemical bonds and patterns found on the Periodic Table</p> <p>http://www.cta.org/~media/Documents/PDFs/Conferences/GTCN2012/Eighth%20Grade%20Science%20Standards%20with%20Manipulatives.pdf?dmc=1&ts=20140814T0831531954 (Directions for manipulatives for differentiation)</p> <p>The teacher may allow some students to complete assessment with a partner</p>	N/A
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	<p>The teacher may allow students to propose a new orientation of the Periodic Table.</p> <p>https://www.google.com/search?q=periodic+table+trends&espv=2&tbm=isch&tbo=u&source=univ&sa=X&ei=tYHqU5bcJpP8yQSmsoCoCA&sqi=2&ved=0CBwQsAQ&biw=640&bih=399#q=alternate%20periodic%20table&tbm=isch (Images of alternative Periodic Table orientations)</p>	<p>The student may propose and defend an alternate Periodic Table.</p> <p>The student may create a new element and defend its placement on the Periodic Table.</p>
Critical Content:	<ul style="list-style-type: none"> • Periodic Table • Elements • Products • Reactants • Patterns 	
Key Skills:	<ul style="list-style-type: none"> • Identify patterns within the Periodic Table 	
Critical Language:	Periodic Table, Elements, Products, Reactants, Patterns, Identify	

Learning Experience # 2	
The teacher may introduce matter and its classification so that students can classify items as an atom, element, compound, or molecule.	
Generalization Connection(s):	Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence Scientific investigations often guide the exploration of the properties of matter helpful in determining if a substance is composed of

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	different types of natural resources (e.g. fossil fuels) and if the substance can be used for human consumption	
Teacher Resources:	http://www.bbc.co.uk/bitesize/ks3/science/chemical_material_behaviour/compounds_mixtures/revision/3/ (Visual video demo of atoms, molecules, compounds) http://www.quia.com/rr/42473.html (Atoms and molecules game) http://www.quia.com/pop/38608.html?AP_rand=58000101 (Atoms, molecules, compounds and mixtures visual activity) http://staff.fcps.net/jswango/unit1/chap1/matter%20packet.pdf (Worksheet for reinforcement of classification)	
Student Resources:	http://www.it.itb.ac.in/~vijaya/ssrvvm/worksheetscd/getWorksheets.com/Science/elements.pdf (Definition sheet) http://www.quia.com/rr/42473.html (Atoms and molecules game)	
Assessment:	Students will identify various types of matter as an atom, element, compound, or molecule and defend their decisions with rationale.	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide definitions to the vocabulary words.	The student may use definitions to aid them in completing the worksheet.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may ask students to brainstorm examples of matter.	The student may add different examples of matter and which classification it falls under.
Critical Content:	<ul style="list-style-type: none"> • Atom • Element • Compound • Molecule • Matter 	
Key Skills:	Identification and classification of elements	
Critical Language:	Atom, Element, Compound, Molecule, Matter, Classification, Identification	

Learning Experience # 3	
The teacher may introduce an “Adopt an Element” experience so that the students can research an element of their choice and investigate its physical and chemical characteristics.	
Generalization Connection(s):	Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence The separation of mixtures allows for purification of materials which often facilitates the creation of new materials or enhances existing products which may drive what industries manufacture

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Teacher Resources:	www.Ptable.com (Dynamic/Interactive Periodic Table) https://www.youtube.com/watch?v=fLSfgNxoVGk (Bozeman Science tour of Periodic Table) http://sciencespot.net/Pages/classchem.html (Various resources for Periodic Table) http://www.inquiryinaction.org/classroomactivities/topic.php?topic=Solubility (Solubility activities) http://cpr.molsci.ucla.edu/cpr/cpr_info/preview_public.asp?a_id=400055&e=e (Assignment for possible alteration/adoption)	
Student Resources:	https://www.youtube.com/watch?v=fLSfgNxoVGk (Bozeman Science tour of Periodic Table) www.Ptable.com (Dynamic/Interactive Periodic Table) https://www.youtube.com/watch?v=fLSfgNxoVGk (Bozeman Science tour of Periodic Table)	
Assessment:	Students will create a presentation (poster, Prezi, etc.) describing the characteristics of their element.	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may suggest an element which may be easier to research The teacher may limit the project requirements The teacher may allow students to work in pairs	The student may present their findings one-on-one to the teacher
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may suggest an element which may be more difficult to research.	The student may create a presentation describing the characteristics of their element.
Critical Content:	<ul style="list-style-type: none"> • Solubility • Malleability • Color • Boiling/freezing/melting point • State of matter • Density • Magnetism • Metal • Non-metal • Transition metal • Bonding properties 	
Key Skills:	<ul style="list-style-type: none"> • Researching 	
Critical Language:	Solubility, malleability, color, boiling/freezing/melting point, state of matter, density, magnetism, metal, non-metal, transition metal, bonding properties, researching	

Learning Experience # 4

The teacher may lead a discussion around mixtures and substances so that the students can differentiate between homogeneous, heterogeneous, and pure substances.

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Generalization Connection(s):	Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence Scientific investigations often guide the exploration of the properties of matter helpful in determining if a substance is composed of different types of natural resources (e.g. fossil fuels) and if the substance can be used for human consumption	
Teacher Resources:	http://office.microsoft.com/en-us/word-help/draw-flowcharts-with-word-and-powerpoint-HA001055266.aspx AND https://www.youtube.com/watch?v=0VR7iBlmDB4 (directions to use MSWord to make a flow chart) http://www.gliffy.com/uses/flowchart-software/ (program to build flowcharts) http://www.chemheritage.org/percy-julian/teachers/7a.html (activities types of mixtures and substances) http://www.edutopia.org/blog/student-grouping-homogeneous-heterogeneous-ben-johnson (quick activity homogeneous vs. heterogeneous mixtures using students in the classroom) http://grade7byng.pbworks.com/w/file/attach/48672183/S7%20PTM-MIXTURES%20-%20DistEd%20-%20Lessons%201-3.pdf (worksheet for homogeneous vs. heterogeneous mixtures)	
Student Resources:	http://www.chemheritage.org/percy-julian/activities/7a.html (student version of teacher resource) http://chemwiki.ucdavis.edu/Analytical_Chemistry/Qualitative_Analysis/Classification_of_Matter https://www.youtube.com/watch?v=OpWFUqPptWE http://www.chemprofessor.com/matter.htm	
Assessment:	Students will create an accurate, assembled flow chart or other graphic organizer.	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may group students in mixed ability groups to complete the flow chart.	The student may work with their peers to recreate the flow chart.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide opportunities for students to share their thinking with their peers.	The student may explain their thinking to their peers while recreating the flow chart.
Critical Content:	<ul style="list-style-type: none"> • Mixture • Homogenous • Heterogeneous • Substance • Pure substance 	
Key Skills:	Sequencing	
Critical Language:	Mixture, homogenous, heterogeneous, substance, pure substance, sequencing	

Learning Experience # 5

The teacher may conduct demonstrations (filtration, solubility, magnetism, density) so that the student can build a conceptual

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understanding of physical properties of matter.		
Generalization Connection(s):	<p>Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence</p> <p>Scientific investigations often guide the exploration of the properties of matter helpful in determining if a substance is composed of different types of natural resources (e.g. fossil fuels) and if the substance can be used for human consumption</p>	
Teacher Resources:	<p>http://www.epa.gov/safewater/kids/flash/flash_filtration.html (introduction to water filtration - video)</p> <p>http://water.epa.gov/learn/kids/drinkingwater/upload/2005_03_10_kids_activity_grades_4-8_waterfiltration.pdf (water filtration demonstration)</p> <p>http://www.coolmagnetman.com/magindex.htm (magnetism activities/demos)</p> <p>http://www.spoof.gsfc.nasa.gov/stargaze/MagTeach.htm (magnetism background and activities)</p> <p>http://www.coolmagnetman.com/magindex.htm (magnetic properties activities)</p> <p>http://www.middleschoolchemistry.com/lessonplans/chapter3/lesson5 (density demos/activities)</p> <p>http://www.educationfund.org/uploads/docs/Publications/Curriculum_Ideas_Packets/Density_Dynamic_Duo_of_Mass-and-Volume.pdf (density curriculum with activities)</p> <p>Graybill, G. (2010). <i>Properties of matter</i>. Glenview, Illinois: Pearson Education, Inc.</p>	
Student Resources:	<p>http://www.bozemanscience.com/ap-phys-016-density/ (background video on density)</p> <p>http://education-portal.com/academy/lesson/states-of-matter-and-methods-of-separating-mixtures.html#lesson</p> <p>http://www.bbc.co.uk/bitesize/ks3/science/chemical_material_behaviour/compounds_mixtures/revision/9/</p> <p>https://www.youtube.com/watch?v=DqLKPmGyXbE</p> <p>https://www.youtube.com/watch?v=tLmh_rMQu7M</p>	
Assessment:	The students will design a physical characteristics lab and conduct their investigations on a mystery mixture to complete a lab report on their findings.	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide a lab report format (fill in the blank) for the students to complete. The teacher may allow pictures or words in the lab report.	The student may complete a lab report using a guided format.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide the steps of the scientific method.	The student may create a lab report which demonstrates their use of every step in the scientific method.
Critical Content:	<ul style="list-style-type: none"> • Density • Mass • Volume • Melting point • Boiling point • Freezing point • Filtration 	

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	<ul style="list-style-type: none"> • Magnetism • Solubility • Physical size
Key Skills:	<ul style="list-style-type: none"> • Filtration • Measuring
Critical Language:	Density, mass, volume, melting point, boiling point, freezing point, filtration, magnetism, solubility, physical size, filtration, measuring

Learning Experience # 6

The teacher may create investigative scenarios involving unknown substances so that the students can determine the identity of the unknown substances based on the physical properties.

Generalization Connection(s):	Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence Scientific investigations often guide the exploration of the properties of matter helpful in determining if a substance is composed of different types of natural resources (e.g. fossil fuels) and if the substance can be used for human consumption	
Teacher Resources:	http://chemistry.bd.psu.edu/jircitano/density.html (density of elements) http://www.science.co.il/PElements.asp (boiling and melting point of elements) http://periodic-table-of-elements.org/#/SOLUBILITY (solubility of elements)	
Student Resources:	http://www-materials.eng.cam.ac.uk/mpsite/interactive_charts https://www.youtube.com/watch?v=C17o68cR6NA https://www.youtube.com/watch?v=0g8IANs6zpQ https://www.youtube.com/watch?v=wx0UAFMZkMw	
Assessment:	The students will complete a lab write up defending their position on the identification of the unknown substance.	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may limit the information placed in the data tables. The teacher may provide a more commonly used unknown sample (salt).	The student may use a modified data table to identify an unknown substance.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide a more complex sample for the student to identify.	The student may investigate an unknown substance using more processes to narrow down their unknown.
Critical Content:	<ul style="list-style-type: none"> • Density • Mass • Volume • Melting point 	

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	<ul style="list-style-type: none"> • Boiling point • Freezing point • Filtration • Magnetism • Solubility • Physical size
Key Skills:	<ul style="list-style-type: none"> • Filtration • Measuring • Reading charts and data tables
Critical Language:	Density, mass, volume, melting point, boiling point, freezing point, filtration, magnetism, solubility, physical size, filtration, measuring, reading charts and data tables

Learning Experience # 7				
The teacher may use media (video or simulation) involving various items changing so that the students can differentiate between physical and chemical changes.				
Generalization Connection(s):	<p>Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence</p> <p>Scientific investigations often guide the exploration of the properties of matter helpful in determining if a substance is composed of different types of natural resources (e.g. fossil fuels) and if the substance can be used for human consumption</p> <p>The separation of mixtures allows for purification of materials which often facilitates the creation of new materials or enhances existing products which may drive what industries manufacture</p>			
Teacher Resources:	<p>www.Phet.com</p> <p>http://www.learner.org/courses/essential/physicalsci/session4/closer1.html</p> <p>https://www.youtube.com/watch?v=gCbqjs-pqJo (examples of demonstrations a teacher may perform)</p>			
Student Resources:	<p>www.Phet.com</p> <p>http://www.chem4kids.com/files/matter_chemphys.html</p> <p>http://studyjams.scholastic.com/studyjams/jams/science/matter/changes-of-matter.htm</p>			
Assessment:	Students complete two Venn diagrams differentiating chemical and physical properties and physical and chemical changes.			
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)			
	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Access (Resources and/or Process)</td> <td style="width: 50%;">Expression (Products and/or Performance)</td> </tr> <tr> <td>The teacher may provide a word list for the Venn Diagrams.</td> <td>The student may use a word list to categorize physical and chemical properties/changes into Venn Diagrams.</td> </tr> </table>	Access (Resources and/or Process)	Expression (Products and/or Performance)	The teacher may provide a word list for the Venn Diagrams.
Access (Resources and/or Process)	Expression (Products and/or Performance)			
The teacher may provide a word list for the Venn Diagrams.	The student may use a word list to categorize physical and chemical properties/changes into Venn Diagrams.			

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Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide real-world examples of physical and chemical changes.	The student may place real-world provides examples of physical and chemical changes into the proper location of the Venn Diagram. The student may create their own examples of physical and chemical changes.
Critical Content:	<ul style="list-style-type: none"> Physical properties (size, color, density), physical changes (ripping, stretching), chemical properties (flammability, reactivity) chemical changes (presence of gas, change in color) 	
Key Skills:	<ul style="list-style-type: none"> Differentiating, classifying 	
Critical Language:	Physical properties (size, color, texture), physical changes (ripping, stretching), chemical properties (flammability, magnetism) chemical changes (presence of gas, change in color), differentiating, classifying	

Learning Experience # 8		
The teacher may demonstrate various techniques and processes for water purification (filtration or other means) so that students can describe how to separate mixtures and determine the best method to use based on the type of mixture.		
Generalization Connection(s):	<p>Scientific investigations often guide the exploration of the properties of matter helpful in determining if a substance is composed of different types of natural resources (e.g. fossil fuels) and if the substance can be used for human consumption</p> <p>The separation of mixtures allows for purification of materials which often facilitates the creation of new materials or enhances existing products which may drive what industries manufacture</p>	
Teacher Resources:	http://pbskids.org/zoom/activities/sci/waterfilter.html http://water.epa.gov/learn/kids/drinkingwater/upload/2005_03_10_kids_activity_grades_4-8_waterfiltration.pdf http://www.filters.co.nz/table/water-filtration-science/experiments-for-little-kids/	
Student Resources:	http://www.epa.gov/safewater/kids/flash/flash_filtration.html http://www.rahmahmuslimhomeschool.co.uk/index/science-build-your-own-water-filtration-water-filter-experiments/	
Assessment:	In pairs, students will set up a filtration procedure and properly filter a mixture into components.	
Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	<p>The teacher may use student relevant examples to help them understand how filtration can be used in the real world. (gold panning, mining, how kidneys filter, etc.)</p> <p>The teacher may provide pictures or a story board of the steps of filtration for student reference use.</p>	The students may receive more modeling to gain understanding. Students may use a complete filtration story board to aid them in construction of their physical filters.

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Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide research tools, (computers, and case studies) to assist students in creating new ways of filtering mixtures	The Students will create an innovative filtration process.
Critical Content:	<ul style="list-style-type: none"> • The physical properties of a substance in a mixture such as boiling point, melting point, freezing point, solubility, magnetic properties, physical size, and density • Matter’s physical properties which can be used to separate mixtures and solutions • Examples of how the separation of mixtures helps to understand the variations of matter in its composition • Various techniques and tools used to separate mixtures and substances 	
Key Skills:	<ul style="list-style-type: none"> • Identify properties of substances in a mixture that could be used to separate those substance from each other • Develop and design a scientific investigation to separate the components of a mixture • Use specific techniques to separate mixtures and solutions • Evaluate and critique experimental procedures designed to separate mixtures • Evaluate and critique experimental procedures designed to separate mixtures 	
Critical Language:	Evaluate, develop, identify, critique, mixtures, substances, separation, density, solubility	

Learning Experience # 9	
The teacher may introduce alternative filtration processes (e.g., a kidney, liver) so that students can apply their understanding of filtration to a different natural system.	
Generalization Connection(s):	Mixtures separated by their properties (solubility, boiling point, physical size, and densities) assist in a variety of processes (i.e. water filtration, recycling center, kidneys, etc.), some which are vital to human existence The separation of mixtures allows for purification of materials which often facilitates the creation of new materials or enhances existing products which may drive what industries manufacture
Teacher Resources:	www.teacherhealthk-12.uthscsa.edu/curriculum/blood http://health.howstuffworks.com/human-body/systems/kidney-urinary/kidney2.htm http://www.rpi.edu/dept/chem-eng/Biotech-Environ/Projects00/memfilt/kidneys.htm
Student Resources:	www.teacherhealthk-12.uthscsa.edu/curriculum/blood http://health.howstuffworks.com/human-body/systems/kidney-urinary/kidney2.htm http://www.rpi.edu/dept/chem-eng/Biotech-Environ/Projects00/memfilt/kidneys.htm http://www.renalinfo.com/us/how_kidneys_work_and_fail/kidney_functions/filtering_the_blood/ http://kidshealth.org/kid/htbw/kidneys.html http://www.cyh.com/HealthTopics/HealthTopicDetailsKids.aspx?p=335&np=152&id=2409
Assessment:	Students will complete a flow chart of the kidney filtration process.

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Differentiation: (Multiple means for students to access content and multiple modes for students to express understanding.)	Access (Resources and/or Process)	Expression (Products and/or Performance)
	Teacher may provide a story board of the kidney filtration process. The teacher may provide a puzzle (cut up flow chart with answers) for students to piece together.	The student may use guided practice to complete the flow chart. The students will recreate a flow chart in correct order.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide research tools for the students	The student may create their own model of a kidney based on the function in relation to filtration. The student may create their own flow chart
Critical Content:	<ul style="list-style-type: none"> • Matter’s physical properties which can be used to separate mixtures and solutions • Examples of how the separation of mixtures helps to understand the variations of matter in its • Various techniques and tools used to separate mixtures and substances 	
Key Skills:	<ul style="list-style-type: none"> • Identify properties of substance in a mixture that could be used to separate those substance from each other • Evaluate and critique procedures designed to separate mixtures • Ask testable questions to perform separation of mixtures 	
Critical Language:	Filtration, solution, matter, experimental procedures, mixture separation	

Learning Experience # 10		
The teacher may introduce students to local mining operations and discuss minerals, metals, and environmental impacts so that students can understand that some minerals do not come in pure form but must be separated from an ore mixture.		
Generalization Connection(s):	Scientific investigations often guide the exploration of the properties of matter helpful in determining if a substance is composed of different types of natural resources (e.g. fossil fuels) and if the substance can be used for human consumption The separation of mixtures allows for purification of materials which often facilitates the creation of new materials or enhances existing products which may drive what industries manufacture	
Teacher Resources:	Guest speakers (energy companies, drillers, miners, etc) Fieldtrips (http://www.countryboymine.com/) Separation technologies- http://www1.eere.energy.gov/manufacturing/industries_technologies/imf/pdfs/separationsreport.pdf	
Student Resources:	http://sciencecases.lib.buffalo.edu/cs/collection/detail.asp?case_id=263&id=263 - This case study, developed for a general chemistry course, is intended to teach students the interdisciplinary nature of environmental science. Students take on the role of environmental chemists. Using atomic absorption spectroscopy, they test for lead contamination in groundwater samples taken from an old mining district in Lake County, Colorado. After researching remediation methods, students propose practical solutions to local soil contamination	
Assessment:	Students will analyze a case study about a local mining operation, identifying minerals, metals, and ores, and determine environmental impacts of the operation.	
Differentiation:	Access (Resources and/or Process)	Expression (Products and/or Performance)

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(Multiple means for students to access content and multiple modes for student to express understanding.)	The teacher may provide students with variety of case studies.	The student may choose a case study based on their interest and reading level.
Extensions for depth and complexity:	Access (Resources and/or Process)	Expression (Products and/or Performance)
	The teacher may provide students with a variety of case studies or research tools.	The student may choose a case study at their interest and reading level.
Critical Content:	<ul style="list-style-type: none"> • Examples of how the separation of mixtures helps to understand the variations of matter in its composition • Various techniques and tools used to separate mixtures and substances • Properties of matter used to determine usefulness in industrial manufacturing 	
Key Skills:	<ul style="list-style-type: none"> • Identify properties of substance in a mixture that could be used to separate those substance from each other • Use specific techniques to separate mixtures and solutions • Evaluate and critique procedures designed to separate mixtures • Ask testable questions to perform separation of mixtures • Evaluate and critique procedures designed to separate mixtures 	
Critical Language:	Compare, contrast, separate, properties, evaluate, critique, investigate, substances, density, matter	