

Conceptual Curriculum Map (CCM)

Content Area Science
Grade Level: 10

Course Chemistry 21/22

Unit 1: Introduction to Chemistry and Density	<u>Science Transfer Goal(s)</u> ST.1: Students will be able to independently use their learning to actively seek and analyze new scientific information and perspectives to make sense of phenomena. ST.2: Students will be able to independently use their learning to scientifically evaluate information to make informed decisions and/or design solutions. <u>Global Competency Transfer Goal(s)</u> CT.1: Students will be able to analyze and evaluate evidence, arguments, claims and beliefs to draw conclusions, make informed decisions, and solve problems.		
Focus & Timeframe Students will learn the tools scientists use to make measurements through the exploration of the phenomenon of density Approx eight 78 minute classes	Standards There are no applicable NGSS standards for this unit. <i>Analyze and interpret data to determine how the proportion of mass to volume of an object determines the buoyancy of an object within another.</i>	Conceptual Overview Students will understand that... - science uses defined and systematic processes to answer questions - scientists use mathematical tools to analyze, interpret, and draw conclusions.	Rationale Students need to understand that scientists use specific instruments, language, and procedures to help them make sense of the world around them and to answer questions. Scientists use these instruments and language when communicating with other scientists.
Unit 2: Stars to Atoms	<u>Science Transfer Goal(s)</u> ST.1: Students will be able to independently use their learning to actively seek and analyze new scientific information and perspectives to make sense of phenomena. <u>Global Competency Transfer Goal(s)</u> CT.1: Students will be able to analyze and evaluate evidence, arguments, claims and beliefs to draw conclusions, make informed decisions, and solve problems. CT.2: Students will be able to reflect on their own thinking when presented with alternative points of view, and revise and/or reconsider their thinking.		
Focus & Timeframe Students will first learn the physical structure of the atom followed by an understanding of how atoms are formed in stars. Students will then learn how the various elements are organized into the periodic table. Approx thirteen 78 minute classes	Standards HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. (Linda has a great idea for a project about fission and fusion: The future of energy) HS-ESS1-1. Develop a model based on evidence to illustrate the life span	Conceptual Overview Students will understand that... - atoms are the fundamental unit of all matter - The sun produces the majority of energy on earth through nuclear fusion and that all matter found on earth was generated in stars - The periodic table is organized by increasing protons and provides basic information about each element.	Rationale An understanding of atomic theory allows an individual to account for all of the materials observed in our world as well as the changes those materials can undergo. At this point in their education, students should have a conceptual understanding of the building blocks of matter Students should understand that nuclear fusion in the sun produces the majority of energy on earth and that all matter found on earth was generated via nuclear fusion processes that took

	of the sun and the role of nuclear fusion in the sun's core to release energy in the form of radiation. HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements. HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. (Trends not covered in this unit)		place throughout the life-cycles of stars Finally, students should be able to use the periodic table as a tool to identify basic properties of each element.
Unit 3 Material Science	Science Transfer Goal(s) ST.1: Students will be able to independently use their learning to actively seek and analyze new scientific information and perspectives to make sense of phenomena. ST.2: Students will be able to independently use their learning to scientifically evaluate information to make informed decisions and/or design solutions. Global Competency Transfer Goal(s) CT.1: Students will be able to analyze and evaluate evidence, arguments, claims and beliefs to draw conclusions, make informed decisions, and solve problems.		
	Standards	Conceptual Overview	Rationale
	Focus & Timeframe Students will learn that atoms will combine to form compounds. These compounds are held together with secondary forces which are weaker than the primary bonds holding the atoms together. The strength of the primary and secondary bonds determine the physical characteristics of the substances. Approx ten 78 minute classes	Students will understand that... - the location of an element on the periodic table allows for a prediction of the type of bond that forms which then allows for a determination of the physical properties of the compound - different patterns in the periodic table may be observed and can provide evidence for causality in explanations of chemical phenomena - investigating the form of molecules at the atomic level can help to determine the properties they display at the macro level.	Students should understand that electrostatic interactions between atoms determine bond types which can then allow scientists to make predictions about the resulting properties of the compounds on the micro and macro scale.

	scale to infer the strength of electrical forces between particles. HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.		
Unit 4 Chemical Reactions	Long-Term Outcomes/Transfer Goals: Science Transfer Goal(s) ST.1: Students will be able to independently use their learning to actively seek and analyze new scientific information and perspectives to make sense of phenomena. Global Competency Transfer Goal(s) CT.1: Students will be able to analyze and evaluate evidence, arguments, claims and beliefs to draw conclusions, make informed decisions, and solve problems. CT.2: Students will be able to reflect on their own thinking when presented with alternative points of view, and revise and/or reconsider their thinking.		
	Standards	Conceptual Overview	Rationale
	Focus & Timeframe Students will learn that matter is conserved in chemical reactions as well as the indicators and types of chemical reactions. In addition, students will understand how the molecules interact with each other during chemical reactions and predict the products of these reactions. Approx ten 78 minute classes	Students will understand that... - the total amount of energy and matter in closed systems is conserved. - changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. - science assumes laws are consistent which then allows scientists to make predictions. - chemical reactions are predictable based upon the structure of the atoms and compounds involved.	By learning about how atoms and molecules interact with one another and rearrange during a chemical reaction, students can explain phenomena, including the environmental impacts of some reactions as well as the use of reactions in consumer products.
	HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. HS-PS1-4 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. HS-PS3-2 Develop and use models to illustrate that		

	energy at the macroscopic scale can be accounted for as a combination of energy associated with the motion of particles (objects) and energy associated with the relative positions of particles (objects).		
Unit 5 Climate Change	Long-Term Outcomes/Transfer Goals: Science Transfer Goal(s) ST.3: Students will be able to independently use their learning to engage in public discourse on science-related issues, using scientific reasoning and empirical evidence. Global Competency Transfer Goal(s) CT.2: Students will be able to reflect on their own thinking when presented with alternative points of view, and revise and/or reconsider their thinking. CO: Students will be able to respectfully engage with others in constructive and critical dialogue, and take the initiative needed to accomplish a shared goal.		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe Students will look at geoscience data in a wide variety of contexts to identify and explain patterns that show how Earth's climate is changing. Approx six 78 min classes	HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.	Students will understand that... - an increase in carbon dioxide levels causes a rise in the Earth's temperature. - environmental changes are the result of multiple causes.	Students should understand that the decisions they make can have positive and negative impacts on the environment. Students should understand the relationship between carbon emissions and the Earth's climate.
Unit 6 Earth's Energy	Long-Term Outcomes/Transfer Goals: Science Transfer Goal(s) ST.3: Students will be able to independently use their learning to engage in public discourse on science-related issues, using scientific reasoning and empirical evidence. Global Competency Transfer Goal(s) CT.2: Students will be able to reflect on their own thinking when presented with alternative points of view, and revise and/or reconsider their thinking. CO: Students will be able to respectfully engage with others in constructive and critical dialogue, and take the initiative needed to accomplish a shared goal.		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe Students will explore energy conservation	HS-PS3-1: Create a computational model to calculate the change in the energy of one	Students will understand that... Energy and matter are not created or destroyed; they	Students should understand that the Earth energy system is complex and subtle variations to one aspect can lead to drastic changes in other aspects of

through dimensional analysis, chemical energy, 1st and 2nd Laws of Thermodynamics, phase changes, and specific heat. Chemical energy will be explored as it relates to climate change and the energy balance on Earth. Approx eight 78 minute classes	component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. HS-PS3-4: Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics) HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. HS-ESS2-6 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.	undergo transformations from one form to another. there is a cause and effect relationship between the energy flow into, out of, and within Earth's systems resulting in observable environmental impacts.	the Earth's system.
Unit 7 Carbon Chemistry	Long-Term Outcomes/Transfer Goals: Science Transfer Goal(s) ST.2: Students will be able to independently use their learning to scientifically evaluate information to make informed decisions and/or design solutions. Global Competency Transfer Goal(s) CT.1: Students will be able to analyze and evaluate evidence, arguments, claims and beliefs to draw conclusions, make informed decisions, and solve problems.		

	CI: Students will be able to exhibit curiosity, imagination, flexibility, and perseverance in order to innovate and make valuable contributions to the community.		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe Students will explore the Earth’s atmospheric composition with an emphasis on how the production of carbon dioxide by the combustion of fossil fuels affects Earth’s climate. Stoichiometry will be utilized to help students make predictions about the amounts of carbon dioxide that is produced by specific alkanes. Approx twelve 78 minute classes	HS-PS1-7 Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth’s surface can create feedback that causes changes to other Earth systems. HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	Students will understand that... ● burning fossil fuels produce greenhouse gases which affect the Earth’s climate. ● combining chemicals in specific ratios leads to increased efficiency and minimized waste.	Students should understand that carbon dioxide produced from the combustion of fossil fuels impacts the Earth’s climate. Students should understand that the amount of products in chemical reactions can be predicted using stoichiometry. This knowledge can be used to help reduce the amount of greenhouse emissions at the personal and bulk scale.
Unit 8 Ocean Chemistry	Long-Term Outcomes/Transfer Goals: Science Transfer Goal(s) ST.2: Students will be able to independently use their learning to scientifically evaluate information to make informed decisions and/or design solutions. Global Competency Transfer Goal(s) CT.1: Students will be able to analyze and evaluate evidence, arguments, claims and beliefs to draw conclusions, make informed decisions, and solve problems. CI: Students will be able to exhibit curiosity, imagination, flexibility, and perseverance in order to innovate and make valuable contributions to the community.		
	Standards	Conceptual Overview	Rationale
Focus & Timeframe Students will	HS-PS1-5. Apply scientific principles and evidence to	Students will understand that...	Students should understand that dissolving different amounts of

explore properties of water including solubility, concentrations and solutions, and acids and bases to further explain environmental impacts of climate change such as ocean acidification. Approx seven 78 minute classes	provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	● patterns exist which allow scientists to predict if and how much a substance will dissolve . ● the amount of a substance dissolved in water can be quantified as concentration. ● solutions can be classified as acidic, basic, or neutral, each having different effects on the environment.	substances into water creates solutions with different concentrations. These solutions can be categorized into acids, bases or neutral and an understanding of these classifications along with the concentration can help predict how they can affect their environment.
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