Course Title:	**Chemistry B**	
Michigan High School Content Expectations for Chemistry		
Unit 9 Big Idea:	**Stoichiometry**	
Essential Questions	**1. What do we need to know to determine the amount?**	
Standards	**Assignment**	**Description**
C5.2d, C5.2f	Lesson 9.2: Stoichiometric Calculations	Students will be able to calculate the correct ratio of masses of the two chemicals needed for a reaction.
C5.2e	Lesson 9.3 Limiting Reactant and Percent Yield	Students will examine balanced equations considering these two terms: excess reagent and limiting reagent. Students will be able to identify the limiting reagent in a chemical reaction.
Unit 10 Big Idea	**Behavior of Matter**	
Essential Questions	**1. Why does different matter behave differently?**	
Standards	**Assignment**	**Description**
C2.2b, C2.2c	Lesson 10.1: Kinetic-Molecular Theory	Students will explore gases as particles, and the theory that explains why gases behave the way they do. Students will develop an understanding of the behavior of gasses and will explain the unique ways the gas particles move.
C4.5a, C4.5b, C4.5c, C1.1h	Lesson 10.2: Gas Laws	Students will be able to explain why different gases often behave the same way while they are greatly affected by temperature and pressure conditions. Students will solve word problems by examining and organizing information and selecting the proper gas laws to solve the problems.
C4.1a	Lesson.10.3: Ideal Gases	Students will learn more about ideal gases and how most gases are not quite ideal. Students will be able to identify the gases that would act more like ideal gasses. Students will conduct calculations

		by using the Ideal Gas Law formula PV=nRT to solve word problems to find out the pressure, the mole, and the temperature of the gases.
C2.2a, C2.2b, C3.3a, C3.3b	Lesson 10.4: Liquids and Solids	Using the kinetic-molecular theory, students will be able to explain how liquids and solids differ from gases and how those differences result in different properties. Students will apply their understanding of the kinetic molecular theory to explain the heat conduction in liquids and solids and how the heat transfers at the molecular level.
Unit 11 Big Idea	**Energy and Heat**	
Essential Questions	**1. What is heat?**	
Standards	**Assignment**	**Description**
C5.4a, C2.2f	Lesson 11.1: Heat Flow & Specific Heat	Students will study how heat flows between substances and learn about the specific heat value, which is the amount of heat required to raise the temperature of one gram of a given substance one degree Celsius. Students will be able to calculate the amount of heat transferred by using the specific heat value of a substance.
C2.2d, C2.2f	Lesson 11.2: Heat Transfer - Conduction and Convection	Students will learn about the transfer of heat, which substances transfer heat more effectively than others, and why we can cool down in water faster than in air.
C3.4c, C2.2d	Lesson 11.3: Enthalpy	Students will learn another term for heat, “enthalpy” and will use this term to refer to the amount of heat loss or gain. Students will calculate the change in enthalpy within a system.
C5:4b, C5.4d	Lesson 11.4:	Students will learn about the relationship

	Energy and Phase Changes	between enthalpy change (energy change) and phase change, and learn how to calculate the amount of heat lost or gained in phase changes. Students will use a simulation and investigate the heat loss or gain in phase changes of three different substances, create graphs of the temperature vs time, and interpret the data to solve problems.
C2.1a, C3.4a, C3.1c, C3.4d	Lesson 11.5: Energy Changes in Chemical Reactions	Students will learn about the change in energy in chemical reactions and what happens on a molecular level that results in a reaction either absorbing or giving off heat. Students will use the potential energy diagram to determine if the enthalpy is positive or negative, the energy of the reactants/products, the heat of reaction, etc. Students will interpret the chemical reaction equations to determine if the energy needed to break the bonds of a compounds or the energy given off when new bonds are formed. Students will be able to explain how a heat pack works and create an enthalpy diagram for the heat pack reaction.
C3.1a	Lesson 11.6: Hess's Law	Students will calculate the Heat of reaction using Standard Heats of Formation.
C2.2e, C3.4e, C3.4f	Lesson 11.7: Entropy and Spontaneous Reactions	Students will develop an understanding of the concept of entropy and the spontaneous reactions. Students will explain why entropy is high or low in given chemical reactions and physical changes of substances. Students will predict whether reactions are spontaneous or not by calculating $\triangle$

		G when given △H, T, and △S .
Unit 12 Big Idea	**Solutions**	
Essential Questions	**1. What makes a solution a solution?**	
Standards	**Assignment**	**Description**
C4.7a, C4.7b, C3.4g	Lesson 12.1: Solutions	The first step in studying solutions is to understand their composition. Students will learn to define a solution as a homogeneous mixture, including gasses and solids. Students will develop an understanding of solubility and concentration of a solution, and will learn to use the solubility curves graph to retrieve information. Students will also learn to calculate the concentration using different measurements of concentration, such as mass, volume percent, molality, or molarity.
C5.r1a, C5.r1b, C1.1h	Lesson 12.2: Properties of Solutions	Students will study the properties of solutions and learn about another class of properties called “colligative properties.” These are properties that depend on the amount of solute dissolved in a solvent but not necessarily on the identity of the solute. As the lesson progresses, students will learn how to calculate the melting point of the solution as well as learn how the solute affects other properties of solutions. Students will investigate how ethylene glycol used in automobile radiators work to protect against freezing and will use the investigation/calculation results to determine if a given concentration of

		ethylene glycol high enough to be used in a car radiator.
Unit 13 Big Idea	**Reaction Rate and Equilibrium**	
Essential Questions	**1. Why do different chemical reactions occur at different rates?**	
Standards	**Assignment**	**Description**
C5.3a, C5.3b, C5.3c	Lesson 13.2: LeChateleir's Principle	Students will investigate the factors affecting equilibrium and be able to predict in which direction a reaction will proceed in order to reach equilibrium.
Unit 14 Big Idea	**Acids and Bases**	
Essential Questions	**1. How are acids and bases different?**	
Standards	**Assignment**	**Description**
C5.7a, C5.7c, C5.7i	Lesson 14.1: Defining Acids & Bases	Students will learn to identify acids and bases by examining their formulas and names as well as by their properties. Students will also learn how to distinguish between Arrhenius and Bronsted-Lowry acids and bases and to identify and recognize conjugate acid-base pairs.
C5.7c, C5.7d, C5.7g	Lesson 14.2: pH and pOH	Students will learn how pH value tells us how concentrated acidic and basic solutions are, how to calculate pH values, and how to classify solutions as acidic or basic based on these pH values.
C5.7b, C5.7e, C5.7f, C5.7h, C1.2A, C1.2D	Lesson 14.3: Acid-Base Neutralization	Students will develop an understanding of the effect of neutralization by understanding the difference between strong and weak acids and bases, the amounts of each needed for neutralization, and the products obtained in a neutralization reaction. Students will write dissociation equations for the given strong acids and bases, write ionic equations and net ionic

		equations for the given reactions between strong acids and bases, and solve word problems. Given equations of acid rain, students will conduct online research on acid rain and discuss the issue of neutralizing acid rain.
Unit 15 Big Idea	**Nuclear Reactions**	
Essential Questions	**1. Can matter be created or destroyed?**	
Standards	**Assignment**	**Description**
C4.10e, C1.1A, C1.1B, C1.2B	Lesson 15.1: Discovery of Radioactivity	Students will learn what nuclear radiation is, why some isotopes emit radiation, and how to write the symbols for different isotopes of an element and for the radiation that is emitted. Students will investigate the radiation exposure in different situations and locations and discuss the issues of radiation exposure and its consequences by evaluating the investigation results.
C2.r5b	Lesson 15.2: Radioactive Decay	Students will learn about the types of radiation that can be emitted in natural radioactive decay, and we will learn how to use these in writing nuclear equations for the different types of decay.
C2.5a, C2.r5b	Lesson 15.3: Half Life and Radiocarbon Dating	Students will learn what half-life is and how to calculate the amount of a radioactive isotope remaining after a given time.
C2.r5d, C3.5a, C1.1A, C1.1B, C1.1E, C1.1i, C1.2A, C1.2C, C1.2D	Lesson 15.4: Fission and Fusion	Students will learn more about nuclear reactions that are initiated by scientists, nuclear energy, and how to identify

		nuclear equations for fission and fusion reactions. Topics include nuclear reactions and the law of conservation and the origin of elements found on Earth. Students will conduct online research on safety of nuclear energy, and present their objective argument with supporting evidence from their research.
Unit 16 Big Idea	**Introduction to Organic Chemistry**	
Essential Questions	**1. How can carbons be identified?**	
Standards	**Assignment**	**Description**
C4.2e, C5.8a, C5.8b	Lesson 16.1: Simple Hydrocarbons	Students will continue writing structures for simple compounds that contain hydrogen and carbon in this lesson, and learn how to name them.
C5.8c	Lesson 16.3: Reactions of Organic Compounds	There are several different reactions that can be used to build large molecules. Students will study two types of reactions: addition reactions and condensations reactions. By the end of this lesson, students will become familiar with some of the large organic molecules contained in materials that they use on a daily basis and which reaction is used to synthesize them.
Unit 17 Big Idea	**Oxidation, Reduction & Electrochemistry**	
Essential Questions	**1. How can electrons be responsible for chemical reactions?**	
Standards	**Assignment**	**Description**
C5.6a	Lesson 17.1: Defining Oxidation and Reduction	Students will be able to identify oxidizing and reducing agents in the redox (oxidation-reduction) reactions.
C5.6b	Lesson 17.2: Oxidation Numbers	Students will broaden their understanding of oxidation and reduction in this lesson by considering molecular

		compounds. Students will evaluate all types of chemical reactions to see if oxidation and reduction are occurring. Students will also study corrosion and relate it to what we know about oxidation and reduction.
C5.6b, C5.6c, C5.6d, C5.6e	Lesson 17.3: Electrochemistry	Students will learn how to identify the parts of an electrochemical cell, determine at which electrode oxidation or reduction takes place, and calculate the cell potential. Students will design a voltaic cell using magnesium as one of the electrodes and by selecting another element for the other electrode. Students will explain why they selected the element including the activity of the metal and the spontaneous reaction. Students will then calculate the chemical potential of the cell.
C5.8c: Recognize that proteins, starches, and other large biological molecules are polymers.	Lesson 16.3: Reactions of Organic Compounds	Given a chemical equation, students will identify which type of reaction it represents by following classification strategies. Students will investigate what substance is produced when vinegar and baking soda is mixed by balancing the chemical equation and interpreting the data given.