Scope and Sequence – Chemistry II B

2014-15

Course Chem II A (.5 credits)

Instructor(s)	Capi Marceau, Joe Ruwitch,
Text	*Chemistry by Addison - Wesley*
Prerequisite	Algebra 1 and Physical Science Matter with a B or better
Grade	11-12 (10^{th} only with instructor permission)
Course Description	Chemistry II is a college preparatory course with an in-depth study of the atom, elements, compounds and the periodic table. Additional topics include chemical reactions, moles and stoichiometry. Laboratory activities are a critical component of the course. This course is designed to meet and in many areas exceed the OSA standards and benchmarks in physical science, science concepts and processes, history and nature of science, and scientific inquiry. This course will also prepare the student for further study in the advanced courses in Chemistry.
Units	**Unit 1** (3 weeks): Stoichiometry – topics include: mole ratios in chemical reactions, stoichiometric calculations, limiting reactants, and percent yield. Content Standards Covered (Codes only): H.3S.1, H.3S.2, H.3S.3, H.1P.1, H.2P.1 CCSS Literacy Standards Covered (Codes only): See NGSS NGSS: HS-PS1-2
	Unit 2 (3 weeks): Energy – topics include: thermochemistry, calorimetery, phase change, latent heat of fusion and vaporization calculations, and absolute zero. Content Standards Covered (Codes only): H.3S.1, H.3S.3, H.2P.1, H.2P.2, H.3S.1, H.3S.2, H.3S.3, H.3S.5 CCSS Literacy Standards Covered (Codes only): See NGSS NGSS: HS-PS1-4
	Unit 3 (3 weeks): Gas laws – topics include: Boyle's Law, Guy Luassac's Law, Charles Law, Daltons Law, Ideal gas laws, and molar volume of gases. Content Standards Covered (Codes only): H.1P.1, H.1P.2, H.2P.1, H.3S.3, H.3S.5 CCSS Literacy Standards Covered (Codes only): See NGSS NGSS: HS-PS1-5
	Unit 4 (3 weeks): Solutions – topics include: aqueous solutions, molarity, molality, equilibrium reactions, Haber process, strong and weak acids, and pH calculations and titrations. Content Standards Covered (Codes only): H.2P.2, H.3S.1, H.3S.2, H.3S.3, H.3S.5 CCSS Literacy Standards Covered (Codes only): See NGSS NGSS: HS-PS1-5, HS-PS1-6
EA Opportunities	None
CRLE Opportunities	None
Work Sample(s) or Performance Task Opportunities	None

Unit 1:	Stoichiometry
Time Frame	3 weeks
Summary of Unit	Students will further investigate the concept of the mole in chemistry. Being the cornerstone of chemical computation the mole is an essential element of the study of chemistry. Students will use molar ratios to determine theoretical yields for deferent reactions, including reactions where there is a limiting reactant. Based on the chemical equations and stoichiometric calculations students will predict the mass of product, number of molecules, or volume of gas expected to be produced in a chemical reaction.

NGSS Content Standards	Standard's Code	Standard
	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.**
CCSS Literacy Standards	Imbedded in NGSS:	**WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-2),(HS-PS1-5) **WHST.9-12.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-PS1-2) **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7) **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7)
Major Assignments/ Learning Activities	• Lab: Molar ratio – $NaHCO_3$ and NaCl • Lab: Quantitative analysis – Fe and $CuCl_2$	
Common Summative Assessments	Unit 1 Test	
Performance Tasks or Work Samples	None	
Materials	You will need a supply of paper, pen with blue or black ink and/or pencil, calculator, and a composition lab book that is graph paper ruled.	

Unit 2:	Energy	
Time Frame	3 weeks	
Summary of Unit	This unit will investigate chemical potential energy. Both exothermic and endothermic reactions will be studied. Phase changes and the energy of phase changes are an additional area of study Students will write balance and calculate using thermo equations. The units of energy in Joules and calories will be discussed and used during this unit. Student will also examine personal energy use and examine energy issues facing our society.	
NGSS Content Standards	Standard's Code	Standard
	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.**
CCSS Literacy Standards	Imbedded in NGSS:	**SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-PS1-4) Mathematics – **MP.4** Model with mathematics. (HS-PS1-4) **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7) **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. (HS-PS1-4),(HS-PS1-7) **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7)
Major Assignments/ Learning	• Lab: Calorimeter – Peanut lab • Lab: Heat of Fusion of Ice	

Activities	
Common Summative Assessments	Unit 2 Test
Performance Tasks or Work Samples	None
Materials	You will need a supply of paper, pen with blue or black ink and/or pencil, calculator, and a composition lab book that is graph paper ruled.

Unit 3:	Gas laws	
Time Frame	3 weeks	
Summary of Unit	Gases, unlike solids and liquids, have neither fixed volume nor shape. There are three variables, which affect gases: pressure, volume, and temperature. This unit will allow students to explore and investigate the relationships between these variables.	
NGSS Content Standards	Standard's Code	Standard
	HS-PS1-5	**Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.**
CCSS Literacy Standards	Imbedded in NGSS:	**RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS1-5) **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-2),(HS-PS1-5) **MP.2** Reason abstractly and quantitatively. (HS-PS1-5),(HS-PS1-7) **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7) **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7)
Major Assignments/ Learning Activities	• Lab: Boyles law • Lab: Gay Luassac's law • Molar volume of a gas • Rockets H_2 and O_2	
Common Summative Assessments	Unit 3 Test	
Performance Tasks or Work Samples	None	
Materials	You will need a supply of paper, pen with blue or black ink and/or pencil, calculator, and a composition lab book that is graph paper ruled.	

Unit 4:	Solutions
Time Frame	3 weeks
Summary of Unit	Nearly every chemical reaction takes place in homogeneous mixtures called solutions. Therefore, we must understand the properties of solutions before we can even begin to understand those reactions. Perhaps the most salient characteristic of a solution is its concentration--how much solute is dissolved in what amount of solvent.

	Acids, bases, and pH will also be introduced in this unit. Students will have an opportunity to investigate these properties in lab and complete titration reactions to determine the pH of a solution.	
NGSS Content Standards	Standard's Code	Standard
	HS-PS1-5	**Apply scientific principles and evidence to 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.***
CCSS Literacy Standards	Imbedded in NGSS:	**RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-PS1-5) **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-PS1-2),(HS-PS1-5) **WHST.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-PS1-6) **MP.2** Reason abstractly and quantitatively. (HS-PS1-5),(HS-PS1-7) **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7) **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-PS1-2),(HS-PS1-4),(HS-PS1-5),(HS-PS1-7)
Major Assignments/ Learning Activities	• Lab: pH Introduction lab – household pH • Lab: pH micro scale titration • Lab: Acid / base titration	
Common Summative Assessments	Unit 4 Test	
Performance Tasks or Work Samples	None	
Materials	You will need a supply of paper, pen with blue or black ink and/or pencil, calculator, and a composition lab book that is graph paper ruled.	