CHEMISTRY

4325

June 2008

CHEMISTRY				
Course Description:	Chemistry 4325 is recommended for 11 th or 12 th grade students who plan to attend college, but not major in a scientific field. This course is generally taken as a third science credit. In this course, chemistry topics are approached in a less mathematical and theoretical manner than Chemistry 4320.			
Grade Level:	11-12			
Length of Course:	Frequency: 7 periods per 6 day cycle Duration: 44 minutes Length: full year course Credits: 1			
Prerequisites:	Algebra I			
Textbook:	World of Chemistry (Zumdahl, Zumdahl, DeCoste)			
Expected Level of Achievement	Students will be required to maintain a 70% or better. They will be required to come to class prepared to learn. 93-100% = A 85-92% = B 77-84% = C 70-76% = D Below $70\% = F$			

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Chemistry Essentials (Language of Chemistry) (p. 1 of 2)		
Key Learning(s):	Standard processes, terminology, laboratory equipment and techniques, data collection and safety concepts are essential tools for learning and practicing chemistry.		
Essential Question(s):	What is chemistry? How is my life touched daily by chemical processes? What vocabulary, tools and techniques must I use to study chemistry? How do I collect and manage data in the lab? How must I be safe when using dangerous materials and reactions?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.1.12 B	Apply concepts of models as a method to predict and understand science	The student will use appropriate vocabulary terms in all written and spoken work.	"Universe Flow Chart" puzzle of vocab.	Text: World of Chemistry
3.1.12 C	and technology. Access and apply patterns in science and technology.	The student will properly select and safely use available scientific tools. The student will keep a well maintained class notebook	Lab: Intro to Lab Equipment Color-coded map of the classroom storage area.	 Diagram/usage page. Equipment on display. Colored pencils or markers. Ruler.
3.4.12 A	Apply concepts about the structure and properties of matter.	The student will locate and discuss lab data from a well maintained a laboratory notebook ("lab book.")	Laboratory Safety Guideline Sheet Students may use the notebook	 Lab book (diary) Category labels Equipment to sort Lab book
3.4.12 B	Apply and analyze	The student will create and manage an	and/or lab book as resources for certain tests and quizzes at the	Student Notebook

	energy sources and	electronic notebook of class handouts	discretion of the teacher.	Lab instruction sheets
3.4.12 C	conversions. Apply the principles of motion and force.	and assessments. The student will utilize the Scientific Method whenever working in the lab.	Lab: Burner	Class discussion
3.7.12 B	Evaluate appropriate instruments and apparatus to accurately	The student will evaluate and respect the need for safe handling of equipment and chemicals, especially the use of safety glasses during labs	Lab: Balance Inquiry: Paper Towel Absorbency	Chemicals and other consumables Instructions given on an
3.6.12 B	Analyze knowledge of information technologies of	The student will validate the need to conduct one's self in a safe and calm manner at all times during laboratory experiences.	Lab reports with valid data, calculations, error analysis, graphical analysis and conclusions.	"as needed basis" for equipment used infrequently.
	processes encoding, transmitting, receiving, storing,	The student will facilitate the learning of others through serious work within a pair or small group	Teacher and peer review	Dynamics (lab "partners")
	retrieving and decoding.	The student will manage and maintain the		of partner expectations.
3.4.12 A	Apply concepts about the structure and	system developed by the teacher to display and store equipment and chemicals available for student use in the classroom.	Quizzes Unit Test	Signs and reminder notes throughout the classroom
2 2 1 2 P	properties of matter.	The student will demonstrate knowledge and practice writing skills through the	Lab Practical (Semester I Performance Assessment)	Samples to view.
3.2.12 Б	Evaluate experimental information for appropriateness and adherence to relevant science processes.	 preparation of organized lab reports including the following sections: Essential Question Tools & Techniques Data & Diagrams Calculations & Graphs Sources of Error 		Supplemental Text
3.1.12 C	Assess and apply patterns in science and technology	 Percentage of Error Vocabulary Conclusions Questions 		
		Throughout the course, the student will design and perform experiments to collect sufficient data to allow for valid conclusions to be drawn.		

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Quantifying Matter (p. 1 of 2)		
Key Learning(s):	Chemists use the concept of the "mole" to measure and compare matter. The Metric System is utilized for all scientific measurement. All measurements contain a degree of uncertainty. Scientists deal with very large or very small numbers using "Scientific Notation."		
Essential Question(s):	How can matter be measured and the results communicated clearly to others? How can very small or large numbers be easily recorded and manipulated? What metric prefixes will I encounter in everyday measurements?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.1.12 A	Apply concepts of	The student will use the seven basic SI units and	Metric "Walk Around"	Texts: World of
	systems,	prefixes of the metric system including mega, kilo,	involving actual samples	Chemistry
	subsystems,	deci, centi, milli, micro, and nano.	of various metric	
	to solve complex		measures as they relate to	Teacher-generated
	technological	The student will manipulate values in both decimal	English measures.	materials
	problems.	and scientific notation using a scientific calculator.		
	proceedings		Discussion and practice.	Student supplied samples
3.1.12 B	Apply concepts of	The student will employ metric units of measure		for discussion
	models as a method to predict and understand science	for problem solving as well as in written and	Graphic organizer of	
		verbal communication of lab data.	English/Metric unit comparisons	Internet Resources
	and technology.	The student will perform calculations with metric	-	CFF Resources
		units and round off answers utilizing the rules of		
		"Significant Figures" for addition, subtraction,	Lab: Density	Computers and probes
3.1.12 C	Access and apply	multiplication and division.		
	patterns in science			Scientific Calculator
	and technology.	The student will perform unit conversions utilizing		
		the "Factor Label" problem solving method.		Film: Measurement

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Physical and Chemical Changes in Matter (p.1 of 2)		
Key Learning(s):	Matter can be altered physically yet retain its identity. Matter that is changed chemically becomes a new substance. Energy is required for either type of change.		
Essential Question(s):	How can the matter be changed yet keep its identity? How is new matter created? Can either type of change be reversed? Will the quantity of matter be altered by these changes?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.1.12 B	Apply concepts of models as a method to predict and understand science and technology.	The students will brainstorm and identify types of physical properties and changes using photo collages. The student will analyze physical and chemical changes in multiple lab experiences throughout the year.	Lab: FeS Lab: Chalk vs. Baking Soda Lab: Law of Conservation	Text: World of Chemistry Teacher-generated materials (photo collages, etc.) Student supplied samples
3.1.12 C	Access and apply patterns in science and technology.	The student will identify and discuss devices that cause physical and chemical changes in print media and on- line. The student will demonstrate that changes can be	of Matter Lab: Mixtures Inquiry: Purification of "Dirty" Water	for discussion Internet Resources CFF Resources
3.1.12 E	Evaluate change in nature, physical systems and man-made systems.	balanced ("equilibrium") such that no visual change is noticed (ex: water into and out of pierced cup = same water level but new molecules in the cup.)The student will review the Universe Diagram from their Essentials Unit to allow for that vocabulary to be used in new ways on reports and in conversation.	Demo: Distillation of "Dirty" Water Lab reports with valid data, calculations, error analysis and conclusions.	Computers and probes Supplemental Text

3.4.12A	Apply concepts	The student will give examples to compare and relate	Teacher and peer review	
	about the	these laws of nature:	-	
	structure and	Conservation of Matter	Class discussions	
	properties of	(= "Matter is neither created nor destroyed")		
	matter.	Conservation of Energy	Quizzes	
		Conservation of Mass-Energy		
3.2.12 A	Evaluate the		Unit Test	
	nature of	The student will analyze a recipe for evidence of		
	scientific and	physical and chemical changes		
	technological			
	knowledge.	The student will differentiate among elements,		
		compounds and mixtures through appropriate verbal		
3.2.12 B	Evaluate	and written expression.		
	experimental			
	information for	The student will analyze various mixtures and discuss		
	appropriateness	unique qualities of each (solution, suspension, colloid.)		
	and adherence			
	to relevant	The student will locate or create illustrations of		
	science	mixtures on the molecular level.		
	processes.			
		The student will select and apply appropriate lab		
3.2.12 E	Evaluate	techniques to separate parts of a mixture (distillation,		
	change in	decantation, chromatography, filtration, etc.)		
	nature,			
	physical	The student will research methods of water purification.		
	systems and			
	man made			
	systems			

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Heat and Temperature (p. 1 of 2)		
Key Learning(s):	Heat and temperature have different meanings and measures. Heat cannot be measured without knowing how temperature has changed. Heat comes in many forms that change matter.		
Essential Question(s):	What are the three most commonly used temperature scales? How are the Celsius and Kelvin scales related? How can heat be collected and measured? How does heat cause change in a given substance?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
		The student will recognize and generate kinetic and	Lab: Heat of Fusion of Ice	Texts: World of
3.1.12 D	Analyze scale	potential energy examples from his/her own life.		Chemistry
	as a way of		Lab: Heat of Fusion of	
	relating		Wax	Teacher-generated
	concepts and	The student will utilize only metric measures of		materials
	ideas to one	temperature in any and all lab exercises.	Lab: Moth Crystals (=	
	another by		melting/freezing points)	Reference Tables
	some	The student will be able to convert Celsius to Kelvin		
	measure.	(°C = K + 273) and discuss the need for the Kelvin	Lab: Energy Content of	Internet Resources
2 1 12 5		scale of proportional temperature ("Absolute Zero"	Common Foods	
3.1.12 E	Evaluate	concept.)		CFF Resources
	nature physical		Lab: Specific Heat	
	systems and	The student will converse about and assign heat involvement	Capacities of Metals	Computers and probes
	man-made	to phase changes among solids, liquids and gases including:		
	systems.	melting, freezing, boiling, evaporating, condensing,	Graphs	Supplemental Text
2 4 12 D	5	solidifying, liquefying, subliming, desubliming.		
3.4.12.B	Apply and	The student will use engaging when we approximate	Daily Homework	
	analyze	The student will use appropriate units when measuring,		
	energy	calculating and discussing temperature or neat.	Problem Worksheets	
	sources and	The student will use tables to select appropriate		
		The student will use tables to select appropriate	Quizzes	

conversions and their relationship to	mathematical constants to solve problems involving: Heat of Fusion (HF), Heat of Vaporization (HV) and Specific Heat Capacity (SHC) for numerous substances	Unit Test	
heat and temperature.	(especially those for pure water.)The student will create and analyze graphs of HF, HV and SHC for various substances.The student will analyze graphs of vapor pressure vs. temperature using data tables for water and other various substances.		

Northern York County School District Curriculum			
Course Name: Chemistry 4325 (p. 1 of 2)			
Content:	Atomic Structure		
Key Learning(s):	ey Learning(s): Matter is made of atoms that cannot be subdivided. Three subatomic particles exist for all atoms. All atoms of a give element have the same atomic number (# protons.) Waves of light can be used to study the structure of the atom.		
Essential Question(s):	What are atoms made of? How are atoms differentiated from one another? How can light be used to identify and map the structure of an atom?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.1.12 B	Apply concepts	The student will identify, name, describe and locate	"Quark Adventure" (on-	Text: World of Chemistry
	of models as a	by position these major subatomic particle of an	line) + Worksheet:	
	method to	atom: electron, proton and neutron.	Fundamental Particles	Teacher-generated

	predict and			materials
	understand	The student will discuss brief history of discovery.	Worksheet: Inside the	Student White boards
	technology	The student will utilize a computer program to	Atom	Student while boards
	teennology.	recognize the existence of yet smaller subatomic	Create a visual to	Reference Tables
	Analyze scale as	particles: quark, meson, baryon, neutrino, gluon.	compare relative sizes and	
3.1.12 D	a way of relating		distances of subatomic	• Spectrum Wall
	ideas to one	The student will construct Bohr Models of various	particles in atoms.	Chart
	another by some	atoms.	Rutherford's Gold Foil	 Spectrum tubes Bower supply
	measure.	The student will correctly use these terms in written	Experiment	 Power supply Spectroscope
		and verbal discussions: atomic number, atomic mass,	L	• speedoseope
	Evaluate change	mass number.	Worksheet: Inside the	Internet Resources
3112E	physical systems	The student will select proper values for examples	Atom (cont)	
5.1.12 L	and man-made	chosen by teacher.	Crossword	Reading: Hot Shirts (Chem Matters 1992)
	systems.			Sample Venn diagrams
	Apply concepts		Venn diagrams (ex:	
3.4.12 A	structure and	The student will describe similarities and difference	Isotopes of Cu)	CFF Resources
	properties of	terms "nuclide" and "nucleon" properly	Lab: Flame Tests	Commutan
	matter.	terms nuende und nueleon property.		Computers
	A	The student will define: electromagnetic spectrum	Lab: Electromagnetic	
	Apply advanced	and spectroscopy as studied with the Bohr atom.	Spectrum and Spectral	
3712A	and techniques	The student will state the meanings of the terms:	Lines	
5.7.12 11	to answer	"wavelength, frequency and energy" as they apply to	Report on a reality topic	
	complex	the colors of light emitted by de-excited atoms.	such as: Fireworks,	
	questions.		Lasers, Neon signs, Bar	
	analyze energy	The student will identify the variables in the equation $E_{\rm e}$ b) and f).	Codes, Fluorescent lights, CD players I asik	
	sources and	equations: $E = n\lambda$ and $i\lambda = v$	surgerv. etc.	
3.4.12 B	conversions and	The student will map simple electron levels (ex: He		
	their relationship	$= 1s^2 2s^2$) by relating patterns to Periodic Table	Daily Homework	
	temperature	arrangement and location of element.	Problem Workshoots	
	temperature.	The student will calculate average atomic masses		
	Analyze physical	and relate them to isotopic mixtures.	Quizzes	

	technologies of structural design,	Unit Test	
3.6.12 C	analysis and engineering, personnel relations.		
	financial affairs, structural production,		
	marketing, research and design to real world		
	applications.		

Northern York County School District Curriculum		
Course Name:	Chemistry 4325	
Content:	Nuclear Chemistry (p. 1 of 2)	
Key Learning(s):	Radiation comes to us from the sun as well as from radioactive materials. There is much energy available in the nuclei of atoms. The use of nuclides in medicine and industry can have benefits as well as dangers.	
Essential Question(s):	How is electromagnetic radiation used in our everyday lives? What does it mean for something to be "radioactive?" What dangers and benefits do the use of nuclear radiation pose? What really happened in the 1979 TMI accident? How does a nuclear reactor work?	
Grade Level:	11-12	

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.4.12 A	Apply concepts about the structure and properties of matter.	The student will identify isotopic nomenclature and draw various isotopic Bohr Models.	L: Isotopes & Half Life Advancing Science Van Visit: Radiation and Half	Texts: World of Chemistry Teacher-generated
3.5.12 A	Analyze and evaluate earth features and processes that change the earth.	The student will represent half-life decay via graphs and charts. The student will calculate amounts of radioactive isotope remaining after a given time period of decay.	Life Half-Life Graphs Sketch of the parts of a	materials PowerPoint: Let's Build a Nuclear Reactor
3.1.12 E	Evaluate change in nature, physical systems and man made systems.	The student will differentiate among properties of major radiation types (α , β , γ , Xray) The student will balance nuclear equations and	nuclear reactor. "KWL" graphic organizer for hazards.	 Half Life Lab instructions Pennies (pre and post- 1982 Balance
3.4.12 B	Apply and analyze energy sources and conversions and their relationship to heat and temperature.	denote type of radiation involved in each. The student will differentiate properties among all seven forms of electromagnetic radiation: radio-TV, microwaves, IR, visible, UV, Xray,	Student research on some aspect of electromagnetic radiation (student choice by interest.)	 Graph paper Reference tables

3.6.12 C	Analyze physical technologies of structural design.	gamma.	Class participation in	Reactor Overheads
	analysis and engineering, personnel	The student will research and discuss the effects of radiation used in our daily lives (ex: radar	and health issues.	Textbook diagrams
	relations, financial affairs, structural	microwave ovens, sunburn, remote controls.)	Student TMI research documentation.	KWL blank
	research and design to real world	The student will research and discuss health benefits and detriments of nuclear isotopes and other forms of radiation used for medicinal	Daily Homework	Personal research Pair and Share information
	applications.	purposes. (ex: MRI, Xrays, tracers)	Problem Worksheets	GPU Info
	Analyze the use of renewable and	The student will participate in a class discussion of nuclear reactor parts, materials, construction	Quizzes	Video: TMI Accident
4.2.12 A	nonrenewable resources.	and operation.	Unit Test	TMI News Reports
	Analyze factors	The student will explain the operation of the reactor to produce usable energy in the form of		Reference Tables
4.2.12 B	arrecting the availability of	electricity to our homes.		Internet Resources
	nonrenewable resources.	The student will research and discuss benefits and detriments of usage of nuclear isotopes as an		CFF Resources
	Evaluate solid waste	alternative power source to fossil fuels.		Computers
4.2.12 D	management practices.	The student will research the TMI accident and others and follow-up details.		
4 3 12 A	Analyze the complexity of environmental health	The student will investigate health and environmental hazards and impacts associated		
1.5.1211	issues.	with nuclear power.		
4.3.12	Analyze the local, regional and national impacts of environmental health			

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Periodic Table (p. 1 of 2)		
Key Learning(s):	The Periodic Table is arranged by atomic number and electron configuration. Elements on the table fall into categories by their behavior during chemical reactions. Atomic masses are the average mass of one mole of that element.		
Essential Question(s):	Why does such an oddly arranged table make logical sense to chemists? How can an element's behavior be predicted by its location on the table? Why are the elements on the edges of the table the most reactive ones? How are atomic masses determined?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.1.12 B	Apply concepts of models as a	The student will observe samples of real elements and typical element chart.	Lab: Little Things	Texts: World of Chemistry
	method to predict and understand	The student will review: Atomic Structure basics (Inside the Atom)	Lab: Mole & Mass Relationships	Teacher-generated materials
	science and technology.	The student will review the Mole Concept as it applies to individual atoms and illustrate what a "little thing" means. (ex: atoms or molecules are far too little to count	L: Metals Worksheet: Counting	Map criteria sheetMap blankColored pencils or
3.1.12 C	Access and apply patterns in science and technology.	The student will create a computer spreadsheet to calculate numbers of each subatomic particle (p ⁺ , e ⁻ , n) for any given atom asked.	atoms (mole concept.) Worksheet: Inside the Atom (review)	 markers Personal class notes Sample maps
3.1.12 D	Analyze scale as a way of relating concepts and ideas to one another by some measure.	The student will correctly discuss the location of a given element using the terms for the table: Row, Period, Series (horizontally) and Family, Column, Group (vertically)	Participation in "Mole Day" celebration (=Oct 23 rd)	 Computer sample Reference tables Reference Tables

3.4.12 A	Apply	The student will use element behaviors to classify into	Construct a keyed "map"	Student supplied samples
	concepts	following categories:	of the periodic table	for discussion of mole
	about the	metal, nonmetal, metalloid, inert ('noble gas")	analogous to a map of the	concept.
	structure and		U.S. showing major	
	properties of	The student will use element behaviors to classify into	chemical data (families,	Internet Resources
	matter.	families and review family names (Ex: alkali, noble	periods, phases, etc.)	
		gas, etc.)		CFF Resources
	Analyze		"Family" Report on five	
3.6.12 B	knowledge of	The student will complete the element "	elements from a given	Computers
	information	Fact Sheet" of characteristics and data of common	chemical family in one	
	technologies	elements in their daily life (ex: copper, iron, radon)	assigned column of	
	of processing,		Periodic Chart including	
	encoding,	The student will learn 7 diatomic elements	charts of properties as	
	transmitting,	$(H_2, N_2, O_2, F_2, Cl_2, Br_2, I_2)$ to be recalled later when	well as interesting facts	
	receiving,	balancing chemical equations.	about these elements.	
	storing,			
	retrieving and		Class participation.	
	decoding.			
	Analyze and		Daily Homework	
	evaluate earth			
3.5.12 A	features and		Worksheets	
	processes that			
	change the		Quizzes	
	earth.			
			Unit Test	

Northern York County School District Curriculum		
Course Name:	Chemistry 4325	
Content:	Compounds, Bonding & Nomenclature (p. 1 of 3)	
Key Learning(s):	Elements form bonds to create compounds by using their valence electrons. Bonds can be ionic (give & take,) or covalent (share.) Metals typically donate valence electrons (= cations) while non-metals take (= anions) or share. Compounds are named by a specific set of rules that will identify their bond type. The shapes of molecules depend on their number and types of bonds.	

Essential Question(s):	How are valence electrons involved in making compounds? What does the name of a compound tell about its structure? How can a model be used to represent a molecule? How does the shape of a molecule affect its physical and chemical properties? What do the numbers of atoms in a formula tell about its composition?
Grade Level:	11-12

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.1.12 A	Apply concepts of systems,	The student will draw electron dot models from Bohr models showing only valence electrons (up	Lab: Paperclip Formulas (shapes of molecules)	Texts: World of Chemistry
	subsystems, feedback and	to 8 in number.).	Lab: % Water in Foods (data and calculations	Paperclip setFormula list
	control to solve complex technological	The student will complete Packet: Chemical Bond and Electron Dot Model review.	from each type of food tested.)	Colored pencils Magnet set
	problems.	The student will complete Property Chart: Ionic, Covalent, Metallic and Network and use it to	Lab: Hydrated Crystals	Formula practice sheets
3.1.12 B	Apply concepts of models as a method to predict and	differentiate between behaviors of common substances.	Activity: Making Plaster of Paris	 Whiteboards Reference tables of
	understand science and technology.	The student will recognize a list of compounds by their common names and formulas (ex: vinegar,	Demo: MgO	 Markers Scrabble" game
		baking soda, table salt)	Lab: Breaking Compounds	piecesScore sheets
3.1.12 C	Access and apply patterns in science	The student will identify presence of intermolecular forces that affect behaviors and	Computer spreadsheet: Formula Masses and	Lab instructions & equipment
3.1.12 E	and technology. Evaluate change in	phase of pure substances: Van der Waals and polarity (group activity)	Names	Fruits & vegetables (students supply)
	nature, physical systems and man-	The student will create compounds using Ion Magnets on board (+ and – fit)	Sheets (class participation)	• Food dehydrator
3.4.12 A	made systems. Apply concepts about the structure and properties of matter.	The student will differentiate between cations (+) and anions (-) and select elements that will form each by their Periodic Table positions.	Home survey of household chemical storage (kitchen, garage,	 Various brands of candy (M&Ms, Smarties, etc) Calculator Balance

3.6.12 B	Analyze knowledge of information technologies of processing, encoding, transmitting,	The student will recognize and identify polyatomic ions by structure and name using reference table provided to write proper names and formulas for compounds according to set rules.	etc) Drawings of molecules with additional examples that fit each structural pattern	Common compound list Various household chemicals • Household chemicals (personal) • Advertisements
	receiving, storing, retrieving and decoding.	The student will use the "type" designations (ex: Type I = Binary Ionic) in the text to write proper names based on bond type.	Whiteboard performance with magnets. Whiteboard "show & tell"	Chemical Labels (personal)
	Evaluate the effectiveness of computer software	The student will use the Formula Scrabble game cards (along with reference tables) on whiteboards to create and name specific compounds from their	for formulas written in class.	Student supplied samples for discussion
3.7.12 D	to solve specific problems.	formulas.	Practice sheets	Teacher-generated materials
	1	The student will create their own formulas and	Computer generated	
		write appropriate names for each.	tables for multiple	Supplemental Text
		The student will perform formula mass	formula and formula mass	internet Resources
		calculations for chosen compounds.	Computer generated	CFF Resources
		The student will complete Worksheet: % composition and pie graphs of compounds	tables for multiple compounds including formula, formula mass	Computers
		The student will complete Worksheet: Empirical formula from % data	and % composition and corresponding pie graphs.	
		The student will write empirical and molecular formulas from the reverse of each.	Lab: Candy Math (pieces of candy represent atoms to form ionic compounds)	
		The student will contribute labels to class	Class Participation	
		investigation of household chemicals.	Daily Homework	
			Problem Worksheets	
			Quizzes	
			Unit Test	

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Chemical Reactions (p. 1 of 2)		
Key Learning(s):	Chemical reactions are statements of what occurs during a chemical change and must be balanced to satisfy the Law of Conservation of Matter. Stoichiometry is used to predict the amount of any participating substance or energy content involved in the change.		
Essential Question(s):	Are chemical reactions predictable? How do the rules of formula writing come into play when predicting and balancing reactions? How is the mole used to calculate quantities of substances in a reaction? How can the phase of a substance be indicated in a reaction? How do batteries work?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
	Apply concepts of	The student will identify the reactants and products	Lab: Styles of Reactions	Texts: World of
3.1.12 B	models as a	of any reaction.		Chemistry
	method to predict		Lab: Logic (DR style)	
	and understand	The student will use appropriate notation for		Teacher-generated
	science and	phases of matter in equations.	Lab: Electrochemical Cell	materials
	technology.		(SR style)	
		The student will identify if reactions are		Calculator
3.1.12 C	Access and apply	exothermic or endothermic and place energy term	Drawings of cells not	
	patterns in science	appropriately, using tables for values as needed.	previously viewed and	Reference Tables
	and technology.		answers for a series of	
		The student will write word equations from written	questions about each.	Student supplied samples
2112 0		descriptions of changes in matter, convert word	(whiteboards and quiz)	for discussion
3.1.12 E	Evaluate change in	equations to formula equations and balance		
	nature, physical	equations to show conservation of matter.	Packet: Actual Cell	Internet Resources
	systems and man-		Construction	
	made systems.	The student will recognize five styles of reactions:		CFF Resources
		composition, decomposition, single replacement,	Demo: Electrolysis of	

		double replacement, combustion.	Water	United Streaming video
3.2.12 A	Evaluate the nature of scientific and	The student will predict and complete reactions having missing or improper information.	Demo: Electroplating	Computers and probes
3.4.12 A	Apply concepts about the structure and properties of matter.	The student will utilize stoichiometric relationships to do mole calculations involving: Mass to Mass, Mass to Volume and Volume to Volume. The student will identify oxidation-reduction reactions and balance simple ones by assigning oxidation numbers to free elements and to those within simple compounds	Class Discussion of Demonstrations Daily Homework Problem Worksheets Class Participation	Supplemental Text
3.4.12 B	Apply and analyze energy sources and conversions and their relationship to heat and temperature	The student will define and draw wet cell batteries. Labeled parts will include: anode, cathode, salt bridge, ionic solutions involved, voltmeter, and direction of e- flow.	Quizzes Unit Test	
4.3.12 A	Analyze the complexity of environmental health issues	The student will predict spontaneous electrochemical reactions between materials and determine the maximum voltage possible for each combination. The student will distinguish between common battery types noting voltage differences and uses for each size and shape.		

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Solutions (p. 1 of 2)		
Key Learning(s):	Solutions are homogeneous mixtures with constant properties. Concentration can be measured in many ways with molarity being the preferred unit for chemists. Graphs are useful in discussing the properties of solutions. Not all liquid mixtures are solutions.		
Essential Question(s):	How will I know if a solution has formed? How can I determine the concentration of a solution? What information can I infer from a Solubility Curve? Why and how are the colligative properties of a solvent changed by the addition of a solute?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
	Apply concepts		Group Activity: Find	Texts: World of
3.1.12.B	of models as a	The student will appropriately use the following	examples of the nine	Chemistry
	method to	terms in written and verbal discussion: solution,	combinations.	
	predict and	solute, solvent, and solvation (hydration)		Teacher-generated
	understand		Lab: Solubility Curves	materials
	science and	Identify water as the "universal solvent" = aqueous		
	technology.	solutions	Interpret: Solubility	Teacher and student-
			Curves with Student-	supplied examples of
3.1.12 D	Analyze scale as	The student will list and give examples of the 9	generated Questions.	liquid mixtures for
	a way of relating	phase combinations that can result in solution		discussion
	concepts and	creation.	Interpret: Tables of	
	ideas to one		Solubility vs. Solubility	Several crystalline
	another by some	The student will distinguish between "miscible and	Curve Graphs	samples +
	measure.	immiscible," relating polarity to miscibility (review		
3.1.12 E	Evaluate change in	of bonding concepts)	Lab: Logic (Predicting	Lab supplies and
	nature, physical		precipitates and	equipment.
	made systems	The student will describe and predict factors that	writing reactions to form	
	Apply concepts	affect rate of solution.	specific products.	Droppers of solutions +
	rippij concepts			Laminated test sheet

3.4.12 A	about the	The student will describe the importance and use of	Lab: Making Slushies	
	structure and	a volumetric flask for determining molar solutions.	(FP depression and	Calculator
	properties of		concentration)	
	matter.		Discussion of common	Supplementary Text
		Through the use of Solubility Curve data, the student	applications of solubility	
		will:	principles (antifreeze, ice	Internet Resources
		• define solution equilibrium and use it to	for sidewalks, etc.)	
	Apply the	determine if a solution is saturated,		CFF Resources
	Apply the	unsaturated or supersaturated.	Activity: Prepare Molar	
3.2.12 C	scientific inquiry	• compare the terms "concentrated and dilute" and tell how they relate to the degree of	Solutions	Computers and probes
	to solve multi-	saturation of any solution.	PowerPoint/Toondoo	
	step problems.	• Predict curves for various substances based	presentation: Chemical	
		on their solubility.	Makeup of Three	
	Evaluate	• Read graphs and write questions concerning	Common Solutions	
	computer	data on these graphs.	(student category choice – ex:	
0 7 10 D	operations and		cosmetics)	
3.7.12 B	concepts as to	The student will determine solubility of compounds		
	their	formed by various mixtures undergoing DR style	Daily Homework	
	effectiveness to	reactions.		
	solve specific		Problem Worksheets	
	problems.	The student will define the following concentration		
		units and perform calculations using them: molarity,	Quizzes	
		molality, ppm, % by mass.		
			Unit Test	
		a f collipstice proportion		
		of comgative properties.		
		The student will calculate the freezing point		
		depression and boiling point elevation for various		
		aqueous solutions using water's molal constants for		
		each change		
		cuch chunge.		
		The student will again differentiate among solution		
		suspension and colloid examples and behaviors		
		graphically representing these unique qualities on the		
		molecular level using manual or computer-generated		
		graphics (review of matter concepts.		
		Bruphies (101101) of matter concepts.		

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Acid and Base (p. 1 of 2)		
Key Learning(s):	Acids are dangerous compounds that release hydronium ions in aqueous solution. The strength of an acid is measured on the pH scale. Many household substances have acidic or basic qualities as shown by indicators. The concentration of an unknown solution can be determined by titrating it with a known solution using a buret.		
Essential Question(s):	How will I know which common household substances pose a danger to me? How can a physician determine the concentration of a substance in my body? How does the pH of a substance suggest its use and danger? What important properties are attributed to acids and bases I will encounter? How are acids and bases formed and what impact do they have on materials in our world?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
			Lab: Indicators	Texts: World of
3.1.12 A	Apply concepts of	The student will identify compounds according to		Chemistry
	systems,	the Arrhenius theory of electrolytes.	Lab: Alka Seltzer	
	subsystems,			Teacher-generated
	feedback and	The student will define the roles of the hydronium	Lab: Electrolytes	materials
	control to solve	ion and hydroxide ions in acid and base theory.		
	complex		Lab: Titration	Reference Tables
	technological	The student will utilize indicators to test for acidic		
	problems.	and basic properties of matter. Indicators to know	Lab: Antacids	Calculator
		include: litmus, phenolphthalein, BTB and cabbage		
	A 1 1	juice.	Lab: Formation of Acid	Student supplied samples
3.1.12 C	Access and apply		Rain	for discussion
	patterns in science	The student will give the structure and name of		
	and technology.	common acids and bases by memory and more	Class discussion	Household chemicals for
		complex acids using reference materials. The		testing
		student will use the accepted naming system for	Daily Homework	

3.1.12 E	Evaluate change in	acids.	Problem practice	Indicators and solutions for testing:
	systems and man- made systems.	The student will compare and contrast the properties of Arrhenius acids and bases	Worksheets	 Computer pH probes Indicator strips (as listed)
24124	Apply concepts	The student will learn the pH scale in common	Quizzes	 Phenolphthalein solution
3.4.12 A	and properties of matter.	hydronium ion = pH)	Unit Test	Previous lab data
		The student will distinguish between strong and weak properties of acids and bases.		 computer probes burets
3.7.12 B	Evaluate appropriate instruments and	The student will predict pH of common household substances by using indicators at home on items of their choosing.		 acid solution base solution phenolphthalein solution
	apparatus to accurately measure materials and processes.	The student will discuss that the term "neutral" means an equal number of hydronium and hydroxide ions, not that there are neither of each. $(pH=7)$		Supplementary Text Internet Resources
	Evaluate	The student will discuss why all solutions of salts		CFF Resources
3.2.12 B	experimental information for appropriateness and adherence to relevant science	formed in neutralization reactions are not neutral. The student will perform a titration with a known basic solution to determine by calculation the strength of an unknown acid.		Computers and probes
	processes.	The student will define and use tables of K_{sp} and K_a values to determine properties and solubility of compounds.		
3.7.12 D	Evaluate the effectiveness of computer software to solve specific problems.	The student will discuss how acid rain forms and the chemical changes it produces. The student will suggest and debate personal and government actions to minimizing its formation.		

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Organic Chemistry (p. 1 of 2)		
Key Learning(s):	Carbon is the basis of all living things. Carbon combines into a myriad of different molecules by making four covalent bonds. The properties of carbon molecules depend on the number and types of bonds.		
Essential Question(s):	How can carbon be so versatile? What are isomers and how do they form? What common substances are made of carbon?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
			Draw and name numerous	Texts: World of
3.1.12 A	Apply concepts	The student will review carbon's structure and its	examples	Chemistry
	of systems,	electron dot model that leads to its multiple bonding		
	subsystems,	capability.	Practice and review sheets	Teacher-generated
	control to solve		Decil dans de serle e se	materials
	complex	The student will differentiate among the properties of	Build molecules as	One and a Martal Cata
	technological	the three anotropes of carbon (diamond, graphite, soot)	formula	Organic Woder Sets
	problems	The student will investigate fractional distillation of	ioimuia.	Reference Tables
	problems	petroleum hydrocarbons with a focus on boiling points	Build isomers	Reference Tables
		phases, and vapor pressures of the different	Duna isomers.	Student supplied samples
3.1.12 B	Apply concepts	components.	Predict shapes and	for discussion
	of models as a	1	formulas from number of	
	method to	The student will review single, double and triple bonds	C atoms involved.	Supplementary Text
	predict and	and the shared pairs involved in each.		
	understand		Class Discussion:	Supplementary Handouts
	science and	The student will use molecular model sets to build and	Brainstorm examples of	
	technology.	name varieties of hydrocarbon homologs (isomers.)	household organics,	Internet Resources
			specifically automotive	

			products, cosmetics,	CFF Resources
			foods and cleaners.	Computers
3.1.12 C	Access and		Whiteboard Practice	Computers
	apply patterns	The student will draw and name various members of		
	in science and	homologous families of hydrocarbons including:	Diagram of distillation	
	technology.	• Alkanes	tower with compounds	
3.1.12 E	Evaluate	• Alkenes	labels by height on	
	change in	Alkynes Cyclics	column.	
	nature, physical	 Aromatics (benzene) 	Project Suggestion:	
	systems and	() Thomates (cenzene)	Create a household	
	man-made	The student will draw and name all homologs using the	inventory (database) of	
	systems.	IUPAC system of naming.	compared to the source of the	
3.4.12 A	Apply concepts	The student will convert structural formulas to	primary components.	
	about the	molecular formulas and back again and predict both	storage needs, biological	
	structure and	morecular formatals and back again and predict both.	& environmental hazards	
	matter.	The student will identify functional groups of new	of each and disposal	
		compounds including:	methods.	
		Halocarbons	Sort the database to create	
3.6.12 A	Analyze	 Alconois Carboxylic acids 	lists of:	
	that relate to		• similar chemicals	
	propagating,	The student will identify and draw monomers of	duplicate locales	
	growing,	organic polymers including but not limited to:	• room contents	
	maintaining,	• Proteins	• nazardous chemicals	
	adapting,	• Starch	Model Worksheets	
	converting	 Cellulose Plastics #1 7 		
	converting.	• Flashes $\#1 - 7$	Quizzes	
		The student will apply this information to that of the Recycling Unit to follow.	Unit Test	
			Evidence of	
			understanding will	
			emerge in the Recycling	
			Unit Project.	I

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	Waste Management and Recycling (p. 1 of 3)		
Key Learning(s):	The earth's resources are finite so must be managed safely and economically. Everyone is responsible for living as "green" as possible to minimize waste.		
Essential Question(s):	What are the pros and cons of different trash management strategies? How can I live a "greener" lifestyle with a smaller <i>Carbon Footprint</i> ? What happens to my trash when it leaves the curb?		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
4.3.12 A 4.2.12 B	Explain the difference disposal methods for toxic and hazardous waste. Analyze factors affecting the availability of renewable and nonrenewable resources. - Evaluate the use of natural resources and offer approaches for using them while diminishing waste.	 The student will relate organic chemistry to the structure and nature of trash and its disposal. The student will investigate types of waste generated by homes and businesses. Papers (office, news, glossy) Cardboard Plastics (codes #1-7) A1 Steel (Aerosol cans) Food Water The student will discuss the idea to "Reduce, Reuse and Recycle" and brainstorm ways to "RRR." 	NOTE: This makes an excellent "end of year" culminating assessment. (teams of 2 students for a single item) Trash Project: Lab report format with the following <u>suggested</u> components: Essential questions Procedure to collect data Discussion of the problem Discussion of "Being Green" and "Carbon Footprint."	Texts: World of Chemistry Teacher-generated materials Data Collection Chart (= one month duration) Lab reports all year long (as models) Phone Book/Internet Trash Bill Local business resources

			Diagrams/ photos	Family Assistance
		The student will research the pros and cons of the following waste management options:	 Class & teacher data Personal data 	Reference Tables
4.2.12 D	Evaluate solid waste management practices. Research new technologies in the	LandfillIncinerationRecycling	 Trash Hauler info Local Recycler info 	Student supplied samples for discussion
	of materials	 Composting 	 Lists of recyclables 	Supplementary Texts
		The student will collect personal data for one month at his home, share it with class and collect	• Chart of #1-7 plastics properties,	Internet Resources
3.8.12 A	Synthesize and evaluate the	classmates' and teacher's data.	examples and usesCalculations:	CFF Resources
	interactions and constraints of society	The student will select a specific trash item, do research and share with class the following info:	3 or more graphs created from class	Computers
	and technology on society.	Chemical Composition (with molecular data from Organic Unit)	and personal data utilizing all styles	
3.8.12 B	Apply the use of ingenuity and	 Ideas for Reuse Disposal Options 	as appropriate (line, bar, pie)	
	technological resources to solve	Hazards to EnvironmentAlternatives	Conclusions about	
	and improve the quality of life.	The student will create a "reuse" for the item of choice and bring it for "Show & Tell"	Solutions suggested Vocabulary learned from	
	1 5	choice and orning it for show & ren.	project	
3.8.12 C	Evaluate the consequences and		PowerPoint Presentation (in lieu of paper report)	
	impacts of scientific and technological solutions.		Daily Homework	
3.2.12 A	Evaluate the nature of		Charts and Graphs	
	technological knowledge.		Quizzes	
3.2.12 C	Apply the elements of			

	scientific inquiry to solve multi-step problems.		
3.2.12 D	Analyze and use the technological design process to solve problems.		
3.6.12 A	Analyze biotechnologies that relate to propagating, growing, maintaining, adapting, treating and converting.		
3.6.12 C	Analyze physical technologies of structural design, analysis and engineering, personnel relations, financial affairs, structural production, marketing, research and design to real world applications.		
3.5.12 B	Analyze the availability, location and extraction of earth resources.		

Northern York County School District Curriculum			
Course Name:	Chemistry 4325		
Content:	States of Matter and Kinetic Theory (p. 1 of 2) NOTE: This unit may be minimized or deleted at year's end.		
Key Learning(s):	Chemists make predictions about the motion of molecules and the attractions between them based on the Kinetic Theory. We can relate substances' physical states, particular arrangements and behaviors of gases on conditions and changes of both pressure and temperature.		
Essential Question(s):	What factors determine the state of matter in which a substance exists? What laws describe the behavior of gases? What is meant by "STP?"		
Grade Level:	11-12		

Number	Standard	Student Learning Experiences	Procedures for Assessment	Resources
3.1.12 B	Apply concepts of models as a method to	The student will review Kinetic Theory of Matter. The student will distinguish between real and ideal gases, and conditions necessary for both.	Lab: Density of a Gas Lab: Boyles' Law (w/probes)	Texts: World of Chemistry Teacher-generated materials
	predict and understand science and technology.	The student will understand the need for standard conditions known as "STP" and learn the values for STP, perform practice corrections to STP and make actual lab data corrections utilizing reference materials.	Lab: Charles' Law Demo: Determination of Absolute Zero	Lab Materials: • Pressure bulb • Thermometers
3.1.12 C	Access and apply patterns in science and technology.	The student will define pressure and convert among all common units of pressure (torr, mm Hg, kPa, atm, psi) The student will describe how a barometer and a manometer are used, draw diagrams of each, predict	Lab: % O ₂ in Air Lab: gases of the Air Lab: Collecting Hydrogen over Water	 Water of varying temperatures Small tubes of trapped air Barometer
3.1.12 E	Evaluate change in nature, physical systems and	pressure readings from such diagrams of each, predict workings of common examples of manometers (ex: tire gauge.).	Lab: Collecting Butane Demo: HCl and NH ₃ "Race"	 Manometer Tire gauge 22.4 L box to view Eudiometer tube Butane lighter

	man-made	The student will calculate the density of various gases at	Class Participation	
	systems.	STP and verify them using reference tables.	(whiteboard problem	Calculator
			solving)	Reference Tables
3.4.12 A	Apply	The student will state Avogadro's Law (1 mole of any gas = 22.4 L_{\odot} (8 STP) and perform calculations based on this law	Create pie graph of air.	
	concepts	22.4 L @ 511) and perform calculations based on this law.	Create graph of lab data	Supplementary Text
	about the	The student will state and perform simple calculations based	to predict value of	
	structure and	on the following laws:	absolute zero (again)	Internet Resources
	matter	• Boyles' Law (PV = k)	ubsolute zero (uguili)	CEE Descurrees
	matter.	• Charles' Law $(V/T = k)$	Class Discussion of	CIT Resources
		• Gay-Lussac's Law (P/T=k)	everyday examples of all	Computers and probes
		• Combined Gas Law $(P_1V_1/T_1 = P_2V_2/T_2)$ • Ideal Gas Equation (PV-pPT)	laws.	computers and proces
3.7.12 B	Evaluate	• Ideal Gas Equation (1 V – IK 1)		
	appropriate	The student will observe vacuum jar and testing of various	Internet Research:	
	instruments	samples (= PV relationships)	Finding Sample	
	to accurately		Experiments (ex: not air	
	measure	The student will define and discuss the need for the Kelvin scale of temperature, thus creating the value known as	can explosion)	
	materials and	"absolute zero"		
	processes.		Daily Homework	
	Ŧ	The student will perform conversions to Kelvin from Celsius	, j	
3.4.12 B	Apply and	and the reverse.	Problem Worksheets	
	analyze	The student will state Dolton's Low of Portial Prossure (P -		
	energy	$P_1+P_2+P_2$ and perform simple calculations based on this	Quizzes	
	sources and	law (ex: gas collected "over water")		
	and their		Unit Test	
	relationship to	The student will list common gases of the air by percentage.		
	heat and	The student will list the properties of each common gas (O		
	temperature.	N_2 , N_2 and perform lab tests to determine the identities of		
	-	these colorless, odorless gases.		
		-		
		The student will understand the need for a correction to		
		dry pressure when gases are collected		
		State Graham's Law of Diffusion and perform calculations		
		based on this law to determine the relative rates of diffusion		
		of gases of varying masses.		